LBSC 690: Information Technology
Lecture 13
Security, copyright, and policy

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Security

Breaking security of a system

- (usually) involves making it do something it wasn't designed to do
- requires skill, lateral thinking to find the holes (though once found, there are standard tools to explot)
- requires similar skill, lateral thinking to guard against

i.e. security is hard!

Security example: email

What are the potential security pitfalls in emailing valuable information?

Preventative steps

You need professional help to actively ensure security; but preventative steps can help:

- Reduce target space: limit the possible vectors for attack
- Avoid storing sensitive information if you can avoid it
- If you must store sensitive information:
  - Avoid storing sensitive information together
  - Encrypt the information where possible
- Ensure encrypted communication channels wherever possible

Richard Stallman and hacker culture

- Lead software programmer at MIT's AI lab during 1970s
- Early 1970s: software source code released with machines, freely available to modify
- Late 70s, early 80s: source code withheld, copyright enforced (see Bill Gates and his Basic interpreter, 1976)
- In reaction, founded GNU project, 1983, to produce free software implementation of UNIX

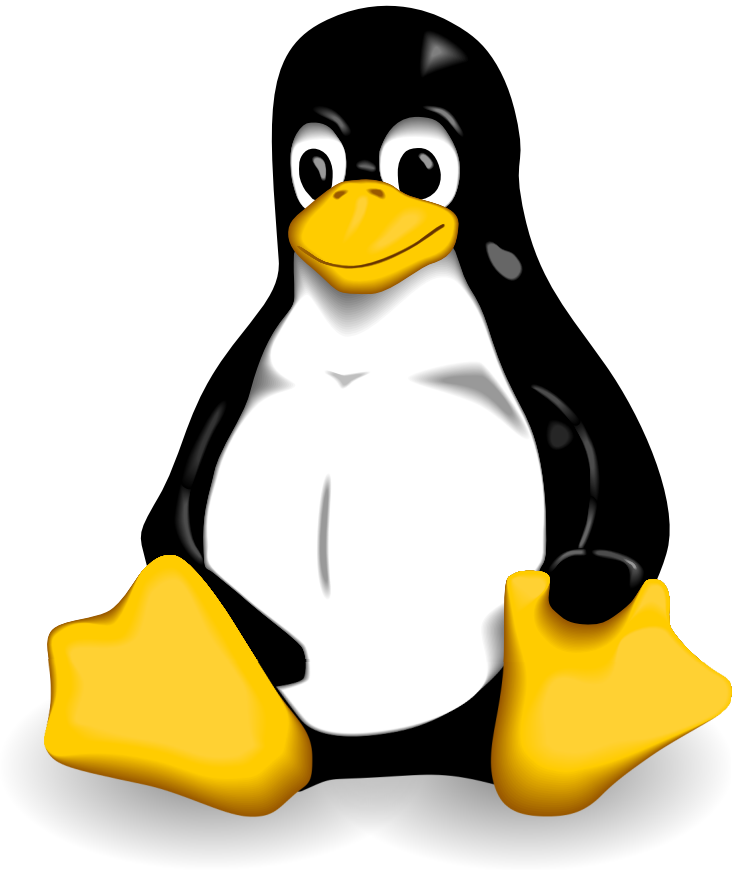
The Free Software movement

- “Free software” means “free to modify”:
  - You receive the source code
  - You can modify and redistribute the source code
- Stallman and others at MIT set up Free Software Foundation (FSF) in 1985 to support GNU project and Free Software movement

The GNU Public License (GPL)

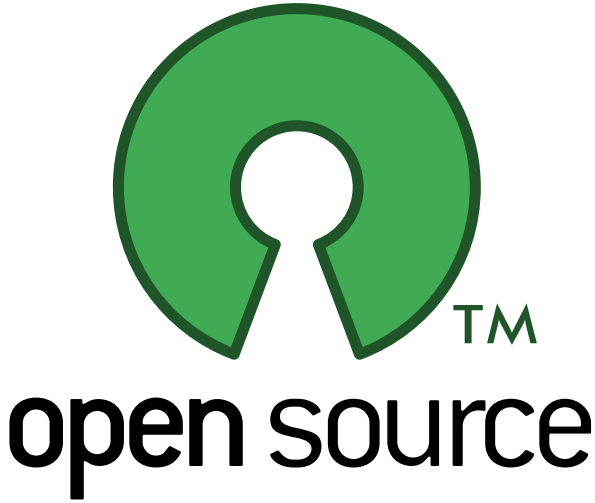
- Software license with a “freedom virus”
- Allows free reuse and extension of program and its source code (“copyleft”)
- Requires that software that uses or extends GPL software must itself be released under the GPL

Early free software



- GNU project quickly replicated UNIX toolset, libraries, and compiler
- But unsuccessful in building kernel (the “heart” of the operating system)
- This came instead in 1991 when 22-year-old Finnish CS student, Linus Torvalds, started work on Linux

Open source software



- Other “free” software streams than GNU (esp. Berkeley tradition of UNIX)
- Raymond’s “Cat & Baz” (1997); Netscape’s source code release 1998 (first major “end-user” app to go open source)
- Term / brand “open source” coined in 1998; distance from ideological connotation of “free software”
- Philosophy extended beyond software, particularly to digital content (Wikipedia; Creative Commons)

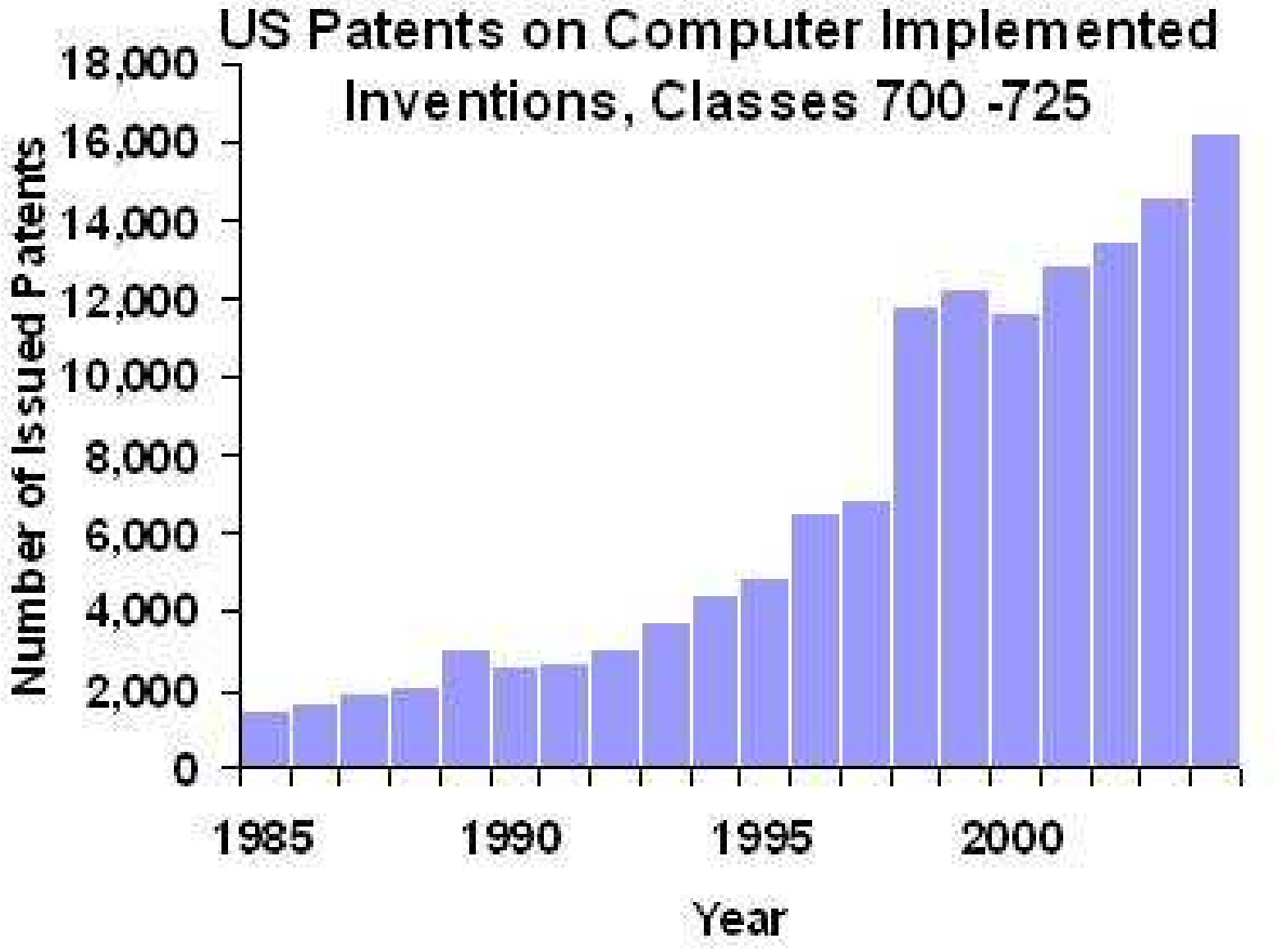
GPL versus Open source licenses

- Other open source software licenses (e.g. “BSD”) allow software to be extended
- Variant of GPL (“Lesser” or “Library” GPL) allows software to be used as a library in closed-source applications
- For example:

FreeBSD	released under BSD license; extensively used in the closed-source Mac OS X
KHTML	released under LGPL; forked by Apple as the basis for the closed-source Safari browser
Linux	released under GPL; used by Google as basis of open-source Android operating system

- FSF has enforced GPL against Linksys, OpenTV, and Cisco.

Inflation of software patent numbers



[1] Wikipedia, “Software Patents”

Economic cost of patents

- “A study in 2008 found that American public companies’ total profits from patents (excluding pharmaceuticals) in 1999 were about $4 billion–but that the associated litigation costs were $14 billion.”[1]
- Estimated cost of software patent lawsuits in 2008: $11.26 billion [2]

[1] The Economist, August 20th, 2011; http://www.economist.com/node/21526370:

[2] http://esp.wikidot.com/local--files/2008-state-of-softpater

Patents as rent

License fees for Android mobiles

- 50% of Android mobiles subject to patent licensing agreements with Microsoft
- HTC reportedly pays $5 to Microsoft for each Android phone it releases
- Oracle currently suing Google for patent infringement, seeking $6.1 billion in damages
- Apple is also suing Android manufacturers
- The Android software itself costs nothing – it is an open source extension of the Linux kernel

Software patents as litigation weapons

Nortel networks patents auctioned at bankruptcy in July 2011.

- Google wanted “to shore up the competitive position of its Android mobile operating system against threats from Apple, Oracle and Nokia”[3]
- Contested by consortium including Apple, Microsoft, RIM, and Sony.
- Won by latter for $4.5 billion

Instead, Google purchased Motorola Mobility for $12.5 billion, largely for its patent portfolio.

[3] The Guardian, July 2, 2011; http://www.guardian.co.uk/technology/2011/jul/02/google-pi-auc

Proliferation of trivial patents

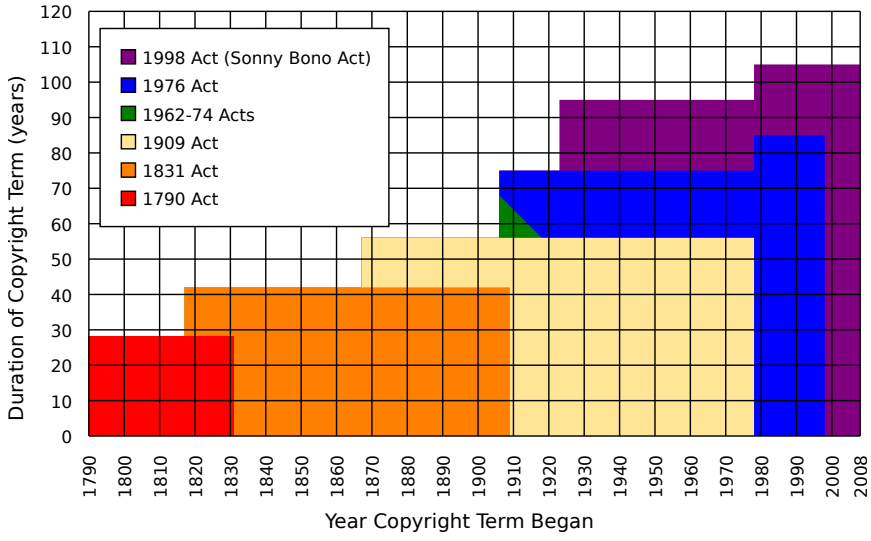
- One-click online shopping (U.S. Patent No. 5,960,411.)
- Online shopping carts (U.S. Patent No. 5,715,314.)
- The hyperlink (U.S. Patent No. 4,873,662.)
- Video streaming (U.S. Patent No. 5,132,992.)
- Internationalizing domain names (U.S. Patent No. 6,182,148.)
- Pop-up windows (U.S. Patent No. 6,389,458.)
- Targeted banner ads (U.S. Patent No. 6,026,368.)
- Paying with a credit card online (U.S. Patent No. 6,289,319.)
- Framed browsing; (U.S. Patent Nos. 5,933,841 & 6,442,574.)
- Affiliate linking (U.S. Patent No. 6,029,141.)

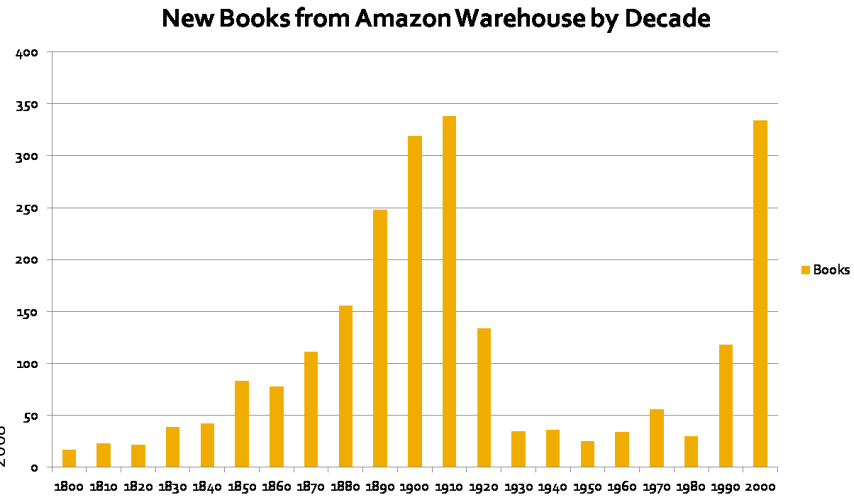
[1] Electronic Frontier Foundation, `https://www.eff.org/patent-busting`

Effect on small players

- It is very difficult to write a large piece of software without (usually unknowingly) violating some software patent
- Patent lawyers for large companies notoriously compare “size of stack of patents”, rather than actual contents
- Startups lack patent portfolio, vulnerable to being sued by larger companies, unless they grow rapidly or seek big-partner protection
- Open source (free) software has no mechanism for collecting patent loyalties (risk of being sued typically falls on user of OSS)

Infinite copyright is killing culture





- Copyright is being extended faster than it is expiring
- The end result: (practically) infinite copyright

Big data and its implications

- What relevance does “open source” have in a world where everything is “software as a service”?
- Possession of large user base, data set gives competitive advantages:
  - Networking effects $\rightarrow$ accelerating returns
  - Machine learning $\rightarrow$ better software
- A person’s data has value; who owns it? Who should own it?