

# Breaking into Open Source and Linux: A USB 3.0 Success Story

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# Sarah Sharp: Today

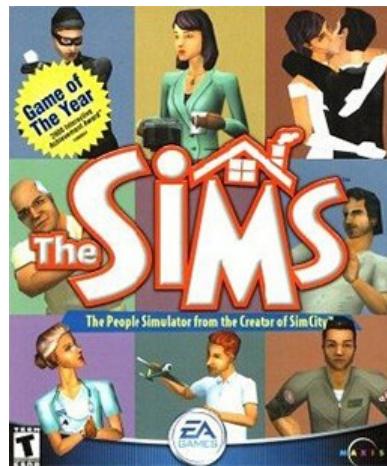
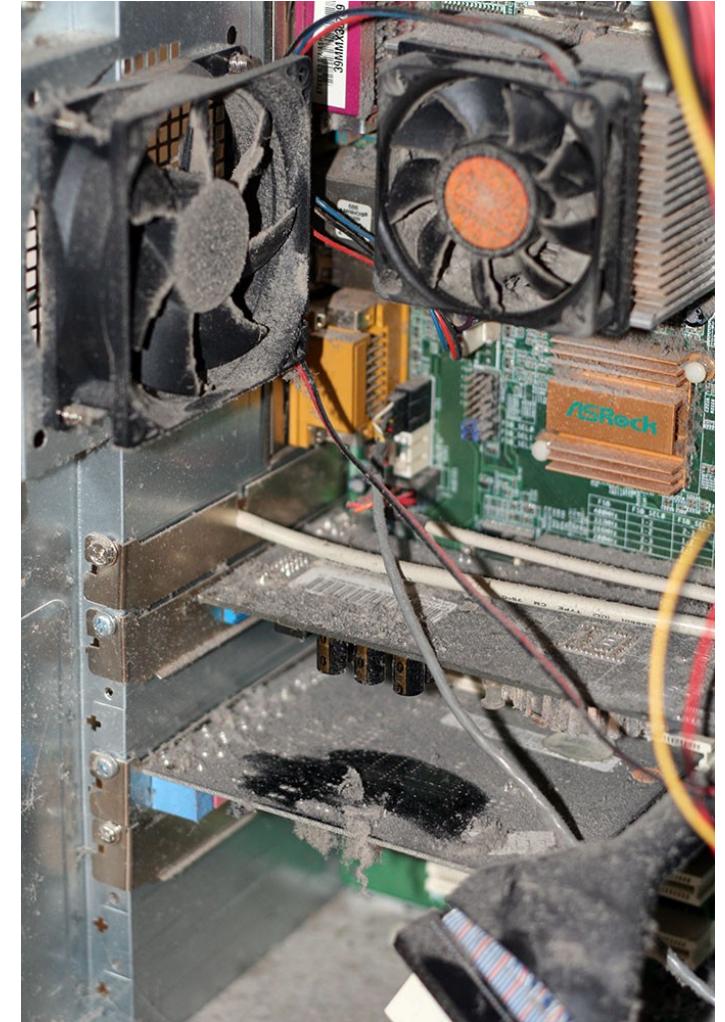


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**"We struggle with insecurity because we compare our behind-the-scenes with everyone else's highlight reel."**

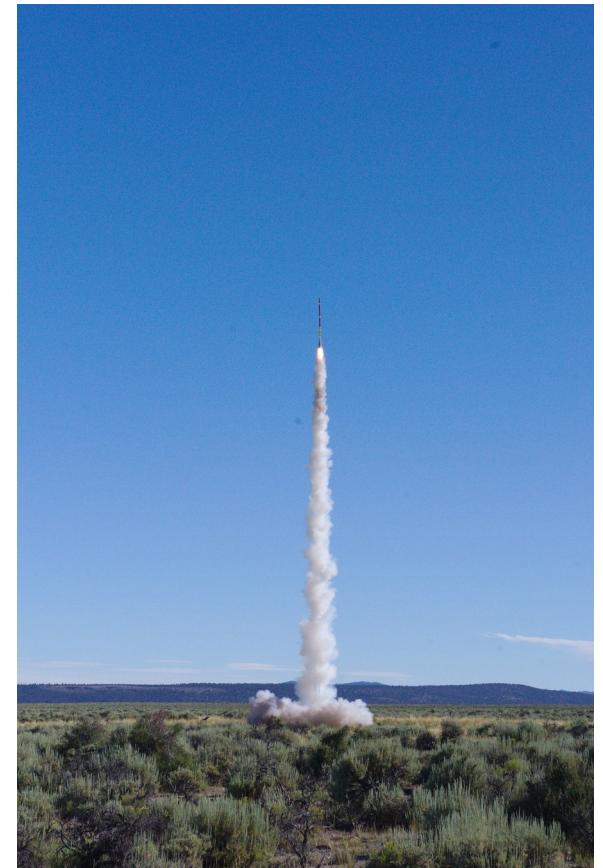
<http://alistapart.com/column/seeing-past-the-highlight-reel>

# Sarah Sharp: 12 years ago



# Sarah Sharp: College

- Portland State University
- Met ECE Professor Doug Hall
- Learned how to program
- My boyfriend introduced me to
  - open source, Linux, rockets



# Portland State Aerospace Society

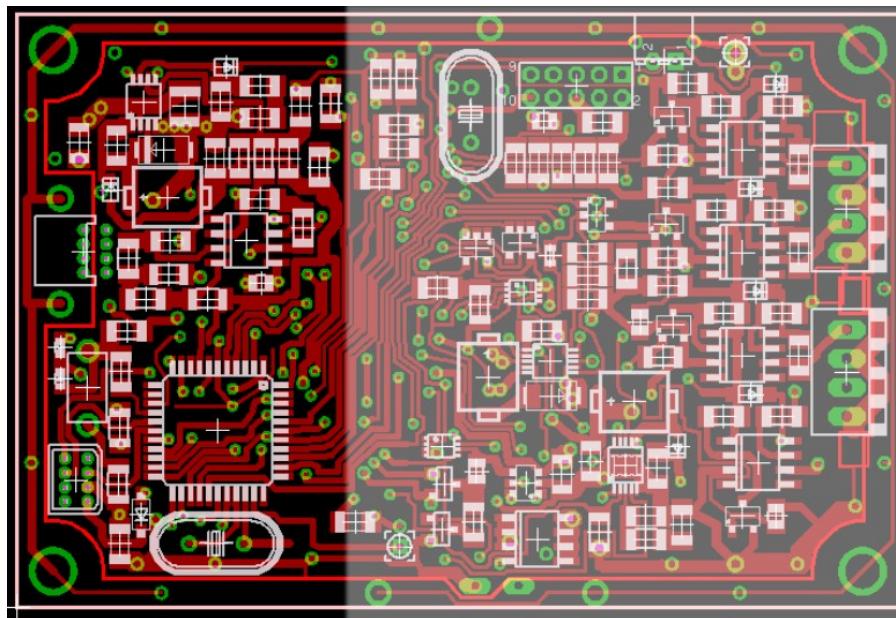


# Rockets and Open Source



# Sarah Sharp: College

- Met CS Professor Bart Massey
- ECE senior capstone:  
USB-based sensor nodes for PSAS rocket
- Class credit:  
microprocessor pin-out combinatorial search



# Lesson 1: Rules can be bent

# Sarah Sharp: College

- Bart introduced me to
  - The local Linux kernel community
  - Greg Kroah-Hartman
- Greg suggested usbfs2 project
- Bart helped me get:
  - ECE elective credit
  - Intel undergraduate research grant



# Lesson 2:

## Find a mentor and do hands-on projects

# USB filesystem (usbfs)

USB device driver

userspace

usbfs

kernel

USB core

USB host controller

# usbfs2

- Goal: replace IOCTLs with read/write syscalls
- Didn't want to make userspace block
- Needed asynchronous completion
- Why not use ASYNC I/O?

# Lesson 3: Technical Debt

# Sarah: Senior year

- Bart encouraged me to present at OSCON on usbfs2
- Kristin Accardi was on OSCON paper selection committee



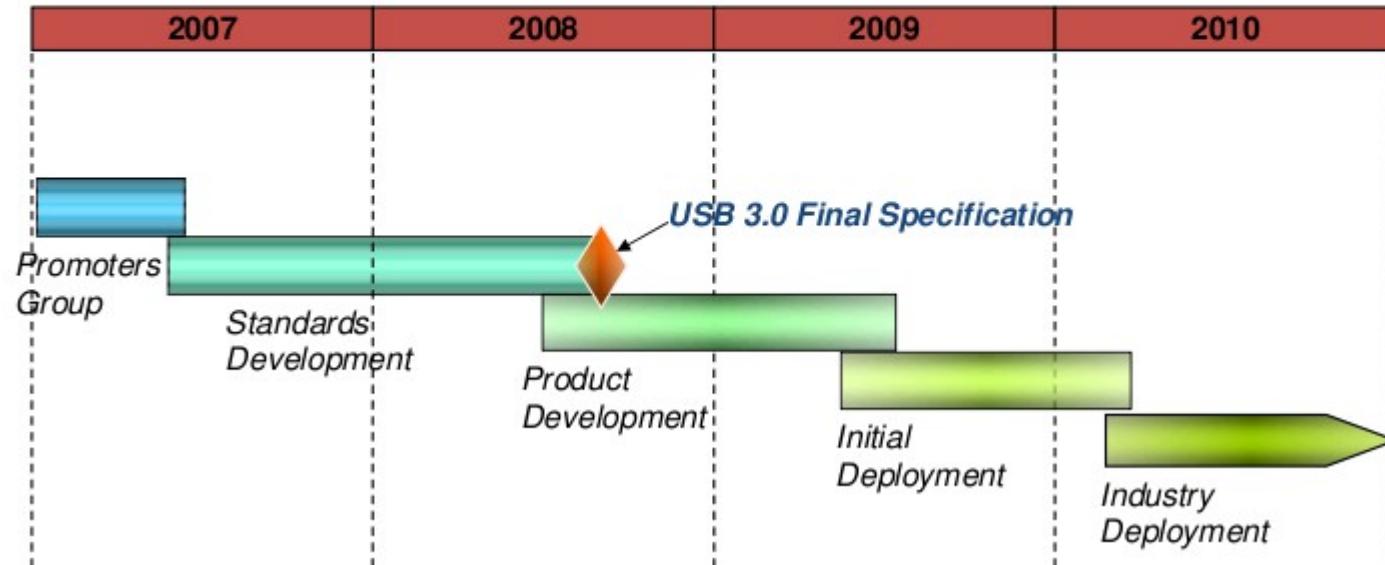
# Characteristics of a good open source developer

- Meticulous
  - Double checks work, addresses feedback
- Excellent communication skills
  - Clear, concise, persuasive, responsive
- Self learner, curious, asks questions
- Prefers to work in an open manner

# Lesson 4: Grow your network

# Sarah: Linux USB 3.0 developer

- Hired by Intel in July 2007
- USB 3.0 specification draft
- Hardware was still in FPGA form



# Linux USB Stack

userspace

USB device driver

kernel

USB core

USB host controller

# USB device topology



## Configuration

### Interface

#### Alternate Setting

- Endpoints:
  - IN or OUT
  - Buffer Size
  - Interval

# USB 3.0 host changes

- USB 1.1/2.0 hosts
  - scheduling done in software
  - unaware of device endpoints
- USB 3.0 host
  - supports virtualization
  - scheduling done in hardware
  - must be aware of device endpoints

# Linux USB Stack

userspace

USB device driver

kernel

USB core

USB host controller

# Linux USB Maintainers



USB subsystem



USB 1.1 host and  
USB core



USB 2.0 host



USB device drivers and  
power management

# What is being a Linux kernel maintainer like?

- Ten to hundreds of emails a day
- Very rapid development cycle
- Looking at long-term health of the project
- Maintains code for 5 - 20 years
- Reputation is on the line for each patch

# Linux kernel code submission

- Many revisions (often up to v8)
- Must meet coding style standards
- Must be complete and maintainable
- Often old code needs to be refactored
- Can't break other users, subsystems

# Lesson 5: Open source is social and technical

# Sarah Sharp: Kernel maintainer

- xHCI driver was accepted in 2009
  - two years after I was hired
- USB 3.0 kernel maintainer
- Learned about:
  - reviewing other people's code
  - working with bug reporters
  - sending pull requests
  - stable backports

# Sarah Sharp: Conference Speaker

- Uploaded USB 3.0 demo video to reddit
- Articles published about Linux getting USB 3.0 support before Windows
- Spoke or demoed at numerous conferences
  - SuperSpeed Developer Conference Japan 2010
  - Linux Conference Australia 2010, 2011, 2013
  - Libre Software Meeting (France) 2011
  - LinuxCon (North America & Europe)
  - OSCON, Open Source Bridge (Portland)

# Lesson 6: Promote yourself

# Sarah Sharp: Today



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