Operating Systems
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Course: CO20-320202
September 27, 2018

Problem Sheet 1

Problem 1.1

Solution:

(a) Please check the program *"scat.c"* under the folder named *"1a"*.

(b) When we are using the argument *"-l"* we can definitely see that the program execution is much faster. On top of that, the possibility that the processes goes into system mode is significantly less unlike when using the argument *"-s"*. When we use the argument *"-s"* we can see that we spent more time in system mode and the execution time of the program is drastically higher than *"-l"*.

The reason for this is that when we use *"-s"* we make only system calls for every byte, i.e., for every input character. Every time this character has to be printed out we have to switch from user to system mode, which is pretty expensive. The *write()* and *read()* system calls always return length 1 or less in this case.

When using *"-l"* we store the output in a buffer and once the buffer is full it gets printed out. The program execution is faster in this case because we have significantly less system calls *read()* and *write()*. Also, when we use *strace* on *"-l"* we can see that the length that *write()* and *read()* return is mostly 4096, except at the last several characters where it might be less than 4096.

(c) Please check the program *"scat.c"* under the folder named *"1c"*.

When we use Linux system call *sendfile()* we see behaviour similar to library function calls. This is the case because we increase the reading/writing buffer to 4096 (because it is stated in the task 1c: *"...Set the amount of data that is copied in each call of sendfile() such that it matches the number of bytes read and written by the C library..."*). If we decrease the size of the buffer the execution time becomes greater and the time we spent in system mode becomes greater.

Problem 1.2

Solution:

Please check the program *"watch.c"* under the folder named *"2"*.