Maurely Acosta (PID: 3914479)
Tomas Ortega (PID: 5677483)
4/27/2018

Project 4 Report

In project 4 we modified the file **LibFS.c**, where we built a user-level library, libFS, that implements a file system. The file system we built inside of a library that applications can link with to access files and directories.

Each member contributed to the project. Maurely Acosta did the first 6 methods that we needed to modify in **LibFS.c**. She also contributed to writing the report and running the tests. Tomas Ortega wrote the last 5 methods that we needed to modify in **LibFS.c**, contributed to the report, and ran the tests on his computer for verification.

The first thing we did was create the bitmap data structure that would be used to keep track of allocated inodes. We modified three methods for this functionality: bitmap_init(), bitmap_first_unused(), and bitmap_reset().

We modified the remove_inode() method, which would be called by both methods File_Unlink() and Dir_Unlink(). The File_Unlink() method delete the file referenced by file, removes its name from the directory, frees up any data blocks and inodes used by the file. The Dir_Unlink() is the same procedure as File_Unlink(), but for directories.

Two other important methods we implemented were File_Read() and File_Write(), which would load the disk sector containing the inode. Depending on the function it would either called the Disk_Read() or Disk_Write() method. The Dir_Read() method is similar to the File_Read() method by reading sectors into a buffer.

Our code was able to pass all the tests. Below are screenshots of our results:

```
Maurelys-MacBook-Pro:project-4-provided-materials maurely$ sudo make
make -f Makefile.LibFS
gcc  -Wall -fPIC -c LibFS.c -o LibFS.o
gcc -shared -o libFS.so LibFS.o -L. -lDisk
gcc  -O -Wall  -c main.c -o main.o
gcc -o main.exe main.o -R. -L. -lFS -lDisk
gcc  -O -Wall  -c simple-test.c -o simple-test.o
gcc -o simple-test.exe simple-test.o -R. -L. -lFS -lDisk
gcc  -O -Wall  -c slow-ls.c -o slow-ls.o
gcc -o slow-ls.exe slow-ls.o -R. -L. -lFS -lDisk
gcc  -O -Wall  -c slow-mkdir.c -o slow-mkdir.o
gcc -o slow-mkdir.exe slow-mkdir.o -R. -L. -lFS -lDisk
gcc  -O -Wall  -c slow-rmdir.c -o slow-rmdir.o
gcc -o slow-rmdir.exe slow-rmdir.o -R. -L. -lFS -lDisk
gcc  -O -Wall  -c slow-touch.c -o slow-touch.o
gcc -o slow-touch.exe slow-touch.o -R. -L. -lFS -lDisk
gcc  -O -Wall  -c slow-rm.c -o slow-rm.o
gcc -o slow-rm.exe slow-rm.o -R. -L. -lFS -lDisk
gcc  -O -Wall  -c slow-cat.c -o slow-cat.o
gcc -o slow-cat.exe slow-cat.o -R. -L. -lFS -lDisk
gcc  -O -Wall  -c slow-import.c -o slow-import.o
gcc -o slow-import.exe slow-import.o -R. -L. -lFS -lDisk
gcc  -O -Wall  -c slow-export.c -o slow-export.o
gcc -o slow-export.exe slow-export.o -R. -L. -lFS -lDisk
rm simple-test.o slow-cat.o slow-mkdir.o slow-rm.o slow-rmdir.o slow-import.o slow-touch.o main.o slow-ls.o slow-export.o
Maurelys-MacBook-Pro:project-4-provided-materials maurely$
```

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simple-test

```
Maurelys-MacBook-Pro:project-4-provided-materials maurely$ sudo ./simple-test.exe test
file system booted from file 'test'
file '/first-file' created successfully
file '/second-file' created successfully
dir '/first-dir' created successfully
dir '/first-dir/second-dir' created successfully
ERROR: can't create dir '/first-file/second-dir'
ERROR: can't create dir '/first_dir/third*dir'
file '/first-file' unlinked successfully
ERROR: can't unlink dir '/first-dir'
dir '/first-dir/second-dir' unlinked successfully
file '/second-file' opened successfully, fd=0
successfully wrote 1024 bytes to fd=0
fd 0 closed successfully
file system sync'd to file 'test'
```

slow-ls

```
Maurelys-MacBook-Pro:project-4-provided-materials maurely$ sudo ./slow-ls.exe test /
Password:
directory '/':
     NAME            INODE
0    first-dir        3
1    second-file      2
```

slow-touch

```
Maurelys-MacBook-Pro:project-4-provided-materials maurely$ sudo ./slow-touch.exe test /testfile
file '/testfile' created successfully
Maurelys-MacBook-Pro:project-4-provided-materials maurely$
```

```
Maurelys-MacBook-Pro:project-4-provided-materials maurely$ sudo ./slow-ls.exe test /
directory '/':
     NAME            INODE
0    first-dir        3
1    second-file      2
2    testfile         1
Maurelys-MacBook-Pro:project-4-provided-materials maurely$
```

slow-cat

```
Maurelys-MacBook-Pro:project-4-provided-materials maurely$ sudo ./slow-cat.exe test /second-file
Maurelys-MacBook-Pro:project-4-provided-materials maurely$
```

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slow-export

```
[Maurelys-MacBook-Pro:project-4-provided-materials maurely$ sudo ./slow-export.exe test /second-file abc
[Maurelys-MacBook-Pro:project-4-provided-materials maurely$ cat abc
[Maurelys-MacBook-Pro:project-4-provided-materials maurely$ ls
LibDisk.c           LibFS.o          Tests          main.exe          slow-export.c      slow-ls.exe       slow-rmdir.c
LibDisk.h           Makefile         abc            simple-test.c     slow-export.exe    slow-mkdir.c      slow-rmdir.exe
LibDisk.o           Makefile.LibDisk libDisk.so     simple-test.exe   slow-import.c      slow-mkdir.exe    slow-touch.c
LibFS.c             Makefile.LibFS   libFS.so       slow-cat.c        slow-import.exe    slow-rm.c         slow-touch.exe
LibFS.h             README           main.c         slow-cat.exe      slow-ls.c          slow-rm.exe       test
Maurelys-MacBook-Pro:project-4-provided-materials maurely$
```

slow-import

```
[Maurelys-MacBook-Pro:project-4-provided-materials maurely$ sudo ./slow-import.exe test /filenew abc
[Maurelys-MacBook-Pro:project-4-provided-materials maurely$ sudo ./slow-ls.exe test /
directory '/':
     NAME            INODE
0    first-dir       3
1    second-file     2
2    testfile        1
3    filenew         4
[Maurelys-MacBook-Pro:project-4-provided-materials maurely$ sudo ./slow-cat.exe test /filenew
Maurelys-MacBook-Pro:project-4-provided-materials maurely$
```

slow-rm

```
[Maurelys-MacBook-Pro:project-4-provided-materials maurely$ sudo ./slow-rm.exe test /filenew
file '/filenew' removed successfully
Maurelys-MacBook-Pro:project-4-provided-materials maurely$
```

```
[Maurelys-MacBook-Pro:project-4-provided-materials maurely$ sudo ./slow-ls.exe test /
directory '/':
     NAME            INODE
0    first-dir       3
1    second-file     2
2    testfile        1
Maurelys-MacBook-Pro:project-4-provided-materials maurely$
```

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slow-mkdir

```
2    testfile           1
[Maurelys-MacBook-Pro:project-4-provided-materials maurely$ sudo ./slow-mkdir.exe test /dirnew
directory '/dirnew' created successfully
[Maurelys-MacBook-Pro:project-4-provided-materials maurely$ sudo ./slow-ls.exe test /
directory '/':
     NAME              INODE
0    first-dir         3
1    second-file       2
2    testfile          1
3    dirnew            4
Maurelys-MacBook-Pro:project-4-provided-materials maurely$ █
```

slow-rmdir

```
3    dirnew            4
[Maurelys-MacBook-Pro:project-4-provided-materials maurely$ sudo ./slow-rmdir.exe test /dirnew
directory '/dirnew' removed successfully
[Maurelys-MacBook-Pro:project-4-provided-materials maurely$ sudo ./slow-ls.exe test /
directory '/':
     NAME              INODE
0    first-dir         3
1    second-file       2
2    testfile          1
Maurelys-MacBook-Pro:project-4-provided-materials maurely$ █
```

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References

Arpaci-Dusseau, Andrea C. "Project 4: A Slow File System (SFS)." *Project 4: A Slow File System (SFS)*, 2004, pages.cs.wisc.edu/~dusseau/Classes/CS537-F04/Projects/P4/.