BOOTHROYD STUART MERIDIAN

MLP™ Meridian Lossless

From the industry leaders in high precision signal processing, Meridian is proud to announce a new audio coding system – MLP. Meridian Lossless Packing offers the potential for higher quality sound in new and old formats.

Background

Meridian Lossless Packing, or MLP, is an audio coding scheme using proprietary technology, that has been developed over three years by Meridian Audio and its associates.

Lossless Packing

Unlike perceptual or lossy data reduction, lossless coding does not alter the final decoded signal in any way, but merely 'packs' the audio data more efficiently into a smaller data rate for transmission.

MLP is a simple-to-decode method optimised for the new requirements brought about by applications like DVD Audio, and in particular has been optimized to enable more opportunities for multichannel and for audio at high sample rates with high precision.

Why Lossless Packing?

We want to deliver the very best listening experience to end-users.

These days that means multichannel for surround sound, more bits to get the highest possible dynamic range and higher sample rates to ensure all the nuances of the performance can be delivered.

However, the more bits used and the higher the sampling rate is, the more bandwidth is needed to carry the information.

Modern high-rate formats like 96kHz 24-bit are capable of carrying more information than is strictly necessary for the human listener, or than is available from modern microphone and converter techniques. This means that such audio streams contain true redundancy.

MLP is an audio coding scheme that discovers the redundancy and packs the audio into a smaller space – but in such a way that a simple decoder can recover the original signal exactly bit-for-bit.

Guaranteed Quality

Currently the highest quality sound comes with Linear PCM coding.

Unfortunately, distribution formats like CD and DVD do not require the mastering or playback process to be lossless – that is the data can be subtly changed on the way through the production chain.

MLP is a *true lossless* system. The original data is delivered bit-for-bit at the playback. It even has a method of confirming that the whole chain is lossless. This means that for the first time, the listener can be sure of hearing exactly what the producer intended – bit-for-bit, note-for-note.

There is no need for elaborate listening tests to qualify this coding system – it simply guarantees delivery of the original recording, efficiently, over a number of carriers, archive and computing platforms.

Cascadable

MLP is cascadable. This means that a signal can be encoded and decoded multiple times in succession and the output data will always be an *exact replica* of the original.

For the first time in audio, we have a coding system which guards against generation loss!

Robust

The MLP bitstream is robust against transmission errors, such as would occur with serious disc damage or break-up on a transmission.

Full re-start points in the bitstream occur at intervals of between 10ms and

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30ms. In the event of a transmission drop-out, lossless operation will immediately resume. Minor transmission errors are recovered in under 2ms and the bitstream is designed to give very benign performance in difficult transmission conditions.

The multiple restarts allow fast cueing and reviewing in an MLP stream on disc.

MLP meets all the ISC requirements for DVD Audio.

Data Rate

MLP allows very useful savings in data rate.

Because lossless packing exploits the true information in the signal, the amount of packing (compression) that can be obtained varies with the audio content. Thus, lossless compression schemes tend to produce a variable output data rate. MLP has a variable rate option because this is the most efficient for storing audio in computer files.

However, MLP has an extremely important fixed data-rate option. Great care has been taken in the design of the encoder to ensure that not only does MLP save on file-space (average rate), but that it also *always* reduces the *peak data rate*.

This means that MLP can always reduce the bandwidth of an audio stream.

Typical savings in data rate are shown in the specification table below. For example, a saving of 8 bits/sample means that a 24-bit signal can be sent in the space that previously would only allow 16 bits.

Applications

There are many applications for a lossless coding system. MLP has been optimized for modern carriers. Here are some examples:

- High-rate multichannel audio on DVD
- 3 or 4-channels on CD
- 2-channels 20–24-bit on CD
- 88.2kHz 2-channel on CD

Decoders for MLP

Meridian expects major semiconductor suppliers to incorporate the MLP algorithm, and have code available.

MLP requires relatively low computational power for playback: 6 channels of 96kHz 24-bit can be decoded in a modest DSP chip.

From June 1998, MLP will be supplied in Meridian's Surround Decoders as standard.

Content Providers

MLP has some features that assist content providers in providing material for issue on new formats, including:

- Longer playing time than allowed by LPCM.
- Higher quality by delivering more channels or bits for the same playing time.
- Allows multichannel at 192kHz.
- Guaranteed quality. The Lossless Decoder delivers bit-accurate data.
- High-quality mix-down options; longer playing time with multichannel material.
- Options to deliver artistically correct 2-channel alongside multichannel with less penalty on playing time or data rate.
- Fine control over delivered quality and playing time.
- Constant packed data rate allows easy prediction of playing time.
- The large reduction in the audio data rate means that many more options for audio with pictures are possible.
- Additional data channel in the stream to carry copyright and signature information.

MLP Specification highlights

Channels and meaning

- Up to 64 channels
- Flags for speaker feed identification
- Flags for hierarchical feeds (e.g. M&S, Ambisonic B-format and others.

Sampling

- 44.1kHz to 192kHz
- Higher rates possible
- Mixed rates possible

Precision

- Up to 24 bits delivered precisely
- Automatic, or adjustable in 1-bit steps
- Highest sound quality

Decoder

- Lossless over different platforms

Encoder

- Encoder option for economical 2-channel mix-down
- Pre-encode options to noise-shape like Meridian 518.
- Accepts many file formats.

Bitstream

- Contains all information for decoder (no side-chain)
- Fixed or variable data rate options
- High error protection
- Error recovery within 2ms
- Cueing within 30ms
- Uses Lossless Matrixing™
- Can be used on CD, DVD
- Can be sent on SPDIF/AES, Firewire and other connections.
- Ideal for studio use.
- Losslessly cascadable

Other Information

The MLP bitstream can carry additional information along with the audio. For example:-

- Content provider information
- Signature fields to validate the copy
- Watermark
- Accuracy warranty

High Coding Efficiency

Table 1	Data-rate reduction: bits/sample/channel	
Sampling kHz	Peak	Average
48	4	8
96	8	9
192	10	11

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