Building Production Debug Capabilities into Device Drivers

PJ Waskiewicz
Shannon Nelson
LAN Access Division, Intel
4/9/2012
Who are we?

- Shannon Nelson
  - Intel Software Developer – 25 years
- Peter (PJ) Waskiewicz
  - Intel Software Developer – 11 years
- Intel LAN Access Division
  - Drivers for high speed wired networking
  - Other kernel goodies as required by new technology
- Also adjunct professors (ECE 373)
Field debugging is hard

- Devices can randomly do bad things
- Issues can be very difficult to reproduce in labs
- Customers can’t be guinea pigs
- Little to no crumbs left after an error
Debugging without impact

- Debugging in general has overhead
  - Prints in interrupts are bad
  - Timing thrown off my debug code
- Need to capture debug data without impacting performance
- Drivers need every ounce of optimization possible
The Capstone project...

- Build debug infrastructure inside network device driver
  - Includes (but not limited) to descriptor states, contents, interrupt config, PHY types, etc.
- Capture data into blob
- Userspace tool to collect blob and parse it
  - Display data in nice format
  - Could be CLI and/or GUI
What will you learn?

• Deep knowledge of how Linux device drivers interact with hardware
• Learn how debugfs works in Linux
• How to expose debug data without impacting performance
• How to document driver and userspace application features
• How to test “hardware” failures using QEMU
Questions?