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# CS 342 Operating Systems Project #4 Report

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## Section 3

The written app.c program was executed with the following arguments: number of files to be created (N), test case number. During the programs execution the written kernel module was also executed and it's output was observed for different test cases such as creating and writing and reading N files synchronously, writing N files then reading them and after reading completed writing and reading again and finally reading and writing multiple files simultaneously using threads. The observations and outputs of the kernel module were given in the sections below.

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## Observations

Our kernel module gives us information about the in-memory file structures related to processes, files, file systems and block I/O. In the first part of our program we create given N number of files and then wrote 20,000,00 characters for each file. When we look at the outputted information information such as user's id, process access mode, name of the file were outputted the same as when the module was tested during the read operation. Although these file informations were mostly unchanged we saw a change in the cached blocks of the buffer cache during these operations. Since the purpose of the cache is to store the frequently accessed data faster we saw some blocks cached after they are accessed. In our program we observed that the number of blocks was a number like 39056 during the writing operations however, this number was turned into 0 during the reading operations. From this observations we think that the operating system caches these files while its writing and empties their cache while reading it. Also we observed in our three different test cases that writing and reading multiple files asynchronously versus synchronously also effects the outputted file information since at the time of the module's execution they are reading and writing different amount of files in different orders. Some sample segments from the output of our kernel module are shown below during read and write operations.

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## Outputs

### Output during Write Operation (cropped for space saving)

May 25 15:38:35 ubuntu kernel: [ 267.472556] fd: 0, current file position ptr: 0, user's id: 0, access mode:393219, file name: 1, inode no: 4, file length: 0, no of blocks: 0

May 25 15:38:35 ubuntu kernel: [ 267.472563] fd: 1, current file position ptr: 0, user's id: 0, access mode:393219, file name: 1, inode no: 4, file length: 0, no of blocks: 0

May 25 15:38:35 ubuntu kernel: [ 267.472567] fd: 2, current file position ptr: 0, user's id: 0, access mode:393219, file name: 1, inode no: 4, file length: 0, no of blocks: 0

May 25 15:38:35 ubuntu kernel: [ 267.472570] fd: 3, current file position ptr: 19996672, user's id: 0, access mode:134578206, file name: 0.txt, inode no: 3027378, file length: 19996672, no of blocks: 39056

May 25 15:38:35 ubuntu kernel: [ 267.472578] Storage device the block is in: sda,

May 25 15:38:35 ubuntu kernel: [ 267.472579] the block number: 3307520,

May 25 15:38:35 ubuntu kernel: [ 267.472580] use count: 0

May 25 15:38:35 ubuntu kernel: [ 267.472580]

May 25 15:38:35 ubuntu kernel: [ 267.472581] Storage device the block is in: sda,

May 25 15:38:35 ubuntu kernel: [ 267.472583] the block number: 3307521,

May 25 15:38:35 ubuntu kernel: [ 267.472583] use count: 0

May 25 15:38:35 ubuntu kernel: [ 267.472583]

May 25 15:38:35 ubuntu kernel: [ 267.472585] Storage device the block is in: sda,

May 25 15:38:35 ubuntu kernel: [ 267.472586] the block number: 3307522,

May 25 15:38:35 ubuntu kernel: [ 267.472587] use count: 0

May 25 15:38:35 ubuntu kernel: [ 267.472587]

May 25 15:38:35 ubuntu kernel: [ 267.472588] Storage device the block is in: sda,

May 25 15:38:35 ubuntu kernel: [ 267.472589] the block number: 3307523,

May 25 15:38:35 ubuntu kernel: [ 267.472590] use count: 0

May 25 15:38:35 ubuntu kernel: [ 267.472590]

May 25 15:38:35 ubuntu kernel: [ 267.472591] Storage device the block is in: sda,

May 25 15:38:35 ubuntu kernel: [ 267.472593] the block number: 3307524,

May 25 15:38:35 ubuntu kernel: [ 267.472593] use count: 0

May 25 15:38:35 ubuntu kernel: [ 267.472593]

May 25 15:38:35 ubuntu kernel: [ 267.472594] Storage device the block is in: sda,

May 25 15:38:35 ubuntu kernel: [ 267.472596] the block number: 3307525,

May 25 15:38:35 ubuntu kernel: [ 267.472597] use count: 0

May 25 15:38:35 ubuntu kernel: [ 267.472597]

May 25 15:38:35 ubuntu kernel: [ 267.472598] Storage device the block is in: sda,

May 25 15:38:35 ubuntu kernel: [ 267.472599] the block number: 3307526,

May 25 15:38:35 ubuntu kernel: [ 267.472600] use count: 0

May 25 15:38:35 ubuntu kernel: [ 267.472600]

May 25 15:38:35 ubuntu kernel: [ 267.472601] Storage device the block is in: sda,

May 25 15:38:35 ubuntu kernel: [ 267.472602] the block number: 3307527,

May 25 15:38:35 ubuntu kernel: [ 267.472603] use count: 0

May 25 15:38:35 ubuntu kernel: [ 267.472603]

May 25 15:38:35 ubuntu kernel: [ 267.472604] Storage device the block is in: sda,

May 25 15:38:35 ubuntu kernel: [ 267.472605] the block number: 3307528,

May 25 15:38:35 ubuntu kernel: [ 267.472606] use count: 0

May 25 15:38:35 ubuntu kernel: [ 267.472606]

May 25 15:38:35 ubuntu kernel: [ 267.472607] Storage device the block is in: sda,

May 25 15:38:35 ubuntu kernel: [ 267.472608] the block number: 3307529,

May 25 15:38:35 ubuntu kernel: [ 267.472609] use count: 0

May 25 15:38:35 ubuntu kernel: [ 267.472609]

May 25 15:38:35 ubuntu kernel: [ 267.472611] Storage device the block is in: sda,

May 25 15:38:35 ubuntu kernel: [ 267.472612] the block number: 3307530,

May 25 15:38:35 ubuntu kernel: [ 267.472613] use count: 0

May 25 15:38:35 ubuntu kernel: [ 267.472613]

May 25 15:38:35 ubuntu kernel: [ 267.472614] Storage device the block is in: sda,

May 25 15:38:35 ubuntu kernel: [ 267.472615] the block number: 3307531,

May 25 15:38:35 ubuntu kernel: [ 267.472616] use count: 0

[illegible]



[illegible]

[illegible]

[illegible]

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May 25 15:38:35 ubuntu kernel: [ 267.472874]
May 25 15:38:35 ubuntu kernel: [ 267.472875] Storage device the block is in: sda,
May 25 15:38:35 ubuntu kernel: [ 267.472876] the block number: 3307613,
May 25 15:38:35 ubuntu kernel: [ 267.472877] use count: 0
May 25 15:38:35 ubuntu kernel: [ 267.472877]
May 25 15:38:35 ubuntu kernel: [ 267.472878] Storage device the block is in: sda,
May 25 15:38:35 ubuntu kernel: [ 267.472879] the block number: 3307614,
May 25 15:38:35 ubuntu kernel: [ 267.472880] use count: 0
May 25 15:38:35 ubuntu kernel: [ 267.472880]
May 25 15:38:35 ubuntu kernel: [ 267.472881] Storage device the block is in: sda,
May 25 15:38:35 ubuntu kernel: [ 267.472882] the block number: 3307615,
May 25 15:38:35 ubuntu kernel: [ 267.472883] use count: 0
May 25 15:38:35 ubuntu kernel: [ 267.472883]
May 25 15:38:35 ubuntu kernel: [ 267.472884] Storage device the block is in: sda,
May 25 15:38:35 ubuntu kernel: [ 267.472885] the block number: 3307616,
May 25 15:38:35 ubuntu kernel: [ 267.472886] use count: 0
May 25 15:38:35 ubuntu kernel: [ 267.472886]
May 25 15:38:35 ubuntu kernel: [ 267.472887] Storage device the block is in: sda,
May 25 15:38:35 ubuntu kernel: [ 267.472888] the block number: 3307617,
May 25 15:38:35 ubuntu kernel: [ 267.472889] use count: 0
May 25 15:38:35 ubuntu kernel: [ 267.472889]
May 25 15:38:35 ubuntu kernel: [ 267.472890] Storage device the block is in: sda,
May 25 15:38:35 ubuntu kernel: [ 267.472891] the block number: 3307618,
May 25 15:38:35 ubuntu kernel: [ 267.472892] use count: 0
May 25 15:38:35 ubuntu kernel: [ 267.472892]
May 25 15:38:35 ubuntu kernel: [ 267.472893] Storage device the block is in: sda,
May 25 15:38:35 ubuntu kernel: [ 267.472894] the block number: 3307619,
May 25 15:38:35 ubuntu kernel: [ 267.472895] use count: 0
May 25 15:38:35 ubuntu kernel: [ 267.472895]

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### Output during Read Operation (cropped for space saving)

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May 25 15:58:36 ubuntu kernel: [ 1468.209357] fd: 0, current file position ptr: 0, user's id: 0,
access mode:393219, file name: 1, inode no: 4, file length: 0, no of blocks: 0
May 25 15:58:36 ubuntu kernel: [ 1468.209364] fd: 1, current file position ptr: 0, user's id: 0,
access mode:393219, file name: 1, inode no: 4, file length: 0, no of blocks: 0
May 25 15:58:36 ubuntu kernel: [ 1468.209367] fd: 2, current file position ptr: 0, user's id: 0,
access mode:393219, file name: 1, inode no: 4, file length: 0, no of blocks: 0
May 25 15:58:36 ubuntu kernel: [ 1468.209369] fd: 3, current file position ptr: 19996672, user's
id: 0, access mode:134578206, file name: 0.txt, inode no: 3027447, file length: 19996672, no of
blocks: 0
May 25 15:58:36 ubuntu kernel: [ 1468.209375] Storage device the block is in: sda,
May 25 15:58:36 ubuntu kernel: [ 1468.209375] the block number: 18446744073709486080,
May 25 15:58:36 ubuntu kernel: [ 1468.209376] use count: 0
May 25 15:58:36 ubuntu kernel: [ 1468.209376]
May 25 15:58:36 ubuntu kernel: [ 1468.209377] Storage device the block is in: sda,
May 25 15:58:36 ubuntu kernel: [ 1468.209378] the block number: 18446744073709486080,
May 25 15:58:36 ubuntu kernel: [ 1468.209379] use count: 0
May 25 15:58:36 ubuntu kernel: [ 1468.209379]
May 25 15:58:36 ubuntu kernel: [ 1468.209380] Storage device the block is in: sda,
May 25 15:58:36 ubuntu kernel: [ 1468.209381] the block number: 18446744073709486080,
May 25 15:58:36 ubuntu kernel: [ 1468.209382] use count: 0
May 25 15:58:36 ubuntu kernel: [ 1468.209382]

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[illegible]

[illegible]



May 25 15:58:36 ubuntu kernel: [ 1468.209690] use count: 0  
May 25 15:58:36 ubuntu kernel: [ 1468.209690]  
May 25 15:58:36 ubuntu kernel: [ 1468.209691] Storage device the block is in: sda,  
May 25 15:58:36 ubuntu kernel: [ 1468.209692] the block number: 18446744073709486080,  
May 25 15:58:36 ubuntu kernel: [ 1468.209693] use count: 0  
May 25 15:58:36 ubuntu kernel: [ 1468.209693]  
May 25 15:58:36 ubuntu kernel: [ 1468.209694] Storage device the block is in: sda,  
May 25 15:58:36 ubuntu kernel: [ 1468.209695] the block number: 18446744073709486080,  
May 25 15:58:36 ubuntu kernel: [ 1468.209696] use count: 0  
May 25 15:58:36 ubuntu kernel: [ 1468.209696]