CprE 488 – Embedded Systems Design
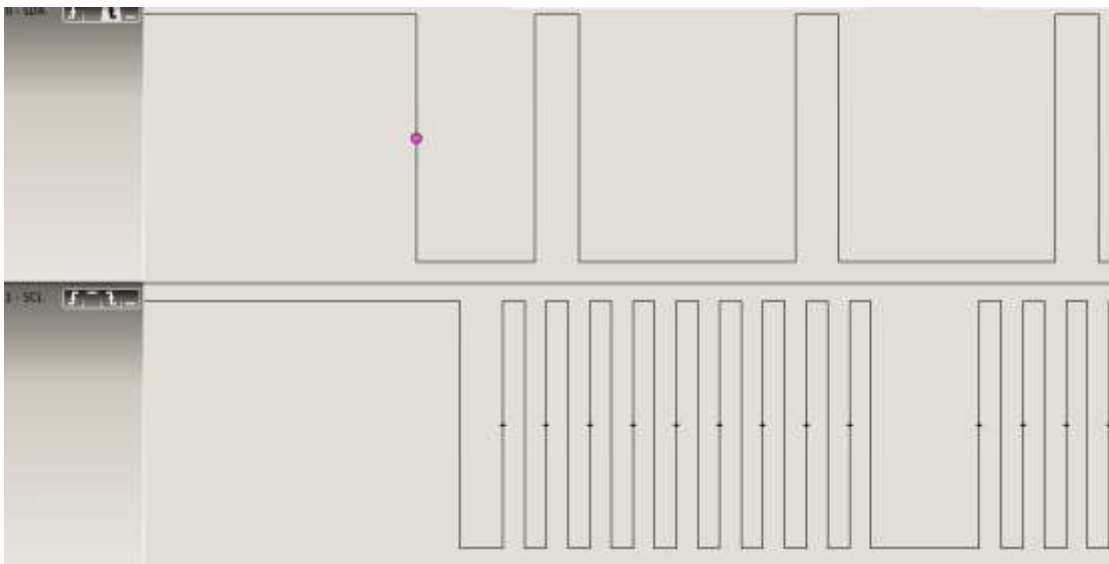
HW-3: Linux Device Drivers

Assigned: Friday of Week 6
Due: Friday of Week 7
Points: 10

1) Decode the following I^2C waveform, assuming the top signal is SDA and the bottom signal is SCL. What transaction is being requested? Defend your answer.

2) Fun with Documentation. Unlike in previous labs, where it was possible to get by without reading any of the background material or documentation, the driver development in MP-3 will make you a very sad panda if you don't have a good feel for embedded Linux.

For starters, Xilinx maintains a very nice wiki on porting Linux to Zynq-based devices. In MP-3, we will not be following their directions precisely, but it provides a useful overview of several of the major steps involved. Read through the wiki (starting here: http://www.wiki.xilinx.com/Getting+Started), and in your writeup, describe the 4 files that are needed to boot Linux on Zynq.

Next, open up the Zynq-7000 technical reference manual, which is available on the CprE 488 course webpage: http://class.ece.iastate.edu/cpre488/resources/ug585-Zynq-7000-TRM.pdf. Read all 1800+ pages (or just Chapter 6, your choice) and provide a summary, in your own words, of the steps involved in the Zynq boot process. Where does code get executed from, how does the programmable logic get programmed, etc.?

Finally, check out the *Linux Device Drivers* reference, also available on the course webpage: http://class.ece.iastate.edu/cpre488/resources/ldd3.pdf. Specifically, focus on Chapters 1-3 and 13. In your writeup, answer the following three questions:

- What are the three different classes of devices in Linux? Which class is most appropriate for a USB missile launcher? Briefly defend your answer.
- From a programmer's perspective, what makes driver development different from user-space application development? For example, why can we not call libc functions such as *printf()*? Why is floating-point code not allowed?
- What is the difference between major and minor device numbers? Does it matter which device number we use for our missile launcher?
- What is an "urb" in the context of a USB device driver?