

## 3limited-direct-execution-lab

CST 334 (Operating Systems)  
Dr. Glenn Bruns

## Lab: Limited Direct Execution

The purpose of this lab is to help you understand the mechanics of interrupts. Please work with a partner. This is a paper-and-pencil lab -- you don't need to log into mlc104.

1. The images below show a blank interrupt vector table, and some operating system code related to the handling of a mouse click.

Without looking at the lecture slides or your notes, fill in the sequence of steps that occur when a mouse click happens. Discuss with your partner to try to remember and understand how this works. Fill in some entries of the interrupt vector table.

- user process 123 is running
- user clicks mouse
- ?
- ?
- etc.

interrupt vector table	
0	<input type="text"/>
1	<input type="text"/>
2	<input type="text"/>
3	<input type="text"/>

### OS kernel code

```
...
process_keyboard_input() {
    ...
}
process_mouse_click() {
    ...
}
...
```

Please take your time. When you're finished, please compare your answer to the lecture slides.

2. Suppose a text editor user process is running (as in the previous problem) and a mouse click occurs that is related to a browser process. Is the mouse click interrupt still processed immediately by the OS?
3. When your code does a divide by zero, does either an interrupt or trap occur? If so, is it an interrupt or a trap?
4. What kind of value is found in an entry in the interrupt vector table?

5. Could you write code on mlc104 that would call the `process_mouse_click()` function of the Linux kernel? If not, why not?

If you still have time, please do the following:

6. Figure out the process ID of your current bash shell. Hint: try to remember the command we use for listing processes.

7. Use command 'ps' to show all the processes currently running. Read the man page for ps and try a few of the options.

8. Explain what this bash command does:

```
$ ps -A | wc -l
```

9. In class we learned that a process can have child processes. Try command 'pstree'. Read the man page and understand what it does. Try a few of the command line options.

10. Using pstree, write down the path in the tree from the first 'init' process to your bash shell.

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