

Allyson Pascua
Assignment 0502

dumpe2fs for my image

```
allyson@allyson-VirtualBox: ~/Documents/cmsi387/homework/csi-fs
ev/loop0
dumpe2fs 1.42.5 (29-Jul-2012)
Filesystem volume name:   <none>
Last mounted on:         <not available>
Filesystem UUID:         4f8b8296-1e2d-483e-88cb-2cac84b4b69b
Filesystem magic number:  0xEF53
Filesystem revision #:    1 (dynamic)
Filesystem features:      ext_attr resize_inode dir_index filetype sparse_super
Filesystem flags:         signed_directory_hash
Default mount options:    user_xattr acl
Filesystem state:         not clean
Errors behavior:          Continue
Filesystem OS type:       Linux
Inode count:              64
Block count:              512
Reserved block count:     25
Free blocks:              481
Free inodes:              49
First block:              1
Block size:               1024
Fragment size:            1024
Reserved GDT blocks:      1
Blocks per group:         8192
Fragments per group:      8192
Inodes per group:         64
Inode blocks per group:   8
Filesystem created:       Sat May  4 21:48:04 2013
Last mount time:          n/a
Last write time:          Sat May  4 22:33:40 2013
Mount count:              2
Maximum mount count:      -1
Last checked:             Sat May  4 21:48:04 2013
Check interval:           0 (<none>)
Reserved blocks uid:      0 (user root)
Reserved blocks gid:      0 (group root)
First inode:              11
Inode size:               128
Default directory hash:   half_md4
Directory Hash Seed:      3b86b9fb-b1e0-44d4-84ce-205f9f59df9c

Group 0: (Blocks 1-511)
  Primary superblock at 1, Group descriptors at 2-2
  Reserved GDT blocks at 3-3
  Block bitmap at 4 (+3), Inode bitmap at 5 (+4)
  Inode table at 6-13 (+5)
  481 free blocks, 49 free inodes, 3 directories
  Free blocks: 28, 30-35, 37-53, 55-511
  Free inodes: 16-64
allyson@allyson-VirtualBox:~/Documents/cmsi387/homework/csi-fs$
```

Superblock at block 1
located at 00000400

```
allyson@allyson-VirtualBox: ~/Documents/cmsi387/homework/csi-fs
00000000 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |.....|
*
00000400 40 00 00 00 00 02 00 00 19 00 00 00 e1 01 00 00 |@.....|
00000410 31 00 00 00 01 00 00 00 00 00 00 00 00 00 00 00 |1.....|
00000420 00 20 00 00 00 20 00 00 40 00 00 00 00 00 00 00 |. ... ..@.....|
00000430 34 ef 85 51 02 00 ff ff 53 ef 00 00 01 00 00 00 |4..Q...S.....|
00000440 84 e4 85 51 00 00 00 00 00 00 00 00 01 00 00 00 |...Q.....|
00000450 00 00 00 00 0b 00 00 00 80 00 00 00 38 00 00 00 |.....8...|
00000460 02 00 00 00 01 00 00 00 4f 8b 82 96 1e 2d 48 3e |.....0....-H>|
00000470 88 cb 2c ac 84 b4 b6 9b 00 00 00 00 00 00 00 00 |.,.....|
00000480 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |.....|
*
000004c0 00 00 00 00 00 00 00 00 00 00 00 00 00 01 00 00 |.....|
000004d0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |.....|
000004e0 00 00 00 00 00 00 00 00 00 00 00 00 3b 86 b9 fb |.....;...|
000004f0 b1 e0 44 d4 84 ce 20 5f 9f 59 df 9c 01 00 00 00 |..D..._.Y.....|
00000500 0c 00 00 00 00 00 00 00 84 e4 85 51 00 00 00 00 |.....Q....|
00000510 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |.....|
*
00000560 01 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |.....|
00000570 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |.....|
*
00000800 04 00 00 00 05 00 00 00 06 00 00 00 e1 01 31 00 |.....1..|
00000810 03 00 04 00 00 00 00 00 00 00 00 00 00 00 00 00 |.....|
00000820 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |.....|
*
00001000 ff ff ff 17 08 00 20 00 00 00 00 00 00 00 00 00 00 |.....|
00001010 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |.....|
*
00001030 00 00 00 00 00 00 00 00 00 00 00 00 00 00 80 00 |.....|
00001040 ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff |.....|
*
00001400 ff 7f 00 00 00 00 00 00 ff ff ff ff ff ff ff ff |.....|
00001410 ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff |.....|
*
00001800 00 00 00 00 00 00 00 00 84 e4 85 51 84 e4 85 51 |.....Q...Q|
00001810 84 e4 85 51 00 00 00 00 00 00 00 00 00 00 00 00 |...Q.....|
00001820 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |.....|
*
00001880 ed 41 e8 03 00 04 00 00 87 eb 85 51 83 eb 85 51 |.A.....Q...Q|
00001890 83 eb 85 51 00 00 00 00 e8 03 04 00 02 00 00 00 |...Q.....|
000018a0 00 00 00 00 00 00 00 00 0e 00 00 00 00 00 00 00 |.....|
000018b0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |.....|
*
00001b00 80 81 00 00 00 30 04 04 84 e4 85 51 84 e4 85 51 |.....0.....Q...Q|
allyson@allyson-VirtualBox:~/Documents/cmsi387/homework/csi-fs$ sudo dumpe2fs /dev/loop0 | grep -i superblock
dumpe2fs 1.42.5 (29-Jul-2012)
Primary superblock at 1, Group descriptors at 2-2
allyson@allyson-VirtualBox:~/Documents/cmsi387/homework/csi-fs$
```

Finding locations of directories, files, and links created for this assignment
According to superblock, the inode table starts at block 1800 (06 * 400)

```
00000800 04 00 00 00 05 00 00 00 06 00 00 00 e1 01 31 00 |.....1..|
00000810 03 00 04 00 00 00 00 00 00 00 00 00 00 00 00 00 |.....|
00000820 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |.....|
```

Now we're at location 1800.

inode 2 is the root (location 1880, since each inode is 128 bytes in size [80 in hex])

```
*
00001800  00 00 00 00 00 00 00 00 84 e4 85 51 84 e4 85 51 |.....Q...Q|
00001810  84 e4 85 51 00 00 00 00 00 00 00 00 00 00 00 00 |...Q.....|
00001820  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |.....|
*
00001880  ed 41 e8 03 00 04 00 00 87 eb 85 51 83 eb 85 51 |.A.....Q...Q|
00001890  83 eb 85 51 00 00 00 00 e8 03 04 00 02 00 00 00 |...Q.....|
000018a0  00 00 00 00 00 00 00 00 0e 00 00 00 00 00 00 00 |.....|
000018b0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |.....|
```

Root directory located at 3800 (0e * 400)

```
00003800  02 00 00 00 0c 00 01 02 2e 00 00 00 02 00 00 00 |.....|
00003810  0c 00 02 02 2e 2e 00 00 0b 00 00 00 14 00 0a 02 |.....|
00003820  6c 6f 73 74 2b 66 6f 75 6e 64 00 00 0f 00 00 00 |lost+found.....|
00003830  24 00 1b 01 73 75 62 2d 6e 6f 6e 2d 65 6d 70 74 |$...sub-non-empt|
00003840  79 2d 66 69 6c 65 2d 68 61 72 64 2e 74 78 74 2d |y-file-hard.txt-|
00003850  0c 00 00 00 28 00 16 01 74 6f 70 2d 6e 6f 6e 2d |....(...top-non-|
00003860  65 6d 70 74 79 2d 66 69 6c 65 2e 74 78 74 74 2e |empty-file.txtt.|
00003870  73 77 78 69 6c 65 72 50 0e 00 00 00 88 03 13 02 |swxilerP.....|
00003880  74 6f 70 2d 6c 65 76 65 6c 2d 64 69 72 65 63 74 |top-level-direct|
00003890  6f 72 79 00 00 00 00 00 6c 03 12 01 74 6f 70 2d |ory.....l...top-|
000038a0  6e 6f 6e 2d 65 6d 70 74 79 2d 66 69 6c 65 00 00 |non-empty-file..|
000038b0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |.....|
```

sub-non-empty-file-hard.txt → 12th inode → inode f

top-non-empty-file.txt → 25th inode → inode c

top-level-directory → 31th inode → inode e

Files inside directory top-level-directory

```
00007400  0e 00 00 00 0c 00 01 02 2e 00 00 00 02 00 00 00 |.....|
00007410  28 00 02 02 2e 2e 00 00 00 00 00 00 1c 00 12 01 |(|.....|
00007420  6e 6f 6e 2d 65 6d 70 74 79 2d 66 69 6c 65 2e 74 |non-empty-file.t|
00007430  78 74 65 2e 0f 00 00 00 20 00 16 01 73 75 62 2d |xte.....sub-|
00007440  6e 6f 6e 2d 65 6d 70 74 79 2d 66 69 6c 65 2e 74 |non-empty-file.t|
00007450  78 74 66 69 0d 00 00 00 ac 03 1f 07 74 6f 70 2d |xtfi.....top-|
00007460  6e 6f 6e 2d 65 6d 70 74 79 2d 66 69 6c 65 2d 73 |non-empty-file-s|
00007470  79 6d 62 6f 6c 69 63 2e 74 78 74 00 00 00 00 00 |ymbolic.txt.....|
00007480  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |.....|
```

sub-non-empty-file.txt → 14th inode → inode f

top-non-empty-file-symbolic.txt → 22nd inode → inode d

Determining the offset

offset(inode) = 1800 + (80 * (inode - 1))

sub-non-empty-file-hard.txt → offset(f) = 1f00

top-non-empty-file.txt → offset(c) = 1d80

top-level-directory → offset(e) = 1e80

sub-non-empty-file.txt → offset(f) = 1f00 (same as its hard link)

top-non-empty-file-symbolic.txt → offset(d) = 1e00

Determine overall data block that has file's first data block

- **sub-non-empty-file.txt**

sub-non-empty-file-hard.txt (same since this is a hard link):

```
00001f00 b4 81 e8 03 2e 00 00 00 85 eb 85 51 83 eb 85 51 |.....Q...Q|
00001f10 b3 e7 85 51 00 00 00 00 e8 03 02 00 02 00 00 00 |...Q.....|
00001f20 00 00 00 00 00 00 00 00 36 00 00 00 00 00 00 00 |.....6.....|
00001f30 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |.....|
```

Offset = 400 * 36 = D800

```
0000d800 54 68 69 73 20 69 73 20 61 20 6e 6f 6e 2d 65 6d |This is a non-em|
0000d810 70 74 79 20 66 69 6c 65 20 69 6e 20 74 68 65 20 |pty file in the |
0000d820 73 75 62 64 69 72 65 63 74 6f 72 79 2e 0a 00 00 |subdirectory....|
0000d830 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |.....|
```

- **top-non-empty-file.txt**

```
00001d80 b4 81 e8 03 35 00 00 00 6d ea 85 51 6c ea 85 51 |....5...m..Ql..Q|
00001d90 6c ea 85 51 00 00 00 00 e8 03 01 00 02 00 00 00 |l..Q.....|
00001da0 00 00 00 00 00 00 00 00 24 00 00 00 00 00 00 00 |.....$......|
00001db0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |.....|
```

Offset = 400 * 24 = 9000

```
00009000 54 68 69 73 20 69 73 20 61 20 6e 6f 6e 2d 65 6d |This is a non-em|
00009010 70 74 79 20 66 69 6c 65 20 69 6e 20 74 68 65 20 |pty file in the |
00009020 74 6f 70 20 6c 65 76 65 6c 20 64 69 72 65 63 74 |top level direct|
00009030 6f 72 79 2e 0a 00 00 00 00 00 00 00 00 00 00 00 |ory.....|
00009040 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |.....|
*
```

- **top-level-directory:**

```
00001e80 fd 41 e8 03 00 04 00 00 0b eb 85 51 ec ea 85 51 |.A.....Q...Q|
00001e90 ec ea 85 51 00 00 00 00 e8 03 02 00 02 00 00 00 |...Q.....|
00001ea0 00 00 00 00 00 00 00 00 1d 00 00 00 00 00 00 00 |.....|
00001eb0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |.....|
```

Offset = 400 * 1d = 7400

```
00007400 0e 00 00 00 0c 00 01 02 2e 00 00 00 02 00 00 00 |.....|
00007410 28 00 02 02 2e 2e 00 00 00 00 00 00 1c 00 12 01 |(.|
00007420 6e 6f 6e 2d 65 6d 70 74 79 2d 66 69 6c 65 2e 74 |non-empty-file.t|
00007430 78 74 65 2e 0f 00 00 00 20 00 16 01 73 75 62 2d |xte.....sub-|
00007440 6e 6f 6e 2d 65 6d 70 74 79 2d 66 69 6c 65 2e 74 |non-empty-file.t|
00007450 78 74 66 69 0d 00 00 00 ac 03 1f 07 74 6f 70 2d |xtfi.....top-|
00007460 6e 6f 6e 2d 65 6d 70 74 79 2d 66 69 6c 65 2d 73 |non-empty-file-s|
00007470 79 6d 62 6f 6c 69 63 2e 74 78 74 00 00 00 00 00 |ymbolic.txt.....|
00007480 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |.....|
```

- **top-non-empty-file-symbolic.txt**

path is stored in the inode itself since file is a symbolic link

```
00001e00 ff a1 e8 03 18 00 00 00 0b eb 85 51 ec ea 85 51 |.....Q...Q|
00001e10 ec ea 85 51 00 00 00 00 e8 03 01 00 00 00 00 00 |...Q.....|
00001e20 00 00 00 00 00 00 00 00 2e 2f 74 6f 70 2d 6e 6f |...../top-no|
00001e30 6e 2d 65 6d 70 74 79 2d 66 69 6c 65 2e 74 78 74 |n-empty-file.txt|
00001e40 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |.....|
```