Section Meetings

Hong Kong
BroadcastAsia 2006

BroadcastAsia 2006 was held this year on June 20-22 in Singapore. Due to the World Cup Soccer TV transmission schedule, the attendance for this year was comparatively low. Most engineers were busy conducting live transmission/reception and could not attend the BroadcastAsia 2006 conference and exhibition.

The Hong Kong Section decorated the booth with annual event photos to attract delegates. The most interesting issues discussed in the conference this year were training through professional associations such as SMPTE. One area that drew a lot of delegate interest was the growing gap between the advancement of technology and the technical training necessary to raise technical standards of engineers.

The exhibition attracted suppliers/manufacturers from Italy, the U.K., and France; each had a special area to showcase their products and solutions. The main topic of discussion was IPTV. Conference papers also focused on this trend, with majority of discussions on IPTV and exploring interactivity. The market potential of IPTV and Interactive TV were discussed and software solutions were demonstrated. With IPTV being the hot topic in Asia, the various related areas will be the focal points for upcoming conferences in the region.

Engineers from Southeast Asia inquired about SMPTE and were introduced to the membership and the networking opportunities that come along with the various activities conducted in Hong Kong. Although BroadcastAsia was not held in Hong Kong, it attracted a large number of Hong Kong engineers, making it a good opportunity to meet, share experiences, and keep in touch with fellow industry professionals.

—Oonagh Chan/Membership Chair

Hong Kong
June 2006

The Hong Kong Section celebrated the launch of a local SMPTE Student Chapter on June 29, with the attendance of more than 70 representatives from the television and film industries, as well as educational institutions. The ceremony was held at the Hong Kong Institute of Vocational Education (IVE) in Kwun Tong District where the student chapter was established.

L. Lo (l) delivers the welcome speech.

Group photo: Y. K. Poon (first on the left) and Percy Fung (with cap in the middle) were instrumental in setting up the Student Chapter.

In her welcome speech, O. L. Lo, Nexus Principal, Hong Kong Institute of Vocational Education (Sha Tin Nexus), pointed out that the Student Chapter was the result of the efforts made by the local Section of SMPTE, the industry, and the educational institutions, which signified a closer tie between the industry and the schools. Students will have a close and direct contact with professionals to expand their knowledge related to their respective fields.

SMPTE Asia Pacific Governor K. L. Lam, and Section Chair Tony Ngai thanked those who made the event possible, especially Percy Fung, Digital Magic, and Y. K. Poon, IVE, who were instrumental in setting up the student chapter. Both ensured that the local Section would strive to become the most active trade association in the industry and to introduce advanced technologies to the trade and educational institutions with more technical seminars in the pipeline.

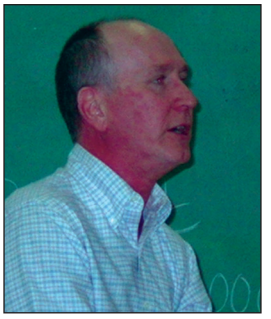
After the ceremony, guests and members toured the facilities of IVE, which included a digital screening room with Dolby Digital Surround system, digital color grading, HD production studios, Discreet and Apple training centers, Arriscan, and Arrilaser.

—Raymond Lai, Secretary/Treasurer

Pasadena City College
May 2006

On May 2, the Pasadena City College Chapter welcomed Sheldon Bull, a writer, producer, and director."

A PCC alumnus, Bull graduated from UCLA with a BA in motion pictures and television. While attending UCLA, he became interested screenwriting. He landed his first job at NBC's "The McLean Stevenson Show," where he stayed for eight episodes. "The show was awful because nothing worked. Nevertheless, it was a good experience—I had to figure out a lot of things," said Bull.



Sheldon Bull addresses students at the PCC meeting in May.

Bull got his first writing credits for "M*A*S*H," for which he wrote two episodes. In addition, he developed, produced, and wrote episodes for "Newhart" for two years, followed by "Coach," where

he wrote for three years. In his three years working on "Sabrina the Teenage Witch," Bull has written, directed, and produced several episodes.

Having been in the industry for over 30 years, Bull explained how the industry has changed over the years. He emphasized that cable has not only changed the industry, but has opened the doors for other networks to grow and create competition.

(L-R) Speaker Sheldon Bull and PCC Student Chair Smitha Kalkuzhi at the meeting in May.

When asked about the differences between writing for a single or multicamera show, he responded that single-camera shows such as "Scrubs," have no audience; they have a lot of sets, in comparison to a multicamera show such as "Two and a Half Men," where there is a studio audience and longer scenes. Consequently, single-camera shows take only a couple of hours to shoot, whereas "Sabrina," with many more scenes (45 scenes, 17 scenes a day) takes three days.

In his answer to the secret for a successful show, Bull stated, "In this business, you need to know how to handle your actors!"

—Carmen Porreca, Faculty Advisor

Washington, D.C.
June 2006

The Washington, D.C., Section meeting on June 15 featured a presentation by Quantel's chief technical officer, Jon Pannaman. Sixteen members and guests attended the event, which was held at the Hilton Hotel in Mclean, VA. The purpose of the meeting was to present the philosophy, rationale, and technology behind the Quantel LAN/WAN production/post-production workflow system, based on "Zone Magic" technology, and to demonstrate its operational capabilities. The remainder of this report is a summary of Jon Pannaman's presentation.

The Zone Magic system runs on high-powered Windows2000/XP-based workstations and VxWorks data servers. The system is scalable and expandable without rebooting, and it automatically tracks and adapts to changes in near realtime. It supports mixed-format and mixed-resolution, local and remote program sharing and production that can span a room, a city, and the entire world.

Wherever possible, Quantel selected open-architecture software and standard platforms as a foundation. When system conception and development began around 1996, the state of processor technology led Quantel to prefer the Intel chips to the Motorola series. Also, options such as Linux and MacOS were not ready for this arena, where extremely high reliability and fault tolerance, plus the ability to run many widely used third-party applications, were, and are, critical requirements. If the system were being developed today, other choices might be made, but Quantel's and their users' experiences with this system have revealed no substantive problems from use of

the Windows operating system. Consideration of alternatives depends on customer demands. The system runs on a 1 Gbit/sec Ethernet, with faster networking under development for use where needed.

Even in the 1990s VxWorks was a respected realtime multitasking industrial Unix-like operating system used in many government and military applications. It has since been used in the Mars Exploration rovers Spirit and Opportunity, a Linksys wireless router, and in a ReplayTV DVR; Boeing plans to use it in their new 787 airliner. VxWorks also has an excellent history of immunization from viruses and other malware. MySQL is the open-source database used for storage and management of all program data.

The underlying storage concept is to have program data (video, from standard definition (SD) up through 4k digital cinema, plus associated multiple channels of audio) stored directly via SDI I/O (not over the Ethernet) to a RAID-5 server, with each video frame stored separately, along with its metadata, which includes identification of the video acquisition format. SD video is stored as IMX I-frames. HD video is stored as DV100 I-frames. Metadata is stored in AAF format and can easily accommodate new SMPTE or other metadata definitions, requiring only a simple software modification. During acquisition, the program video is stored two ways—in full resolution and in a low-resolution browse format. There are options to allow the data to be stored in multiple locations, though the operation of the system and its reliability generally do not warrant the extra expense.

The editor is isolated from direct computer operations—he uses pull-down menus that automatically update when programs are added or deleted or when additional servers are brought online. The user need never be concerned about where the data is stored; the system handles that behind the scenes. Although many customers allow access to all program data from all workstations, areas and zones can be set up to provide limits.

When the editor selects a clip for use, the browse clip is downloaded to the editor's workstation via UDP (instead of TCP) over IP. The Quantel workstation software stack performs all error correction. Although the workstation does run the Windows OS, only layer 1 (physical), layer 2 (data link), and some of layer 3 (network) of the OSI 7-layer structure are used when performing Quantel's functions. Quantel's workstation software bypasses the rest of Windows (they could not sectionalize the MacOS in the same way), using their own drivers and hardware resources, optimizing performance for editing functions while minimizing Windows' idiosyncrasies. Having Windows on the workstation supports the use of many third-party software packages that the user prefers for production and post-production functions. The structure of their workstation package enables users to buy only the software and specialized hardware to use on their own workstations and simplifies Quantel's ability to migrate the package to other hardware and operating systems, if sufficient demand arises.

The editor can perform any desired production/post-production operations on the clip, just as on any editing workstation (the latest release includes speed adjustment with coincidental audio pitch adjustment). The difference is in what happens to the data. Any operations that do not require a

Jon Pannaman, Quantel, speaker at the Washington, D.C., June meeting

change to one or more video frames creates an edit command list—it doesn't alter the source data. On the workstation, the editor sees the effect implemented in the browse copy locally stored. If changes to one or more frames are performed (such as fades or color correction), copies of only those affected original-quality frames are immediately and invisibly downloaded to the workstation, where the changes are made to those copied frames. When all editing is completed and the editor has (properly) named his edited program, the edit command list and the modified frames are automatically stored on the server.

When a scheduler identifies a program and location for broadcast (publishing), the system immediately moves a copy of the original frames and modified frames, in accordance with the edit command list, to the broadcast location cache storage. At all times, the original data is available to others who might want to copy or edit it for a different purpose. Common Object Request Broker Architecture (CORBA) provides asset management control to prevent deletion of original data that is in use by others, in a manner similar to some better CAD systems. CORBA enables heterogeneous applications in various languages on various platforms to interoperate.

Critical to obtaining the proper system configuration, and to its successful use, is the customers doing their homework—thoroughly describing how the system will be used, source and broadcast formats, network data, and video bandwidth requirements, access control needs, expansion plans, and program file-naming standards. It is also necessary for the customer to have the equivalent of a database manager to determine when clips can be deleted from the master storage, as well as when the system will need more storage. The concepts behind Quantel's system have been carefully crafted toward freeing the users from being computer experts, enabling them to concentrate on their function, not the equipment.

Thanks to Quantel for hosting the meeting and for the excellent refreshments. Thanks also to Rob Foreman, Quantel regional sales manager, who coordinated the arrangements, and to the Quantel support team for their help with the demonstration.

—David Weinberg, Section Manager

Washington, D.C.
Joint Meeting with the AES

The Washington, D.C., Section and the Audio Engineering Society held a special joint meeting on June 3. Forty-three SMPTE and AES members and guests attended the event, which took place at the headquarters of National Public Radio. The meeting was chaired by David Weinberg, SMPTE Section Manager and Vice-Chair of the AES section, who recounted his experiences with grounding problems and then introduced the guest speaker.

Bill Whitlock, president of Jensen Transformers, presented a three-hour seminar on "Understanding, Finding, and Eliminating Ground Loops." Whitlock is a leading expert in this field and his experience includes contributing to AES48-2005 and IEC60268-3, standards addressing grounding practices and interfacing—subjects that are closely intertwined. His many white papers and schematics are on the Jensen website at www.Jensen-Transformers.com.

Whitlock declared that grounding and interfacing are widely thought of as "black art," and articles on the subjects are rife with myths. Furthermore, fundamental principles of physics are overlooked, ignored, or forgotten. Manufacturers are often "clueless." Fortunately, Ohm's law is all one needs to understand grounding/interfacing.

Safety First. Whitlock stressed that safety must never be compromised in order to troubleshoot or fix ground loop problems, and that there is no reason to do so. He reminded us about the role of the green ground wire and safety ground, the National Electric Code, and their importance to the preservation of life. Key to this is the rule that the white (neutral) and green wires inside walls must be tied together only at the safety ground point in the breaker panel, and equipment's green wire should never be lifted. Whitlock cautioned that equipment will fail, and a missing safety ground can be lethal. Earth ground does not figure into this safety issue, it only serves as a relatively lower impedance path in the event of a lightning strike.

Ground Doesn't Mean Zero. Just because there is a metal rod in the ground does not mean that it is at 0Vac, although it does provide a reference point. Impedance between any two points in the earth do not exhibit a zero impedance, and there are many electric fields acting on the earth, so there is a voltage difference, and thus a ground current, such as between the cable TV feed ground at the street and the ground in your house. In fact, if there are two earth grounds in the event of a lightning strike; there will be thousands of volts, and hundreds of amps, between them. Thus, having more than one earth ground is less safe than having only one, and violates the NEC, unless they are solidly bonded together.

As in the earth, there is always resistance in wire (including cable shields), no matter how heavy the gauge, so there will always be measurable AC voltage, and therefore current, between any two ground points.

Hum Troubleshooting. Many ground-loop hum problems arise from having multiple ground points, which can easily be the path along a signal cable shield, through the equipment to one safety ground, through the non-zero impedance to another earth or other ground connection, then back to the other piece of equipment and to the other end of that same signal cable shield.

Temporarily lifting the safety ground, or the ground at one end of a signal cable, and listening, might confirm that there are ground currents flowing in signal cables via the signal return wire or shield. This illustrates the inappropriate nature of the RCA connector and feeding unbalanced signals between cabinets, a practice that arose when a convenient interconnection method within a TV cabinet became also the de facto

From left to right: Karl J. Kuhn, SMPTE DC Section Chair; Gerald Tennent, AES DC Section Chair; Scott Dargan, AES DC Section Treasurer; Bill Whitlock, President, Jensen Transformers; David J. Weinberg; AES DC Section Vice-Chair and SMPTE DC Section Manager, Jim Anderson, VP, AES Eastern Region; Fred Geil, AES DC Section Secretary.

standard for connections between cabinets.

Whitlock lamented that far too much "pro" equipment has unbalanced inputs and outputs, hence the need for frequent hum-elimination troubleshooting. He described two useful tools: the Jensen TA-R1 RCA-RCA test adapter that breaks the signal path yet retains ground connections, and wideband Jensen Iso-Max transformers, designed to feed a signal between unbalanced connections while isolating the ground between them, thus eliminating that ground current.

Noise. Noise gets into equipment because of the RLC of cables plus interface problems, and they cannot be eliminated by anything an electrician can do to the power wiring. A spectrum of typical leakage current will show frequencies into the MHz range. Only a balanced interface can minimize the transfer of this RF noise to the next stage.

Shields. Shields only inhibit electric field coupling, not magnetic. Thus they provide no help if you run a signal cable near a power cable, since the power cable also generates magnetic fields. An 85%-coverage copper-braid shield is better than a 100% foil shield for most conditions because of the uniformly distributed nature of the current carrying capability, versus the shield wire used with foil shields.

"Exotic cables will not stop noise. Expensive cables, even if double or triple shielded, made of 100% unobtainium, and hand woven by virgins will have no significant effect on hum or buzz. Only the resistance of the grounded conductor can make a difference."

If you have to use coax, Belden 8241F, with a low-resistance copper-braid shield, works well for audio and video.

Balanced Works. Whitlock stressed the concept of a balanced interface. Signal symmetry has nothing to do with a balanced connection, which does not require equal signal voltages with respect to ground. In fact, the voltage levels on each conductor are irrelevant. It is the balanced impedance to ground that provides the far superior common mode rejection ratio (CMRR) performance.

The real definition: "A balanced circuit is a two-conductor circuit in which both conductors and all circuits connected to them have the same impedance with respect to ground and to all other conductors. The purpose of balancing is to make the noise pickup equal in both conductors, in which case it will be a common-mode signal, which can be made to cancel out in the load." (Henry Ott)

Furthermore, "Only the common-mode impedance balance of the driver, line, and receiver play a role in noise or interference rejection. This noise or interference rejection property is independent of the presence of a desired differential signal. Therefore, it can make no difference whether the desired signal exists entirely on one line, as a greater voltage on one line than the other, or as equal voltages on both of them. Symmetry of the desired signal has advantages, but they concern headroom and crosstalk, not noise or interference rejection." (from "Informative Annex" of IEC Standard 60268-3).

Impedance matching is only important when transmission-line effects become substantive, which is when the signal wavelengths in the cable are at least 10% of a cycle. In those cases, impedance matching inhibits reflections along the cable that lead to cyclic reinforcement and cancellation, which can cause serious signal loss problems at certain frequencies. For audio, this is not a problem until the cable reaches about 4000 ft. In fact, the best CMRR is achieved when the source impedances are very low and the receiver impedances are relatively high. This leads to the demonstrable conclusion that sending audio, and for shorter cable lengths even video, over tightly twisted pair, even UTP, will work exceptionally well, but only if the transmitter and receiver have properly balanced connections.

Whitlock explained why in the real world a good transformer still beats transformerless interfaces in terms of CMRR and ground-loop problems. Nevertheless, THAT Corp. has implemented Whitlock's patent #5,568,561 in their 1200, 1203, and 1206 chips that accurately emulates a transformer's benefits. It includes bootstrapped input resistors to achieve very high common-mode input impedances, yet preserves the necessary path for first-stage DC bias.

The Pin 1 Problem. When in equipment an XLR connector's pin 1 is tied anywhere except directly to the green wire ground point (such as to signal ground), there is a pin 1 problem, caused by noise current flowing in the signal ground, thus inserting noise into the signal. This should be avoided, especially when trying to realize 24-bit audio performance.

For audio system designers, Whitlock offered several tips:

- Hum might be reduced by plugging the various components into the same outlet strip, in effect tying the grounds together. However, this will not help remove hum from the cable TV feed; a signal isolation transformer might be necessary.
- Typical foil cable shielding is ineffective for magnetically induced noise, but steel conduit can help.
- When troubleshooting hum problems, work stage-by-stage backward through the system, but first remove any ground-lift devices in the system.
- Avoid unbalanced interfaces whenever possible.
- Tight twisting of wires in a balanced cable improves CMRR.
- Electrolytic capacitors in balanced interface circuits guarantee poor impedance balances, due to their inconsistent characteristics versus frequency between units (wide tolerances).
- When interfacing unbalanced sources to balanced receivers; use a shielded twisted pair with the shield and low (-) signal conductor connected together at the source ground.

The importance and popularity of the topic was obvious, as attendees raised many questions and shared war stories during the discussion/question period afterward. Thanks are extended to NPR for their hospitality.

—Fred Geil, AES-DC Section Secretary,
and David J. Weinberg AES-DC Section Vice-Chair
and SMPTE-DC Section Manager