

Software systems and issues: where we are

- ✓ **operating systems**
 - controlling the computer
- ✓ **file systems**
 - storing information
- ✓ **applications**
 - programs that do things
- ✓ **middleware, platforms**
 - where programs meet systems
- **interfaces, standards**
 - agreements on how to communicate and inter-operate
- **open source software**
 - freely available software
- **intellectual property**
 - copyrights, patents, licenses

Software property topics

- **interfaces**
- **data formats**
- **standards and standardization**
- **protection mechanisms**
 - trade secrets
 - licenses
 - patents
 - copyrights
- **open source / free software**
- **real software systems**

Independent implementations of an interface

- **who owns an interface?**
- **can interfaces be owned?**
- **company A sells something (hardware or software)**
- **company A publishes (widely) the API for programming it**
 - with the intent that third parties will develop applications for the thing
 - and thus make it more attractive so company A will sell more
- **company B uses A's interface definition to make a cheaper version of the thing that works the same**
 - so all the third-party applications will run on B's cheaper version
 - thus cutting into A's market
- **company A sues company B**
- **who should win?**

Proprietary vs open data formats

- **who owns a data format?**
- **many data formats are proprietary**
 - can only be produced and interpreted by proprietary software
 - e.g., Microsoft Office (Word, Excel, ...), Flash, Real, ...
 - if available at all, may require royalty payment to owner
 - can be used to control markets, maintain competitive advantage
 - e.g., by incompatible upgrades or incomplete disclosure
- **some formats involve patent protection, usually because the algorithm is patented**
 - patent owner may require payment
 - e.g., (in theory) JPEG, GIF, MP3, FAT
- **"open" formats are non-proprietary**
 - can be produced and interpreted by anyone for free
 - e.g., HTML, PNG (portable network graphics), ODF (open document format), PDF (now)

Standards and standardization

- **standard: technical specification sufficiently precise that it ensures independent implementation, uniformity, interoperability, ...**
 - physical measurements: length, weight, time, chemical composition, ...
 - mechanical properties: plugs & sockets, CD/DVD dimensions, ...
 - electrical properties: voltage, frequency, ...
 - software: character sets, programming languages, operating system interfaces, data formats, information exchange protocols, ...
- **standardization: process of establishing a specification**
 - usually involves competing entities, so tradeoffs are needed between mutual benefit and competitive advantage
 - often international (e.g., ISO: International Organization for Standardization)
- **de facto vs de jure standards**
 - de facto: Windows, Office, Internet Explorer, Flash, PDF, ...
 - de jure: ASCII, some programming languages, ...

Licenses

- **are shrinkwrap and clickwrap licenses valid and enforceable?**
- **is licensing replacing purchase?**
- **are warranty and liability disclaimers for software valid?**

Patents & copyrights

- **US Constitution, Article 1, Section 8:**
- **"The Congress shall have Power ... To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries;**
- **copyright protects expression but not idea**
 - you can't copy my program
 - but you can implement the same idea in some different form
- **patent protects an idea**
 - you can't use my patented idea
 - but you can achieve the same effect in a different way
- **the meaning of "different" is NOT usually clear**

Amazon's 1-click patent

United States Patent
Hartman, et al.

5,960,411
September 28, 1999

Method and system for placing a purchase order via a communications network

Abstract

A method and system for placing an order to purchase an item via the Internet. The order is placed by a purchaser at a client system and received by a server system. The server system receives purchaser information including identification of the purchaser, payment information, and shipment information from the client system. The server system then assigns a client identifier to the client system and associates the assigned client identifier with the received purchaser information. The server system sends to the client system the assigned client identifier and an HTML document identifying the item and including an order button. The client system receives and stores the assigned client identifier and receives and displays the HTML document. In response to the selection of the order button, the client system sends to the server system a request to purchase the identified item. The server system receives the request and combines the purchaser information associated with the client identifier of the client system to generate an order to purchase the item in accordance with the billing and shipment information whereby the purchaser effects the ordering of the product by selection of the order button.

Inventors: **Hartman; Peri** (Seattle, WA); **Bezos; Jeffrey P.** (Seattle, WA); **Kaphan; Shel** (Seattle, WA); **Spiegel; Joel** (Seattle, WA)
Assignee: **Amazon.com, Inc.** (Seattle, WA)

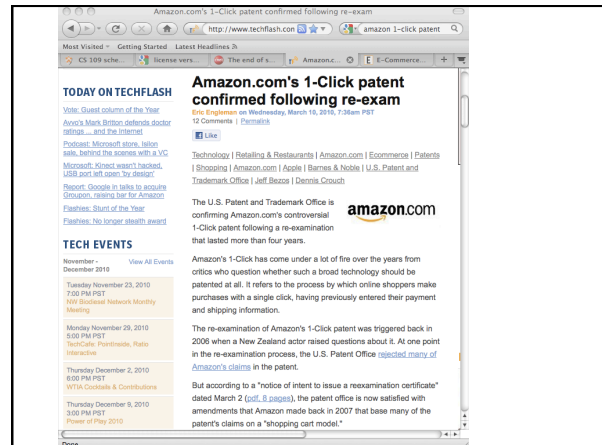
On again, off again...

USPTO partially confirms validity of Amazon "1-click patent"

From Wikinews, the free news source you can write!

October 9, 2007

Today, the United States Patent and Trademark Office (USPTO) issued an office action which confirmed the patentability of claims 6 to 10 of the Amazon 1-Click patent, US 5,960,411^[1]. The patent examiner, however, rejected claims 1 to 5 and 11 to 15. Amazon now has up to six months to amend the rejected claims to overcome the examiner's rejection, provide arguments to demonstrate that the examiner is in error and/or provide evidence to demonstrate the patentability of their claims. During this period, the entire patent is still considered valid under US patent law.



The screenshot shows a web browser displaying a TechFlash article. The article title is "Amazon.com's 1-Click patent confirmed following re-exam". The text of the article states: "The U.S. Patent and Trademark Office is confirming Amazon.com's controversial 1-Click patent following a re-examination that lasted more than four years." Below the article, there is a "TECH EVENTS" section with a calendar of events for November and December 2010.

Patent reform?

- **patent system is showing real strain, if not actually broken**
 - large and growing number of applications each year
 - number of examiners is not growing
 - standards for prior art and obviousness may be too low especially for software and business methods
 - new technologies are always a problem
- **lots of money at stake, lots of powerful interests**
 - patent "trolls" who use patents to try to extract money by litigation
 - Open Patent, PubPat look for prior art to invalidate bad patents
- **recent Supreme Court cases try to decide what is patentable**
 - KSR v Teleflex: stronger standard of what is obvious (4/07)
 - Bilski: patentability of business methods denied by Federal Circuit 10/08 oral arguments at Supreme Court 11/09/09

Trade secrets

- **information disclosed only under some kind of agreement**
- **basically a contract / binding legal agreement between two parties ("non-disclosure agreement" or NDA)**
- **no recourse if secrecy is lost**
- **often used as an argument about why information should not be made public**
 - voting machine technology
 - breathalyzer technology
 - ...

Open source / free software

- **source code: instructions in a readable programming language**
 - usually has significant commercial value
e.g., Windows, Office, TurboTax, Photoshop, ...
 - usually proprietary, secret, not revealed
even if compiled version is given away (e.g., iTunes, Internet Explorer)
- **"open source": source code is available, can be copied and used**
 - a reaction to restrictions on proprietary code
 - promoted by Free Software Foundation, other open source projects & groups
- **various kinds of licenses determine what can be done with it**
 - mainly concerned with keeping source code open enough that others can continue to build on it and improve it
 - prevents anyone from taking it private / proprietary
- **a viable threat to proprietary software in important areas**

Free Software Foundation (Richard Stallman, MIT, ~1985)

- **plan to build an operating system and all supporting software**
 - "GNU" -- "GNU's not Unix"
- **started non-profit organization called Free Software Foundation**
- **wanted source code to be released so that it could not be converted to proprietary, would remain free forever**
 - "free" as in "free speech", not "free beer"
ok to charge for distribution, support, etc.
- **source released under copyright agreement that requires that any subsequent distribution be covered by the same agreement**
- **GNU GPL (General Public License): "copyleft"**
 - full permission to use, copy, modify, distribute modifications
 - copies, derivative works, etc., must have the same terms if distributed
 - copies, etc., must have the same license attached to them
 - NO permission to add further restrictions; explicitly forbidden
- **source code has to be freely available**
 - can't "take it private"

Open source examples

- **Linux, other Unix variants**
 - FreeBSD (Mac OS X uses this), NetBSD, OpenBSD, OpenSolaris
- **Apache web server**
- **Mozilla web browser (Firefox)**
- **OpenOffice**
 - work-alike for Microsoft Office
- **GCC (GNU compiler collection)**
 - compilers for C, C++, Fortran, etc.
- **Perl, Python, PHP, ...**
 - major programming languages
- **MySQL, SQLite and other database systems**
- **lots of smaller systems**
 - standard Unix tools, languages, etc.

Open source questions

- **why do programmers contribute?**
- **why do companies use it?**
- **is it better than commercial software?**
- **is it a threat to Microsoft?**
- **what economic model explains it?**
- **will its legal protections hold up?**
- **should it be required for crucial systems like electronic voting?**

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Real programs (warning: most of these numbers are flaky)

- **6th Edition Unix** 9000 lines
- **Linux: 10.8 M lines in 24,800 source files** (v 2.6.31.6, 11/09)
 - includes many device drivers, etc., not all needed, not all simultaneous
- **first C compiler: about 2700 lines**
- **GCC C/C++ compiler: 3.15 M lines** (v 4.4.2, 11/09)
- **Firefox: 2 M lines (mozilla.org)** (v 3.5.5, 11/09)
- **Apache web server: 338 K lines (apache.org)** (v 2.2.14, 11/09)
- **Windows 98: 18 M lines (but what's included?)**
- **Windows XP: 38 M lines**
- **Windows Vista: 100 M lines?**
- **Windows 7: ???**

What's hard about big programs?

- **lots of components with hidden or implicit connections**
 - a change in one place has unexpected effects elsewhere
software as spaghetti
 - most errors occur at interfaces between components
 - language features, software design, etc., devoted to reducing and controlling interconnections
- **changes in requirements or environment or underpinnings**
 - each change requires rethinking, adapting, changing -- a fresh chance to get something wrong
- **constraints on performance, memory, schedule, ...**
 - force people to create more complicated code or cut corners
- **coordination and cooperation among groups of people**
 - management complexity grows rapidly with size of organization
 - Brooks's Law: Adding manpower to a late software project makes it later

Special purpose systems

- **not all computers run a general-purpose operating system**
- **game machines, cell phones, digital cameras, camcorders, ...**
 - may run a single program specialized to a single task
 - but increasingly these use versions of standard operating systems
- **it's easier to build a new product if you can use off-the-shelf software as a controller**
 - much less work to get started
 - easier to add new features

Why software instead of hardware?

- **general-purpose software instead of special-purpose hardware:**
- **software is**
 - more flexible
 - easier to change in the field
 - cheaper to manufacture (though often costly to create originally)
- **hardware is**
 - faster, more efficient
 - more reliable, more robust
 - more secure against intrusion, theft, reverse engineering
- **dividing line is not always clear**
 - ROM, flash memory, etc.
 - plug-in cards, game cartridges

Fundamental Software Ideas

- **algorithm: sequence of precise, unambiguous steps**
 - performs some task and terminates
 - based on defined basic / primitive operations
 - describes a computation independent of implementation details
- **programming language:**
 - grammar, syntax, and semantics for expressing computation
notation is important: there are many, many languages
- **program: algorithms implemented in a programming language**
- **compilers, interpreters: programs that convert from the high level language used by people to a lower level**
 - a compiler is a program that writes a program
 - an interpreter also acts as a computer so the program can be run
- **libraries and components: programs written by others**
 - packaged in a form that can be used in a new program
- **abstraction, layers, interfaces, virtualization**
 - hiding details, pretending to be something else
- **bugs: the need for absolute precision**
 - cover all cases, cope with failures and misuse