



Fraunhofer

IIS

FRAUNHOFER INSTITUTE FOR INTEGRATED CIRCUITS IIS

AAC SOFTWARE



BENEFITS

HIGHEST AUDIO QUALITY FOR ANY APPLICATION

As the inventor of mp3 and co-developer of the AAC standard, Fraunhofer is able to provide AAC encoder and decoder implementations that guarantee the highest sound quality at the desired bit-rate

GET ALL AAC FLAVORS FROM A SINGLE SOURCE

Fraunhofer offers encoders and decoders for all AAC profiles on all major platforms

PROVEN TRACK RECORD

Fraunhofer IIS is the leading international research lab in the field of audio coding and has more than 20 years of experience in developing, implementing and licensing software audio codec implementations that have enabled more than one billion devices.

COMPLETE OFFERING

In addition to excellent audio quality and high coding efficiency, Fraunhofer's AAC implementations offer full broadcast metadata support.

THE AAC FAMILY OFFERS THE FULL SPECTRUM OF CHOICES, FROM HIGH-QUALITY AUDIO AT LOWEST BIT-RATES, UP TO LOSSLESS ENCODING AND DELAY-OPTIMIZED AUDIO. THANKS TO THE INVOLVEMENT OF FRAUNHOFER IN ALL MPEG AAC STANDARDIZATION ACTIVITIES, WE CAN OFFER FAST ACCESS TO HIGH-QUALITY, PRODUCT-READY IMPLEMENTATIONS ON EMBEDDED PROCESSORS AND PC PLATFORMS.

**DO YOU WANT TO BE COMPATIBLE WITH
APPLE ITUNES MUSIC?**

**DO YOU WANT TO ESTABLISH A BANDWIDTH-
EFFICIENT WEB RADIO SERVICE?**

**DO YOU WANT TO PROVIDE A HIGH-QUALITY
VOIP OR TELEPRESENCE APPLICATION?**

**DO YOU WANT TO OFFER A LOSSLESS
VERSION OF FULL STUDIO-QUALITY MUSIC?**

**TO ALL THESE QUESTIONS THE AAC SOFT-
WARE FAMILY FROM FRAUNHOFER MAY
PROVIDE THE RIGHT ANSWER.**

Fraunhofer IIS has successfully licensed its ready-to-use AAC implementations to a broad customer base including vendors of software or hardware devices, SoC manufacturers as well as content owners and service providers such as labels and download stores. The code is available as source code or as object code libraries.





AAC PROFILES

MPEG AAC-LC

AAC-LC is the successor of the highly successful mp3 audio codec, the industry-standard coding scheme invented by Fraunhofer IIS. AAC-LC delivers superb quality in compressed audio at only 64 kbit/s per channel – almost indistinguishable from the original. AAC-LC fulfils the requirements for broadcast quality as defined by the European Broadcasting Union (EBU). With sampling rates ranging from 8 kHz up to 192 kHz, bit-rates up to 256 kbit/s per channel, and with support for up to 48 channels, AAC-LC is one of the most flexible audio codecs available today. Indeed, it can be used in a range of applications that demand highest quality at a limited bandwidth. The standard also supports mono, stereo and all common multi-channel configurations (for example 5.1 or 7.1). The low computational demands make AAC-LC the ideal solution for any low bit-rate, high-quality audio application on mobile devices.

MPEG HE-AAC

HE-AAC combines the AAC-LC audio codec with Spectral Band Replication (SBR) bandwidth expansion tool enabling an even more efficient compression and opening new transmission channels. HE-AAC delivers good stereo quality at bit-rates of 32 to 48 kbit/s per channel. The codec is completely multi-channel compatible. (HE-AAC is also known as aacPlus.)

MPEG HE-AAC v2

HE-AAC v2 adds the Parametric Stereo (PS) feature to HE-AAC leading to even greater efficiency in low-bandwidth media. Fraunhofer's HE-AAC v2 codec delivers good-quality audio at bit-rates from 16 to 24 kbit/s per channel. (HE-AAC v2 is also known as aacPlus v2.)



MPEG AAC-ELD

AAC-LD, the low delay version of AAC, combines the full bandwidth and superior quality of AAC with the low coding delay that is necessary for two-way audio communication. AAC-LD features an algorithmic delay of only 20 ms, while offering CD-like audio quality at 64 kbit/s per channel. By integrating SBR technology with the feature set of the LD codec, AAC-ELD provides full audio bandwidth at data-rates down to 24 kbit/s per channel. Both, the AAC-LD and AAC-ELD codecs are perfectly suited for bi-directional communication applications such as VoIP, Telepresence and video conferencing.

HD-AAC

The MPEG standard HD-AAC offers lossless music encoding with quality beyond CDs while being compatible with iPods and mobile phones. Indeed, today's audio CDs store uncompressed music in 16-bit, 44.1 kHz quality, while most music is now produced in the improved 24-bit, 96 kHz format. HD-AAC provides this high-quality sound experience to the user, the online music distribution and the consumer electronics industry. Based on the MPEG standards, Scalable to Lossless Coding (SLS) and AAC, HD-AAC provides a bit stream that can be scaled according to available bandwidth up to full lossless compression of 24-bit quality music content.

MPEG Surround

MPEG Surround is a fully stereo compatible surround extension and may be used in combination with the AAC family of codecs. It provides unsurpassed compression efficiency for high-quality multi-channel audio while offering surround sound and stereo in one single stream.

Codec	Features	Typical Applications	Typical Bit rate
AAC-LC (Low Complexity AAC)	High performance audio codec for excellent audio quality at low bit-rates	<ul style="list-style-type: none"> – Apple iPod – iTunes – ISDB television broadcasting (Japan) 	128 kbit/s (Stereo)
HE-AAC (High Efficiency AAC)	High performance audio codec for good quality at bit-rates of 32-48 kbit/s per channel	<ul style="list-style-type: none"> – XM Radio – Mobile music download – Digital Radio Mondiale 	64 kbit/s (Stereo)
HE-AAC v2	Highest performance audio codec for good quality at bit-rates of 16-24 kbit/s per channel	<ul style="list-style-type: none"> – 3GPP music download – Digital radio DAB+ – Internet radio streaming to mobile devices such as iPhone 	48 kbit/s (Stereo)
HD-AAC (High Definition AAC)	Lossless audio codec for better-than-CD-quality with 24 bit and up to 192 kHz	<ul style="list-style-type: none"> – Home networks – Music distribution / production 	Roughly half the bit-rate of the uncompressed file
AAC-LD (Low Delay AAC)	AAC encoding with 20 ms algorithmic delay	<ul style="list-style-type: none"> – Video conferencing – Telepresence – VoIP telephony – Broadcast gateway 	128 kbit/s (Stereo)
AAC-ELD (Enhanced Low Delay AAC)	Low delay full audio bandwidth codec at data-rates down to 24 kbit/s per channel and 15 ms delay	<ul style="list-style-type: none"> – Video conferencing – Telepresence – VoIP telephony – Broadcast gateway 	64 kbit/s (Stereo)
MPEG Surround	Surround Sound extension e.g. for AAC-LC and HE-AAC	<ul style="list-style-type: none"> – Digital broadcasting – Mobile applications with binaural surround sound – Music distribution 	64...192 kbit/s (5.1 channels)

AAC SOLUTIONS

With more than 20 years of experience in developing and implementing audio codecs, Fraunhofer IIS is the leading provider of AAC implementations. Optimized encoder and decoder software is available on PC platforms using Windows, Mac OS or Linux.

For real-time implementations of AAC encoders and decoders on embedded processors or DSPs, Core Design Kits (CDKs) are available. They are optimized for devices with limited memory and computational power, such as mobile players and smartphones.

Fraunhofer IIS also offers AAC encoder and decoder libraries optimized for Apple iPhone OS.

PHILIP GRAHAM, SENIOR DIRECTOR OF ENGINEERING FOR
CISCO'S TELEPRESENCE SYSTEMS BUSINESS UNIT

**"WE CHOSE FRAUNHOFER NOT ONLY BECAUSE IT
INVENTED THE TECHNOLOGY, BUT BECAUSE OF ITS
OUTSTANDING TECHNICAL REPUTATION, WHICH
WAS CLEAR IN THE PROCESS OF INTEGRATION OF
THE TECHNOLOGY."**

PHILIPPE DELACROIX, PRESIDENT & CEO OF DIGIGRAM

**"OUR PARTNERS AND CUSTOMERS EXPECT A
STATE-OF-THE-ART BLEND OF PERFORMANCE AND
AUDIO QUALITY FROM DIGIGRAM. TO MEET AND
SURPASS THEIR EXPECTATIONS, OFFERING THE
MOST ADVANCED SET OF AUDIO CODECS FROM
FRAUNHOFER THROUGHOUT OUR ENTIRE RANGE
WAS THE WAY TO GO."**

ARNAUD PERRIER, SENIOR PRODUCT MARKETING MANAGER
AT HARMONIC

**"THE HE-AAC CODEC FROM FRAUNHOFER IIS
OFFERS OUTSTANDING QUALITY AND ALLOWED
US TO RAPIDLY INCORPORATE THIS FUNCTION
INTO OUR MARKET-LEADING LINE OF ELECTRA
ENCODERS."**

JIM MARGGRAFF, CEO OF LIVESCRIBE

**"SINCE FRAUNHOFER IS WELL-KNOWN AS A
LEADING, HIGH-QUALITY SOURCE FOR AUDIO
CODECS OUR DECISION TO WORK WITH THEM
WAS EASY."**

For more information about AAC Software, please visit

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About Fraunhofer IIS

The Fraunhofer IIS Audio and Multimedia division, based in Erlangen, Germany, has been working in compressed audio technology for more than 20 years and remains a leading innovator of technologies for cutting-edge multimedia systems. Fraunhofer IIS is universally credited with the development of mp3 and co-development of AAC (Advanced Audio Coding) as well as technologies for the media world of tomorrow, including MPEG Surround, MPEG Spatial Audio Object Coding and the Fraunhofer Audio Communication Engine.

Through the course of more than two decades, Fraunhofer IIS has licensed its audio codec software and application-specific customizations to at least 1,000 companies. Fraunhofer estimates that it has enabled more than 1 billion commercial products worldwide using its mp3, AAC and other media technologies.

The Fraunhofer IIS organization is part of Fraunhofer-Gesellschaft, based in Munich, Germany. Fraunhofer-Gesellschaft is Europe's largest applied research organization and is partly funded by the German government. With nearly 15,000 employees worldwide, Fraunhofer-Gesellschaft is composed of 57 Institutes conducting research in a broad range of research areas.