A4 - Kernel Module and Linked List

The goal of this homework assignment is to help you become familiar with a Linux kernel module and to understand how to use linked lists.

Instructions are available here: https://xiaoguang.wang/cs594-s25/hw/hw4.html

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Hints:

1. It is better to develop the kernel module in a QEMU virtual machine (or on a machine that you can easily reboot).

2. You can use the VM for assignments A2 and A3; however, do not use your customized Linux kernel. You may comment out the last two lines in *run-ubuntu.sh* to enable the default kernel on Ubuntu:

```
... ...
sudo ${QEMU_BIN} \
    -s \
    -nographic \
    -smp ${NCPU} -m ${MEMSIZE} \
    -nic user,host=10.0.2.10,hostfwd=tcp:127.0.0.1:2200-:22 \
    -net nic,model=e1000 \
    -drive file=${UBUNTU_IMG},format=qcow2 \
#    -kernel ${BZIMAGE} \
#    -append "${CMDLINE}"
```

Otherwise, you will encounter a kernel compilation error:

```
make -C /lib/modules/6.8.0-dirty/build M=/home/ubuntu/hw/code modules
make[1]: *** /lib/modules/6.8.0-dirty/build: No such file or directory.  Stop.
make: *** [Makefile:38: hw4] Error 2
```

Assignment 4: Linked list + kernel module

Introduction

This assignment is designed for you to become familiar with a Linux kernel module and to understand how to use linked lists.

Task 1: Use the linked list in a kernel module (~60 minutes)

[42 points] Download the source code for homework 4 -- hw4.tar.gz. Carefully read the code to understand the template code given and what you need to write.

Then add comments (`M1-M8`, `X1-X5`, `X9-X22`) explaining what each code block means and implement features (`X6-X8`). Rename the folder's name to `hw4_firstname` and create a gzip-ed tarball named `hw4_firstname.tar.gz`. **Turn in the gzip-ed tarball.**

Grading rubric

Makefile

- Explanation: M1-M8 - 1pt each =8pts

hw4.c

- Explanation: X1-X5,X9-X22 - 1pt each =19pts

- Implementation: X6-X8 - 5pts each =15pts

Task 2: Report the execution result

[3 points] Upload a screenshot (named `hw4_firstname.png|jpg`) of your kernel debug message using `dmesg` while you run following command. Specifically, run the **following command** and **`dmesg`** in **one SSH session using tmux**.

sudo insmod hw4.ko int_str="1,2,3,4,5"