Open Source

Freedom for a digital world

William Jagels, Jonathan Terner, and Nikolas Vanderhoof

Binghamton University

April 25, 2016

Overview

Overview

Open Source...

- Benefits users
  - Protects liberties
  - No DRM
- Is practical
  - No vendor lock in
  - Extensible
  - Repurposable
- Is good for the economy
  - Free of cost
  - Open innovation
  - Skilled community
- Is secure
  - Community of bug fixers
  - Provably secure instead of obscurity

Summary

The Four Freedoms of Free Software

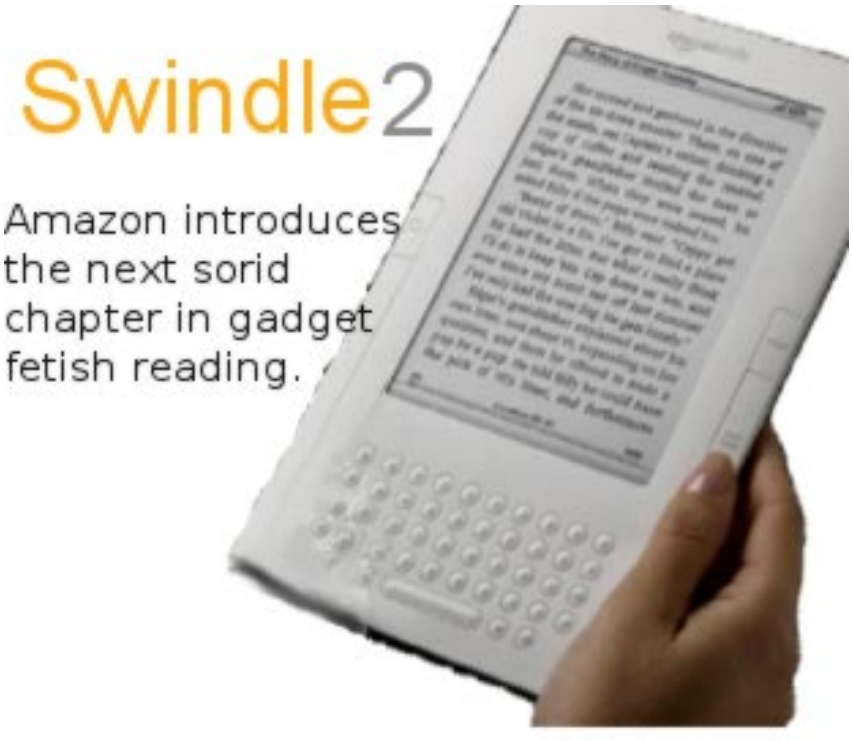
- Freedom 0–Use
- Freedom 1–Study
- Freedom 2–Copy
- Freedom 3–Improve

Free Software and Education

- Free software in schools
- Fosters sharing and helping
- Dependence on Windows
- Lots of code to read

Threats to Freedom

- Surveillance
- Censorship
- Software That Is Not Free
- Internet Services
- Computers For Voting
- The War On Sharing
- Rights in Cyberspace

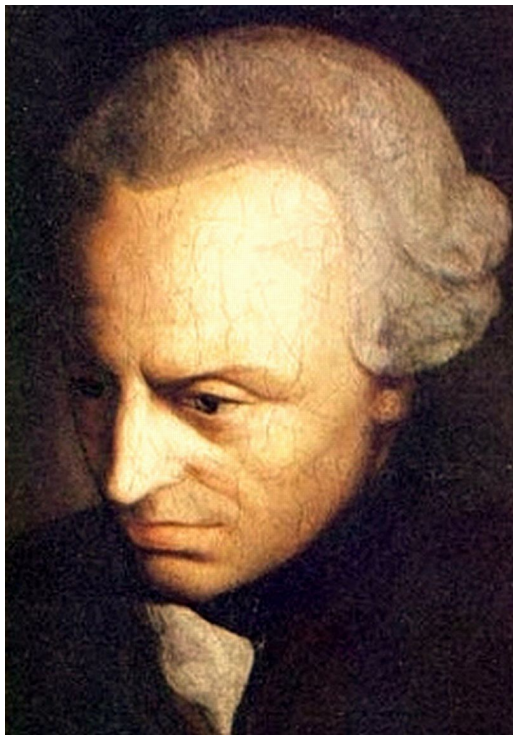


(*Amazon Swindle*, 2009)

Analysis

Stallman's Argument: Basis

- A deontological standpoint
- Stallman as an ethical essentialist
  - proprietary software
  - restricted data formats
  - internet services
  - surveillance
  - "always bring up [free software] as an ethical issue" (Stallman, 2011, para. 63)



(*Immanuel Kant (painted portrait)*, 2014)

Stallman's Argument: Logos

- Deductive reasoning
  - tobacco and proprietary software comparison (Stallman, 2011, para. 55)
- Contradictory premises
  - dismissing economics of free digital society (para. 34)
  - later addressing economics of digital media (para. 109)

Stallman's Argument: Pathos

- Use of strong characterizations
  - "Computers are Stalin's dream" (Stallman, 2011, para. 3)
  - All DRM should be illegal (para. 30)
- Strong appeals to tradition
  - values derived from a non-digital society
  - Amazon Kindle (para. 98)
- Calls Amazon Kindle (para. 98)
  - an immediate end to digital surveillance
  - "you can't wait until there is another dictator" (para. 13)

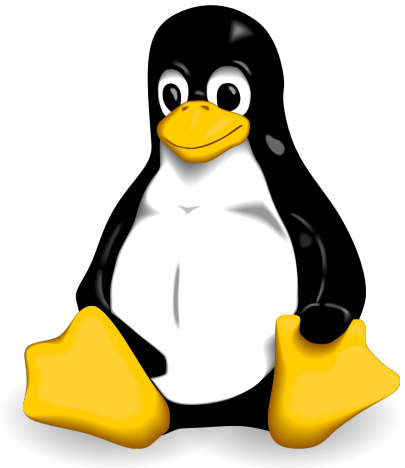
Practical Advantages of Open Source

Software for Freedom vs. Freedom for Software

- Needs fulfilled by free software
  - a need for software
  - a need for ethical software and practices
- Stallman's emphasis on a "free digital society"
- Consequentialist stance on free software
  - open source vs. free software
  - a less radical approach
  - weighing the utility of open source
  - need-driven software (Bisson, 2007, p. 17)

GNU + Linux, GNU/Linux

- The GNU operating system
  - "written for your freedom" (Stallman, 2011, para. 48)
- The need for a kernel
  - 1990: GNU Hurd
  - 1991: Linux
- Fusion of Linux and GNU
  - GNU + Linux, or just Linux?
  - Torvalds vs. Stallman



(*Tux*, 2012), (*Heckert GNU white*, 2011)

Linux: open source success principles

- Using / creating the best tools for the job
- Not started with open source in mind (Torvalds, 2016, 3:30)
- Open source contributions
  - GPL and copyleft
  - Collaborative efforts and development
  - Formation of a communities around open-source code
- Flexibility
  - Availability of source code promotes reuse
  - power saving on Linux cellphone benefit Linux supercomputers (Zemlin, 2013, 11:34)

Another Success Story: Apache HTTP Server

- Most popular web server since 1995
- Open source project
- Inherited the NCSA Common Gateway Interface.
- Repurposed software components
  - enabling efficient software development (Bisson, 2007, p. 17)

(*Feather*, n.d.)

Preventing Obsolescence

- Vendor lock-in
  - warned against by Stallman (2011, para. 54)
- Proprietary software creates vendor dependency
  - maintenance
  - updates
  - support
- Case Study: Electronic voting machines (Colannino, 2012, p. 916)
  - migration to electronic voting machines
  - software escrow
  - code was licensed for testing, not deployment.

Quality Assurance

- Linus's Law
  - 6,782 lines of code added/subtracted from Linux daily (Zemlin, 2013, 12:03)
- Software peer-review
- Core developers and user developers
- Mozilla bug reports (Wang, Shih, & Carroll, 2015, p. 352)
  - value differences
  - skill differences
  - reciprocal skill transfer
  - disorganization preventable

(*Mozilla Firefox logo 2013*, 2014)

Economic Advantages of Open Source

Apache Web Server

- 66% of major sites (Powell, 2012, p 696)
- Web server development is expensive
- Lowers requirements for web companies
- Allows publication of ideas and research

Open Simulator

- Open entrepreneurship case study
- Powerful developer network
- Used to start software companies
- Sharing benefits all parties
- (Yetis-Larsson, Teigland, & Dovbysh, 2014)

(*OSCC13 Track Leaders Meeting in UCI vLab*, 2013)

Red Hat

- $524M in revenue last quarter (Red Hat Inc., 2015, p. 24)
- Red Hat Enterprise Linux
  - “Free” alternative CentOS
- Support & Certifications
- Software licensed by GNU GPL
- Open technologies (ex. GlusterFS)

id Software

- Creators of Doom and Quake
- Example of delayed open source
- Doom engine
  - Cutting edge technology when released
  - Eventually outperformed by competitors
  - Open sourced engine 1997
  - Continued to sell content packs for engine
  - (Caulkins et al., 2013, p. 1188)
- Makes economic sense for companies to open source
- (Caulkins et al., 2013)

Economic Benefits

- Efficient use of human resources
- Reuse of works
- Shared knowledge
- Lower costs
- Greater quality of living
- Powerful community

Security Differences between Open Source and Closed Source

Security Through Obscurity

- Malicious hackers cannot see source
- Any code found is obfuscated
- In-house code reviews find bugs
- Developers have time to correct bugs

Security Through Transparency

- Community will find bugs
- Developers less likely to inset malicious code
- Users that find bugs can propose fixes quickly

Microsft Office and Apache OpenOffice

- Microsoft Office had 108 total vulnerabilities
- OpenOffice had only 16
- Similar number of low severity vulnerabilites
- Microsoft–7 times medium and high severity risks
- Speed of Apache's patches
- (Schryen, 2009)

Source Dependent Attacks

- Buffer Overflow
- SQL Injection
- Patch Reverse Engineering
- (Clarke, Dorwin, & Nash, n.d.)

Source Independent Attacks

- User Participation
- Brute Force
- Protocol Vulnerability
- Inside Jobs
- (Clarke et al., n.d.)

Conclusion

Closing Thoughts

- Stallman's ideas are not as radical as they seem
- Open source promotes freedom and learning
- Gives developers a starting point
- Suited for tinkerers
- Helps users feel involved and invested

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