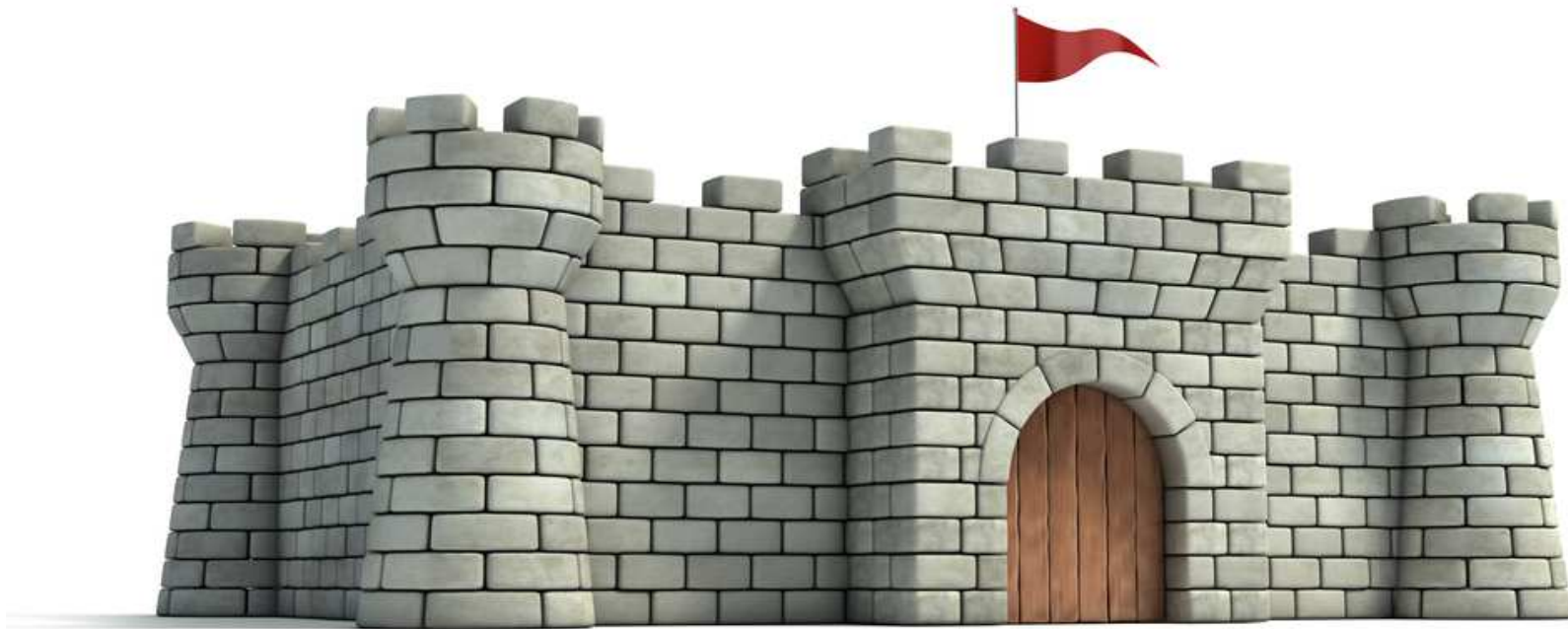


Linux Kernel LED Drivers



Topics

- 1) How can the kernel driver delay?
- 2) How can the kernel **drive an LED**?

Delays in the Kernel

- Can delay within a system call to the kernel:

```
#include <linux/delay.h>
int my_read(...) {
    msleep(100);
}
```

– ..

Kernel switches to other processes while waiting.

- **Ex:** Delay 200ms between characters
(Note: Poor use of printk!)

```
#include <linux/delay.h>
int my_read(...) {
    int i;
    printk(KERN_INFO);
    for (i = 0; i < count; i++) {
        printk("%c", buff[i]);
        msleep(200);
    }
    printk("\n");
}
```

Kernel Driving LEDs

- **Drivers Accessing LEDs**
 - Could hard-code your driver to flash a specific LED.
 - Bad: ..

Linux runs on virtually any hardware:
We want to be able to re-use our drivers on any
Beaglebone, Raspberry Pi, etc.

- **Decouple driver's LED on/off decisions from a specific LEDs**
 - ..
In user space, each LED is mapped to a trigger.
Device tree can specify default LED trigger.

Driving LEDs

- ..
 - `#include <linux/leds.h>`
`DEFINE_LED_TRIGGER(my_trigger);`
 - **in init:**
`led_trigger_register_simple(
 "da-name", // New trigger name
 &my_trigger); // Previously defined trigger struct`
 - **in exit:**
`led_trigger_unregister_simple(my_trigger);`
 - **drive LEDs:**
`led_trigger_event(my_trigger, LED_FULL);`
`led_trigger_event(my_trigger, LED_OFF);`

Kernel LED Demo

- `demo_ledtrig.c`

- Cat led0's trigger:

```
(bbg)$ cat /sys/class/leds/beaglebone....0/trigger
```

- Load driver:

```
(bbg)$ insmod demo_ledtrig
```

- Cat led0's triggers again

- Change trigger

```
(bbg)$ echo demo > /sys/class/leds/beaglebone...0/trigger
```

- Write text to demo_ledtrig

```
(bbg)$ echo 'hello world' > /dev/demo_ledtrig
```

Summary

- Use triggers to drive LEDs from the kernel
 - Have user-space setup mappings to actual LEDs (use device trees as needed)