PROSPECTS FOR STANDARDIZATION IN CABLE AUDIO

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ABSTRACT

Several forces are converging to swing the attention of the cable industry toward high quality stereo audio. These include tv multichannel sound, digital audio as an encryption technique, the new pay audio services, and Compact Disc digital audio in the consumer marketplace. Several incompatible systems have been proposed for transmitting high quality stereo audio over cable plants. Since each has been optimized for its own particular purposes, selecting one as a standard involves a complex set of trade-offs.

BACKGROUND

Audio has always been a stepchild of the CATV industry. This is because cable has been -- and remains -- a television business. But the attention of the cable industry is starting to swing in the direction of audio. There are a variety of reasons for this, and there are also a variety of questions to be answered before cable can take advantage of its potential as an audio medium. One of these questions is standardization.

Standardization has not been a significant problem in the video domain. There is NTSC video and that's about that. True, there are a number of scrambling techniques in use, and different cable plants tend to be subject to different technical constraints. But there has been very little argument about the basic format for carrying video information. As we shall see, however, in the audio domain there is very little but argument.

This question of standardization is never clear cut. Some argue that imposition of standards stifles development, constricts the free marketplace, and condemns the state of the art to the Dark Ages. Others insist that failure to agree on standards delays development, creates chaos, and frightens away investors. Our purpose here is not to settle this ancient argument, only to outline some issues involved in transmission standards for high quality stereo audio over cable systems.

FORCES

Why is audio drawing attention after being a throwaway for so long? We have identified four principal reasons. First is stereo television, particularly the question of what to do about multichannel sound in broadcast tv. Second is digital audio encryption, which some believe to be the ultimate weapon against theft of service. Third is pay audio services -- which may turn into a tidy profit center at some systems. Finally there is the Compact Disc, a technological innovation in the consumer hi-fi market that offers interesting opportunities to a broadband medium like cable.

Multichannel Sound

Now that the FCC has given the green light to television broadcasters to begin transmitting stereo and second language audio, what will the cable business do about it? We already know that many systems cannot carry the BTSC multichannel format. We also know that cable will face strong marketplace pressure to provide stereo service to its subscribers.

To ignore multichannel sound in the face of heavy promotion by broadcasters and set manufacturers carries a definite risk for cable operators -- the risk of being perceived by subscribers as offering low quality, less than state of the art service. Ironically, an aggressive approach by cable operators could actually depress the market for new stereo tv sets by giving subscribers stereo tv sound through their existing hi-fi equipment. But whether cable is an active or passive carrier of stereo tv sound, it faces the same problem -- how to get the sound into the subscriber's home.

Digital Encryption

Because audio can be digitized, it

can be encrypted, providing the 'hardest' possible security for a premium video signal. Use of digital audio for this purpose was pioneered in the satellite business, but now there is a cable product, with more likely to follow. There are some who believe that digital encryption is the last best hope of the cable business to protect itself against video piracy.

Pay Audio

During the past year, a handful of cable operators have begun to offer pay audio in one form or another. Most pay audio tiers combine stereo program audio for cable networks like MTV or The Nashville Network with several of the dozen or more audio services now available by satellite. These packages are either bundled into a top of the line multipay package or sold as a separate tier. Many large MSOs are taking a hard look at pay audio, and plan to begin serious market tests in the near future.

Compact Disc

The consumer hi-fi business and the pre-recorded music business are very excited about Compact Disc (CD) digital audio, the new high quality format for the consumer market. During 1983, high prices and a limited supply of software held CD player sales in the U-S to about 35,000 units. The 1984 forecast is for about 200,000 units as prices fall to the $300-$400 range and over 1,000 software titles become available. Industry optimists predict that the Compact Disc and the vinyl LP will reach parity sometime in the early 1990s.

What is interesting about the CD for the cable business is that broadcast FM radio does not have the bandwidth to transmit full fidelity digital audio into the home of the consumer. About 1.5 MHz is needed for every CD stereo pair, and FM radio has only 200 kHz. As a broadband medium, cable is one of the few ways of transmitting high-quality digital audio directly into the home. It may be useful to think of digital as 'high definition audio' -- an analogy to high definition television, which traditional broadcasters can't transmit either.

SYSTEMS

Several different systems have been proposed for transmitting high quality stereo audio over cable plants. Some of these are in use, while others are still in the prototype stage. Each has been optimized for a particular application. Here are seven system types:

FM Multiplex Systems

The ordinary broadcast FM standard is the most common means of transmitting stereo audio over a cable plant. Carriers are typically placed either in the 88-108 MHz FM band, or just above it in the aircraft navigation band. In the latter case, a block converter is used to convert the signals to a frequency that the subscriber can receive. Catel, Leaming, and Pioneer are among the companies manufacturing audio block converters.

Video-Dependent Analog Systems

Video-dependent analog systems transmit stereo audio in analog form within the video bandwidth. They tend to be proprietary, and hence incompatible with existing video transmission methods. This means a total retrofit of headend and subscriber equipment. An example is the MAAST system marketed by Telease, which can incorporate several channels of audio into each video channel.

Video-Independent 'Afterburner' Systems

Video-independent systems transmit stereo audio in-band, but in NTSC-compatible form. Stereo decoding is accomplished by an 'afterburner' device inserted in the line between the converter box and the subscriber's set. Without the device, the subscriber gets regular mono audio. With the device, he can retrieve stereo. The 'afterburner' is designed as a premium option that can be self-installed. An example is the TPM system marketed by Cable TV Supply.

Video-Dependent Digital Systems

Like their analog cousins, video-dependent digital systems transmit stereo audio in-band using proprietary technology. The audio is digitized and can be encrypted for 'hard' security of premium video services. A example is the Oak Sigma system.

Integrated Analog Systems

Integrated analog systems transmit stereo audio out-of-band in proprietary analog formats. Their audio-only converter boxes can include features normally associated with video boxes, features like discrete channel tuning, addressability, and remote control. An example is the Studioline/Leaming system.

Integrated Digital Systems

Integrated digital systems resemble integrated analog systems, but digitize the audio, thereby permitting encryption.

They can offer CD quality -- either 16-bit linear PCM or a close equivalent. An example is the Sony CADA system.

It can be seen that we are far from any consensus on how audio should best be carried on a cable system. The reason for this is simple. Each of the available systems has been optimized for a different purpose. The block converter is optimized for straightforward, low cost technology. The Oak Sigma is optimized for digital encryption. The Studioline system is optimized for pay audio tiering. TPM is optimized for NTSC compatibility. Sony's CADA is optimized for Compact Disc quality. And so on.

TRADE-OFFS

Is it possible to make any sense out of this confusion? Only partially. There are trade-offs involved, trade-offs that overlap and interlock in curious ways. Here are a few:

Analog vs. Digital

Will cable eventually be a digital audio medium, or is digital more trouble than it is worth? In digital's favor are the fact that it can be encrypted, that it can match the quality of the state-of-the-art in consumer hi-fi, the Compact Disc, and the fact that it can be blended with other types of digital data or digital services. But digital is also more expensive, for the moment at least, and is a tremendous hog when it comes to bandwidth. Analog is less expensive, more spectrum-efficient, and can approach the quality level of digital audio.

In-band vs. Out-of-band

Some systems propose to transmit stereo audio with video, while others propose to transmit audio somewhere else on the system. Putting audio with video has several advantages. First, audio and video can be tuned together, eliminating subscriber frustration with the so-called 'dual-tuning' problem. Second, in-band

audio means one box. But in-band transmission limits audio offerings to stereo program audio -- leaving no room for stand-alone pay audio services. It also imposes an upper limit on quality. 16-bit linear PCM is just not going to fit in-band.

Video vs. Audio

Should cable continue to think of itself as a video medium as when it comes to audio? In other words, is stereo program audio for video services the be-all and end-all of audio on cable? Or will there be room for audio by itself, in whatever form? If both program audio and stand-alone audio are to be part of cable's plan, should they share a common transmission system or be handled individually? Should one be optimized for stereo tv sets and the other for stereo systems, or will the merging of component video and component audio blur the distinction?

Short-term vs. Long-term

The cable industry has not yet made a large investment in audio transmission systems. But it seems like it is about to. Will we see several generations? Or will the first generation be flexible enough to endure? Is the object of the game to find a 'quick fix' for the multichannel sound problem, or to view cable as an audio medium in its own right?

CONCLUSION

There are many reasons for cable operators to be in the audio business, and the industry appears on the threshold of getting into high-quality stereo for the first time. Various suppliers have their own incompatible ideas about what stereo audio means to cable, and have therefore designed incompatible systems optimized to suit these ideas. But the big question remains. What is cable's vision of itself as an audio medium? It is the answer to this question that will set tomorrow's standards.