

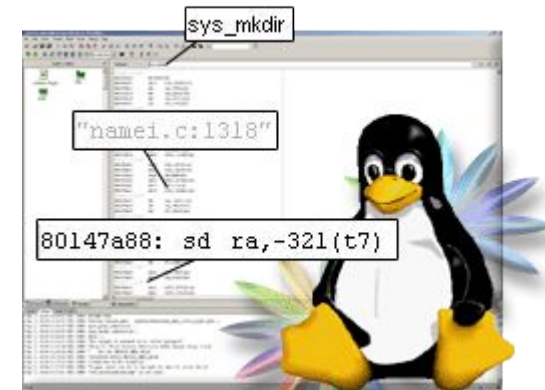
ECE 373 – EMBEDDED OPERATING SYSTEMS AND DEVICE DRIVERS



Spring 2022

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
- Jump Trading Group Kernel/HW engineer - current



- 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 - 3+ 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 – 3+ 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
 - Seth Rohrbach



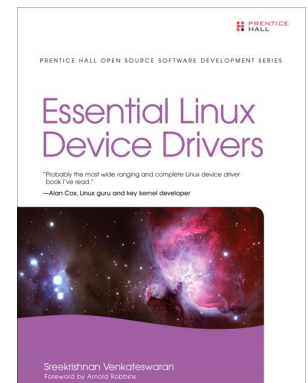
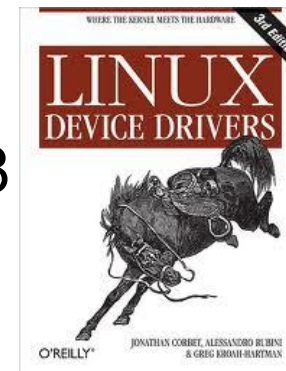
Resources

- Written (optional)
 - Linux Device Drivers Development
 - Madieu, Packt, ©2017



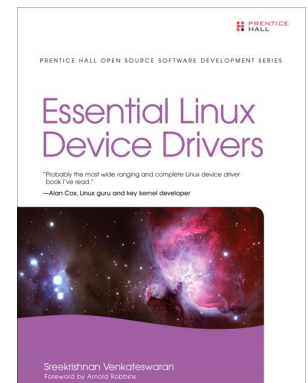
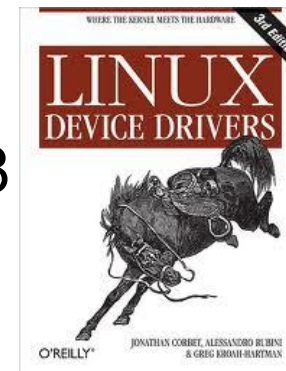
Resources

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 - Linux Device Drivers Development
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- Written (optional)
 - 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



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 COVID-19 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

