Image file formats

Some commonly used file formats

TIFF (Tagged Image File Format)

- Usually Images are larger in size and of high quality.
- Can have multiple extensions based on applications. But hence not portable.
- May or maynot be compressed.
- Algorithms that can be used to compress TIFF images :
    - Huffman coding
    - LZW compression
- Not suitable for web

TIFF continued..

- It is organized in 3 sections :
  - Image File Header (IFH)* - first 8 bytes of image file
  - Image File Directory (IFD)*
  - Bitmap data

TIFF subfiles

- IFD contains multiple 12-byte records called ‘tags’. There are 70 tags defined in as public tags. User defined tags are called private tags.
- There are three possible ways to arrange data in TIFF

TIFF continued..

- Header contains information about byte order, version information and a position at which first IFD starts. (word, word, double word)
- Each IFD contains information about height and width of an image depth of each pixel and type of data encoding used. Some file tags are : Artist, Uncompressed, ImageHeight, Copyright.
- Bitmap data may not be continuous. Hence simple applications may not be able to read TIFF files.

BMP

- Simple – Highly standardized and widespread.
- Does not offer significant image compression.
- Simple editor can support BMP images due to its simplicity.
- Hence widely used.
- BMP section is broken into 4 main sections –
  - File header
  - Image header
  - Color table
  - Pixel data

BMP continued ..

- The file header (14 bytes) contains information about file size and location at which data is stored.
- The Image header (40 bytes*) tells information about rows and columns of an image, bits per pixel, type of compression used if any.
- The color table& provides color palette
- Pixel data is written in bottom to top fashion. Row starts with double word boundaries.
- Each row is written left to right.

PNG (Portable Network Graphics)

- PNG file consists of PNG signature followed by series of chunks.
- Chunk contains –
  - Length (4byte unsigned integer)
  - Chunk type (4byte chunk type code) - Image header, image data etc.
  - Chunk data – data type appropriate for chunk type. Field can be of zero length.
  - Cyclic Redundancy Check (CRC) (4 byte)

PNG continued ..

- First 8 bytes identify PNG image :

```
137 80 78 71 13 10 26 10
```

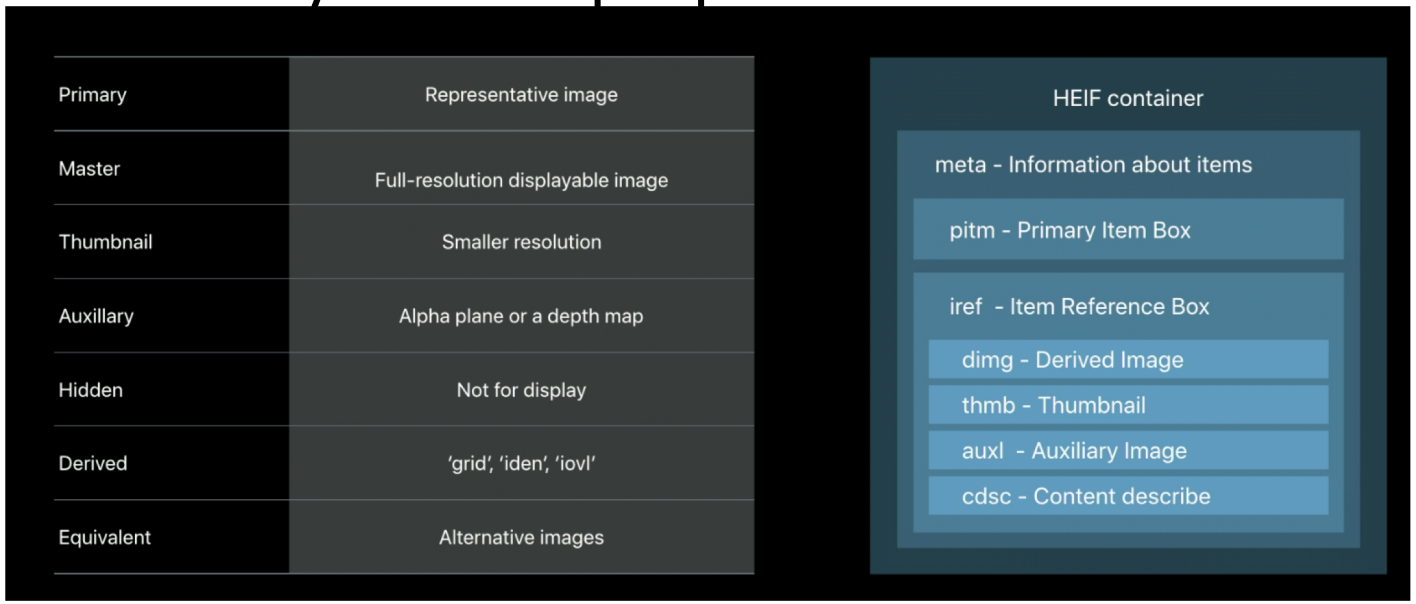
- Length : 4 byte unsigned int. does not include itself, type code and CRC.
- Chunk type : chunk type identifies the type of data in data field.
- Chunk Data : The data appropriate to chunk type. Can be of 0 length.
- CRC : calculated on previous data. Does not include length field.

HEIF (High Efficiency Image Compression)

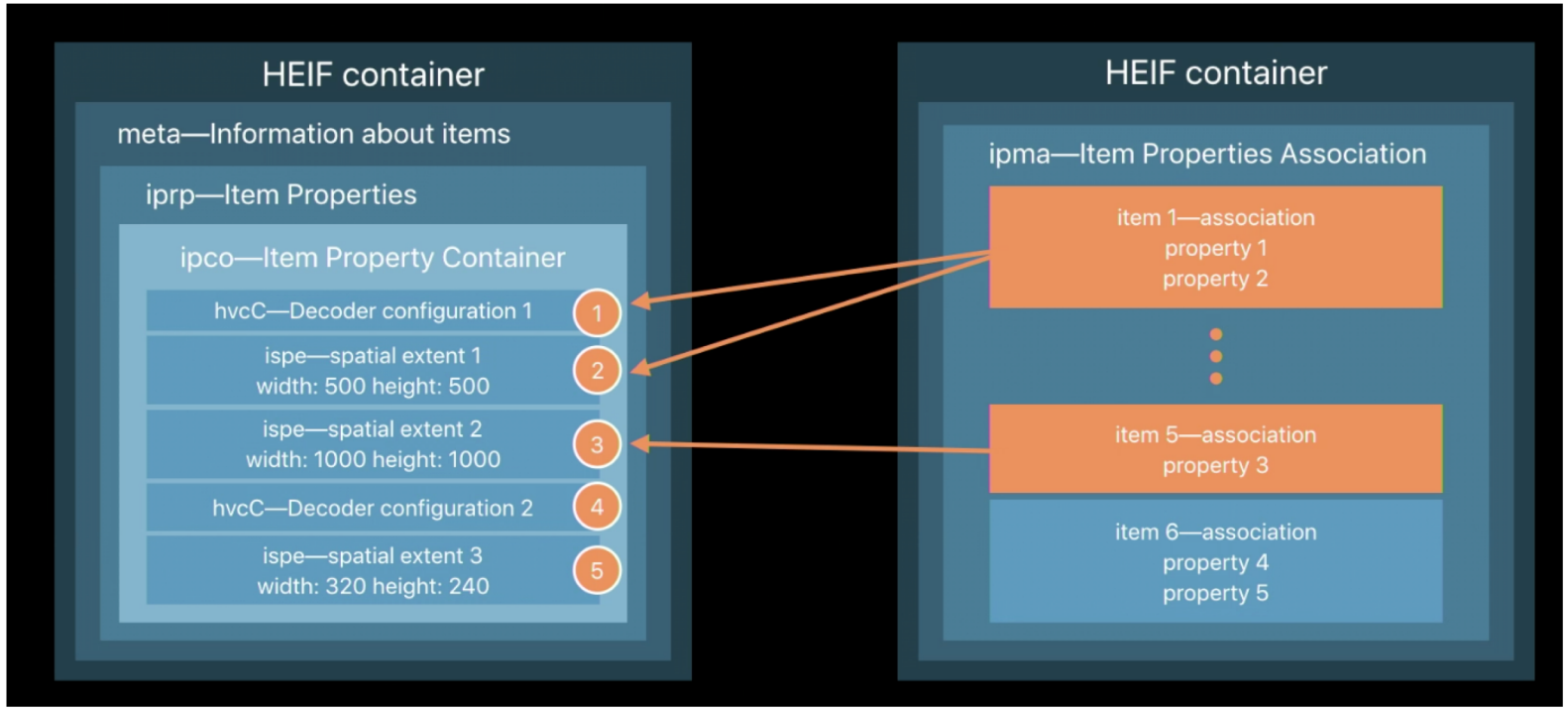
- Being used by apple to replace JPEG.
- It is a format for image sequences as well as for individual images.
- still images encoded with the HVEC (H.265) video format.
- Works well with live photos
- “MPEG group claims that twice as much information can be stored in a HEIF style image as a JPEG one of the same size.”
- HEIF supports 16 bit color as oppose to 8-bit color used by JPEG

HEIF continued ..

- Container and codec are separate.
- Every element in HEIF file is called an ‘item’.
- Structures link one item to other.
- Items identify various properties in the file format.



HEIF continued ..



HEIF continued .. (JPEG vs HEIF)

- Block size :
  - 8x8 block size for jpeg 8 to 16 for HEIF. It is flexible.
- Can predict all values within a block using data from other blocks.
- CABAC coding is used instead of Huffman coding.
- JPEG uses global quantization matrix. HEVC uses separate quantization parameters. This gives flexibility of local quantization.
- Deblocking filter to smoothen the transition. SAO follows.

References

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