

newmediatools part one

This Evolution Will Be Televised

Production Tools and Techniques for Blu-ray and HD DVD

by Michael Frondelli

When Hollywood launches a new format and puts out the casting call, the post-production studios' need for the tools necessary to meet their demands is an overwhelming call to arms for technical solutions. Instantaneously, the imagination of the Hollywood studio's marketing machine revs into media convergence overdrive, adding more compelling content with advanced features, not only to capitalize on the stunning image potential of the Blu-ray and HD DVD formats in consumer players, but by concurrently integrating this experience into gaming platforms to attract consumers worldwide, in all age groups.

Growth and development of the new HD formats takes time, and now with two competing formats, Hollywood is insatiably cranking to release as many new titles as possible in the coming year. Every facility *Pro Sound News* visited was buzzing with activity, and many facilities are working double shifts to meet studio expectations.

While these formats are far from mature, their release expectations have significantly streamlined even as late as six months ago. At Post Haste Sound (Santa Monica, CA), owner Jim Allan recalls, "Initially, they ordered more than what would even fit on the disc. The first purchase order we got, *The Fantastic Four*, ordered everything under the sun, and the audio streams alone took up 50 percent of the disc. Now there are fewer streams on a Blu-ray disc." Post Haste editor/mixer, Randall Smith, added, "They wanted lossless DTS, MLP Lossless Dolby, in all languages, the commentary tracks at 448 kbps and a standard Dolby track at 640 kbps."

Blu-ray and HD DVD discs are touted to be the ultimate consumer formats. Tom McAndrew, Sony Picture Entertainment's supervising audio engineer, (Culver City, CA) refers to Sony's Blu-ray disc at

times as "UMD" (Universal Media Disc).

ASSET DELIVERY

"At Sony", McAndrew tells us, "Whatever clients want to send us, we can take. We receive Pro Tools sessions via DigiDelivery, DVD-R, FTP, FireWire and MO. Files from Sony sound (feature film) deliver final complete flattened 5.1 dubs as Pro Tools sessions from a direct fiber link, we will encode those as a render, and that audio ends up on a server. Material that we encode here, we encode directly to Pro Tools systems on our local Macs, to local hard drives, and encode AC3 or whatever the final destination of compressed file is going to be. Then we would transfer across to our internal network to our authoring engineer."

McAndrew adds, "With TV titles, English audio is typically delivered on the same Digi Betacam as video. Foreign audio, depending on whether it is for Sony or a third-party client, with pre-encoded AC3, is transferred into Pro Tools as an un-conformed foreign dub from that territory, and we'll put it together to match picture."

"With FOX, they do a down conversion," states Allan. "We receive a DigiBeta tape with the appropriate window code NDF NTSC code and NDF Film-based code 23.976. This is the same core work tape used for close captioning and subtitles. They do not want to send D5s around."

WORKFLOW

Most post studios that have been producing titles for standard DVD since its initial release, agree that their most significant change is a non-real-time workflow process. Sony's, McAndrew concurs,



Dolby's Media Producer audio codec software in use

"Our workflow process has definitely changed, DVD used to be 100 percent real-time encoding because it would accomplish two purposes, a QC pass of the source material, simultaneous with the audio encode. The AC3 encode process just does what it does, and you're more concerned with source quality, unlike video where it is variable bit-rate compression where you have to look at what it is actually doing to the source."

Roger Fiets, senior audio engineer and manager at Deluxe Digital in Burbank, CA, shares a similar view: "We are moving away from real-time streaming; all the new encoding is software-based and it is faster than real time. It allows me to QC the work before it actually gets encoded. I QC the audio first before it ever gets encoded."

Allan describes the Post Haste asset ingestion process: "When a project comes in, the assets get ingested into the RAID, someone downloads it to their local drive and works locally and only the newly created materials and the final session are put back onto the RAID daily in a work in progress folder."

Whereas Steve Thompson, creative and

technical director, Pacific Ocean Post (POP), Santa Monica, CA, says, "Everything up to encoding is exactly the same as it is for DVD. For our clients, we not only do DVD streams, we do their archive audio and layback to their HD masters for broadcast. It is a part of our regular workflow up until the point that we decide that we're going to deliver X, Y or Z for this particular disc."

SOFTWARE SOLUTIONS

With the Hollywood studio content creation demand on overdrive, post-production facilities are relying on background audio processing and batch encode solutions to meet deadlines. Both Dolby and DTS have been proactive in creating these tools for some time now.

DTS was very early in introducing its DTS-HD Master Audio Suite, consisting of the DTS-HD Encoder, the StreamPlayer decoder

and the StreamTools.

DTS-HD Master Audio encoding produces a variable bit rate (VBR), bit-for-bit stream that may include up to 7.1 channels with sample rates of 48, 96 and 192 kHz. DTS-HD Master Audio encoded files also contain a backward-compatible DTS Digital Surround 5.1 or 6.1 channel "core" with its bit rate selectable between 768, 960, 1152, 1344 or 1509 kbps.

Dolby Media Producer software suite contains three separate software products—Dolby Media Encoder, Decoder and Tools—and is designed to support all Dolby audio formats used in mastering DVD-Video, DVD-



Tom McAndrew,
Sony Picture
Entertainment's supervising audio engineer



Steve Thompson,
creative and technical
director of Pacific Ocean
Post (POP)



The Stream Player window from the DTS Master Audio Suite software codec package

HD CODEC FEATURES

	Max. no. of channels	Max. bitrate (Mbps)	Sample rate (kHz)	Word length (bits/sample)
DTS Digital Surround	5.1	1.509	48 44.1 (HD only)	16-24
DTS Digital Surround ES	6.1	1.509	48 44.1 (HD only)	16-24
DTS Digital Surround 96/24	5.1	1.509	96 88.2 (HD only)	24
DTS-HD High Resolution Audio	7.1	5.76 BD/3.018 HD	48/96 44.1/88.2 (HD only)	24
DTS-HD Master Audio	8 (48/96kHz) 6 (192kHz - BD) 2 (192kHz/176.4kHz - HD)	24.5 BD/18 HD	48/96/192 44.1/88.2/176.4 (HD only)	24
DTS-HD LBR (Secondary Audio)	5.1 (BD) 2 (HD)	0.256 0.512	48 12/24/22.05/44.1 (HD only)	16-24
Dolby Digital	5.1	0.64 BD/0.504 HD	48	16-24
Dolby Digital Plus	7.1	1.7 BD/3.0 HD	48	16-24
Dolby TrueHD	8 (48/96kHz) 6 (192kHz/24 - BD) 2 (192kHz/24 - HD)	18.64	48/96/192	16-24
MLP Lossless	6 (96kHz - HD only) 2 (192kHz - HD only)	9.6 (HD only)	96/192	24
LPCM	8 (48/96kHz) 6 (192kHz/24 - BD) 2 (192kHz/24 - HD)	27.648	48/96/192	16-24

Sources: Dolby Laboratories, DTS

Audio, HD DVD and Blu-ray Disc formats. It supports multichannel non-real-time encoding and real-time file decoding of Dolby Digital Plus, supporting data rates from 48 kbps to 6 Mbps and from 1-13.1 discrete channels. Dolby Digital supports data rates from 56 to 640 kbps and from 1-5.1 discrete channels. Dolby TrueHD supports data rates up to 18 Mbps, and from 1-8 discrete channels. MLP Lossless supports data rates up to 9.6 Mbps and from 1-6 discrete channels via an intuitive user interface.

Deluxe's Fiets admits, "Dolby Media Producer and DTS Master Audio Suite have increased workflow, and we now have QC tools that we did not have before. One of my biggest challenges is what are we going to do with 7.1? The DTS encoder allows you to indicate what the speaker placement was for the original mix (both DTS and Dolby allow you to adjust down-mix coefficients)."

Allan recalls, "Our biggest problem in the beginning was that we had to do the R&D ourselves to service our clients. To avoid the real-time process, we set up a little network using the Minnetonka software, which mimics the new Dolby tools, while we have been waiting for the release of Dolby's Media Producer." While Smith shares, "We have been beta testing the DTS Master Audio series for a number of months."

Sony's McAndrew has a slightly different experience with videotape, "The new tools from Dolby and DTS are great, particularly Dolby's, which will give you batch encode, so you can set it up to batch encode several different files overnight. The problem with

standard Dolby or DTS rendering encoders is, however, if you are encoding audio from a videotape comp real with 20 deleted scenes, you have to load it into Pro Tools, cut them up into each individual deleted scene and bounce them all as individual files to drag them into the encoder." Since this processing can't be performed in the background, it's extremely labor intensive and time-consuming. He adds, "The good thing about the Dolby and DTS tools is, that they provide cores that the player can extract so you can at least hear the legacy lossy Dolby or DTS."

MANAGING THE REAL ESTATE— THE BIT BUCKET ISSUE

POP's Thompson declares, "We have the same problem as DVD. Any time you buy a new hard drive it is just a matter of time before it's going to fill up. As big as these disks are, we are still facing the fact that you can double the size of your storage, and it is still not big enough and for many of our clients."

According to Allan, "In preparing actual high-end audio, we would consider audio worthy of being lossless. Initially, some of the commentary tracks were being done about 96K." However, as Post Haste operations manager, Ken Hansen, clarifies, "For Blu-ray, they tend to up anything that was standard at 192 to 224 kbps, if it is just a commentary." Allan adds, "In a dialogue scene, you can be at rates lower than a standard AC3 stream because there is not much going on."

At Deluxe, according to Fiets, "The audio bit rate is dictated by the video. Bonus mate-

finite bit bucket."

According to Smith, "We send in a composite print master with dialogue, music and effects mixed, and the software itself does a good job. If you take an action film versus drama the sizes that are coming out of it are going to be completely different in lossless. That's because the drama will take up comparatively less space, because there is less action going on, particularly in the surrounds. All the value-added content we've been doing for Blu-ray has been encoded using standard def AC3, 2.0, stereo tracks. What I have seen recently is that people are finally starting to put supplementary materials on a standard DVD disc."

Smith adds, "Even with all the space and trying to figure out the audio tracks, we are running into problems space-wise. It is just like what we were experiencing getting audio ready for DVD; it's just a bigger playground."

SECRET WEAPON

The "must have" tool in the secret weapons arsenal cited by end-users working on HD discs is, by far, the Neyrinck SoundCode for Dolby Digital and DTS, which functions as a Pro Tools AudioSuite plug-in, that will operate on Pro Tools LE, M-Powered and HD systems and is compatible with Intel-based Macintosh systems. A standalone product developed by Paul Neyrinck (www.neyrinck.com), Neyrinck SoundCode evens the playing field for audio post production.

The SoundCode Encoder features faster-than-real-time encoding, a punch-in/out function which can save time when fixing an existing encoded mix file, metadata management, 5.1 channel/48 kHz Dolby Digital encoding (with time-code support), 6.1-channel/48 kHz and 96 kHz/24-bit DTS encoding. On the decode side, the features include faster-than-real-time decoding, decoding in sync with Pro Tools timeline and video playback, live bit-

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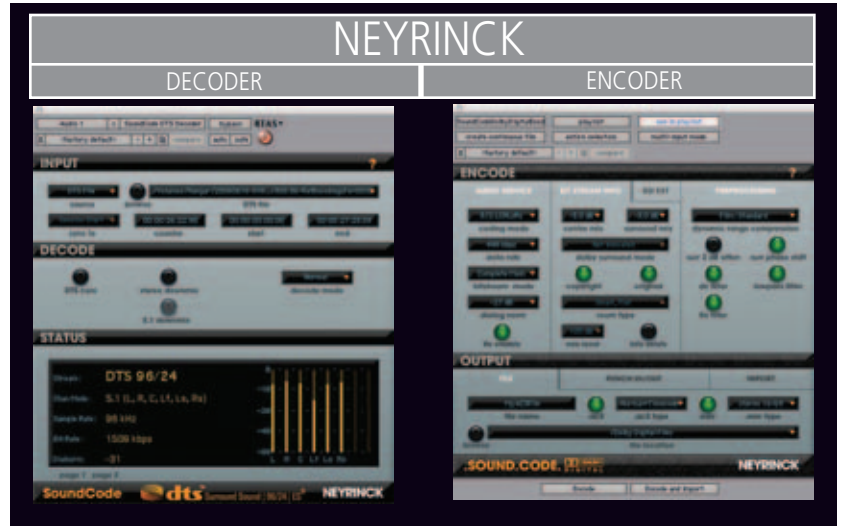
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stream decoding from an external DVD player, metadata display, output level metering, CRC error and dynamic range compression display with Dolby Digital and sample-accurate, direct-file decoding for DTS.

McAndrew reveals, "While Dolby and

DTS tools are great for features when you have all your .wav files separated out to accomplish multiple encodes overnight." When working in Pro Tools, he says, "the Neyrinck SoundCode is my *secret weapon*, it's a non-real-time Pro Tools AudioSuite plug-in rendering encoder for AC3 and DTS." McAndrew continues, "SoundCode supports bit rates in excess of standard DVD up to 640 kbps instead of topping out at 448 kbps, so this is applicable for Blu-ray. It eliminates the step of having to *walk out* .wav files from a session. This is very useful in processing audio from videotape."

At Deluxe, Fiet reports that they use SoundCode for encoding in DTS HD and



Neyrinck's Soundcode rendering software encoder and software decoder is compliant with a number of Dolby Digital and DTS codec variations. The Pro Tools AudioSuite plug-in offers faster-than-real-time operation. Shown are the Soundcode DTS decoder (left) and the Dolby Digital encoder interface windows.

are looking forward to using it for Dolby Digital Plus. "We now have the ability to QC an encoded stream before it even gets to authoring."

Smith states, "Until recently there was not a way to play encoded audio backlocked with video." Allan adds, "We have been using the Neyrinck DTS HD decoder from Pro Tools, which gives us the ability to emulate the authored DVD and listen to the sound precisely as they will at the authoring facility." Thompson is also using the Neyrinck at POP.

CRACKLE AND HUM

Some assets have deteriorated over time and suffer audible artifacts. Allan explains that 50 percent of the work at Post Haste is, "optical with defects. Most plug-ins do a good job for LP crackle and digital 'artifacts.' However, getting at defects that are created by optical reproducers is really a Sonic specialty, shaving very fine layers off to get down to filtering out the hums and buzzes."

Smith adds, "Definitely Sonic NoNOISE is the best. Although there is a plug-in I would like check out to take out hums—Algorithmix's reNOVator plug-in."

McAndrew says, "Most of the audio we receive is complete approved audio. For TV product with crackles and pops, I use the Waves Restoration bundle, X-Click, X-Hum, X-Crackle and X-Noise."

MAINTAINING AUDIO QUALITY

Allan states his Post Haste quality philosophy: "We have leaned on the technology, but we have not abandoned traditional editorial techniques. So when we do an up-mix, it's typically a combination of the processing to create stereo from mono and editorial techniques to actually flesh it out. That means adding background and ambiences from library, replacing some FX—say gunshots—and reorienting them in the soundfield." This also includes "creating low-frequency information for older titles for a subchannel."

Smith elaborates, "Aesthetics is a must in classic titles, like *Miracle on 34th Street*,

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blending in older and new elements, such as period traffic sounds within the frequency response. Sound effects libraries like the Sound Ideas 1000 series are extremely important in fitting older titles into the 5.1 format."

QUALITY CONTROL (QC)

Another vital part of the HD authoring process that is still maturing is quality control. Allan shares, "Our biggest challenge is QC, so we're able to look at the product we are going to send our clients. Our workflow model evolved over time, a real-time model, playing files in real time as opposed to QC'ing the files. Certifying them in QC and then encoding them means that if you don't like what you hear when you QC it, you can make a change and just re-encode. Where in the case of the previous real-time model with a DB-569 encoder you would have to go back and try to punch in, and it

would usually blow the stream."

Fiets notes, "The Dolby Media Producer decoder gives me the ability to QC Dolby Digital Plus, Dolby True HD and AC3 streams in real time, synced up to the HD D5. There was no way to do that before. Here at Deluxe, we receive pre-encoded feature audio delivered from third-party studios that has to be QC'd."

Sony's McAndrew has a number of ways to QC during a project, "On our authoring department servers, we can multiplex a project together. Therefore, it exists on a server, so it performs as if it were a disc. We can also burn BD-Rs [Blu-ray Disc Recordable refs], even dual-layer. Sony software engineers can put a project into QC during stages of partial completion while we are still accumulating featurettes, music videos, gag reels and menus. We can burn discs using third-party software, such as, InterVideo WinDVD and Cyberink Power DVD."

Fiets adds, "DTS, Dolby and their third-party developers are coming out with tools, in addition to our Deluxe proprietary software tools, that make QC way more advanced in the pre-authoring stage, QC'ing the audio, playing back in sync with picture. In the case of DTS, we are using Neyrinck that is a decoder for Pro Tools. My big goal here at Deluxe is

to get to the point where not one piece of audio gets to authoring that would cause the disk to fail—I mean 100 percent," though he adds that Deluxe has "a pretty flawless record" already.

Next month, in Part Two of the Tools for

New Media special report, we'll hear about, storage issues, delivery, authoring and the High Definition Authoring Alliance, plus we interview Mi Casa's Brant Biles on creating a 7.1 mix for the HD release, Tenacious D: The Pick of Destiny.

HD DISC CODECS

HD DVD

Lossless: Mandatory Linear PCM (8/7.1/6 channels*)
Dolby TrueHD (MLP Lossless) (7.1/2 channels*)

Lossless: Optional DTS-HD Master Audio (7.1 channels)

Lossy: Mandatory Dolby Digital Plus (7.1 channels)
Dolby Digital (5.1 channels)
DTS Digital Surround (5.1 channels)
MPEG Audio

Lossy: Optional DTS-HD High Resolution Audio (8 channels)
DTS Digital Surround ES (6.1 channels)
DTS Digital Surround 96/24 (5.1 channels)

Blu-ray Disc

Lossless: Mandatory Linear PCM (8/7.1/2 channels*)

Lossless: Optional Dolby TrueHD (MLP) (7.1 channels)
DTS-HD Master Audio (8 channels)
Linear PCM* (8/7.1 channels*)

Lossy: Mandatory Dolby Digital (5.1 channels)
DTS Digital Surround (5.1 channels)

Lossy: Optional Dolby Digital Plus (7.1 channels)
DTS-HD High Resolution Audio (8 channels)
DTS Digital Surround ES (6.1 channels)
DTS Digital Surround 96/24 (5.1 channels)

Sources: Blu-ray Disc Association, Dolby Laboratories, DTS, DVD Forum

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Editor's Note:

The term "mandatory" in the audio format specifications for Blu-ray Disc and HD DVD has caused some confusion. Mandatory formats are required to be supported by all players; a player must be able to decode all mandatory formats included on a given disc to at least 2-channel stereo. As with DVD, the exact number of channels utilized and sample and bit rates are at the discretion of the content creators, within the capabilities of each codec and the respective disc specifications.

Those codecs or configurations in the table above followed by an asterisk (*) indicate dissimilar information obtained from the sources.

Dolby Digital, Dolby Digital Plus, Dolby TrueHD, DTS Digital Surround, DTS-HD High-Resolution Audio or DTS-HD Master Audio may be used as the sole soundtrack on an HD DVD or BD.

According to Dolby, every HD DVD player must be capable of processing any of the three Dolby formats, while a basic BD player might include only a Dolby Digital decoder. If a Dolby Digital Plus or Dolby

TrueHD bit stream is included on a BD, a Dolby Digital core included as part of the stream ensures compatibility with all playback configurations without requiring a separate Dolby Digital track. An advanced BD player capable of 7.1 would usually include a Dolby Digital Plus and a Dolby TrueHD decoder.

According to DTS, a basic HD DVD or BD player will always have a decoder capable of processing the DTS Digital Surround 5.1 channel core that may be extracted from a DTS-HD soundtrack and provide a minimum of a stereo analog output. Either type of DTS-HD soundtrack with its embedded DTS Digital Surround core assures backward compatibility with all DTS decoders. Advanced HD DVD or BD players will include advanced DTS-HD decoders capable of processing the full DTS-HD Master Audio lossless or DTS-HD High Resolution component of the soundtrack up to eight channels, and provide PCM or DTS-HD advanced digital output via HDMI to be decoded by AVRs or preamp processors.

Although Linear PCM is defined in the specifications as 7.1, some producers have experimented putting full bandwidth audio on all eight channels. —Steve Harvey