

Chapter 4: Intellectual Property

Lecture Overview

- Introduction
- Intellectual property rights
- Protecting intellectual property
- Fair use and new restrictions on use
- Peer-to-peer networks and content distribution
- Protections for software
- Open-source software
- Legitimacy of intellectual property protection for software
- Creative Commons

4.1 Introduction

Property (rights) (Propriedade, direito de...)

John Locke (17th Cent.), *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

É de todos...



É MEU!!!

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?

Uma casa...

Valor?

- Materiais, mão de obra: 60%
- Taxas, licenças, etc.: 20%
- Eng. Civil/Supervisão: 15%
- Arquitectura: 5%



Duplicar a casa sem pagar o projecto de arquitectura

- Vale a pena?

Desmaterialização progressiva...

CD/DVD

- Materiais, mão de obra: 0,1€
- Venda: 15€

Serviço Streaming (Spotify): 84€/ano

- Infraestrutura, pessoal: ?
- Pagamento ao detentor do Copyright: 0,005-0,009 €/música

Serviços de download “Hi-res” (Qobuz, HDtracks,...)

- Preços próximos aos dos CDs...

Vale a pena “duplicar”?

Tired of being treated like a criminal for sharing music online?

You're in good company. Over 60 million other music fans use peer-to-peer programs like Kazaa and Morpheus to share their favorite tunes. Yet the record labels are bullying ISPs and hunting down college kids in an effort to shut down file sharing.

Isn't it time for a new approach? The Electronic Frontier Foundation thinks so. We believe the answer lies in a model that fairly compensates artists while supporting music lovers. Join EFF today so the music can play on.

**File-Sharing:
It's Music to our Ears**



Stand up for your right to share the music you love!
Join EFF today at www.eff.org/share.

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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 \neq physical manifestation
- Does right to own property extend to intellectual property?

Benefits of Intellectual Property Protection

- Some people are altruistic¹; some are not²
- Allure of wealth can be an incentive for speculative work
- Authors of U.S. Constitution recognized benefits to *limited* intellectual property protection
- ¹ David Patterson podia ter patenteado muitas das ideias em torno das arquiteturas RAID e RISC
- ² Depois de se reformar e ser convidado como distinguished engineer na Google, o seu trabalho aí foi sistematicamente patenteado pela própria Google...

Limits to Intellectual Property Protection

- Giving creators rights to their inventions stimulates creativity
- Society benefits most when inventions are in public domain
- Congress (as well as legislators in most western countries) has struck a compromise by giving authors and inventors rights for a limited time

Prices Fall When Works Become Public Domain

<i>Artist</i>	<i>Work</i>	<i>Previous Rental Fee</i>	<i>Year Became Public Domain</i>	<i>Purchase Price</i>
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. Copyright © 1996 by Randolph P. Luck. Reprinted with permission.

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

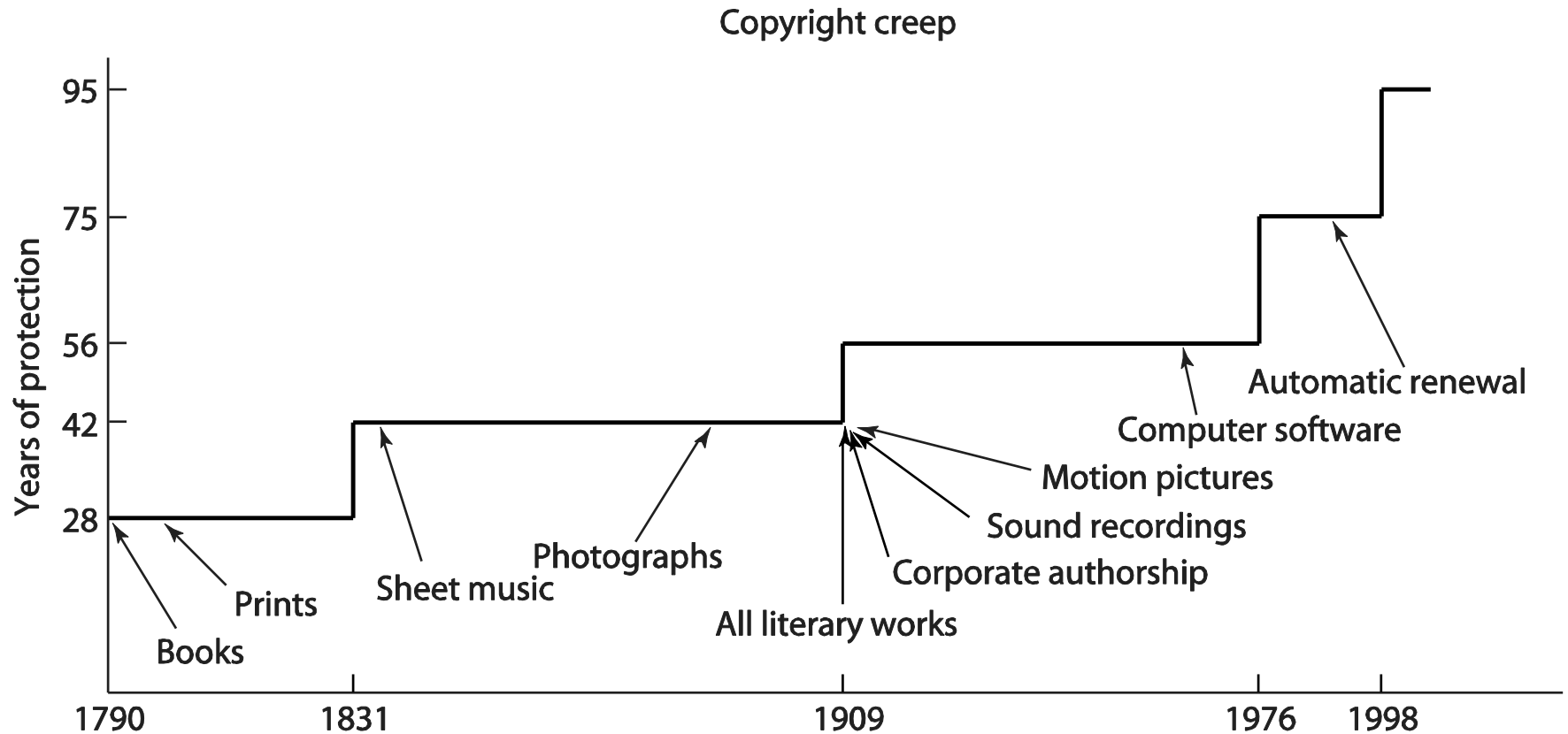
Patent

- 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 (direitos de autor)

- Provides owner of an original work five rights
 - Reproduction
 - Distribution
 - Public display
 - Public performance
 - Production of derivative works
- Copyright-related industries represent 6% of U.S. gross domestic product (~ \$1000B/yr – nota: PIB 2019 ~ 19000B)
- Copyright protection has expanded greatly since 1790

Copyright Creep



Copyright Creep

- Since 1790, protection for books extended from 28 years to 95 years or more
- Some say 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 ruling
 - CTEA does not create perpetual copyrights
 - CTEA is constitutional

Is it Easy to Set a Price for Copyright Use?

- Fair prices are established by markets, provided that,
 - There are **no monopolies**, and
 - There is an **equilibrium** between demand and supply

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

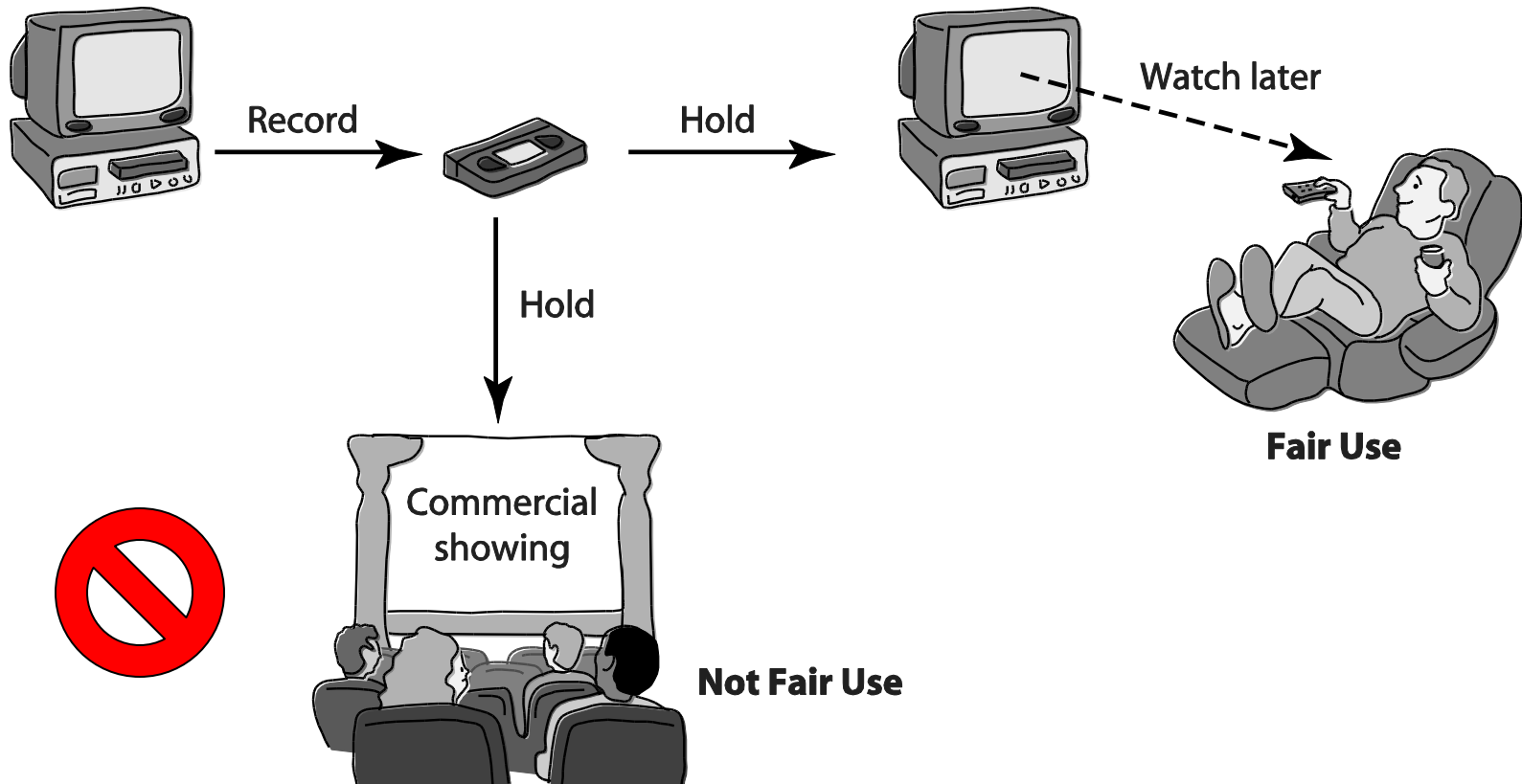
“Fair Use”: para reflectir...

- Pode a violação de direitos de autor/patentes ser enquadrada como “fair use” no caso de remédios como os para HIV/SIDA?
- The Guardian, <https://www.theguardian.com/business/2017/oct/18/intellectual-property-laws-demand-a-21st-century-solution>
 - Wealth before health? Why intellectual property laws are facing a counterattack (Joseph Stiglitz)

Sony v. Universal City Studios

- Sony introduced Betamax VCR (1975)
- People started time shifting TV shows
- Movie studios sued Sony for copyright infringements
- U.S. Supreme Court ruled (5-4) that time shifting is fair use

Time Shifting



Digital Recording Technology

- Duplicating analog (vinyl records, cassette tapes) is lossy (hiss, noise, 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

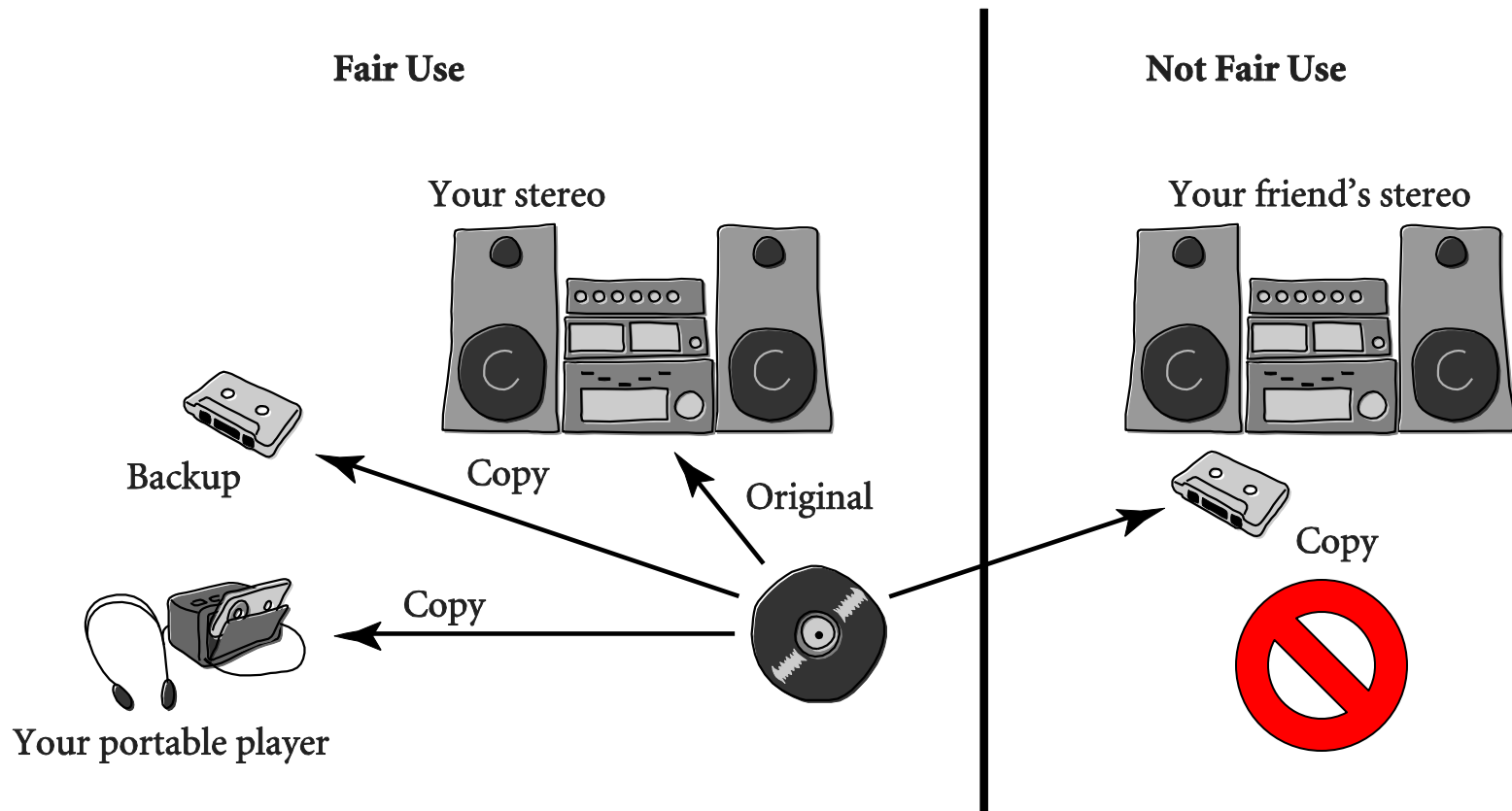
Audio Home Recording Act of 1992

- 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
 - Algumas tentativas goradas porque, e.g., alguns aparelhos não reproduziam o “disco”, hacking era fácil, D-A-A-D (passar a analógico e converter novamente em digital), etc.

RIAA v. Diamond Multimedia

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

Space Shifting



Google Books

- 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 (copying books for commercial reasons)
- Out-of-court settlement reached

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 = Lost Profits



© Reuters/CORBIS

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Digital Millennium Copyright Act

- 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

Tentativas falhadas de impedir cópia

- Secure Digital Music Initiative
- Sony/BMG Extended Copy Protection
- Content Scramble System (para os DVDs)
- Advanced Access Content System (para os HD-DVD)
- Digital Rights Management
- Microsoft Xbox
- Razões
 - Código foi “crackado”
 - Chaves criptográficas divulgadas on-line
 - “Discos” não funcionavam em alguns leitores
 - ...

4.6 Peer-to-Peer (P2P) Networks - Collaborative Content Distribution

Peer-to-Peer Networks

- Peer-to-peer network
 - Transient network, connects computers running same networking program
 - Computers can access files stored on each other's (hard) drives
- 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

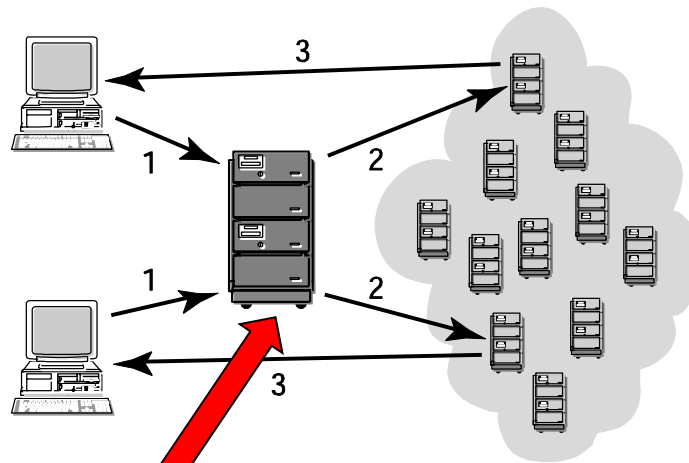
Napster

- Peer-to-peer music exchange network, began operation in 1999
- One “supernode” holds the whole index of file distribution
- 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

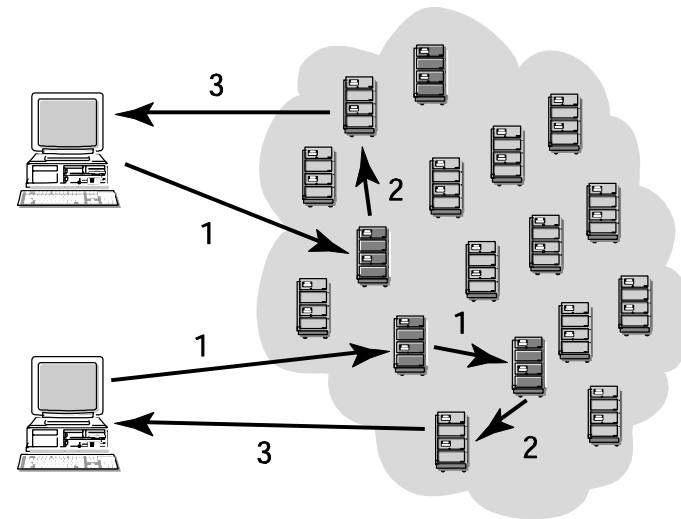
FastTrack

- Second-generation peer-to-peer network technology
- 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)



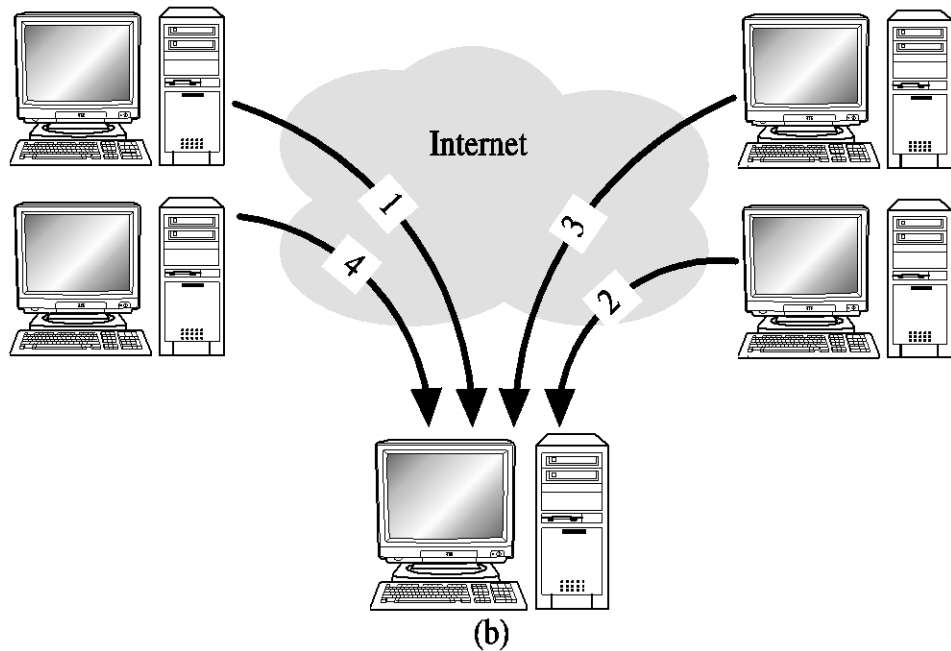
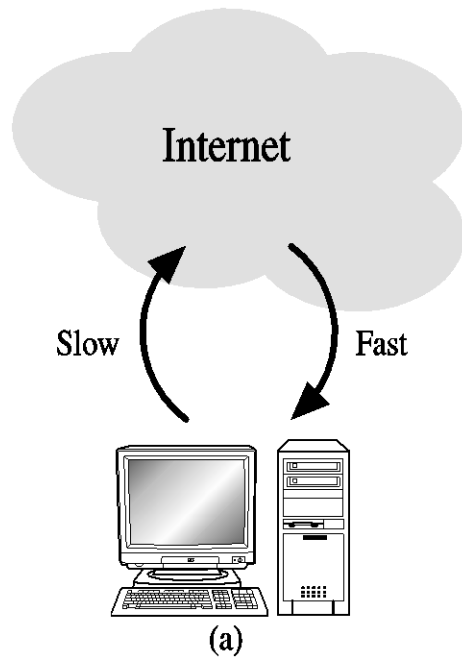
(b)

SPOF

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



RIAA Lawsuits

- 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 Verizon
- 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

MGM v. Grokster

- Entertainment industry interests sued Grokster and StreamCast for the copyright infringements of their users
- Lower courts
 - Ruled in favor of Grokster and StreamCast
 - Cited *Sony v. Universal City Studios* as a precedent
- U.S. Supreme Court
 - Reversed the lower court ruling in June 2005
 - Proper precedent *Gershwin Publishing v. Columbia Artists*

Legal Action Against The Pirate Bay

- The Pirate Bay started 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
- More than 150 proxy servers all over the world

PRO-IP Act

- Gives federal law enforcement agencies right to seize domain names of sites facilitating copyright infringement
- Operation In Our Sites (2010)
 - Seized domain names of 10 Web sites making available full-run movies
 - Seized several hundred more domain names over next 1 ½ years

Legal Music Services on the Internet

- Subscription services, some based on monthly fee; some free (with advertising injections)
- Consumers pay for each download on top of monthly fee (e.g., Qobuz)
- Apple's iTunes Music Store leading service, surpassing WalMart as top music retailer in United States
- Still, illegal downloading far more popular than legal music services

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

- *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

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

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
- Further court rulings led to patents being granted for wider range of software

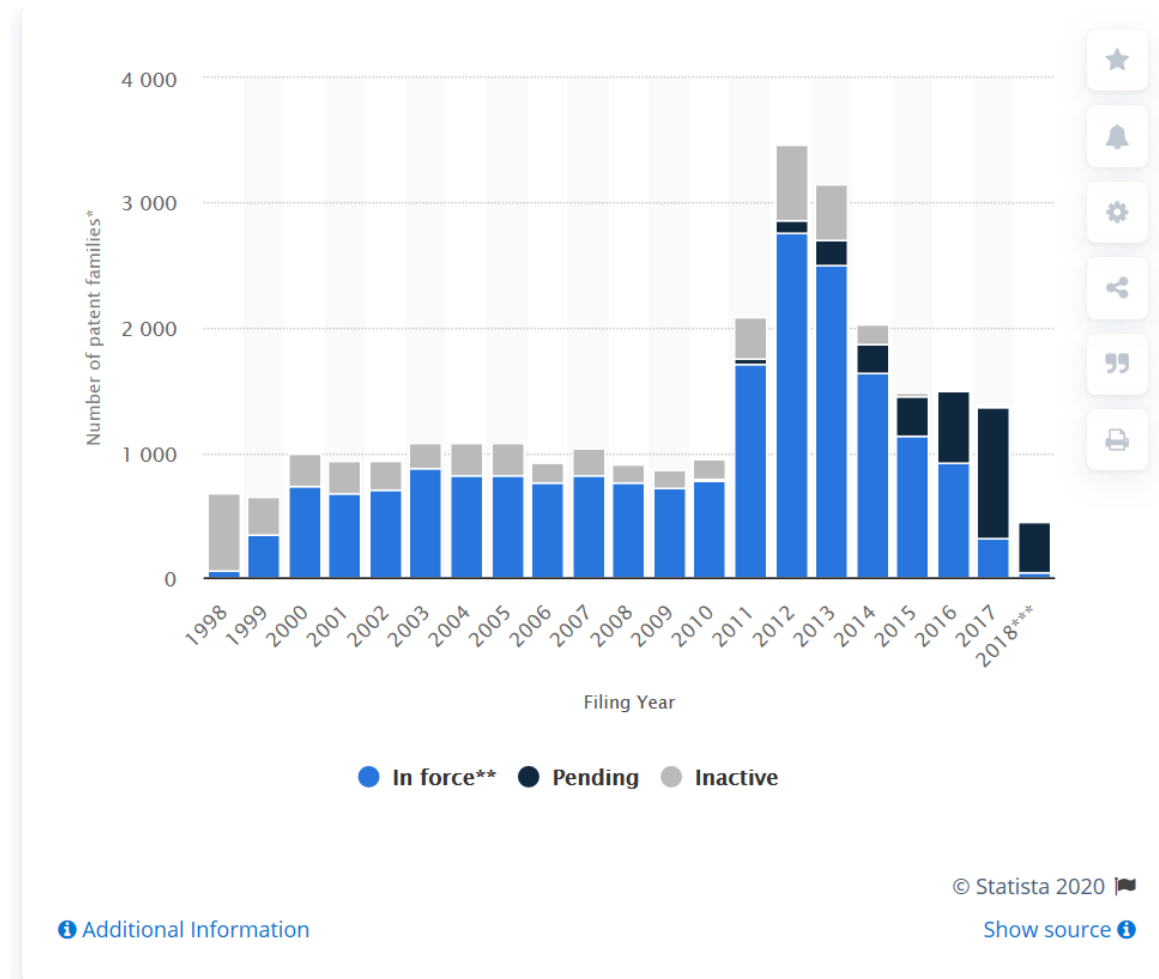
Software Patents (2/3)

- 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
 - 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 (CEO Amazon): software patents should expire in 3-5 years

Google(Alphabet) patents filled each year



<https://www.statista.com/statistics/1033921/number-of-alphabet-google-patents-by-filing-year-and-status-worldwide/>

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Exemplo recente de patente a expirar

US6269453B1: Method for reorganizing the data on a RAID-4 or RAID-5 array in the absence of one disk

- Inventor: Joseph F. Krantz
- Current Assignee: Hewlett Packard Enterprise Development LP
- Application filed by Compaq Computer Corp 1993-06-29
- Priority to US08/084,370 1993-06-29
- Application granted 2001-07-31
- Publication of US6269453B1 2001-07-31
- Anticipated expiration 2018-07-31
- Application status is Expired – Lifetime 2020-03-25

Key Differences between Software Copyrights and Software Patents

	<i>Software Copyright</i>	<i>Software Patent</i>
What is protected?	Object Program, screen displays	Software process with practical utility
Is getting protection expensive?	No	Yes
Is getting protection time consuming?	No	Yes
Is reverse engineering allowed?	Yes	No

- Exemplos de reverse engineering (RE)
 - Linux Samba (RE do Microsoft SMB, hoje CIFS e cuja especificação é do domínio público)
 - Linux NTFS driver (RE do Microsoft NTFS)

4.8 Open-Source Software

Criticisms of Proprietary Software

- Increasingly harsh measures (e.g., patent trolls) 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 (copyleft)

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
- **Implementation can be scrutinized**
- **Implementers get help from the community**
- Shifts focus from manufacturing to service

Examples of Open-Source Software

- BIND
- Apache
- Sendmail
- Android operating system for smartphones **(but what about the apps?!)**
- Firefox and Chrome
- OpenOffice.org
- Perl, Python, Ruby, TCL/TK, PHP, Zope
- GNU compilers: C/++, Objective-C, Fortran, Java, Ada,...

Impact of Open-Source Software

- Linux an alternative to proprietary versions of Unix
- Linux operating system on 95% of the world's 500 fastest supercomputers (but with closed-source modules, e.g., Nvidia, ...)

Crititque of the Open-Source Software Movement (1/3)

- 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)

Critique ... (2/3):

Observações/opiniões pessoais

- Dualidade: software pessoal / “empresarial”
- Pessoal (de aplicação marcadamente individual)
 - Geralmente de boa/muito boa qualidade
 - Instalação/configuração/upgrade geralmente fácil
 - Suporte geralmente labirintico em wikis et al, muitos trolls...

Critique ... (3/3):

Observações/opiniões pessoais

- “Empresarial” (experiência limitada a software de virtualização, storage e filesystems)
 - Geralmente de boa/muito boa qualidade
 - Instalação/configuração mediantemente fácil a difícil
 - Upgrade geralmente difícil (dependências)
 - Suporte: de fácil a inexistente
 - Tudo mais fácil se se comprarem os serviços 😊
- Em todos os casos, documentação pobre, inexistente, profundamente desorganizada, etc.

4.9 Legitimacy of Intellectual Property Protection for Software

Do We Have the Right System in Place?

- Software licenses typically prevent you from making copies of software to sell or give away
- Software licenses are legal agreements
- Not discussing morality of breaking the law
- Discussing whether society *should* give intellectual property protection to software

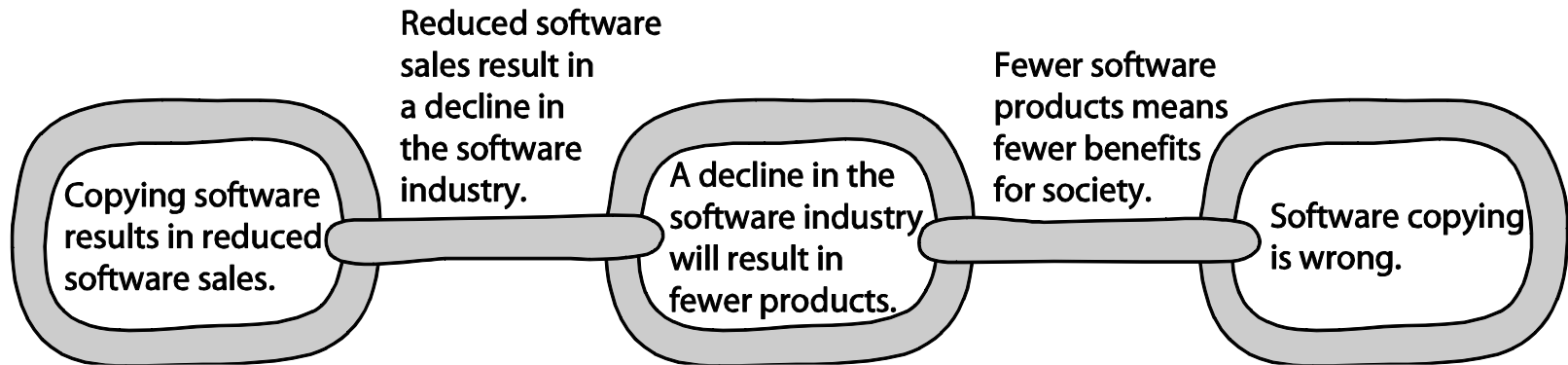
Para reflectir: E não é discutido...

- Garantias de software: quase nada é garantido
 - “Única” indústria em que tal acontece...

Rights-based Analysis

- “Just deserts” argument
 - Programming is hard work that only a few can do
 - Programmers should be rewarded for their labor
 - They ought to be able to own their programs
- Criticism of “just deserts” argument
 - Why does labor imply ownership?
 - Can imagine a just society in which all labor went to common good
 - Intellectual property not like physical property

A Consequentialist Argument Why Software Copying Is Bad



Beth Anderson

Utilitarian Analysis

- Argument against copying
 - Copying software reduces software purchases...
 - Leading to less income for software makers...
 - Leading to lower production of new software...
 - Leading to fewer benefits to society
- Each of these claims can be debated
 - Not all who get free copies can afford to buy software
 - Open-source movement demonstrates many people are willing to donate their software-writing skills
 - Hardware industry wants to stimulate software industry
 - Difficult to quantify how much society would be harmed if certain software packages not released

Conclusion

- Natural rights argument weak
- Utilitarian argument not strong, either
- Nevertheless, society has granted copyright protection to owners of computer programs
- Breaking the law is wrong unless there is a strong overriding moral obligation or consequence

4.10 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



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