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

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:
AAAAAAAA
AAAAAAAA
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
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
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:
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
Block 1:
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
Block 2:
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
Block 3:
AAAAAAAA
AAAAAAAA
AAAAAAAA
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
Block 6:
07000000
00000000
00000000
00000000
00000000
00000000
00000000
00000000
Block 7:
08000000
00000000
00000000
00000000
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00000000
00000000
00000000
Block 8:
09000000
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Block 9:
0A000000
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00000000
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Block 10:
0B000000

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00000000
00000000
Block 11:
0C000000
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00000000
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00000000
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Block 12:
0D000000
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00000000
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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:
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
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
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00000000
00000000
00000000
00000000
Block 7:
08000000

00000000
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00000000
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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
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00000000
00000000
00000000
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00000000
00000000
Block 12:
0D000000
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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
00000000
Block 15:
FFFFFFFF
00000000
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:
AAAAAAAA
AAAAAAAA

AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
Block 1:
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
Block 2:
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
Block 3:
AAAAAAAA
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:
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
Block 7:
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
Block 8:
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
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:
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
Block 1:
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
Block 2:
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
Block 3:
AAAAAAAA
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
Block 11:
0C000000
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Block 12:
0D000000
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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:
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
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
Block 5:
04000000
00000000
00000000
00000000
00000000
00000000
00000000
00000000
Block 6:
0A000000
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Block 7:
06000000
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Block 8:
07000000
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Block 9:

08000000
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00000000
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Block 10:
0B000000
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Block 11:
0C000000
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00000000
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Block 12:
0D000000
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00000000
00000000
Block 13:
0E000000
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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:
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:
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
Block 1:
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
Block 2:
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
Block 3:
AAAAAAAA
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:
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
Block 7:
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
Block 8:
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
AAAAAAAA
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
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
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00000000
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00000000
00000000
00000000
00000000
Block 9:
0A000000
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00000000
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Block 10:
0B000000
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Block 11:
0C000000
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Block 12:
0D000000
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Block 13:
0E000000
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00000000
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Block 14:
0F000000
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00000000
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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.