

File System Report

Implementation

The way we implemented the file system was beginning with the skeleton of the assignment we tackled the first function which was `bitmap_init`. This function was basically allocating memory for the bitmap with `n` number of sectors and setting `n` of those bits to 1. What we did was create a buffer and then wipe it by writing all 0's to it's entire sectors. Then what we did was flip `n` bits starting from the start bit until we finish. We had to do some checks to make sure we started/ended in the right bits. After we had that done, we tackled first unused which used `Disk_Read` to read each sector from the start sector until we saw the first that was set to 0. It was a pretty straight forward function but once we flipped the bit, we wrote it back to memory using the functions provided. The next function was `bitmap_reset` which was the opposite of `bitmap_first_unused` but we flip the bit from 1 to 0. In illegal file name we basically did regex patters and by referencing the `simple-test.c` file we saw some files with asteriks and weird patterns that we had to exclude. Remove inode was a bit more complex and porbably the hardest part of the project. What we did was split it into different functions for each case between a file or a directory. We would perform different checks and then make the code simpler. We basically find the inode and wipe the data and then update the parent and write all the data to the buffer which gets written to the disk. The next functions are the File/Dir funcitons which were the easiest functions of the project because we had the building blocks to implement them. We also wrote some other helper functions to help us do some validation and search and return inodes.


Images

```
lramo062@ocelot:~/Downloads/hw4-partial-implement 104% rm file
lramo062@ocelot:~/Downloads/hw4-partial-implement 105% ./simple-test.exe file
FS_Boot('file'):
... disk initialized
... load disk from file 'file' failed
... couldn't open file, create new file system
... formatted superblock (sector 0)
... formatted inode bitmap (start=1, num=1)
... formatted sector bitmap (start=2, num=3)
... formatted inode table (start=5, num=250)
... successfully formatted disk, boot successful
file system booted from file 'file'
File_Create('/first-file'):
... load inode table for root from disk sector 5
... process token: 'first-file'
... load parent inode: 0 (size=0, type=1)
... could not find child inode
... found parent_inode=0, child_inode=-1
... new child inode 1
... load inode table for child inode from disk sector 5
... update child inode 1 (size=0, type=0), update disk sector 5
... load inode table for parent inode 0 from disk sector 5
... get parent inode 0 (size=0, type=1)
... new disk sector 255 for dirent group 0
... append dirent 0 (name='first-file', inode=1) to group 0, update disk sector 255
... update parent inode on disk sector 5
... successfully created file/directory: '/first-file'
file '/first-file' created successfully
File_Create('/second-file'):
... load inode table for root from disk sector 5
... process token: 'second-file'
... load parent inode: 0 (size=1, type=1)
... could not find child inode
... found parent_inode=0, child_inode=-1
... new child inode 2
... load inode table for child inode from disk sector 5
... update child inode 2 (size=0, type=0), update disk sector 5
... load inode table for parent inode 0 from disk sector 5
... get parent inode 0 (size=1, type=1)
... load disk sector 255 for dirent group 0
... append dirent 1 (name='second-file', inode=2) to group 0, update disk sector 255
... update parent inode on disk sector 5
... successfully created file/directory: '/second-file'
file '/second-file' created successfully
Dir_Create('/first-dir'):
... load inode table for root from disk sector 5
... process token: 'first-dir'
... load parent inode: 0 (size=2, type=1)
... could not find child inode
... found parent_inode=0, child_inode=-1
... new child inode 3
```

```
... load inode table for child inode from disk sector 5
... update child inode 3 (size=0, type=1), update disk sector 5
... load inode table for parent inode 0 from disk sector 5
... get parent inode 0 (size=2, type=1)
... load disk sector 255 for dirent group 0
... append dirent 2 (name='first-dir', inode=3) to group 0, update disk sector 255
... update parent inode on disk sector 5
... successfully created file/directory: '/first-dir'
dir '/first-dir' created successfully
Dir_Create('/first-dir/second-dir'):
... load inode table for root from disk sector 5
... process token: 'first-dir'
... load parent inode: 0 (size=3, type=1)
... found child_inode=3
... process token: 'second-dir'
... load parent inode: 3 (size=0, type=1)
... could not find child inode
... found parent_inode=3, child_inode=-1
... new child inode 4
... load inode table for child inode from disk sector 6
... update child inode 4 (size=0, type=1), update disk sector 6
... load inode table for parent inode 3 from disk sector 5
... get parent inode 3 (size=0, type=1)
... new disk sector 256 for dirent group 0
... append dirent 0 (name='second-dir', inode=4) to group 0, update disk sector 256
... update parent inode on disk sector 5
... successfully created file/directory: '/first-dir/second-dir'
dir '/first-dir/second-dir' created successfully
Dir_Create('/first-file/second-dir'):
... load inode table for root from disk sector 5
... process token: 'first-file'
... load parent inode: 0 (size=3, type=1)
... found child_inode=1
... process token: 'second-dir'
... load parent inode: 1 (size=0, type=0)
... parent not a directory
... error: something wrong with the file/path: '/first-file/second-dir'
ERROR: can't create dir '/first-file/second-dir'
performing Dir_Read... load inode table for root from disk sector 5
... process token: 'first-dir'
... load parent inode: 0 (size=3, type=1)
... found child_inode=3
... found parent_inode=0, child_inode=3
... load inode table for root from disk sector 5
... process token: 'first-dir'
... load parent inode: 0 (size=3, type=1)
... found child_inode=3
... found parent_inode=0, child_inode=3
... load inode table for root from disk sector 5
... process token: 'first-dir'
... load parent inode: 0 (size=3, type=1)
```

```
... found child_inode=3
... found parent_inode=0, child_inode=3
... load inode table for root from disk sector 5
... process token: 'first-dir'
... load parent inode: 0 (size=3, type=1)
... found child_inode=3
... found parent_inode=0, child_inode=3
... load inode table for root from disk sector 5
... process token: 'first-dir'
... load parent inode: 0 (size=3, type=1)
... found child_inode=3
... found parent_inode=0, child_inode=3
... load inode table for root from disk sector 5
... process token: 'first-dir'
... load parent inode: 0 (size=3, type=1)
... found child_inode=3
... found parent_inode=0, child_inode=3
... load inode table for root from disk sector 5
... process token: 'first-dir'
... load parent inode: 0 (size=3, type=1)
... found child_inode=3
... found parent_inode=0, child_inode=3
dir /first-dir size before unlink is 120 bytes
Dir_Create('/first_dir/third*dir'):
... load inode table for root from disk sector 5
... process token: 'first_dir'
... load parent inode: 0 (size=3, type=1)
... could not find child inode
... process token: 'third*dir'
... illegal file name: 'third*dir'
... error: something wrong with the file/path: '/first_dir/third*dir'
ERROR: can't create dir '/first_dir/third*dir'
... load inode table for root from disk sector 5
... process token: 'first-file'
... load parent inode: 0 (size=3, type=1)
... found child_inode=1
... found parent_inode=0, child_inode=1
file '/first-file' unlinked successfully
... load inode table for root from disk sector 5
... process token: 'first-dir'
... load parent inode: 0 (size=3, type=1)
... found child_inode=3
... found parent_inode=0, child_inode=3
ERROR: can't unlink dir '/first-dir'
... load inode table for root from disk sector 5
... process token: 'first-dir'
```

```
... load parent inode: 0 (size=3, type=1)
... found child_inode=3
... process token: 'second-dir'
... load parent inode: 3 (size=1, type=1)
... found child_inode=4
... load inode table for child
... found parent_inode=3, child_inode=4
... load inode table for root from disk sector 5
... process token: 'first-dir'
... load parent inode: 0 (size=3, type=1)
... found child_inode=3
... process token: 'second-dir'
... load parent inode: 3 (size=1, type=1)
... found child_inode=4
... load inode table for child
... found parent_inode=3, child_inode=4
... load inode table for root from disk sector 5
... process token: 'first-dir'
... load parent inode: 0 (size=3, type=1)
... found child_inode=3
... process token: 'second-dir'
... load parent inode: 3 (size=1, type=1)
... found child_inode=4
... load inode table for child
... found parent_inode=3, child_inode=4
dir '/first-dir/second-dir' unlinked successfully
... load inode table for root from disk sector 5
... process token: 'first-dir'
... load parent inode: 0 (size=3, type=1)
... found child_inode=3
... process token: 'second-dir'
... load parent inode: 3 (size=1, type=1)
... found child_inode=4
... load inode table for child
... found parent_inode=3, child_inode=4
... load inode table for root from disk sector 5
... process token: 'first-dir'
... load parent inode: 0 (size=3, type=1)
... found child_inode=3
... process token: 'second-dir'
... load parent inode: 3 (size=1, type=1)
... found child_inode=4
... load inode table for child
... found parent_inode=3, child_inode=4
dir /first-dir/second-dir size is 120 after unlink
File_Open('/second-file'):
... load inode table for root from disk sector 5
... process token: 'second-file'
... load parent inode: 0 (size=3, type=1)
... found child_inode=2
... found parent_inode=0, child_inode=2
```

```
... load inode table for inode from disk sector 5
... inode 2 (size=0, type=0)
file '/second-file' opened successfully, fd=0
successfully wrote 1024 bytes to fd=0
File_Close(0):
... file closed successfully
fd 0 closed successfully
FS_Sync():
... successfully saved disk to file 'file'
file system sync'd to file 'file'
lramo062@ocelot:~/Downloads/hw4-partial-implement 106% 
```