Lecture Overview

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

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?

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

Expanding the Argument to Intellectual Property

- Writing a play akin to making a belt buckle
  - Belt buckle
    - Mine ore
    - Smelt it down
    - Cast it
  - Writing a play
    - “Mine” words from English language
    - “Smelt” them into prose
    - “Cast” them into a complete play

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

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<th>Artist</th>
<th>Work</th>
<th>Previous Retail Price</th>
<th>Date Became Public Domain</th>
<th>Purchase Price</th>
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Prices fall when works become public domain. 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.

Trade Secret

- Confidential piece of intellectual property that gives company a competitive advantage
- Never expires
- Not appropriate for all intellectual properties
- Reverse engineering allowed
- MUST be kept “secret”
- 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

If a trademark is misused it could come undone.

If you don’t have strong legal protection, don’t worry if, from time to time, it may seem that people are using your mark. But the same could happen if you didn’t trademark your mark.美联储 have shown that similar marks may lead to confusion and might be subject to legal action. All trademarks are under control. Most don’t have to be re-vetted. Even if a mark is in use, you can’t feel that you’ve missed the boat by taking action. Xerox.com

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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

- Basic Books v. Kinko’s Graphics Corporation
- Davey Jones Locker
- No Electronic Theft Act

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 (CTEA) of 1998, arguing Congress exceeded Constitutional power
- U.S. Supreme Court
  - CTEA does not create perpetual copyrights
  - CTEA is constitutional

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 ⇒ 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
- 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
- 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

### 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
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

Digital Rights Management (DRM)

- Can prevent you from
  - Making back ups
  - Recording TV programs for later viewing
  - Using the media player of your choice
  - Remixing music or clips of movies into your own home movies
  - Re-installing computer game after you upgrade your OS
  - Copying or printing portions of an e-book
  - Reading an e-book on another computer

Digital Millennium Copyright Act (DMCA)

- Exemptions
  - Nonprofit libraries, archives, and educational institutions under certain circumstances.
  - Reverse engineering
  - Encryption research
  - Protection of minors
  - Personal privacy
  - Security testing
  - “nothing in section 1201 affects rights, remedies, limitations or defenses to copyright infringement, including fair use.”

Digital Millennium Copyright Act (DMCA)

- Limits internet service providers from copyright infringement liability for simply transmitting information over the Internet.
  - Service providers, however, are expected to remove material from users’ web sites that appears to constitute copyright infringement.
- Limits liability of nonprofit institutions of higher education
- Requires that “webcasters” pay licensing fees to record companies.

What can you copyright?

American courts recognize copyrights on the following:
- Books (nearly all text based items),
- Music,
- Works of art,
- Films,
- Video,
- Photographs
In the computing realm:
- Source code,
- Translations of source code (including binaries)
- Look and feel (many courts disagree)
- Structure, sequence and organization

Patent eligibility

To be eligible for a patent, the invention must be:
- Novel (unknown to/unused by others)
- Cannot have been previously been described in writing.
- Non-obvious
- Useful in some way
Be a process, machine, or composition of matter
- Where is software?
What cannot be patented?
- Laws of nature
- Mathematical formulas
Secure Digital Music Initiative

- 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

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

- Contents of DVDs encrypted using Content Scramble System (CSS)
- Need decryption keys to view a DVD
- 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 and found not guilty

Foiling HD-DVD Encryption

- Hardware, software, and entertainment companies created Advanced Access Content System to encrypt HD-DVDs
- Encryption key posted on Digg.com
- 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

Online Music Stores Employed Digital Rights Management

- When iTunes Music Store opened, 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 to sell DRM-free music
- Apple followed suit in 2009

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

Napster

- 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

- 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
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

Recording Industry Association of America (RIAA)

- Prosecuting individuals for illegally sharing copyrighted songs, typically on peer-to-peer networks
- Most of them are settled out of court for $3,000 to $5,000
  - minimum $750 per song charge
  - maximum of $150,000 for willful infringement

Recently in the News

- Student fined $675,000 for sharing 30 songs
  - Joel Tenenbaum
    - Admitted to downloading and distributing music over peer-to-peer network (Kazaa)
    - Prosecuted and convicted on basis of 30 shared songs.
    - Fine of $22,500 per infringement

Recently in the News

- Jamie Thomas-Rassett
  - Accused of illegally downloading and distributing 30 songs
  - October 2007:
    - Fined $222,000
    - Overturned on technical grounds
  - June 2008:
    - Fined $1.92 million for only 24 tracks
    - Reduced to $54,000
  - Being challenged
    - Third trial coming to address issue of damages

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
  - Granted Grokster and StreamCast a summary judgement
  - 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 Corporation v. Columbia Artists Management

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
- Still, illegal downloading far more popular than legal music services

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. Accolate**
  - 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
- 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: 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

**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 (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
- Shifts focus from manufacturing to service

Examples of Open-Source Software

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

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

Critique 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)
Licenses

* Many companies use licenses to provide additional protections not provided by copyright
  - Restrict right of first sale
  - Restrict right to make copies and/or modify for personal use
  - Restrict reverse engineering

* In particular, shrinkwrap licenses have been an issue because you cannot view them until after you have opened the 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

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

Consequentialist Argument Why Software Copying Is Bad

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
**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