CS 470 - Operating Systems
Spring 2019 – Homework 1
20 points

Out: January 18, 2019
Due: January 25, 2018 (Friday)

The purpose of this homework is provide experience with using a virtual machine (VM) and developing a (trivial) kernel module in Linux.

(15 points) This assignment is to implement the Linux Kernel Module project on pages 96-101 of the textbook using a Linux VM. It consists of three parts: creating a virtual machine, creating a simple kernel module that can be loaded and removed from the kernel, and using the kernel linked list structure.

1. If you already have a Linux VM, and are willing to use it, you can skip this step. Please not that while the assignment should not cause any issues, it may be possible to "break" the Linux kernel inadvertently.

Otherwise, install the image described below. For the virtual machine, use VirtualBox or other virtualization product. VirtualBox is available on the lab machines (both Linux and Windows), or can be downloaded from the VirtualBox website (http://www.virtualbox.org) and installed.

The file **/home/hwang/cs470/hwk1/cs470-ubuntu.zip** on csserver is a zipfile containing a VirtualBox virtual disk image (**cs470-ubuntu.vdi**) that is to be used to create a virtual Linux machine. Copy the zipfile to your own development space. Extract the VDI file from the zipfile. (Please note that the zipfile is about 3GB and the extracted VDI file is about 7GB.) To create the VM do the following:

1. Start up VirtualBox, click on the New button. This will open the VM wizard for creating a new VM.
2. Give your VM a name like "cs470-ubuntu". The OS type is ubuntu, and the version should be 64-bit, then click Next. If there is only 32-bit for version, you either have a 32-bit machine, in which case you'll need to do this assignment on a lab machine. Or you need to turn on hardware virtualization (in particular, HP machine have it turned off by default) in which case, you'll need go into the BIOS settings and turn it on, then try again.
3. Set base memory size to 2048 MB, and click Next.
4. Click on the radio button for "Use an existing virtual hard disk file". Browse to the VDI file (**cs470-ubuntu.vdi**), then click Create.
5. To start a VM, select it, then click on the Start button. The OS will boot up. The default user name is **cs470admin** and the password is **GoPurpleAces!**. This account has administrator privileges, which means the it can run the **sudo** command by providing the account password.

2. If using your own VM, create a directory for this homework and use scp to copy the kernel module stub (**simple.c**) and the **Makefile** from the **/home/hwang/cs470/hwk1** directory on csserver. In the provided VM, the **homework1** directory of the cs470admin account contains the appropriate files.

The makefile will compile the stub into a kernel module as described in the textbook. You should not change the makefile or the names of the files.

3. Implement the Linux Kernel Module project as outlined in the textbook. The coding for this homework is to be done individually, though you can confer with others regarding how to use the kernel data structures and commands. Note that the purpose of this assignment is to deal with allocating kernel structures on loading the module and deallocating them upon removing the module, so the birthday list should not be deallocated until the module is removed. **To demonstrate this, the `simple_exit` function should print out each node's data before deallocating it.**

(5 points) Demonstrate the project to the instructor as outlined in the textbook no later than 5:00pm on Friday, January 25. Appointments may be made during most times the instructor does not have scheduled activities. Demos may be attempted at most two times after which late penalties for this portion will accrue per attempt.

What to Submit

Create a tarfile or a zipfile containing a **well-documented `simple.c`** file and the makefile for the kernel module. Submit your archive using the submission system (http://submission.evansville.edu) by 11:59pm on Friday, January 25, for full credit (i.e., use a web browser in the VM). Your username for this course is your ACENET username with suffix "-cs470" appended to it (e.g. dh27-cs470), and your initial password is your student ID number including the leading 0 (i.e. 7 digits). The grading script only will accept submissions. It will not run anything.