Apple Positional Audio Codec (APAC)

Platform Encoder and Decoder

June 2025

APAC is a versatile audio codec capable of accommodating a wide range of target bitrates and supporting all common input audio formats, including immersive audio. The decoder is paired with a flexible renderer to provide an optimal listening experience for any particular playback device, ranging from theaters to head-tracked headphones.

The APAC encoder that ships with Apple platforms supports scene-based and channel-based formats. Scene-based audio encompasses the Ambisonics format, which is supported up to third order. Ambisonics represents a sound field by directionally focused audio components. The definitions of the maximum encoder and decoder capabilities, including supported audio formats, are organized in enumerated APAC Profiles, where each profile can have multiple Levels. The platform decoder supports all content produced by the platform encoder. The content generated by the platform encoder will have a Profile and Level depending on the input format given below.

APAC Profile and Level of encoded content

For Ambisonics: Maximum Ambisonics order	For multi-channel audio: Maximum channel count	Profile	Level
3	-	5	0
-	2	31	0
-	6	31	1
-	8	31	2
-	12	31	3
-	24	31	4
-	32	31	5
-	64	31	6

A generic encoder configuration typically includes bitrate, sample rate, and the number of input channels. For APAC, a few additional parameters should be configured, including the input channel layout and the properties described below.

The APAC encoder generates loudness and DRC metadata to support loudness control during playback. The metadata is embedded within the APAC bitstream. For the best loudness experience, it is recommended that the encoder be informed about the relevant content characteristics, which are:

- the *Content Source* indicating the content type and
- the *DRC Compressor Configuration* based on the signal characteristics.

APAC encoded content can be segmented for HLS streaming. Each segment must commence with an Audio Synchronization Frame (ASP) packet, which is an independently decodable packet. It is recommended to configure the encoder to utilize a regular ASP interval of 1.6s duration which results in a value of 75 for a sampling rate of 48 kHz. When constructing an HLS stream based on APAC content, certain information about the content may be required to adequately describe an APAC track in an HLS playlist. This information may include the Profile and Level of the content, as well as the channel layout tag. The HLS Authoring Specification provides more details.

Platform Codec Availability

The APAC platform encoder is available for the following minimum operating systems and higher versions.

Encoder availability

Operating System	Minimum Version
macOS	26.0
iOS	26.0
iPadOS	26.0

Operating System	Minimum Version
tvOS	26.0
visionOS	26.0

The APAC platform decoder is available with the following minimum operating systems and higher versions.

Decoder availability

Operating System	Minimum Version
macOS	14.0
iOS	17.0
iPadOS	17.0
tvOS	17.0
visionOS	1.0

Setting the Content Source type

When using AVAssetWriter, the content source type can be set on the encoder by using the `AVEncoderContentSourceKey` key and one of the enum values of `AVAudioContentSource`.

Setting the DRC Compressor Configuration

When utilizing AVAssetWriter, the dynamic range compressor configuration can be set on the encoder by employing the `AVEncoderDynamicRangeControlConfigurationKey` key with one of the enumerated values of `AVAudioDynamicRangeControlConfiguration`. It is important to note that the value `AVAudioDynamicRangeControlConfiguration_None` should not be utilized, as inclusion of loudness/DRC metadata is a mandatory requirement.

Setting the ASP Interval

When using AVAssetWriter, the Audio Synchronization Packet interval can be set on the encoder by using the `AVEncoderASPFrequencyKey` key. For more information about encoder settings refer to AVFAudio - AudioSettings.

Encoding from the Command Line

Encoding and decoding from the command line is supported by the `afconvert` tool. For instance, the following command line encodes a multi-channel PCM CAF file with a 5.1 channel layout using the content source type 36, DRC Compressor Configuration 1, and ASP interval 75:

```
afconvert pcm.caf encoded.mp4 -d apac -l MPEG_5_1_A -u csrc 36
          -u cdrc 1 -u aspf 75
```

It can be decoded into the original format by:

```
afconvert encoded.mp4 decodedPCM.caf -d LEI24
```

In a similar way, first-order Ambisonics (FOA) can be encoded for instance by:

```
afconvert FOA_PCM.caf FOA_enc.mp4 -d apac -l 0xBE0004 -u csrc 39
          -u cdrc 3 -u aspf 75
```

The encoded FOA file can be decoded into a two-channel binaural signal PCM file:

```
afconvert FOA_enc.mp4 FOA_dec.caf -d LEI24 -l Binaural
```