Visual Imaging in the Electronic Age
ART 2107, ARCH 3702, CS 1620, ENGRI 1620

Internet History
Opportunities and Problems
November 25, 2014

Prof. Donald P. Greenberg
dpg5@cornell.edu
1973 - Vinton Cerf & Robert Kahn - designed Internet architecture based on TCP/IP

Early 1980’s - ARPANET becomes known as Internet researchers enticed to use CSNet (paid by NSF)
ARPAnet (Circa 1980)
1973 - Vinton Cerf & Robert Kahn - designed Internet architecture based on TCP/IP

Early 1980’s - ARPANET becomes known as Internet researchers enticed to use CSNet (paid by NSF)

1990 - ARPANET - decommissioned and replaced by NSFNet backbone NSF - expands network to other research communities

1993 - NSF - no longer provides funding for NSFNet backbone NAP’s (network access points) established in four cities
Internet - History & Growth Chronology cont’d

1993 - Mosaic - Introduced by University of Illinois (Marc Andreesen)

1994 - NSF - links four national supercomputer centers at 155 Mbs (bandwidth to approach 2.5 Gbs) contracts MCI to link other sites

Internet - opens to commercial usage

1994 - Netscape - formed by Jim Clark
Internet Protocols

- **Communication Protocols** (TCP/IP) – used to link computers and other communicating devices together
- **Computer Languages** (HTML) – used to encode the format of web pages
- **Communication Protocols** (HTTP) – used to retrieve web pages from elsewhere on the network
- Protocols of the **World Wide Web** (www)
- Graphically oriented **Web browsers** (Mosaic)

All of this is FREE!
Original Internet Rules

• Free
• Everyone is equal, first come, first serve
• There are no rules
Challenges of Today’s Internet Environment

• Protection of Intellectual Property
• Maintenance of net neutrality and a free Internet?
• Freedom of Speech vs. Security vs. Privacy?
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 respected Writings & Discoveries”
Patent Criteria

• According to patent law, an invention must be “novel, non-obvious, and have utility”

• **Novelty**
  
  No one can patent something that is known (e.g. – prior publication, already being sold)

• **Non-obvious**
  
  The invention could not have been conceived by someone “having ordinary skill in the art”

• **Utility**
  
  Must perform some function, be operable and beneficial to society
Length of Patents

- Type of Patent
  - Utility ............. 20 yrs.
  - Plant ............. 20 yrs.
  - Design ............ 14 yrs.

- Note: This includes the time required (usually 2 or 3 years) from application to acceptance, and thus shortens the time.
Tragedy of the Commons
Tragedy of the Commons

• Initially described by Garrett Hardin in the journal Science in 1968.
• The article describes a situation in which multiple individuals, acting independently with their own self interest, ultimately deplete a shared limited resource, even when it is clear that no one benefits.
• Examples: overuse of water in the Southwest U.S.A., exhaustion of oil supplies, overfishing of the Grand Banks, destruction of salmon runs in Pacific Northeast

Method of exercising a cat

Elongated Paper Clip

And this 1994 patent for a "slightly elongated" paper clip.
Apple vs. Samsung

- Can a “look and feel,” e.g., rounded corners, be patented?
- U.S. International Trade Commission ruled in June 2013 that sales of some older iPhones and iPads should be banned because Apple infringed a Samsung patent.
- Obama Administration vetoed the decision.
- Tech industry is split as companies fear injunctions stemming from patents on tiny features.
Rounded Corners

iPhone vs. Galaxy 3
Patent Infringement

• Many companies (particularly technology companies) create massive patent portfolios, mostly for defensive reasons

• Infringement on a patent can be expensive:
  - Monetary value
  - Injunction
  - Put a company out of business

• Digital technology is so overcrowded with patents that it tends towards oligarchies and may stifle innovation

Uncle Don
Intellectual Ventures

Nathan Myhrvold, chief of Intellectual Ventures.

Steve Lohr. “Turning Patents Into ‘Invention Capital’”, NYT, 2/18/10

The $5B investment firm has “scooped up” 30,000 patents and is trying to build an efficient market for “invention capital”

They are ready to fight large technology companies, many who have ignored the patent rights of others.
Intellectual Ventures

- Business model is to extract licensing fees and return funding to investors.
- They have collected and returned more than $1B.
- Clients must sign strict non-disclosure agreements but supposedly include Verizon, Intel, Nokia and Sony. Investors include Microsoft.

Intellectual Ventures or Vultures?

• Is this a business which is gaming the current rules to its advantage?
• Is this a tragedy of the Commons?
Contributory Infringement

“One who, with the knowledge of the infringing activity, induces, causes or materially contributes to the infringing conduct of another.”

- Gerschwin Publishing vs. Columbia Artists, 1971
Sony Corp. of America vs. Universal City Studios - “Betamax Case” 1984

Media type: Video recording
Media: Encoding magnetic tape
Developed by: Sony
Usage: Video storage
Sony Corp. of America vs. Universal City Studios - “Betamax Case” 1984

• **1976** – Universal & Walt Disney sued (partly to influence Congress to provide more protection to the film industry) to stop Sony from manufacturing a device that could be used for copyright infringement.

• **Two years later**, the District Court ruled in Sony’s favor, but this was overturned by the 9th Circuit Appeal’s Court. “The main purpose of Betamax was copying and thus contributory infringement.”

• **1984** – The Supreme Court ruled the making of individual copies of complete TV shows for the purpose of “time-shifting” does not constitute copyright infringement.
Contributory Infringement
Sony Case

Sony was not liable for the infringing uses since the betamax had “substantial noninfringing uses”
Case Study – Napster
Napster’s model

Napster’s Popularity

- Oregon State – 10% of the schools Internet bandwidth
- Florida State – 20% - 30%
- University of Illinois - Urbana – 70% - 80%
- Grinnell – 100%

Schools had to ban it!
Napster’s Popularity

C.U. Nabs Five for Illegal Downloads

Universities falling in line with legislation

By Signe Pike
Sun Staff Writer

What do Napster, Gnutella, Kazaa and Morphius all have in common? They all facilitate the illegal trading of copywritten new notices of copywrite infringement within the Cornell community.

Since the shut-down of Napster, many other programs have stepped in to keep the trading of music alive. While unlike
Peer-to-Peer Computing

A way of sharing information by hooking up the content of an individual computer into a global information index that others can use.
Peer-to-Peer Computing

- Peer-to-peer computing poses the most significant threat to traditional distribution channels that content providers have ever faced.
- The process is decentralized
- Difficulty in tracking transfer of files (prerequisite for royalty payments)
BitTorrent Inc.

- It is peer-to-peer connected, but after the original data is distributed, it only manages (tracks) connections.

- It does not have any knowledge of the contents of the files being distributed.
BitTorrent Inc.

- Technology can be used for text, music, video, and broadcast TV
- BitTorrent amassed a number of licenses from Hollywood
- In 2008 CBC became the first public broadcaster in North America to use BitTorrent for a full show

- Wikipedia
Stop On-line Piracy Act (SOPA)

Protect Intellectual Property Act (PIPA)

Both of these bills were introduced to Congress, supported by major media and entertainment companies

Intent was to shut down foreign websites that distribute unauthorized copies of software, videos and music
• Tech industry maintained the “language was too broad” and could threaten free speech and stifle innovation
• Sites could be responsible for “all content and links posted by their users”
• Tough job for social networks
SOPA and PIPA – What Happened?

• An Internet Groundswell
  Initiated by Tumblr, Reddit, et al.,
  Helped by Twitter
  Followed by Wikipedia (went dark 1/25/2012)

• The bill was withdrawn
Challenges of Today’s Internet Environment

• Protection of Intellectual Property
• Maintenance of net neutrality and a free Internet?
• Freedom of Speech vs. Security vs. Privacy?
Net Neutrality

Principle proposed for user access networks participating in the Internet:

- no restrictions on content, sites, or platforms
- any equipment may be attached
- any mode of communication is allowed as well as communication which does not unreasonably degrade other traffic
Arguments Against Net Neutrality

Prioritization of bandwidth is necessary for future innovation – thus “tiered service”

Added revenue will pay for building increased broadband

No incentive to make large investments (e.g. fiber-optics) unless additional fees for tiered service

Telecommunication & ISP companies

Bob Kahn (Father of Internet)
Current FCC Proposal 2014

• Broadband providers cannot “unreasonably discriminate” against competition (e.g., Skype or Netflix) who want to use broadband for voice or video services.

• Broadband providers can use “reasonable network management” to cope with congestion.

• Less restrictive on wireless companies.
Current F.C.C. Proposal

- Tiered pricing – allows phone and cable companies to sell priority services for additional money
- Owners of the “pipes” need to disclose policy
- Landlines will have greater difficulty satisfying FCC standards than wireless
• Netflix pays Comcast several million dollars to have faster delivery on their networks.

• Comments on the Open Internet and tiered pricing are due to the FCC this week.
Video by Oliver
https://www.google.com/search?q=john+oliver,+net+neutrality
President Obama on the FCC Regulations

• “… the government will remain vigilant and see to it that innovation is allowed to flourish

• “… that consumers are protected from abuse

• “… that the democratic spirit of ‘the Internet remains intact’”

December 22, 2010
The New York Times
• Should the Web remain free and open?
• This month members of the Washington, D.C., Appeals Court expressed doubt over the government requirement that ISPs treat all traffic equally.
• Government’s concern is that large, wealthy companies (Google, Facebook) could pay for tiered service and thus stymie small competitors.
• Verizon pushed for authority to manage its own “pipes.”

• Government argued that legal content creators should have equal access to Internet users lest big players gain unfair advantage.

• At issue is whether the F.C.C. has jurisdiction and is illegally imposing rules meant for telephony.
Net Neutrality: President Obama's Plan for a Free and Open Internet
Challenges of Today’s Internet Environment

- Protection of Intellectual Property
- Maintenance of net neutrality and a free Internet?
- Freedom of Speech vs. Security vs. Privacy?
The First Amendment

“Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press, or the right of the people peaceably to assemble, and to petition the Government for a redress of grievances.”
The Fourth Amendment

“The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no warrants shall issue, but upon probable cause, supported by oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.
On the Internet, Nobody Knows You’re a Dog
And here’s a “Reality” Check

http://www.unc.edu/depts/jomc/academics/dri/idog.html
Europe’s Proposed New Law on Online Privacy

• Internet companies (Amazon, Facebook, etc.) will need to:
  – Obtain explicit consent for use of personal data
  – Delete that data forever at consumer’s request or face fines for failure to comply (as high as 2% of companies annual global revenue)
Europe’s Proposed New Law on Online Privacy

• Websites will be compelled to explain:
  – Why the data is being collected
  – Retain the data only as long as necessary
  – Notify regulators within 24 hours if data is stolen
  – Offer consumers the right to transport data from one service to another
• Should Internet Service Providers or Search Engine Companies Be Responsible for Content?
Google Street View in New York City
Julian Assange – Hero or Villian?
The Foreign Intelligence Surveillance Act (FISA) approved by Congress in 1978 has for years been developing a secret and unchallenged body of law on core 4th Amendment issues.

It has a surveillance court which can approve wiretap orders and consider requests related to nuclear proliferation, espionage, and terrorism.
• When National Security Agency contractor Edward Snowden revealed that leading internet providers were giving the FBI “direct access” to their servers, there was an uproar.

• Note that telecom companies were required to make real-time call monitoring available to the government (1994).
## FISA warrant requests for electronic surveillance

### September 2013

<table>
<thead>
<tr>
<th>Year</th>
<th># Requests Submitted</th>
<th># Requests Modified(^{[b]})</th>
<th># Requests Denied</th>
<th>Cumulative # Warrants Issued</th>
</tr>
</thead>
<tbody>
<tr>
<td>1979–1999</td>
<td>12,082</td>
<td>0</td>
<td>0</td>
<td>12,090</td>
</tr>
<tr>
<td>1979</td>
<td>199</td>
<td>0</td>
<td>0</td>
<td>207(^{[7]})</td>
</tr>
<tr>
<td>2000</td>
<td>1,005</td>
<td>1</td>
<td>0</td>
<td>13,102(^{[2]})</td>
</tr>
<tr>
<td>2001</td>
<td>932</td>
<td>2</td>
<td>0</td>
<td>14,036</td>
</tr>
<tr>
<td>2002</td>
<td>1,228</td>
<td>2 (^{[d]})</td>
<td>0</td>
<td>15,264</td>
</tr>
<tr>
<td>2003</td>
<td>1,724</td>
<td>79</td>
<td>4 (^{[e]})</td>
<td>16,988</td>
</tr>
<tr>
<td>2004</td>
<td>1,758</td>
<td>94</td>
<td>0</td>
<td>18,742</td>
</tr>
<tr>
<td>2005</td>
<td>2,074</td>
<td>63</td>
<td>0</td>
<td>20,814</td>
</tr>
<tr>
<td>2006</td>
<td>2,181</td>
<td>77</td>
<td>1</td>
<td>22,990</td>
</tr>
<tr>
<td>2007</td>
<td>2,371</td>
<td>86</td>
<td>4</td>
<td>25,360</td>
</tr>
<tr>
<td>2008</td>
<td>2,082</td>
<td>2</td>
<td>1</td>
<td>27,443</td>
</tr>
<tr>
<td>2009</td>
<td>1,329</td>
<td>14</td>
<td>1</td>
<td>28,763</td>
</tr>
<tr>
<td>2010</td>
<td>1,511</td>
<td>14</td>
<td>0</td>
<td>30,342</td>
</tr>
<tr>
<td>2011</td>
<td>1,676</td>
<td>30</td>
<td>0</td>
<td>32,087</td>
</tr>
<tr>
<td>2012</td>
<td>1,789</td>
<td>40</td>
<td>0</td>
<td>33,942</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td>33,949</td>
<td>11</td>
<td><strong>[f]</strong></td>
<td>33,942</td>
</tr>
</tbody>
</table>

\(^{[a]}\) Excludes physical searches

Wikipedia, September 24, 2013
N.S.A.’s Back Doors

- In 2006, the National Institute of Standards and Technology (NIST) helped build an international encryption system to prevent computer hacking and theft.
- The National Security Agency secretly inserted a “back door” into the system that allowed federal spies to crack open any data using NIST’s technology.
- Access was provided to Hotmail, Skype (Microsoft) as well as iPhones, Android and BlackBerry phones.
Should these back doors be closed?
Major Ruling Shields Privacy of Cellphones
Supreme Court Says Phones Can’t Be Searched Without a Warrant

By ADAM LIPTAK  JUNE 25, 2014
Apple and Others Encrypt Phones, Fueling Government Standoff

U.S. Says New Technology Will Hinder Police Investigations
End