




**NBA 600**  
**Open Source**  
 Class 12, Mon 11/26

Prof. Dan Huttenlocher

### Wednesday – Final Class


- Attendance required
  - Hand in comments on student presentations
- Presentations by 4 student teams
  - Approx 15 mins (bring copy for me to class)
    - Okonmah, Farhangi, Figliani
    - Golden, Slowik, Wilks
    - Lim, Moth, Johnson
    - Fritz, Adelco, Chang
- Course evaluations



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### Short Papers


- Considerable consensus on continued mix of amateur and professional content
- But somewhat different views on
  - Revenue models for amateur content
  - Separate versus combined sites
  - Future strength of current networks



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### What is Open Source (OSS)?


- Open source software is distributed in human readable form without charge
  - Subject to a license that encourages or requires similar terms for derivative works
  - Machine executable form readily created from this source form by knowledgeable people
- Phrase “open source” widely used
  - Early project was Stallman’s GNU project, termed “Free Software”
    - Free Software Foundation (FSF), philosophical objections to term open source



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### Components of Open Source Project


- A license governing the software
  - Several licenses approved by Open Software Initiative (OSI)
- A group of experts responsible for changes to the software
  - Level of formality varies greatly
- A broader community of software developers contributing to the work
- A software development methodology
- Tools for software developer collaboration



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### Open Source Licensing

- Protect rights to do following with software
  - Free distribution and redistribution of source and executable
    - Use the software
    - Study and learn from the code
  - Creation of derivative works
    - Improve the software
    - Extend the software
  - Integrity of reputation
    - Protect the good name of the software
- Several standard licenses: GPL, Apache, ...

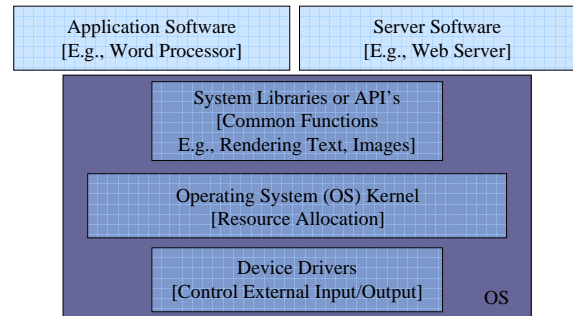


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## Where OSS Has Succeeded

- There are many open source projects
  - SourceForge.net, a leading site for open source development, lists over 100,000 projects
  - A small number of open source projects are highly successful
    - Provide widely used alternative to traditional commercial or “closed source” software
  - Many more projects are used by small communities of experts
- The most successful projects tend to be systems software, not applications

## Systems Software Components



## Goldman Report: Rise of Linux

- Linux on Intel likely to emerge as dominant platform in corporate data centers
  - Replacing proprietary Unix systems
    - Sun Solaris, HP UX, IBM AIX
  - Limiting growth of Windows server systems
- Linux has evolved into “enterprise class” operating system
  - Not just for low-end “edge” servers such as file, print, Web, email
- Significant consequences for both IT vendors and IT departments

## Linux Value Proposition

- Enables use of lower-cost Intel based (IA) server hardware with Unix-like OS
  - Previous choice of Windows on IA hardware vs. vendor-specific Unix and hardware bundle
- Enables use of many hardware vendors
  - Linux runs on IA servers from Dell, IBM, HP, etc. as well as variety of non-IA servers
  - Previous choice of vendor-specific solution resulted in “lock in”
    - Switching cost to change applications to new OS
- Relatively easy to port to Linux from Unix

## Change in Industry Structure

- Competitive structure of IT industry long based on proprietary lock-in
  - Hardware-software-services bundle from one vendor works together but not with components from other vendors
- IBM, Sun, Apple historically large forces in this approach
- Linux interoperates with hardware from all vendors, and with broad range of applications software
  - Breaking the lock-in

## Linux Provides Common Platform



- Sun Solaris on Sparc
- IBM AIX on AS-400
- ...
- MS Windows on IA
- Linux on ...
- MS Windows on IA
- Applications need only support Linux API's and not different vendor-specific Unix API's

## Linux Vendors

- No proprietary software advantage
  - Open source, widely available
- Main value is in certification and support
  - Certifying that certain versions of Linux perform up to particular standards
    - With various commonly used application and infrastructure software
  - Cataloging and providing easy patches/updates
- Possibility of proprietary extensions
  - But generally counter to open source community

## Server Vendor Strategies

- Complete solution vendors (IBM, HP) embracing Linux
  - HW, OS, infrastructure SW, consulting, support
  - Somewhat cannibalizing own proprietary Unix
  - IBM most aggressive
    - Linux competency center, 250 engineers
- Box vendors (Dell) embracing Linux
  - Largely as alternative to Windows
    - Mainly lower end servers
- Proprietary Unix vendors (Sun) – success?

## OS Vendor Market

- HP and IBM exploiting Linux to
  - Cut own costs
  - Provide better cross-platform support to customers
  - Providing appropriate solutions components from hardware, software, consulting
- Apple and Sun continuing their model of bundled proprietary system
  - Sun much less successful because of head-on Linux competition in core market
- Microsoft having mixed server success

## Broader Open Source Context

- Open source is changing IT industry competitive structure
  - Making certain lines of business less attractive and others more attractive
  - Too big to ignore, demands a response from many industry players
- Open content potential new model for digital goods more broadly – “guilds”
  - Much of the reward comes from recognition rather than financial remuneration
    - But where do companies and people get paid?

## Other Open Source Projects

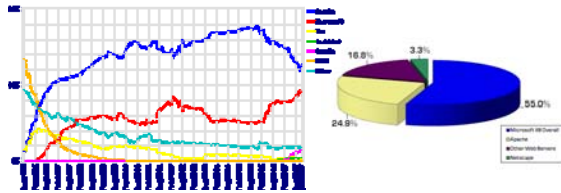
- Technology-focused systems software
  - Broad base of technical users with skills and desire to contribute
    - Operating systems (Linux and GNU)
    - Web and application servers (Apache/Tomcat)
    - Databases (MySQL, Postgres, Cloudscape/Derby)
    - Security
    - Storage
- Less domain-specific application software
  - Business process critical
  - Users don't have technical skills or motivation

## Systems Software Market

- Linux has had substantial effect on OS market
  - Support from large firms like IBM important for mainstream adoption
- Open source email and Web servers predate many commercial solutions
- What other infrastructure software likely to move to open source
  - E.g., Databases with MySQL
    - What important from business perspective

## Apache a Major Web Server

- Surveys of Web server software
  - Netcraft polls nearly 150M host names
  - Port80 polls hosts at Fortune 1000 companies



## Open Source Project Structure

- Apache Software Foundation (ASF) has relatively formal organizational structure
- Foundation sponsors multiple OSS projects
- Structure of ASF
  - Rings of "merit"
  - Committers can modify code of particular project
  - Members of ASF generally chosen from meritorious committers



## ASF Collection of Projects

- The ASF is an umbrella organization whose policies and operations are decided by the members
  - Board acting on behalf of membership
- Day to day work done by individual projects
  - Each governed by project management team with a lead who is "corporate officer"
- Promotion to being a committer from a contributor is a big deal
  - About 1000

- Thanks for a good half semester
- Next class four student team presentations plus course evaluations