Chapter 4: Intellectual Property

COMP422 Ethics and Professional Issues in Computing
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Based on
Ethics for the Information Age (5th Ed.)
by
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Chapter Overview (1/2)

- Introduction
- Intellectual property rights
- Protecting intellectual property
- Fair use
- New restrictions on use

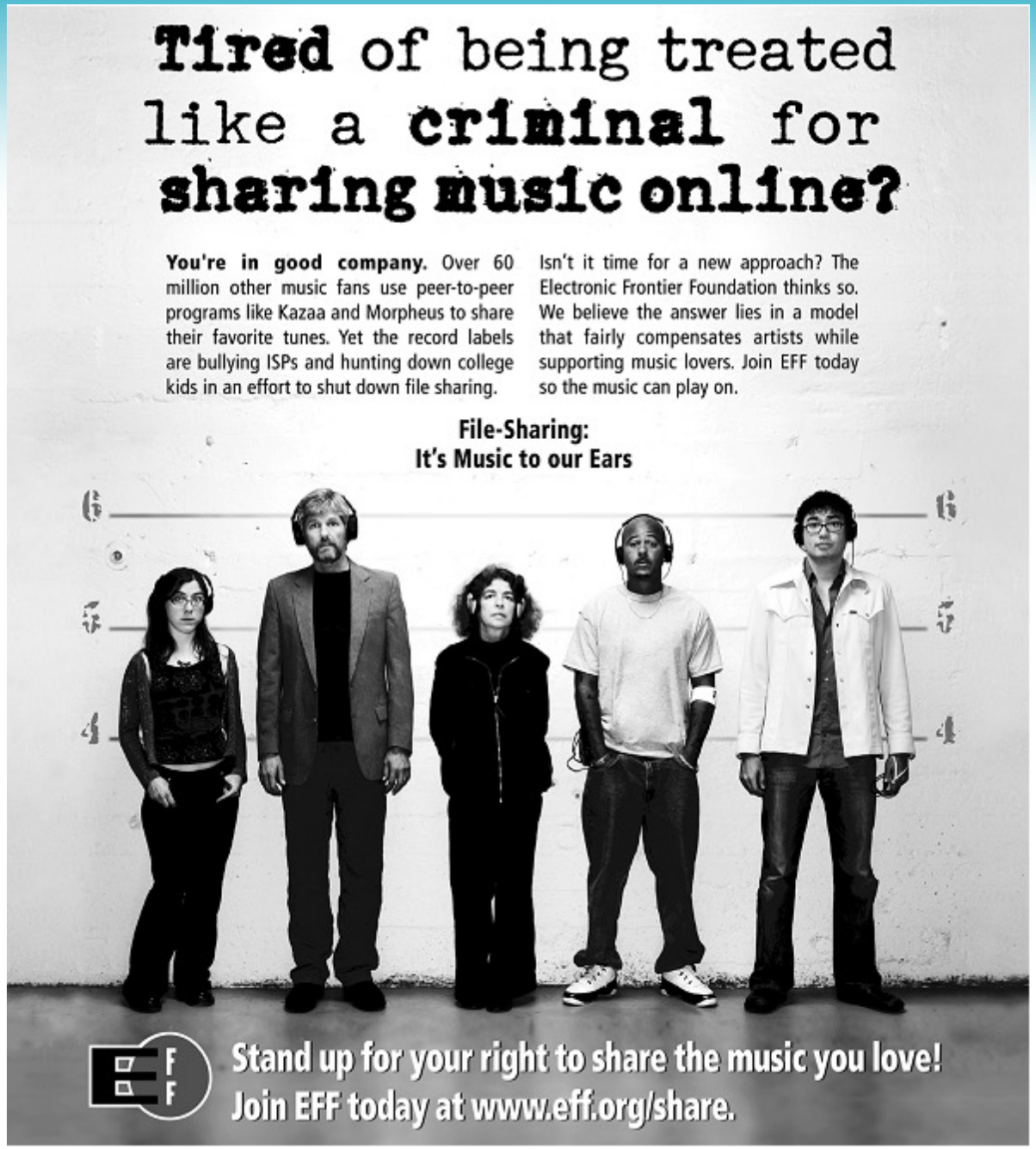
Chapter Overview (2/2)

- Peer-to-peer networks
- Protections for software
- Open-source software
- Legitimacy of intellectual property protection for software
- Creative Commons

4.1 Introduction

Information Technology Changing Intellectual Property Landscape

- Value of intellectual properties much greater than value of media
  - Creating first copy is costly
  - Duplicates cost almost nothing
- Illegal copying pervasive
  - Internet allows copies to spread quickly and widely
- In light of advances in information technology, how should we treat intellectual property?



4.2 Intellectual Property Rights

What Is Intellectual Property?

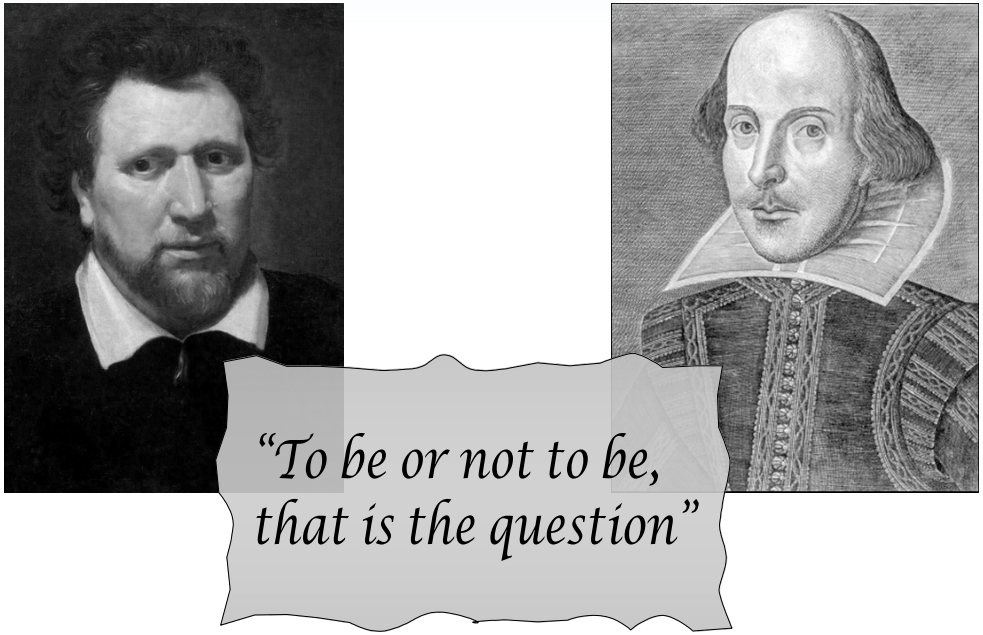
- Intellectual property: any unique product of the human intellect that has commercial value
  - Books, songs, movies
  - Paintings, drawings
  - Inventions, chemical formulas, computer programs
- Intellectual property ≠ physical manifestation

Property Rights

- Locke: *The Second Treatise of Government*
- People have a right…
  - to property in their own person
  - to their own labor
  - to things which they remove from Nature through their labor
- As long as…
  - nobody claims more property than they can use
  - after someone removes something from common state, there is plenty left over

Locke's Notion of Property Rights

Analogy Is Imperfect



- If Ben Jonson and William Shakespeare simultaneously write down *Hamlet*, who owns it?
- If Ben "steals" the play from Will, both have it

Benefits of Intellectual Property Protection

- Some people are altruistic; some are not
- Allure of wealth can be an incentive for speculative work
- Authors of U.S. Constitution recognized benefits to *limited* intellectual property protection

Limits to Intellectual Property Protection

- Giving creators rights to their inventions stimulates creativity
- Society benefits most when inventions in public domain
- Congress has struck compromise by giving authors and inventors rights for a limited time

Prices Fall When Works Become Public Domain

Artist	*Work*	*Previous Rental Fee*	*Year Became Public Domain*	*Purchase Price*
Ravel	Daphnis et Chloe Suite no. 1	$450.00	1987	$155.00
Ravel	Mother Goose Suite	540.00	1988	70.00
Ravel	Daphnis et Chloe Suite no. 2	540.00	1989	265.00
Griffes	The White Peacock	335.00	1993	42.00
Puccini	O Mio Babbino Caro	252.00	1994	26.00
Respighi	Fountains of Rome	441.00	1994	140.00
Ravel	Le Tombeau de Couperin	510.00	1995	86.00
Respighi	Ancient Aires and Dances Suite no. 1	441.00	1996	85.00
Elgar	Cello Concerto	550.00	1997	140.00
Holst	The Planets	815.00	1997	300.00
Ravel	Alborada Del Gracioso	360.00	1999	105.00

Table from "Letter to The Honorable Senator Spencer Abraham," by Randolph P. Luck from LUCK'S MUSIC LIBRARY.

4.3 Protecting Intellectual Property

Trade Secret

- Confidential piece of intellectual property that gives company a competitive advantage
- Never expires
- Not appropriate for all intellectual properties
- Reverse engineering allowed
- May be compromised when employees leave firm

Trademark, Service Mark

- Trademark: Identifies goods
- Service mark: Identifies services
- Company can establish a “brand name”
- Does not expire
- If brand name becomes common noun, trademark may be lost
- Companies advertise to protect their trademarks
- Companies also protect trademarks by contacting those who misuse them

Xerox Corporation ran this advertisement as part of its campaign to protect its trademark

Patent

- A public document that provides detailed description of invention
- Provides owner with exclusive right to the invention
- Owner can prevent others from making, using, or selling invention for 20 years

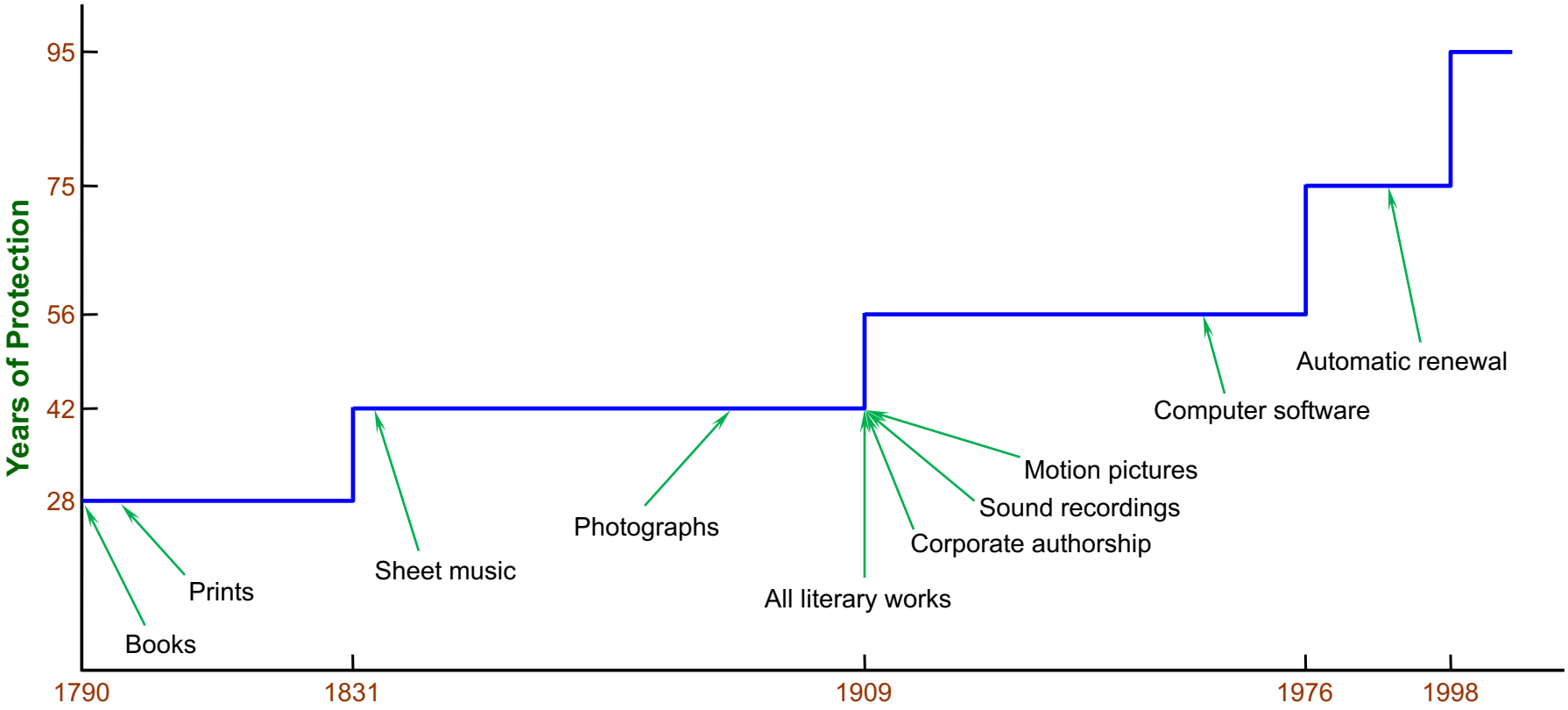
Copyright

- Provides owner of an original work five rights
  - Reproduction
  - Distribution
  - Public display
  - Public performance
  - Production of derivative works
- Copyright-related industries represent 5% of U.S. gross domestic product (> $500 billion/yr)
- Copyright protection has expanded greatly since 1790

Key Court Cases and Legislation (PP. 173-174)

- *Gershwin Publishing Corporation v. Columbia Artists Management, Inc.*
- *Basic Books v. Kinko's Graphics Corporation* (Kinko needed to pay US$510,000 to a group of 8 publishers. Kinko got out of the "Professor Publishing" business)
- Davey Jones Locker
- No Electronic Theft Act (1994)

Copyright Creep



Copyright Creep

- Since 1790, protection for books extended from 28 years to 95 years or more
- Some suggested latest extension done to prevent Disney characters from becoming public domain
- Group of petitioners challenged the Copyright Term Extension Act of 1998, arguing Congress exceeded Constitutional power
- U.S. Supreme Court (Copyright Term Extension Act)
  - CTEA does not create perpetual copyrights
  - CTEA is constitutional

4.4 Fair Use

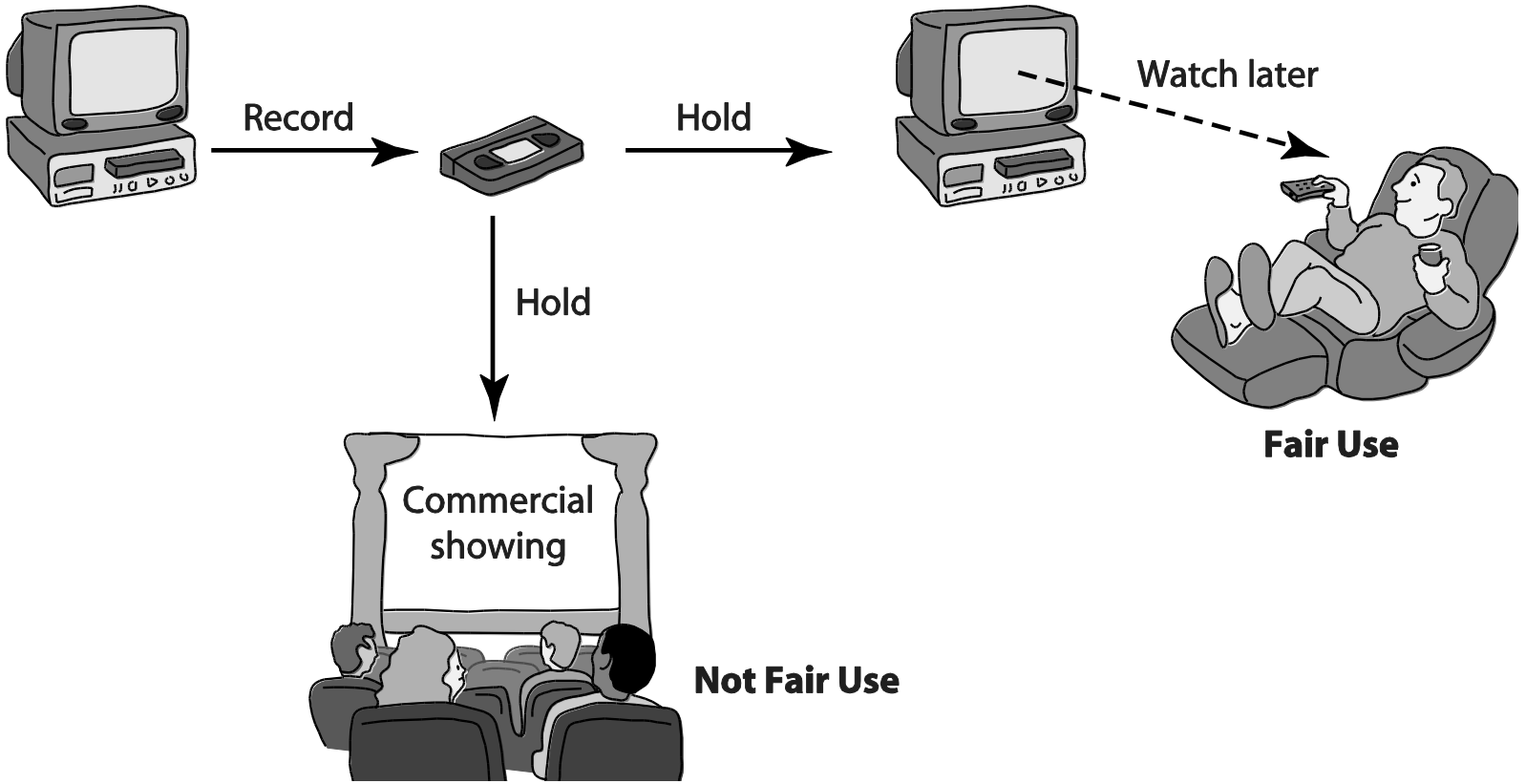
Fair Use Concept

- Sometimes legal to reproduce a copyrighted work without permission
- Courts consider four factors
  - Purpose and character of use
  - Nature of work
  - Amount of work being copied
  - Affect on market for work

Sony v. Universal City Studios

- Sony introduces Betamax VCR (1975)
- People start time shifting TV shows
- Movie studios sue Sony for copyright infringements
- U.S. Supreme Court rules (5-4) that time shifting is fair use

Time Shifting



Digital Recording Technology

- Copying from vinyl records to cassette tapes introduced hiss and distortions
- Introduction of compact disc a boon for music industry
  - Cheaper to produce than vinyl records
  - Higher quality
  - Higher price $\Rightarrow$ higher profits
- BUT it's possible to make a perfect copy of a CD

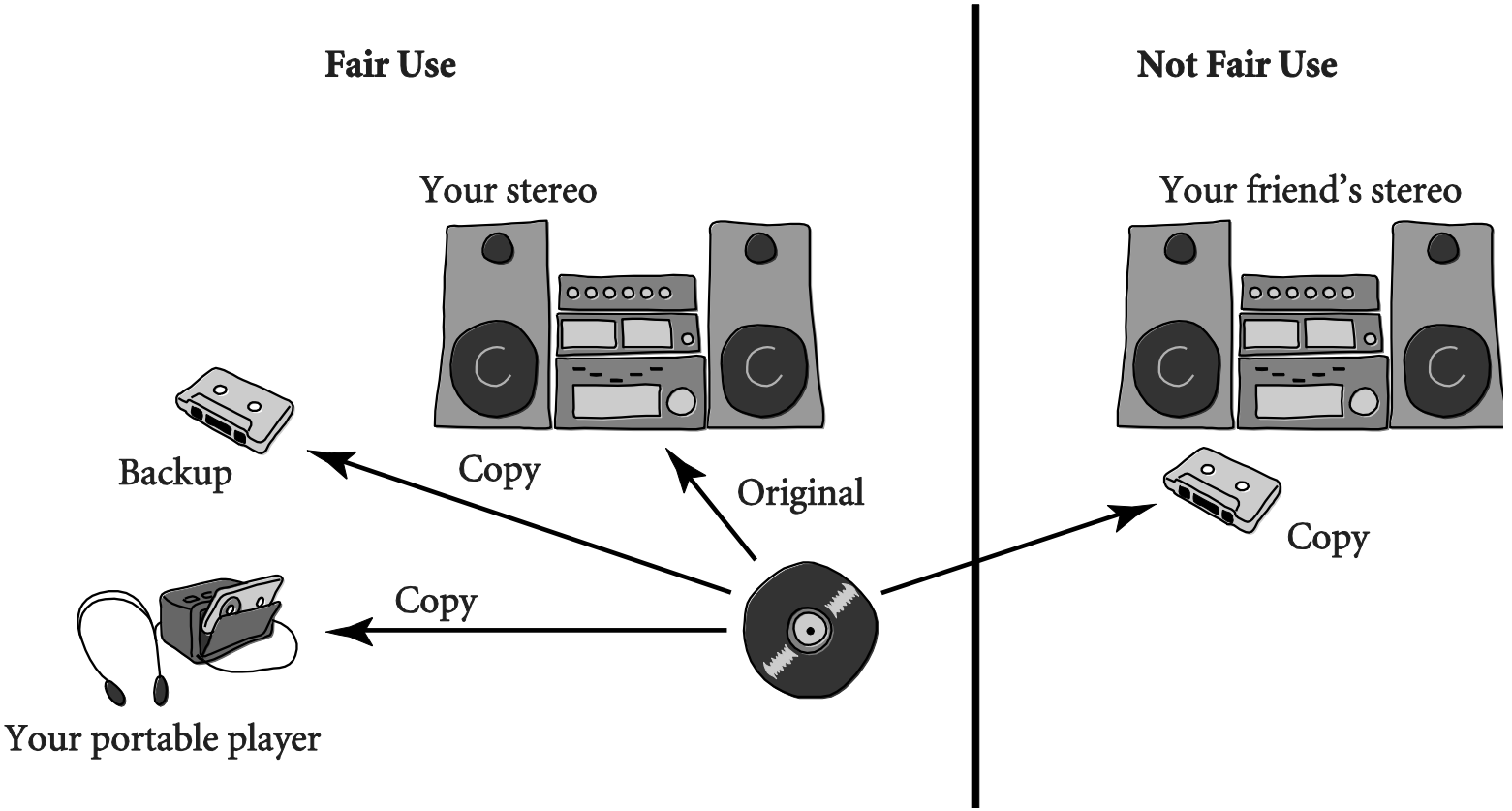
Audio Home Recording Act of 1992

- Protects rights of consumers to make copies of analog or digital recordings for personal, noncommercial use
  - Backup copy
  - Give to family member
- Digital audio recorders must incorporate Serial Copyright Management System (SCMS), so consumers can’t make a copy of a copy

RIAA v. Diamond Multimedia Systems

- MP3 compression allows songs to be stored in 10% of the space, with little degradation
- Diamond introduces Rio MP3 player (1998)
- People start space shifting their music
- RIAA starts legal action against Diamond for violation of the Audio Home Recording Act
- U.S. Court of Appeals, 9th Circuit, affirms that space shifting is consistent with copyright law

Space Shifting



Kelly v. Arriba Soft Corporation (PP. 180-181)

- Kelly: Photographer maintaining Web site with copyrighted photos
- Arriba Soft: Creates search engine that returned thumbnail images
- Kelly sues Arriba Soft for copyright infringement
- U.S. Court of Appeals, 9th Circuit, affirms that use of images is a fair use

Google Books (PP. 181-183)

- Google announced plan to scan millions of books held by several huge libraries, creating searchable database of all words
- If public domain book, system returns PDF
- If under copyright, user can see a few sentences; system provides links to libraries and online booksellers
- Authors Guild and publishers sued Google for copyright infringement
- Out-of-court settlement under review by U.S. District Court for Southern District of New York

Benefits of Proposed Settlement

- Google would pay $125 million to resolve legal claims of authors and publishers and establish Book Rights Registry
- Readers would have much easier access to out-of-print books at U.S. public libraries and university libraries
- University libraries could purchase subscriptions giving their students access to collections of some of world's greatest libraries
- Authors and publishers would receive payments earned from online access of their books, plus share of advertising revenues

Criticisms of Proposed Settlement

- Google should have gone to court
  - Google had a good case that its use was a fair use, based on precedent of *Kelly v. Arriba Soft*
  - If Google had been found not guilty of copyright infringement, it could have given public access to books at lower rates
- Agreement gives Google a virtual monopoly over orphaned works
- Potential chilling effect of Google tracking the pages that people are viewing

Court Rejects Proposed Settlement

- March 2011: U.S. District Court for Southern District of New York rejected proposed settlement
- Judge ruled agreement would have:
  - Given Google significant advantage over competitors
  - Rewarded Google for “wholesale copying of copyrighted words without permission”
  - Given Google liberal rights over orphaned works

4.5 New Restrictions on Use

Counterfeit CDs Means Lost Profits

© Reuters/CORBIS

Digital Millennium Copyright Act

- Passed by Congress in 1998
- First big revision of copyright law since 1976
- Brought U.S. into compliance with Europe
- Extended length of copyright
- Extended copyright protection to music broadcast over Internet
- Made it illegal for anyone to
  - Circumvent encryption schemes placed on digital media
  - Circumvent copy controls, even for fair use purposes

Digital Rights Management

- Actions owners of intellectual property take to protect their rights
- Approaches
  - Encrypt digital content
  - Digital marking so devices can recognize content as copy-protected

Secure Digital Music Initiative (1998)

- Goals
  - Create copy-protected CDs
  - Secure digital music downloads
- Consortium of 200 companies developed “digital watermarking” scheme
- Failed
  - Internet copying became huge before SDMI ready
  - Some SDMI sponsors were electronics companies
  - Digital watermarking encryption cracked (2000)

Sony BMG Music Entertainment Rootkit

- Millions of audio CDs shipped with Extended Copy Protection, a DRM system
- Prevented users from
  - Ripping audio tracks into MP3 format
  - Making more than 3 backup copies
- Relied upon Windows “rootkit” that hid files and processes; usually only hackers use rootkits
- Huge public outcry once secret uncovered
- Sony BMG stopped production and compensated consumers

Encrypting DVDs (P. 186)

- Contents of DVDs encrypted using Content Scramble System (CSS)
- Need decryption keys to view a DVD
- In 1999, Jon Johansen wrote a decryption program for Linux
- *2600 Magazine* published the code
- Motion picture studios sued *2600 Magazine* and won
- Johansen tried in Norway (2003) and found not guilty

Foiling HD-DVD Encryption (PP. 186-187)

- Hardware, software, and entertainment companies created Advanced Access Content System to encrypt HD-DVDs
- Encryption key posted on Digg.com (2007)
- AACS leaned on Digg.com to censor postings containing key
- Digg users fought back
- AACS “expired” the key and issued a new one
- A month later, a Digg user posted the new key

Criticisms of Digital Rights Management

- Any technological “fix” is bound to fail
- DRM undermines fair use
- DRM could reduce competition
- Some schemes make anonymous access impossible (Microsoft’s Windows Media Player keeps track of all the contents the user views)

Online Music Stores Employed Digital Rights Management

- When iTunes Music Store opened in 2003, all music was protected with a DRM scheme called FairPlay
- FairPlay blocked users from freely exchanging purchased music
  - Songs couldn't be played on more than 5 different computers
  - Songs couldn't be copied onto CDs more than 7 times
- Songs purchased from iTunes Store wouldn't play on non-Apple devices
- DRM-protected music purchased from other online retailers couldn't be played on iPod

Online Music Stores Drop Digital Rights Management

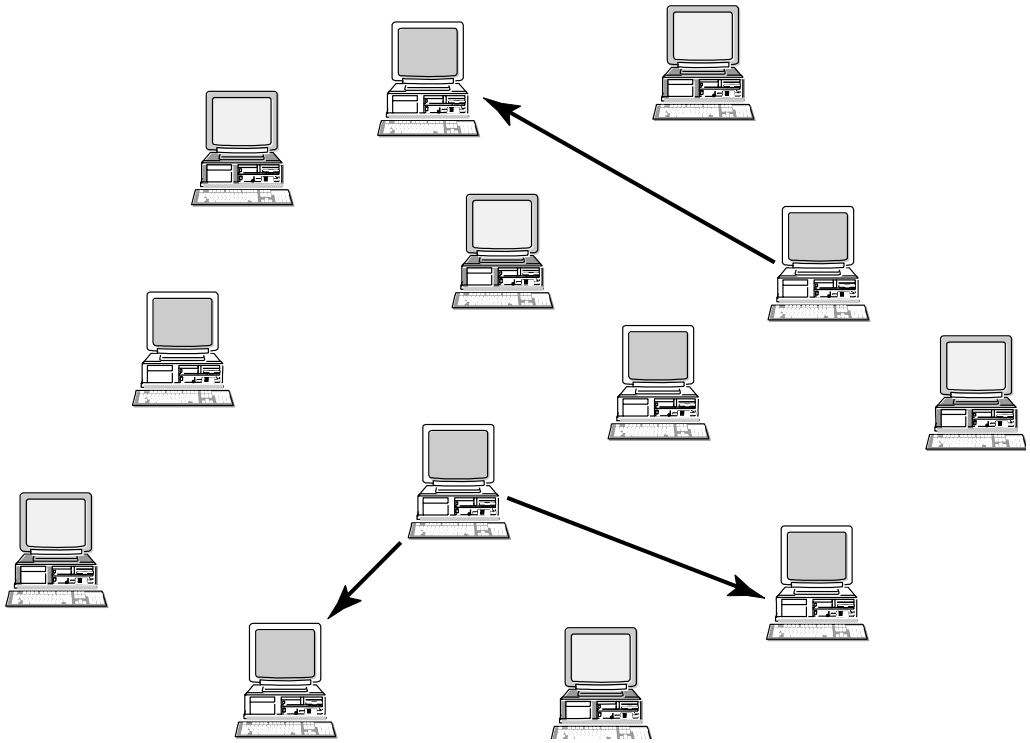
- Consumers complained about restrictions associated with DRM
- European governments put pressure on Apple to license FairPlay or stop using DRM
- Amazon reached an agreement with all four major music labels (Universal Music Group, Sony BMG, Warner Music Group, & EMI) to sell DRM-free music
- Apple followed suit in 2009

4.6 Peer-to-Peer Networks

Peer-to-Peer Networks Facilitate Data Exchange

- Peer-to-peer network
  - Transient network
  - Connects computers running same networking program
  - Computers can access files stored on each other's hard drives
- How P2P networks facilitate data exchange
  - Give each user access to data stored in many other computers
  - Support simultaneous file transfers among arbitrary pairs of computers
  - Allow users to identify systems with faster file exchange speeds

A Peer-to-Peer Network



A peer-to-peer network connects computers running the same networking program. Computers can access files stored on each other's hard drives.

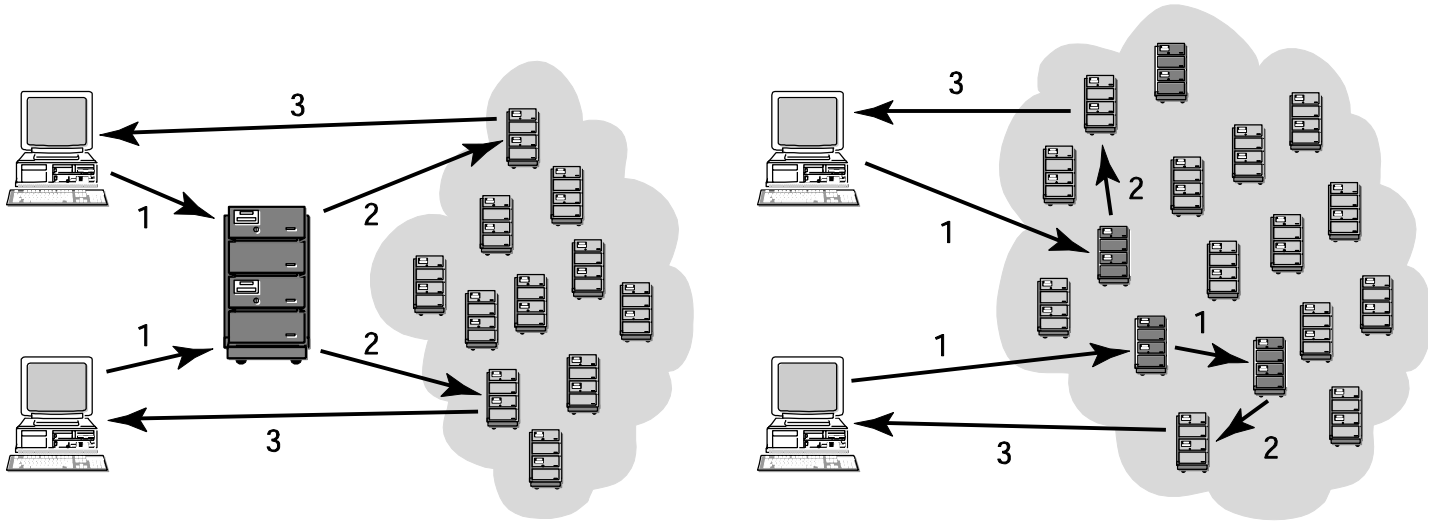
Napster (P. 189)

- Peer-to-peer music exchange network
- Began operation in 1999
- Sued by RIAA for copyright violations
- Courts ruled in favor of RIAA
- Went off-line in July 2001
- Re-emerged in 2003 as a subscription music service

FastTrack (P. 189)

- Second-generation peer-to-peer network technology introduced in 2001
- Used by KaZaA and Grokster
- Distributes index among large number of “supernodes”
- Cannot be shut down as easily as Napster

Comparing Napster and FastTrack



(a) (b)

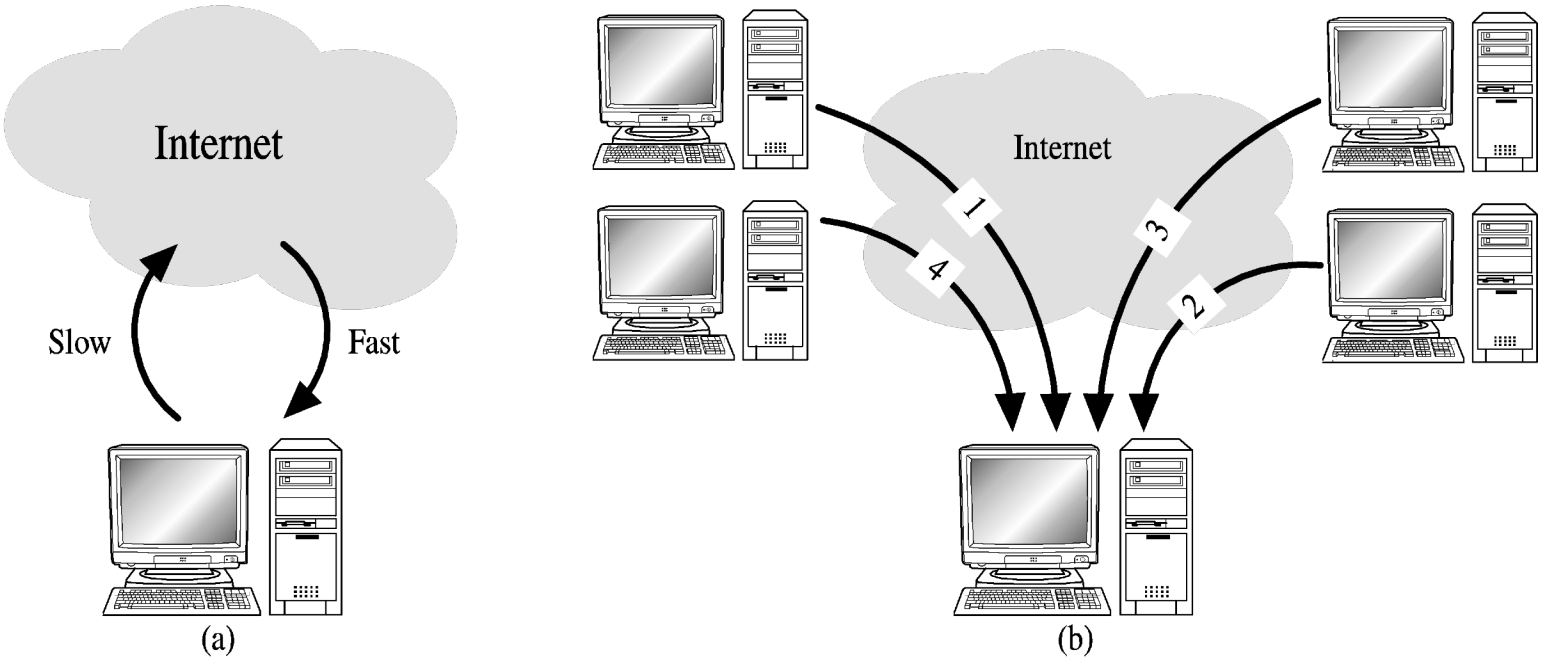
a) In Napster, a central server maintains the index of all files available for sharing. Retrieving a file in 3 steps: (1) make the request to the central server, (2) establish a connection between the sending & receiving computers, (3) transfer the file.

b) In FastTrack, the index of available files is distributed among many “supernodes”. Each supernode has information about available files on “nearby” computers. Different users connect with different supernodes.

BitTorrent

- Broadband connections: download much faster than upload
- BitTorrent speeds downloading
  - Files broken into pieces
  - Different pieces downloaded from different computers
- Used for downloading large files
  - Computer programs
  - Television shows
  - Movies

Concept Behind BitTorrent



a) Broadband Internet connections provide higher speeds for downloading than for uploading.

b) BitTorrent reduces downloading timed by enabling a computer to download different pieces of a file simultaneously from many different peers.

RIAA Lawsuits (PP. 190-192)

- April 2003: RIAA warned file swappers they could face legal penalties
- RIAA subpoenaed Verizon for identities of people suspected of running supernodes
- Judge ruled in favor of RIAA
- September 2003: RIAA sued 261 individuals
- December 2003: U.S. Court of Appeals ruled Verizon did not have to give customer names to RIAA

Huge Jury Judgments Overturned

- Jammie Thomas-Rassert
  - Federal jury ordered her to pay $1.92 million
  - Damages reduced to $54,000
- Joel Tenenbaum
  - Jury ordered him to pay $675,000
  - Judge reduced award to $67,500
- Does RIAA have to prove someone actually copied the songs that people made available on Kazaa?
  - New York decision: No
  - Massachusetts, Arizona decisions: Yes

Legal Action Against The Pirate Bay

- The Pirate Bay located in Stockholm, Sweden
- One of world's biggest BitTorrent file-sharing sites
- People download songs, movies, TV shows, etc.
- After 2006 raid by police, popularity increased
- In 2008 the International Federation of the Phonographic Industry sued four individuals connected with site
- Defendants said The Pirate Bay just a search engine
- Found guilty; sentence to prison and fined $6.5 million
- Meanwhile, The Pirate Bay still operational

Legal Music Services on the Internet

- Subscription services for legal downloading
- Some based on monthly fee; some free
- Consumers pay for each download
- Apple's iTunes Music Store leading service, surpassing WalMart as top music retailer in United States

4.7 Protections for Software

Software Copyrights

- Copyright protection began 1964
- What gets copyrighted?
  - Expression of idea, not idea itself
  - Object program, not source program
- Companies treat source code as a trade secret

Violations of Software Copyrights

- Copying a program to give or sell to someone else
- Preloading a program onto the hard disk of a computer being sold
- Distributing a program over the Internet

Important Court Cases (P. 196)

- *Apple Computer v. Franklin Computer*
  - Established that object programs are copyrightable
- *Sega v. Accolade*
  - Established that disassembling object code to determine technical specifications is fair use

Software Patents (1/3)

- Until 1981, Patent Office refused to grant software patents
  - Saw programs as mathematical algorithms, not processes or machines
- U.S. Supreme Court decision led to first software patent in 1981 (PP. 196-197)
- Further court rulings led to patents being granted for wider range of software

Software Patents (2/3)

- Thousands of software patents now exist
  - Microsoft files ~3,000 applications annually
  - Licensing patents a source of revenue
- Secondary market for software patents
  - Patent trolls: Companies that specialize in buying patents and enforcing patent rights (P.197)
  - Companies would rather settle out of court than spend time and money going to trial
  - RIM didn't settle quickly; ended up paying $612 million

Software Patents (3/3)

- Critics say too many patents have been issued
  - Patent Office doesn't know about prior art, so it issues bad software patents
  - Obvious inventions get patents
- Companies with new products fear getting sued for patent infringement
  - Build stockpiles of patents as defense mechanism
  - Software patents used as legal weapons
- Bezos: software patents should expire in 3-5 years

Safe Software Development

- Reverse engineering okay
- Companies must protect against unconscious copying
- Solution: “clean room” software development strategy
  - Team 1 analyzes competitor’s program and writes specification
  - Team 2 uses specification to develop software

4.8 Open-Source Software

Consequences of Proprietary Software

- Increasingly harsh measures being taken to enforce copyrights
- Copyrights are not serving their purpose of promoting progress
- It is wrong to allow someone to “own” a piece of intellectual property

Open-Source Definition

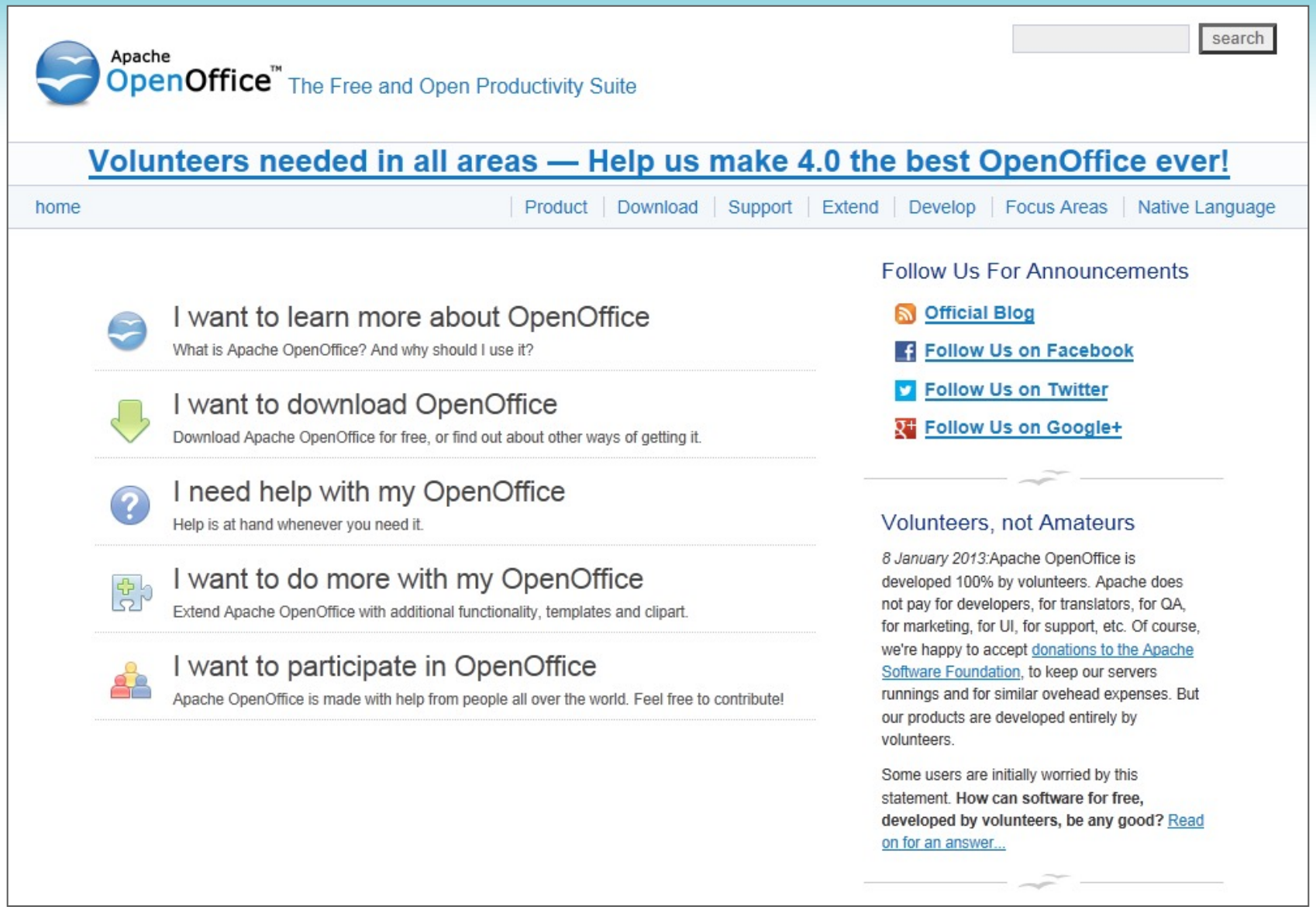
- No restrictions preventing others from selling or giving away software
- Source code included in distribution
- No restrictions preventing others from modifying source code
- No restrictions regarding how people can use software
- Same rights apply to everyone receiving redistributions of the software

Beneficial Consequences of Open-Source Software

- Gives everyone opportunity to improve program
- New versions of programs appear more frequently
- Eliminates tension between obeying law and helping others
- Programs belong to entire community
- Shifts focus from manufacturing to service

Examples of Open-Source Software

- BIND
- Apache
- Sendmail
- Android operating system for smartphones
- Firefox
- OpenOffice.org
- Perl, Python, Ruby, TCL/TK, PHP, Zope
- GNU compilers for C, C++, Objective-C, Fortran, Java, and Ada


Apache
OpenOffice™ The Free and Open Productivity Suite
search
Volunteers needed in all areas — Help us make 4.0 the best OpenOffice ever!
home
Product
Download
Support
Extend
Develop
Focus Areas
Native Language
I want to learn more about OpenOffice
What is Apache OpenOffice? And why should I use it?
I want to download OpenOffice
Download Apache OpenOffice for free, or find out about other ways of getting it.
I need help with my OpenOffice
Help is at hand whenever you need it.
I want to do more with my OpenOffice
Extend Apache OpenOffice with additional functionality, templates and clipart.
I want to participate in OpenOffice
Apache OpenOffice is made with help from people all over the world. Feel free to contribute!
Follow Us For Announcements
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Volunteers, not Amateurs
8 January 2013:Apache OpenOffice is developed 100% by volunteers. Apache does not pay for developers, for translators, for QA, for marketing, for UI, for support, etc. Of course, we're happy to accept donations to the Apache Software Foundation, to keep our servers runnings and for similar ovehead expenses. But our products are developed entirely by volunteers.
Some users are initially worried by this statement. How can software for free, developed by volunteers, be any good? Read on for an answer...

GNU Project and Linux

- GNU Project
  - Begun by Richard Stallman in 1984
  - Goal: Develop open-source, Unix-like operating system
  - Most components developed in late 1980s
- Linux
  - Linus Torvalds wrote Unix-like kernel in 1991
  - Combined with GNU components to make an O.S.
  - Commonly called Linux

Impact of Open-Source Software

- Linux putting pressure on companies selling proprietary versions of Unix
- Linux putting pressure on Microsoft and Apple desktops

Crititique of the Open-Source Software Movement

- Without critical mass of developers, quality can be poor
- Without an “owner,” incompatible versions may arise
- Relatively weak graphical user interface
- Poor mechanism for stimulating innovation (no companies will spend billions on new programs)

Open-Source Licenses

- Legal and binding contracts between the author and the user of a software component
- Declaring how the software can be used under what specified conditions
- We will see some popular open-source licenses in this lecture

Copyleft v.s. Permissive Licenses

- **Copyleft**
  - Other people have the right to use, modify, and redistribute the work as long as the obligation is maintained
  - In another word, to use software with this license, one must make their code open for others to use
- **Permissive**
  - Non-copyleft open source license that guarantees the freedom to use, modify, and redistribute, while also permitting proprietary derivative works
  - Usually with minimal restrictions on how others can use open source components

GNU General Public License (GPL)

- GPL is a copyleft license
- Must release its full source code and all of the rights to modify and distribute the entire code
- Any software that is written based on any GPL component must do the same

Apache License

- Permissive license
- Allows you to freely use, modify, and distribute
- Grants patent rights

Berkeley Software Distribution (BSD)

- Permissive license
- Allows one to freely modify and distribute code in the source or binary format
- As long as one retains a copy of the copyright notice, list of conditions, and the disclaimer

MIT License

- Permissive license created by the Massachusetts Institute of Technology
- Can do whatever you want with software licensed under the MIT license
- As long as you add a copy of the original MIT license and copyright notice to it
- Simple, short and to the point – commercial organizations prefer it

	GPL	Apache	BSD	MIT
Nature	Copyleft	Permissive		
Patent Use	**Yes**	**Yes**	**No**	**No**
Disclose Source	**Yes**	**No**	**No**	**No**
License & copyright notice	**Yes**	**Yes**	**Yes**	**Yes**
Remain same license	**Yes**	**No**	**No**	**No**

Choose an open source license

An open source license protects contributors and users. Businesses and savvy developers won't touch a project without this protection.

Which of the following best describes your situation?

I need to work in a community.

Use the **license preferred by the community** you're contributing to or depending on. Your project will fit right in.

If you have a dependency that doesn't have a license, ask its maintainers to **add a license**.

I want it simple and permissive.

The **MIT License** is short and to the point. It lets people do almost anything they want with your project, like making and distributing closed source versions.

Babel, **.NET Core**, and **Rails** use the MIT License.

I care about sharing improvements.

The **GNU GPLv3** also lets people do almost anything they want with your project, *except* distributing closed source versions.

Ansible, **Bash**, and **GIMP** use the GNU GPLv3.

What if none of these work for me?

My project isn't software.

There are licenses for that.

I want more choices.

More licenses are available.

I don't want to choose a license.

Here's what happens if you don't.

https://choosealicense.com by GitHub

4.9 Creative Commons

Streamlining Creative Re-use

- Under current copyright law, eligible works are copyrighted the moment they are created
- No copyright notice does not mean it's okay to copy
- Must contact people before using work
- That slows down creative re-use
- Free Creative Commons license indicates
  - Which kinds of copying are okay
  - Which rights are being retained
- Flickr and Magnatune two well-known sites using Creative Commons licenses

creative commons About Licenses Public Domain Support CC Projects News

About

- Want to let people share and use your photographs, but not allow companies to sell them?
- Looking for access to course materials from the world's top universities?
- Want to encourage readers to re-publish your blog posts, as long as they give you credit?
- Looking for songs that you can use and remix, royalty-free?

If you answered *yes* to any of the questions above, then you should learn more about Creative Commons. Probably the quickest and easiest introduction to CC is to watch the following short video:

What is Creative Commons?

Creative Commons is a nonprofit organization that enables the sharing and use of creativity and knowledge through free legal tools.

Our free, easy-to-use copyright licenses provide a simple, standardized way to give the public permission to share and use your creative work — on conditions of your choice. CC licenses let you easily change your copyright terms from the default of "all rights reserved" to "some rights reserved."

Creative Commons licenses are not an alternative to copyright. They work alongside copyright and enable you to modify your copyright terms to best suit your needs.

What can Creative Commons do for me?

If you want to give people the right to share, use, and even build upon a work you've created, you should consider publishing it under a Creative Commons license. CC gives you flexibility (for example, you can choose to allow only non-