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Assignment 6 – Device Driver

Description:
This assignment builds a simple device driver in the C language with minimal functionalities. That includes an open, release, read, write, and at least one ioctl command. It must also be able to be unloaded and indicate that it has unloaded from the system. The program takes in data from the user, a number, and writes it to the device driver. And then it's read back to the user.

Approach / What I Did:
For this assignment, I first implemented open, read, write, init, exit, and release functions, in the module directory to build the structure of the device driver. Then moved on to the test C file, In the Test directory, to test the loading, unloading and functions, present in the device drive structure.

The open, read, and write function handle the opening, reading, and writing of the device driver. The loctl function is responsible for basic input and output. It is implemented with the test program, where the user can enter a number for encryption, writing to the device driver, and being read back from the device driver.
The init and exit functions are to initialize and exit the device driver. init function initializes the device driver and allocates major and minor numbers for the driver. It creates and adds device structure as well as structure class to the device system. The exit function exits the device driver by destroying the device structure and the structure class and finally unregistering the device.

Issues and Resolutions:

One issue I had was making the data read being encrypted, and I could not get the data encrypted properly. But I managed to read and write the data fine.

My other issue is the whole testing system is fairly simple and straight to the point. With the bare minimum of the device driver.

How to Run
Exact steps are shown in the screenshot.

From the module dir:
Make
sudo insmod deviceDriver.ko //This will load the device driver
cd ..
cd Test // Go the test folder
make
sudo make run ./mahdavi_abbas_HW6_main continued...

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To unload the device driver:
Cd Module
Sudo rmmod deviceDriver
cd ..
cd Test
make clean

Screen shot of compilation:

```
student@student-VirtualBox:~/Documents/A6/csc415-device-driver-AbbasMahdavi021$ cd Module
student@student-VirtualBox:~/Documents/A6/csc415-device-driver-AbbasMahdavi021/Module$ make
make -C /lib/modules/`uname -r`/build M=/home/student/Documents/A6/csc415-device-driver-AbbasMahdavi021/Module
modules
make[1]: Entering directory '/usr/src/linux-headers-5.4.0-126-generic'
  CC [M]  /home/student/Documents/A6/csc415-device-driver-AbbasMahdavi021/Module/deviceDriver.o
  Building modules, stage 2.
  MODPOST 1 modules
  CC [M]  /home/student/Documents/A6/csc415-device-driver-AbbasMahdavi021/Module/deviceDriver.mod.o
  LD [M]  /home/student/Documents/A6/csc415-device-driver-AbbasMahdavi021/Module/deviceDriver.ko
make[1]: Leaving directory '/usr/src/linux-headers-5.4.0-126-generic'
student@student-VirtualBox:~/Documents/A6/csc415-device-driver-AbbasMahdavi021/Module$
```

```
student@student-VirtualBox:~/Documents/A6/csc415-device-driver-AbbasMahdavi021/Module$
sudo insmod deviceDriver.ko
[sudo] password for student:
student@student-VirtualBox:~/Documents/A6/csc415-device-driver-AbbasMahdavi021/Module$
cd ..
student@student-VirtualBox:~/Documents/A6/csc415-device-driver-AbbasMahdavi021$ cd Test
student@student-VirtualBox:~/Documents/A6/csc415-device-driver-AbbasMahdavi021/Test$
```

```
@student-VirtualBox:~/Documents/A6/csc415-device-driver-AbbasMahdavi021/Test$ make
gcc -c -o mahdavi_abbas_HW6_main.o mahdavi_abbas_HW6_main.c -g -I.
gcc -o mahdavi_abbas_HW6_main mahdavi_abbas_HW6_main.o -g -I. -l pthread
student@student-VirtualBox:~/Documents/A6/csc415-device-driver-AbbasMahdavi021/Test$
```

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Screen shot(s) of the execution of the program:

```
student@student-VirtualBox:~/Documents/A6/csc415-device-driver-AbbasMahdavi021/Test$ sudo make run
 ./mahdavi_abbas_HW6_main
[sudo] password for student:
./mahdavi_abbas_HW6_main
Device Driver Test Started!

Opening Device Driver...
Device Opened Successfully!

Let's test the write function!
Enter a number to be written to the Device: 10

Data being sent to the device..

Testing..

Reading data from Device Driver..

The TEST wrote the number data, 10, to the device!

The TEST read back the number data, 10, from the device!

TEST COMPLETE!

-Closing Device Driver..
Device Driver closed Successfully!
make: 'mahdavi_abbas_HW6_main' is up to date.
student@student-VirtualBox:~/Documents/A6/csc415-device-driver-AbbasMahdavi021/Test$
```