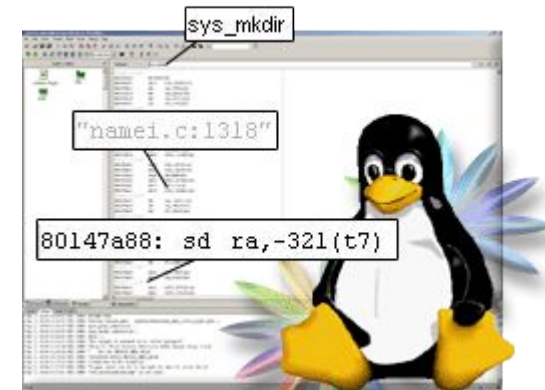# ECE 373 – EMBEDDED OPERATING SYSTEMS AND DEVICE DRIVERS

Spring 2020

Writing SW to control HW

- Linux kernel and driver architecture

- Driver interface to kernel

- Driver interface to hardware

- Writing a new driver

- Debugging in tight spaces

- How to find more information

Instructor

- PJ Waskiewicz

  - ppw@pdx.edu

  - Intel Linux Kernel Developer – 16 years

  - SolidFire/NetApp Sr. Principal Engineer/SW Architect – 4 years

  - Plays bass

  - Sings occasionally

  - Races motorcycles

  - (Used to) drive over things with his Jeep

  - Dad

Instructor (hiatus)

- Shannon Nelson

  - Shannon.Nelson@pdx.edu

  - Ex-Intel Software Developer – 29 years

  - Oracle Kernel Engineer – 2 years

  - Pensando Kernel Engineer - 1+ years

    - Also plays bass guitar

    - Also sings occasionally

    - Married and two grown children

    - Owns a small airplane

Instructor (hiatus)

- Charles Stoll
  - stoll@pdx.edu
  - Intel Software Engineer – 2+ years

  - Climbs rocks
  - Biker (not the gasoline type)
  - Taught and lived abroad for 2 years
  - Plays board games

Schedule

- Class times

  - Monday/Wednesday 4:40pm – 6:30pm

- Office hours

  - By appt. - can do Zoom, Google Hangouts, phone, etc.

  - Email at strange hours

- Lab time - let's discuss...

- TA
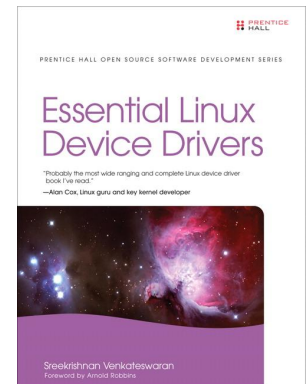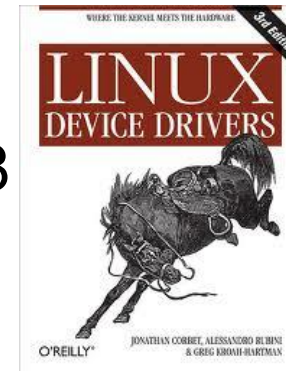
  - Tyler Hull

Resources

- Written (optional)
  - Linux Device Drivers Development
    - Madieu, Packt, ©2017
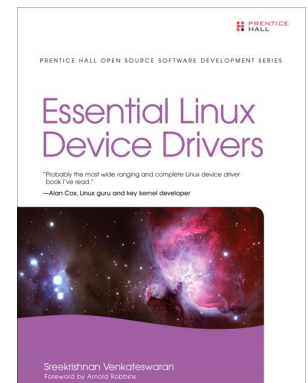
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  - Essential Linux Device Drivers
    - Vankateswaran, Prentice Hall, ©2008
    - http://elinuxdd.com
  - Linux Device Drivers, 3rd Edition
    - Corbet, Rubini, and Kroah-Hartman, O'Reilly, ©2005
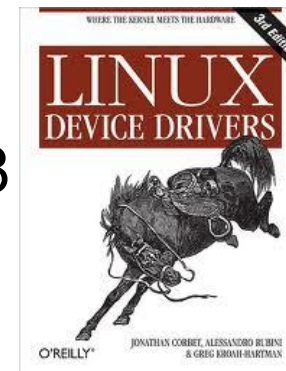   - http://lwn.net/Kernel/LDD3/

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    - http://lwn.net/Kernel/LDD3/
- Wikipedia
- Lots of others...

HW Resources

- Virtual machines

  - "PCIe" bus needed

  - Intel (or other) network device

  - Need full root access

- VirtualBox

  - Owned/maintained by Oracle

  - Run a computer inside a computer

  - VT-x (Intel), AMD-V (AMD)

  - Limited ARM64 support

The PDP-7

Other stuff...

- Dinner-ish time class

  - Eating allowed, but not aloud

  - Please utilize "mute" on Zoom for your classmates

    - I can mute, but don't make me!

- Stay healthy and safe
  - Resources for SARS-CoV2 mitigation
  - Classes recorded, live or pre-recorded

- Ask questions, flexibility is key
  - Email us, ask for time if needed
  - Don't wait, ask early
  - "Fail-Fast"

Topics

OS review, Linux Internals and Driver Intro
Kernel comm channels
Chardevs
PCI, MMIO, I/O Ports
Datasheets
Timers and Delays
Threads, Completion queues
Debugging techniques
Coding Notes
Review, Midterm
Serial and Block drivers
Userspace drivers
DMA, Descriptor concepts
Network drivers
Linux Build Infrastructure
How to configure and strip
Embedded Linux, Hobby boards
USB drivers (time permitting)
Final Review