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Section G

Lab 5

3/8/18

Lab 5

Architectures:

- x86
- m68k
- arm
- mips
- openrisc

Filesystems:

- JFS
- ext4
- XFS

The hello world module and the command outputs:

```

root@cirno:/host/cpre308/lab5/src-1/src/hello-world# lsmod
Module                  Size  Used by
root@cirno:/host/cpre308/lab5/src-1/src/hello-world# modinfo hello_world.ko
filename:                /host/cpre308/lab5/src-1/src/hello-world/hello_world.ko
description:             A simple cat driver
author:                  Sean Hinchee seh@iastate.edu
license:                 GPL
depends:
vermagic:                4.10.1seh mod_unload
root@cirno:/host/cpre308/lab5/src-1/src/hello-world# insmod hello_world.ko
we [people of #cat-v] should get renamed to cat --warning_level verbose
root@cirno:/host/cpre308/lab5/src-1/src/hello-world# lsmod
Module                  Size  Used by
hello_world             1123  0
root@cirno:/host/cpre308/lab5/src-1/src/hello-world# rmmod hello_world.ko
I can no longer sit back and allow NIX infiltration, NIX indoctrination, NIXsubv
ersion and the international NIX conspiracy to sap and impurify all of our precio
us cats.
root@cirno:/host/cpre308/lab5/src-1/src/hello-world# lsmod
Module                  Size  Used by
root@cirno:/host/cpre308/lab5/src-1/src/hello-world# █

```

The prototypes are not identical because the kernel should be static (covering the static prefix for `ssize_t`) and because the arguments in the kernel involve a file (as file descriptors are not a necessary abstraction in this scope). Additionally, due to the fact that this is a character device we know we will be receiving character strings (rather than accommodating for binary streams in the read system call).

According to the struct `file_operations` the following operations are among those supported:

- `llseek`
- `read`
- `write`
- `mmap`
- `open`
- `flush`

- lock

The expected output for the module upon first reading is:

- opened: “I already told you 0 times Hello World!”
- written to: “Sorry, this operation isn't supported.”
- read from: No output.
- closed: No output.

The major number for the module is 254, outputs follow:

```
root@cirno:/host/cpre308/lab5/src-1/src/hello-file# insmod hello_file.ko
hello_file: loading out-of-tree module taints kernel.
hello_file: module license 'unspecified' taints kernel.
Disabling lock debugging due to kernel taint
I was assigned major number 254. To talk to
the driver, create a dev file with
'mknod /dev/cpre308 c 254 0'.
Try various minor numbers. Try to cat and echo to
the device file.
root@cirno:/host/cpre308/lab5/src-1/src/hello-file# mknod /dev/cpre308-0 c 254 0
root@cirno:/host/cpre308/lab5/src-1/src/hello-file# cat /dev/cpre308-0
I already told you 0 times Hello World!
root@cirno:/host/cpre308/lab5/src-1/src/hello-file# cat /dev/cpre308-0
I already told you 1 times Hello World!
root@cirno:/host/cpre308/lab5/src-1/src/hello-file# echo "hello" > /dev/cpre308-0
Sorry, this operation isn't supported.
bash: echo: write error: Invalid argument
root@cirno:/host/cpre308/lab5/src-1/src/hello-file# mknod /dev/cpre308-1 c 254 1
root@cirno:/host/cpre308/lab5/src-1/src/hello-file# cat /dev/cpre308-0
I already told you 3 times Hello World!
root@cirno:/host/cpre308/lab5/src-1/src/hello-file# cat /dev/cpre308-1
I already told you 4 times Hello World!
root@cirno:/host/cpre308/lab5/src-1/src/hello-file# rmmod hello_file.ko
root@cirno:/host/cpre308/lab5/src-1/src/hello-file# cat /dev/cpre308-0
cat: /dev/cpre308-0: No such device or address
root@cirno:/host/cpre308/lab5/src-1/src/hello-file# random: crng init done
```

The process flow for the above commands is very logical. A module is loaded, the device file is made, operations are performed, the module responds to said operations, then the module is deleted and the device file ceases to function/exist as a result.