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ECE357

HW2P2

2)

a)

“atime” is the last time a file was visited. For this case, the last time the file was accessed was on September 21, 2022 at 12:10pm. The initial atime of the file was 12:00pm when the echo command was executed. Then when the cat command was ran, the atime was again updated to 12:10pm, September 21, 2022 because it was accessed to output to standard output. Since running the “touch” command does not change the atime, only the mtime, thus the the atime is 12:10pm on September 21, 2022.

“ctime” is the last time the metadata of the file were modified and since the touch command was used to alter the metdata. This command was run on September 21, 2022 at 2pm.

The “mtime” would be September 19, 2022 2pm because we used the touch command to make it look like we started two days earlier. However, “ctime” gives it away.

b)

i) The computer uses fsck to scans and fixes the filesystem for any faults and inconsistencies. It will walk the pathname tree, visiting each node and ensuring that the inodes and free block map are in sync with the data.

ii) fsck will not be enough to fix the errors. When initializing files, an unexpected crash may occur, causing the boot process to halt and the machine to enter user mode. Only the root disk was mounted because the startup procedure was corrupted. Commands saved under /usermare no longer accessible, resulting in filesystem errors.

iii) It will take a very long time since fsk walks through and visits every Inode in the filesystem one at a time so it will take quite a long time if it has go through 2TB of Inodes

iv) Dealing with a Journaling filesystem would be substantially quicker. Journaling has an unlimited number of entries; new additions will simply replace the existing ones. The kernel will combine all of the atomic transaction's components and write them to the journal sequentially from old to new. If there is a BEGIN entry but no COMMIT, the kernel will instruct the system call to halt, indicating a system crash. If both are present, the blocks in the journal are written to the filesystem without problem.

c)

The file data cache of the video are processed in 4k chunks which are read super fast since all of the data is already accessed and ready to be read. When the user breaks sequential order of how the data is being read, like moving the video backwards, the disk needs to access another 4k chunk from memory which is a slower operation that reading from cached parts of a video file. As a result, when there is a replay from the beginning, there is a delay since it is retrieving data from the disk. Furthermore, since the video file is likely huge, the entire movie is not stored in the cache, hence the first part was not cached when traced back.

d)

The rename system call is used in the first command, mv /A/B/C/D/E /A/B/C/Q. It renames the file E to Q on the same filesystem. If Q already exists, it will be overwritten. The second operation, mv /A/B/C/Q /A/B/X/Y, however, takes a long time to finish since these two paths may not be on the same filesystem (not a hardlink). On the second filesystem, it would first cp /A/B/C/D/E /A/B/C/Q and then rm /A/B/C/Q. This technique entails copying data from one filesystem to another byte by byte, which takes longer to complete.