Driver Basics



Getting our hands dirty

ECE 373

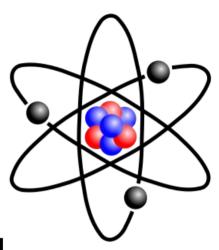
Prelims

• Questions on class?



Fun with Atoms and VM's

- Serial link to Atom box
 - Null modem serial cable
 - Putty and minicom
- Screen capture and session logging
 - Putty and minicom logs
 - Script command



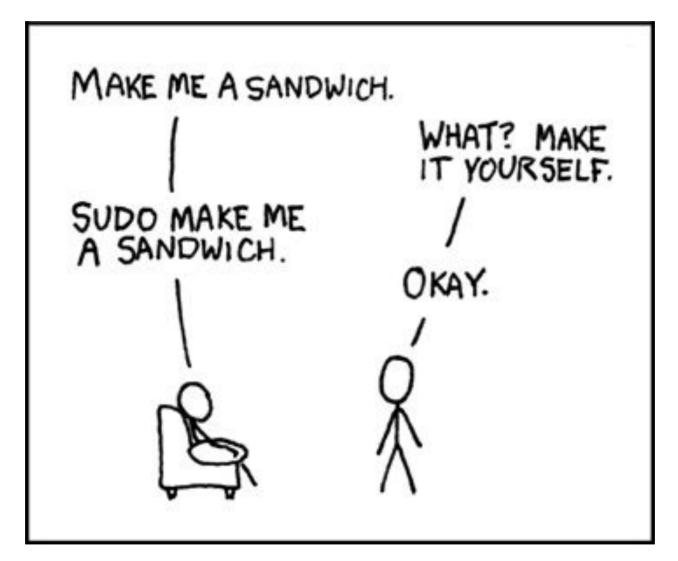
Virtual Machines

- "Serial" link to machine
 - Connects to a COM port
 - Also putty and minicom



- Also screen capture and session logging
- Emulates full computer inside of a "bare metal" machine
- Can load different "hardware" to emulate behavior
- Can direct-assign hardware into a VM as well

Running as root

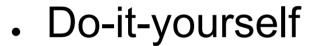


http://xkcd.com/149/

File Sharing – USB memory

GUI goodness

- Ubuntu GUI automounts USB
- /media/<volume-name>



- mkdir /media/usb
- Plug in USB drive
- Look for /dev/sdX in /var/log/messages or syslog
- mount /dev/sdX /media/usb
- umount /dev/sdX

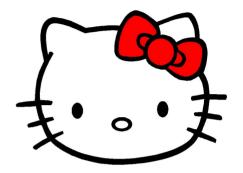


Virtual Machines

- Hypervisor (thing that runs VM) integrates with host
 - Hypervisor examples:
 - KVM
 - Hyper-V
 - VMware and friends
 - VirtualBox
 - Parallels (Mac-specific)
- Host == "bare metal"
- Share files between VM and host
 - Hypervisors have shared folders to map
 - ssh into VM (may need to install openssh-server)
 - Virtual "USB stick" for VM

Hello Kernel

```
#include <linux/init.h>
#include <linux/module.h>
MODULE LICENSE ("Dual BSD/GPL");
static int init hello init(void)
   printk(KERN INFO "Hello, kernel\n");
   return 0;
static void exit hello exit (void)
   printk(KERN INFO "Goodbye, kernel\n");
module init(hello init);
module exit(hello exit);
```



Plug-In APIs

- Application Programming Interface
- Defines "hooks" on which to hang your driver
- Standard programming connections



Bits and pieces

- Standard API for all driver modules
- Minimal callback hooks and Compile headers
 - Basic #include's
 - MODULE LICENSE(lic) legal strings
 - __init, __exit
 - module_init(func)
 - module exit(func)
- printk() and KERN_xxx
- Kernel Makefile convolutions
- Compile command

Makefile

Makefile

```
KERNEL DIR = /lib/modules/$(shell uname -r)/build
PWD := $(shell pwd)
obj-m += hello kernel.o
default:
        $(MAKE) -C $(KERNEL DIR) M=$(PWD) modules
clean:
        $(MAKE) -C $(KERNEL DIR) M=$(PWD) clean
        Tabs, not spaces
```

Try it out

- Compile: make
- Load: insmod hello kernel.ko
- Results
 - lsmod
 - dmesg more detailed, but limited circular buffer
 - tail /var/log/syslog managed syslog text
 file, not as much detail
 - journalctl for your systemd overlords
- Remove: rmmod hello kernel

