

Technology Brief

Broadcast Infrastructure

Dolby ED2

Next Generation Audio Mezzanine Codec

To deliver Dolby Atmos and other new audio experiences, the broadcast industry needs audio technology that provides a smooth transition from traditional stereo and 5.1 channel workflows using existing infrastructure.

Dolby ED2 is an extension to the Dolby E codec to support next-generation immersive and personalized audio, as well as to provide new tools to solve audio production issues. Dolby ED2 is backward compatible with Dolby E-capable pass-through and decoding products to allow broadcasters to integrate next-generation audio using existing contribution encoders, decoders, routers, and monitoring tools.

Key Features and Benefits

Dolby ED2 is an extension to the proven Dolby E mezzanine audio codec and enables the carriage of personalized and immersive audio and metadata. While Dolby E supports surround sound audio and the carriage of multiple streams, it does not have the extensions necessary to carry Dolby Atmos audio, loudness information, and other important metadata. Dolby ED2 extends Dolby E to introduce a new metadata system and provides the ability to package and synchronize multiple Dolby ED2 substreams to carry more audio. To minimize outboard equipment and to guarantee sample accurate channel alignment, all Dolby ED2 decoders and transcoders have inbuilt sample-accurate multi-stream frame synchronizers as standard.

A new metadata system called Professional Metadata (PMD) provides an extensible framework for carriage of the metadata required to deliver immersive and personalized audio experiences alongside existing audio formats in the same professional broadcast workflow.

Key Features

- Next generation audio mezzanine codec designed for SDI infrastructure and satellite backhaul
- Backward compatible with Dolby E pass-through and decoding products
- Supports up to 128 audio channels with 8 channels carried per Dolby ED2 substream on a single AES3/SDI audio pair
- Provides new metadata to manage immersive audio, personalized audio, loudness, and rendering to existing formats
- Extensible for future audio use cases

Dolby ED2 is backward compatible with Dolby E-based products. Any product that supports Dolby E pass-through will also support Dolby ED2 pass-through. In addition, any existing product that can decode Dolby E can also decode the audio elements and Dolby E-compatible metadata in a Dolby ED2 stream. Products that implement Dolby ED2 will understand the topology of a Dolby ED2 bitstream and can:

- Render complete audio presentations
- Actively process audio elements
- Perform loudness compliance
- Support full PMD status and diagnostic analysis

Bitstream Topology

Dolby ED2 builds upon Dolby E where each bitstream carries a maximum of 8 channels of audio. Dolby Atmos and personalized audio require the carriage of more than 8 channels of audio. For example, a Dolby Atmos immersive audio presentation may be delivered as 5.1.4 or 9.1.6 channel-based audio, or as many audio objects with time-varying three-dimensional positions, or a combination of both channels and dynamic objects. Dolby ED2 supports these higher channel counts by providing metadata that describes the topology and synchronization of each audio presentation that is distributed across multiple Dolby ED2 substreams. This functionality allows for higher channel count audio to be sent via bandwidth-constrained satellite or fiber contribution links in a compressed format with guaranteed, sample-accurate alignment on reception.

Professional Metadata

PMD provides an extensible method for carrying audio metadata either within a Dolby ED2 stream or as a separate data stream. PMD consists of multiple metadata payloads, each providing descriptive information about the essence. The Audio Topology Payload identifies the channel ordering for stereo, surround, and immersive audio within 1 or more Dolby ED2 substreams and allows for the carriage of multiple audio programs, e.g., a stereo as well as an immersive version of the audio. The Loudness Payload identifies the measured audio loudness, measurement method, and other intelligent loudness signaling. The Presentation Payload instructs downstream receivers on how to render out alternate presentations, e.g., creating international/domestic audio variants, generating audio description presentations, and creating

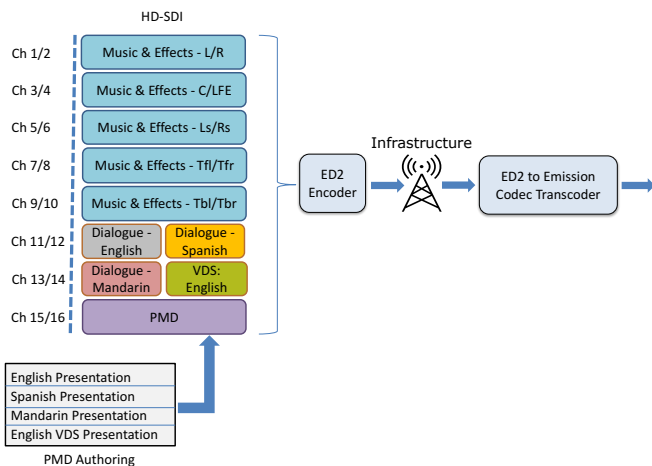


Figure 1. Example layout of audio elements and metadata before encoding

legacy downmixes. The Object-Audio Metadata Payload provides positional metadata to describe audio objects in the bitstream. These and other payloads provide rich audio capabilities to support next-generation audio use cases.

For baseband, uncompressed mezzanine delivery, PMD is carried as a separate data burst to allow for lightweight extraction and parsing. The PMD payloads can be repackaged to be sent as a separate stream on SDI or AES, or carried as an RTP payload for IP-based workflows.

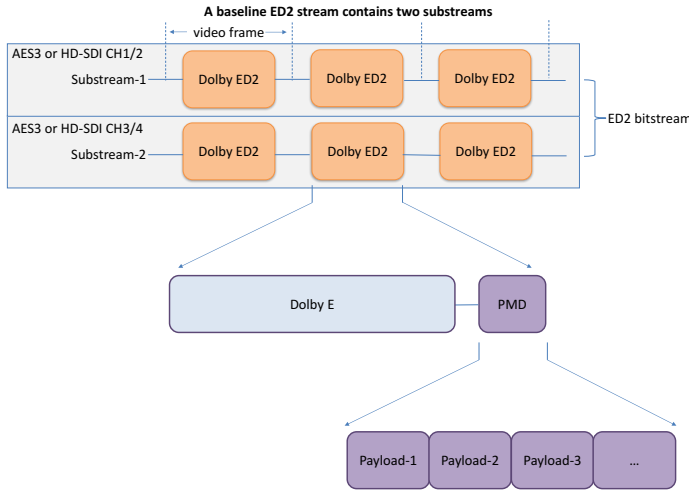


Figure-2. Basic structure of Dolby ED2, Dolby E and PMD

Dolby ED2 in Live Workflows

From the audio mixing console, the program music/effects, dialogue objects, and other audio elements are input to a Dolby ED2 encoder as independent audio channels. The Dolby ED2 encoder, in conjunction with an object-based audio authoring tool, encodes the audio and generates PMD parameters, e.g., audio object positions and audio presentations. The encoder outputs a Dolby ED2 stream for contribution delivery. Existing contribution encoders and integrated receiver-decoders (IRDs) that support Dolby E will support Dolby ED2 so long as the encoders support multiple pairs of Dolby E for contribution. The efficiency benefits of Dolby ED2 allow conventional stereo and 5.1-channel presentations to be delivered alongside object-based audio presentations for redundancy and multi-format delivery.

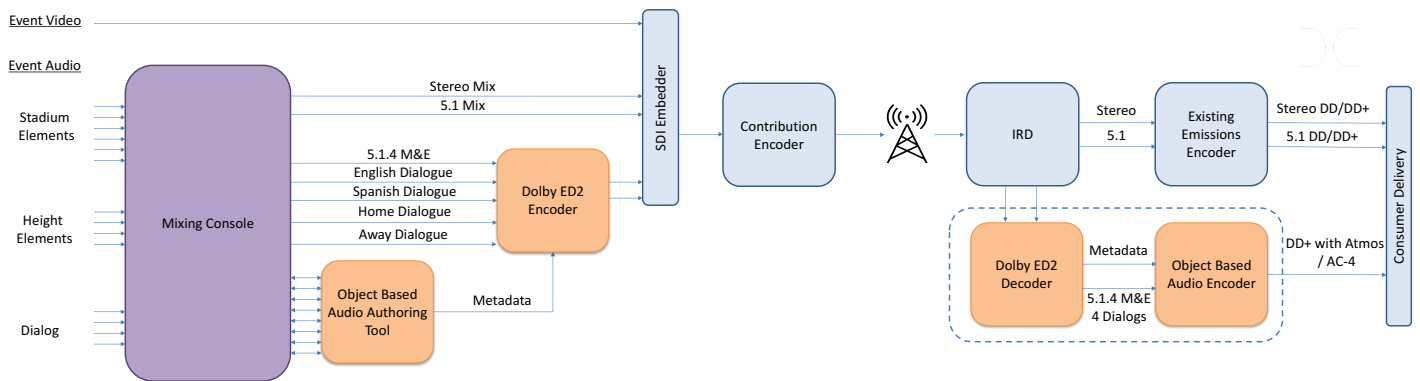


Figure-3. Dolby ED2 Live Workflow

At a broadcast head-end, Dolby ED2 can be decoded into PCM + PMD to support uncompressed SDI or IP audio workflows. Dolby ED2 can be recorded or played out for live-to-file or file-to-live use cases. For emission, Dolby ED2 can be transcoded into a next-generation audio format such as Dolby Digital Plus with Dolby Atmos or Dolby AC-4 for efficient consumer delivery.

Dolby ED2 Monitoring

Dolby ED2 decoders provide full monitoring capabilities for the multiple audio presentations and metadata in a Dolby ED2 stream. A Dolby ED2 decoder is able to render immersive, surround, and stereo presentations of the carried audio. The backward compatibility of Dolby ED2 allows a Dolby E decoder in an existing contribution/distribution chain to provide basic audio metering and confidence monitoring of a Dolby ED2 stream.

Conclusion

Dolby ED2 provides a low-friction path to integrating next-generation audio into existing live/linear workflows. The efficiency of Dolby ED2 allows it to be carried alongside existing stereo and 5.1-channel audio for redundancy and multi-format delivery. The backward compatibility of Dolby ED2 allows it to be transmitted, received, and decoded by a large install-base of Dolby E decoders. Professional metadata defines new parameters to specify audio topology, describe presentations, and improve loudness control. Dolby ED2 provides the foundation for state-of-the-art, scalable next-generation audio solutions for authoring and contribution of live and post-produced content.