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CS4513
Project 1

Experiment Design

For my experiements I used bash scripting to execute my rm program, and timed the execution in the bash script. I ran three experiments, first one testing how long it takes for a rename operation to complete, seccond one testing the throughput of deleting a large file cross partition, and last one testing how long it took to delete a tree of directories and files. Each of these tests was run six times, both empying the trash and flushing the drive cache to ensure the machine was properly reset for the next test. The tests were all run on my desktop running ArchLinux, with 8GB of RAM, a 3.5ghz i7, and a 500GB WD Blue SATA hard drive.

The rename experiment, copied 10,000 1MB files on the same partition as the trash folder. The script printed out the time it took for all 10,000 files to copy at the end.

```
record start_time
for I from 1 to 10,000
        allocate 1 mb file
        ./rm file
record end_time
printf end_time - start_time
```

The throughput experiment created a 2GB file on a different partition than the trash folder, then ran ./rm to copy the file over to the trash folder. At the end it printing out the speed of the file transfer im MB/S

```
allocate 2GB file
record start_time
./rm file
record end_time
print 2gb / end_time – start_time
```

The directory and file tree experiement created a series of 10 directories, which each had a directory tree containing 10 directories. It also created 10Mb files in each of the directories. After setting up this directory structure on a seperate partition than the trash directory, it executed ./rm to test the time it takes to delete all of theese files and directories

```
allocate directory structure + files
record start_time
./ rm *
record end_time
print end_time - start_time
```

Results

Rename Experiment

Run	File Size (mb)	Number of Files	Total Time (s)	Time per file (ms)
1	1	10,000	180	18
2	1	10,000	179	17.9
3	1	10,000	179	17.9
4	1	10,000	206	20.6
5	1	10,000	181	18.1
6	1	10,000	179	17.9
Average	1	10000	184	18.4

Throughput Experiment

Run	File Size (GB)	Total Time (s)	Speed (mb/s)
1	2	36	56
2	2	39	52
3	2	40	51
4	2	33	62
5	2	32	64
6	2	33	62
Average	2	35.5	57.83

Directory Tree Experiment

Run	# Files	# Directories	File Size (MB)	Total Time (s)	Time per file (ms)	Time per dir (s)
1	1010	110	10	188	186.14	1.71
2	1010	110	10	195	193.069	1.77
3	1010	110	10	214	211.881	1.945
4	1010	110	10	161	159.406	1.46
5	1010	110	10	164	162.376	1.491
6	1010	110	10	164	162.376	1.491
Average	1010	110	10	181	179.21	1.64

Analysis

Rename Experiment

The average time per rename was 18.4ms, which makes sense that it would be this low, as the file contents was not actualy copied but rather the directory inodes gained a new entry. Howerver this does seem a little bit high for a rename call, and likely a lot of the time is spent on the file creation call, which I had done in the same loop. Perhaps if I had done this before hand the results would be slightly more accurate.

Throughput Experiment

The average time was 35.5s and the average speed was 57.83mb/s. This makes sense as the average write speed obtained by my hard drive is around 60mb/s. In this test the file was being directly copied, this speed falls a little under this statistic, but is in a reasonable range.

Directory Tree Experiment

The average time to delete a file was 179.21 ms, and the estimated time from using data from the throughput experiement is 173ms per file. This experiment performed 6ms slower, howerver this time difference could be accounted for by the addional time required for deleting the directories and not just the files. Overall this experiment performed as expected.