Software Models
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Introduction
- Non-technical interlude...
- Many more type of software than before:
  - commercial projects
  - contract
  - shareware
  - open source
- Influences:
  - commercial needs
  - IP protection & licensing
  - documentation
  - support

Commercial
- Classical model, but many variations
- Internal vs. for sale
  - e.g., Columbia SSOL vs. PeopleSoft
- One time vs. retail
  - only run one (or few copies)
  - custom programming
  - mistake control
  - retail aka "shrink wrap", but also download or "ship and enable"
- games: cartridges
- embedded – OS, peripheral, cell phones, industrial control, ...

Commercial software
- Many different licenses:
  - single computer (Microsoft XP)
  - multiple computers by same owner (e.g., laptop and home) – common for consumer software
  - IP address (servers)
  - floating license – "no more than 3 simultaneous users" (CAD and SE tools)
  - single network (e.g., within Columbia) – site license

Contract
- Consulting – individually or through consulting houses, e.g., ArthuAndersen, EDS or Wipro (India)
- "Work for hire" – output belongs to customer (GRA vs. undergraduate!)
- Usually, specific to customer
- Often, outside of core competency of client (e.g., govt, hospital, ...)
- Billed by project or by hour

Shareware
- not = open source
- can freely download binaries
- usually low-cost, limited functionality items (e.g., create buttons for web pages)
- "crippleware": limited functionality (can’t save work) or time limit on usage
- mostly Mac and Windows
Open source

www.opensource.org
- Free redistribution
- Source code
  - distribute either unobfuscated source code or binaries
- Derived works
  - same license as original code
- Integrity of author’s source code
  - allow distribution of modified code

Open Source

- No discrimination against persons or groups
- No discrimination against fields of endeavor
  - commercial use, non-military use
- Not specific to product
  - not just if part of some distribution
- Must not restrict other software
  - can’t require other software to be open-source

Open Source

- Examples of open-source licenses:
  - GNU General Public License
    - modifications are also GPL
  - GNU Library (Lesser) Public License
    - allow linking into non-GPL code
  - BSD license
    - least restrictive – allow commercial use
  - Artistic license
    - force new naming for modifications

Almost open-source

- Lots of programs that are free and/or provide source code, but:
  - don’t allow modification (TeX)
  - non-commercial or educational use only
  - limited to particular hardware
  - may be patent-encumbered (e.g., audio codecs)
  - only for customer (e.g., in case supplier goes bankrupt)

Example: BSD license

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Open source arguments

- “The Cathedral and the Bazaar” (Eric Raymond)
- Social arguments
  - knowledge dissemination
  - avoid wasted effort (“doing it anyway”)”
  - cf. pro bono by lawyers
  - skill strengthening and visibility (academics)
- Technical arguments
  - quality
  - security
  - standards-compliance
  - testing on many systems
Cathedral and the Bazaar

1. Every good work of software starts by scratching a developer's personal itch.
2. Good programmers know what to write. Great ones know what to rewrite (and reuse).
3. "Plan to throw one away; you will, anyhow." (Fred Brooks, "The Mythical Man-Month", Chapter 11)
4. If you have the right attitude, interesting problems will find you.

Open source successes

- TeX (not quite open-source)
- gcc compiler and tools
- Linux and *BSD (FreeBSD, OpenBSD, NetBSD) operating systems
- Apache web server
- sendmail mail transport agent (MTA)
- gimp bitmap graphics tool
- Tcl, Perl, Python language implementations

Open source - problems

- Ideal: small group of authors write code, thousands contribute bug fixes (not just bug reports!) and enhancements
- Need large community of technical users
  - less likely to work well for recipe management or kid's games
  - more forgiving of lack of documentation or clean install
  - can integrate different tools
  - if not, author becomes tech support

- Thus, works less well for specialized programs with small user base (hundreds) – get mostly complaints
- Mostly individuals moon-lighting or paid by unrelated company (e.g., Linus Torvalds)
- Business model uncertain:
  - packaging (Red Hat)
  - tech support contract (MySQL)
  - free with hardware (IBM)
  - grants and donations
Which model is “right”?

- Commercial needs:
  - size of customer base
  - who pays?
- Intellectual property issues
  - are there patents?
  - does employer rely on IPR (trade or sell)?
- Documentation
  - how much documentation is needed to make the program useful?
- How much support is needed?
  - open-source support: mean vs. variance

“Levels” of programming

- Programmable applications
  - add macro to Excel
- Code generators
  - generate UI code from “wizard”
- Application embedding
  - new UI for IE or Mozilla
- Web scripting
  - no UI in normal sense
- “Classical” application
  - Java, C
  - use mostly OS and UI APIs

“Levels” of programming

- Device drivers and OS kernel
- embedded systems
  - specialty OS (e.g., VxWorks) or no OS\n  - often, lower-end processors
    - no virtual memory
    - no cache
    - limited memory space
    - special operations (e.g., DSP MAC)
- Specialty programming:
  - language compilers