

Learning Objectives

- Practice writing and using kernel modules on the Linux operating system
- Practice utilizing command-line utilities to observe the actions and status of kernel modules
- Review the common operating system data structure circular double-linked list

Assignment Description Part 1

The first task is to implement the Kernel Data Structures assignment on page 99-101 of the textbook using the Linux include files, macros, and sample code provided as a reference. You should output to the kernel module a simple statement of 'Adding Birthday Day:# Month:# Year:#' each time you create a new node on the linked list. The # should be the same as what is in the example figure below. Ensure that your code is working properly by checking the contents of the kernel buffer for the appropriate output messages. When deleting the nodes from the linked list you should similarly output a message for each deleted node of 'Deleting Birthday Day:# Month:# Year:#'. For deleting the elements from the list, you should do this **in reverse order**, instead of the way the book does it. See the figure below for an example of what your kernel buffer should look like after loading and removing your kernel module.

```
File Edit View Search Terminal Help
oscreader@OSC:~/Desktop/testcode/ch2_hw$ sudo insmod simple_new.ko
oscreader@OSC:~/Desktop/testcode/ch2_hw$ dmesg
[82825.490053] Loading Birthday Module
[82825.490055] Adding Birthday Day:2 Month:8 Year:1995
[82825.490056] Adding Birthday Day:3 Month:9 Year:1996
[82825.490057] Adding Birthday Day:4 Month:10 Year:1997
[82825.490058] Adding Birthday Day:5 Month:11 Year:1998
[82825.490059] Adding Birthday Day:6 Month:12 Year:1999
oscreader@OSC:~/Desktop/testcode/ch2_hw$ sudo rmmod simple_new
oscreader@OSC:~/Desktop/testcode/ch2_hw$ dmesg
[82825.490053] Loading Birthday Module
[82825.490055] Adding Birthday Day:2 Month:8 Year:1995
[82825.490056] Adding Birthday Day:3 Month:9 Year:1996
[82825.490057] Adding Birthday Day:4 Month:10 Year:1997
[82825.490058] Adding Birthday Day:5 Month:11 Year:1998
[82825.490059] Adding Birthday Day:6 Month:12 Year:1999
[82831.398849] Removing Birthday Day:6 Month:12 Year:1999
[82831.398851] Removing Birthday Day:5 Month:11 Year:1998
[82831.398852] Removing Birthday Day:4 Month:10 Year:1997
[82831.398853] Removing Birthday Day:3 Month:9 Year:1996
[82831.398854] Removing Birthday Day:2 Month:8 Year:1995
[82831.398854] Removing Birthday Module
oscreader@OSC:~/Desktop/testcode/ch2_hw$
```

I have provided a Makefile to help you to build your kernel module. Place the provided Makefile into your work directory and update it with the appropriate object file name for your submission.

Assignment Description Part 2

The second task for your assignment is to repeat the first task, but to instead implement your own versions of the functions for building a linked list. You must replace any functions/macros that come from the types.h or lists.h with your own functions. Your second solution should build a **circular doubly-linked list** and repeat the same process of adding five elements and traversing those elements when the kernel module is loaded and traversing the list and removing the elements in reverse order when the kernel module is removed. Be sure to remember to free the kernel memory in each task.

Submission

The assignment is due **Tuesday, October 2 @ 11:59pm** and should follow the name scheme ppape_CSCI4300_HW1A.c and ppape_CSCI4300_HW1B.c where you would use your own first initial and last name instead of 'ppape'. You should submit your solution to part 1 as HW1A and part 2 as HW1B.