CSCI 215 Social & Ethical Issues In Computing

Class 17 – Internet (and internet)
Notes

• **Midterms Graded**
  • Very few essay portions were given full marks
  • Everybody did well

• **Homework 4 – Posted**
  • Due Friday by midnight (technically 11:59pm)

• **Homework 5 – “Baby” homework**
  • Compiling a list of documentaries to choose from
  • Group Viewing of documentary (?)

• **Project Rough Draft Due Friday by midnight**
A few notes on Projects

• If you are in a group – in the future, please only submit one document on D2L

• Some concerns have come up about similar topics between groups. Yes, there are a few overlaps – repeated topics are fine.
Midterm

• Why did everybody guess “Wabbit” for “What virus from 1971 printed “I’m the [omitted], catch me if you can!”?”
Review

- What does CC stand for?
- How can I use an image with the following license?
Review

• What’s the difference between a Copyright and a Patent?

• What’s the difference between Copyright and Copyleft?
Intellectual Property

• Speaking of Patents:
  • For >20 years, companies were patenting genes
  • ACLU went after one company, Myriad Genetics
  • 2013: Supreme Court decide (9-0) that it is illegal to patent genes
THE INTERNET
Internet – a history

Telegraph 1843
• Congress gave $30,000 to Samuel Morse to build 40 mile telegraph line between Washington D.C and Baltimore, Maryland.
• Up to this point, messages had to be hand delivered
• On May 1, Morse sent a bible verse from US Capital to partner in Baltimore “What hath God Wrought?”
Internet – a history

Telephone 1876

• Alexander Graham Bell wanted to improve issues with the telegraph, including the fact that telegraphs can only transmit one message over a wire at a time

• Suggested a “harmonic or musical telegraph” that transmitted different sound frequency to each message

• From here, realized he could transmit human voice. Him and Thomas Watson transmitted speech electronically in 1876.

• Telephones took off in 1890’s, after Bell’s first patent expired.

• Note: Privacy was a concern even then – telephone men responsible for operating systems were accused of eavesdropping on sensitive conversations
Internet – a history

Radio 1895 and Television 1927 (The original wireless)

- Guglielmo Marconi successfully transmitted radio waves in Italy.
- Marketed as “a superior way to transmit telegraph messages”

- Philo Farnsworth made first successful transmission in 1927, introduced to the public at the world’s fair in 1939.
Remote Computing 1937

Bell Labs (remember them?) researchers George Stibitz and Samuel Williams built a system which allowed them to perform complex number calculations over the telephone.

Stibitz demonstrated to American Mathematical Society by using teletype machine to enter numbers, send to calculator 250 miles away. Once calculator was done, it sent the answer back to the teletype machine, which then printed the answer.
Internet – a history

ARPA

• DoD created the Advanced Research Projects Agency (ARPA) in response to the Soviet Union’s launch of Sputnik (remember the space race?)
• The agency’s first director, Lidlicker, imagined a “Galactic Network”, or a global computer network that could exchange programs and data.
• This vision did not align with computer manufacturers, who thought of computers as number-crunching machines
• Also did not work well over existing telephone lines
Internet – a history

ARPANET 1967

• Fear of a nuclear attack led ARPA to commission ARPANET
• Built on a concept that the lose of any computer or communication links would be a devastating loss, so networks should be decentralized.
• 1972, Ray Tomlinson wrote software allowing messages to be sent and received by ARPANET computers (Birth of Email)
• The next step, ARPA researchers thought, would be connecting ARPANET to other networks based on different designs.
• So, they created an internetworking architecture that allowed networks to inter connect (TCP/IP Protocol)
• Many consider this to be the Birth of the Internet – which happened on Jan 1, 1983
Internet – a history

NSFNET

- National Science Foundation (NSF) saw this networking as a potentially powerful tool for academia (universities), and so created TCP/IP-based network called NSFNET
- NSF encouraged universities to use network to work collaboratively, and also sell subscriptions (although it banned the use of commercial traffic)
- In April 1995, NSF stopped funding NSFNET, at which point commercial networking providers took over.
Internet – a history

Sweet Sweet Broadband

• Broadband was introduced and offered high-speed Internet (at least 10x faster than dial-up) and did not tie up phone lines
• Better yet, Fiber Optic networks are replacing coper networks
These Countries Have The Fastest Internet Speeds
Average internet connection speed in Q2 2014

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Average speed in Mbps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>South Korea</td>
<td>24.6</td>
</tr>
<tr>
<td>2</td>
<td>Hong Kong</td>
<td>15.7</td>
</tr>
<tr>
<td>3</td>
<td>Switzerland</td>
<td>14.9</td>
</tr>
<tr>
<td>4</td>
<td>Japan</td>
<td>14.9</td>
</tr>
<tr>
<td>5</td>
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<td>14.3</td>
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<td>6</td>
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<tr>
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<td>8</td>
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<tr>
<td>10</td>
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<td>11.8</td>
</tr>
<tr>
<td>14</td>
<td>United States</td>
<td>11.4</td>
</tr>
</tbody>
</table>

Source: Akamai
Internet

• What is the difference between internet and Internet?
The Internet

• On the physical aspect of the internet
https://www.ted.com/talks/andrew_blum_what_is_the_internet_really
https://www.youtube.com/watch?v=ONMwumOgagw
Deep Web vs Dark Web

• What is the difference?
Deep Web

- Not indexed by main search engines like Google, Bing, Yahoo, etc.
- 96% of the internet is estimated to be “deep web”.
- More than half of Deep Web content resides in topic-specific databases, such as
  - National Climatic Data Centre,
  - NASA EOSDIS
  - the National Oceanographic Data Centre,
  - etc.

Dark Web

• Collection of thousands of websites that use anonymity tools like Tor and I2P to hide their IP address (http://www.wired.com/2014/11/hacker-lexicon-whats-dark-web/)

• In other words, you need special software to access it

• ~.01% of the web

• Uses include (but are not limited to)
  • drugs, weapons, counterfeit documents and child pornography
  • WikiLeaks
  • Even Facebook has a dark web version for those who are on the dark web because they are concerned about
Deep Web
http://www.ted.com/talks/jamie_bartlett_how_the_mysterious_dark_net_is_going_mainstream
Silk Road

- February 2011 - launched by Ross William Ulbricht under charges of being the site's pseudonymous founder "Dread Pirate Roberts"
  - Charged with: money laundering, hacking, and conspiracy to traffic narcotics
  - Sentenced to life without parole
- October 2013 - Shut down in 2013 by FBI
- November 2013 - Silk Road 2.0 re-launched by former site’s admin
- November 2014 – Shut down by an international law enforcement operation targeting dark net and tor browsing activities called Operation Onymous
- January 2015 – Silk Road 3 Reloaded launched by Diabolus Market – a competitor trying to capitalize on the name
Tor and Tor Browser

• Came from a US Navel Research Lab project called The Onion Router
• “Onion” refers to the multiple layers of encryption
• Electronic Freedom Foundation (EFF) started funding the project in 2004, after the project was released and made open source

• [https://www.torproject.org/about/overview](https://www.torproject.org/about/overview)
How Tor Works: 1

Step 1: Alice’s Tor client obtains a list of Tor nodes from a directory server.
Tor and Tor Browser

How Tor Works: 2

Step 2: Alice’s Tor client picks a random path to destination server. Green links are encrypted, red links are in the clear.
Tor and Tor Browser

Step 3: If at a later time, the user visits another site, Alice’s tor client selects a second random path. Again, green links are encrypted, red links are in the clear.
Tor and Tor Browser

• You can download the Tor Browser to start perusing the dark net: https://www.torproject.org/projects/torbrowser.html.en
• Built on top of Firefox
Tor and Linux Distro

- Next Level: Linux TAILS distro, everything is built around privacy
- Bootable USB (or disk or what have you) that does not leave a trace on the machine
- All communications MUST go through Tor
- Non-anonymous communications are blocked
- Utilizes virtual keyboard to block key loggers
Before you start your illegal paper writing scheme

• To get to a website, you must exit the Tor Network, and this exit node may be monitored and your traffic may be tracked
• 2007 a Security Researcher was able to retrieve passwords and emails from an exit node (because they were unencrypted)
• Exit nodes are also susceptible to man-in-the-middle attacks
• Plugins can leak your IP (this includes bitTorrent)
• NSA and other agencies target Tor, with some success.
• Tor users have more than doubled since Snowden, the volunteer relay nodes have not
More devastatingly

• If you use ToR (or VPN), Congress has granted the FBI a single warrant allowing them to hack your computer

• https://publicpolicy.googleblog.com/2015/02/a-small-rule-change-that-could-give-us.html
Speaking of Snowden

Some files released relate to Tor

Slides entitled “Tor Stinks” and some excerpts:
"We will never be able to de-anonymize all Tor users all the time."

"With manual analysis we can de-anonymize a very small fraction of Tor users,"

In a different top-secret presentation: "the king of high-secure, low-latency internet anonymity".
The Digital Divide

• “Today high speed broadband is not a luxury, it’s a necessity.” – President Obama, January 14, 2015

• **Digital Divide**: the gap between demographics and regions that have access to modern information and communications technology, and those that don't or have restricted access.

• This “digital divide” is concentrated among older, less educated, and less affluent populations, as well as in rural parts of the country that tend to have fewer choices and slower connections.
Digital Divide

Figure 4: Percentage of Broadband Adoption by Demographic Group

- College degree: 89%
- Less than high school: 35%
- Income > $30K: 93%
- Income < $25K: 43%
- Urban: 72%
- Rural: 58%
- Asian: 81%
- White: 74%
- Hispanic: 56%
- African American: 55%
Figure 6: Number of Provider Choices and Internet Use

Source: Census, American Community Survey; NTIA/FCC, Broadband Map; CEA Calculations.
Digital Divide

Figure 6: Broadband Availability by Urban and Rural (June 2012)
Digital Divide

Figure 5: Computer Ownership and High-Speed Internet Use for Individuals by State: 2013

Source: U.S. Census Bureau, 2013 American Community Survey.
Net Neutrality / Open Internet

Net Neutrality:

• “Father of Net Neutrality” **Tim Wu**

• Worked at a company that made network equipment, including routers that allowed China to sensor the internet

• 2002, coined “net neutrality” or the idea that internet service providers must treat all traffic equally, and let users do what they wished with their bandwidth.

• 2010 FCC creates “Open Internet”, rules that not only prevented ISPs from blocking content, but barred them from discriminating against traffic in other ways.

• [http://www.wired.com/2014/06/tim-wu/](http://www.wired.com/2014/06/tim-wu/)
Net Neutrality / Open Internet

Net Neutrality:
• 2014, the FCC proposed new plans that would allow for tiers of internet, or “pay to play”.
• Chairman Tom Wheeler claimed companies would not be allowed to "act in a commercially unreasonable manner to harm the Internet, including favoring the traffic from an affiliated entity."
• FCC Opened for comments from the public
  • First round: 100 – 1 were in favor of net neutrality
  • Second Round: 60% were opposed (found largely to be because of a form letter)
  • Then John Oliver happened, and the FCC 18 year old system went down
  • Over 4 million comments, (680,000 comments were not accounted for according to the FCC)
https://www.youtube.com/watch?v=fpbOEoRrHyU
Net Neutrality / Open Internet

**Net Neutrality:**

- New rules, rooted in Title II of the Communications Act, ban throttling, blocking and paid prioritization