Jesse Knuckles
I pledge my honor that I have abided by the Stevens Honor System.

3.2: This shows that I have created my device special file, my device driver function works, and that the user mode scull program can print the proper values of the task_info struct on input i.

```
jknuckle@debian:~/jknuckle-pa4/driver$ id
uid=1000(jknuckle) gid=1000(jknuckle) groups=1000(jknuckle),24(cd
rom),25(floppy),27(sudo),29(audio),30(dip),44(video),46(plugdev),
100(users),106(netdev),111(bluetooth),113(lpadmin),116(scanner)
jknuckle@debian:~/jknuckle-pa4/driver$ uname -a
Linux debian 6.1.0-18-amd64 #1 SMP PREEMPT_DYNAMIC Debian 6.1.76-
1 (2024-02-01) x86_64 GNU/Linux
jknuckle@debian:~/jknuckle-pa4/driver$ ls -l /dev/scull
crw-r--r-- 1 root root 244, 0 Mar 26 09:47 /dev/scull
jknuckle@debian:~/jknuckle-pa4/driver$ make
make -C /lib/modules/6.1.0-18-amd64/build M=/home/jknuckle/jknuck
le-pa4/driver modules
make[1]: Entering directory '/usr/src/linux-headers-6.1.0-18-amd6
4'
  CC [M]  /home/jknuckle/jknuckle-pa4/driver/scull.o
  MODPOST /home/jknuckle/jknuckle-pa4/driver/Module.symvers
  LD [M]  /home/jknuckle/jknuckle-pa4/driver/scull.ko
  BTF [M] /home/jknuckle/jknuckle-pa4/driver/scull.ko
Skipping BTF generation for /home/jknuckle/jknuckle-pa4/driver/sc
ull.ko due to unavailability of vmlinux
make[1]: Leaving directory '/usr/src/linux-headers-6.1.0-18-amd64
'
jknuckle@debian:~/jknuckle-pa4/driver$ sudo insmod ./scull.ko
jknuckle@debian:~/jknuckle-pa4/driver$
```

```
jknuckle@debian:~/jknuckle-pa4/src$ ./scull i
Device (/dev/scull) opened
state 0, cpu 1, prio 120, pid 9424, tgid 9424, nv 0, niv 0
Device (/dev/scull) closed
jknuckle@debian:~/jknuckle-pa4/src$ ./scull i
Device (/dev/scull) opened
state 0, cpu 6, prio 120, pid 9425, tgid 9425, nv 0, niv 0
Device (/dev/scull) closed
jknuckle@debian:~/jknuckle-pa4/src$
```

4.1: This shows that my linked list is properly set up in the device driver, and that it prints the proper values to the kernel log when the driver is removed from the kernel.

```
jknuckle@debian:~/jknuckle-pa4/src$ id
uid=1000(jknuckle) gid=1000(jknuckle) groups=1000(jknuckle),24(cdrom),25(floppy),27(sudo
),29(audio),30(dip),44(video),46(plugdev),100(users),106(netdev),111(bluetooth),113(lpad
min),116(scanner)
jknuckle@debian:~/jknuckle-pa4/src$ sudo insmod ../driver/scull.ko
jknuckle@debian:~/jknuckle-pa4/src$ ./scull i
Device (/dev/scull) opened
state 0, cpu 1, prio 120, pid 9439, tgid 9439, nv 0, niv 3
Device (/dev/scull) closed
jknuckle@debian:~/jknuckle-pa4/src$ ./scull i
Device (/dev/scull) opened
state 0, cpu 7, prio 120, pid 9440, tgid 9440, nv 0, niv 0
Device (/dev/scull) closed
jknuckle@debian:~/jknuckle-pa4/src$ sudo rmmod scull
jknuckle@debian:~/jknuckle-pa4/src$ sudo dmesg | tail -6
[46340.766233] scull open
[46340.767010] scull close
[46343.986614] scull open
[46343.988558] scull close
[46363.054674] Task 1: PID 9439, TGID 9439
[46363.054737] Task 2: PID 9440, TGID 9440
jknuckle@debian:~/jknuckle-pa4/src$
```

4.2:This shows that p input to my user mode program works properly, that the processes are running concurrently in different cpus, and that the device driver linked list is working and printing the proper info to the kernel log when the driver is removed from the kernel.

```
jknuckle@debian:~/jknuckle-pa4/src$ id
uid=1000(jknuckle) gid=1000(jknuckle) groups=1000(jknuckle),24(cdrom),25(floppy),27(sudo
),29(audio),30(dip),44(video),46(plugdev),100(users),106(netdev),111(bluetooth),113(lpad
min),116(scanner)
jknuckle@debian:~/jknuckle-pa4/src$ sudo insmod ../driver/scull.ko
jknuckle@debian:~/jknuckle-pa4/src$ ./scull p
Device (/dev/scull) opened
state 0, cpu 6, prio 120, pid 9494, tgid 9494, nv 0, niv 0
state 0, cpu 6, prio 120, pid 9494, tgid 9494, nv 0, niv 0
state 0, cpu 5, prio 120, pid 9495, tgid 9495, nv 0, niv 0
state 0, cpu 7, prio 120, pid 9496, tgid 9496, nv 0, niv 0
state 0, cpu 5, prio 120, pid 9495, tgid 9495, nv 0, niv 0
state 0, cpu 7, prio 120, pid 9496, tgid 9496, nv 0, niv 0
state 0, cpu 0, prio 120, pid 9497, tgid 9497, nv 0, niv 0
state 0, cpu 0, prio 120, pid 9497, tgid 9497, nv 0, niv 0
Device (/dev/scull) closed
jknuckle@debian:~/jknuckle-pa4/src$ sudo rmmod scull
jknuckle@debian:~/jknuckle-pa4/src$ sudo dmesg | tail -6
[46618.304638] scull open
[46618.310203] scull close
[46624.316742] Task 1: PID 9494, TGID 9494
[46624.316807] Task 2: PID 9496, TGID 9496
[46624.316815] Task 3: PID 9495, TGID 9495
[46624.316821] Task 4: PID 9497, TGID 9497
jknuckle@debian:~/jknuckle-pa4/src$ 
```

4.3:This shows that t input to my user mode program is working properly, that all the threads are being created of the same process, that they are running concurrently on different cpus, and that the device driver linked list is working properly and prints the proper values to kernel log when the driver is removed from the kernel.

```
jknuckle@debian:~/jknuckle-pa4/src$ id
uid=1000(jknuckle) gid=1000(jknuckle) groups=1000(jknuckle),24(cdrom),25(floppy),27(sudo
),29(audio),30(dip),44(video),46(plugdev),100(users),106(netdev),111(bluetooth),113(lpad
min),116(scanner)
jknuckle@debian:~/jknuckle-pa4/src$ sudo insmod ../driver/scull.ko
jknuckle@debian:~/jknuckle-pa4/src$ ./scull t
Device (/dev/scull) opened
state 0, cpu 1, prio 120, pid 11332, tgid 11331, nv 0, niv 0
state 0, cpu 0, prio 120, pid 11333, tgid 11331, nv 0, niv 0
state 0, cpu 1, prio 120, pid 11332, tgid 11331, nv 0, niv 0
state 0, cpu 2, prio 120, pid 11335, tgid 11331, nv 0, niv 0
state 0, cpu 4, prio 120, pid 11334, tgid 11331, nv 0, niv 0
state 0, cpu 4, prio 120, pid 11334, tgid 11331, nv 0, niv 0
state 0, cpu 2, prio 120, pid 11335, tgid 11331, nv 0, niv 0
state 0, cpu 0, prio 120, pid 11333, tgid 11331, nv 0, niv 0
Device (/dev/scull) closed
jknuckle@debian:~/jknuckle-pa4/src$ sudo rmmod scull
jknuckle@debian:~/jknuckle-pa4/src$ sudo dmesg | tail -6
[51824.065618] scull open
[51824.070577] scull close
[51852.255302] Task 1: PID 11332, TGID 11331
[51852.255719] Task 2: PID 11333, TGID 11331
[51852.255743] Task 3: PID 11334, TGID 11331
[51852.255759] Task 4: PID 11335, TGID 11331
jknuckle@debian:~/jknuckle-pa4/src$ █
```