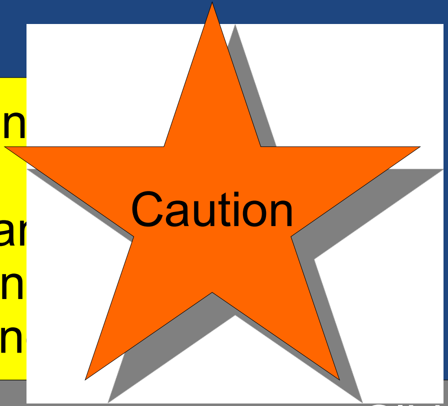
Intro to Linux Drivers

Kernel coding is differen

Can be hard to understar
different syntax, function
advanced C code in kern



Topics

1) What is the “Hello world” of Linux drivers?
2) How can we build a driver?
3) No printf()?!? What can we do?

Hello World -- the Driver

Building a Linux Driver

What’s in a Driver?

- printk(): ..

  printk(KERN_INFO "Hello world!\n");

- module_init() & module_exit() macros: tell kernel our functions to..

```
static int __init testdriver_init(void)
{
      // Driver’s initialization code when loaded
}
static void __exit testdriver_exit(void)
{
      // Driver’s cleanup code when unloaded
}

// Macros telling kernel which functions to run
module_init(testdriver_init);
module_exit(testdriver_exit);
```

What’s in a Driver?

- What are __init and __exit?

```
static int __init testdriver_init(void) {...}
static void __exit testdriver_exit(void){...}

module_init(testdriver_init);
module_exit(testdriver_exit);
```

..

__init: startup only; freed when kernel booted.

__exit: function not needed if modules built into kernel.

- MODULE_XYZ(): Macros defining module info

```
// Information about this module:
MODULE_AUTHOR("Dr. Evil");
MODULE_DESCRIPTION("A simple test driver");
MODULE_LICENSE("GPL");          // Important to leave as GPL.
```

Driver Build Demo

(in my directory 12-TestDriver/)

- To Show
  - testdriver.c
  - Makefile
    1) invokes the kernel’s Makefile
    2) kernel re-executes our Makefile
    3) deploy .ko file to NFS public directory

Working with .ko files

Commands

- Commands for working with drivers (.ko files)
  - List loaded modules
    - ..
  - Load module
    - ..
  - Unload module
    - ..
  - View module info
    - ..
  - View strings
    - ..

Demo

- Load drv on target:

```
(bbg)$ lsmod
  Columns are: Module, Size, # Used by (and those modules)
(bbg)$ dmesg

(bbg)$ insmod daDriver.ko

(bbg)$ lsmod
(bbg)$ dmesg
```

- Remove on target;

```
(bbg)$ rmmod daDriver.ko
(bbg)$ lsmod
(bbg)$ dmesg
```

- View driver info
  [(on host/target) {shows dependencies, vermagic, params}]:

```
(bbg)$ modinfo daDriver.ko
(bbg)$ uname -r
(bbg)$ strings daDriver.ko
```

printk()

- printk(): kernel's printf; view with dmesg
  - printk(KERN_INFO "Hello %d %s!\n", 1, "world");

    ..
- Log levels in KERNEL/include/linux/kern_levels.h
  - KERN_EMERG (“0”) to KERN_DEBUG (“7”)
  - Usually use..
- Important messages shown on serial port
  - Set threshold

    (bbg)$ echo 7 > /proc/sys/kernel/printk
  - View threshold

    (bbg)$ cat /proc/sys/kernel/printk

    First number is the console log level.

printk() - cont.

- UBoot Aside
  - You can set log level via Linux’s cmdline from UBoot

    => set bootargs ${bootargs} loglevel=3
- Demo
  - Open serial terminal (shows some messages)
  - View demo_printk.ko

    (bbg)$ insmod demo_printk.ko

Summary

- printk(): Kernel's printf() to dmesg
  - Uses log levels KERN_EMERG to KERN_DEBUG
- module_init() and module_exit() set entry/exit points for driver
- .ko Commands
  - lsmod, insmod, rmmod, modinfo, strings