

will open new channels of communications among peoples.

Bandwidth for HDTV Captioning

Based on a preliminary estimate, all the above design goals can be accommodated within a data bandwidth of about 10,000 bits/sec. This estimate assumes three independent channels (three different languages, for example), with all three able to build their respective captions/subtitles in 1/2 sec simultaneously. A rich set of features, flexible screen addressing, and a large character set are also assumed. Such a world-market format would require between 1000 and 2000 bits to build each caption or subtitle. To build three captions/subtitles at once would require the transmission of about 5000 bits. To follow a fast-moving program, all three must be built in less than 1/2 sec, so an instantaneous bandwidth of 10,000 bits/sec should be available, not considering compression or error correction.

Of course, the full bandwidth of 10,000 bits/sec is needed for only 1/2 sec prior to each caption/subtitle event. Even if such events were to occur every 3 sec (an exaggerated estimate for most programming), this would leave 2/3 of the total bandwidth available for lower-priority program-related

data, or more than 8000 bits/sec. During a 1-hr program, such a channel could deliver the information equivalent of two high-density diskettes in addition to the captions and subtitles.

Conclusion

The advent of advanced-television systems in the U.S. presents a one-time opportunity to correct the shortcomings of the current closed-captioning system while adding important new features. To seize this opportunity, the industry will need to cooperate in the timely development of an international format for program-related data. The potential for serving many other audiences, in addition to deaf and hard-of-hearing viewers, will help guarantee that captioning and subtitling become a familiar sight on the world's video screens.

References

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2. Pub. L. No. 101-431, 104 Stat. 960 (1990) (codified at 47 U.S.C.A. §§ 303(u), 330(b)).
3. *Report and Order, In re Amendment of Part 15 of the Commission's Rules to Implement the provisions of the Television Decoder Circuitry Act of 1990*, Gen. Dkt. No. 91-1, FCC Dkt. No. 91-119 (Adopted April 12, 1991).
4. 47 U.S.C.A. § 330(b).
5. *TV Decoder Circuitry Act of 1990: Hearings Before the Subcomm. on Communications*, 101st Cong., 2nd Sess. 13-14 (1990).
6. Electronic Industries Assn. Marketing Services Dept.
7. Various studies have been undertaken in recent years, for instance:
 - Koskinen, Wilson and Jensema (Mar. 1986). "Using Closed Captioned Television in the Teaching of Reading to Deaf Students," *American Annals of the Deaf*, 131:43-46;
 - Goldman (Feb. 1988). "Reading with Closed-Captioned TV," *J. of Reading*, 31:458-461;
 - Neuman and Koskinen, "Using Captioned Television to Improve the Reading Proficiency of Language Minority Students," Temple University, June 1990.A complete bibliography is available from the authors of this paper.
8. *Report and Order, supra* note 3, p. 13, para. 36.
9. National Captioning Institute, *TeleCaption II Decoder Module Performance Specification* (Nov. 1985).
10. Certain of the new features mandated by the FCC will have the effect of causing disruptions in decoders sold before 1985 — caption producers will need to include additional, backward-compatible code for some features and delay use of others until the population of these early decoders is considered insignificant.
11. Two technical standards for teletext have emerged: World System Teletext (WST) and the North American Basic Teletext Specification (NABTS). Originally developed in the U.K. for use with PAL video, WST is the more commonly used standard worldwide and is used by some U.S. broadcasters. NABTS, a more sophisticated system, has been used by CBS and Canadian broadcasters.

The Post Experience

March 27-28, 1992, Toronto, Ontario, Canada

By Bill Bishop

The Post Experience — a comprehensive and educational multimedia seminar — was presented March 27 to 28, 1992, by the SMPTE Toronto Section. The event is slated for a repeat performance at the 134th SMPTE Technical Conference and Equipment Exhibit, which will take place November 10 to 13, 1992, at the Metro Toronto Convention Centre in Toronto, Ont., Canada.

"The Post Experience is the first seminar to put together all the elements of post-production and present them in one complete program," said Harvey Rogers, YTV Canada, who served as organizing chairman of the event. "The seminar was an eye-opening adventure into the world of post-production."

Held at Film House and Wallace Avenue Studios in Toronto, The Post Experi-

ence attracted more than 150 people from all segments of the industry. Using multimedia presentations and entertaining audience participation, leading editors, technicians, and other specialists delved into virtually every aspect of the post process including sound editing, Foley artistry, automated dialogue replacement (ADR), off- and on-line editing, special effects, and distribution.

"The Post Experience was an invaluable seminar for anyone in motion-picture and television production who is not intimately familiar with the current post-production process," Rogers said. "Post-production technology continues to advance and become more sophisticated. This seminar provided a rare overview of the current technology and methods used by the post-production community."

Rogers added that an understanding of post-production allows motion-imaging professionals to do their job better, no matter what aspect of production they are involved in.

"If people on the production side, for

example, understand post-production," Rogers said, "then it will be easier for everyone to work together on a film, television show, or commercial. By fostering an understanding of the post process, everyone — including secretaries, production assistants, and suppliers — can do their job more effectively."

The Friday Session

The Post Experience got under way on Friday, March 27, at Film House on Adelaide Street East. Michael Quast of YTV was co-host, along with his Aniform sidekick "Q," an interactive animated character who offered humorous quips from a studio monitor.

Sound Finishing and Foley Artists

The first presentation was a clip from *Indiana Jones and the Temple of Doom*, which vividly showed how each layer of sound effects and ADR is added to a motion-picture scene.

To highlight the unique talent of Foley artists, the audience was shown a film

Bill Bishop is president of Bishop Communication, Toronto, Ont., Canada. He is also publisher of *In Motion*, Kodak Canada's newsletter for the motion-picture and television imaging industry.



Ellen Heine demonstrating the E-Pix off-line editing system, as Michael Beard addresses the audience.

called *Track Stars*, which used a split-screen format to illustrate how Foley artists record enhanced sound effects using props, body movements, and other tricks of the trade.

Andy Malcolm of Film House then offered a revealing live look at Foley artists in action, using David Cronenberg's *Naked Lunch* as a working example. Malcolm recreated the sound of footsteps, windows shattering, and doors opening from one particular scene in the film. He also reproduced the sound of a large bug being squashed by smashing a lobster with a shoe.

"We can create almost any sound in the world using all kinds of props and surfaces," Malcolm said. "Although most people think these sounds are recorded while shooting, most sound effects are reproduced in a Foley studio."

In addition to sound post-production, the Friday night session included two Kodak films: *The Making of the Kodak Olympic Commercial*, which showed how the high-resolution medium of film origination and digital technology can be combined to create magic, and *Pieces of Silver*, which charted 100 years of motion-picture film history.

Screening and Audio Mix

Don White and David Appleby, Film House, used the *Naked Lunch* scene to explain how the audio mix process is used to bring all the audio elements — ADR, Foley premix, effects premix, and music — together.

"It can take up to 100 hours of work to go from the guide track stage to the final mix," White said. "You must decide which voice tracks must be replaced, what additional sounds must be added, and what levels of music and audio effects to use. During this process, the sound editor

works closely with the director to achieve the desired result."

Screening of Dailies

Dailies from the Atlantis/YTV television series "Maniac Mansion" were then shown to the audience as a prelude to the off-line editing and sound post-production exercises scheduled for the next day. The "Maniac Mansion" dailies were to be used to create a finished scene using ideas and input from the seminar participants.

The Saturday Session

The Saturday session was staged at Wallace Avenue Studios, where an elaborate post-production and multimedia facility had been created especially for the seminar. Three large television screens were projected above the stage to allow the audience to see all the images and computer software used by the post-production crew.



Harvey Rogers, chairman of the seminar's organizing committee (left), with Diane Cappelletto, committee treasurer, and Fred Lemmin, sponsorship coordinator.

At the Shoot

Post-production supervisor Michael Beard opened the session by discussing the important post-production issues to consider during production.

"It's important for the production and post-production crews to meet prior to shooting, so that each crew understands what system will be used for the production," Beard said. "For example, the colorist should meet with the director of photography to discuss the kind of look they want to achieve."

Working with sample sheets provided in the comprehensive seminar binder, Beard then reviewed the proper procedure for recording details on sound, camera, and continuity sheets. Beard also emphasized the importance of a properly presented time code slate.

"The clap of the slate is used to sync the sound to the film," Beard said, "but it provides the post-production team with valuable information. If you rush the slate, this information may be lost."

Moving on from "At the Shoot," the audience was shown how the film-to-tape transfer process works. The presentation, which was produced at Magnetic North, explained the use of Kodak Keycode™ numbers and how Kodak particle transfer rollers (PTR) are used to remove particles from film during the transfer phase.

"The new Keycode numbers on Kodak film allow post-production crews to record information directly into a computer," Beard said. "This makes it easier to move back and forth between film and videotape. Kodak PTRs makes sure that the transferred image is as clean as possible."

Ellen Heine, Adcom, presented a fascinating demonstration of the E-Pix off-line editing system, which uses the random access format to edit scenes stored on optical disc.

"By accessing an optical disc," Heine said, "you accelerate the off-line editing process by many times. You can access any

part of any scene in the blink of an eye. This leaves more time for creative decisionmaking."

Heine worked with the dailies from "Maniac Mansion" to show how an edit decision list is created. Members of the audience were asked to choose which shots should be used to create the scene. As the edit decisions were made, the computer monitor illustrated how each shot is added, deleted, and revised with the simple movement of a computer mouse.

The On-Line Process

Beard then explained how the on-line editing process is used to quickly put together a production, scene by scene, using the computerized edit decision list compiled during the off-line stage.

"During the on-line process, the edit decision list is conformed automatically by a computer that lays down each scene from each roll of tape. Digital effects such as flips, spins, and rolls are also added during the on-line phase of post-production. In other words, you do your creative thinking during the off-line editing process and then use the on-line suite to compile your finished production."

Special Visual Effects

John Gajdecki of Visual Effects ran a demo reel of the special effects he created for numerous television programs and feature productions. He explained how some of the effects were created using blue-screen technology and why it is important for the visual effects producer to work closely with the production crew.

"Special effects engineers usually visit the set to make sure that the visual effects the director wants can indeed be created," Gajdecki said. "Sometimes the director will get some incredible idea for a special effect that may be impossible or astronomically expensive to create. For example, if you want to use a moving camera instead of a stationary one, the cost of generating special visual effects goes up at least ten times."

Luncheon Speaker

During the luncheon break, Garry Blye, producer of the television series "Missing Treasures," discussed his experiences in film and television over the past 25 years. Blye talked about the many times he relied on the magic of post-production while working with networks in Canada and the U.S.

ADR, Music, and Sound Effects

After lunch, Bob Predovich, Masters Workshop, explained the process of ADR. Three members of the audience were invited onstage to replace dialogue for the "Maniac Mansion" scene. Under normal circumstances, the actor on-screen would reread lines that were not clear or out of sync. However, if the voice of the actor is



SMPTTE President Blaine Baker and Executive Vice-President Irwin Young viewing a presentation at The Post Experience.

not appropriate, another person can provide a new voice through ADR.

David Greene of Magnetic Music talked about the magic music adds to a scene. "Music doesn't require a pictorial reality," Greene said. "You can use whatever music you want to add suspense, humor, or excitement. This gives you a lot of creative latitude. Just keep in mind that every song is licensed, unless it is in the public domain."

Using a segment from *Terminator 2*, Steve Zaretsky, New England Digital, revealed how the audio effects process has become computerized. Using an Apple Macintosh computer to access hundreds of audio segments stored on optical disc, layers of sound were added to create such sounds as the Metal Man walking through steel bars in *Terminator 2*.

"The visual effects of that scene cost millions of dollars to produce," Zaretsky said, "but the sound effects were created with a 90-cent can of dog food. We opened the can and let the dog food slurp out. That sound was added to a mixture of other audio effects to give us the sound of the Metal Man walking through the bars."

After the Post

When the final mix was done — by making a few subtle changes to the sound — the scene from "Maniac Mansion" was completed. During the seminar, the 3-min scene from "Maniac Mansion" was taken from raw daily footage to a completed ready-for-broadcast segment.

Three final issues were discussed at the end of the seminar. Harvey Rogers explained how closed captioning is produced for television productions; distribution expert Ismé Bennie from Paragon outlined what issues should be considered during post-production to facilitate international markets; and Jeff DeWolde from Interna-

tional Image explained the technical standards required for offshore distribution.

Fun and Games

The Post Experience was more than just serious learning. There was also a lot of fun. More than 85 prizes were given out during the seminar, including CDs, T-shirts, jackets, and hats. A special award was given to the person wearing the most logos from the television and motion-picture industry.

"We asked everyone to wear casual attire with as many logos as possible so that they would be relaxed as well as get a feeling for the laid-back atmosphere in a post-production studio," Rogers said. "We will be asking everyone at the seminar in November to dress in casual attire as well."

Seminar to be Repeated in November

The Post Experience will be held again on November 9, 1992, the day before the 134th SMPTTE Technical Conference and Equipment Exhibit officially opens. The event will take place at the Metro Toronto Convention Centre from 8:30 a.m. to 5:30 p.m.

According to Diane Cappelletto, Kodak Canada, who is a member of the organizing committee, The Post Experience will be an integral part of the conference program.

"Anyone who wants a complete overview of the post-production process as it stands today, should not miss this valuable seminar," Cappelletto said. "The audience at the March event was unanimously positive."

The Post Experience was made possible by a dedicated group of volunteers working over an eight-month period, along with generous donations from numerous corporate sponsors.