GPAC support for High Efficiency Image Format (HEIF)

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@WeAreGPAC
Multimedia OSS since 2003:

- MP4Box (packager) + MP4Client (player)
- MPEG #HEVC #DASH #SHVC #CENC + IETF + W3C
- FOSDEM15: Producing media content for the browsers using GPAC
- FOSDEM16: GPAC/MP4Box.js
- FOSDEM17: GPAC: delivery of VR/360 videos using Tiles
What is HEIF?

- **New image container format**
  - Derive from ISOBMFF
  - With some image-specific constructs (boxes)

- **Containing**
  - For individual images
  - Image sequences (bursts)
  - Image metadata

- **Codec agnostic**
  - Originally designed for HEVC still picture
  - Officially supports AVC still and JPEG

- **Nice features**
  - Image transformations (rotation, mirror, grid overlays…)
  - Additional image planes (alpha masks, …)
  - Thumbnails, cover images, hidden images
  - Codec optimizations (parameter sets sharing, tiling, multi-layer…)
  - Progressive refinement
HEIF container design

- **Single images**
  - stored as items in the “meta” box
  - May share properties (transformation rules) and data (param sets, tile data) with other images

- **Image sequences**
  - stored as ISOBMF tracks
  - With a new handled type “pict”

```
ftyp   brand
/
moov
  track (pict)  track (pict)  ...  track (pict)
/
meta
  Item info  Item location  other item
/
mdat
  Coded image  Coded image  ...  Coded image
```
# HEIF brands and file extension

<table>
<thead>
<tr>
<th>brand</th>
<th>coding format</th>
<th>extension</th>
<th>mime</th>
</tr>
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<tbody>
<tr>
<td>mif1</td>
<td>any</td>
<td>.heif</td>
<td>image/heif</td>
</tr>
<tr>
<td>msf1</td>
<td>any</td>
<td>.heif</td>
<td>image/heif-sequence</td>
</tr>
<tr>
<td>heic</td>
<td>HEVC (Main or Main Still Picture profile)</td>
<td>.heic</td>
<td>image/heic</td>
</tr>
<tr>
<td>heix</td>
<td>HEVC (Main 10 or format range extensions profile)</td>
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<td>AVC (no profile restrictions), only still image</td>
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<td>JPEG in 'mjpg' pict track, images sequences</td>
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</table>
Why would you use HEIF?

- **Codec efficient**
  - Up 2x better compression than JPEG when it uses HEVC
  - Allows partitioning of a picture into tiles (HEVC)

- **Image collection**
  - Multiple images in the same file
  - Efficient storage of image bursts and HDR images
  - Keeps links between a master image and its derived versions (visual effects)

- **Extensible format**
  - You can add your own codec if needed!
  - Not restricted to images
    - possibility to include other media types (text, audio,..)
GPAC and HEIF

- Generation and Extraction using MP4Box

  MP4Box -add-image file.hvc:primary -ab heic -new image.heic

  This will take the first image of the HEVC file, create a “meta” box, add one image item, make it a primary item and add the “heic” brand to the output file.

  MP4Box -add-image file.hvc:time=1.2:primary -ab heix -new image.heic

  This command line will do the same but for the next IDR frame after the given time and add the “heix” brand.

  MP4Box -add-image tiled.hvc:split_tiles:primary -ab heic -new tiled.heic

  This command line will take a tiled HEVC stream and generate one item per tile and one item for the entire image.

- Initial support of HEIF playback in MP4Client
For more information

HEIF Post :
http://gpac.io/2017/06/09/gpac-support-for-heif/

Tile Based HEVC Post :
http://gpac.io/2017/02/01/hevc-tile-based-adaptation-guide/

GPAC source code :
https://github.com/gpac/gpac/