Name: Key

Homework 5

Due: November 24th (Sunday), 11:59 pm on Blackboard

This homework requires you to think about files and directories in a Unix file system (e.g., Linux). You may need to look up details on the web.

A user with user ID 100 and group ID 200 enters the commands below. For purposes of this homework, we will assume the time when a user starts is 4298400 (decimal), and that each command takes 1 second to enter. Thus, line 2 is executed at time 4298401 and so on.

Line number	Command
1	`mkdir a`
2	`mkdir b`
3	`mkdir c`
4	`touch a/x`
5	`ln a/x b/y`
6	`echo hi there > a/x`
7	`cp a/x c/z`
8	`mv b/y ./g`
9	`echo bye > g`

1. You should already understand a Unix umask. If you do not, look up the meaning. Suppose the user umask is 022. What will the permissions be for directory ./a after line 1? Why?
   777 - 022 = 755
2. Suppose the inode number for ./a (line 1) is 19375. What will the inode contain after line 1 has been executed?
   Permissions, created/modified/accessed timestamps, pointers to null (data blocks), UID and GID, a set of files including . and .., file size and links.
3. Does inode 19375 change after line 2 has been executed? If so, what changes?
   No, a new inode is created for ./b.

4. Suppose the inode for a/x created in line 4 is 20030. What do the pointers in the inode contain afer line 4?
   Pointers to null data blocks, since there is no data.
5. Do the pointers in inode 20030 change after line 5?
   No. Hardlinks do not modify data pointers.
6. After line 5, what inode numbers will the directory entries for a/x and b/y contain? Why?
   20030. Hardlinks share inodes.
7. Do the pointers in inode 20030 change after line 6?
   Yes. They used to point to null, now they point to data blocks containing data.
8. When line 7 is executed, will any value in inode 20030 change? If so what? If not, why not?
   No. Timestamps are not copied over when a new file is created, and the original timestamps are not changed.
9. When line 8 is executed, does the "modified" time stamp in the inode corresponding to b/y change? Why or why not?
   The modified timestamp does not change. This is because the time stamp only tracks changes made to data blocks, and the data blocks don't change.
10. After line 9, what are the contents of a/x and c/z? Why?
    a/x: bye. a/x is hardlinked to ./g, which we echoed "bye" into
    c/z: hi there. c/z is a copy of a/x from before the hardlinking and echoing occured.