ECE598: Advanced Operating Systems – Homework 6
Spring 2015
Graphics

Due: Wednesday, 15 April 2015, 5pm

Answer the following questions, putting the answer in some sort of document (.txt, .pdf, .doc).

1. When adding a new interface to the kernel, what is one advantage to adding it as a system call? What is one disadvantage of adding it as a system call?

2. The new "4k" video standard supports monitors with a resolution of 4096 x 2160 pixels. If you assume a depth of 32bpp (bits per pixel) and an update refresh rate of 60Hz,

    (a) What bandwidth is needed to update this display?

    (b) Can an HDMI 1.0 connection provide this much bandwidth?

    (c) What is the bandwidth of an HDMI 2.0 connection? Why might they have chosen this speed?

3. The Raspberry Pi mailbox interface lets you submit a 32-bit value to the GPU. The top 28 bits are the message, the bottom 4 bits are the channel. To configure a framebuffer, you need to send the address of a framebuffer structure as the message to channel 1.

    (a) What restrictions are there on where this structure can be in memory?

    (b) With gcc how can you ensure that a structure's address does not have any of the bottom 4 bits set?

4. What would this code do, if you assume the framebuffer points to an 800x600x24bpp RGB framebuffer?

```c
void do_something(int x, int y1, int y2, char *framebuffer) {
    int y;
    for(y=y1;y<y2;y++) {
        framebuffer[(y*pitch)+(x*3)+1]=255;
    }

}
```

Submit your work

E-mail the file containing your answers to the questions to me by the homework deadline.