CS 115: COMPUTING FOR THE SOCIO-TECHNO WEB

How the Internet Works & Internet Governance
Today

- How the Internet Works
- Who controls the Internet (Internet governance)
- Net neutrality
Internet VS Postal Mail

TCP ~ Higher Level Protocols

IP ~ Lower Level Protocols
The Internet

**Packet Switching:** Messages are broken into packets. They travel from the source to destination through a maze of routers and links.
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**Core and edge:** The edge is what we see directly (e.g., the mailboxes) and the core is everything behind the edge that makes the system work.
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TCP (Transport Control Protocol):
- Creates connection two machines
- Provides reliable transport
IP (Internet Protocol):
- Delivers packets
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Internet Hourglass
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Diagram showing the relationship between different protocols and technologies in the internet architecture.
Encapsulation

HTTP/1.0 200 OK
Connection: close
Date: Thu, 06 Aug 1998 12:00:15 GMT
Server: Apache/1.3.0 (Unix)
Last-Modified: Mon, 22 Jun 1998 ......
Content-Length: 6821
Content-Type: text/html

<HTML>
  <TITLE></TITLE>
  <BODY></BODY>
</HTML>
Encapsulation

TCP Header
Encapsulation

IP header
Encapsulation

IP header

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Encapsulation

IP header - what address?
Addressing

Every machine on the Internet has an IP address.

IPv4: 32 bits written as 4 decimal numerals up to 256, e.g. 149.130.12.213 (Wellesley College)

Domains get converted to IP addresses with a “Domain Name Server” (DNS)
- **Uniform Resource Locator**
  - T. B-L wanted URI: Universal Resource Identifier
- It tells you where something is located, i.e., the name of the server that has it
- It also tells you how you could get it

- **gov** - Government agencies
- **edu** - Educational institutions
- **org** - Organizations (nonprofit)
- **mil** - Military
- **com** - commercial business
- **net** - Network organizations
- **ca** – Canada
- **kz**–...
ICANN coordinates names and numbers to connect the Internet and the Web.

Growing → Global → Gone!

- The Internet was (and is!) growing: Jon Postel (a researcher at USC) used to do ICANN’s job in the 1990s.
- ICANN was created in 1998 because things started to get a little messy (Internet was a global issue)
- Perception of U.S. government control is gone! Fully privatized in 2016.

Cool and important things ICANN does:

- Converting the Internet Protocol addressing space from IPv4 to IPv6
- Expanding domain name space (more generic top-level domains, more internationalized scripts)
- Globalized its accountability structure (no agreements with any ONE government).
## Country code game

<table>
<thead>
<tr>
<th>Top-Level Domain</th>
<th>Country?</th>
<th>Branding?</th>
</tr>
</thead>
<tbody>
<tr>
<td>.tv</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.cc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.md</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.fm / .am</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.co</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.me</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.cv</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.io</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.ly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.mr</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.ms</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Country code game -- answers!

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<th>Branding?</th>
</tr>
</thead>
<tbody>
<tr>
<td>.tv</td>
<td>Tuvalu</td>
<td>Television</td>
</tr>
<tr>
<td>.cc</td>
<td>Cocos (Keeling) Islands</td>
<td>Chinese company, country club, consulting company, chat community, church community, community center, chamber of commerce, or community college</td>
</tr>
<tr>
<td>.md</td>
<td>Moldova</td>
<td>Medical</td>
</tr>
<tr>
<td>.fm / .am</td>
<td>Federated States of Micronesia Armenia</td>
<td>Radio</td>
</tr>
<tr>
<td>.co</td>
<td>Colombia</td>
<td>Alternative to .COM</td>
</tr>
<tr>
<td>.me</td>
<td>Montenegro</td>
<td>Self-promotion</td>
</tr>
<tr>
<td>.cv</td>
<td>Cape Verde</td>
<td>Resumes!</td>
</tr>
<tr>
<td>.io</td>
<td>British Indian Ocean Territory</td>
<td>Tech</td>
</tr>
<tr>
<td>.ly</td>
<td>Libya</td>
<td>Bit.ly url shortener</td>
</tr>
<tr>
<td>.mr</td>
<td>Mauritania</td>
<td>Male branding</td>
</tr>
<tr>
<td>.ms</td>
<td>Montserrat</td>
<td>Female branding</td>
</tr>
</tbody>
</table>
Pakistan lifts ban on YouTube after launch of local version

Tommy Wilkes

ISLAMABAD (Reuters) - Pakistan said on Monday it had removed a three-year ban on YouTube after the Google-owned video-sharing website launched a local version that allows the government to demand removal of material it considers offensive.

'Borat,' 'Brokeback' among human rights victims?

WASHINGTON (AP) — Fictional gay cowboys and a faux reporter from Kazakhstan suffered human rights abuses in 2006 as crackdowns on flesh and blood victims were extended to the Internet, award-winning films and noted plays worldwide, the State Department says.

From the movies Borat to Brokeback Mountain, foreign governments banned or restricted access to a variety of big and little screen entertainment as well as live events, the State Department says.

British comedian Sacha Baron Cohen — creator of Borat, the crass Kazakh chronicler of the American condition — and the Baron Cohen, who has vexed the authoritarian Kazakh government with his mocking and rocketed to fame in the film Borat: Cultural Learnings of America for Make Benefit Glorious Nation of Kazakhstan, became a victim when Kazakhstan moved against his satirical website.

Specifically, it took control of the registration of .kz Internet domains in 2005 and then revoked Baron Cohen's Borat domain, since relocated, because it deemed his site offensive, the report said.
Politics & Internet

How does the description and definition of the Internet affect policy?

“I'll be offering my vision when my campaign begins. And it will be comprehensive and sweeping. And I hope that it will be compelling enough to draw people toward it. I feel that it will be. But it will emerge from my dialogue with the American people. I've traveled to every part of this country during the last six years. During my service in the United States Congress, I took the initiative in creating the Internet. I took the initiative in moving forward a whole range of initiatives that have proven to be important to our country's economic growth and environmental protection, improvements in our educational system.”

-- Presidential Candidate Al Gore (1999)
Internet Governance

Who controls the Internet?
Internet Governance

Who controls the Internet?
No one!
Internet Governance

Who controls the Internet?
No one!
(or many different entities)
THE THREE LAYERS OF DIGITAL GOVERNANCE

No one person, government, organization, or company governs the digital space. Digital Governance may be stratified into the three layers depicted here: Infrastructure, Logical, Economic and Societal. Solutions to issues in each layer include policies, best practices, standards, specifications, and tools developed by the collaborations of stakeholders and experts from actors in business, government, academia, technical, and civil society. For a map of Digital Governance Issues and Solutions across all three layers, visit [https://map.netmundial.org](https://map.netmundial.org).

**DIGITAL GOVERNANCE ACTORS**

- IGF
- World Economic Forum
- NETmundial Initiative
- W3C
- Industrial Internet Consortium
- ISOC
- National Governments
- Private Sector (ex.: Facebook, Google, Sony, Alibaba)
- Inter-governmental Organizations (ex.: OECD, UNESCO, WTO, WIPO)
- Civil Society (ex.: Human Rights Watch, APC)
- Academia
- Law Enforcement Agencies (ex.: INTERPOL, FBI)

**LOGICAL LAYER**

- ICANN / IANA
- IETF
- NRO / RIRs
- ISO
- ETSI
- TLD Operators
- Domain Name Registrars
- IEEE
- W3C

**INFRASTRUCTURE LAYER**

- GSMA
- National ICT Ministries
- National Regulators
- Network Operators

**THE INTERNET BACKBONE (IP NETWORKS)**

- National Operators
- Satellite Operators
- Mobile Operators

**THE ROOT ZONE**

- Root Services
- Domain Names
- IP Addresses
- Protocol Parameters

**ECONOMIC AND SOCIOECONOMIC LAYER**

- Manufacturing and Trade
- Education
- Entertaiment
- Internet of Things
- Economic and Social Development
- Finance
- Healthcare
- Security
- Civil and Human Rights
- News and Media
- Public Sector and Taxation

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Internet Governance

Submarine cables that make the Internet possible – Jan 2017
Internet Governance

Residential ISP in the USA

- Altice USA
- Armstrong Zoom
- AT&T Internet Services
- Atlantic Broadband
- B2X Online - VA
- Bernard Telephone Co
- CenturyLink
- Charter Communications
- Cincinnati Bell
- Comcast High Speed Internet
- Comelec
- Consolidated Communications
- Cox Communications
- CS Technologies, Inc.
- Exede Internet
- Google Fiber
- HughesNet
- Interlync Internet Services
- ImOn Communications
- Mediacom
- Midcontinent Communications
- MV Link
- RCN Corporation (acquired by TPG)
- Rise Broadband
- Shentel
- Sonic.net
- South Slope
- Sprint (including Clearwire)
- Ting Internet
- USA Communications
- PenTeleData
- Windstream (including Earthlink)
- Verizon High Speed Internet
- WideOpenWest (wow!)

https://en.wikipedia.org/wiki/List_of_broadbandProviders_in_the_United_States
Internet Governance

National Internet Diversity at the International Frontier - February 2014
The Internet

Separate Content and Carrier: Once the carriers (ISP) inspect the bits you are receiving into your home, these private businesses could use that power in other ways: to conduct surveillance, enforce laws, and impose their morality on their customers.
**Net Neutrality**

**Communications Act of 1934** (updated in 1996):

**Common Carrier**
Any business that transports things on behalf of the general public, without discrimination and without unreasonable charges.

**Information Service**
Offering the capability for generating, acquiring, storing, transforming, processing, retrieving, utilizing, or making available information via telecommunications.
1996 - Internet service is an information service (delivered through telephone lines in U.S.)

2003 - Law professor, Tim Wu, coins the term “net neutrality” – a concept of non-discriminatory network management. Concern is with Internet Service Provider (ISP) market concentration.

2005 - Federal Communications Commission (FCC) publishes Four Freedoms in Policy Statement:

- consumers are entitled to access the lawful Internet content of their choice;
- consumers are entitled to run applications and services of their choice, subject to the needs of law enforcement;
- consumers are entitled to connect their choice of legal devices that do not harm the network; and
- consumers are entitled to competition among network providers, application and service providers, and content providers.

2008 - BitTorrent/Comcast case -- was the light-touch regulation of 2005 enough?

2010 - FCC issues Open Internet Order and applies some common carrier rules to Internet (no blocking, no throttling, transparency). Also codifies the Four Freedoms. Wireless services not included. Verizon appeals on grounds that FCC doesn’t have authority to regulate Internet as both information service and telecommunications service.

2014 - Verizon wins its appeal. Net neutrality becomes a popular issue: John Oliver does a segment on HBO’s Last Week Tonight. President Obama makes a statement. FCC decides that reclassifying the Internet is the only way.

2015 - FCC issues new Order reclassifying Internet as a telecommunications service (common carrier)

2017 - Repeal of 2015 rules with FCC Restoring Internet Freedom Order
AT&T and Time Warner have reached an agreement to merge after decades of consolidation and deals in the telecommunication and media industries.

Pre-1984

AT&T Corp. Born 1877 as the Bell Telephone Co.

Ameritech

BellSouth

Pacific Telesis

Southwestern Bell

NYNEX

U.S. West

McCaw Cellular

McCa Luzon and NCR spun off

McCaw bought by AT&T

Named changed to SBC

Bell Atlantic

AirTouch

Verizon Wireless

Vodafone AirTouch

 Verizon buys Verizon Wireless

AOL buys Time Warner

AOL spun off

Yahoo's web assets

possible deal

Other deals and attempts among media and telecom companies

Walt Disney Co. buys Capital Cities/ABC Inc.

News Corp buys 34% stake in DirecTV

Comcast drops its bid for Walt Disney Co.

Comcast completes purchase of NBCUniversal

21st Century Fox withdraws bid for Time Warner

Source: staff and news reports

Market capitalization

AT&T $226 billion

Time Warner $72 billion
“Ten movies streaming across that, that Internet, and what happens to your own personal Internet? I just the other day got... an Internet was sent by my staff at 10 o'clock in the morning on Friday. I got it yesterday [Tuesday]. Why? Because it got tangled up with all these things going on the Internet commercially.

[...] They want to deliver vast amounts of information over the Internet. And again, the Internet is not something that you just dump something on. It's not a big truck. It's a series of tubes. And if you don't understand, those tubes can be filled and if they are filled, when you put your message in, it gets in line and it's going to be delayed by anyone that puts into that tube enormous amounts of material, enormous amounts of material.”

Senator Ted Stevens, Chair, Comm. on Commerce, Science and Transportation (charged with regulating the internet)
Net Neutrality

Is this true:

AT&T + CNN = NETFLIX + amazon
To-do

- Back to Wednesday schedule tomorrow (no lab)
- Assignment 3 on Net Neutrality due Friday