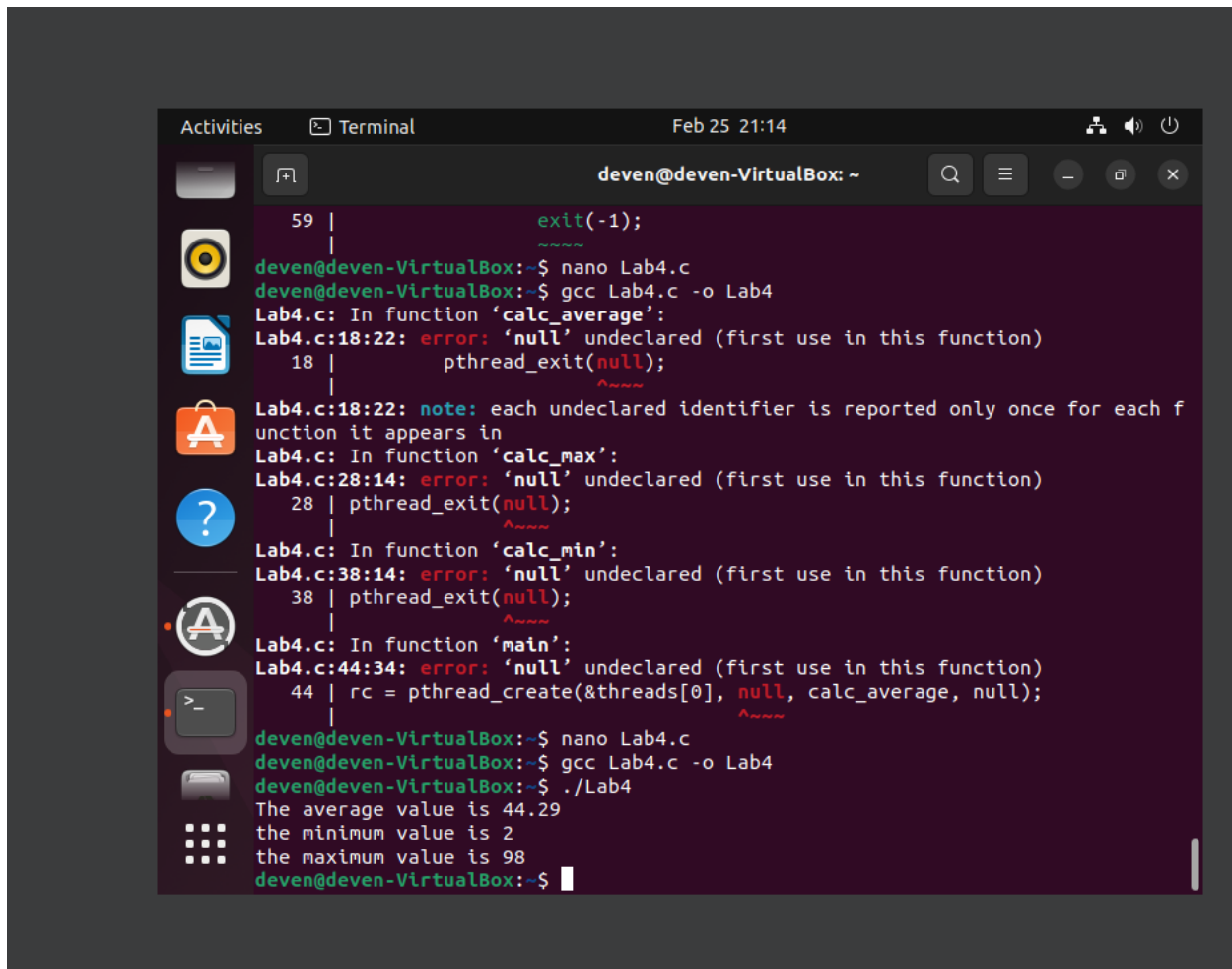


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Lab 4 CS 470

2/25/2023

Lab 4



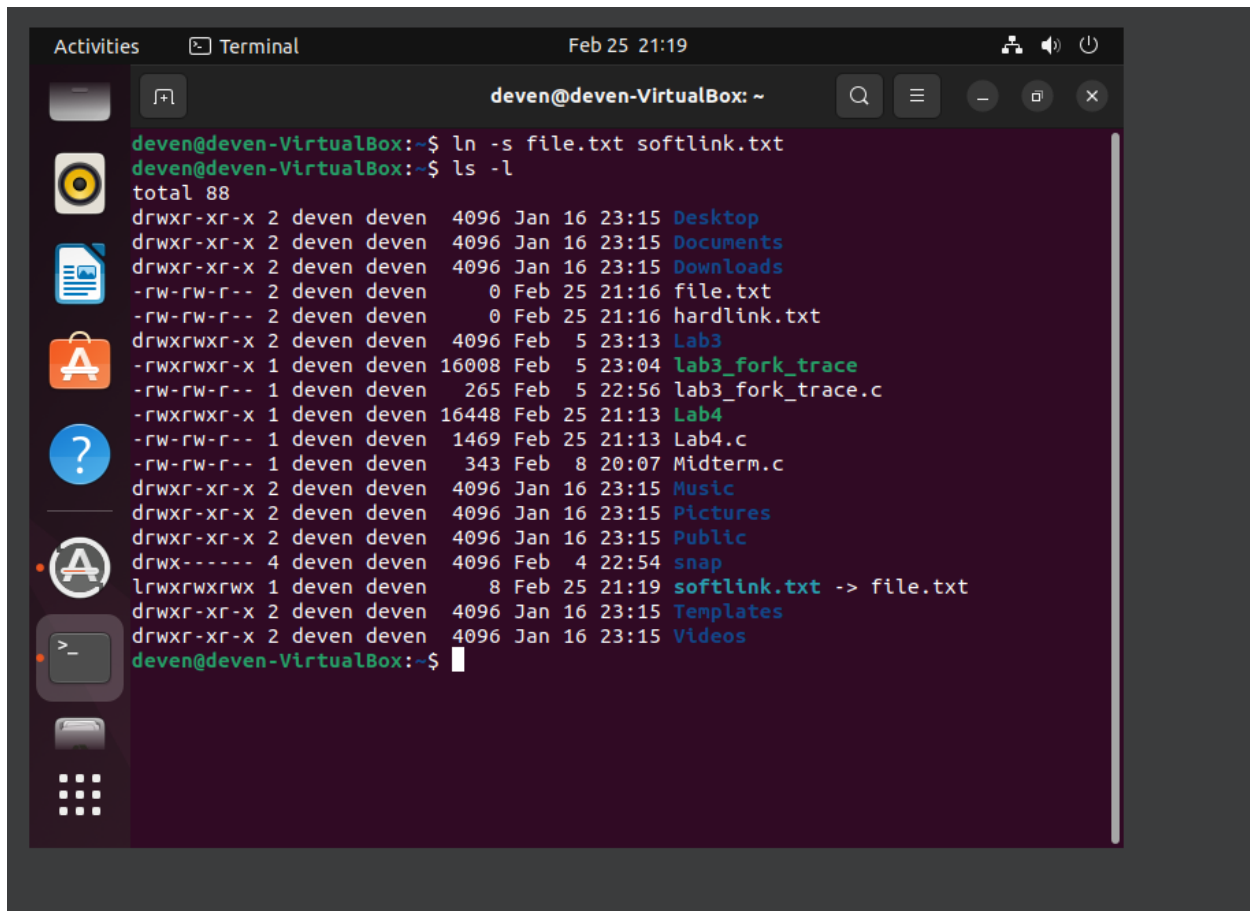
```
59 |         exit(-1);
    |
deven@deven-VirtualBox:~$ nano Lab4.c
deven@deven-VirtualBox:~$ gcc Lab4.c -o Lab4
Lab4.c: In function 'calc_average':
Lab4.c:18:22: error: 'null' undeclared (first use in this function)
    18 |         pthread_exit(null);
        |                        ^~~~~
Lab4.c:18:22: note: each undeclared identifier is reported only once for each f
unction it appears in
Lab4.c: In function 'calc_max':
Lab4.c:28:14: error: 'null' undeclared (first use in this function)
    28 | pthread_exit(null);
        |              ^~~~~
Lab4.c: In function 'calc_min':
Lab4.c:38:14: error: 'null' undeclared (first use in this function)
    38 | pthread_exit(null);
        |              ^~~~~
Lab4.c: In function 'main':
Lab4.c:44:34: error: 'null' undeclared (first use in this function)
    44 | rc = pthread_create(&threads[0], null, calc_average, null);
        |                                  ^~~~~
deven@deven-VirtualBox:~$ nano Lab4.c
deven@deven-VirtualBox:~$ gcc Lab4.c -o Lab4
deven@deven-VirtualBox:~$ ./Lab4
The average value is 44.29
the minimum value is 2
the maximum value is 98
deven@deven-VirtualBox:~$
```

In the above picture I tackle question 2 of the Lab, unfortunately I did things a bit out of order, however all other questions will be included in this document. You will notice that initially the debugger/compiler flagged an error at the first instance of every null keyword in each method. This is because I forgot that for C, this keyword needed to be capitalized, after fixing it in nano, the code was compiled and executed.

Activities Terminal Feb 25 21:17

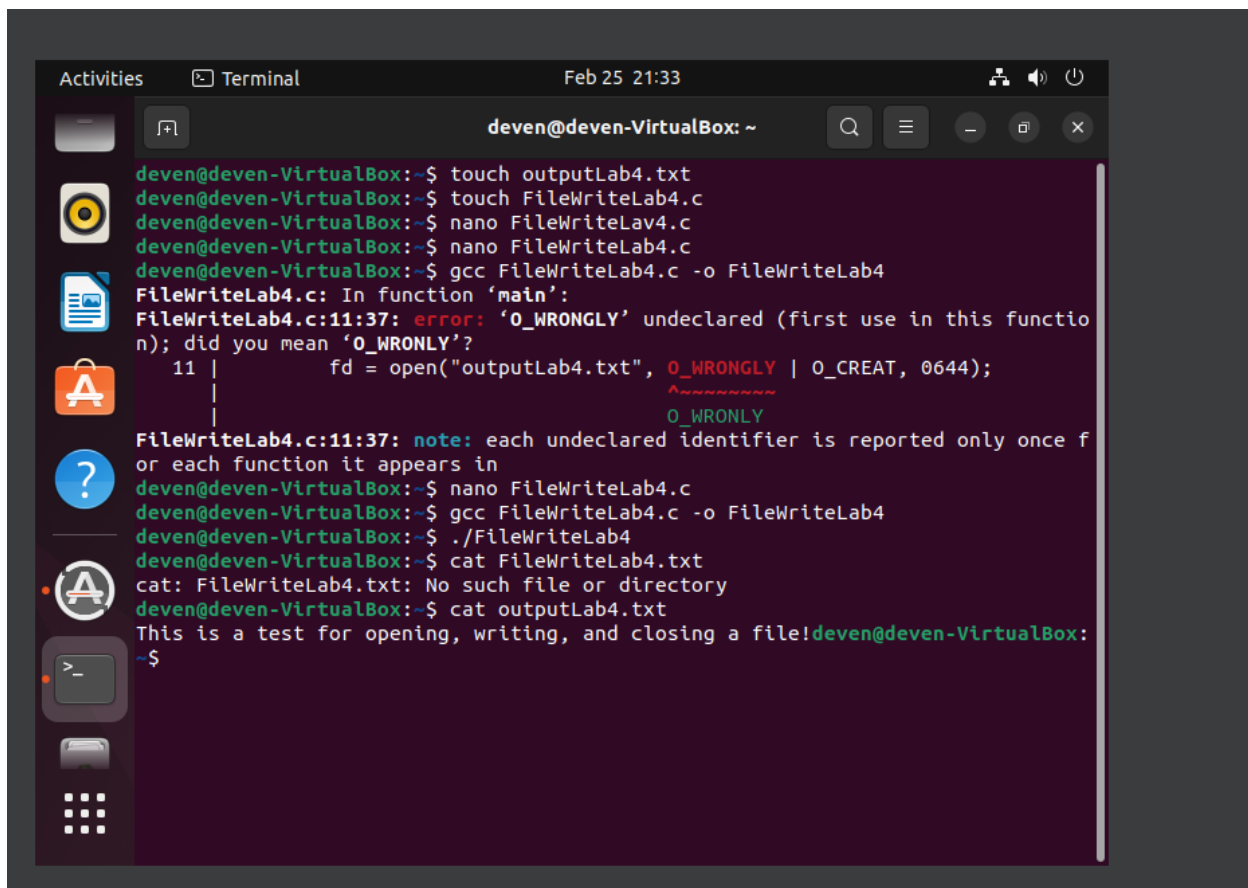
deven@deven-VirtualBox: ~

```
deven@deven-VirtualBox:~$ ln file.txt hardlink.txt
ln: failed to access 'file.txt': No such file or directory
deven@deven-VirtualBox:~$ touch file.txt
deven@deven-VirtualBox:~$ ln file.txt hardlink.txt
deven@deven-VirtualBox:~$ ls
Desktop  file.txt      lab3_fork_trace  Lab4.c  Pictures  Templates
Documents hardlink.txt  lab3_fork_trace.c Midterm.c Public    Videos
Downloads Lab3          Lab4            Music    snap
deven@deven-VirtualBox:~$ ls -l
total 88
drwxr-xr-x 2 deven deven 4096 Jan 16 23:15 Desktop
drwxr-xr-x 2 deven deven 4096 Jan 16 23:15 Documents
drwxr-xr-x 2 deven deven 4096 Jan 16 23:15 Downloads
-rw-rw-r-- 2 deven deven   0 Feb 25 21:16 file.txt
-rw-rw-r-- 2 deven deven   0 Feb 25 21:16 hardlink.txt
drwxrwxr-x 2 deven deven 4096 Feb  5 23:13 Lab3
-rwxrwxr-x 1 deven deven 16008 Feb  5 23:04 lab3_fork_trace
-rw-rw-r-- 1 deven deven  265 Feb  5 22:56 lab3_fork_trace.c
-rwxrwxr-x 1 deven deven 16448 Feb 25 21:13 Lab4
-rw-rw-r-- 1 deven deven  1469 Feb 25 21:13 Lab4.c
-rw-rw-r-- 1 deven deven   343 Feb  8 20:07 Midterm.c
drwxr-xr-x 2 deven deven 4096 Jan 16 23:15 Music
drwxr-xr-x 2 deven deven 4096 Jan 16 23:15 Pictures
drwxr-xr-x 2 deven deven 4096 Jan 16 23:15 Public
drwx----- 4 deven deven 4096 Feb  4 22:54 snap
drwxr-xr-x 2 deven deven 4096 Jan 16 23:15 Templates
drwxr-xr-x 2 deven deven 4096 Jan 16 23:15 Videos
deven@deven-VirtualBox:~$
```

A terminal window titled "deven@deven-VirtualBox: ~" with a search bar and window controls. The terminal shows the execution of two commands: `ln -s file.txt softlink.txt` and `ls -l`. The `ls -l` output lists various files and directories with their permissions, owners, sizes, and timestamps. The files include `Desktop`, `Documents`, `Downloads`, `file.txt`, `hardlink.txt`, `Lab3`, `lab3_fork_trace`, `lab3_fork_trace.c`, `Lab4`, `Lab4.c`, `Midterm.c`, `Music`, `Pictures`, `Public`, `snap`, `softlink.txt -> file.txt`, `Templates`, and `Videos`. The terminal window is part of a desktop environment with a sidebar on the left containing icons for applications like a file manager, web browser, and terminal.

```
deven@deven-VirtualBox:~$ ln -s file.txt softlink.txt
deven@deven-VirtualBox:~$ ls -l
total 88
drwxr-xr-x 2 deven deven 4096 Jan 16 23:15 Desktop
drwxr-xr-x 2 deven deven 4096 Jan 16 23:15 Documents
drwxr-xr-x 2 deven deven 4096 Jan 16 23:15 Downloads
-rw-rw-r-- 2 deven deven  0 Feb 25 21:16 file.txt
-rw-rw-r-- 2 deven deven  0 Feb 25 21:16 hardlink.txt
drwxrwxr-x 2 deven deven 4096 Feb  5 23:13 Lab3
-rwxrwxr-x 1 deven deven 16008 Feb  5 23:04 lab3_fork_trace
-rw-rw-r-- 1 deven deven  265 Feb  5 22:56 lab3_fork_trace.c
-rwxrwxr-x 1 deven deven 16448 Feb 25 21:13 Lab4
-rw-rw-r-- 1 deven deven 1469 Feb 25 21:13 Lab4.c
-rw-rw-r-- 1 deven deven  343 Feb  8 20:07 Midterm.c
drwxr-xr-x 2 deven deven 4096 Jan 16 23:15 Music
drwxr-xr-x 2 deven deven 4096 Jan 16 23:15 Pictures
drwxr-xr-x 2 deven deven 4096 Jan 16 23:15 Public
drwx----- 4 deven deven 4096 Feb  4 22:54 snap
lrwxrwxrwx 1 deven deven  8 Feb 25 21:19 softlink.txt -> file.txt
drwxr-xr-x 2 deven deven 4096 Jan 16 23:15 Templates
drwxr-xr-x 2 deven deven 4096 Jan 16 23:15 Videos
deven@deven-VirtualBox:~$
```

Pictured above are the creation of hard and soft links to the same file in the root directory.



The screenshot shows a terminal window titled "Terminal" with the date and time "Feb 25 21:33". The prompt is "deven@deven-VirtualBox: ~". The user enters several commands: "touch outputLab4.txt", "touch FileWriteLab4.c", "nano FileWriteLav4.c" (note the typo), "nano FileWriteLab4.c", and "gcc FileWriteLab4.c -o FileWriteLab4". The compiler outputs an error: "FileWriteLab4.c:11:37: error: 'O_WRONGLY' undeclared (first use in this function); did you mean 'O_WRONLY'?" The error points to line 11, column 37, where the code is "fd = open("outputLab4.txt", O_WRONGLY | O_CREAT, 0644);". The user then runs "gcc FileWriteLab4.c -o FileWriteLab4" again, which produces a note: "note: each undeclared identifier is reported only once for each function it appears in". The user then runs "nano FileWriteLab4.c", "gcc FileWriteLab4.c -o FileWriteLab4", and "cat FileWriteLab4.txt". The "cat" command outputs "This is a test for opening, writing, and closing a file!". Finally, the user runs "cat outputLab4.txt", which outputs "deven@deven-VirtualBox: ~\$".

```
deven@deven-VirtualBox:~$ touch outputLab4.txt
deven@deven-VirtualBox:~$ touch FileWriteLab4.c
deven@deven-VirtualBox:~$ nano FileWriteLav4.c
deven@deven-VirtualBox:~$ nano FileWriteLab4.c
deven@deven-VirtualBox:~$ gcc FileWriteLab4.c -o FileWriteLab4
FileWriteLab4.c: In function 'main':
FileWriteLab4.c:11:37: error: 'O_WRONGLY' undeclared (first use in this function); did you mean 'O_WRONLY'?
11 |         fd = open("outputLab4.txt", O_WRONGLY | O_CREAT, 0644);
    |                                     ^~~~~~
    |                                     O_WRONLY
FileWriteLab4.c:11:37: note: each undeclared identifier is reported only once for each function it appears in
deven@deven-VirtualBox:~$ gcc FileWriteLab4.c -o FileWriteLab4
deven@deven-VirtualBox:~$ ./FileWriteLab4
deven@deven-VirtualBox:~$ cat FileWriteLab4.txt
cat: FileWriteLab4.txt: No such file or directory
deven@deven-VirtualBox:~$ cat outputLab4.txt
This is a test for opening, writing, and closing a file!
deven@deven-VirtualBox:~$
```

And the final step of opening, writing to, and closing a document. I noticed similarities to how this functions in java while doing this assignment, however the addition of numerical codes to denote the different access permissions is something not done in the Java language, my thoughts are that this is because java does not communicate with the system and file structures at the same level as code executed from the terminal.