

ATRAC9™ File Format

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1 ATRAC9™ File Format

Features of the ATRAC9™ File Format

ATRAC9™ including ATRAC9™ Band Extension (shortened to "ATRAC9™" hereafter except under special conditions) is a high-compression audio codec optimized for games, and it has the following features.

- High sound quality
- High compression
- Low delay (granularity)
- Low CPU load
- Low memory consumption

Overall Structure of an ATRAC9™ File

The file format of an ATRAC9™ file created with at9tool.exe is the RIFF-WAVE format.

The file is comprised of four chunks (fmt, fact, smpl, and data), as shown in Figure 1.

Because the smpl chunk is used to store loop information, the smpl chunk is not included in ATRAC9™ data that does not include loop information.

Figure 1 Structure of the RIFF-WAVE Format

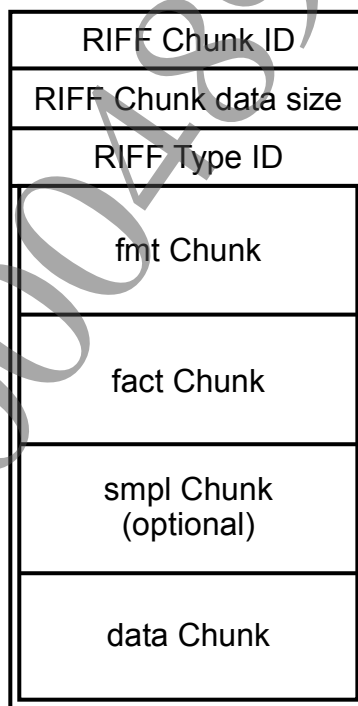


Table 1 Field information of the RIFF-WAVE Format

Field	Type	Description
RIFF Chunk ID	unsigned char[4]	Identification ID ('R', 'I', 'F', 'F' = 0x52, 0x49, 0x46, 0x46)
RIFF Chunk Data Size	unsigned int	File size -8[Byte]
RIFF Type ID	unsigned char[4]	Identification ID ('W', 'A', 'V', 'E' = 0x57, 0x41, 0x56, 0x45)

Reference Materials

New Multimedia Data Types and Data Techniques

http://download.microsoft.com/download/9/8/6/9863C72A-A3AA-4DDB-B1BA-CA8D17EFD2D4/RIF_FNEW.pdf

(Microsoft, updated April 15, 1994)

Multiple Channel Audio Data and WAVE Files

<http://www.microsoft.com/whdc/device/audio/multichaud.msp>

(The above reference destinations have been confirmed as of March 24, 2015. Note that pages may have been subsequently moved or the contents modified.)

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2 Detailed Information of Chunks

fmt Chunk

The fmt chunk is 60-byte data with the structure shown in Table 2.

The values of `nBlockAlign` and `wSamplesPerBlock` are associated with the sampling frequency, bit rate and encode mode of ATRAC9™. Refer to Table 3 for the relationships.

Table 2 fmt Chunk Field Information

Field	Type	Description
fmt Chunk ID	unsigned char[4]	Identification ID ('f', 'm', 't', ' ' = 0x66, 0x64, 0x74, 0x20)
fmt Chunk Data Size	unsigned int	Chunk size -8[Byte] (52)
wFormatTag	unsigned short	Identification ID (WAVE FORMAT EXTENSIBLE = 0xFFFFE)
nChannels	unsigned short	Number of channels
nSamplesPerSec	unsigned int	Sampling frequency (48000, 24000, 12000)
nAvgBytesPerSec	unsigned int	Average byte rate [Byte/s] Calculated by rounding off $nBlockAlign * nSamplesPerSec / wSamplesPerBlock$
nBlockAlign	unsigned short	Audio block size [Byte]
wBitsPerSample	unsigned short	Quantifying bit number (0)
cbSize	unsigned short	Extension size (34)
wSamplesPerBlock	unsigned short	Number of output samples of the audio block
dwChannelMask	unsigned int	Channel map of speaker position
SubFormat	GUID	Codec identifier (KSDATAFORMAT_SUBTYPE_ATRAC9 = {47E142D2-36BA-4d8d-88FC-61654F8C836C})
dwVersionInfo	unsigned int	Version information (1 or 2) - 1: ATRAC9™ other than ATRAC9™ Band Extension - 2: ATRAC9™ Band Extension
ConfigData	unsigned char[4]	ATRAC9™ setting information
Reserved	unsigned int	Reserved area (0)

Note

In version 2.1.1.1 and earlier of at9tool, 1 or 2 was stored in `Reserved` to indicate that the multi-channel data specifications were not finalized. In version 2.5.0.0 and later of at9tool, 0 is stored in `Reserved` because the multi-channel data specifications have been finalized.

In version 2.8.0.5 and later of at9tool, ATRAC9™ Band Extension is supported. In accordance, 2 will be stored in `dwVersionInfo` for ATRAC9™ Band Extension in order to distinguish between ATRAC9™ Band Extension and ATRAC9™ other than ATRAC9™ Band Extension.

Note that ATRAC9™ Band Extension is not supported in PlayStation®Vita, so do not use it in audio data for PlayStation®Vita.

Table 3 nBlockAlign and wSamplesPerBlock in ATRAC9™

Encoding mode	Sampling frequency	wSamplesPerBlock	Bit rate	nBlockAlign
ATRAC9™ Superframe mode OFF	48kHz	256	36 kbps	24
			48 kbps	32
			60 kbps	40
			72 kbps	48
			84 kbps	56
			96 kbps	64
			120 kbps	80
			144 kbps	96
			168 kbps	112
			192 kbps	128
			240 kbps	160
			288 kbps	192
			300 kbps	200
			336 kbps	224
			360 kbps	240
			420 kbps	280
			504 kbps	336
	24kHz	128	36 kbps	24
			48 kbps	32
			60 kbps	40
			72 kbps	48
			84 kbps	56
			96 kbps	64
			120 kbps	80
			144 kbps	96
			168 kbps	112
			192 kbps	128
			240 kbps	160
			288 kbps	192
			300 kbps	200
			336 kbps	224
			360 kbps	240
			420 kbps	280
			504 kbps	336
	12kHz	64	36 kbps	24
			48 kbps	32
			60 kbps	40
			72 kbps	48
			84 kbps	56
			96 kbps	64
			120 kbps	80
			144 kbps	96
			168 kbps	112
			192 kbps	128
			240 kbps	160
			288 kbps	192
			300 kbps	200
			336 kbps	224
			360 kbps	240
			420 kbps	280
			504 kbps	336

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Encoding mode	Sampling frequency	wSamplesPerBlock	Bit rate	nBlockAlign
ATRAC9™ Superframe mode ON	48kHz	1024	36 kbps	96
			48 kbps	128
			60 kbps	160
			72 kbps	192
			84 kbps	224
			96 kbps	256
			120 kbps	320
			144 kbps	384
			168 kbps	448
			192 kbps	512
			240 kbps	640
			288 kbps	768
			300 kbps	800
			336 kbps	896
			360 kbps	960
	24kHz	512	420 kbps	1120
			504 kbps	1344
			36 kbps	96
			48 kbps	128
			60 kbps	160
			72 kbps	192
			84 kbps	224
			96 kbps	256
			120 kbps	320
			144 kbps	384
			168 kbps	448
			192 kbps	512
			240 kbps	640
			288 kbps	768
			300 kbps	800
			336 kbps	896
			360 kbps	960
			420 kbps	1120
			504 kbps	1344
	12kHz	256	36 kbps	96
			48 kbps	128
			60 kbps	160
			72 kbps	192
			84 kbps	224
			96 kbps	256
			120 kbps	320
			144 kbps	384
			168 kbps	448
			192 kbps	512
			240 kbps	640
			288 kbps	768
			300 kbps	800
			336 kbps	896
			360 kbps	960
			420 kbps	1120
			504 kbps	1344

Document serial number: 000004892115

fact Chunk

The fact chunk is 20-byte data with the structure shown in Table 4.

Overlap delay is associated with the sampling rate of ATRAC9™. Refer to Table 5 for the relationships.

Table 4 fact Chunk Field Information

Field	Type	Description
fact Chunk ID	unsigned char[4]	Identification ID ('f', 'a', 'c', 't' = 0x66, 0x61, 0x63, 0x74)
fact Chunk Data Size	unsigned int	chunk size -8[Byte] (12)
Total Samples	unsigned int	Total number of samples per channel
Input And Overlap Delay Samples	unsigned int	Total value of input delay (0) and overlap delay
Encoder Delay Samples	unsigned int	Total value of input delay (0), overlap delay, and encode delay (0)

Table 5 Sampling Frequency and Overlap Delay in ATRAC9™

Sampling frequency	Overlap delay
48kHz	256
24kHz	128
12kHz	64

smpl Chunk

The smpl chunk stores the loop information.

See the "New Multimedia Data Types and Data Techniques" document for more information on the smpl chunk.

The loop start and end positions are stored in dwStart and dwEnd in the cue chunk of the smpl chunk. Note that Encoder Delay Samples of the fact chunk are added to dwStart and dwEnd.

The smpl chunk is not included in ATRAC9™ data that does not include loop information.

data Chunk

The data chunk stores audio data.

See the "New Multimedia Data Types and Data Techniques" document for more information on the data chunk.

3 ATRAC9™ Band Extension

ATRAC9™ Band Extension Format

ATRAC9™ Band Extension is an extension format of ATRAC9™. When encoding with the ATRAC9™ Band Extension format, low frequency bands are encoded with the conventional format, and the encoding results for high frequency bands will be stored as data that accurately represents the characteristics of the audio (this encoded data for high frequency bands is hereafter referred to as "characteristic data").

When decoding, extension into audio data for high frequency bands will be performed based on audio data for low frequency bands and characteristic data for high frequency bands. Since characteristic data uses much less volume than the conventional encoded data format, improvements in audio quality and bandwidth can be expected for ATRAC9™ Band Extension format audio data at low bitrates in comparison with the conventional format.

Output PCM During Seek Playback of ATRAC9™ Band Extension Data

During playback of ATRAC9™ Band Extension data, if noise information is included as high band characteristic data in the audio data, seed values for random noise generation will be generated from the stream information. Therefore, when performing seek playback, etc., a different seed value will be used depending on the playback start position, and the resulting PCM data that is output may be different.

For example, when the output is compared in the following cases for certain ATRAC9™ Band Extension input data, there is a possibility of the output PCM not matching for the same section.

- Output PCM from the start of the file to the end
- Output PCM from the seek start position to the end