Sony Wave64

Introduction

The RIFF/WAVE file format as defined by Microsoft allows to store up to 4 GB of audio data in a single file. This is sufficient to hold about 6h 45min of uncompressed PCM coded stereo 16-bit audio signals with a sample rate of 44.1 kHz. However, for multi channel audio (e.g. 5.1 surround), high-definition formats (24 bits, 96 or 192 kHz sample rate) or some special applications in production and broadcasting, the file size limit of 4 GB is rather inconvenient, since long recordings need to be split into several files. The file size limit of 4 GB exists, because all size fields in the RIFF/WAVE format have a size of 32 bits, resulting in a maximum size of $2^{32} = 4294967296$ bytes.

The Sony Wave64 file format is defined as a true 64 bit file format that allows to overcome the limitations of the RIFF/WAVE format. The file format was originally defined by Sonic Foundry. In Summer 2003, Sony Pictures Digital acquired Sonic Foundry's Desktop Software assets. Since then, the new format is officially promoted as *Sony Pictures Digital Wave 64*. Companies are encouraged to support this format and no royalties have to be paid to use it.

General Format Specification

The Sony Wave64 file format is very similar to the well known RIFF/WAVE format. Therefore, existing software implementations of RIFF/WAVE file filters are likely to be extendable to support the Sony Wave64 file format with little programming effort. Because of the similarities to the RIFF/WAVE format, only the differences between these formats are described. It is assumed that the reader is familiar with the original format as defined by Microsoft.

1. The recommended file name extension for Sony Wave64 files is *.w64* instead of *.wav*. However, the first bytes of the file can be used to identify the Sony Wave64 format, thus allowing software to recognise Sony Wave64 files without relying on the recommended extension.

2. Instead of four characters (known as *FOURCC codes*), the Sony Wave64 format uses 128-bit globally unique identifiers (GUIDs) to identify chunks. A list of pre-defined GUIDs is given below. There are already GUIDs for the most common FOURCC codes, like "RIFF", "WAVE", "FMT " and "DATA". A Sony Wave64 file starts with a RIFF-GUID, followed by the total file size (see below), followed by a WAVE-GUID. As implementors are obliged to skip over unknown chunks, anyone can add custom chunks. In contrast to the FOURCC codes used in the RIFF/WAVE-Format, there is no danger of two independent developers defining the same chunk in a different way.

3. All 32-bit size fields are replaced with 64-bit fields, stored as usual in little-endian format (i.e. Intel byte-order).

4. The size field between the RIFF- and the WAVE-GUID (starting at byte offset 16 in the file) specifies the total size of the file *including the header itself*. In contrast, for RIFF/WAV files, the size field at offset 4 does not include the RIFF-FOURCC and the size field itself, making it 8 bytes less than the total file size.

5. Also, the chunk size fields directly following the chunk-GUID and preceeding the chunk body, include the size of the chunk-GUID and the chunk length field itself. Therefore, it corresponds to the chunk data size plus 24 (16 bytes for the GUID, 8 bytes for the size field).

6. All chunks are byte-aligned on 8-byte boundaries, but their chunk size fields do *not* include any padding if it is necessary. Standard RIFF/WAV files use 2-byte alignment of chunks.

Markers and Regions

Most chunks defined for RIFF/WAVE files can be used in Sony Wave64 files without any change, e.g. the "FMT " or "DATA" chunk. However, some chunks need to be adapted to the specific requirements of large

files. One of these chunks is the "CUE " chunk that is used to store markers. For this purpose, a completely new CUE64 chunk with the following format was defined by Sony:

```
#pragma pack(push, 1)
typedef struct {
    GUID            Guid;
    LONGLONG llSize;
    DWORD           dwMarkerCount;
    } CUE64_HEADER;
#pragma pack(pop)
```

Offset	Description	Size	Type
0	MARKER-GUID	16 bytes	GUID
16	Total chunk size in bytes	8 bytes	LONGLONG
24	Total number of markers/regions	4 bytes	DWORD
28	Marker/region 1 (see below)	x1 bytes	
28+x1	...	...	
...	Marker/region n (see below)	xn bytes	

The total chunk size includes the Marker GUID and it <u>must</u> be an integral of 8 bytes. This ensures Wave64 chunks always lie on 8 byte (64 bit) boundaries.

The following structure is used to store a marker or region:

```
#pragma pack(push, 1)
typedef struct {
        DWORD           dwId;
        DWORD           dwPadding1;
        LONGLONG    llPosition;
        LONGLONG    llLength;
        DWORD           dwcbName;      // never will more than 32 bits be needed for size
        DWORD           dwPadding2;
} CUE64;
#pragma pack(pop)
```

Offset	Description	Size	Type
0	Marker/region ID	4 bytes	DWORD
4	Padding (ignore)	4 bytes	
8	Marker position (sample offset, corresponds to dwSampleOffset in RIFF/WAV 'cue' chunk)	8 bytes	LONGLONG
16	Length of the region (-1 for markers)	8 bytes	LONGLONG
24	Length of the marker/region name in bytes (not characters), 0 for unnamed. See note 1.	4 bytes	DWORD
28	Padding (ignore)	4 bytes	
32	If marker/region is named, name in Unicode format. See note 2.	n bytes (always even)	WCHAR

Notes:
1. Unnamed markers have a length of 0 (dwcbName=0). Alternatively, unnamed markers can have dwcbName=2 where the WCHAR name field consists of a two-byte zero terminator. Applications <u>must</u> handle either case for reading files. When writing Sony Wave64 files, it is recommended that unnamed markers use dwcbName=2 with a two-byte zero terminator.
2. A NULL terminator is not required for named markers. Applications <u>must</u> properly handle marker names whether or not the NULL terminator is included. When writing Sony Wave64 files, it is recommended that named markers include the NULL terminator.

LEVL-Chunk

Another chunk that needs to be adapted to the specific requirements of 64 bit files is the "LEVL"-chunk, also referred to as Peak Envelope Chunk, defined within the EBU Broadcast Wave Format Specification (see EBU Tech 3285 - Supplement 3). VCS proposes to keep all but one of the fields in the 'LEVL'-chunk definition the same. The only exception is the position of the peak, which is a 64-bit field now. To further distinguish the Sony Wave64 "LEVL"-Chunk from the RIFF/WAVE-"LEVL"-Chunk, the version field must contain 0x80000000 instead of 0x00000000.

GUIDs

Currently, the following Chunk-GUIDs are defined:

Name / FOURCC	GUID
"RIFF"	{ 66666972-912E-11CF-A5D6-28DB04C10000 }
"LIST"	{ 7473696C-912F-11CF-A5D6-28DB04C10000 }
"WAVE"	{ 65766177-ACF3-11D3-8CD1-00C04F8EDB8A }
"FMT "	{ 20746D66-ACF3-11D3-8CD1-00C04F8EDB8A }
"FACT"	{ 74636166-ACF3-11D3-8CD1-00C04F8EDB8A }
"DATA"	{ 61746164-ACF3-11D3-8CD1-00C04F8EDB8A }
"LEVL"	{ 6C76656C-ACF3-11D3-8CD1-00C04F8EDB8A } (1)
"JUNK"	{ 6b6E756A-ACF3-11D3-8CD1-00C04f8EDB8A }
"BEXT"	{ 74786562-ACF3-11D3-8CD1-00C04F8EDB8A } (2)
MARKER	{ ABF76256-392D-11D2-86C7-00C04F8EDB8A }
SUMMARYLIST	{ 925F94BC-525A-11D2-86DC-00C04F8EDB8A }

(1) GUID not contained in the original Sonic Foundry/Sonic specification but added by VCS.
(2) Proposed by Steinberg, accepted by Sonic Foundry/Sony.

Note the pattern that is used: The GUIDs of all standard RIFF FOURCC codes start with a lowercase ASCII representation of the FOURCC followed by the same byte pattern. The GUIDs of all standard WAVE FOURCC codes also start with a lowercase ASCII representation of the FOURCC, followed by another but also constant byte pattern. It is commended to use this pattern only for existing RIFF/WAV chunks that can be directly transferred to Sony Wave64 chunks. For all other new chunks that do not refer to an existing RIFF/WAVE chunk, completely new GUIDs shall be generated.
Please feel free to e-mail GUIDs and/or specifications of custom defined chunks to be added to this documentation.

Migration from RIFF/WAV to Sony Wave64

It is expected that the size of most files stays within the limits of 4 GB. For compatibility reasons it is advantageous to keep these files in the original RIFF/WAVE format. To achieve this, a *junk*-chunk must be

written to the beginning of the file. As soon as the size of the file exceedes 4 GB, the file header and this junk-chunk must be overwritten with the corresponding Sony Wave64 structures.

Companies and Products supporting the Sony Pictures Digital Wave64 Format

- Cockos Incorporated: Reaper.
- Cube-Tec International: Dobbin.
- FMJ-Software: Awave Audio.
- SADiE
- Silverspike: TapeIt 2.
- Sony Media Software: SoundForge, Vegas, ACID Pro, CD Architect ...
- Steinberg: Nuendo, Cubase, WaveLab.
- VCS: AudioToolSet (ATS), including StarTrack and Orion.
- VirtualDub

Please note that information on products supporting Wave64 is mainly based on promotional material. No compatibility tests were done by VCS.

If your company/product supports Sony Wave64, please send us a link to be included in this list.

Acknowledgements

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