TVTechnology

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Transport Stream Distribution Models

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As we prepare to enter into nice summer weather, I thought that it would be a perfect time to warm up to more details about transport stream distribution models. This is the way PBS has been distributing audio and video to its affiliate stations, and recently Fox network has stated that it will also implement a transport distribution model to provide HD video and multichannel audio to its local stations. After chairing a panel on multichannel audio issues at the recent PBS Technology conference during NAB, I am even more convinced that this approach, which has served not only PBS but also cable and satellite, is the wave of the very near future.

TRANSPARENT DISTRIBUTION

As we discussed last time, sending a transport stream from network headquarters to local stations allows for the audio and video to be pre-compressed into a "composite" ATSC transport stream (in other parts of the world, this would, of course, also work with DVB or other national standards) that contains audio, video, and all the required data such as PSIP and closed captioning. After receiving the signal from satellite, the local station needs only to modulate, amplify, and emit the signal and they are on the air with full high-definition video and 5.1 channel audio capabilities.

The major downside is that while the local station does not incur the expense of an HD audio and video encoder, they have no way to insert local branding or programming. Yes, this is quite a major drawback, and it can get a bit worse. Unless there is some way to "break into" the pre-compressed stream, the audio and video must be decoded to baseband signals, then treated like another source on the master control switcher before being re-encoded for transmission to consumers. This is the "bit worse" part because it means that audio that has been pre-Dolby Digital (AC-3)-encoded will now be decoded and re-encoded, possibly all the time.

LOCAL OPERATIONS

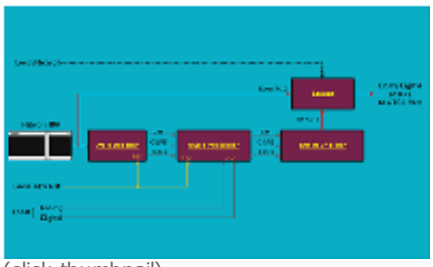

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Fig. 1: Possible implementationof multichannel audio at a PBS affiliate station which allows network audio to pass metadata intact to the consumer, but with the capability to insert local branding and other audio as needed.

Recently, some advances have been made that allow for the local situation to be radically improved. As discussed last time, the Terayon BP 5100 will allow insertion of a station's bug or logo to be inserted over the pre-encoded network signal while remaining in the compressed domain. It will also accept a locally encoded ATSC transport stream and splice between the network and local on command.

Fig. 1 shows how just the audio section of such an arrangement might work. It can be seen that the network delivered Dolby Digital (AC-3) stream is both decoded and passed through to a splicer. The decoded audio can then be treated like any standard 5.1 channel audio source and be routed, switched, or voiced over prior to being Dolby Digital (AC-3) encoded at the end of the chain. This encoded signal is also applied to the splicer, and if timed properly, a relatively well-behaved switch can occur between the two streams.

I know we brought it up last time, but I cannot overstress the point that increasing the bitrate of both the network and also the local Dolby Digital (AC-3) rates to the ATSC maximum of 448 kbps is a good idea. It will minimize any possible (but unlikely) audible artifacts due to the recoding step.

Stepping back from the details of the system and looking at it from a wide perspective, it is interesting to note that transport stream distribution has the capability of providing the closest copy of the original audio to consumers. Every other approach will end up producing the Dolby Digital (AC-3) stream for transmission, but in these cases it is invariably preceded by some other type of audio coding system, be it Dolby E, MPEG, or high rate Dolby Digital (AC-3) and metadata is either separated from the audio, not present, or made invalid by changes to the baseband audio. Transport stream distribution overcomes all of these issues because if you are passing on the pre-compressed Dolby Digital (AC-3) stream, metadata is never separate and the audio cannot be changed.

UPDATES

Since my last column, NBC has also made an important step forward. Jim Starzynski has found a way to get audio metadata to pass through its satellite distribution system. Affiliates will now have access to the metadata that was previously only available at the network thereby furthering the metadata path to the consumer.

One thing I forgot to mention last time was an update on satellite distribution equipment manufacturers and their ability to pass Dolby E. As of the last NAB, Tiernan, one of the oldest and most deployed DTV distribution system manufacturers

still had not implemented this important feature. Needless to say, I was very focused on visiting the folks at Tiernan, and as luck would have it I ran into them during the PBS Technology Confer-ence at NAB. After speaking at length with Jack Herbert and Damon Semprebon from Tiernan (aka Radyne Comstream), I was extremely happy to hear that with a software upgrade, their THE-1 encoder and TDR-6 IRD are capable of providing a 20-bit, 48kHz, bit-for-bit accurate path capable of carrying Dolby E. Although I am quite sure they were extremely happy to see me leave their booth at the show, my hat is off to Jack, Damon, and the Tiernan team back in San Diego-well done!

I also stopped by the Wohler booth as promised to see Carl Dempsey, Will Wohler, and crew and discovered a very interesting new monitoring platform called the E8. In addition to the always-excellent sound and metering, it combines a flexible set of useful features all in one box. The unit contains extensive inputs, including the long-needed and very clever idea of an auto-sensing SD/HD-SDI input from which any of the audio groups can be de-embedded. Even cooler is the fact that they will offer just that small section as an OEM product. The product also includes multichannel Dolby Digital (AC-3) and Dolby E decoding, and the discrete digital outputs and metadata are available for feeding downstream equipment. Nicely, this feature is implemented on a plug-in card that could be replaced with a card allowing any possible future formats to be supported. They also announced an HD version of the famous PenPal test signal generator, which packs an incredible amount of useful test signals into a pocket-sized device (and yes, both versions also provide embedded audio test signals).

Of course I also haunted the Dolby booth and found that Jeffrey Riedmiller was showing a very advanced remote application for the venerable LM100 loudness meter. It takes away the arduous process of capturing logging data then creating an Excel spreadsheet and graph. Everything is displayed on a large window, and happily the front panel display of the actual LM100 is left nice and simple: one loudness, one number, and no "eyeball averaging the meter." We will take a closer look at this new software in a future column.

My search for master control switchers brought me to the Nvision booth where I saw the NV5128-MC, which in addition to combining master control and routing functions, importantly will also handle almost any audio format, including Dolby E. The unit has built-in Dolby E decoding and allows mixing of baseband PCM and Dolby E signals (after decoding of course). They, like me, are still pondering the issue of how and where to switch metadata when fading between stereo and 5.1-channel sources. This problem remains, I believe, a modern day Occam's Razor (perhaps in sheep's clothing) .

Next time, we will provide a progress report on the two major recurring themes in digital television: lip sync and loudness. Surprisingly, there is a bit of good news on both fronts, some of which we alluded to above. As always, thanks for your time! **Print Page**