

Image and Audio File Formats

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Outline

- Audio File Formats
- Image File Formats

Audio File Formats

Introduction (1/3)

- An audio file format is a file format for storing digital audio data on a computer system.
- This data can be stored **uncompressed**, or **compressed** to reduce the file size.

Introduction (2/3)

- There are three major groups of audio file formats:
 - **Uncompressed audio formats**, such as **WAV** and raw header-less PCM.
 - **Formats with lossless compression**, such as FLAC and Windows Media Audio Lossless (WMA Lossless).
 - **Formats with lossy compression**, such as **MP3** and Windows Media Audio Lossy (WMA lossy).

Introduction (3/3)

File Extension	Creation Company	Description
wav		Standard audio file container format used mainly in Windows PCs.
AIFF	Apple	Standard audio file format used by Apple.
mp3		MPEG Layer III Audio. Is the most common sound file format used today.
wma	Microsoft	Windows Media Audio format.
ra & rm	Real-Networks	A RealAudio format designed for streaming audio over the Internet.

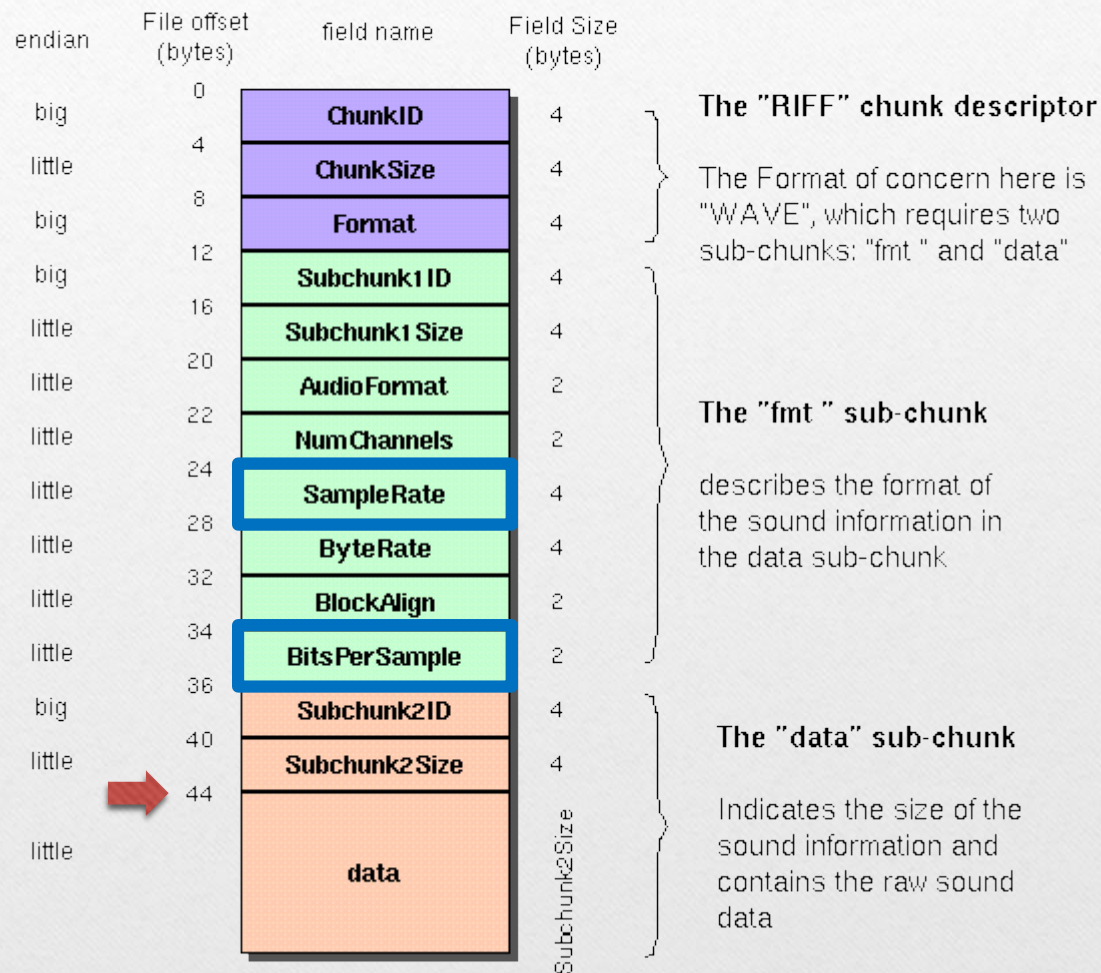
WAV (1/2)

- Waveform Audio File Format (**WAVE**, or more commonly known as **WAV** due to its filename extension) is a Microsoft and IBM audio file format standard for storing an audio bitstream on PCs.
- It is the main format used on Windows systems for raw and typically **uncompressed audio**.

WAV (2/2)

- The usual bitstream encoding is the linear pulse-code modulation (**LPCM**) format.
- Both WAVs and AIFFs are compatible with **Windows**, **Macintosh**, and **Linux** operating systems.

The Canonical WAVE file format



Endianness

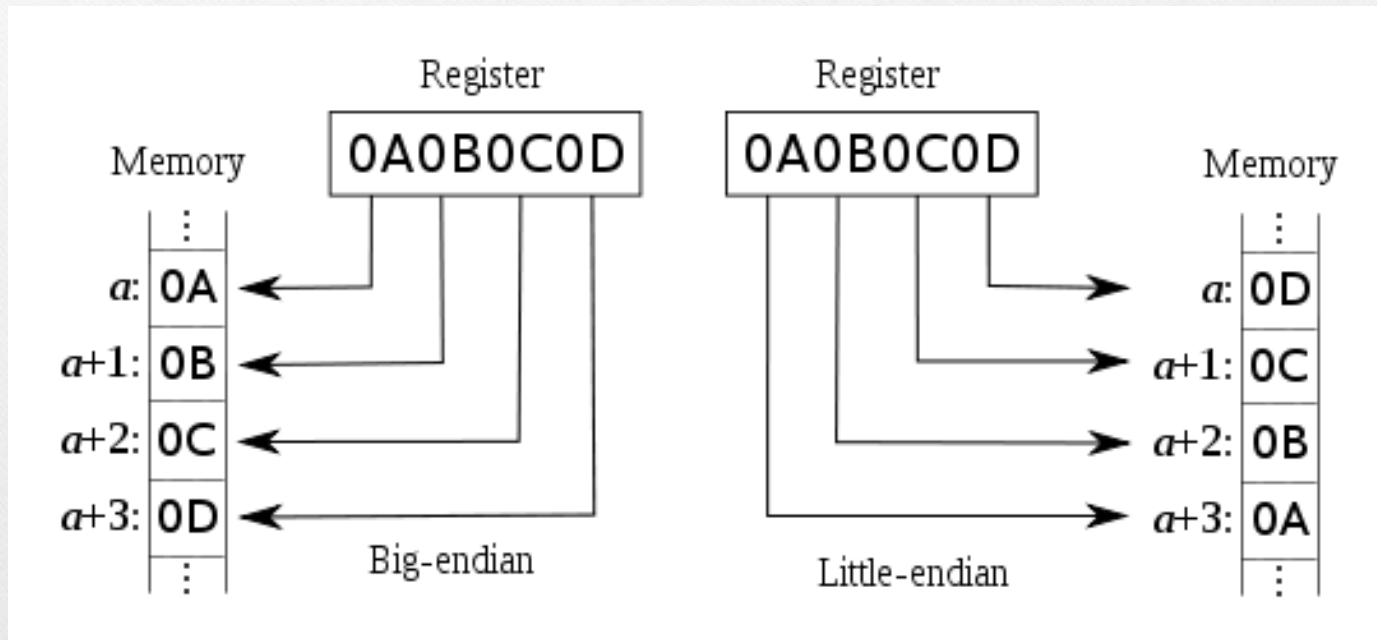


Image File Formats

JPEG

- JPEG (Joint Photographic Experts Group) is a **lossy compression** method.
- The JPEG filename extension is JPG or JPEG.
- JPEG applies lossy compression to images, which can result in a significant reduction of the file size.

GIF

- GIF (Graphics Interchange Format) is limited to an **8-bit palette**, or **256 colors**.
 - This makes the GIF format suitable for storing graphics with relatively few colors such as simple diagrams, shapes, and logos.
- The GIF format supports **animation** and is still widely used to provide image animation effects.

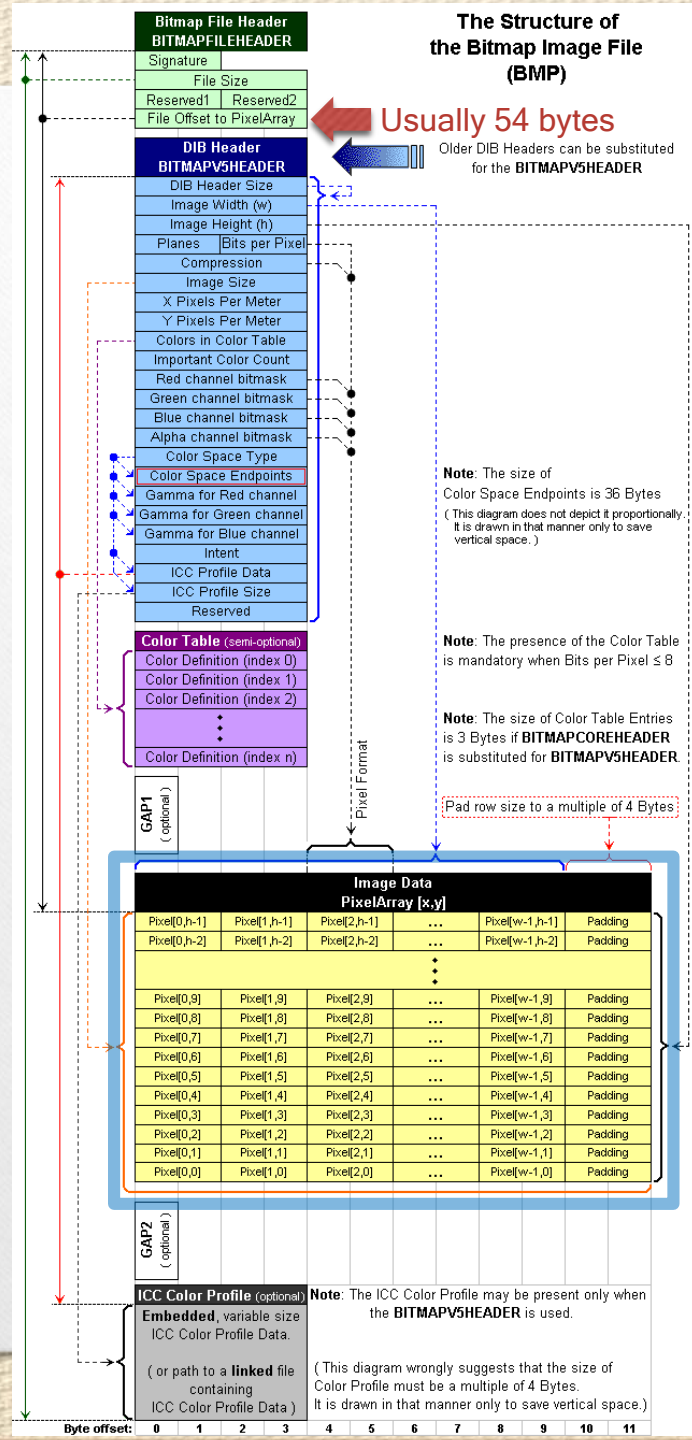
PNG

- PNG (Portable Network Graphics) is a raster graphics file format that supports lossless data compression.
- PNG was created as an improved, non-patented replacement for **GIF**, and is the most used **lossless image compression** format on the Internet.

BMP

- The BMP file format, also known as bitmap image file or simply a **bitmap**, is a raster graphics image file format used to store bitmap digital images.
- BMP files are **uncompressed**, hence they are large; the advantage is their simplicity and wide acceptance in Windows programs.

The Structure of the Bitmap Image File (BMP)



BMP Image Data Format

Image Data PixelFormat [x,y]					
Pixel[0,h-1]	Pixel[1,h-1]	Pixel[2,h-1]	...	Pixel[w-1,h-1]	Padding
Pixel[0,h-2]	Pixel[1,h-2]	Pixel[2,h-2]	...	Pixel[w-1,h-2]	Padding
			♦		
			♦		
			♦	Pad row size to a multiple of 4 Bytes	
Pixel[0,9]	Pixel[1,9]	Pixel[2,9]	...	Pixel[w-1,9]	Padding
Pixel[0,8]	Pixel[1,8]	Pixel[2,8]	...	Pixel[w-1,8]	Padding
Pixel[0,7]	Pixel[1,7]	Pixel[2,7]	...	Pixel[w-1,7]	Padding
Pixel[0,6]	Pixel[1,6]	Pixel[2,6]	...	Pixel[w-1,6]	Padding
Pixel[0,5]	Pixel[1,5]	Pixel[2,5]	...	Pixel[w-1,5]	Padding
Pixel[0,4]	Pixel[1,4]	Pixel[2,4]	...	Pixel[w-1,4]	Padding
Pixel[0,3]	Pixel[1,3]	Pixel[2,3]	...	Pixel[w-1,3]	Padding
Pixel[0,2]	Pixel[1,2]	Pixel[2,2]	...	Pixel[w-1,2]	Padding
Pixel[0,1]	Pixel[1,1]	Pixel[2,1]	...	Pixel[w-1,1]	Padding
Pixel[0,0]	Pixel[1,0]	Pixel[2,0]	...	Pixel[w-1,0]	Padding

Pixel Format

- The 8-bit per pixel (8bpp) format supports 256 distinct colors and stores 1 pixel per 1 byte. Each byte is an index into a **table (palette)** of up to 256 colors.
- The 16-bit per pixel (16bpp) format supports 65536 distinct colors and stores 1 pixel per 2 byte WORD. Each WORD can define the **alpha, red, green and blue** samples of the pixel (often **5.6.5** in RGB notation).
- The 24-bit pixel (24bpp) format supports 16,777,216 distinct colors and stores 1 pixel value per 3 bytes. Each pixel value defines the red, green and blue samples of the pixel (**8.8.8.0.0** in RGBAX notation). Specifically in the order (blue, green and red, 8-bits per each sample).

The End.

Any question?

Reference

1. http://en.wikipedia.org/wiki/Audio_file_format
2. http://en.wikipedia.org/wiki/Image_file_formats
3. http://en.wikipedia.org/wiki/BMP_file_format