

PNG Parser

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What to do?

- To implement PNG (Portable Network Graphics) parser.
- Implementation in 'C' Language.

What is 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 Graphics Interchange Format (GIF), and is the most used lossless image compression format on the Internet.
 - [Wikipedia](#)

PNG Format

- A PNG file starts with an 8-byte signature
 - 89 50 4E 47 0D 0A 1A 0A
- After the header comes a series of chunks, each of which conveys certain information about the image.
- Types of Chunks
 - Critical
 - Ancillary

Chunk Format

Length	Chunk Type	Chunk Data	CRC
4 bytes	4 bytes	Length bytes	4 bytes

Critical Chunks

- Required to successfully decode a PNG Image
- **IHDR** must be the first chunk; it contains (in this order) the image's width, height, bit depth, color type, compression method, filter method, and interlace method.
- **PLTE** contains the palette; list of colors.
- **IDAT** contains the image, which may be split among multiple IDAT chunks. The IDAT chunk contains the actual image data, which is the output stream of the compression algorithm.
- **IEND** marks the image end.

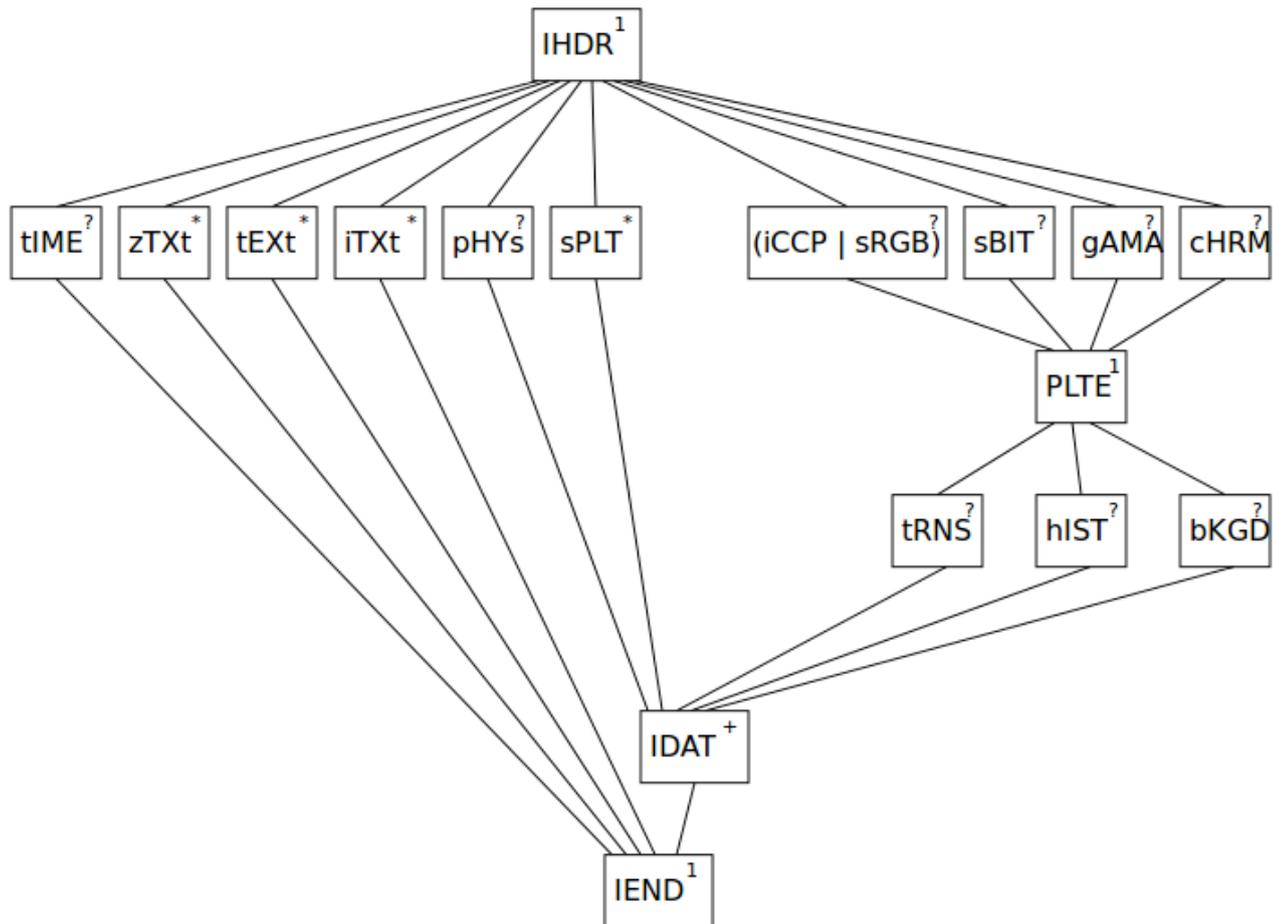
Ancillary Chunks

- Ancillary chunks may be ignored by a decoder.
- **bKGD** gives the default background color. It is intended for use when there is no better choice available, such as in standalone image viewers.
- **cHRM** gives the chromaticity coordinates of the display primaries and white point.
- **gAMA** specifies gamma.
- **hIST** can store the histogram, or total amount of each color in the image.
- **iCCP** is an ICC color profile.
- **iTXt** contains UTF-8 text, compressed or not, with an optional language tag.
- **pHYs** holds the intended pixel size and/or aspect ratio of the image.
- **sBIT** (significant bits) indicates the color-accuracy of the source data.
- **sPLT** suggests a palette to use if the full range of colors is unavailable.
- **sRGB** indicates that the standard sRGB color space is used.
- **tEXt** can store text that can be represented in ISO/IEC 8859-1, with one key-value pair for each chunk.
- **tIME** stores the time that the image was last changed.
- **tRNS** contains transparency information.
- **zTXt** contains compressed text with the same limits as tEXt.

Chunks Order

chunk diagrams

Symbol	Meaning
+	One or more
1	Only one
?	Zero or one
*	Zero or more
	Alternative



Design of Parser

- PNGParser.h –
 - Contains MACROS, Structures of Chunks and PNG
- PNGParserADT.c – Function Definitions
- PNGParser.c - main()
- crc.h - crc.c function declarations
- crc.c – function definitions for CRC
 - crc.c copied from <https://www.w3.org/TR/PNG/#D-CRCAppendix>

Contribution

- Design was finalised together.
- Designing Structures, flow of parser and reading File, verifying and processing buffer implemented by Suresh.
- Processing of Chunk Types, CRC done by Prashanth.

Testing

- Order of Chunks
- CRC
- Chunk Types
- Corrupted Chunks
- Color Types
- Time Stamp
- Testing Images from <http://www.schaik.com/pngsuite/>

Output Screens

Problems Tasks Console Properties Call Graph

<terminated> (exit value: 0) PNG [C/C++ Application] /home/suresh/workspace_cpp/PNG/Debug/PNG (13/10/16, 1:01 AM)

SIZE OF IMAGE IS 40 x 40 PIXELS.

COLOR TYPE : INDEXED COLOR

gAMA:

1.00000

sBIT:

R: 4 G: 4 B: 4

PLTE data:

PALETTE INDEX 0:	R:	0	G:	0	B:	0
PALETTE INDEX 1:	R:	255	G:	0	B:	119
PALETTE INDEX 2:	R:	0	G:	255	B:	255
PALETTE INDEX 3:	R:	0	G:	255	B:	0
PALETTE INDEX 4:	R:	119	G:	0	B:	255
PALETTE INDEX 5:	R:	0	G:	119	B:	255
PALETTE INDEX 6:	R:	119	G:	255	B:	0
PALETTE INDEX 7:	R:	255	G:	0	B:	255
PALETTE INDEX 8:	R:	255	G:	0	B:	0
PALETTE INDEX 9:	R:	0	G:	255	B:	119
PALETTE INDEX 10:	R:	255	G:	255	B:	0
PALETTE INDEX 11:	R:	255	G:	119	B:	0
PALETTE INDEX 12:	R:	0	G:	0	B:	255

RAW DATA IDAT: 78 9c cd d0 b1 0d 80 30 0c 44 d1 43 8a 2c 21 96 a0 61 88 6c ...

PARSING COMPLETED

Output Screens (Contd..)

Problems Tasks Console Properties Call Graph

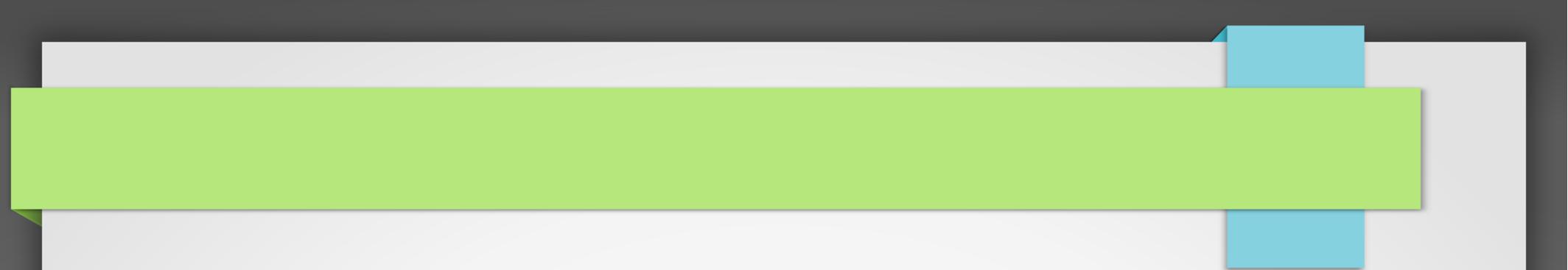
```
<terminated> (exit value: 0) PNG [C/C++ Application] /home/suresh/workspace_cpp/PNG/Debug/PNG (13/10/16, 1:02 AM)
SIZE OF IMAGE IS 512 x 512 PIXELS.
COLOR TYPE : GREY SCALE
RAW DATA IDAT: 78 01 04 e1 4b af 6d d9 92 25 6a b5 66 66 bd 8f 31 d7 da db ...
RAW DATA IDAT: 2f 9f fc f0 ab cf 49 d7 03 7d 0a 43 ae 33 42 d9 19 1d 3c cf ...
RAW DATA IDAT: 0b 00 86 7b 01 6f 56 f7 67 d7 e7 cf 6b 77 f5 d4 f0 72 be f3 ...
RAW DATA IDAT: ef 9c 9e c5 da b9 71 e5 42 20 1c 63 52 cf dc 07 26 84 c2 b1 ...
RAW DATA IDAT: ee 6e 5c 0f 58 8f 1e 52 c8 e8 5c a6 09 9a c9 b8 32 d1 90 bd ...
RAW DATA IDAT: 1a b5 17 24 6c e2 aa 20 8a 45 1c 00 a7 34 01 1a 6a 04 16 23 ...
PARSING COMPLETED
```

Problems Tasks Console Properties Call Graph

```
<terminated> (exit value: 0) PNG [C/C++ Application] /home/suresh/workspace_cpp/PNG/Debug/PNG (13/10/16, 1:06 AM)
SIZE OF IMAGE IS 32 x 32 PIXELS.
COLOR TYPE : TRUE COLOR
gAMA:
    1.00000
RAW DATA sPLT: 73 69 78 2d 63 75 62 65 00 10 00 00 00 00 00 00 ff 00 00 ...
RAW DATA IDAT: 78 9c d5 96 c1 0a 83 30 10 44 a7 e0 41 7f cb 7e b7 fd ad f6 ...
PARSING COMPLETED
```

References

- https://en.wikipedia.org/wiki/Portable_Network_Graphics
- <https://www.w3.org/TR/PNG/>
- <https://www.w3.org/TR/PNG/#D-CRCAppendix>



THANK YOU