My Own System Call

Description

I copy the user supplied file name from user space to kernel space using strncpy_from_user(). Then I traverse task_struct using for_each_process(task). If the pid matches the input pid then it prints 5 fields which are process name, pid, process state, RT_Priority and static priority using printk in the kernel log. Also I keep concatenating these values to a string called data which I will later write into the file. For writing to file I use filp_open() to open and create the file, and use kernel_write to write data to the file. I then close the file using filp_close() and return 0, on successful execution. If I encounter any errors, I've handled them appropriately in the program, and explained them below.

User input

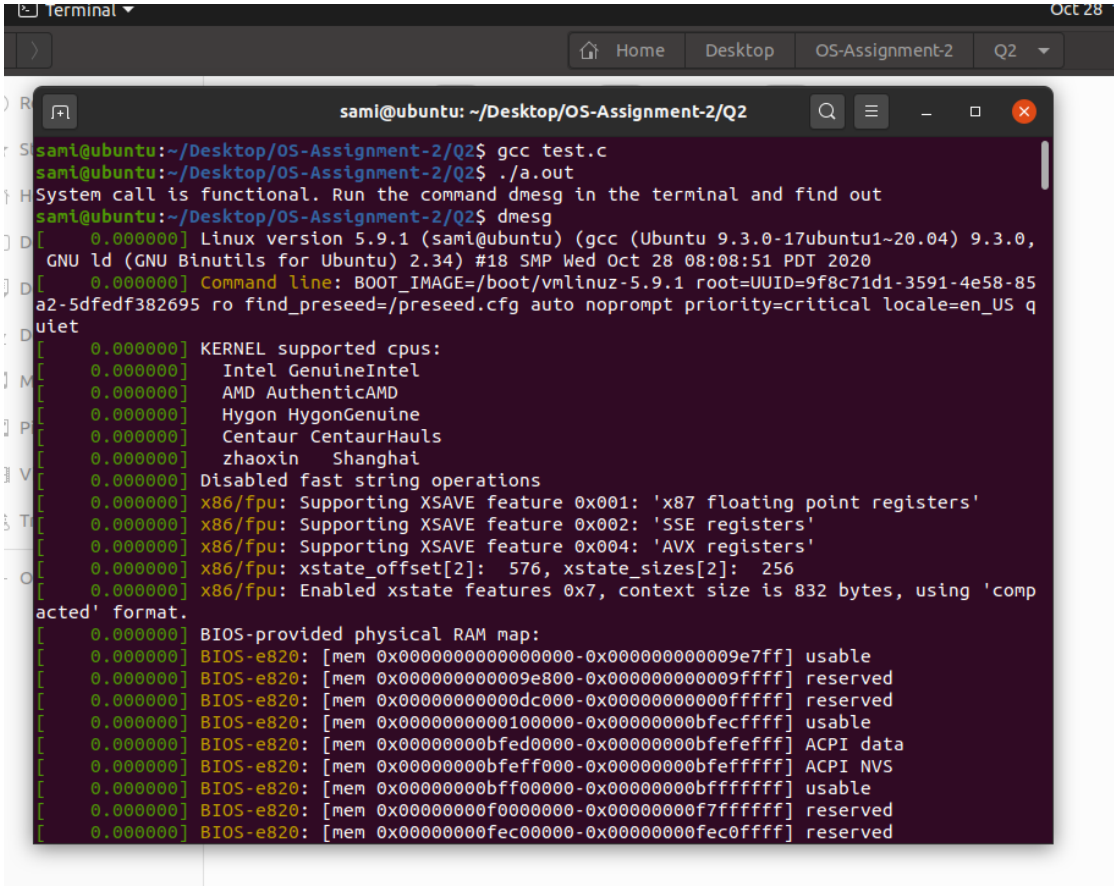
I have hardcoded the user inputs in test.c file. The pid is passed using getpid() and the filename supplied is "output" which is saved in the home directory

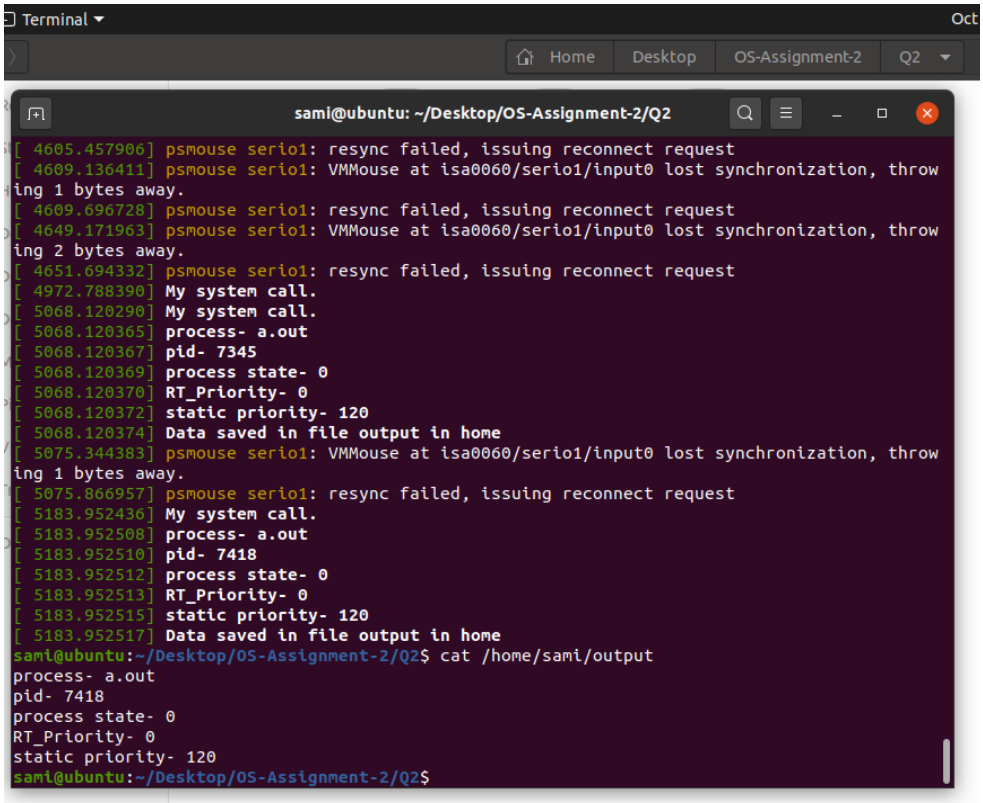
Expected output

On doing dmesg on the terminal we can see the kernel log printed on the terminal. It will show "My System Call" which means I was able to enter my system call. Then it will print the 5 fields of the given pid, provided it exists in task_struct. The next line will tell us that the data was saved in the given input file, which we can confirm by opening the file saved in the home directory. If there was error, then it will be printed in the terminal.

Errors handled

The pathname should not exceed length of 300. It should also not be empty.
The file to be written to couldn't be opened
The pid given does not correspond to any task in task_struct


Terminal
Oct 28
Home
Desktop
OS-Assignment-2
Q2
sami@ubuntu: ~/Desktop/OS-Assignment-2/Q2
sami@ubuntu:~/Desktop/OS-Assignment-2/Q2$ gcc test.c
sami@ubuntu:~/Desktop/OS-Assignment-2/Q2$ ./a.out
System call is functional. Run the command dmesg in the terminal and find out
sami@ubuntu:~/Desktop/OS-Assignment-2/Q2$ dmesg
[0.000000] Linux version 5.9.1 (sami@ubuntu) (gcc (Ubuntu 9.3.0-17ubuntu1~20.04) 9.3.0, GNU ld (GNU Binutils for Ubuntu) 2.34) #18 SMP Wed Oct 28 08:08:51 PDT 2020
[0.000000] Command line: BOOT_IMAGE=/boot/vmlinuz-5.9.1 root=UUID=9f8c71d1-3591-4e58-85a2-5dfedf382695 ro find_preseed=/preseed.cfg auto noprompt priority=critical locale=en_US quiet
[0.000000] KERNEL supported cpus:
[0.000000] Intel GenuineIntel
[0.000000] AMD AuthenticAMD
[0.000000] Hygon HygonGenuine
[0.000000] Centaur CentaurHauls
[0.000000] zhaoxin Shanghai
[0.000000] Disabled fast string operations
[0.000000] x86/fpu: Supporting XSAVE feature 0x001: 'x87 floating point registers'
[0.000000] x86/fpu: Supporting XSAVE feature 0x002: 'SSE registers'
[0.000000] x86/fpu: Supporting XSAVE feature 0x004: 'AVX registers'
[0.000000] x86/fpu: xstate_offset[2]: 576, xstate_sizes[2]: 256
[0.000000] x86/fpu: Enabled xstate features 0x7, context size is 832 bytes, using 'compacted' format.
[0.000000] BIOS-provided physical RAM map:
[0.000000] BIOS-e820: [mem 0x0000000000000000-0x000000000009e7ff] usable
[0.000000] BIOS-e820: [mem 0x000000000009e800-0x000000000009ffff] reserved
[0.000000] BIOS-e820: [mem 0x00000000000dc000-0x00000000000fffff] reserved
[0.000000] BIOS-e820: [mem 0x0000000000100000-0x00000000bfecffff] usable
[0.000000] BIOS-e820: [mem 0x00000000bfed0000-0x00000000bfefefff] ACPI data
[0.000000] BIOS-e820: [mem 0x00000000bfeff000-0x00000000bfefffff] ACPI NVS
[0.000000] BIOS-e820: [mem 0x00000000bff00000-0x00000000bfffffff] usable
[0.000000] BIOS-e820: [mem 0x00000000f0000000-0x00000000f7ffffff] reserved
[0.000000] BIOS-e820: [mem 0x00000000fec00000-0x00000000fec0ffff] reserved


Terminal
Oct
Home
Desktop
OS-Assignment-2
Q2
sami@ubuntu: ~/Desktop/OS-Assignment-2/Q2
[4605.457906] psmouse serio1: resync failed, issuing reconnect request
[4609.136411] psmouse serio1: VMMouse at isa0060/serio1/input0 lost synchronization, throwing 1 bytes away.
[4609.696728] psmouse serio1: resync failed, issuing reconnect request
[4649.171963] psmouse serio1: VMMouse at isa0060/serio1/input0 lost synchronization, throwing 2 bytes away.
[4651.694332] psmouse serio1: resync failed, issuing reconnect request
[4972.788390] My system call.
[5068.120290] My system call.
[5068.120365] process- a.out
[5068.120367] pid- 7345
[5068.120369] process state- 0
[5068.120370] RT_Priority- 0
[5068.120372] static priority- 120
[5068.120374] Data saved in file output in home
[5075.344383] psmouse serio1: VMMouse at isa0060/serio1/input0 lost synchronization, throwing 1 bytes away.
[5075.866957] psmouse serio1: resync failed, issuing reconnect request
[5183.952436] My system call.
[5183.952508] process- a.out
[5183.952510] pid- 7418
[5183.952512] process state- 0
[5183.952513] RT_Priority- 0
[5183.952515] static priority- 120
[5183.952517] Data saved in file output in home
sami@ubuntu:~/Desktop/OS-Assignment-2/Q2$ cat /home/sami/output
process- a.out
pid- 7418
process state- 0
RT_Priority- 0
static priority- 120
sami@ubuntu:~/Desktop/OS-Assignment-2/Q2$