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Newsrooms Facing Radical Change

Picture-Based Editing, Disk-Based Automation Lead New Technologies

by Chris Dickinson

LONDON

Broadcast station newsrooms are set to undergo radical changes in the next few years, with major manufacturers showing new solutions designed to increase speed and flexibility.

Everyone in newsroom design has known for some time that the world they inhabit was about to be forever altered by the introduction of picture-based editing and control. Digitally compressed pictures acceptable to news editors and the arrival of affordable disk storage systems are now on the verge of recreating the modern news environment.

WHAT'S NEXT?

So what can users expect from the newsroom manufacturers?

Avid, for one, has come from practically nowhere four years ago to a \$140 million-a-year business and brand leader today. The

company has already introduced NewsCutter, its stripped-down desktop editing system aimed at the news environment, and AirPlay, a disk-based playout machine. There are also plans for a disk-based camcorder, part of a collaborative venture with Japanese camera manufacturer Ikegami.

Avid has also been developing its own networking system, AvidNet, which is designed to transport compressed digital signals over Asynchronous Transfer Mode (ATM) networks.

Most recently, AvidNet was billed as the company's answer to an integrated newsroom system. However, the recent purchase of BASYS Automation System's newsroom products division will change things.

Peter Davies, vice president of Avid's European operations, said it will take several months to integrate BASYS and Avid products, but eventually broadcasters will be able to combine video, sound and text on every desktop in the newsroom.

A second acquisition, announced simultaneously with the BASYS deal, netted SofTECH Systems, a Windows-based newsroom automation software developer. SofTECH will be moved to Avid's Californian R&D operations. Its software skills add much-needed Windows potential to BASYS, which is still trapped in dowdy DOS screen control.

"As a result of our move into broadcast systems, we have, for a period of time, appreciated the fact that the market is looking for a one-stop solution for editing, archiving and newsrooms," Davies said. "With BASYS and SofTECH, we saw a window of opportunity to

provide that solution."

Avid and BASYS have actually been working together for some time developing interfaces between Avid products and the BASYS newsroom. So when BASYS was put up for sale by its parent, computer giant DEC, the Macintosh-centered Avid moved in. Whether BASYS' DEC hardware platforms will now be swapped for Macintosh remains to be seen, though Davies stressed that nothing radical will change for a while.

"One of the advantages BASYS has is that its products are very sound and very stable," he said. "Also, BASYS systems are actually hardware independent."

EDITING WINDOWS

For the future, the Avid/BASYS/SofTECH newsroom will consist of Windows-based

editing, audio and script control on each journalist's desktop, networked together with a central computer storage system and with either direct playout to air through the computer or control of a tape-based cart machine.

Avid, of course, is not alone in having this vision. Dynatech NewStar, BASYS' big rival, has been working toward a similar goal for some time. In January 1994, Dynatech purchased non-linear editing system manufacturer EMC and has since been working on integrating EMC's technology into NewStar newsroom systems. NewStar also gets important

(continued on page 6)

Data Translation's Media 100 draws raves at Toronto MacWorld.

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Australian TV Plays Asian Role
See Page 4



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TRADE SHOWS

NON-LINEAR EDITING SPARKS INTERBEE '94

TOKYO

As had been expected, non-linear storage, with applications such as video-on-demand and digital compression were the major interests at InterBEE '94 in November.

The 30th annual show drew nearly 25,000 visitors and 438 exhibitors.

But while the show featured many new products, most new items had been expected and there appeared to be a lack of true innovation that has characterized previous events.

Said one attendee from the U.S.: "I knew what was to be exhibited here before I left home. The only thing we need is the memory with more capacity, more speed and lower cost."

As in other shows around the world, many of the most interesting products were presented at events just prior to InterBEE. Sony, for example, recently held a private product introduction exhibit in Tokyo, and a recent show in Yokohama featuring SGI equipment drew a substantial audience.

However, InterBEE did draw crowds around the new non-linear editing systems. Although the popular conception is that the technology is not quite ready for introduction into broadcast facilities, it is being carefully watched by station engineers.

The show also featured lengthy discussions of new digital distribution systems and the so-called "information superhighway."

"Every day, the news chronicles report another field test of digital delivery to the home," said Scott Ross, of the U.S.'s Digital Domain. "But the wire is not what is important in the long run. It is what runs over the wire — the content — that sells."

Although Japan has played a major role in broadcast equipment over the past 30 years, it was the consensus at the show that it needs to concentrate on the software control of such broadband digital systems to maintain leadership in the future.

TRADE SHOWS

MULTIMEDIA GROWS AT PHOTOKINA

COLOGNE, GERMANY

Multimedia technology was highly visible at Photokina this year, with nearly every stand in the professional video section clearly aimed at that market.

Although the concept of multimedia has repeatedly come under attack in Europe for not being clearly defined, a stronger idea is emerging in Germany of a computer-based video and audio processing system linked to a variety of mailboxes, banks and the Datex-J national mailbox operated by the state tele-

phone company, Telekom.

At present, Datex-J provides 2400-baud communication, which is rather slow, even for text files. But with new links to the Internet, most equipment and software suppliers are targeting a future market of desktop video producers and users.

At the show, two stands were almost overrun with attendees: Fast Electronics and Silicon Graphics. Fast has been attending Photokina since it launched its first desktop video cards in 1990. The cards have made an enormous impact on the market with many of the entrants in video art contests using cheap PC cards from Fast.

While this was the first Photokina for Silicon Graphics (SGI), crowds at the stand almost made demonstrations impossible. Said one SGI spokeswoman: "This is where the market is at. This is just the beginning."

Photokina was also the venue for the European SMPTE conference. Ken Davies, vice president of engineering at the Society, opened the conference by calling attention to the "convergence" of technologies. Once disparate industries such as audio, video, computers, etc., are all converging on a digital architecture, leading to dramatic changes in the way each operates.

Ulrich Frank of the Business Information Department of Koblenz University spoke of the emerging broadband "wide area networks" that, he said, will have profound effects on the professional domestic markets.

David Larsen of Silicon Graphics addressed the need to prepare for an interactive future. He also stressed the word "convergence" when referring to the melding of television, computers and the print media onto a single multimedia architecture.

NETWORKS

EU REJECTS TELECOM PROJECT

BONN, GERMANY

The three backers of a massive video distribution project in Germany are "shocked and dismayed" at the rejection of the plan by EU Commissioner for Competition Karel van Miert.

The venture, Media Service GmbH (MSG), was designed to reach more than 20 million homes with digital TV and other multimedia services by the end of next year.

The three owners, state telephone company Deutsche Telekom, media conglomerate Bertelsmann, and program wholesaler Leo Kirch, were notified in November that MSG in its planned format will not be allowed. The reasoning behind the decision was that the project would become an effective monopoly of digital cable television in Germany with complete control over access to the network.

This is the second time the EU has blocked a major enterprise of this nature. van Miert pointed out that the decision was made with the full support of the German Kartellamt, the monopoly control board.

Still, the decision did not sit well with the project's backers.

"We are at a loss to understand the decision, as we had detailed a whole range of safety measures, including an independent board of program suppliers who would ensure free access and fair treatment for all," said Klaus Czerwinski, a spokesman for Deutsche Telekom.

Shortly after the decision, all three companies began talking about "alternative possibilities," but declined to say what they were.

"We are looking at the decision and have to decide whether to try again with the existing partners, take new partners on board or try going it alone," Czerwinski said.

BUSINESS

SONY PUSHES EAST EUROPEAN SALES

BASINGSTOKE, U.K.

Sony Broadcast has launched a major effort in Eastern Europe, opening several regional sales offices in the area.

The company recently opened sales offices in Warsaw, Poland, Prague, Czech Republic, and Budapest, Hungary. The offices will give Sony more direct support of dealer and distributor networks in the region.

"With the abandonment of SECAM, Polish broadcast professionals are looking to be an even more powerful force within the cultural climate of Europe as a whole," said Tadeusz Cichowicz, manager of the new Warsaw office.

One of the main tasks for all three regional offices will be to support Sony installations. In Poland, state broadcaster TV Poland has installed more than 20 Digital Betacam VTRs, as well as numerous BVP cameras, PVM monitors and a fleet of OB vehicles.

COMPUTER VIDEO

FAST CONSIDERS MOVING TO U.S.

MUNICH

Mathias Zahn, owner of Fast Electronics, is considering moving the company headquarters to Redwood City, California, to escape German taxes and government interference.

Zahn, 37, developed his company as a manufacturer of "dongles," hardware devices designed to prevent illegal copying of software.

Although the jump to multimedia systems resulted in a five-fold increase in sales since 1990, Zahn said neither the private sector nor the government seems willing to provide credit for future investment. Credit has increased only 50 percent in the past five years.

To make matters worse, the state of Lower Saxony recently donated a research grant to Munich-based company Digital Devices Development to create a system similar to Fast's Video Machine as a way to create high tech jobs in the area.

Although Zahn admits that Fast could also apply for research grants, but he says that it involves too much paperwork, and the bureaucratic delay can slow the introduction of a new product for up to a year.

"It is not subsidies I am looking for, but a level playing field," he said.

German banks flatly refuse to lend large sums without physical collateral, such as buildings and machinery, and they regard the computer industry as high risk.

Fast currently has a staff of 14 in Redwood City. Zahn said the other major reason he would move the company is the German corporate tax, which last year consumed 55 percent of the company's profit. In addition, the German national wage average is \$25 per hour.

"The desktop video market is 10 times bigger in the U.S., and it is a perfect place to keep an eye on new technology," Zahn said. "But we have not made a decision yet, and if we do it will not be easy. We shall keep our research and development in Munich. It is a good place to work and the standard of engineers is high. There is also less chance of them being lured away by the competition."

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Vol 13, No 1
JANUARY 1995

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 **TV Technology** (ISSN: 0887-1701) is published monthly, except for April and December which have 2 issues, by Industrial Marketing Advisory Services, Inc. 5827 Columbia Pike, Suite 310, Falls Church VA 22041. Phone: 703-998-7600; FAX: 998-2966. Second-class postage paid at Falls Church VA 22046 and additional mailing offices.
POSTMASTER: Send 3579 forms and address changes to TV Technology, P.O. Box 1214, Falls Church VA 22041. Copyright 1995 by Industrial Marketing Advisory Services, Inc. All rights reserved. For reprints contact the author and TV Technology.

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Member, Business Publications, Audit of Circulation 

PRINTED IN THE USA

Australian TV Plays Asian Role

by Barrie Smith

SYDNEY, Australia

Australia is fast becoming a political focus of Southeast Asia and the South Pacific. Australians are continually being told their country is now "part of Asia" — shrimps on barbies et al.

Unfortunately, the basic clumsiness of many Australian leaders traveling in the area makes this combination a treacherous task.

However, one government-funded organization is setting matters to right.

AusTV — Australia Television International — was established in late 1992 after the gov-

ernment approved a plan by the Australian Broadcasting Corporation (ABC) for a satellite service covering most of Southern Asia.

With a start-up cost of A\$5.4 million, the ABC established an operating base in the city of Darwin in the Northern Territory. The facility houses three edit suites, two with Sony Betacam SP BVW 75P recorders and BVW 65P and BVU 800P playback machines. A third suite houses two BVW 75Ps and one BVW 65P.

The facility also holds an interchange booth with four BVW-75Ps, while graphics are handled by a Quanta Delta character generator, an Ampex ESS-3 stillstore and a G2 paint-box.

STUDIO SETUP

In the studio, AusTV has placed three Ikegami 355P CCD cameras with Fujinon remote pan/tilt heads. All cameras are linked to a Ross vision mixer, a Quanta Delta and an E-flex DVE. There is also a Master 21 presentation switcher plus a Grass Valley 110 switcher.

Central routing is handled by a 50 x 30 matrix with seven 16x1 remote switchers. All routing is analog.

Programs are aired from a Sony FlexiCart machine containing four BVW 75Ps, plus three BVW 75Ps for recording incoming signals.

Programming comes largely from ABC's facility in Sydney some 1200 miles south, supplemented by news coverage from a team in Darwin. Also carried are five audio channels consisting of TV sound and 24-hour programming from Radio Australia, the ABC's external radio service, plus three other channels that are unused at this point.

The station's primary coverage area, receivable on 7- to 13-foot dishes, takes in southern China, northern Australia and Papua New Guinea and west to Bangladesh with Indonesia in the footprint's center. The fringe area (dishes 26-48 feet) reaches Korea, Sri Lanka and Vanuatu.

The satellite is the Indonesian-owned-and-operated Palapa B2P, which carries a host of services from numerous nations.

AusTV's current operational budget is believed to be A\$6 million, which is small compared to other carriers. But the ABC accomplishes this by relying on the corporation's extensive program resources.

AD SUPPORT

From the outset, it was decided the operation would also receive funding from advertising. Ad rates begin at A\$55,000 for a three-month campaign. A 12-month campaign sells for A\$460,000.

The ABC believes it can offer a unique service in terms of the quality and range of programs. Many of the other satellite services are news only, while operations like HBO run only movies.

Programming is determined by the ABC board, with input primarily from ABC schedules. Editorial guidelines ensure material is suitable for the multiplicity of cultures in the viewing area.

Each night of the 24-hour-a-day service contains two half-hour newscasts, plus frequent updates in Bahasa Indonesian, Thai, Cantonese and Mandarin. There are also special international editions of current affairs and business programs. Other programming consists of Australian comedy, dramas, children's and lifestyle titles. The national obsession — sports — fills out the rest.

Program material is delivered in many ways. Much of it — like weekend sports — arrives as live feeds from other satellite sources.

Prakash Mirchandani, AusTV news director, said the audience is informed of upcoming events "largely through newspapers and TV guides that publish the programs in most countries."

"We have a fax poll number as well, which we advertise for anyone who wants to get program information," he said.

Mirchandani said audience feedback has been "very positive — particularly the responses we get from very senior people in government. The biggest draw is the news service: a lot of people feel it is probably the most regionally focused news service, preferable to the BBC and CNN."

An unlikely foe at the outset of the service was the Northern Territory government, fearing that clumsy "southerners" would tread on their unique links with Asia. But, according to Mirchandani, the authorities are now calm.

Operations are run from the ABC building in Darwin. The compact building accommodates about 60 people.

SHARED EFFORT

Engineer John Yip explained that a variety of companies were responsible for the installation. Varian provided its Klystron high-power amplifiers (HPAs). Scientific Atlanta delivered a 26-foot satellite dish, while Wegener Communications installed audio modulators. Most of the studio equipment is from Sony.

"Programming goes into the uplink chain of the earth station," Yip said. "The uplink chain comprises a number of processing units, which include the Wegener modulators to provide the subcarrier modulation. The signal then goes into the exciter — a video modulator and upconverter — lifting it to a 6 GHz signal. Here it goes into the dual-redundancy Klystron HPAs, then to the dish itself."

"The signal is received by the satellite and then is downlinked as a 4 GHz signal," he added. "The set frequency is 6.105 MHz up, and 3.880 MHz down."

"In the Darwin earth station we have a downlink chain which allows us to monitor 'off air' to (make sure) the parameters are correct and to detect any measurable interference."

"The TV sound is on a subcarrier of 6.8 MHz. Radio Australia (ABC's external service) is on 7.2, using the Wegener Panda I modulation. This uses straight-forward FM modulation, which is an inefficient use of the Panda. When we want to add more subcarriers or sound channels, we have to resort to the Panda I. This is a more efficient type of narrow band modulation, giving the same results but occupying much less bandwidth."

"In order to transmit additional sound channels using the Wegener, we just plug in separate cards. Then it will send the signal out — all these subcarriers are independent of each other. Normally within that bandwidth you could only carry one channel."

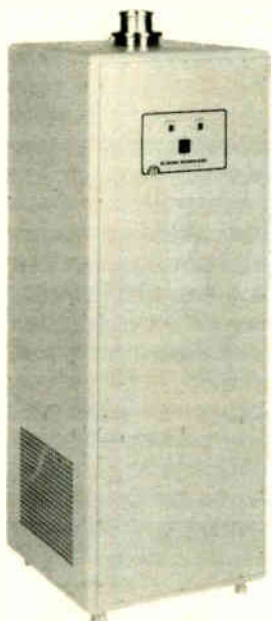
Later this year Australia Television's service will be carried on a Hughes Apstar satellite, although Palapa will continue to carry the signal as well.

The far-reaching Apstar, with a much more powerful signal, will extend coverage to all of Asia, the Middle East and parts of Europe and Africa — most of which could be downlinked to dishes as small as 6 feet. It is hoped the footprint will also reach Moscow.

These plans have yet to overcome government worries about the financial viability of the service, with the Minister of Communications asking for an audit. There is also some ethical concern within the Labor government and ABC staff groups about reliance on commercial sponsorship of an international service presenting the national voice to Australia's neighbors. ■

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Multimedia in Germany

BONN, Germany

German telephone company Deutsche Telekom (DT) has undertaken a rash of multimedia test projects in recent months, although the effort has met with some criticism from within the German programming community.

Through its testing program, DT plans to make Germany a leader in interactive multimedia. The largest project is a 4,000-home field test in Stuttgart conducted jointly with the city's existing cable system and using equipment donated by Hewlett-Packard, IBM and Alcatel.

The project uses a 5-megabaud (five million bits per second) digital system that operates on the cable system's spare capacity known as the hyperband. It is planned to provide access to home banking and data banks, as well as pay-per-view programming.

However, critics of the new system point out that home banking and other information services are already available for a flat rate of DM6 per month as part of the Dtex-J system, which is available to anyone with a telephone line and a modem. Currently, there is little incentive for people to pay more to get the same services through their television sets.

The system has met with little enthusiasm from program providers. Television stations and program sales companies throughout Germany have been asked to donate their latest films, although no one has accepted the offer yet.

A spokesman for Deutsche Telekom said no plans have been made to purchase programs.

"We expect the broadcasters and other service providers to pay for the use of the system," he said.

Jurgen Doetz, manager of German channel Sat1, said that without support from terrestrial broadcasters, the project stands little chance of success.

"These projects are only of any real value if they are supported by the broadcast industry," he said. "The only programming that we have access to that we could donate are old local news programs. The chances of anybody wanting to pay for something like that are very low."

A program director for another channel put it even more bluntly: "They have not even begun to think the thing through. Quite honestly, I do not think that they have a clue what they are doing." ■

Just A Little Compression Here, Sir?

by Paul McGoldrick

GUEST COMMENTARY

The message coming from the papers at the 136th SMPTE Technical Conference held in October as part of the World Media Expo was hardly mixed. Whether the conference organizers meant it or not, the only paper offering any real disagreement with the currently vaunted JPEG and MPEG standards of compression was the first of the morning, held at a time when most of the delegates were immersing themselves in their first coffee of the day or still lining up at a downtown hotel for a shuttle bus to the Los Angeles Convention Center.

It also seemed that the questions proffered to non-MPEG supporters were in the form of rather antagonistic statements instead of real desires for information — sound bites spat out to try to negate the benefits of any other system.

To say that MPEG has a lot to offer for the future is a non-controversial statement; to say that it is the be-all and end-all for compression needs is vaunted hype from a few. It is unfortunate that pure engineering concerns and the clout of big business should collide in this way.

Without joining in on the controversy, let's try and put what we were told at the conference in perspective as far as uses, benefits and potential futures are concerned.

DIRECT ACTION

The most direct statements about JPEG vs. MPEG undoubtedly came from Steven Vigneaux of Avid. It is natural that Avid, being very much in the editing business, should be rather concerned that the format they use for compression be capable of being edited — they want to be in business, right?

Avid feels strongly that MPEG is not editable on an intra-frame basis with the current standard and technology and is, therefore, not of any use today for them. Yes, they have people working on MPEG solutions, but they are not for today. Ah, retort the critics, you should regard MPEG as a tool kit: select one of the lower levels and you can edit.

Then came a small bombshell from a Sony delegate (Hugo Gaggioni) with an obviously very informed prophecy: that full MPEG editing would be seen at NAB 1995.

The negative thrown out against JPEG at the same time was that the multi-generational capability is "difficult." Whether there are degradation problems with multiple generations is obviously for the potential user to decide with his own material in his own time; the Avid position on editing is certainly valid today, however, and for those who want to use an easily available, low-cost compression technology, JPEG is here today and is undeniably the dominant standard for disk-based systems.

The compression costs for MPEG are high today while the engineering cost reduction programs concentrate on the decoders, particularly for the consumer set top. There

was ready agreement from the speakers that MPEG 1 compression costs will not reduce until 1996. Mihailo Stojancic of IBM Microelectronics described a VLSI implementation of MPEG 2 decoding, and some ideas of where further integration is going to take place were discussed.

A HIGHER QUALITY

An "optimized" version of JPEG is also used by Panasonic in its WJ-MX1000 (formerly Postbox) non-linear editing system. The company feels the quality of the system is as good as VHS, Ralph Biesemeyer explained, and Panasonic is working on higher-quality versions.

The "optimization" employed in the process is fixed-length encoding, as compared to the JPEG variable length. The result is a much more straight-forward recording process but, as Biesemeyer acknowledged during questions, there would be quality variations as picture material changes. Relevant or not, visible or not in its current version, it is a limitation that could be problematical at higher quality levels.

Developments in the majority Sony/Philips consortium on the White Book standard for MPEG use in interactive media were outlined by Jeff Niedermayer of Optimage. The soon-to-be-released 2.0 version (replacing 1.1) takes the interactive control of the software away from the recording medium itself (the Video CD) and into the controlling hardware.

The other main improvement in version 2.0 is that it allows the recording of both high- and low-resolution stills, which would make the Video CD one of the largest still library sources available, and also allow the introduction of menu screens. The current standard allows replay on Video CD players as well as on CDI, CDO and even on PCs or Macs with an MPEG playback card.

Bernard Tichit of Thomson Broadcast described the DSS (DirecTV) implementation of MPEG 2 for Hughes direct-to-home satellite service in the U.S. The system allows very high-quality video with "CD" audio quality

and provides four to eight channels for each satellite transponder. DirecTV offers more than 100 channels and is the largest Direct Satellite Broadcasting (DSB) capacity to date.

Dr. Paul Haskell of Compression Labs, Inc. (CLI) added dramatically to the confusion of this company's direction, emphasizing MPEG solutions for three quality levels: video telephony, group teleconferencing, and distribution video (the latter is a quality definition, so it would include medical imaging, for example, even though that is unlikely to be distributed).

The confusion? The chairperson of the session — Karen Mills of White Light Video — asked a question about video servers of Dr. Haskell and CLI's position on them. The answer basically stated that CLI would depend on others' hardware for such functions. The Desktop Video Group and the Broadcast Group at Compression Labs are not totally communicating with one another.

TWO SYSTEMS

Mark Koz of compression equipment manufacturer Future Tel reminded the delegates of a misconception that is prevalent: that MPEG 2 will be a replacement technology for MPEG 1. He emphasized that it is not; both are international standards and MPEG 1 can, in fact, produce higher-quality pictures at a lower data rate.

The best example of this is the distribution of a News for Cable program from San Francisco station KRON to cable headends along standard T1 telephone lines (at 1.5 Mbps). Any other distribution system, such as fiber or satellite, would not have been economical for the introduction of the programming.

Separately, Craig Porter (KRON's chief engineer) reports that there have been no negative comments on quality from viewers of the news program.

Also in the Telco arena, Richard Mizer of Pacific Bell explained how various movies were now being quality controlled and edited on telephone circuits; "Jurassic Park" was one, with the Skywalker Ranch linked to Spielberg in Poland. PacBell now offers a parallel compo-

nent digital tariff on DS3 circuits using Alcatel (Telettra) codecs and Dolby audio coding. PacBell feels that 6:1 compression can, in the future, offer lossless transmission for masters and the company will offer service for analog and digital, component and composite signals.

Mizer also pointed out an oft-forgotten point: the actual DCT process already offers some compression, before any algorithm, and it is totally reversible.

So, what of that lonely early-in-the-morning paper alluded to at the beginning of this piece? The paper was given by Dr. John Huffman of Aware. Dr. Huffman's paper was entitled "A Wavelet Image and Video Compression Bitstream." A little explanation is perhaps in order here as this area is murky in mathematics and equations that are well beyond virtually all of us.

Standard compression techniques are mostly based on a four-stage process in the encoding and the reverse in the decoding. Normally there is pre-processing (this is generally set to remove a lot of the hopefully non-visible parts of the video signal that the encoding process is going to hiccup on), a motion-compensation system, DCT (Direct Cosine Transform), and then the quantization.

The heart of all compression systems is in the process of the transform, which in standard DCT is a frequency transform, mathematically a continuous function. Wavelet Bitstream protocols are a spatial transform and are discrete mathematical functions: a view of where and when a signal occurs instead of just the frequency. Supporters of Wavelet compression would argue that DCT is a 20-year old (but only now finding functionality in areas such as standard converters) and is the base level of a Wavelet protocol.

Most of the prestigious universities in the United States that have DSP research programs are looking at various aspects of wavelets, and a number of government programs are looking at their use in specialized programs: from "spook" areas to the relatively mundane problem of compressing

(continued on page 6)



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CONTINUED FROM PAGE 1

Changes Loom for News Systems

input from Dynatech's Utah Scientific and DigiStore activities.

Charlie Raynsford, technical support manager for NewStar, said numerous manufacturers are joining the newsroom revolution.

"What we have found as a supplier of newsroom software is that everybody's integrating newsrooms into other servers," he said. "The trend is for integration under Windows NT to make other applications available to journalists."

NewStar is an open system, which can be supplied as a software-only package for integration into a broadcaster's own hardware systems. But Dynatech is also developing hardware platforms that make it easier for journalists to access, edit and play out material. One of these systems is EditStar.

"A key feature of EditStar is its ability to potentially edit footage from rushes or live feeds in NewStar, whereby a journalist will take footage in and look at it on the workstation, edit and apply scripts and audio," Raynsford said. "An EDL is then produced from the desktop PC and the journalist then cuts into a VTR for editing."

"Where we compete with what I believe

other manufacturers are doing is with our DigiStore product," he added.

This is a super-PC with hard disks that take in various forms of PAL, NTSC, PAL component and digital component signals. It acts like a Beta Cart, giving instant access to clips.

NewStar also offers three levels of seniority in the newsroom: journalist, editor and senior editor. This allows the broadcaster to lock out basic journalists from functions such as accessing running orders. Editors will give the OK for a story to air, but final approval from a senior editor is needed before the material is allowed by NewStar to play.

SONY SOLUTIONS

Over at Sony, designers intend to build on the company's long track record in the news environment with its camcorders, edit suites and Beta Cart machines. The result will be a much wider approach to the news operation.

Sony is openly showing its hybrid desktop editing system, the DES-500, featuring a combination of VTR and disk storage control in the same workstation. But John Ive, Sony's European divisional director of broadcast and professional audio products,

said the DES-500 is only one aspect of a total solution for the newsroom.

"Don't get too hung up on the DES-500," Ive says. "In terms of news, we are coming from a different direction. Up to now, you have been able to run a newsroom system as a separate operation, with a fairly simple interface to your airplay device, but with editing done totally separately. We are coming with the idea that news needs to be more integrated, while, at the same time, journalists do not want their desks cluttered with different screens and keyboards. So we have to manufacture an integrated system."

"The second point comes when you think that some newsrooms have in excess of 100 individual terminals," he added. "If they are all to be capable of accessing video, plus providing 10-12 sophisticated edit suites and X number of lines in and out, you have one enormous video transfer challenge on your hands. We envisage building on a serial digital infrastructure in which there is no limit to the capacity."

"Other manufacturers are trying to approach the problem by building up a system from a workstation. We are saying that is not the right way to approach it. Start with the infrastructure and add the elements to it. This is where S/X comes in."

S/X is the latest code name for Sony's digitally compressed networking technology, first shown as S-PEG in a back room at NAB in March. Though the technology is still in development, hence Sony's reluctance to show it on the floor at IBC, S/X is a variant of MPEG 2 and uses a video signal compression algorithm based on Discrete Cosine Transform (DCT) technology (found in a large number of products, including Digital Betacam).

The prototype standard works by converting video signals to data. Multiple, compressed video signals can then be sent in one data stream.

Ive said Sony will consider working with existing newsroom system companies or go it alone, offering a complete solution. He added that the DES-500, or at least the technology within it, is the potential editing device within the newsroom system.

PEN IN HAND

An alternative approach to the news editing side comes from Quantel, which has Newsbox, a non-linear editing system based on the company's proprietary pen and tablet control. Quantel has eschewed integration of picture editing on a newsroom control system, opting instead for creating a user-friendly editing system journalists might find easier to use.

Newsbox comes either as a stand-alone product or networked with a Quantel Clipbox hard disk storage system and up to eight workstations. David Scammell, marketing manager at Quantel, said a standard-size individual Newsbox can store 30 minutes of compressed video, with Clipbox able to store 30 hours compressed or eight hours uncompressed video.

"Because Clipbox gives you a central pool of storage capacity, you've got incredibly high throughput," Scammell said. "It also allows people to move away from acquiring expensive VTRs and playout machines. You only need one replay machine and something to record onto, and it will play out straight to air."

BTS' approach to the newsroom, shaped by a new customer-first management style at the company, is based on its Media Pool video

server, officially introduced at IBC. Media Pool is a disk-based cart machine, in that it can handle video, audio, stills, text and data. It has variable compression rates, and can handle upwards of 100 hours of full bandwidth video.

Ruttger Keienburg, BTS' new president and CEO, said the company is working with third-party developers to design applications for Media Pool.

"Software applications include broadcast and post production, be it news or non-linear editing in the on-line suite," Keienburg said.

The media costs of the system work out to less than US\$1 per megabyte, he added. Already, the PBS and ABC networks in the U.S. have announced plans to test Media Pool. ABC will use the system in its New York facilities for compiling sports material. At PBS, Media Pool will initially be used for managing playout across all U.S. time zones, eventually transferring all programming feeds to the system.

For its part, Panasonic has launched a new single-rack cart system capable of playing out two separate channels in a totally automated system. Dubbed Smart-Cart, the system was demonstrated at IBC in a combined disk and tape system and running under Panasonic's MARC 8000 software.

Steve Owen, Panasonic Broadcast's general manager of engineering, said the company is also developing new optical disk technology that will complement its top-end D- digital component VTRs, D-3 digital composite and forthcoming quarter-inch DVC digital component formats.

"It is a more flexible variant of magneto-optical recording that uses proprietary Matsushita [the parent of Panasonic] technology," Owen said. ■

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Compression Battles Continue in the SMPTE

fingerprint records.

Much international acceptance of wavelets has been gained but we have, perhaps, only one video example that we have met: the ImMIX Video Cube. High quality, easily scalable quality (either by resolution or computational power), software decoding, and transcoding abilities are some of the benefits put forward by the Wavelet supporters.

For telco operations, Award and Analog Devices promise LSI devices in the second quarter of 1995. There are also going to be consumer devices using the technology at CES next year.

Which system is going to be what we see? KGO-TV's Jim Cassebella explained that the station is ABC's selected guinea-pig for conversion from a tape-based operation to an all-digital server station. For the moment, the station is staying full bandwidth for commercials — a political reason, he said. However, the staff is still arguing over the degree of compression, if any, to apply to program material. KGO is certain, however, that anything the station masters will be archived to the highest quality possible.

We were also reminded that MPEG 2, despite having hardware already available, is not yet an approved international standard. That was described as unusual, but it seems all too familiar. It is another de facto standard, in this case with many, many, proprietary implementations. This seems to constitute a lack of standards.

The industry is also very unclear about the position of Intellectual

Property Rights associated with MPEG, and no one knows whether there are any "submarine" patents being held back until financial profit dictates the disclosure and repeats of the blackmail we have seen too often in the U.S. and in our industry.

As Hugo Gaggioni observed to the delegates, "Our core technology is 4:2:2. There it is without the hype. That's the real world."

About 1,200 man-years have gone into MPEG 2. More will go into MPEG 4 pegged (excuse the pun) for release and implementation in 1998. But, as a questioner asked about which system would give the best quality pictures with today's hardware, the answer was unequivocal: "Your call."

As Steven Vigneaux introduced his paper (quoting a noted science fiction author), "Any sufficiently advanced technology is indistinguishable from magic." That simply won't fly for the investment that stations will be asked to make in the next few years. If we look at solutions today, whether they use JPEG, Motion JPEG, MPEG 1, MPEG 2, or any proprietary version, we must consider whether we are getting what we need today and whether our material might be recoverable at a later date at a higher quality. ■

Paul McGoldrick is an international video consultant who began his career at the BBC in 1963. He has held positions at numerous manufacturing companies, including Harris, Magni Systems and Snell & Wilcox. He is currently writing a book on computer video technology.

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TECHNOLOGY REVIEW

Recording on the Video Machine

by Andrew von Gamm

MUNICH

The new Video Machine digital recorder/player (DRP) from Fast Electronics is the company's latest development and is its most ambitious PC/Apple add-on card and software package to date.

Previous products include the Screen Machine, Movie Line and the older linear version of the Video Machine. The Video Machine is what has become known as a hybrid editor in that it can be used on line or off line or even as a mixture of both.

I test drove the new Video Machine DRP around the foot-hills of the Bavarian Alps for two days using a Betacam SP camcorder and player. If you are used to Windows (or Apple) and are video literate, the very steep part of the learning curve should take about a day.

BRAVE NEW WORLD

Considering that this is a totally new way of doing things compared to analog tape or strips of film, I found the system easily understandable. There were bits of the program to represent every type of editing device, and once I had found out what was what, operation of the virtual machine was usually as easy (and sometimes easier) as working its physical counterpart.

The Video Machine itself is a full-length PC card with a couple of piggy-back cards added on. Recording is done on either one 16-bit (wide) SCSI hard disk or two identical 8-bit disks. The Video Machine has its own SCSI interface and relies on the PC merely to process the software and give the user the usual Windows working surface.

On installation, the Video Machine formats the SCSI disks separately, testing for speed of access and reliability. It soon becomes apparent that the quality of the overall system is limited by the quality and size of the disks, although these can be daisy chained to provide almost unlimited storage. However, using the lowest compression rate and highest quality of 3:1, one gigabyte (GB) provides only two-and-a-half minutes of storage.

The system is hybrid and can be used as both an off-line hard disk recorder and an on line editor using the original footage for the final edit, or even as a mixture of both. If you just want to create an EDL file to edit original footage, you can work in any format includ-

ing film and 16:9, as long as the material has been converted into regular PAL or NTSC to be put into the computer. According to the system's developers at Fast, the Video Machine can also be used as a standards converter, though not at broadcast quality.

Like anything in life, with the Video Machine, you need to know what you are going to do before you start doing it. On entering the record mode, the program asks how long the tape is and how many sound tracks and at what resolution you want them stored.

The wide range of compression rates and the ability to stick on any amount hard disk capacity means that a system bought today can be upgraded to higher qualities and greater storage without having to even pull the card or change the chips.

Once the format has been decided upon and the footage is safely tucked away in the computer, the fun begins. The stored file is now called a reel and the time has come to rip it up into clips to be put on a new reel which can be sub-divided into racks. For this, a modest little

can either be placed straight onto the time-line using the auto-assemble function or dragged and dropped clip by clip.

There are two virtual video players on the time line and effects are placed on an effects track between them, just like Adobe Premiere. The first and last scenes act as icons for each scene and sound tracks are automatically slotted in below. The effects library is huge with all the two dimensional wipes, squeezes, tumbles and zooms the heart desires. With the optional Aladdin Media Printer from Pinnacle, more than 100 3-D effects and a third off-line video recorder or graphics layer can be added.

GRAPHICS PREVIEW

Once on the time line, the unfinished product with all effects and graphics can be previewed in part or whole. The range of the time-line window is infinitely zoomable from a few milliseconds to the whole project.

It is on the time-line that the Video Machine displays its only real flaw — and it is a flaw that is not really a fault of the machine itself, but its environment. We found, when using two eight-bit SCSI disks, the shortest clip that could be shown in preview mode was two seconds long. If a clip was shorter than two seconds, the preview picture went blank until the hard disk found the next frame. By using a 16-bit SCSI disk, this shortest time could be reduced to 1.2 seconds. This minor limitation did not effect the final edit and one could still preview the first edit point. The second edit could be previewed by starting the recorder at the beginning of the short clip.

In all fairness, Fast pointed out that an update in January will eliminate this problem by adding a separate graphics track as part of the optional Aladdin package that can also be used as a third recorder. This tiny glitch also should be compared to waiting for tape machines to roll into place.

Although the Video Machine does not have its own titling program, it imports graphics from any other program as a regular video clip. These can be keyed or faded in using any of the effects available. A straight-forward EPS file was created in CorelDraw. As it was to be scrolled from right to left, the picture was long and thin and scroll speed could be set up using a titling tool. If the title or graphics has to move or is an animation, then the animation recorder can import and export single frames. This is

(continued on page 12)



The Fast Video Machine can be used as an off-line hard disk recorder or an on-line editor.

The program then displays a little colored bar that marks off compression rates from left to right and then colors them red, violet and green. Red means you will run out of space, violet means that you may run out of space during the edit and green means that you have all the space you need to make the recording.

Using single-field mode, very high compression rates can be achieved with very little loss of quality for full off-line work. Even in half-field mode, a 12:1 seemed to be more than good enough for the Betacam SP material we shot. In full-field mode, 50:1 compression gave a quality that was marginally better than most domestic VHS recorder.

Using the clip editor is probably the most powerful tool within this massive program. As well as a jog/shuttle button, there is a marker that also allows the user to go to any part of the reel. Markers can either be set on the fly or frame by frame. The clips are either placed on a rack or can be dragged and dropped to the time line.

Using the clip editor is very fast. Because the material is all on the disk and nothing is final, you can have an "about-here-will-do" attitude to everything. Each clip is moved to a storyboard and marked with a little picture of the opening shot, which makes identifying footage wonderfully easy. The storyboards



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Editors Draw MacWorld Crowds

by James Careless

TORONTO

Non-linear video editing — the process of editing digitized video on a computer, rather than sequentially on VTRs — was the television production development on display at this year's Toronto MacWorld Exposition in October.

The show, which focused solely on products for the Apple Macintosh, exposed the public to three different non-linear products: Edipix's Media 100, Avid's Media Suite Pro 3.0 and Radius' VideoVision Telecast.

All three systems have many basic features in common. First, they are compatible with both NTSC and PAL, and they feature a roughly quarter-screen-sized "main video" window showing the actual footage being manipulated. They also have menus consisting either of pictures and text or text only that details the shots available in the computer's hard drive(s).

MARCH OF TIME

They also feature linear timeline graphs that show the state of the production in terms of the video (represented as a series of small "snapshots") and audio tracks compiled so far.

As well, all three use the "drop and drag" method of control, in which a mouse is used to click on the needed video or audio clip and then drag it to the point on the linear timeline where it is to be inserted. Being non-linear, clips can be inserted at any point on the timeline. That is where the similarities end, however.

The Media 100 is designed to run on the Macintosh Quadra 800, 840AV or 950 with 2 NuBus slots available. Media 100 is aimed at both corporate clients and small TV stations, said Randy Bowler, marketing director for Edipix Canada.

Media 100 1.3 provides four tracks of mixable CD-quality audio. A complete system (with options) is capable of rendering more than 50 different transition effects, such as wipes, DVE-style page turns and linear keying of PICT titles. It can also export edit commands in CMX 3400, CMX 3600, Grass Valley Group and Sony BVE formats.

Edipix has an upgraded Media 100 — version 2.0 — but only portions of it were available at MacWorld.

One feature highlighted by Edipix is the ability to assemble a program using low-resolution video. This saves hard drive space to allow more video to be produced with less memory.

Once this "off-line" edit is complete, said Bowler, the operator can "say to the system 'now automatically assemble this for me, and this time capture my sequences again, but at very high resolution.'"

Avid's Media Suite Pro 3.0 is aimed at providing users with an affordable, stripped-down version of Avid's high-end systems, according to Anthony Lewin of Toronto's Elm Street Computer Terminal, who demonstrated the system at the show.

"What we are doing is taking that technology and making it more available to a wider bunch of people," he said.

This simplicity is evident in items like the on-screen display that provides text-only clip menus.

Still, stripped-down does not mean devoid of features. For instance, Media Suite Pro 3.0 has four channels of CD-quality audio with three bands of equalization. As well, like Media 100, it also offers dissolves, wipes, titles and DVE-style effects. However, unlike Media 100, it only requires 20 MB RAM, as opposed to Media 100's 48 MB. Media Suite Pro 3.0 runs on Macintosh Quadra 900, 950, IIfx, 800, or 650 with NuBus chassis.

Lewin said Media Suite Pro differentiates itself from other systems in several ways.

"The key difference is that Media Suite Pro is not based on QuickTime," he said. "While (QuickTime is) great for a variety of things, when you are cutting longer packs with lots of edit points, things can sometimes get out of sync. So I would say for any piece that is longer than 10 minutes, there is a chance things will not sync up the way you want."

Meanwhile, Radius brought out its top-of-the-line VideoVision Telecast system for QuickTime.

"It basically allows us to do component Beta SP quality within a QuickTime format," said Radius spokesman Dennis Lafever.

Also offering four channels of CD-quality audio, Telecast is capable of compositing 99 virtual video and audio channels.

It also offers "adaptive JPEG compression"

with ratios ranging from 3:1 to 50:1. In practice, this means the system varies its compression rate depending on the color content of each frame, thus avoiding artifacts while maximizing hard disk storage capacity.

One of the chief advantages of the system is its open architecture, Lafever said.

VideoVision Telecast runs on the PowerMacintosh 8100, 8100AV, 9150, Quadra 840AV or 950 series, system 7.0.1 or later. It requires only 8 MB of RAM.

To the casual observer, it was not immediately clear which system was superior, mainly because all three companies were attempting to introduce users to the concept of non-linear video editing itself.

Still, if their well-attended stands were any indication, all three companies should benefit on the Macintosh platform. ■

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Fractal Design Boosts Painter 3.0

by Tony Reveaux

APTOS, California

Fractal Design Corp. of Aptos, Calif., was an early developer of "natural media" graphics software for personal computer platforms. Natural media tools refer to painting tools that mimic in the digital realm the look and feel of oils, watercolor, charcoal, pastel and pencils. Traditional artists might question whether a digital watercolor is "real art." Multimedia authors and video graphic designers put aside such concerns to embrace this new technology.

This new breed of artist stands to benefit from the latest developments at Fractal Design. Previews of its latest software revisions hold the promise of merging its media tools with motion data, such as computer animation and digital video. This promise has now become reality.

Painter 3.0 from Fractal Design has come out of the gate with more than 50 new features that help to make it a "mini-Harry" on the desktop for Macintosh, Power Macintosh and Windows computers. It has a suggested retail price of \$499.

Painter 3.0 comes with a refined user interface, multiple floating elements and multimedia and animation capabilities with built-in support for QuickTime or Video for Windows. Any of Painter's painting or image editing tools and effects can be applied to movies frame by frame. Using VCR-like controls, users can scan through digital video clips and select individual frames for editing. Image compositing and masking tools enable users to add or remove characters and objects to video sequences.

Painter 3.0 also extends its tracing paper metaphor to digital video by giving users five layers of "onion skin" that allow them to view multiple frames (including those just before and after the current frame) while making their edits.

For many animators and effects artists who create images in traditional media, scan them and then bring them into a graphics application for manipulation and compositing, these direct-to-frame features within Painter will provide a complete working environment from concept to finished project.

"You can bring in a movie of a video and digitize it, set the video to be the clone source and sketch directly from that movie," said Mark Zimmer, president and CEO of Fractal Design. "If you are doing anything that requires hand work for animation, you can work on a series of multiple frames, draw a sketch and transfer it across the frames. It gives you instant rotoscoping. We maintain the mask in each frame, so you can do matte work. Some batch operations can be easily done. And Painter has numbered files, which is one of the most common denominators of video."

Other refinements to the program's user interface include a new page rotation tool, which makes working with a pressure sensitive tablet even more natural. Users can rotate an image up to 360 degrees to accommodate the way their arms, wrists and hands naturally draw.

Building on the traditional concepts of tiled and random patterns, a brush tool called the Image Hose "sprays" a series of user-defined images with every stroke

to create complex, evocative images. Even QuickTime movies can be "sprayed" through the Image Hose, enabling users to actually "paint with movies."

With the new Gradient Composer, users can create interactive color ramps to apply linear, sweep and circular gradations to an image in any direction, or choose from a selection of styles, including circular, radial, linear, spectral and sepia tones. Painter 3.0 also has advanced selective masking, spot color separations and vector field image warping capabilities.

But what ever happened to Fractal's "3X," the 3-D mapping application whose beta demos wowed the masses at SIGGRAPH? Company insiders report that it is a fully operable application they enjoy using on their desktops, but it is not yet centered on the launchpad.

For that, you will have to wait for Steve Guttman, newly hired vice president of marketing and one of the architects of Photoshop when he was senior marketing manager in charge of Macintosh graphics applications at Adobe. He is in the process of reassessing and restructuring Fractal Design's marketing strategies. You will know soon enough when they are ready to let this wildcat out of the bag. ■

For further information:

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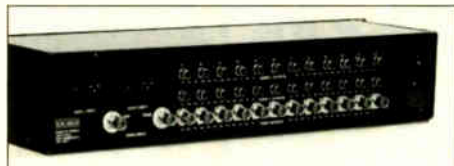


MARKETPLACE

HIGHLIGHTING THE LATEST PRODUCTS AVAILABLE TO PROFESSIONALS IN THE VIDEO INDUSTRY.

DISTRIBUTION AMP

The AVDA 2412 audio/video distribution amp from Broadcast Electronic Engineering offers one video input with 12 outputs, plus two audio inputs, each with 12 outputs.



The video input has common mode rejection with a floating ground that minimizes hum and noise pick-up. The audio amps have high-impedance balanced inputs on XLR connectors with a passive loop to XLR output connectors.

There is also a four-channel audio version.

For further information, contact the company in Canada at telephone: +1-514-467-2577; FAX: +1-514-467-2577, or circle Reader Service 44.

EFP LENS

Fujinon's A55x9.5ESM lens for 2/3-inch cameras offers a focal length of 9.5-525mm, which can be doubled with a 2x extender.



Other features include a 55x zoom ratio and a minimum object distance of 2.4 meters.

Fujinon has enhanced the precision of sliding surfaces inside the lens, resulting in less noise during zoom, focus and iris adjustment.

For further information, contact the company in Japan at telephone: +81-48-668-2152; FAX: +81-48-651-8517, or circle Reader Service 73.

ENCODING SYSTEM

DiviCom Inc. has introduced a new encoding system offering fully integrated MPEG 2 compression.

The system features the DMC 2 program

encoder that compresses a video channel and four audio channels, outputting a single compressed data stream which is then combined with an MPEG 2 transport stream.

The overall system also features a system controller with standard SNMP management software for easy configuration and monitoring.

For further information, contact the company in the U.S. at telephone: +1-408-944-6700; FAX: +1-408-944-6705, or circle Reader Service 54.

MEDIA PRINTER

Pinnacle Systems has begun shipping PAL and component versions of its Alladin media printer.

Alladin is a Windows-based post-production system that offers a 3-D DVE, switching, luma and chroma keying, mixing, character generation and still store and painting systems.

The system is bundled with Image North's Inscribe CG software and CrystalGraphics' TOPAS 3-D modelling software.

For further information, contact the company in the U.S. at telephone: +1-408-668-2152; FAX: +1-408-651-8517, or circle Reader Service 72.

HD SLOW-MOTION

Toshiba is providing the TFS-800 HD slow-motion system featuring a frame-store to enable variable slow-motion replay while preserving the quality of the HD signal.



The unit stores up to 28 frames, although this is expandable to 240 frames.

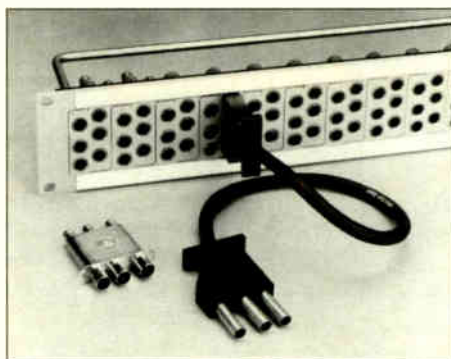
Also featured are reverse and ultra-slow replay, as well as still frame reproduction and up to +/-20 frames fast-motion.

For further information, contact the company in the U.S. at telephone: +1-609-951-8500; FAX: +1-609-951-9172, or circle Reader Service 31.

PATCHING SYSTEM

Trompeter Electronics has introduced the J25W RGB patching system for component video.

The system features 75-ohm, 0.9 center pin connections in a 2RU unit. Patch cords are of flexible triple coaxial cable, and the unit features BNC inputs and Trompeter's own plug design.



Beryllium-copper contacts offer contact resistance of more than 100,000 cycles.

For further information, contact the company in the U.S. at telephone: +1-818-707-2020; FAX: +1-818-706-1040 or circle Reader Service 89.

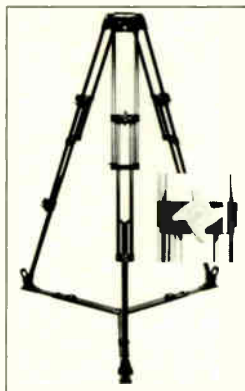
TRIPOD

The Series II ENG/EFP tripod range from Miller Fluid Heads is available in models for lightweight cameras to units weighing up to 25 pounds.

The series features Miller's new Pro-Lok torque-limited leg clamps offering maintenance-free single-turn clamp-and-release.

Also included are redesigned 75mm and 100mm levelling bowls for increased clamping strength and torsion-free attachment to tripod legs.

For further information, contact the company in the U.S. at telephone: +1-201-473-9592; FAX: +1-201-473-9693, or circle Reader Service 26.



LOGO GENERATOR

Fougerolle Audio/Video has launched a new logo generator/inserter that inserts logos in super imposition or transparency

at the exact place desired on the video.

Logos can be sized from 8 x 8 to 64 x 64, and may come from internal pre-programmed PROM, a RAM file, or even from a video clip using the system's video input.

For further information, contact the company in France at telephone: +331-3932-7350; FAX: +331-3418-1566, or circle Reader Service 117.

EQUIPMENT CASES

Zero Cases (Europe) offers 19-inch equipment cases in shock-mount and rigid-mount designs offering protection to IP68 military and IP65 commercial standards.

Cases are available in 3RU to 18RU sizes and offer EMI and RFI shielding.

Zero also offers a full range of finishes, closure types, breather valves, panel flange patterns, etc.

For further information, contact the company in England at telephone: +44-21-554-2001; FAX: +44-21-523-2924, or circle Reader Service 88.

A/V SYNC

Digital Audio Research is delivering the Videola audio-to-video sync system featuring "all-speed" lock for multichannel audio scrub and bi-directional varispeed.

The unit is compatible with a full range of digital and analog video sources.

For further information, contact the company in England at telephone: +44-372-742848; FAX: +44-372-743532, or circle Reader Service 53.

C-MOUNT CAMERA

Hitachi's HV-C20 C-Mount 3-CCD color camera offers newly developed prism optics and an external trigger shutter.

The system is available in NTSC or PAL and includes such features as automatic light control, three-mode white balance, internal or genlock sync and a sensitivity of 2000 lux at f/8.

Power consumption is 4.5W with 12 VDC supply, and the unit weighs about 600 grams.

For further information, contact the company in Japan at telephone: +813-5821-5311; FAX: +813-5821-5391, or circle Reader Service 83.

EDTV ENCODER

YEM offers the EDEC-2000A NTSC digital EDTV encoder able to handle composite video from a live camera, TV receiver or signals from a VCR, laser disc, computer or still video processor.

The unit handles standard and non-standard composite signals and provides contour correction with a built-in vertical and horizontal corrector.

Also included are a noise reducer and a motion-adaptive line-scanning interpolation processor for high resolution, flicker-free reproduction.

For further information, contact the company in Japan at telephone: +81-462-28-8883; FAX: +81-462-29-1944, or circle Reader Service 129.

Send new product press releases along with black and white photographs to: Marketplace Editor, P.O. Box 1214, Falls Church, VA 22041

The Noisy World of Compression

by Brian Flowers

ENGINEERING CORNER

GENEVA, Switzerland

Digital compression enables us to reduce the bit rate and hence the bandwidth required to transmit video signals. Studio-quality uncompressed component digital signals utilize 270 Mbps (megabits per second), but a satellite link to carry that amount of data would be prohibitively expensive.

Fortunately, the average television signal is very repetitive with considerable redundancy, especially if no movement occurs, so the bit rate can be reduced appreciably without losing any essential information. Where much movement occurs, and when the producer cuts from one source to another source, the information rate increases significantly, so a memory buffer is used to absorb these peaks in signal entropy (see sidebar) without exceed-

ing the bit-rate of the compressed signal.

MOVING PICTURES

Moreover, for a moving sequence, the coding system is normally able to predict the content of the next picture quite accurately. Hence the encoder and the decoder make the same prediction, making it necessary only to check the prediction against the actual subsequent picture in the encoder and send a correction signal to the decoder to obtain accurate transmission of the signal. This configuration reduces the required bit rate considerably, but to avoid an accumulation of transmission errors, the complete picture information must be refreshed about once per second.

Another important tool used for bit-rate reduction is DCT (Discrete Cosine Transform), whereby 8 by 8 pixel blocks are transformed into DCT coefficients. These represent the average DC level plus frequency components in ascending order.

Variable-length codes are also used, whereby frequently occurring values are represented by short codes and rarely-occurring values are represented by long codes.

There is one signal which is totally unpredictable by definition, namely white noise. Hence, the most critical sequence used in testing video compression systems is the well-known "Diva plus noise." An opera singer is progressively encircled by full-amplitude white noise, until only her face is visible. If her face remains clear in these circumstances, the compression system is performing very well.

Obviously, the presence of noise on the input signal to a compression system will drastically increase the entropy of the signal, and the codec will work flat out trying to accurately reproduce the noise signal. This obliges the compression system to adopt a lower signal resolution, say 6 bits per sample instead of 8, thereby reducing the quality of the transmitted picture.

To alleviate this problem, some low bit-rate MPEG 2 encoders include noise-reduction at the encoder input. These devices take advantage of the random nature of noise, compared with the predictable nature of picture details, to reduce the noise by integrating it over several frames. The same technique is used for noise-reduction in high-quality standards converters, enabling them to deliver a better signal/noise ratio at their output than they receive at their input. The other side of this coin is a slight loss of resolution on moving detail, so some converters allow you to choose the best compromise between these two parameters for the material being converted.

PROTOTYPE CODECS

For the past year, the EBU has been testing prototype ETSI 34 Mbps codecs, initially at the RAI Research Centre in Turin, Italy and subsequently at EBU Headquarters in Geneva, Switzerland.

The EBU interface requirements include PAL, SECAM and 4:2:2 component digital signals. This gives nine possible input/output configurations.

The four existing makes of ETSI codecs give 16 possible combinations of encoder/decoder. Therefore there are 144 different combinations of input-encoder/decoder-output to be tested.

The key to achieving correct interworking for the various input/output combinations is to insist on the transmission of "clean" component signals, rather than "complementary" component signals. If the codes are to be used purely for national purposes — required only to accept and deliver, for example, PAL signals — complementary component signals are acceptable, since imperfections in the separation of luminance and chrominance signals will cancel out when the component signals are coded back into PAL.

The Eurovision network, however, must cater for all possible combinations of PAL, SECAM and 4:2:2 signals. This implies the provision of a comb-filter in the 34 Mbps encoder's PAL decoder.

IN AND OUT

One input/output combination that can cause problems is 4:2:2 in/PAL out. The 4:2:2 chrominance bandwidth is about twice that of a PAL signal, so the R-Y and B-Y signals must be bandwidth-limited in the 34 Mbps decoder before being coded into PAL. The filters should have a Gaussian response curve, rather than a brick-wall response, otherwise chrominance/luminance crosstalk will occur at color transitions.

Two D-5 VTRs were used to carry out 4:2:2 tests, using CCIR/EBU recorded test-sequences designed to check the performance of video compression systems. D-5 machines record and replay the 270 Mbps 4:2:2 signal with 10 bits per sample without compression, thereby providing completely transparent record and replay facilities.

By interconnecting three codec pairs at 270 Mbps and then playing and recording a 30-minute test sequence through the cascaded codecs, we were able to simulate 18 codecs in cascade. The quality remains remarkably good up to 12 cascaded codecs. Thereafter, the block structure of the coding system becomes apparent on large areas of uniform color.

In conclusion, our tests have shown that the ETSI 300.174/CCIR-Rec. 723 (now ITU-T J.81) codecs are suitable for contribution circuits, even when cascaded several times. Interconnections between codec pairs can be made at 270 Mbps, component analog or composite analog. ■

Brian Flowers is head of service and project manager for the European Broadcasting Union's new Eurovision Control Center in Geneva. He studied engineering at the University of Southampton and served for two years in the Royal Air Force before joining the BBC. In 1962, he was assigned to the EBU's control center in Brussels and has since worked at numerous levels of responsibility for the center.

A QUICK LOOK AT ENTROPY

Entropy is an interesting concept that was first introduced in relation to the second law of thermodynamics, which forbids processes which would cause a reduction in entropy:

Entropy change = heat flow/absolute temperature

From this equation, it can be seen that when heat flows from a hot source to a cooler destination, the entropy gained by the destination is greater than the entropy lost by the source. Since heat always flows from hot to cold, the total entropy of the universe is always increasing. In other words, entropy has an arrow of direction like time itself.

The Austrian physicist, Boltzmann, analyzed the implications of this at the molecular level and thereby derived the equation:

$$S = K \cdot \ln W$$

where S is entropy, K is Boltzmann's constant, and W is the number of possible microstates corresponding to a particular macrostate.

For a digital television signal, entropy can be expressed as the number of bits/pixel required to code a particular video sequence. Most signals require less than two bits/pixel, whereas the "Diva plus noise" sequence requires 4.6 bits/pixel.

Hence, the concept of entropy has applications both in thermodynamics and in information theory.

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Multibeam Technology Gains in Asia

by Barrie Smith

SYDNEY

The geostationary orbital arc covering the southeast Asian and Australian regions spans 130 degrees, and in it there will soon be 51 satellites, some as close as two degrees apart.

Across many cities worldwide, proliferating satellite dishes are becoming a problem for environmental bodies and local regulators. Many operators and their customers are also finding that multiple dishes are occupying vast acreages of land.

One answer to the problem is the multibeam dish antenna, able to operate with multiple geostationary and low earth orbit satellites.

GATHERING STEAM

The technology is slowly attracting attention around the world. In the U.S., there is one company, Antenna Technology, actively engaged in the manufacture of multibeam antennas. In Japan, a multibeam dish operates off a Ka-band domestic satellite. It is believed there are only two or three of this type in existence.

Australia, too, through its government-funded research organization — the CSIRO, Commonwealth Scientific Industrial Research Organisation — has developed a prototype multibeam antenna that attacks the problem from a different direction. Dr. Trevor Bird, research manager for the Electromagnetics and

Antennas Program within the CSIRO's Division of Radiophysics here in Sydney, believes that with so many satellites, the "one satellite, one earth station" approach is wasteful.



CSIRO's prototype 14-foot multibeam antenna

CSIRO has a long history in antenna development, working with a number of international satellite companies, including Hughes U.S. Having been asked by an Australian satellite operator to come up with an efficient dish design, the organiza-

tion first looked at retrofitting an existing dish to provide three feeders in one reflector.

"That works for receive-only and for small dishes," Bird said. "But to get the

a donut — circular laterally, and parabolic in the vertical direction."

The CSIRO work group felt there were a number of disadvantages with the torus, aside from its lack of efficiency. Compared with conventional parabolic reflectors that have aperture efficiencies greater than 50 percent, a torus is less than 20 percent efficient. The search was then on for other methods offering higher efficiency but with the possible trade-off of a narrower field of view.

"The geometry we looked at was a two-reflector system, where both reflectors are shaped," Bird said. "Just as with ordinary spectacles, to overcome astigmatism you can shape the lenses to improve the focusing properties of the eyes. The reflector surfaces are shaped to be able to take beams from a range of directions and to focus them — but they won't be an absolute point focus as they are in a parabolic reflector. Its operation is similar to a collector lens."

OFFSET REFLECTORS

The CSIRO design consists of two reflectors in an offset Cassegrain configuration, plus an array of signal feeds each viewing a selected satellite. Unlike a conventional antenna, in which the feed must be positioned at a single focal point, the CSIRO system's two-reflector arrangement creates a focal surface or "hot zone." By moving the feed anywhere within that zone, a signal can be transmit-

best performance, you end up with a fairly complex feeder, and you are still only able to access satellites spaced a couple of degrees apart.

"So then we started looking at alternatives. One was a torus, shaped like part of



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ted or received with high efficiency. The concept was not invented at CSIRO, but the group did demonstrate that the approach works.

The CSIRO multibeam system's focal surface can accommodate up to 20 feeds. In the case of the 14-foot prototype, this focal surface area spans roughly 16 x 6 feet.

The focal surface is also ideal for tracking satellites in inclined orbit. The earlier two-reflector antenna, like the torus arrangement, is designed to work best when satellites lie along the geostationary arc. Nowadays, many satellites are not fixed in geostationary orbit but are allowed to wander. An operator is compelled to keep on trimming the antenna's direction to keep its signal high. This requires the entire antenna to be moved to follow the satellite.

With the multibeam, one of the feeds is driven to follow the moving satellite. In principle, this means that if you need to access six satellites with six feeds, some of them may be fixed and some of them may be in inclined orbit. It is then possible to install a mechanism to drive the feeds required to track the moving satellites.

As for the panels used in the system, development actually began at CSIRO in the early 1980s during a seven-dish array project. The group developed a technique for producing low-cost reflector panels that have since been used in more than 40 earth stations around the world. This panel technology, as well as an automation technique to produce panels of different shapes, led to the development of the multibeam dish.

In a conventional antenna, adjacent rings

of panels are all the same. In the multibeam system, neighboring panels may differ in shape. The CSIRO's approach uses an adjustable mold, rather than a series of molds, to form the aluminum panels

OTHER APPLICATIONS

The multibeam principle could also be used in terrestrial microwave systems. At millimeter wave frequencies, the propagation path cannot be guaranteed because of rain storms and so forth. A diversity system overcomes this problem. One transmitter could be placed at one site and another at a distance. Then, a multibeam with two feeds could be pointed in those directions, and the receiver could select the optimum signal.

CSIRO is currently testing a prototype of the multibeam and has devised a technique for moving individual feeds. This mechanism can be used to track one satellite, or it can be driven around anywhere within the focal surface to pick up any other satellite. If flexibility is a major requirement, it is also possible to dial in the required direction and the feed will move to that satellite.

With the current prototype, the feed capacity depends upon the inter-satellite spacing. With one degree separation, 20 satellites could be accessed. The antenna's horizontal field of view is 23 degrees along the geostationary arc, permitting a tolerance of +/-3 degrees on either side. The dish can "look" at satellites that move +/-3 degrees out of the geostationary arc before the whole antenna would need to be moved.

Although there has been great interest in the Australian development, it is still a prototype. Dr. Bird believes that if production models were available right now, they would already be selling.

"We have had several enquiries from overseas suppliers, but getting the financ-

ing to progress from the prototype to manufacture is difficult," he said. "We have had some discussions with a couple of companies. One in particular is very interested, and they are waiting to hear the outcome of test results on the present feed movement apparatus." ■

SHOW LISTINGS

21-24 JANUARY — MIDDLE EAST BROADCAST '95

Bahrain, Saudi Arabia. The second international exhibition for radio and television broadcasting and production will be held at the Bahrain International Exhibit Centre. For information, contact organizers at P.O. Box 20200, Manama, Bahrain, telephone: +966-973-550033; FAX: +96-973-553288.

1-3 FEBRUARY — IMAGINA

Monte Carlo. The 14th Imagina exposition, devoted to computer graphics and special effects, will be held at the Monte Carlo convention center and auditorium. For further information, contact Brigitte Saramitto, 31 avenue Hector-Otto, MC 98000 Monaco, telephone: +33-9315-9394; FAX: +33-9315-9395.

7-10 MARCH — COMDEX/COMEXPO '95

Mexico City. To be held at the Exhibition Pavilion or Sports Palace, the show will feature Windows World and Latinet/Telecom. For information, contact The Interface Group at 300 First Ave., Needham, MA, 02194-2722, USA; telephone: +1-617-449-6600.

20-22 MARCH — 1995 PAN ASIA SATELLITE AND CABLE TELEVISION

Hong Kong. Returning for its fifth annual conference, the show will provide the latest in satellite and cable technology. For information, contact AIC conferences, 51 Anson Road, #09-55 Anson Center, Singapore, 0207, telephone: +65-222-8550; FAX: +65-226-3264.

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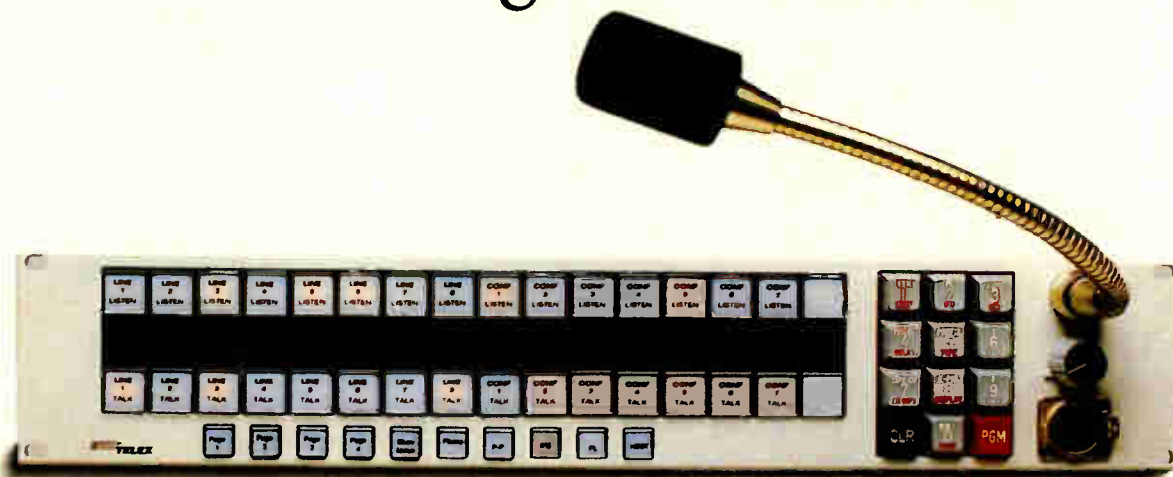
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Interfering With Common Sense

Waiting for the Day When Electromagnetic Compatibility Standards Are in Place Worldwide

by John Watkinson

VIDEO WATCH

EMC stands for electromagnetic compatibility. Put simply, a piece of electrically powered equipment or an entire system is electromagnetically compatible if it does not cause interference with other equipment and if it does not suffer from interference due to other equipment.

You might think this sounds like common sense, and I would agree. However, I have long regarded common sense as a contradiction in terms, and this viewpoint is certainly upheld by the current electromagnetic debate. Basically, if possible, in the European Union, the EMC performance of available equipment has been such that problems have been occurring, and legislation has had to be introduced to enforce standards. These standards will become enforced in Europe in 1996, and it is only a matter of time before something similar appears on a worldwide basis.

NEW KID ON THE BLOCK

Compared to many industries, electronics is a relative newcomer, but it has experienced a phenomenal growth rate not only in the volume of goods, but also in the range of applications. There was a time when the only electronic equipment in the average household was a vacuum-tube radio set.

Interference sources were limited to the ignition of passing motorcycles and the AC/DC motor in the blender. Such interference was short lived and no more than an irritation. Today, electronic equipment is everywhere and is used in applications where a failure can cause loss of life or serious disruption. There are also more potential sources of interference.

Although electromagnetic compatibility is common sense, it also adds to the cost of equipment. Preventing the emission of unwanted radiation from, for example, electric motors requires extra suppression components. Reducing the sensitivity of equipment to interference calls for extra screening and filtering.

In practice, common sense has been overriden by economics, and these extra components were not added. Another factor was that designers simply failed to appreciate how rapidly the electromagnetic environment was degrading, so representative tests were not made during product development.

The consequences of these factors were an increase in RFI-related failures. While many of these caused simple inconvenience, some were more spectacular. Cars

with electronic fuel injection were brought to a halt by a radar set near a freeway. Aircraft have crashed by mistaking power-line radiation for navigation signals. Industrial robots have run amok, killing people. Explosives have gone off prematurely. Events of this kind used to be called freak accidents until they become common enough. For every actual accident, there would be any number of incidents in which disaster was narrowly averted.

The number of incidents in aviation alerted the airlines to the problem, but the reaction has been knee-jerk rather than scientific. Some airlines ban passengers from using electronic equipment at all times, while some only ban use at take-off and landing. Flying on Virgin Airlines recently, I was ordered to turn off my Discman

I have long regarded common sense
as a contradiction in terms...

"because it interferes with the plane." The passenger in the next seat was allowed to use his laptop computer. In these circumstances, it is hardly surprising that legislation was necessary.

Another effect which has gradually grown is the distortion of the AC supply by electric loads. The ideal load for an AC power system is resistive; the current is in phase with and proportional to the voltage. Unfortunately, much electronic equipment behaves in a manner far from ideal. Many power supplies contain transformers to step down the line voltage to that needed by the circuitry. A lightly loaded transformer is almost purely inductive. The current is nearly in quadrature to the voltage so that appreciable current flows even though little power is delivered.

The measure of this phenomenon is called the power factor. The power lost in the distribution network is proportional to the current, so equipment with an adverse power factor is in practice less efficient because a larger proportion of the power it uses is wasted in transmission. The growing use of electronic equipment means that power stations are seeing increasingly inductive loading and suffering more transmission loss than ever. This wasted power translates directly into pollution.

A simple electronic power supply contains a bridge rectifier to obtain DC from the AC line. While this works as far as the equipment is concerned, it is not too good for the power transmission system, as it sees a load that varies throughout the cycle. The diodes only conduct when the instantaneous voltage of the AC input exceeds the voltage of the reservoir capacitor. Thus, load current is only drawn at the peaks of the AC cycle.

Electronic equipment now forms a significant fraction of the load seen by power stations. In addition to the adverse power factor, they are now seeing waveform distortion where the peaks are pulled down

by rectifier conduction. The waveform distortion causes harmonic generation, resulting in increased radiation and losses. Consequently, another aspect of the impending regulations is to improve the load behavior of electrical equipment.

There has been a great deal of opposition in the European EMC regulations, but having waded through many of the arguments, I am still convinced that the intent of the EMC regulations is necessary, timely and beneficial to society. Legislation is actually quite a fair way of avoiding problems. If all manufacturers have to comply, they all have the same increased costs and thus remain equally competitive. Much of the bleating so far appears to be from people who don't appreciate that fact. In some respects, it is reminiscent of the attitude of motor manufacturers who generally oppose the introduction of safety or pollution regulations on the grounds of cost. Naturally, the cost they are considering is the cost to them-

selves, not the cost to the rest of society for clearing up the mess.

COST FACTORS

The implications for professional audio and video equipment manufacturers are not significantly worse than elsewhere, although the smaller sales volume in professional equipment will result in a higher proportion of compliance testing costs to be recouped on each unit.

Preventing emission or unwanted pickup by electronic circuitry is not too difficult as RFI is effectively brought to a halt by a sheet of metal. The ideal totally steel-encased device is impractical because this conflicts with other requirements, such as maintenance access, cooling airflow, signal inputs and outputs and provisions of power. Access doors require flexible metal "fingers" to bridge the joints and

...and this viewpoint is certainly upheld
by the current electromagnetic debate.

effectively prevent RFI leaking through the cracks. Airflow is arranged to pass through a metal labyrinth.

Inputs and outputs are more difficult because cables can act as antennas and bring RF into the equipment from outside or radiate internally generated RF outside. The common solution is to filter and/or decouple all terminals of a connector using a small parallel capacitance and a series inductance such as a ferrite bead. When these are used, the impedance of the wiring into the equipment rises and the parallel capacitor appears as a short circuit to chasses at frequencies above those used by the wanted signals. This still allows differential video inputs using floating BNC connectors.

Screened cables are complemented by metal-bodied connectors that are electri-

cally connected to the screen and which mate with their sockets over their whole circumference to prevent RF leakage in or out.

The BNC connector is no problem as it was designed from the outset as an RF device and can only be wired in this way. Not so the XLR audio connector, which was designed primarily for durability in the days when airlines had propellers. The XLR connection standard uses one pin for the cable screen and the body may be plastic on more recent examples, effectively holding an open house for RF. Analog audio equipment seldom offends in the generation of RF, but it is difficult to see how its susceptibility to RF can be managed when such unsuitable connectors are used.

LISTENING IN

Another RFI problem suffered by audio equipment is self-inflicted. Despite considerable evidence to the contrary, some audio enthusiasts seem to believe that for high quality, the audio bandwidth must extend far beyond the accepted range of human hearing. They argue that preventing audio equipment from responding to RF will damage the sound quality and that the new legislation will destroy the hi-fi industry.

For years, these mumbo-jumbo vendors have produced audio products with over-specified bandwidths that are capable of receiving transmissions from nearby taxis, refrigerators and heating thermostats. The fact that these RF signals are rendered audible at all is because audio equipment becomes non-linear at RF and demodulates them into the audio band. Thus, changing the characteristics of, say, an audio amplifier at 1 MHz can affect the sound because it alters the amount of intermodulation distortion, hence the mistaken view that the excessive bandwidth is required. Good engineering practice (not to be confused with hi-fi folklore) suggests that defining the bandwidth of an audio system once at some central point in a system is beneficial because it prevents non-linearities caused by RF. In a professional installation, this could usefully be the main mixing console output. Elsewhere, band limiting could use a higher frequency to prevent intrusion into the audio band by cascaded filters.

Perhaps forthcoming EMC legislation will do for hi-fi folklore what earlier laws did for quack doctors and the remedies they sold at travelling fairs. I can't wait. ■

John Watkinson is an independent consultant in digital audio, video and data technology and is the author of seven books on the subject, including the newly issued Introduction to Digital Video and The Digital Video Tape Recorder. He is a Fellow of the Audio Engineering Society and is listed in Who's Who in the World. He regularly presents papers at conventions of learned societies and has presented training courses for studios, broadcasters and facilities around the world. He is currently writing a book on audio and video compression.

Seek Out the Person in Charge

by Brian Kelley

CONTRACT ENGINEER

In last month's column, I discussed how a company's location affects its attitude and how this attitude is critical in gauging how a company operates.

However, as I explained last month, location is one of five items that need to be considered when determining attitude. Although it is a helpful tool to better determine a company's potential, it is only one variable. As it turns out, even a bad location does not doom a TV business to permanent stagnancy.

Considering location alone does not give any importance to what people do to make a difference in the direction an organization takes. That is why this article is about ownership.

GRAND DESIGN

Unless you believe that everything happens by mere chance (and watching what

comes across the airwaves in many countries, this may be closer to the truth than we care to admit), ownership is an important consideration. Knowing if a venture is held by an absentee landlord, an indentured servant or an achievement-oriented entrepreneur is extremely helpful to determine what the organization can accomplish.

In many areas of the world, state-run television is the dominant provider. If the only form of state television you know brings to mind the recurring day-long fund-raising telethons of the Public Broadcasting System in the U.S., then you first need to get a brief description of state television around the globe.

In most of the world, the government is involved in more than just a regulatory role. Programming is made and paid for by the government.

In Germany where I live, I very seldom watch state TV. This is also a growing trend among other viewers across the country. But regardless of my viewing habits, the government, in its unceasing creativity, has found a way to get me to pay for the system in the form of a broadcast tax. This "users' fee" is paid for by all owners of television sets. Millions of state TV viewers (and non-viewers) thus finance an extensive federal and regional network paid for with public funds.

Not all countries with state TV finance the system this way, but for purposes of this discussion, state TV means a broadcasting unit (whether terrestrial, satellite

or cable) which is majority-controlled by government and financed primarily with public funds.

In emerging markets, state-run facilities play huge roles. Governments realize the power of the medium to help make or break policy and often hold in the reins tightly for this reason. Poland continues to struggle with just who has the rights to broadcast, creating a bit of a political crisis. Even Italy, a more mature TV market, has had a run-in concerning the topic — the Prime Minister is also the owner of the nation's largest private network.

DO YOUR HOMEWORK

Aside from the political questions that this raises on issues like individual freedoms, it changes the way TV professionals must work. If you are looking to break into one of these exotic countries, be prepared to work up a bit of sweat in the research stage. It is very important to find out who is directly in charge of the operation — who calls the shots and makes the operational decisions. Marketers refer to these people as "gatekeepers."

Finding gatekeepers is hard work. Ownership does say a lot about the motivation of the decision makers and why they do the work they do (or in some cases don't do). Many state companies are managed in name by one person and in practice by others. In the former Soviet bloc, a chairman often got his job due to communist cronyism, while the director of the station, operating under various titles, is the real actuator.

I once worked with one station in Cherepovets (southeast of St. Petersburg) where the actual decision-maker was neither the chairman nor even the director, but a journalist. She was the only person in the company who really knew what was happening (or for that matter when they broadcast). Do not settle for contact with the wrong people early on.

Of course, it does help to know a bit about the figurehead. They usually do not have anything to do with the actual running of a station, but they do have egos that may need massaging, and they can also throw logjams into negotiations. It is better to avoid problems in advance by understanding more about them and what is important to them.

What motivates the figurehead?

One thing is fear. They do not want to do anything to jeopardize their position or status in society. Their ego also plays a role because they have access to real decision-makers in other parts of government. They also look to preserve their status. Being a boss has its private privileges getting others to do your work.

When working with state TV stations, it is wise to take your time and find out who really calls the shots. If you talk with the man or woman described above, you may have an interesting conversation, but you are wasting your time. Once in a regional Russian station near the Volga river, I asked a figurehead what tape standard his company used for broadcast. Even for a non-technician this is a rather basic question. But then I guess I was asking too much. He told me that he would need to check with his chief engineer. Translation: too much time at the dacha, and the company is run by someone else with a less impressive title.

In private television organizations, there

is often a wide spectrum of individuals in leadership roles. Some are merely entrepreneurs who have little knowledge of TV themselves. Very often they are most successful when they focus on finding the people who know "how" and spend their time deciding "what." These are exceptional people to discover when thinking about providing services, expertise or consultation. They need the help and they know it.

Another way people get involved in a private venture is that they are tired of working for someone else and decide to take technical experience and apply it for profit. Unless they have a partner, like the entrepreneur who knows the "what," they usually have a hard time of it. A few innocent and naive questions about a person's background help to flush this out early on in a relationship. If they are more interested in having the best equipment than the best programming and people, they are almost certainly doomed to fail.

Private operations are arising faster than they can be counted, but the shake-out has already begun. Mini-networks are in the nascent stages. Some will fly and others will fail. Many are relying heavily on pirated material of incredibly bad technical quality, but the public is becoming choosier now and expects at the least a better quality of bootleg copy.

However, there are companies trying to play by the rules by actually legally acquiring rights to programming. They make up the future and are well worth working with. They are a unique breed motivated by quite a different set of factors than their sedentary state counterparts.

For these new entrepreneurs, one of their chief motivations is independence. Seeing a collapsing centrally run economy gives good reason to have other resources. But they are not merely interested in the economic benefits. It is psychologically very important to them that they have no boss, can make their own decisions and take risks that they themselves calculate.

As well, the lure of having access to a hard currency is not lost on them either. Who wants to only earn in a currency that can lose 20 percent of its value in one day, as the Russian ruble did in October?

Also playing an important role in the rise of private operations is status. In the old days, political bureaucrats had special privilege by virtue of their position in society. Nowadays, if you can show that you have your own company and special knowledge of technical or market issues, you are a large step up from the common worker.

In between a state-run and a private operation is the semi-private venture. This hybrid group deserves brief mention even if no one I know can explain it. Mix together a state company with a private one and don't provide any further definition and you have a semi-private company. If you have ever seen a jackalope (a fictional cross between a jack rabbit and an antelope) you have a good idea of what I mean. Approach these operations with caution. Whatever you hear about them, remember that all jackalope photos are fakes. ■

Brian Kelley is director of Germany's New Life Network, an international distributor of family and educational television programming produced around the world.

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USER REPORT

Louth is Tops on CFCN's List

by Dale Couatts
Engineering Technologist
CFCN

VANCOUVER, British Columbia

CFCN is a CTV (Canadian Television) network affiliate with stations in Calgary and Lethbridge. The stations operate 22 hours a day and have a combined total audience of more than one million viewers in the Canadian provinces of Alberta and British Columbia.

The Calgary facility had been feeding program material to Lethbridge for local commercial insertion. CFCN wanted all programs and commercials for both stations to be generated out of the Calgary plant under control of a single master control operator.

Calgary's traffic department was to generate the schedules for both stations using a BIAS traffic system. All programming would be common to the two stations, with the exception of one newscast, and 75 percent of the commercials would be common.

device server, a rack-mounted 486 PC that contains plug-in serial cards for real-time device control. The device server allows for a direct RS-422 connection to every piece of broadcast equipment. Up to 32 devices can be supported. CFCN has installed a redundant device server that can be quickly switched on-line in the event of a catastrophic failure.

CLIENT SERVER

Client workstations were placed in the master control room and the VTR area. These workstations are connected to the device server via an ethernet network and are used for list control, editing and monitoring. Each workstation has access to any list on the system and can monitor multiple lists by moving and sizing the on-screen windows that contain the lists.

The status of every device is broadcast throughout the ADC-100 every video frame. This not only ensures that the workstations are updated quickly and accurately, but also maintains total frame accuracy

includes ID, title, start of message time code, duration, made date/time, operator and notes. Interfaces for a barcode reader, barcode printer and VTRs are part of the tape preparation station.

A Dub list from the traffic department can be automatically translated by Turbo Tape into a label list and used to generate barcode label data without any operator typing. Also, time code locations can simply be marked instead of being manually typed. This method of preparation avoids disastrous typing errors. This workstation is, of course, networked to the ADC-100. Turbotape can handle single-spot, multi-spot and multi-segment tapes.

CFCN's fast-moving newscast is the highest rated in the region. It relies heavily on the BVC-1000 cart machine. The cart machine is operated in a two-channel output mode so that dissolves and wipes can be performed between new stories. Also, flexible control and last-second editing are essential for a live news situation. It was critical that the ADC-100 could handle this requirement.

NO PROBLEM

This was not a problem for Louth due to the fact that they control the BVC-1000 at a very low level (VCC level). In fact, under Louth control, the BVC-1000 can provide up to four output channels. VCC level control provides extremely flexible operation and gives Louth the capability for future customizations. Last-second changes are accommodated by the workstation editing capabilities.

After editing, the news stories are brought to the Turbo Tape station where they are quickly logged and entered into the database. The tapes are placed in the cart machine and a playlist is created from the news script. A third ADC-100 playlist is dedicated to news. In the control room, a playlist monitoring feed is installed for the news director.

Before CFCN had fully implemented their new Louth automation system, it was decided that they were going to produce a national country music channel out of the Calgary facility. Since the ADC-100 was in place, this simply meant adding a playlist, the necessary device control, another Turbo Tape station and two more workstations. A Sony BVC-400 cart machine containing all the country music videos and promos is controlled by Louth. At the time of this article, the country music channel is being commissioned and will be on air January 1, 1995. ■

Editor's note: Dale Couatts has worked at CFCN for 15 years and was project manager for the Louth installation.

The opinions expressed above are the author's alone. For further information on the ADC-100, contact Louth Automation (Telephone: +1-415-329-9498; FAX: +1-415-329-9530), or circle Reader Service 24.

The status of every device
is broadcast throughout the ADC-100 every
video frame.

The two stations were to be synchronous. Automated satellite recording and time delay management was also a critical requirement. CFCN required control of a Sony BVC-1000 cart machine, routing switcher, still store, digital audio cart machine, master control switcher, satellite downlink management system and nine VTRs.

Richard Coleman, CFCN's vice president of engineering, knew that a software-based solution would be the only cost-efficient method of managing the proposed system. After thorough evaluation of existing automation systems, the Louth Automation ADC-100 was chosen. This software-based system uses client/server computer architecture and object-oriented software design methods, and it offers extensive user-configuration capabilities. Object-oriented programming allows Louth to easily customize for specific needs and respond to new requirements as they arise.

SYSTEM FUNCTION

Schedules for Calgary and Lethbridge are produced by the traffic department and sent to the operations department on 3.5-inch disks. These schedules are translated by Louth software, and two ADC-100 playlists are produced, as are compile lists for commercial reel compilation.

All commercials for the Calgary station are recorded on 90-minute tapes. The Lethbridge commercials that are not common to both stations are then recorded on a breakaway tape. During playout to air, a 10 x 1 switcher under automation control is used to switch in the Lethbridge commercials for the Lethbridge feed. This switcher simply switches between the Calgary master control switcher output and the VTR containing the Lethbridge commercials. The ADC-100 can also handle live-to-air commercials if desired.

All device control is handled by the



CFCN uses the Louth ADC-100 at its Calgary and Lethbridge stations.

of all switching and editing within the system. A Louth Control Panel is installed with each workstation to provide single-button control of such functions as play, freeze and skip for any of the lists.

CFCN is using the Louth Turbo Tape tape preparation and database system. Turbo Tape's database contains the pertinent information for all commercial and program tapes. The logged information

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U S E R R E P O R T

Yorkshire Airs with Panasonic

by John Hastings

Group Head of Transmission
YTTTV

LEEDS, U.K.

A new transmission facility at Yorkshire Tyne Tees TV has now been on-air since October of 1993 and provides an improved service to 8 million regional viewers and local advertisers in northeast England.

YTTTV is currently one of the largest broadcasters in the UK. It also allows YTTTV to run a transmission service with 40 percent less staff than the previous set-up.

Based at Yorkshire Tyne Tees TV headquarters in Leeds, the new center provides two main feeds to the Yorkshire TV and Tyne Tees regions plus three additional related feeds.

TRIPLE PLAY

To reduce manual intervention to an absolute minimum, three integrated computer based systems form the core of this highly automated state-of-the-art operation:

- the program planning and presentation scheduling system, developed in-house by YTTTV;

- a presentation control, transmission signal routing and automation event control system supplied by Pro-bel;

- MARC automated cassette library and playout systems from Panasonic.

A digital VTR format was specified by YTTTV from the outset to provide the high quality and robustness essential for commercials and program transmission. After very careful evaluation, the D-3 format was chosen and more than 30 of Panasonic's AJ-D350 VTRs were installed, 20 of these being within the MARC library systems.

One of the many reasons for the choice of the AJ-D350 VTR was that the high-density D-3 recording format reduces cassette size, enabling a program of up to 2 hours to be accommodated within the MARC library on a single cassette. This allows virtually all current programming to be transmitted under full automation.

This — coupled with the proven reliability of the MARC system, as well as signifi-

cant design features such as forward-facing cassette bins, dual robotics and use of standard VTRs — confirms the choice of D-3 and MARC as a very sound investment.

The first system of this type to be installed world-wide, each of the two MARC-Digital 800/III systems provides central playout facilities for up to three channels of commercials, programs and promotions. Each MARC stores the complete library of over 3,500 commercials together with programs and promotions for the entire station output.

CUSTOM SOFTWARE

A substantial amount of custom software development has been undertaken by Panasonic to meet the very strict requirements from YTTTV that emphasize operational safety while providing a cost-effective, automated playout solution.

Within each MARC, commercial break pre-compilation, three-channel playout and acquisition of new material into the library are all performed simultaneously, priorities being determined by the MARC in strict accordance with the on-air schedule sup-



The Panasonic MARC system

plied from the presentation system.

A sophisticated interface between the MARC systems and the presentation event controller controls playout in real time and also enables last-minute changes to the on-air schedule to be performed with relative ease. The new in-house scheduling and booking system developed by YTTTV and running on Unix with a Windows front-end allows changes up to 90 seconds before transmission.

There are three main modules to the system: strategic planning, covering anything from six weeks prior transmission to any time in the future; a weekly program planner, for everything from six weeks ahead of transmission; and a third module, typically covering from two weeks ahead right through to actual transmission. All scheduling information is fed into the system, from the first quarterly planning schedule onwards, culminating in the daily event list. Correct and complete data from this system is the key to the overall success of YTTTV's use of automation.

An important aspect in developing a workable automated transmission system was achieved because of Panasonic's co-operation and guidance at every stage of the design process, together with their preparedness to customize standard software. The MARC type III, with its carefully structured software, must be a major asset in any efficiency-conscious broadcast operation.

This integrated system is one of the first full applications of practical automation to be operated in Europe. It offers fully automation transmission without compromising operational flexibility. This provides commercial spot changes within minutes of the on-air while maintaining an entire library of commercials and programs on-line. Since we have installed our system, Channel 4, also in the U.K., has gone live using another large MARC system from Panasonic. ■

Editor's note: As group head of transmissions, John Hastings is responsible for on-air quality and continuity at YTTTV.

The opinions expressed above are the author's alone. For further information on the MARC system, contact Panasonic in Japan (Telephone: +816-901-1161; FAX: +816-908-5969), in Europe (Telephone: +44-753-692-442; FAX: +44-753-512-705), or circle Reader Service 98.

T E C H N O L O G Y U P D A T E

Drake Is Cashing In on Disks

by Robin Adams

Product Manager
Drake Electronics

WELWYN GARDEN CITY, U.K.

The concept of a temporary digital store with a dynamic input and output flow of program material has attracted the term "disk cache." The powerful alliance of current disk caching technology with automated playout hardware and software now provide the broadcaster with the next generation of program playout systems.

For two decades or more, the transmission of programs and interprogram material (interstitials, such as advertising and promotions) has operated through the use of tape-based electromechanical equipment, and has laterally resulted in library cartridge machines and other multicassette solutions.

UPPING THE ANTE

With the overall increase in capacity and speed of delivery, more complex electromechanical tape cassette cart machines were produced. This approach has now reached a limit in effectiveness and the advent of yet more VTR formats has complicated the issue even further. In the future, a greater emphasis on multichannel environments will challenge the existing automation tools beyond their capacity.

While it can be accepted that tape remains a cost-effective method of long-term storage and distribution, its contribution to short-term playout requirements is being surpassed by the introduction of automated systems controlling single or multiple arrays of associated disk caches.

There are general benefits in the use of hard disk caches in an automated playout system in that disks:

- are guaranteed to be more reliable than VTRs;
- are multisegmented to allow users to organize multiple copies of an item to play out at single-frame intervals if necessary;
- provide instant access with no cueing time;
- require only one playout from a VTR to create multiple copies;
- reduce tape handling and VTR wear and tear;
- can generate multiple channel playout from a single source;
- can upload material while other material is playing;
- can time-shift record material from a single frame up to the storage capacity of the disk.

Broadcasters are facing increasing pressure on transmission budgets. Disk caching can make a significant contribution in several ways, mainly due to the superior reliability of high-precision disks that boast a mean-time-between-failure

(MTBF) of between 500,000 and 800,000 hours. That is 50 to 91 years.

ADDING IT UP

This is good news in itself, but when added to the consequent reduction in VTR maintenance costs, the reduction of operator time spent tracking material, the minimization of tape costs and an extension in both the life and effectiveness of traditional multicassette equipment, the figures stack up.

The benefits of disk caching in automated systems is well-illustrated by using the preparation and playout of a promotional break for three simultaneous feeds as an example:

First, a VTR is used to upload the material to the cache off-line. Once the copy is in the cache, it is available for all three feeds, so the VTR plays just once to allow multiple-cache replays to all three feeds. Previously, this would have required seven VTR passes of material for each item in the one break.

Material can, of course, be uploaded in non-sequential order, and if really necessary could take place during transmission of another item. There is no tape handling and there is less opportunity for operational error with suitable control equipment.

For broadcasters who have single network multicassette equipment, the use of a disk cache can extend their capabilities to feed three or more networks without the associated very high capital cost of purchasing additional multicassette machines.

A further hard disk cache in the system can be used as a flexible back-up system for such high-value interstitials as promotions and/or commercial breaks. Conventional back-up can only be provided by running two VTRs or dual multicassette units, with inherently high maintenance and operational costs. However, with dual disk caches, the original material is replayed once and can be monitored prior to air, minimizing the risk. In the event of a failure of the output signal, there is close to no-break changeover as the second disk is already running synchronously.

With the introduction of disk cache-based automated systems, the broadcaster can plan and implement an upgrade path while retaining and extending the life of existing capital equipment without the enormous costs of additional multicassette systems. This innovation will also reduce operational and maintenance costs, as well as ensure a high degree of reliability and flexibility in playout. ■

The opinions expressed above are the author's alone. For further information, contact Drake Electronics in the U.K. (Telephone: +44-1707-333-866; FAX: +44-1707-371-266), or circle Reader Service 67.

USER REPORT

GVG Puts VTM on the Path

by Jozef Mertens
Director of Engineering
VTM

BRUSSELS

The largest serial digital routing installation of Grass Valley's SMS-7000 is in Belgium at VTM, one of the most modern and successful commercial TV stations in Europe.

Following the success of its first channel, which rapidly gained more than 40 percent of the Flemish speaking market, VTM is now planning to launch a second channel early in 1995 called Kanaal 2. Both channels are distributed over cable, as Belgium is the most cabled country in the world with 98 percent penetration.

INSTANT SUCCESS

VTM was founded in 1987 as the first independent commercial channel broadcasting to the Flemish community. Such was the success of the new channel that by 1991, the first stone was laid at a major new US\$40 million investment at Vilvoorde, 15 minutes from the center of Brussels.

Grass Valley, working closely with its Belgian distributor, now called Lines, was chosen as the primary supplier of TV production, routing and distribution equipment.

Equipment supplied by Grass Valley includes Model 4000 and Model 1000 vision mixers, DPM-700 digital effects, Kadenza and Kaleidoscope digital effects, VP editing systems and at the heart of the station, an SMS-7000 routing switcher.

With four edit suites, two production control rooms, a news studio, six news edit suites, viewing rooms, three production studios and a graphics area, the movement of signals around the station is complex and demanding.

When planning for the new building, one of the most important decisions was to go for serial digital distribution throughout the complex. When we opened, we were probably one of the largest all-serial digital sites worldwide, but the rapid take-up of serial digital by other broadcasters over the last two years has shown the wisdom of that decision.

Another important factor in choosing Grass Valley routing equipment was its multistandard support including 360 Mbps. Although currently we are operating at 270 Mbps throughout the building, having the "headroom" for 360 Mbps is important. The importance of 360 Mbps lies in the future both for enhanced widescreen television and also as a possible compressed HDTV standard.

It is worth noting that in Belgium there are considerable preparations underway by broadcasters, including ourselves, to handle PALplus transmission as part of the growing movement toward widescreen transmission and production. Having the headroom of 360 Mbps makes me feel more comfortable running a station which still has 10 more years of its franchise.

MASTER CONTROL

The SMS-7000, along with all the equipment electronics, is situated in the master control room. As part of our philosophy of making the station 360 Mbps-capable, no cable run is more than 150 meters. This gives us headroom for both 360 and 270 Mbps.

VTM is running day to day on 270 Mbps

from one pair of SPGs with four groups of delays. A timing reference is given to all the VTRs (primarily Digital Betacam) and all the external sources from the first delay line. A second reference goes to all the vision mixers and routing switchers. A third reference is used within MCR and a fourth goes to the final coders. Signals to all the vision mixers arrive at +/- 30 microseconds.

Audio is transmitted as NICAM dual sound in sync via RE encoders and is monitored after travelling around seven cable hubs.

The SMS-7000 router has been designed to be capable of a 128 x 128 matrix. We

started with a 64 x 80 video router, which is now up to 80 x 96. The SMS-7000 is capable of handling four different data rates: 143, 177, 270 and 360 Mbps. One of the important features of the SMS-7000 is that data is clocked and re-clocked only at the entry and exit points, ensuring that the signal is not affected by too much reclocking.

Audio routing is via an 80 x 96 matrix, while timecode is via a 64 x 64 matrix. About to be installed at VTM is an RS-422 data matrix measuring 64 x 64. To date, this has been handled by a separate Horizon matrix. When installed, this will mean that

we can access all five layers of the SMS-7000 (video, two layers of audio, timecode and data) from one control panel.

At VTM we have been very pleased with our choice of the SMS-7000. It has outstanding reliability and provides us with the expansion and "headroom" to face the rapidly changing broadcast scene with confidence. ■

Editor's note: Jozef Mertens came to VTM after having worked at Flemish public channel BRTN as chief engineer of ENG/EFP services.

For further information on the SMS-7000, contact Grass Valley in Europe (Telephone: +44-628-478-833; FAX: +44-628-478-140), in the U.S. (Telephone: +1-916-478-3157; FAX: +1-916-478-3187), or circle Reader Service 77.

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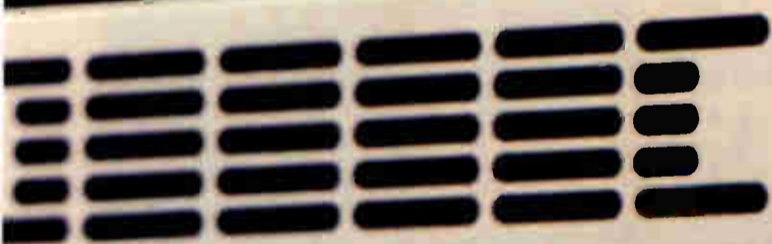
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USER REPORT

Avid Puts Focus Out in Front

by Patrick Coulier
President
Media and Communication Services

BRUGES, Belgium

My brother, Philip, and I founded Media & Communication Services (MCS), an independent audio-visual production company, in 1984. Today, MCS owns three all-digital cable stations: Focus Televisie, Limburg Televisie and Channel 3.

The stations broadcast news programs, local interest stories, weather information and local business commercials to their respective areas: Jabbeke in north-west Flanders, Hasselt and Genk in the north-east, and Dendermonde, located 35 kilometers west of Brussels.

BREAKING GROUND

The first of our stations, Focus Televisie, made broadcasting history on September 1, 1993, when it began transmitting news stories from hard disk. Now, all three stations broadcast in the same fashion using Avid Technology's NewsCutter news editing system and AirPlay digital playback system.

As well as the ability to broadcast from disk, the use of digital non-linear technology allowed Focus TV, Limburg TV and Channel 3 to be built from scratch and begin broadcasting within a very short period of time. Today the same technology enables us to keep operational and maintenance costs to a minimum with just a handful of staff at each station.

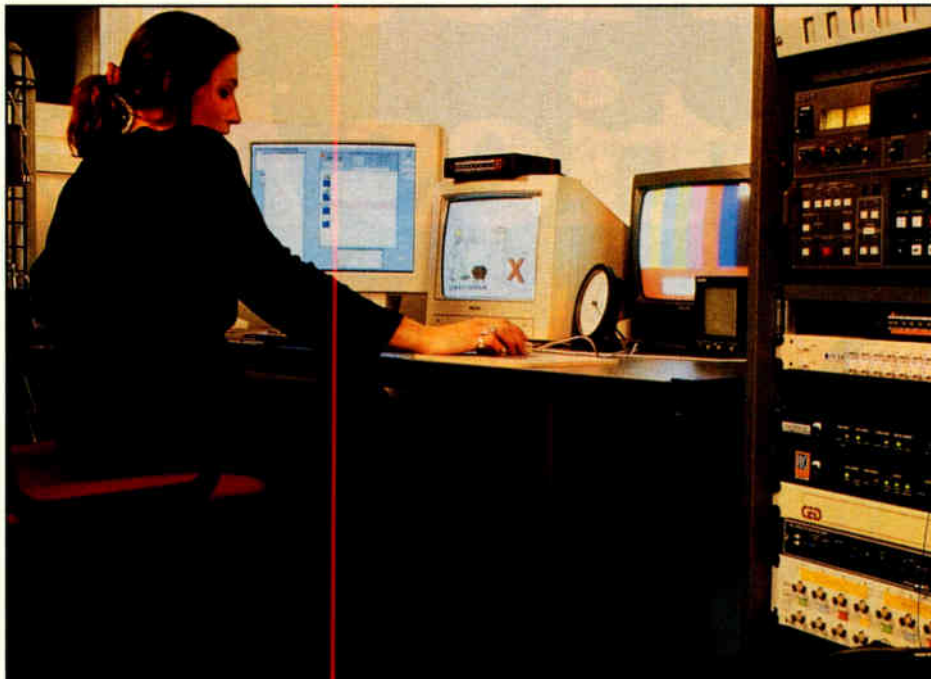
Philip and I oversee the general day-to-day operation of the three stations and we were responsible for start-up and initial equipment purchases. We first saw Avid products in 1993 at Montreux. The Avid Technology stand was the last we visited

Avid Technology's systems offer reliability, picture quality and ease of use.

on the final day of the exhibition, but we immediately realized the great potential in Avid. On our return to Belgium, we talked with Avid's distributors and ordered two NewsCutters, one AirPlay, an Avid AudioVision for audio post-production and a Media Composer 8000 for editing commercials.

At Focus Televisie, we have a small team of professionals, including six journalists, three camera crews and five production staff. The daily news program, which is looped to run from 6:30 p.m. to 1 p.m. the following afternoon, is watched by 83 percent of households in the viewing area at some point during the 18-and-a-half hours of transmission. MCS provides post-production services and sells air time to companies whose commercials are broadcast alongside Focus's news and general interest stories.

We attribute the company's success to the high quality of news reporting, which we believe is only possible by investing in the right people and keeping up to date with technology. We firmly believe that the future of the broadcast industry is based around digital non-linear technology. News stories are continuously changing, and broadcasters have to be able to update stories right up to the last seconds before going on air if they want to provide the best



The Avid AirPlay system has a key role at Focus Televisie

service for the viewers. This degree of flexibility is only available from the speed offered by non-linear equipment.

Avid Technology's systems offer reliability, picture quality and ease of use. Neither of our two NewsCutter operators had any experience editing before using the systems. Now we believe that our news stories are equally as good as those broadcast on the national network.

The equipment is perfect for us. We have been able to become very successful in a short period of time, which is largely due to the Avid equipment allowing us to operate with a small number of staff. Although there is a lot of work, we can do it very quickly by calling upon the speed of the NewsCutter and AirPlay systems. We have built up a close relationship with Avid, and because they understand our specialized application, they are able to provide an excellent support service.

The pace of a typical day at Focus Televisie grows steadily from 9 a.m., reaching its peak at 6:29 p.m. - one minute before going on air. The journalists begin by investigating local news stories. The MCS camera crews are sent out and news reports are shot on Beta SP.

Tapes are sent to the MCS studios during the day where they are digitized into the two NewsCutters for editing. Journalists write up their stories and work with the editors in the Avid suites to finish cutting the stories and adding the voice-overs directly into the NewsCutters.

Around lunch time, the stories are sent via RGBnet into AirPlay where the operator begins to build up the playout sequence. The anchor staff, Tony Vandenbosch and Brigitte Balfoort, are responsible for the final editorial content of the news. They also have the task of introducing each news item.

Shooting the introductions begins in the afternoon in the news desk studio with the camera feeding pictures directly into AirPlay. At 5:30, the first set of commercials is dropped in between the news sto-

ries. The stories are duplicated and a second set of commercials is added.

AD INSERTION

Due to AirPlay's speed and flexibility, the sales team is able to sell advertising time space right up to the last minute before going on air. Many of the commercials are edited using the Media Composer 8000 and

AudioVision which are located in MCS's facility studios. News stories can also be dropped into AirPlay or updated at the last minute. At 6:30 p.m., Focus Televisie begins transmission with the 20 minute program looped to run for 18-and-a-half hours. Any big news that breaks during broadcast can be dropped into the sequence.

At Limburg Televisie, which began broadcasting on April 26, 1994, the story is much the same, with the exception that the program is looped from 6:30 p.m. to 11:30 p.m. the following day. At least one of the news programs is broadcast live each day. A similar format is followed at Channel 3, which began broadcasting on September 26, 1994.

The Avid equipment has enabled us to be much more flexible with our stories. With everything being digital, we can insert new stories or rearrange the playout sequence at any point without having to unload and reload tapes. We have established a very successful and economical method of producing local news and general interest programs. Without Avid's digital non-linear technology for the newsroom, none of this could have been achieved. ■

Editor's note: Patrick Coulier holds a master's degree in business administration from Vrije Universiteit Brussels. In addition to his work at MCS, he also acts as a consultant for cable and satellite companies.

The opinions expressed above are the author's alone. For further information, contact Avid Technology in the U.K. (Telephone: +44-753-655-999; FAX: +44-753-654-999), or circle Reader Service 133.

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Sony M3 w/hard case, NP-1 adaptor & Fujinon lens, \$1100/BO. 803-232-6559.

Sony EVW-300 with Fujinon S12x7.5 lens, tripod adapter, NP-1 battery, Thermodyne hard carry case, 20 hrs use, \$5250. Bob, 617-734-7305.

Panasonic WV-D5000 w/WV-S050 ENG kit, 12:1 lens, 2/3" CCD, strobe effect shutter, 10/14 pin cable, manual, \$750. Paul, 708-352-1200 x4473 or 708-810-9181.

JVC KY15U 16-1 lens, shotgun mic, DRS411U S-VHS w/docking & port adp, chrg, 4 batts, tripod plate, ENG viewfinder, \$4300. Monty, CA. 209-431-8009.

Ikegami 730A camera, lw hrs w/Canon J15x9.5 lens, ENG viewfinder, AC adaptor, Frezzi batt, mint, \$2000. N Coffey, NY. 315-443-5644.

Ikegami ITC-730AP (2) cameras, 1 for parts, 1 complete, BO; Sony VO-4800 3/4" port, BO. J Kesler, KY. 606-843-9999.

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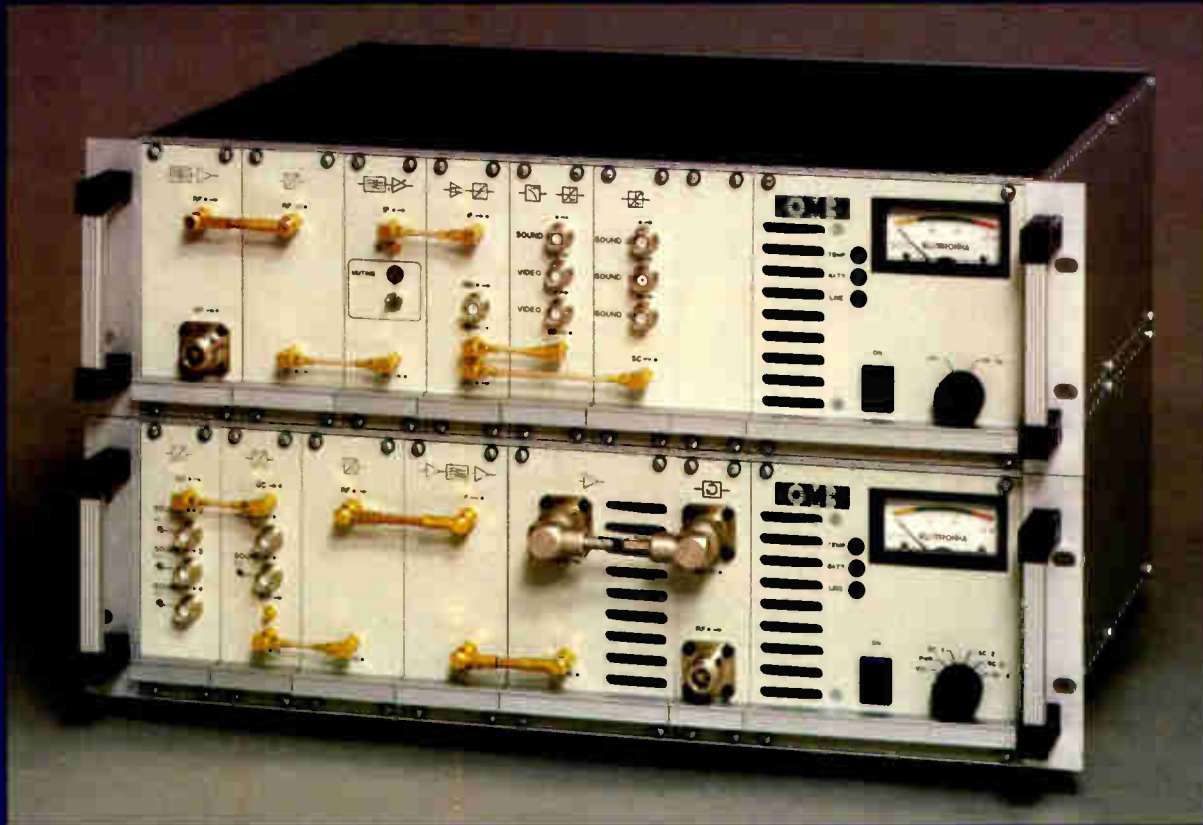
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