

## README:

General layout is as follows:

filesystem.h/c – 'hardware'/'disk' details

shell.h/c – command-line interpreter

fstree.h/c – directory tree data/structure

fsfile.h/c – functions for making new files/directories

fscommands.h/c – the actual commands required to be implemented (as stated in the assignment)

fs\_shell.c – main; just sets up the filesystem and starts the interpreter

scripts used: (you can see the commands echo'd below anyway)

filecmds

moveanddelete

formatd

permissions

If anything's missing, please check <https://github.com/darcykimball/fs>.

The output below demonstrates currentd, chdir, and maked.

```
$ ./fs_shell
init_disk(): Initializing disk...
new_fs_tree(): Initializing filesystem tree...
You start as user: 1
>>
>>
>>currentd
root
>>maked foo
>>chdir foo
>>currentd
root/foo
>>maked bar
>>chdir bar
>>currentd
root/foo/bar
>>chdir
>>currentd
root
>>chdir /foo/bar
>>currentd
root/foo/bar
>>
```

The output below demonstrates createf, extendf, trncf, listf, and sizef. (used script filecmds)

```
$ ./fs_shell < filecmds
init_disk(): Initializing disk...
new_fs_tree(): Initializing filesystem tree...
You start as user: 1
```

```
>>Your command was:
createf movie mov 10
>>Your command was:
listf movie
Index nodes for movie:
Index = 0, Offset = 10, Address (on disk) = 0
>>Your command was:
sizef movie
Blocks: 1
Bytes: 10
>>Your command was:
listfb
Free list indices:
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
>>Your command was:
dumpfs
Block 0:
AAAAAAAAA
AAAAAAAAA
AAAA0000
00000000
00000000
00000000
00000000
00000000
Block 1:
02000000
00000000
00000000
00000000
00000000
00000000
00000000
00000000
Block 2:
```

03000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 3:  
04000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 4:  
05000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 5:  
06000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 6:  
07000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 7:  
08000000  
00000000  
00000000  
00000000

00000000  
00000000  
00000000  
00000000  
Block 8:  
09000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 9:  
0A000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 10:  
0B000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 11:  
0C000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 12:  
0D000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000

Block 13:

0E000000

00000000

00000000

00000000

00000000

00000000

00000000

00000000

Block 14:

0F000000

00000000

00000000

00000000

00000000

00000000

00000000

00000000

Block 15:

FFFFFFFF

00000000

00000000

00000000

00000000

00000000

00000000

00000000

>>>>Your command was:

extendf movie 100

>>Your command was:

listf movie

Index nodes for movie:

Index = 0, Offset = 0, Address (on disk) = 0

Index = 1, Offset = 0, Address (on disk) = 32

Index = 2, Offset = 0, Address (on disk) = 64

Index = 3, Offset = 14, Address (on disk) = 96

>>Your command was:

sizef movie

Blocks: 4

Bytes: 110

>>Your command was:

listfb

Free list indices:

4

5

6

7

8

9

10

11

12

13

14

15

>>Your command was:

dumpfs

Block 0:

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

Block 1:

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

Block 2:

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

Block 3:

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAA0000

00000000

00000000

00000000

00000000

Block 4:

05000000

00000000

00000000

00000000

00000000  
00000000  
00000000  
00000000  
Block 5:  
06000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 6:  
07000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 7:  
08000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 8:  
09000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 9:  
0A000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000

Block 10:  
0B000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 11:  
0C000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 12:  
0D000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 13:  
0E000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 14:  
0F000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 15:  
FFFFFFFF  
00000000  
00000000



00000000

00000000

00000000

00000000

00000000

>>>>Your command was:

trncf movie 109

>>Your command was:

listf movie

Index nodes for movie:

Index = 0, Offset = 1, Address (on disk) = 0

>>Your command was:

sizef movie

Blocks: 1

Bytes: 1

>>Your command was:

listfb

Free list indices:

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

>>Your command was:

dumpfs

Block 0:

AA000000

00000000

00000000

00000000

00000000

00000000

00000000

00000000

Block 1:

02000000

00000000

00000000

00000000

00000000  
00000000  
00000000  
00000000  
Block 2:  
03000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 3:  
04000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 4:  
05000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 5:  
06000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 6:  
07000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000

Block 7:

08000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000

Block 8:

09000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000

Block 9:

0A000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000

Block 10:

0B000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000

Block 11:

0C000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000

Block 12:

0D000000  
00000000  
00000000

```
00000000
00000000
00000000
00000000
00000000
Block 13:
0E000000
00000000
00000000
00000000
00000000
00000000
00000000
00000000
Block 14:
0F000000
00000000
00000000
00000000
00000000
00000000
00000000
00000000
00000000
Block 15:
FFFFFFFF
00000000
00000000
00000000
00000000
00000000
00000000
00000000
>>
```

The output below mainly demonstrates movf, listd, and deletefd. (used script movanddelete)

```
$ ./fs_shell < movanddelete
init_disk(): Initializing disk...
new_fs_tree(): Initializing filesystem tree...
You start as user: 1
>>Your command was:
createf foo txt 100
>>Your command was:
createf bar img 33
>>Your command was:
createf baz doc 99
>>Your command was:
dumpfs
Block 0:
```

AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA

Block 1:

AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA

Block 2:

AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA

Block 3:

AAAAAAAAA  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000

Block 4:

AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA

Block 5:

AA000000  
00000000  
00000000  
00000000

00000000

00000000

00000000

00000000

Block 6:

AAAAAAAAA

AAAAAAAAA

AAAAAAAAA

AAAAAAAAA

AAAAAAAAA

AAAAAAAAA

AAAAAAAAA

AAAAAAAAA

Block 7:

AAAAAAAAA

AAAAAAAAA

AAAAAAAAA

AAAAAAAAA

AAAAAAAAA

AAAAAAAAA

AAAAAAAAA

AAAAAAAAA

Block 8:

AAAAAAAAA

AAAAAAAAA

AAAAAAAAA

AAAAAAAAA

AAAAAAAAA

AAAAAAAAA

AAAAAAAAA

AAAAAAAAA

Block 9:

AAAAAA00

00000000

00000000

00000000

00000000

00000000

00000000

00000000

Block 10:

0B000000

00000000

00000000

00000000

00000000

00000000

00000000

00000000

Block 11:

0C000000

00000000

00000000

00000000

00000000

00000000

00000000

00000000

Block 12:

0D000000

00000000

00000000

00000000

00000000

00000000

00000000

00000000

Block 13:

0E000000

00000000

00000000

00000000

00000000

00000000

00000000

00000000

Block 14:

0F000000

00000000

00000000

00000000

00000000

00000000

00000000

00000000

Block 15:

FFFFFFFF

00000000

00000000

00000000

00000000

00000000

00000000

00000000

>>>>Your command was:

listd

foo rdwr txt 1 100

bar rdwr img 1 33

```

    baz rdwr doc    1    99
>>>>Your command was:
maked grok
>>Your command was:
maked uber
>>Your command was:
listd grok
grok:
>>Your command was:
listd uber
uber:
>>Your command was:
listd
    foo rdwr txt    1    100
    bar rdwr img    1    33
    baz rdwr doc    1    99
    grok rdwr dir    1    0
    uber rdwr dir    1    0
>>>>Your command was:
movf foo grok
>>Your command was:
movf bar grok
>>Your command was:
listd /grok
/grok:
    foo rdwr txt    1    100
    bar rdwr img    1    33
>>Your command was:
listd /
/:
    baz rdwr doc    1    99
    grok rdwr dir    1    0
    uber rdwr dir    1    0
>>>>Your command was:
movf grok uber
>>Your command was:
listd /
/:
    baz rdwr doc    1    99
    uber rdwr dir    1    0
>>Your command was:
listd /uber
/uber:
    grok rdwr dir    1    0
>>Your command was:
listd /uber/grok
/uber/grok:
    foo rdwr txt    1    100
    bar rdwr img    1    33

```



>>>>Your command was:

listf baz

Index nodes for baz:

Index = 6, Offset = 0, Address (on disk) = 192

Index = 7, Offset = 0, Address (on disk) = 224

Index = 8, Offset = 0, Address (on disk) = 256

Index = 9, Offset = 3, Address (on disk) = 288

>>Your command was:

deletefd baz

>>Your command was:

listd

uber rdwr dir 1 0

>>Your command was:

dumpfs

Block 0:

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

Block 1:

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

Block 2:

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

AAAAAAAAAA

Block 3:

AAAAAAAAAA

00000000

00000000

00000000

00000000

00000000

00000000

00000000

Block 4:

AAAAAAAA

AAAAAAAA

AAAAAAAA

AAAAAAAA

AAAAAAAA

AAAAAAAA

AAAAAAAA

AAAAAAAA

Block 5:

AA000000

00000000

00000000

00000000

00000000

00000000

00000000

00000000

Block 6:

0A000000

00000000

00000000

00000000

00000000

00000000

00000000

00000000

Block 7:

06000000

00000000

00000000

00000000

00000000

00000000

00000000

00000000

Block 8:

07000000

00000000

00000000

00000000

00000000

00000000

00000000

00000000

Block 9:

08000000

00000000

00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 10:  
0B000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 11:  
0C000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 12:  
0D000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 13:  
0E000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 14:  
0F000000  
00000000  
00000000  
00000000  
00000000  
00000000

00000000

00000000

Block 15:

FFFFFFFF

00000000

00000000

00000000

00000000

00000000

00000000

00000000

>>>>Your command was:

deletefd uber

Moved back to root directory

>>Your command was:

listd

>>Your command was:

dumpfs

Block 0:

09000000

00000000

00000000

00000000

00000000

00000000

00000000

00000000

00000000

Block 1:

00000000

00000000

00000000

00000000

00000000

00000000

00000000

00000000

Block 2:

01000000

00000000

00000000

00000000

00000000

00000000

00000000

00000000

Block 3:

02000000

00000000

00000000

00000000  
00000000  
00000000  
00000000  
00000000

Block 4:

03000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000

Block 5:

04000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000

Block 6:

0A000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000

Block 7:

06000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000

Block 8:

07000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000

00000000

Block 9:

08000000

00000000

00000000

00000000

00000000

00000000

00000000

00000000

Block 10:

0B000000

00000000

00000000

00000000

00000000

00000000

00000000

00000000

Block 11:

0C000000

00000000

00000000

00000000

00000000

00000000

00000000

00000000

Block 12:

0D000000

00000000

00000000

00000000

00000000

00000000

00000000

00000000

Block 13:

0E000000

00000000

00000000

00000000

00000000

00000000

00000000

Block 14:

0F000000

00000000

```
00000000
00000000
00000000
00000000
00000000
00000000
Block 15:
FFFFFFFF
00000000
00000000
00000000
00000000
00000000
00000000
00000000
00000000
>>>>Your command was:
listfb
Free list indices:
5
4
3
2
1
0
9
8
7
6
10
11
12
13
14
15
>>
```

The output below demonstrates formatd. (used script formatd).

```
$ ./fs_shell < formatd
init_disk(): Initializing disk...
new_fs_tree(): Initializing filesystem tree...
You start as user: 1
>>Your command was:
createf foo txt 100
>>Your command was:
createf bar img 33
>>Your command was:
createf baz doc 99
>>Your command was:
```

```
maked grok
>>Your command was:
maked uber
>>Your command was:
movf foo grok
>>Your command was:
movf bar grok
>>Your command was:
movf grok uber
>>Your command was:
```

```
dumpfs
```

```
Block 0:
```

```
AAAAAAAAAA
AAAAAAAAAA
AAAAAAAAAA
AAAAAAAAAA
AAAAAAAAAA
AAAAAAAAAA
AAAAAAAAAA
AAAAAAAAAA
```

```
Block 1:
```

```
AAAAAAAAAA
AAAAAAAAAA
AAAAAAAAAA
AAAAAAAAAA
AAAAAAAAAA
AAAAAAAAAA
AAAAAAAAAA
AAAAAAAAAA
```

```
Block 2:
```

```
AAAAAAAAAA
AAAAAAAAAA
AAAAAAAAAA
AAAAAAAAAA
AAAAAAAAAA
AAAAAAAAAA
AAAAAAAAAA
AAAAAAAAAA
```

```
Block 3:
```

```
AAAAAAAAAA
00000000
00000000
00000000
00000000
00000000
00000000
00000000
```

```
Block 4:
```

```
AAAAAAAAAA
```



AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA

Block 5:

AA000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000

Block 6:

AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA

Block 7:

AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA

Block 8:

AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA  
AAAAAAAAA

Block 9:

AAAAAA00  
00000000  
00000000  
00000000  
00000000

```

00000000
00000000
00000000
Block 10:
0B000000
00000000
00000000
00000000
00000000
00000000
00000000
00000000
Block 11:
0C000000
00000000
00000000
00000000
00000000
00000000
00000000
00000000
Block 12:
0D000000
00000000
00000000
00000000
00000000
00000000
00000000
00000000
Block 13:
0E000000
00000000
00000000
00000000
00000000
00000000
00000000
00000000
Block 14:
0F000000
00000000
00000000
00000000
00000000
00000000
00000000
00000000
Block 15:

```

FFFFFFFF

00000000

00000000

00000000

00000000

00000000

00000000

00000000

>>>>Your command was:

formatd

Deleting filesystem tree...

Making new filesystem tree...

new\_fs\_tree(): Initializing filesystem tree...

Formatting disk...

init\_disk(): Initializing disk...

>>Your command was:

listd

>>Your command was:

listfb

Free list indices:

0

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

>>Your command was:

dumpfs

Block 0:

01000000

00000000

00000000

00000000

00000000

00000000

00000000

00000000

Block 1:

02000000

00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 2:  
03000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 3:  
04000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 4:  
05000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 5:  
06000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
00000000  
Block 6:  
07000000  
00000000  
00000000  
00000000  
00000000

```

00000000
00000000
00000000
Block 7:
08000000
00000000
00000000
00000000
00000000
00000000
00000000
00000000
Block 8:
09000000
00000000
00000000
00000000
00000000
00000000
00000000
00000000
Block 9:
0A000000
00000000
00000000
00000000
00000000
00000000
00000000
00000000
Block 10:
0B000000
00000000
00000000
00000000
00000000
00000000
00000000
00000000
Block 11:
0C000000
00000000
00000000
00000000
00000000
00000000
00000000
00000000
Block 12:

```

```
0D000000
00000000
00000000
00000000
00000000
00000000
00000000
00000000
00000000
Block 13:
0E000000
00000000
00000000
00000000
00000000
00000000
00000000
00000000
Block 14:
0F000000
00000000
00000000
00000000
00000000
00000000
00000000
00000000
Block 15:
FFFFFFFF
00000000
00000000
00000000
00000000
00000000
00000000
00000000
>>
```

The output below demonstrates changing permissions and permissions checking.

```
init_disk(): Initializing disk...
new_fs_tree(): Initializing filesystem tree...
You start as user: 1
>>Your command was:
createf file txt 100
>>Your command was:
maked dir
>>Your command was:
maked dir2
>>>>Your command was:
```

```
chmod file r
>>Your command was:
extendf file 10
extendf(): you (user 1) don't have permission
>>Your command was:
trncf file 93
trncf(): you (user 1) don't have permission
>>>>Your command was:
chmod dir r
>>Your command was:
chdir dir
>>Your command was:
currentd
root/dir
>>Your command was:
createf file txt 9
createf(): you (user 1) don't have permission
>>>>Your command was:
chdir
>>Your command was:
movf dir dir2
movf(): you (user 1) don't have permission
>>Your command was:
movf dir2 dir
movf(): you (user 1) don't have permission
>>
```

I didn't show any error cases, but things like extending beyond the disk capacity, creating duplicate files, moving directories to themselves, etc. are handled by printing an error message to stderr.