Sustainability of Digital Formats: Planning for Library of Congress Collections

Advanced Audio Coding (MPEG-4)

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Format Description Properties

- ID: fdd000114
- Short name: AAC_MP4
- Content categories: sound
- Format Category: encoding
- Other facets: unitary, binary, sampled
- Last significant FDD update: 2022-04-28
- Draft status: Full

Identification and description

Full name	ISO/IEC 14496-3:2001. Information technology -- Coding of audio-visual objects -- Part 3: Audio. Formal name for the relevant part of the MPEG-4 standard; note that this part covers several types of audio coding including Advanced Audio Coding. Common name: AAC.
Description	Perceptual audio encoding format designed for efficient distribution of sound files over moderate bandwidth connections; may be used at higher data rates for better fidelity. AAC_MP4 compression is a further refinement of AAC_MP2. AAC_MP4 is an object-based coding standard; decoders for AAC_MP2 may not be able to read AAC_MP4. The specification defines various object types and profiles; see Notes. Video-capable iPods and iPhones specify video files for which the audio appears to be audio-*object*-limited rather than profile-compliant; see AAC_MP4_LC. The compiler of this page welcomes comments on this detail.
Production phase	Generally used for final-state, end-user delivery.
Relationship to other formats	
Has subtype	Various AAC_MP4 profiles, not documented at this time; see Notes.
Has subtype	AAC_MP4_LC, AAC Low Complexity Object
Used by	MP4_FF_2_AAC, MPEG-4 File Format, V.2, with Advanced Audio Coding
Used by	QTA_AAC, QuickTime AAC
Used by	MP4_FF_2_V, MPEG-4 File Format, Version 2, with Visual Coding
Used by	MP4_FF_2_AVC, MPEG-4 File Format, Version 2, with Advanced Video Coding
Used by	MP4_FF_2_AVC_BP, MPEG-4 File Format, V.2, with AVC, Baseline Profile
Used by	MP4_FF_2_AVC_MP, MPEG-4 File Format, V.2, with AVC, Main Profile
Used by	MP4_FF_2_AVC_EP, MPEG-4 File Format, V.2, with AVC, Extended Profile
Used by	MP4_FF_2_AVC_HP, MPEG-4 File Format, V.2, with AVC, High Profile

Used by	MP4_FF_2_AVC_H10P, MPEG-4 File Format, V.2, with AVC, High 10 Profile
Used by	MP4_FF_2_AVC_H422P, MPEG-4 File Format, V.2, with AVC, High 4:2:2 Profile
Used by	MP4_FF_2_AVC_H444P, MPEG-4 File Format, V.2, with AVC, High 4:4:4 Profile
Used by	MP4_FF_AVCE_AVCE, MPEG-4 File Format for AVC (Ext), with Non-FRExt Extended AVC Coding
Used by	CAF, Apple Core Audio Format
Used by	Other file or wrapper formats, not documented at this time
Affinity to	USAC, Unified Speech and Audio Coding

Local use

LC experience or existing holdings	None
LC preference	See the Library of Congress Recommended Formats Statement for format preferences for audio works.

Sustainability factors

Disclosure	Open standard. Developed through ISO technical program JTC 1/SC 29 for coding of audio, picture, multimedia and hypermedia information by Working Group 11 (WG11) aka the Moving Picture Experts Group (MPEG).
Documentation	ISO/IEC 14496-3:2001. Information technology -- Coding of audio-visual objects -- Part 3: Audio. Later editions were published in 2005 and 2009; these have not yet been assessed for this description. See also MP4_FF_2.
Adoption	Some adoption for World Wide Web dissemination and playback on specialized devices. QTA_AAC, QuickTime AAC, is used in Apple's iTunes service. Software tools exist for encoding and decoding.
Licensing and patents	Royalties are due on the sale of AAC encoders and/or decoders; no use-based fees; information at Via Licensing. Page available via an Internet Archive capture from April 4, 2016.
Transparency	Depends upon algorithms and tools to read; requires sophistication to build tools.
Self-documentation	Technical (coding) information is contained in the headers for the "frames" that make up the bitstream. See also MP4_FF_2.
External dependencies	Surround sound requires appropriate amplifier and loudspeakers or headphone.
Technical protection considerations	See MP4_FF_2.

Quality and functionality factors

Sound	
Normal rendering	Good support.
Fidelity (high audio resolution)	Moderate to good, given that this is a format for compression. All commentators state that at a given data rate, the quality of AAC_MP4 surpasses AAC_MP2 and is significantly better than MP3_ENC.
Multiple channels	AAC has provision for up to 48 channels, and supports 5.1 (and 7.1?) surround sound.
Support for user-defined sounds, samples, and patches	Not investigated at this time.
Functionality beyond normal rendering	Not investigated at this time.

File type signifiers and format identifiers

Tag	Value	Note

Filename extension	aac	Used for raw bitstream; The File Extension Source associates the *aac* extension with AAC_ADIF, the file format for MPEG-2 AAC. In any case, most AAC files carry an extension that depends upon the selected wrapper; for example, see MP4_FF_2 (mp4, m4a) and QTA_AAC (m4p).
Internet Media Type	See note.	Depends upon wrapper; for example, see MP4_FF_2 and QTA_AAC.
Internet Media Type	audio/mp4	For MP4 File with Audio but without Visual Presentati From IANA and RFC 4337, MIME Type Registration for MPEG-4
Pronom PUID	See note.	No PRONOM PUID as of April 2022
Wikidata Title ID	Q337594	See https://www.wikidata.org/wiki/Q337594. Does not distinguish between profiles of AAC (so covers both MPEG-2 and MPEG-4)

Notes

General	The sets of options in AAC_MP4 are more extensive than those provided in the specification for AAC_MP2. Eight profiles are associated with AAC_MP4 audio, each of which may present sound at various *levels*: • Speech Audio Profile • Synthetic Audio Profile • Scalable Audio Profile • Main Audio Profile • High Quality Audio Profile • Low Delay Audio Profile • Natural Audio Profile • Mobile Audio Internet Working Profile These profiles are described in the specification on pages 15-20. In a given file, the profile and the level chosen for use are indicated by embedded metadata, not documented at this time. The profiles are associated with *audio objects*. Additional profiles are listed in the Wikipedia article Advanced Audio Coding (consulted October 22, 2014): AAC Profile (defined 2003), High Efficiency AAC Profile (2003), and High Efficiency AAC v2 Profile (2006). There is an AAC_MP4 object called *Low Complexity* (AAC_MP4_LC), which is comparable to the AAC_MP2 Low Complexity *profile*. The compiler of this page seeks more information about this matter; Comments welcome.
History	

Format specifications

- ISO/IEC 14496-3:2001 Information technology -- Coding of audio-visual objects -- Part 3: Audio. (Note: later editions from 2005 and 2009 have also been published.)

Useful references

URLs

- MPEG-2/MPEG-4 AAC (http://www.mp3-tech.org/aac.html). Page from MP3-tech.org
- "MP3 and AAC Explained" is a 1999 article by Karlheinz Brandenburg, Fraunhofer Institute, Erlangen, Germany. It has good detail but with a focus on AAC_MP2.
  - MP3 and AAC Explained (https://www.iis.fraunhofer.de/content/dam/iis/de/doc/ame/conference/AES-17-Conference_mp3-and-AAC-explained_AES17.pdf). As published in proceedings of the 17th AES International Conference on High Quality Audio Coding, 1999, Sept 2-5.
- AAC-LC: High performance music distribution - Fraunhofer Institute (https://www.iis.fraunhofer.de/en/ff/amm/broadcast-streaming/aaclc.html).
- AAC-LC - Fraunhofer Institute (https://web.archive.org/web/20141006175539/http://www.iis.fraunhofer.de/en/ff/amm/prod/audiocodec/audiocodecs/aaclc.html). A previous version of the above page from the Fraunhofer Institute, as it appeared on October 6, 2014. Available via Internet Archive.
- M4A.COM, formerly a site with resources for users (https://web.archive.org/web/20120207213839/http://www.m4a.com/). Link via Internet Archive.
- Wikipedia article "MPEG-4 Part 3" (https://en.wikipedia.org/wiki/MPEG-4_Part_3).

- Wikipedia article "Advanced Audio Coding" (https://en.wikipedia.org/wiki/Advanced_Audio_Coding).
- Wikidata entry for Q337594 (https://www.wikidata.org/wiki/Q337594). Information in Wikidata about AAC. Wikidata Title ID: Q337594.

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