Operating Systems–2: CS3523
January 2023

Homework: File-Systems

Submission Date: 30th April 2022 (Sunday), **9:00 pm**

You can use a fresh xv6 repo for doing this assignment.

Part-0:

Read and understand various aspects of file-system in xv6 through: sysfile.c (create(), sys_unlink()), fs.c (readi(), writei(), dirlink(), ialloc(), iupdate(), iget(), ilock(), iunlock(), iput(), itrunc()), bio.c (bget(), bread(), bwrite(), brelse())

Part-1:

Add the following line at the beginning of the log_write() function in log.c

```
cprintf("log_write %d\n", b->blockno);
```

This will print all updates to the file system along with the block number.

Start a new session on xv6 (run `make clean` followed by `make qemu or make qemu-nox)`, and type the following command in the xv6 shell

$ echo > a1

This command creates a new file named a1. You will see a series of disk writes (printed in log_write()).

To submit: Report the printed output and explain what is happening in each disk write. You may want to insert `cprintf()` statements in xv6 code to see where the writes are coming from.

Next, execute the following command to write data to this file:

$ echo x > a1

To submit: Report the printed output and explain what is happening in each disk write. Why do you see certain writes multiple times? You may want to insert `cprintf()` statements in xv6 code to see where the writes are coming from.

Next, repeat the above command once more

$ echo xxx > a1

To submit: Report the printed output and explain what is being written in each disk write. Is there a difference from the previous command? Explain.

Next, delete the file by typing the following command:

$ rm a1

To submit: Report the printed output and explain what is being written in each disk write.

Next, we create a file and write to it together in a single command.

$ echo y > a2

To submit: Report the printed output and explain what is being written in each disk write. Which blocks of the disk are assigned to file a2?

Part-2:

Unlike part-1 where we understood the internals for a single file creation, we will study a bit more when multiple files are getting created. Quit the qemu window and start a fresh invocation of xv6 for this part (run `make clean` followed by `make qemu or make qemu-nox`)

Run the following commands in the xv6 shell

$ echo x > a1

$ echo y > a2

$ echo z > a3

To submit: Report the printed output and explain what is happening in each disk write. Do you see any common portion for each of these commands? Do you see differences in the output of these commands? Explain the commonality and differences.

Next, delete these files using

$ rm a1 a2 a3

To submit: Report the printed output and explain what is happening in each disk write. Do you see any common portion for each of these commands? Do you see differences in these commands? Explain the commonality and differences.

Submission Instructions

Submission is to be done at the appropriate link. Just the pdf report is to be submitted with the details of reasonings/outputs asked above.

1. A report (report.pdf) explaining your outputs and reasonings in brief and your learnings from the assignment. Filename should be HW-FileSystem-<RollNo>.pdf

Grading Policy

1. Part-1: 50%
2. Part-2: 50%

Note: We would run plagiarism checks on the submissions and copy cases would be appropriately dealt with. If needed, we might conduct a viva to confirm the same.