Netpbm format

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The phrase **Netpbm format** commonly refers to any or all of the members of a set of closely related graphics formats used and defined by the Netpbm project. The **portable pixmap format** (**PPM**), the **portable graymap format** (**PGM**) and the **portable bitmap format** (**PBM**) are image file formats originally designed to be easily exchanged between platforms. They are also sometimes referred to collectively as the **portable anymap format** (**PNM**)[1].

Portable pixmap	
Filename extension	`.ppm, .pgm, .pbm, .pnm`
Internet media type	`image/x-portable-pixmap, -graymap, -bitmap, -anymap` **all unofficial**
Developed by	Jef Poskanzer
Type of format	Image file formats

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History

The PBM format was invented by Jef Poskanzer in the 1980s as a format for monochrome bitmaps that could be transmitted within an email message as plain ASCII text, allowing it to survive any changes in text formatting.

The first library of tools to handle the PBM format was Pbmplus. It was developed by the format's creator and released in 1988. It mainly contained tools to convert between PBM and other graphics formats. By the end of 1988, Jef Poskanzer had developed the PGM and PPM formats along with their associated tools and added them to Pbmplus. The final release of Pbmplus was December 10, 1991.

In 1993, the Netpbm library was developed to replace the unmaintained Pbmplus. It was simply a repackaging of Pbmplus with additions and fixes submitted by people all over the world.[2]

File format description

Each format differs in what colors it is designed to represent:

- PBM is for bitmaps (black and white, no grays)
- PGM is for grayscale
- PPM is for "pixmaps" which represent full RGB color.

Each file starts with a two-byte file descriptor (in ASCII) that explains the type of file it is (PBM, PGM, and PPM) and its encoding (ASCII or binary). The descriptor is a capital P followed by a single digit number.

File Descriptor	Type	Encoding
P1	Portable bitmap	ASCII
P2	Portable graymap	ASCII
P3	Portable pixmap	ASCII
P4	Portable bitmap	Binary
P5	Portable graymap	Binary
P6	Portable pixmap	Binary

The ASCII based formats allow for human-readability and easy transport to other platforms (so long as those platforms understand ASCII), while the binary formats are more efficient both at saving space in the file, as well as being easier to parse due to the lack of whitespace.

When using the binary formats, PBM uses 1 bit per pixel, PGM uses 8 bits per pixel, and PPM uses 24 bits per pixel: 8 for red, 8 for green, 8 for blue.
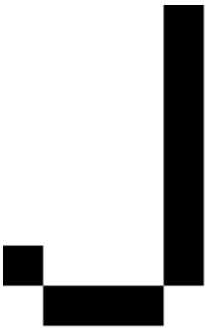
PBM example

A simple example of the PBM format is as follows (There is a newline character at the end of each line.):

```
P1
# This is an example bitmap of the letter "J"
6 10
0 0 0 0 1 0
0 0 0 0 1 0
0 0 0 0 1 0
0 0 0 0 1 0
0 0 0 0 1 0
0 0 0 0 1 0
1 0 0 0 1 0
0 1 1 1 0 0
0 0 0 0 0 0
0 0 0 0 0 0
```

The string *P1* identifies the file format. The hash sign introduces a comment. The next two numbers give the width and the height. Then follows the matrix with the pixel values (in the monochrome case here, only zeros and ones).

Here is the resulting image: J

Here it is again magnified 20 times:

PGM example

The PGM and PPM formats (both ASCII and binary versions) have an additional parameter for the maximum value (numbers of grey between black and white) after the X and Y dimensions and before the actual pixel data. Black is 0 and max value is white. There is a newline character at the end of each line.

```
P2
# Shows the word "FEEP" (example from Netpbm main page on PGM)
24 7
15
0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
0  3  3  3  3  0  0  7  7  7  7  0  0 11 11 11 11  0  0 15 15 15 15  0
0  3  0  0  0  0  0  7  0  0  0  0  0 11  0  0  0  0  0 15  0  0 15  0
0  3  3  3  0  0  0  7  7  7  0  0  0 11 11 11  0  0  0 15 15 15 15  0
0  3  0  0  0  0  0  7  0  0  0  0  0 11  0  0  0  0  0 15  0  0  0  0
0  3  0  0  0  0  0  7  7  7  7  0  0 11 11 11 11  0  0 15  0  0  0  0
0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
```
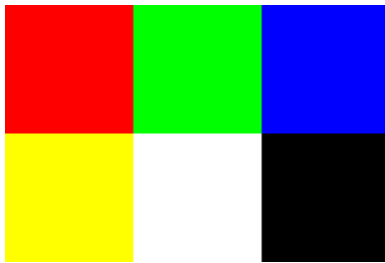
Example (magnified):

PPM example

This is an example of a color RGB image stored in PPM format. There is a newline character at the end of each line.

```
P3
# The P3 means colors are in ASCII, then 3 columns and 2 rows, then 255 for max color, then RGB triplets
3 2
255
255   0   0     0 255   0     0   0 255
255 255   0   255 255 255     0   0   0
```

The image (magnified):

The P6 binary format of the same image will store each color component of each pixel with one byte (thus three bytes per pixel) in the order red, green, then blue. The file will be smaller but the color information will not be readable by humans.

The PPM format is not compressed and thus requires more space and bandwidth than a compressed format would require. For example, the above 192x128 PNG image has a file size of 187 bytes. When converted to a 192x128 PPM image, the file size is 73848 bytes. The PPM format is generally an intermediate format used for image work before converting to a more efficient format, for example the PNG (Portable Network Graphics) format, without any loss of information in the intermediate step.

16-bit extensions

The original definition of the PGM and the PPM binary formats (the P5 and P6 formats) did not allow bit depths greater than 8 bits. One can of course use the ASCII format, but this format both slows down reading and makes the files much larger. Accordingly, many programmers have attempted to extend the format to allow higher bit depths. Using higher bit depths encounters the problem of having to decide on the endianness of the file. Unfortunately it appears that the various implementations could not agree on which byte order to use, and some connected the 16-bit endianness to the pixel packing order.[3]. In Netpbm, the *de facto* standard implementation of the PNM formats, the most significant byte is first.

References

1. ^ PBM, PGM, PNM, and PPM: Summary (http://www.fileformat.info/format/pbm/egff.htm)
2. ^ "Netpbm history" (http://netpbm.sourceforge.net/history.html) . http://netpbm.sourceforge.net /history.html. Retrieved March 17, 2010.
3. ^ "Pnmtotiff User Manual" (http://netpbm.sourceforge.net/doc/pnmtotiff.html) . *netpbm doc at SourceForge*. 27 March 2005. http://netpbm.sourceforge.net/doc/pnmtotiff.html.

- Format details for the various pnm formats:
    - PBM (http://netpbm.sourceforge.net/doc/pbm.html)
    - PGM (http://netpbm.sourceforge.net/doc/pgm.html)
    - PPM (http://netpbm.sourceforge.net/doc/ppm.html)
    - PAM (http://netpbm.sourceforge.net/doc/pam.html)

See also

- Comparison of image viewers
- JBIG/JBIG2
- X BitMap/X PixMap

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