

**Movenda Bitmap Format**  
*MBF v. 1*

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# 1 MBF file format

MBF file format is an image format that allows use of :

- Layers
- Transparency
- Visibility flag

MBF file format is a light, easy to implement, non redundant file format, engineered especially on embedded and mobile devices in conjunction with OpenGL ES API.

A MBF file can contain as many layers as needed. There is no layer count field. It is however trivial to calculate it from dimension and channel count.

Layers are layout from bottom to top, first layer is at the bottom while last layer is the topmost.

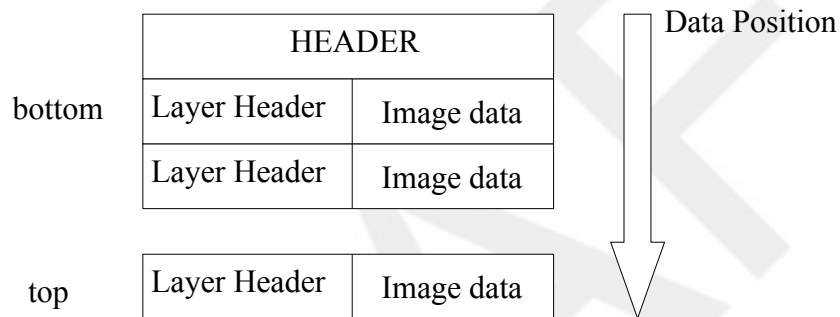


Fig 1

# 2 MBF file structure

MBF file consist of an Header, and one or more layer data segments. Each layer data segments has a layer header and an image data segment.

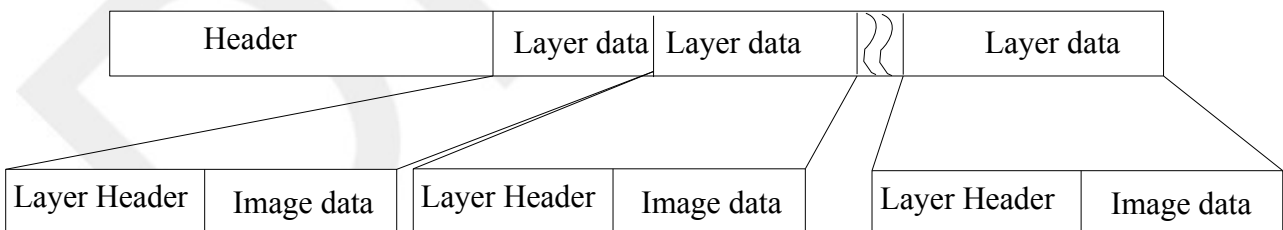


Fig 2

The header is 6 byte long, layer header is 2 bytes long and image data size can be calculated.

Image data segments can be in one of the following formats:

- Luminance scale
- RGB
- RGB + Alpha channel
- PVRTC

Layer can be visible or not visible, and support following blending method:

- Normal
- Multiply
- Darken
- Difference
- Lighten
- Screen

### 3 File Header

1 Byte	2 Byte	2 Byte	1 Byte
Version	Height	Width	Channel layout

*Fig 3*

File Header is 6 byte long as shown in figure (3).

#### 3.1 Version

Name	Version
Length (byte)	1 byte
Range	[1..255]
Format	Unsigned int
Description	Version of file format, number by first release (ver. number 1)

### 3.2 Height

Name	Height
Length (byte)	2 byte
Range	[1..65535]
Format	Unsigned int
Description	Height dimension of all layers in file,

### 3.3 Width

Name	Width
Length (byte)	2 byte
Range	[1..65535]
Format	Unsigned int
Description	Width dimension of all layers in file,

### 3.4 Channel Layout

Name	Channel layout
Length (byte)	1 byte
Range	[0..255]
Format	Enum
Description	Enum field contains channel type as described in Appendix A

## 4 Image constraints

All layers must have the same channel layout, width and height. Height and width are of maximum of 65535 X 65535 pixel, and supported channel layout are numbered in Appendix A.

## 5 Layer

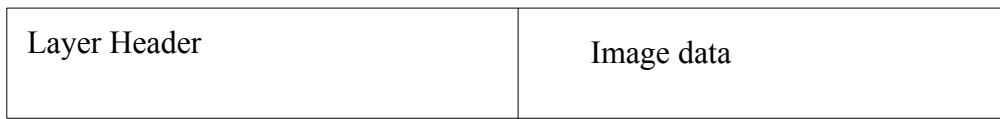


Fig 4

Following the Header, layers are encoded as in figure (4). The layer header currently specifies a visibility flag and blending mode. Every layer header is 2 bytes long.

### 5.1 Layer Header

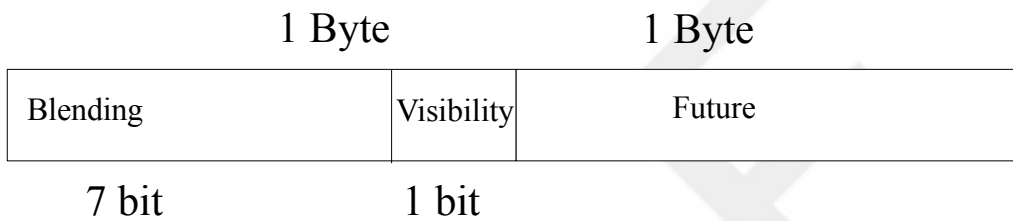


Fig 5

#### 5.1.1 Blending

Name	Blending
Length (byte)	7 bit
Range	[0..127]
Format	N/A
Description	Enum field contains blending mode for the layer. See appendix C

#### 5.1.2 Visibility

Name	Visibility
Length (byte)	1 bit
Range	0 – not visible 1- is visible
Format	Flag
Description	Flag indicates if image data layer is visible or not

### 5.1.3 Future

Name	Future
Length (byte)	1 byte
Range	N/A
Format	N/A
Description	Left for future development

### 5.2 Image Data

The Image data segments for every layer is laid out accordingly to the channel layout as defined in Appendix A. All image data segments are

$(\text{Height}) * (\text{Width}) * (\text{Byte-per-Pixel})$  bytes long.

The latter property is assured by the fact that the image data is either uncompressed or compressed using an algorithm with a fixed compression ratio.

## Appendix A – Channel layouts -

Enum value are as follows. Data is to be packed in Little Endian[2] byte order

Value	Description	BPP	Data type	Notes
0	RGBA_PVRTC4[1]	4	byte array	Red + Green + Blue + Alpha
1	Y8	8	byte array	Luminance
2	YA8	16	byte array	Luminance + Alpha
3	RGB888	24	byte array	Red + Green + Blue
4	RGBA8888	32	byte array	Red+ Green + Blue + Alpha
5	RGBA_PVRTC2[1]	2	byte array	Red + Green + Blue + Alpha
6	Y4	4	byte array	Luminance
7	YA4	8	byte array	Luminance + Alpha
8	RGB565	16	16-bit integer	Red + Green + Blue
9	RGBA4444	16	16-bit integer	Red + Green + Blue + Alpha
10	RGB_PVRTC4[1]	4	byte array	Red + Green + Blue
11	N/A	N/A		N/A
12	N/A	N/A		N/A
13	N/A	N/A		N/A
14	RGBA5551	16	16-bit integer	Red + Green + Blue + Alpha
15	RGB_PVRTC2[1]	2	byte array	Red + Green + Blue

Channel count can be calculated as

(Channel Layout value) MODULO<sup>1</sup> (5)

Channel Layouts with zero channel count are reserved for special purpose such as index mode palettes.

Luminance is a simple format that uses one byte to represent the luminance of each pixel. Images in this format are always scale of a single color (usually grey scale)

RGB is a Truecolor (16,777,216 color palette) scale image format that uses three bytes to represent the Red, Green and Blue channels of each pixel. RGB channels are interleaved.

RGBA is a Truecolor (16,777,216 color palette) scale image format that uses four bytes to represent Red, Green, Blue and Alpha channels of each pixel. RGBA channels are interleaved.

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<sup>1</sup> Given two numbers (either integer or real), a and n, a modulo n is the remainder after numerical division of a by n, under certain constraint

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## Appendix B – References -

[1] Fenney Simon, *Texture Compression using Low-Frequency Signal Modulation*, Graphics Hardware (2003)  
<http://web.onetel.net.uk/~simonihal/assorted3d/fenney03texcomp.pdf>

[2] Wikipedia, *Endianess*  
<http://en.wikipedia.org/wiki/Endianness>

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## Appendix C – Blending modes -

Enum value for blending modes

Value	Description	Notes
0	Normal	
1	Multiply	
2	Darken	
3	Difference	
4	Lighten	
5	Screen	
..	N/A	
127	N/A	

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