CSC-415-01 Fall 2020
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Project: Assignment 6 – Device Driver
Github: rinaykumar
Link: https://github.com/CSC415-Fall2020/assignment-6-device-driver-rinaykumar

Description:

The goal of this assignment was to create a simple Linux kernel module and link it to a user application to show its functionality. A template provided by the instructor was used to create the LKM. Changes were made to the write and read methods, along with adding an ioctl method to send and receive data from the user program, and a method to calculate the nth digit in the Fibonacci sequence.

The user program takes an input of which digit of the Fibonacci sequence the user would like in the form of a string, then sends that string using write to the kernel mod, which then stores the string. The user program then retrieves the message from the kernel mod using read and displays the message back to the user in the terminal. The string is then converted to an integer, and an ioctl call for write is used to send the integer to the kernel mod, where it is stored. Then the user program makes an ioctl read call, which takes the stored integer in the kernel mod, sends it to a method that calculates the nth digit in the Fibonacci sequence, then sends the new calculated result back to the user program. The user program then displays the Fibonacci number.

The program contains utilization of open, release, read, write, and two ioctl commands. To incorporate both read/write and ioctl, the program first sends the input as a string then receives the string back to display it, then converts the string to an int and sends/receives it with ioctl. The copy_to_user method is used in the ioctl function, along with printk statements to the kernel log.

The run the program, the steps are:

1. Navigate to the assignment 6 folder and type ‘make’
2. Then type ‘sudo insmod kernelMod.ko’
3. Then cd into the testProgram folder and run ‘make’
4. Then type ‘sudo make run’ to run the user program

These steps are visualized in Figure 1 below. Figure 1 also shows a sample run with the input of 11, returning the 11th number in the Fibonacci sequence; 89. It then shows an invalid input and the resulting error. Figure 2 shows the kernel log with messages from the KernelMod in one sample run of the program with the input value of 9 and Fibonacci result of 34.

Sample Output:

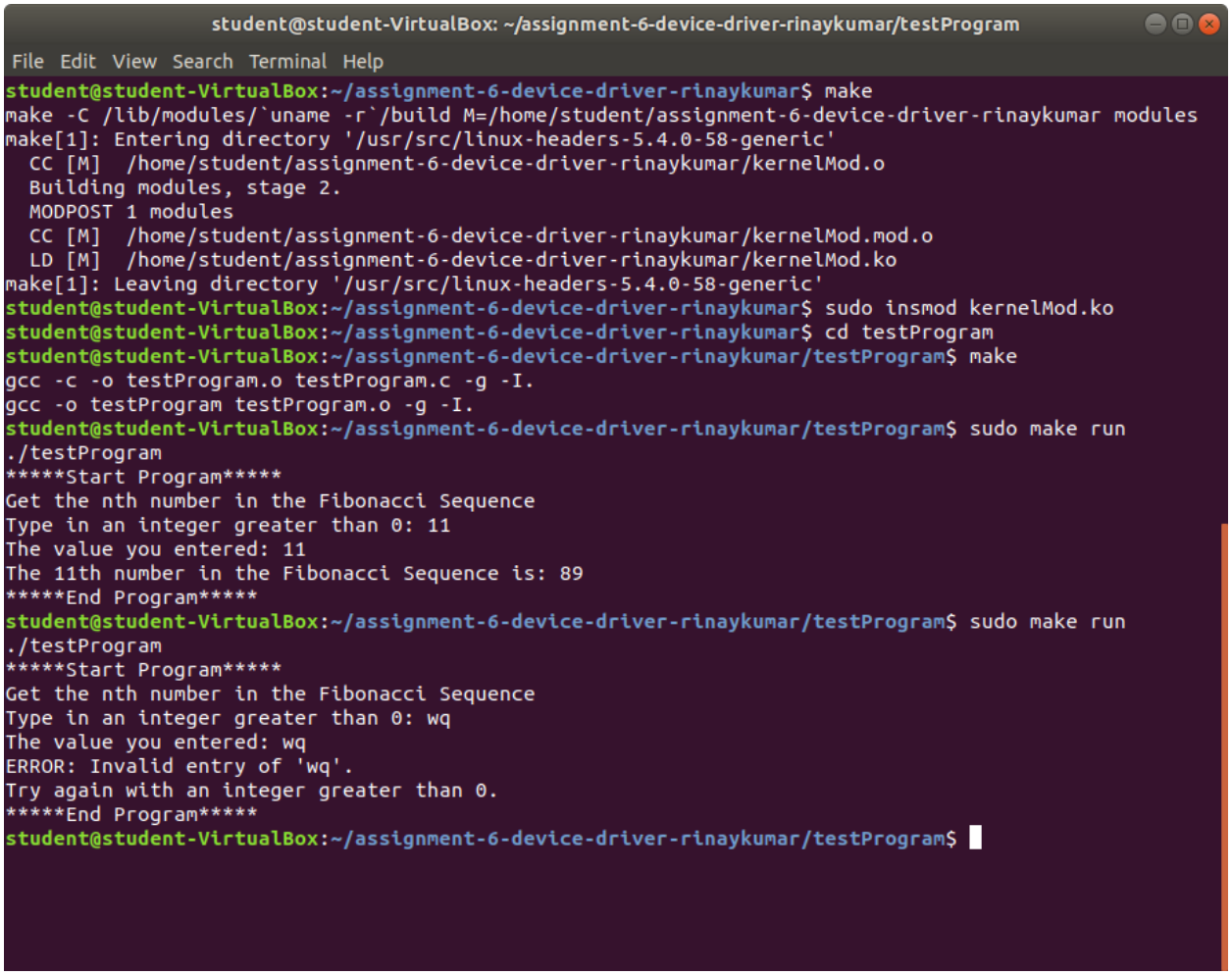

Fig 1. Shows the steps to make and run the program, along with a sample execution.

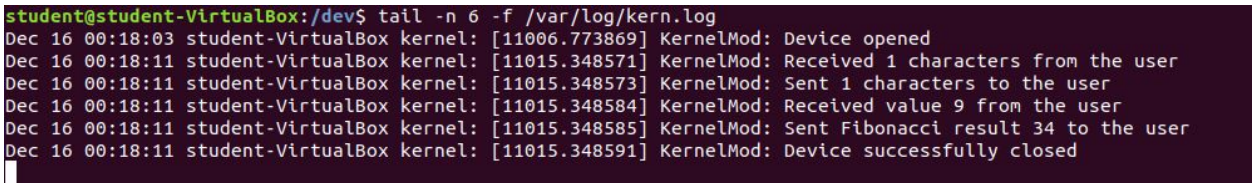

Fig 2. Shows the Linux kernel log with messages from the KernelMod in one sample run.