

# Operating Systems

CMPT 424

## Lab 6

### Goals

#### Memory protection with base and limit tracking

This approximately one-hour active learning exercise will help you make progress on the practical aspects of developing your operating system.

### Instructions

1. Look at your *iProject 3* functional requirements as Issues in GitHub as part of the “*iProject 3*” milestone and make sure that everything is in there.
2. Increase your memory from 256 bytes to 768 bytes. Be sure that you can map a memory partition number (0,1,2) to the appropriate base address (0, 256, 512).
3. Add to your Process Control Block as necessary to keep track of where a given process is held in memory.
4. Add memory protection fields (base and limit memory addresses) to your PCB.
5. Add other new features as specified in your Issues and *iProject 3*.
6. Test. (You should be really good at this by now. You better be!)
7. Read chapter 8.3 in the 8<sup>th</sup> edition of our text again.
8. Read chapters 14.1 and 14.3.3 in the 8<sup>th</sup> edition of our text.

### Questions

1. What?
2. Why?

### Resources

- <http://lwn.net/Articles/250967/>
- <http://duartes.org/gustavo/blog/post/memory-translation-and-segmentation/>
- Chapter 13 in <http://pages.cs.wisc.edu/%7Eremzi/OSTEP/>
- Chapter 15 in <http://pages.cs.wisc.edu/%7Eremzi/OSTEP/>
- Code to test memory limits:

A9 A9 A2 01 EC 13 00 AC 0B 00 8D F0 00 EE 0B 00 D0 F5 00 00

### Grading

Your work on this lab will contribute to your grade for *iProject3*.

### Submitting

Commit your work to your **private** GitHub account in an appropriately-named folder. Make sure to tag your commit messages with the Issue number they address.

The screenshot displays the iProject3 operating system interface. On the left, a terminal window shows the following commands and output:

```
>load
Process ID: 0
>run 0
>Memory access error from process 0
>
```

On the right, a dashboard provides system status information:

- Log:** Shows two entries for Saturday, July 31st, 2021, at 4:17:25 pm and 4:17:19 pm. The first entry is labeled "Idle" with a PID of 310. The second entry is labeled "Memory access error from process 0" with a PID of 181.
- Processes:** A table with columns for PID, PC, IR, ACC, X, Y, Z, Priority, State, and Location. It indicates "No programs are in execution".
- Memory:** A table showing memory addresses (0x000 to 0x018) and their corresponding values (all 00).
- Hard Drive:** A table showing disk sectors (0:0:0 to 0:0:2) and their corresponding values (all 00).
- CPU:** A table showing CPU status (No Instruction) and its corresponding values (all 00).

A red arrow points from the memory access error message in the Log to the memory access error message in the Log.