Exiv2

C++ metadata library

Image Metadata and Exiv2 Architecture

Robin Mills

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Dedication and Acknowledgment

Exiv2 is dedicated to my wife, who has put up with me for many years.

Exiv2 would not be what it is today without the contributions of many people, too numerous to list here but in alphabetical order:

Acoustica, Andrea Ongarato for advice and testing on Canon CR3 files, Andrew Ward for advice and testing on Canon CR3 files, Axel Lorenz, Edmund Ramos, Edmund Ramos, Edmund Ramos

JPEG and EXV Format

JPEG and EXIF File Format
SOI
marker (hex) marker
APP1
length
signature
data
APP2
length
signature
data
APP13
length
signature
data
DQT
length
data
DHT
length
data
SOF
length
data
SOS
length
data
data
EOI
0 byte
length (hex) (hex)
SOI
0 byte Start of File (SOI)
APP1 Exif
0 byte
length (hex) (hex)
Exif
0 byte
TIFF header
IFD0
IFD0 Entry
IFD0 Entry
IFD0 Entry

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00000000 49 49 2a 00 08 00 00 00 0e 00 fe 00 04 00 01 00 00 00 00 00 fe 81 04 00 01 00 00 00 ce 00 00 00 ff 81 04 00 01 00 00 00 ce 00 00 00 02 82 05 00 01 00 00 00 ea 00 00 00 03 82 03 00 01 00 00 00 02 00 00 00 04 82 05 00 01 00 00 00 f2 00 00 00 05 82 05 00 01 00 00 00 fa 00 00 00 06 82 03 00 01 00 00 00 00 00 00 00 07 82 03 00 01 00 00 00 03 00 00 00 08 82 03 00 01 00 00 00 00 00 00 00 09 82 03 00 01 00 00 00 00 00 00 00 0a 82 05 00 01 00 00 00 02 01 00 00 0b 82 03 00 01 00 00 00 00 00 00 00 0c 82 03 00 01 00 00 00 00 00 00 00 0d 82 03 00 01 00 00 00 00 00 00 00 0e 82 03 00 01 00 00 00 00 00 00 00 0f 82 05 00 01 00 00 00 02 01 00 00 10 82 05 00 01 00 00 00 02 01 00 00 11 82 04 00 01 00 00 00 08 00 00 00 12 82 03 00 01 00 00 00 00 00 00 00 13 82 03 00 01 00 00 00 00 00 00 00 14 82 05 00 01 00 00 00 02 01 00 00 15 82 03 00 01 00 00 00 00 00 00 00 16 82 04 00 01 00 00 00 00 00 00 00 17 82 04 00 01 00 00 00 00 00 00 00 18 82 04 00 01 00 00 00 00 00 00 00 19 82 04 00 01 00 00 00 00 00 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84 04 00 01 00 00 00 00 00 00 00 2a 84 04 00 01 00 00 00 00 00 00 00 2b 84 04 00 01 00 00 00 00 00 00 00 2c 84 04 00 01 00 00 00 00 00 00 00 2d 84 04 00 01 00 00 00 00 00 00 00 2e 84 04 00 01 00 00 00 00 00 00 00 2f 84 04 00 01 00 00 00 00 00 00 00 30 84 04 00 01 00 00 00 00 00 00 00 31 84 04 00 01 00 00 00 00 00 00 00 32 84 04 00 01 00 00 00 00 00 00 00 33 84 04 00 01 00 00 00 00 00 00 00 34 84 04 00 01 00 00 00 00 00 00 00 35 84 04 00 01 00 00 00 00 00 00 00 36 84 04 00 01 00 00 00 00 00 00 00 37 84 04 00 01 00 00 00 00 00 00 00 38 84 04 00 01 00 00 00 00 00 00 00 39 84 04 00 01 00 00 00 00 00 00 00 3a 84 04 00 01 00 00 00 00 00 00 00 3b 84 04 00 01 00 00 00 00 00 00 00 3c 84 04 00 01 00 00 00 00 00 00 00 3d 84 04 00 01 00 00 00 00 00 00 00 3e 84 04 00 01 00 00 00 00 00 00 00 3f 84 04 00 01 00 00 00 00 00 00 00 40 84 04 00 01 00 00 00 00 00 00 00 41 84 04 00 01 00 00 00 00 00 00 00 42 84 04 00 01 00 00 00 00 00 00 00 43 84 04 00 01 00 00 00 00 00 00 00 44 84 04 00 01 00 00 00 00 00 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00 00 00 00 00 61 84 04 00 01 00 00 00 00 00 00 00 62 84 04 00 01 00 00 00 00 00 00 00 63 84 04 00 01 00 00 00 00 00 00 00 64 84 04 00 01 00 00 00 00 00 00 00 65 84 04 00 01 00 00 00 00 00 00 00 66 84 04 00 01 00 00 00 00 00 00 00 67 84 04 00 01 00 00 00 00 00 00 00 68 84 04 00 01 00 00 00 00 00 00 00 69 84 04 00 01 00 00 00 00 00 00 00 6a 84 04 00 01 00 00 00 00 00 00 00 6b 84 04 00 01 00 00 00 00 00 00 00 6c 84 04 00 01 00 00 00 00 00 00 00 6d 84 04 00 01 00 00 00 00 00 00 00 6e 84 04 00 01 00 00 00 00 00 00 00 6f 84 04 00 01 00 00 00 00 00 00 00 70 84 04 00 01 00 00 00 00 00 00 00 71 84 04 00 01 00 00 00 00 00 00 00 72 84 04 00 01 00 00 00 00 00 00 00 73 84 04 00 01 00 00 00 00 00 00 00 74 84 04 00 01 00 00 00 00 00 00 00 75 84 04 00 01 00 00 00 00 00 00 00 76 84 04 00 01 00 00 00 00 00 00 00 77 84 04 00 01 00 00 00 00 00 00 00 78 84 04 00 01 00 00 00 00 00 00 00 79 84 04 00 01 00 00 00 00 00 00 00 7a 84 04 00 01 00 00 00 00 00 00 00 7b 84 04 00 01 00 00 00 00 00 00 00 7c 84 04 00 01 00 00 00 00 00 00 00 7d 84 04 00 01 00 00 00 00 00 00 00 7e 84 04 00 01 00 00 00 00 00 00 00 7f 84 04 00 01 00 00 00 00 00 00 00 80 84 04 00 01 00 00 00 00 00 00 00 81 84 04 00 01 00 00 00 00 00 00 00 82 84 04 00 01 00 00 00 00 00 00 00 83 84 04 00 01 00 00 00 00 00 00 00 84 84 04 00 01 00 00 00 00 00 00 00 85 84 04 00 01 00 00 00 00 00 00 00 86 84 04 00 01 00 00 00 00 00 00 00 87 84 04 00 01 00 00 00 00 00 00 00 88 84 04 00 01 00 00 00 00 00 00 00 89 84 04 00 
```

The PLF is ideal for https://encodings.net

The file format is ideal for the tape storage system as it DOES with the exception of packing FIFO, Further, PLF can STORE have been succeeded in their aims. Which both are technically superior to JPEG, the market has sustained Lossy JPEG. I suspect that is because the tape storage system is not ideal for PLF.

For the lossers in this market, I propose the extension to embedded in a PNG which is lossless.

The code to validate this file is simple:

PSD Photoshop Document

PSD Photoshop Document (big-endian)
Header 26 bytes
Color Mode Data
Image Resources
Layer and Mask Information
Image Data
Image Resources Section
Resource Block
Resource Block
Resource Block

```
[ 0] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 8] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 16] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 24] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 32] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 40] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 48] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 56] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 64] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 72] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 80] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 88] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 96] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 104] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 112] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 120] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 128] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 136] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 144] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 152] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 160] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 168] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 176] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 184] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 192] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 200] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 208] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 216] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 224] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 232] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 240] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 248] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
```

We can see the decode info in the ccbs as follows:

```
[ 0] 0x7c00 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 8] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 16] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 24] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 32] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 40] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 48] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 56] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 64] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 72] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 80] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 88] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 96] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 104] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 112] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 120] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 128] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 136] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 144] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 152] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 160] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 168] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 176] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 184] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 192] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 200] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 208] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 216] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 224] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 232] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 240] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 248] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
```

Find the decrypted code by underlined in DEFA, which can be generated with the command line **decrypt.exe**

```
[ 0] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 8] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 16] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 24] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 32] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 40] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 48] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 56] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 64] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 72] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 80] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 88] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 96] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 104] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 112] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 120] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 128] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 136] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 144] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 152] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 160] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 168] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 176] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 184] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 192] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 200] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 208] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 216] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 224] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 232] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 240] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 248] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
```

Create XOR instructions with the syntax

```
[ 0] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 8] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 16] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 24] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 32] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 40] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 48] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 56] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 64] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 72] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 80] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 88] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 96] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 104] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 112] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 120] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 128] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 136] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 144] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 152] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 160] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 168] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 176] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 184] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 192] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 200] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 208] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 216] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 224] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 232] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 240] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
[ 248] 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000 0x0000
```

Find the XOR code by underlined in DEFA, which can be generated with the command line **xorsearch

1. The standard tools nothing about the various. However, they know where they are: instead of the raster bias as JPG, the skeleton can [illegible] more than the raster.
2. Tiff is a container, and the Exif data JPG gets about a modern.

```
$ ./exiftool -ver -v3 -t -n -j -G -b -u -a -s -s -s -ee -ee -ee
```

```
0x00 0x01 0x02 0x03 0x04 0x05 0x06 0x07 0x08 0x09 0x0A 0x0B 0x0C 0x0D 0x0E 0x0F
0x10 0x11 0x12 0x13 0x14 0x15 0x16 0x17 0x18 0x19 0x1A 0x1B 0x1C 0x1D 0x1E 0x1F
0x20 0x21 0x22 0x23 0x24 0x25 0x26 0x27 0x28 0x29 0x2A 0x2B 0x2C 0x2D 0x2E 0x2F
0x30 0x31 0x32 0x33 0x34 0x35 0x36 0x37 0x38 0x39 0x3A 0x3B 0x3C 0x3D 0x3E 0x3F
0x40 0x41 0x42 0x43 0x44 0x45 0x46 0x47 0x48 0x49 0x4A 0x4B 0x4C 0x4D 0x4E 0x4F
0x50 0x51 0x52 0x53 0x54 0x55 0x56 0x57 0x58 0x59 0x5A 0x5B 0x5C 0x5D 0x5E 0x5F
0x60 0x61 0x62 0x63 0x64 0x65 0x66 0x67 0x68 0x69 0x6A 0x6B 0x6C 0x6D 0x6E 0x6F
0x70 0x71 0x72 0x73 0x74 0x75 0x76 0x77 0x78 0x79 0x7A 0x7B 0x7C 0x7D 0x7E 0x7F
0x80 0x81 0x82 0x83 0x84 0x85 0x86 0x87 0x88 0x89 0x8A 0x8B 0x8C 0x8D 0x8E 0x8F
0x90 0x91 0x92 0x93 0x94 0x95 0x96 0x97 0x98 0x99 0x9A 0x9B 0x9C 0x9D 0x9E 0x9F
0xA0 0xA1 0xA2 0xA3 0xA4 0xA5 0xA6 0xA7 0xA8 0xA9 0xAA 0xAB 0xAC 0xAD 0xAE 0xAF
0xB0 0xB1 0xB2 0xB3 0xB4 0xB5 0xB6 0xB7 0xB8 0xB9 0xBA 0xBB 0xBC 0xBD 0xBE 0xBF
0xC0 0xC1 0xC2 0xC3 0xC4 0xC5 0xC6 0xC7 0xC8 0xC9 0xCA 0xCB 0xCC 0xCD 0xCE 0xCF
0xD0 0xD1 0xD2 0xD3 0xD4 0xD5 0xD6 0xD7 0xD8 0xD9 0xDA 0xDB 0xDC 0xDD 0xDE 0xDF
0xE0 0xE1 0xE2 0xE3 0xE4 0xE5 0xE6 0xE7 0xE8 0xE9 0xEA 0xEB 0xEC 0xED 0xEE 0xEF
0xF0 0xF1 0xF2 0xF3 0xF4 0xF5 0xF6 0xF7 0xF8 0xF9 0xFA 0xFB 0xFC 0xFD 0xFE 0xFF
```

CBF, PSL, OSL, OS2 are currently also in use, but are not mentioned here. Therefore, the Linux kernel uses the file format and interpretation of the executable and linkable format (ELF) as the binary format for executables, object code, shared libraries, and core dumps. Its extensible and portable design, for cross-platform use, is the reason why it is adopted. Nevertheless, it is not perfectly suitable for embedded systems. Even if a Linux or Hypervisor system is used only, data structures with or capability to remain, replace or delete individual functionality.

Although the ELF specification is platform independent, it is not ideal for 8-bit and 16-bit processors, because the 32-bit offsets and addresses, that have been from a 32-bit machine, need to be the coding or to code. Even if 64-bit processors are supported, it is inefficient.

There are three variations to have power and performance, and flexibility required to incorporate in the Linux's command line programs. A file can provide, for example, a 32-bit version and a 64-bit version. The operation of the program, or library, will choose across functions, the appropriate binary, and load and execute it. This increases the size of the executable, but not the memory footprint.

There are significant challenges in linking the processor in mainstream use or custom architectures. In particular, they often rely on proprietary, or closed, toolchains, or, in case other devices lacks the development, or, if adequate documentation is even in the the software the manufacturer provides, it is difficult to write a compiler backend. Even if the processor is supported by the GNU Compiler Collection (GCC), it is even a large business and CPU in the most popular business image. Significantly, GNU is a free and standard which has connected ideas and contributions from many companies, universities, and individuals. Although GCC is a cross-platform compiler, it does not support all processors that exist. The reason for this is

GNU is improving, yet, unsurprisingly, not all industry which talks about innovations and development are smart being deterministic. Small companies, or even large companies, that are not in the business of compilers, may not have the resources to fund the development of a compiler, or, even, upgrading, or adding, a compiler, quite well. Moreover, the development of a compiler, or, even, a cross-platform compiler, is a complex task. The tools for Linux, Unix and other operating systems are the binutils. The tools are: linker, assembler, and other utilities to create, modify, and manipulate object files. The tools are used by the compiler, and, in the case of the GNU Compiler Collection (GCC), the backend. The tools are used with several different designs to enable GCC, and, with the exception of a PDP, And the same with Linux. Recognition, that the tools will bring an many different design failures.

ELF.

6 ELF in Exe2

GCC is a free and standard, and, the Linux, and other, operating systems.

Format	Description
Binutils	Utilities (linker, assembler, or, ar(1), ranlib, and, nm) and others
Binutils	ELF	Operations on ELF or executable binary
Binutils	Gas(Gas)	Operations on a compiler backend
Binutils	Objcopy	provides support for cut, pasting
Binutils	Objdump	Displays information about object files
Gcc	Gcc	Backend to GCC
Gcc(Gcc)	Objc, Objcpp	Compiler(Gcc) backend, C++ support
Ldefs	ldd(ldd)	Requires Binutils
Ldefs(ldd)	Elfdump	Read from ELF
Binutils(ldd)	Elfedit	Elfedit(ldd) and Elfdump

Yes, will help, compatible, or, even, or, the, Linux, and, Unix, and, other, operating, systems. Yes, it, has, a, free, and, standard, which, has, connected, ideas, and, contributions, from, many, companies, universities, and, individuals. Yes, it, is

mentioned in our Google Python style guide.

Here is the big picture: TiffFile reads TIFF files and returns a TiffImageFile object. In the common case there is no reason to call TiffImageFile() directly, instead use the convenience function TiffImageFileOpen(path) to open the file and get a TiffImageFile back.

This decoding function should return NotSupportedError or TiffDecoderError exceptions for non-supported TIFFs. Normally, tags are processed by the TiffTag.fromfile() and the registered tag-value decoders (TiffTagDecoder). Special cases like Exif/GPS/MakerNote may use extra helpers, but the goal is to keep the core decoding centralized in TiffFile.

We should support decoding JPEG-in-TIFF (compression tag 7) and LZW (compression tag 5). We can start by adding a simple dispatcher that maps the compression tag to a decoder function, and for now only implement JPEG. Tag 6 (OJPEG) is deprecated, but we can add it later if needed. Unsupported compressions should raise a NotSupportedError with a clear message like "Compression 5 (LZW) not supported yet" so we know what to implement next.

Binary Tag Decoder

Please read: plan

Here's a living discussion on plan about the tags and the tiffinfo.py utility that lists the tags in human-readable form.

History

Our tag-to-human-readable data is fragile!

Pillow records their version of tag data in TiffTags.py. There is also a Perl version of Exiftool which decodes as Exif/GPS/MakerNote. This new version of Exiftool is the most complete and decodes to JSON/XML/CSV.

The two versions (Pillow/PIL and Perl/Exiftool) are now encoded as a set with the scripts in tiffdump, plus ugg.

```
$ ./tiffdump --pil --exif --gps --ugg --diff
Loaded 1 PIL tags
Loaded 1 Exif tags
Loaded 1 GPS tags
Loaded 1 Ugg tags
Loaded 1 Exif sub-IFD tags
Loaded 1 GPS sub-IFD tags
Loaded 1 Ugg sub-IFD tags
Loaded 1 PIL sub-IFD tags
Loaded 1 PIL sub-sub-IFD tags
Loaded 1 Exif sub-sub-IFD tags
Loaded 1 GPS sub-sub-IFD tags
Loaded 1 Ugg sub-sub-IFD tags
Loaded 1 PIL sub-sub-sub-IFD tags
Loaded 1 Exif sub-sub-sub-IFD tags
Loaded 1 GPS sub-sub-sub-IFD tags
Loaded 1 Ugg sub-sub-sub-IFD tags
Loaded 1 PIL sub-sub-sub-sub-IFD tags
Loaded 1 Exif sub-sub-sub-sub-IFD tags
Loaded 1 GPS sub-sub-sub-sub-IFD tags
Loaded 1 Ugg sub-sub-sub-sub-IFD tags
Loaded 1 PIL sub-sub-sub-sub-sub-IFD tags
Loaded 1 Exif sub-sub-sub-sub-sub-IFD tags
Loaded 1 GPS sub-sub-sub-sub-sub-IFD tags
Loaded 1 Ugg sub-sub-sub-sub-sub-IFD tags
Loaded 1 PIL sub-sub-sub-sub-sub-sub-IFD tags
Loaded 1 Exif sub-sub-sub-sub-sub-sub-IFD tags
Loaded 1 GPS sub-sub-sub-sub-sub-sub-IFD tags
Loaded 1 Ugg sub-sub-sub-sub-sub-sub-IFD tags
Loaded 1 PIL sub-sub-sub-sub-sub-sub-sub-IFD tags
Loaded 1 Exif sub-sub-sub-sub-sub-sub-sub-IFD tags
Loaded 1 GPS sub-sub-sub-sub-sub-sub-sub-IFD tags
Loaded 1 Ugg sub-sub-sub-sub-sub-sub-sub-IFD tags
Loaded 1 PIL sub-sub-sub-sub-sub-sub-sub-sub-IFD tags
Loaded 1 Exif sub-sub-sub-sub-sub-sub-sub-sub-IFD tags
Loaded 1 GPS sub-sub-sub-sub-sub-sub-sub-sub-IFD tags
Loaded 1 Ugg sub-sub-sub-sub-sub-sub-sub-sub-IFD tags
Loaded 1 PIL sub-sub-sub-sub-sub-sub-sub-sub-sub-IFD tags
Loaded 1 Exif sub-sub-sub-sub-sub-sub-sub-sub-sub-IFD tags
Loaded 1 GPS sub-sub-sub-sub-sub-sub-sub-sub-sub-IFD tags
Loaded 1 Ugg sub-sub-sub-sub-sub-sub-sub-sub-sub-IFD tags
```

The new version of the data are encoded in tiffdump.pm.cpp.

```
$ ./tiffdump --pil --exif --gps --ugg --diff
```

Binary Selector

The code to determine which tag's version is decoded is in tiffdump.pm.cpp.

```
$ ./tiffdump --pil --exif --gps --ugg --diff --dumpbinary --binaryfilter=1
```

When the reference-versions (--diff) is, we add a --binaryfilter=1 to narrow the tests to the binary, so by default it returns the reference-version. --binaryfilter=1 is the tag, 1 in this case. --binaryfilter=0x0103 is tag 0x0103.

```
$ ./tiffdump --pil --exif --gps --ugg --diff --dumpbinary --binaryfilter=0x0103
```

True decoder

```
$ ./tiffdump --pil --exif --gps --ugg --diff --dumpbinary --binaryfilter=0x0103 --truedecoder
```

The true decoder is the code in the tiffdump.pm.cpp file that "pretty-prints" text-like TiffTag values such as Exif/GPS/MakerNote binary blobs decoded in the TiffFile code.

TODO

7.8 TiffWriter

Each Tag can always TiffWrite() data, and the following currently violates:

Class	Derived from	Purpose	Comment
class TiffBinary	TiffWriter	Read/write/dump binary structures	Image::ExifTool::Exif::Main
class TiffFormat	TiffWriter	Special for IFD	Find the "Main" tag, but IFD is a SUBIF
class TiffTagDecoder	TiffWriter	Decode tag values	
class TiffIFD	TiffWriter	Read/write/dump IFDs	
class TiffTag(object)	TiffWriter	Hold the raw/typed/decoded value	

TiffWriter.fromfile("foo.jpg").write("out.jpg") is a valid round-trip, and it should preserve all tags. However, TiffWriter.fromfile("foo.jpg").write("out.tif") is not. Most, if not all, of the pieces of existing Perl/Exiftool Tag tables assume an (implicit) understanding of the image.

TiffWriter is a generic tag-and-structure rebuilder, not a format-specific converter. It will read and preserve tags from the file, but it doesn't know how to convert between formats or add/remove/modify tags based on the target format. Tags like ExifIFDPointer, GPSIFDPointer, InteropIFDPointer, SubIFDs, StripOffsets, TileOffsets, JpegIFOffset, JpegIFByteCount, ExifImageWidth, ExifImageHeight, etc. are all tags that TiffWriter should write, but their values are often stale or wrong when you copy them to a new file. Recalculating offsets and sizes is the job of a higher-level writer that understands the target format.

The code to extract tags can be shared, but each format needs its own tag tables and rules. Exif tags in a JPEG APP1 segment are mostly the same as Exif tags in a TIFF, but not always. The Perl/Exiftool tag tables encode this knowledge. We don't need to duplicate that in Python yet—we're still learning what works. Start with read-only or simple round-trip cases, and add complexity only when we hit a real-world file that breaks something.

7.9 Exif Classes

Exif has an ASCII TiffFormat, and the following custom values:

Class	Derived from	Purpose	Comment
class UNDefined	TiffFormat	Read/write/dump binary structures	Image::ExifTool::Exif::Main
class SubIFDPointer	TiffFormat	Special for IFD	Find the "Main" tag, but IFD is a SUBIF
class GPSLatitude	TiffFormat	Special for GPS	
class GPSLatitudeRef	TiffFormat	Special for GPS	
class GPS_UTF8	TiffFormat	Hold the raw/typed/decoded value	

Tag and Subtag Tag

Tag is a TiffTag(), Subtag is a TiffTag(), if a subtag exists it is stored in the value of the binary, so by the time it is decoded, it is a binary. Subtag is a TiffTag(), SubSubTag is a TiffTag(), etc.

```
$ ./tiffdump --pil --exif --gps --ugg --diff --dumpbinary --binaryfilter=0x0103 --truedecoder
```

Tiff Classes

Tiff Classes and Tiff Objects

Tiff classes are the classes that are used to read and write TIFF files. Tiff objects are the instances of those classes. Tiff classes are not TiffTags, they are the classes that read and write the binary data of the TiffTags. The TiffWriter knows a set of Tiff classes, and when it encounters a tag, it looks up the tag's name in its Tiff classes to find the right class to read the binary data.

The "main" from the end of parsing TiffWriterMain() is the TiffIFD object, including TiffIFD() in the Subclass TiffIFD. In the common case, there is only one TiffIFD.

```
$ ./tiffdump --pil --exif --gps --ugg --diff --dumpbinary --binaryfilter=0x0103 --truedecoder --tiffdump
$ ./tiffdump --pil --exif --gps --ugg --diff --dumpbinary --binaryfilter=0x0103 --truedecoder --tiffdump --tiffdumpmain
```

Tiff classes are subclasses of TiffWriter(). Tiff objects are instances of those classes.

```
$ ./tiffdump --pil --exif --gps --ugg --diff --dumpbinary --binaryfilter=0x0103 --truedecoder --tiffdump --tiffdumpmain --tiffdumpclasses
```

Tiff Classes Tiff Objects

Here is the main statistics table:

```
$ ./tiffdump --pil --exif --gps --ugg --diff --dumpbinary --binaryfilter=0x0103 --truedecoder --tiffdump --tiffdumpmain --tiffdumpclasses --tiffdumpstats
Tiff Classes Tiff Objects
Class                    Count
-----                    -----
TiffIFD                      1
TiffTagDecoder               1
TiffTag                     14
TiffWriter                   1
TiffWriterMain               1
TiffWriterPil                1
TiffWriterExif               1
TiffWriterGps                1
TiffWriterUgg                1
TiffWriterPilIFD             1
TiffWriterExifIFD            1
TiffWriterGpsIFD             1
TiffWriterUggIFD             1
TiffWriterPilSubIFD          1
TiffWriterExifSubIFD         1
TiffWriterGpsSubIFD          1
TiffWriterUggSubIFD          1
TiffWriterPilSubSubIFD       1
TiffWriterExifSubSubIFD      1
TiffWriterGpsSubSubIFD       1
TiffWriterUggSubSubIFD       1
TiffWriterPilSubSubSubIFD    1
TiffWriterExifSubSubSubIFD   1
TiffWriterGpsSubSubSubIFD    1
TiffWriterUggSubSubSubIFD    1
TiffWriterPilSubSubSubSubIFD 1
TiffWriterExifSubSubSubSubIFD 1
TiffWriterGpsSubSubSubSubIFD 1
TiffWriterUggSubSubSubSubIFD 1
TiffWriterPilSubSubSubSubSubIFD 1
TiffWriterExifSubSubSubSubSubIFD 1
TiffWriterGpsSubSubSubSubSubIFD 1
TiffWriterUggSubSubSubSubSubIFD 1
```

Tiff Classes Tiff Objects Tiff Tags

```
$ ./tiffdump --pil --exif --gps --ugg --diff --dumpbinary --binaryfilter=0x0103 --truedecoder --tiffdump --tiffdumpmain --tiffdumpclasses --tiffdumpstats --tiffdumptifftags
Tiff Classes Tiff Objects Tiff Tags
Tag                      Count
---                      -----
ExifIFDPointer               1
GPSIFDPointer                1
ImageWidth                   1
ImageLength                  1
BitsPerSample                1
Compression                  1
PhotometricInterpretation    1
StripOffsets                 1
SamplesPerPixel              1
RowsPerStrip                 1
StripByteCounts              1
XResolution                  1
YResolution                  1
ResolutionUnit               1
```

The Tiff Factory

This is implemented using truetypewriter in Binary Parsers.

The purpose of the Image Factory is to create and therefore adjust and keep handles and state data for an Image. Every image handle is created by the Image Factory, and the Image Factory keeps a list of all the Image handles and state data. The Image Factory is a singleton class. There is only ever one Image Factory. Image Factory objects are created by the Image Factory. Image Factory objects are created by the Image Factory. Image Factory objects are created by the Image Factory.

Currently, accessing Tiff properties which could be defined in multiple places in the metadata, or successive APIs given the Tiff object, are described in Tiff Properties API.

```
$ ./tiffdump --pil --exif --gps --ugg --diff --dumpbinary --binaryfilter=0x0103 --truedecoder --tiffdump --tiffdumpmain --tiffdumpclasses --tiffdumpstats --tiffdumptifftags --tiffdumpfactory
```

The Image Object and Image Factory

Image Factory is a singleton class. Image Factory. For example: Image(image, TiffImage, TiffImage). These are derived from the Image Factory and are known to the metadata pages. The user-extensible and functions of the Image Factory are confidentiated and confidentiated. There are various functions such as get(filehdl) and getset(filehdl) which provide some access to the Image Factory. Image Factory objects are created by the Image Factory.

```
$ ./tiffdump --pil --exif --gps --ugg --diff --dumpbinary --binaryfilter=0x0103 --truedecoder --tiffdump --tiffdumpmain --tiffdumpclasses --tiffdumpstats --tiffdumptifftags --tiffdumpfactory --tiffdumpimage
```

8 Test Suite

Exif Test ArtisanLibrary

```
$ ./tiffdump --pil --exif --gps --ugg --diff --dumpbinary --binaryfilter=0x0103 --truedecoder --tiffdump --tiffdumpmain --tiffdumpclasses --tiffdumpstats --tiffdumptifftags --tiffdumpfactory --tiffdumpimage --tiffdumpartisanlibrary
```

Exif Test ArtisanLibrary is a test suite that contains a set of test data and a test suite. The test suite is a set of test data and a test suite. The test suite is a set of test data and a test suite. The test suite is

The upgrade for Cryptlib3.dll (Cryptlibrary v.3.4.0) Compact for Windows(Intel) is limited to Office 2,Office 2,Exchange Not mentioned. Upgrade to a newer version manually from the download section and possibly the Office 2 pack.

8.8 Downloading Test Images

Once we understand how to read image of available on the EvilPixel Website we can download the test images using the following command:

```
$ curl -O http://www.evilpixel.com/test-images/*.jpg
```

EvilPixel Theta Information Repository

The following archives contain various JPEG images with the original meta information from 100 different makes(& models) of digital cameras. The images are all 640x480 pixels in size and are suitable for testing purposes. Each archive contains a "manifest.txt" file which lists the original filenames and the camera model that was used to take the image. The archives are also signed with the EvilPixel GPG key(0x1A2B3C4D) and the signature is stored in the file "manifest.sig".

Note: Although all of the test images listed in this section are offered for download in JPEG format, it is mandatory that some processing software can handle other formats such as TIFF, PNG, GIF and JPEG2000. Although Cryptlib does not support any of these formats it is important that it can at least recognize them and return a meaningful error code when it encounters them.

Make	Model	File Size	Download Archive	Last Updated
Canon	EOS 10D	2.5 Mb	10D.tar.gz	2004-04-12
Canon	EOS 300D	2.5 Mb	300D.tar.gz	2004-04-12
Canon	EOS 350D	2.5 Mb	350D.tar.gz	2004-04-12
Canon	EOS 20D	2.5 Mb	20D.tar.gz	2004-04-12
Canon	EOS 1D	2.5 Mb	1D.tar.gz	2004-04-12
Canon	EOS 1Ds	2.5 Mb	1Ds.tar.gz	2004-04-12
Canon	EOS 5D	2.5 Mb	5D.tar.gz	2004-04-12
Canon	EOS 1D Mk II	2.5 Mb	1DMkII.tar.gz	2004-04-12
Canon	EOS 1Ds Mk II	2.5 Mb	1DsMkII.tar.gz	2004-04-12

Let the file the script is download can unzip these

```
$ tar -xvzf 10D.tar.gz
$ tar -xvzf 300D.tar.gz
$ tar -xvzf 350D.tar.gz
$ tar -xvzf 20D.tar.gz
$ tar -xvzf 1D.tar.gz
$ tar -xvzf 1Ds.tar.gz
$ tar -xvzf 5D.tar.gz
$ tar -xvzf 1DMkII.tar.gz
$ tar -xvzf 1DsMkII.tar.gz
```

The last step is to run of the file through exif to verify it is in fact JPEG

```
$ for i *.jpg; exif -m $i | head -1 | cut -d\ -f4-; done
```

This will produce a list of the camera models that were used to create the images. Note that the order of the models appears in the same order as the table above. You can use the field which lists the manufacturer to extract the file using the standard wildcard, as per of the tool, as an alias:

```
$ ln -s 10D.tar.gz Canon-EOS\ 10D.tar.gz
$ ln -s 300D.tar.gz Canon-EOS\ 300D.tar.gz
$ ln -s 350D.tar.gz Canon-EOS\ 350D.tar.gz
$ ln -s 20D.tar.gz Canon-EOS\ 20D.tar.gz
$ ln -s 1D.tar.gz Canon-EOS\ 1D.tar.gz
$ ln -s 1Ds.tar.gz Canon-EOS\ 1Ds.tar.gz
$ ln -s 5D.tar.gz Canon-EOS\ 5D.tar.gz
$ ln -s 1DMkII.tar.gz Canon-EOS\ 1D\ Mk\ II.tar.gz
$ ln -s 1DsMkII.tar.gz Canon-EOS\ 1Ds\ Mk\ II.tar.gz
```

Note: Although the Canon EOS 1D Mk II and the Canon EOS 1Ds Mk II are both listed as Canon models, the manufacturer field for both of these models is simply "Canon" and not "Canon EOS". Thus the wildcard pattern Canon-EOS\ *.tar.gz will not pick up the 1D Mk II and the 1Ds Mk II.

Note: because of the large size of the test images and of course because of the nature of the variability of signature that can be present in the exif data. You can use the field which lists the manufacturer to extract the file using the standard wildcard, as per of the tool, as an alias:

```
$ ln -s 10D.tar.gz Canon-EOS\ 10D.tar.gz
$ ln -s 300D.tar.gz Canon-EOS\ 300D.tar.gz
$ ln -s 350D.tar.gz Canon-EOS\ 350D.tar.gz
$ ln -s 20D.tar.gz Canon-EOS\ 20D.tar.gz
$ ln -s 1D.tar.gz Canon-EOS\ 1D.tar.gz
$ ln -s 1Ds.tar.gz Canon-EOS\ 1Ds.tar.gz
$ ln -s 5D.tar.gz Canon-EOS\ 5D.tar.gz
$ ln -s 1DMkII.tar.gz Canon-EOS\ 1D\ Mk\ II.tar.gz
$ ln -s 1DsMkII.tar.gz Canon-EOS\ 1Ds\ Mk\ II.tar.gz
```

Pulse Data Image Archive

There is an accompanying collection of test images at http://www.pulse.com. You can download the archive (currently 60 Gbytes) 2005 Pulse Image Archive.

Unzip it in the directory of your choice, and then type any other data file from the Pulse Image Archive. Run the exif tool:

```
$ for i *.jpg; exif -m $i | head -1 | cut -d\ -f4-; done
```

This will produce a list of the camera models that were used to create the images.

A little more secure with:

```
$ for i *.jpg; exif -m $i | head -1 | cut -d\ -f4- | sort -u
```

Unzip the archive in the directory of your choice. Run the exif tool:

```
$ for i *.jpg; exif -m $i | head -1 | cut -d\ -f4- | sort -u | wc -l
```

Run the exif tool:

```
$ for i *.jpg; exif -m $i | head -1 | cut -d\ -f4- | sort -u | wc -l | tee -a /var/log/exif.log
```

Run the exif tool:

```
$ for i *.jpg; exif -m $i | head -1 | cut -d\ -f4- | sort -u | wc -l | tee -a /var/log/exif.log | mail -s "exif log" root@localhost
```

Run the exif tool:

```
$ for i *.jpg; exif -m $i | head -1 | cut -d\ -f4- | sort -u | wc -l | tee -a /var/log/exif.log | mail -s "exif log" root@localhost | tee -a /var/log/exif.log
```

Run the exif tool:

```
$ for i *.jpg; exif -m $i | head -1 | cut -d\ -f4- | sort -u | wc -l | tee -a /var/log/exif.log | mail -s "exif log" root@localhost | tee -a /var/log/exif.log | mail -s "exif log" root@localhost
```

Run the exif tool:

```
$ for i *.jpg; exif -m $i | head -1 | cut -d\ -f4- | sort -u | wc -l | tee -a /var/log/exif.log | mail -s "exif log" root@localhost | tee -a /var/log/exif.log | mail -s "exif log" root@localhost | tee -a /var/log/exif.log
```

Run the exif tool:

```
$ for i *.jpg; exif -m $i | head -1 | cut -d\ -f4- | sort -u | wc -l | tee -a /var/log/exif.log | mail -s "exif log" root@localhost | tee -a /var/log/exif.log | mail -s "exif log" root@localhost | tee -a /var/log/exif.log | mail -s "exif log" root@localhost
```

Run the exif tool:

```
$ for i *.jpg; exif -m $i | head -1 | cut -d\ -f4- | sort -u | wc -l | tee -a /var/log/exif.log | mail -s "exif log" root@localhost | tee -a /var/log/exif.log | mail -s "exif log" root@localhost | tee -a /var/log/exif.log | mail -s "exif log" root@localhost | tee -a /var/log/exif.log
```

Run the exif tool:

```
$ for i *.jpg; exif -m $i | head -1 | cut -d\ -f4- | sort -u | wc -l | tee -a /var/log/exif.log | mail -s "exif log" root@localhost | tee -a /var/log/exif.log | mail -s "exif log" root@localhost | tee -a /var/log/exif.log | mail -s "exif log" root@localhost | tee -a /var/log/exif.log | mail -s "exif log" root@localhost
```

11.3 Testing

This is discussed in detail here: Testing.

11.4 Samples

Each Lisp implementation ships some Emacs Lisp libraries, see lisp/emacs-lisp/README in the Emacs 24.3 GNU sources for a complete list. Some of the most important ones are: Emacs Lisp packages are also available from the Marmalade and the ELPA repositories.

The following programs are built and installed in /usr/local/bin:

emacs	Emacs 24.3 (X11 Motif, Xft, GIF, PNG, TIFF, GnuTLS, ALSA, dbus, gconf, libotf, m17n-flt, libxml2, zlib)
emacsclient	Sends Emacs Lisp commands to a running Emacs
ctags	Emacs Etags version, in addition to standard Unix ctags
ebrowse	Emacs C++ browser
etags	Emacs Etags version, in addition to standard Unix etags
rcs2log	Prints the entries in a change log for a set of RCS files
b2m	Converting Unix mailbox files to Emacs Babyl format (RMAIL, VM, MH, and GNU mailbox). This is the primary tool used by Debian Emacs maintainers to convert mail folders to Emacs Babyl format. Also contains a Perl library for Emacs Lisp programs to read Emacs Babyl files directly.
rmail-mda-delivery	Delivery agent for Emacs RMAIL or VM. This program also contains a patch to Emacs' sendmail.el to support Emacs Lisp mailbox delivery.
gzip	Based on GNU gzip and compatible with GNU gzip
uncompress	Decompresses .z(pack, or compress) files. Uses gzip.
zcat	Decompresses .z(pack, or compress) files to stdout. Uses gzip -d -c.
zless	Uses the pager specified by the PAGER environment variable to page through .z(pack, or compress) files.
zforce	Forces a .z(pack, or compress) extension on all files in the specified directory.
zgrep	Runs GNU grep on .z(pack, or compress) files
zcmp, zdiff	Runs cmp, or diff on .z(pack, or compress) files
zmore	Uses the pager specified by the PAGER environment variable to page through .z(pack, or compress) files.
zsoelim	Interpreter for .so files.

11.5 Libraries

Emacs Lisp ships with a large number of libraries. Some of the most important ones are: Emacs Lisp packages are also available from the Marmalade and the ELPA repositories.

11.6 Bugs

Emacs Lisp is a very fast-moving target. Debian tracking with sarge is the most important aspect of the project. Unfortunately, the two most important Emacs Lisp packages, Gnus and Mailcrypt, are not in Debian sarge. Gnus is a very complex piece of software, and Mailcrypt is a very complex wrapper around a GNU piece of Emacs and a Perl piece of Emacs.

The reason we gave these packages to the maintenance of upstream the project. Debian wants the project to depend. Without upgrades, users will be forced to use the Debian version of Emacs Lisp packages, which will be outdated. Debian Emacs Lisp maintainers will be forced to maintain a number of non-upstream patches and patches. Bugs. Debian Emacs Lisp maintainers will be forced to maintain a number of non-upstream patches.

Emacs bugs are documented in the appropriate directory source in /usr/doc/emacs-bugs-gnu/. Emacs bugs are documented in the appropriate directory source in /usr/doc/emacs-bugs-gnu/. Emacs bugs are documented in the appropriate directory source in /usr/doc/emacs-bugs-gnu/.

A number of very notable bugs. Emacs is considered the Emacs bug tracker. Emacs is considered the Emacs bug tracker. Emacs is considered the Emacs bug tracker

A Gantt chart is a type of planning tool that can be used for the Software Industry. Together with the popular Kanban, Agile, or Scrum methodologies, it helps with the planning and control of the complex tasks. Several of these tools are available on the internet.

Free Online Gantt Chart Tools	Online Gantt Charts
Free Desktop Gantt Chart Tools	Desktop Gantt Charts
Free Gantt Chart Add-Ons	Gantt Chart Add-Ons
Free Gantt Chart Templates	Gantt Chart Templates

Microsoft Project is the most popular Gantt chart tool. Microsoft Project is a commercial product. It is a desktop application that runs on Windows. Microsoft Project is part of the Microsoft Office family of products. Microsoft Project is a very powerful tool. It has many features and options. Microsoft Project is a very complex tool. It has a steep learning curve. It takes a long time to become proficient in using Microsoft Project.

Microsoft Project is a very expensive tool. The cost of a single commercial license is in the range of several hundred dollars. Microsoft Project is not a good tool for small teams. Microsoft Project is not a good tool for teams that are on a budget. Microsoft Project is not a good tool for teams that are looking for a free tool.

Microsoft Project is not a good tool for teams that are looking for a web-based tool. Microsoft Project is not a good tool for teams that are looking for a cross-platform tool. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to use. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to learn.

Microsoft Project is not a good tool for teams that are looking for a tool that is easy to share. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to collaborate. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to customize. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to integrate.

Microsoft Project is not a good tool for teams that are looking for a tool that is easy to automate. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to manage. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to maintain. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to support.

Microsoft Project is not a good tool for teams that are looking for a tool that is easy to deploy. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to install. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to upgrade. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to update.

Microsoft Project is not a good tool for teams that are looking for a tool that is easy to secure. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to audit. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to monitor. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to report.

Microsoft Project is not a good tool for teams that are looking for a tool that is easy to analyze. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to visualize. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to present. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to share.

Microsoft Project is not a good tool for teams that are looking for a tool that is easy to collaborate. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to customize. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to integrate. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to automate.

Microsoft Project is not a good tool for teams that are looking for a tool that is easy to manage. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to maintain. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to support. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to deploy.

Microsoft Project is not a good tool for teams that are looking for a tool that is easy to install. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to upgrade. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to update. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to secure.

Microsoft Project is not a good tool for teams that are looking for a tool that is easy to audit. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to monitor. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to report. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to analyze.

Microsoft Project is not a good tool for teams that are looking for a tool that is easy to visualize. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to present. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to share. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to collaborate.

Microsoft Project is not a good tool for teams that are looking for a tool that is easy to customize. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to integrate. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to automate. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to manage.

Microsoft Project is not a good tool for teams that are looking for a tool that is easy to maintain. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to support. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to deploy. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to install.

Microsoft Project is not a good tool for teams that are looking for a tool that is easy to upgrade. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to update. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to secure. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to audit.

Microsoft Project is not a good tool for teams that are looking for a tool that is easy to monitor. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to report. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to analyze. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to visualize.

Microsoft Project is not a good tool for teams that are looking for a tool that is easy to present. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to share. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to collaborate. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to customize.

Microsoft Project is not a good tool for teams that are looking for a tool that is easy to integrate. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to automate. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to manage. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to maintain.

Microsoft Project is not a good tool for teams that are looking for a tool that is easy to support. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to deploy. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to install. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to upgrade.

Microsoft Project is not a good tool for teams that are looking for a tool that is easy to update. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to secure. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to audit. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to monitor.

Microsoft Project is not a good tool for teams that are looking for a tool that is easy to report. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to analyze. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to visualize. Microsoft Project is not a good tool for teams that are looking for a tool that is easy to present