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# Tussles in cyberspace

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# Outline

- A recap of Lessig's "Code is Law"
- The Internet Architecture and its Evolution
- Tussles within the Internet
- Tussles atop the Internet
- Closing remarks
- Discussion

February 11, 2010

# Lessig's Contention: Code is Law

"The software and hardware that make [up] cyberspace constitute a set of constraints [on] access to cyberspace... Code or software or architecture or protocols ... constrain some behavior by making other behavior possible, or impossible."

"Code can achieve perfection of control that will render it, in cyberspace, the most powerful regulator of all."

"The invisible hand [of government and commerce] is building an architecture that is quite the opposite of what it was at cyberspace's birth ... an architecture that perfects control."

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Code is Law: Implications

Commerce is moving cyberspace towards "a fairly unified regulation through code"…

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- Shaped by code, cyberspace will become a world in which:
  - "[Code can do] the work that the law used to do ... far more effectively than the law did."
  - "Effective regulatory power [shifts] from law to code, from sovereigns to software."
  - "[Code] displaces law by codifying the rules, making them more efficient than they were just as rules."

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Code is	Law: Perfect Control	Code
"[W]hat happe protected by mirror the lin term? Would protections? "The point sho protected by balance be right of fair to individuals t she grants to Fair use bed	ns when code protects the interests no copyright law? Should we expect code nits that the law imposes? Fair use? Li d private code build these "bugs" into it " uld be obvious: when intellectual prope code, nothing requires that the same struck. Nothing requires the owner to g use. She might, just as a bookstore allo o browse for free, but she might not. W his right depends on whether it profits h comes subject to private gain."	w e to mited s and f erty is identified rant the sor ws f thether f her. f w end thether f thether f
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# ode is Law: Implications

we do nothing, cyberspace will become a blace of perfect control, devoid of the liberty and free expression that we hold sacred.

"The underpaid heroes who built the Net have ideological reasons to resist government's mandate. They are not likely to yield to its threats. And unlike some commercial interests, they do not have millions riding on a single architecture winning out in the end."

"But as code writing becomes the product of a smaller number of large companies, the government's ability to regulate it increases."

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### Code is Law: Maybe not... "Just as there was a push toward convergence on a simple set of network protocols, there will be a push toward convergence on a <u>uniform set of rules</u> to govern network transactions. This set of rules will include □ not the law of trademark that many nations have, but a unified system of trademark, enforced by a single committee; □ not a diverse set of policies governing privacy, but a single set of rules implicit in the architecture of Internet protocols; not a range of contract law policies, implemented in different ways according to the values of different states, but a <u>single, implicit set</u> of rules decided through click-wrap agreements and enforced where the agreement says." What Lessig doesn't get (or perhaps what I don't get about Lessig's conclusion) is why should code regulations converge? Azer Bestavros -- Tussles in Cyberspace

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# Standards ≠ Uniformity

- Standards are needed for interoperability and *not* for control.
- The Internet architecture (code) promotes a diversity of standards not a single one.
- Internet protocols continue to be invented, extending functionality and diversity.

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Need to understand how (Cyberspace) code evolved and continues to evolve.

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# <text><list-item><list-item><list-item><complex-block><text>







# Tussle: It's all bits

- Store-and-forward communication
  - □ In 1996, the 1934 telecom act was modified to distinguish "telecom" from "info"<sup>†</sup> services.
  - □ Common carriers are held to higher safety standards and must be neutral, and in return are afforded special protections.
  - Now, IP voice and video services are unregulated "information services" that compete directly with regulated voice and video services by "common carriers".

the generating, acquiring, storing, transforming, processing, retrieving, utilizing or making available information via telecommunications
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# Tussle: What's in the name?

### DNS

 A technology invented in 1983 to go from friendly names (csa2.bu.edu) to IP addresses (128.197.12.4)



- □ By the late 1990s, it changed the vocabulary of society "Walmart" → "www.walmart.com"
- □ At the root of big trademark problems e.g., whitehouse.org, nissan.com.

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# Truth in Domain Names Act...

- Anti-cybersquatting Consumer Protection Act is a US federal law enacted in 1999.
  - It makes people who register domain names with the sole intent of selling the rights to these domain names for a profit liable to civil action.
- URL hijacking is a form of "cybersquatting" that capitalizes on typographical errors made by Internet users to lead them to an alternative website owned by a cybersquatter.
- Organizations often register misspelled domain names (e.g., gogle.com, googel.com)!

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# Tussle: What's in the email?

### SMTP

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- A technology invented in 1971 to enable a researcher to send a text message to geek@lab15.mit.edu.
- By late 1990s an email address has become one's cyber identity.
- Today, it limits customer mobility (and hence ISP competition) – not possible to solve as with "local wireless number portability".
- $\Box$  Oh yes, and then there is SPAM.





### **Tussle: Congestion Control** TCP Invented in 1971, it allows two communicating users to decide at what speed they should communicate to be "friendly" to other users. By mid 2000s, the Internet has become the playground of selfish, competing users who "abused" TCP. □ Today, ISPs are struggling to reign in selfish users - being accused of jeopardizing "net neutrality". February 11, 2010 Azer Bestavros -- Tussles in Cyberspace 23 February 11, 2010

# The Perils of Ossification

### Myopic design choices

Cyberspace architects are not good at anticipating how inventions might be used, or in predicting future problems or "killer apps".

### Revisiting design choices is hard

□ Wide adoption requires standardizing early design choices, making it much harder to change.

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Particularly problematic when a technology does not get replaced.





How tractable are you?			
Browser Characteristic	bits of identifying information	one in x browsers have this value	value
User Agent	8.93	488.73	Mozilla/4.0 (compatible; MSIE 8.0; Windows NT 5.1; Triden/4.0; NET CLR 1.1.4022; .NET CLR 2.0.50727; .NET CLR 3.0.4606.2152; .NET CLR 3.6.30729)
HTTP_ACCEPT Headers	3.69	12.94	text@tml, "" gzip, deflate en us
Browser Plugin Details	16.61	100353	Java 1.6.0.17; QuiskTime 7.6.6.0; Flash 10.0.42,34; WindowsMediaplayer 11.0.6721.6208; Silverlight 3.0.60106.0; Adobe Acrobat vession5.?
Time Zone	2.64	6.23	300
Screen Size and Color Depth	15.5	46316.77	1364/760x16
System Fonts	18.2	301059	Materia, Anali C., Anali C., Mati C., Mati C., Mati C., Mati Banti, C., Sunte Men, C. C., Course Men, C. W., Course Men, Manne, Ma
Are Cookies Enabled?	0.27	1.2	Yes
Limited supercookie test	4.13	17.5	DOM local Straage: Yes, DOM session Storage: Yes, IE use/Data: Yes







# Tussles: Beyond net architecture

Tussles resulting from how "code" is used, e.g., depending on the nature of the bits!

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Pointing to (indexing) copyrighted music will get you an RIAA lawsuit □ Caching (de-duplicating) copyrighted







# Closing remarks

- Design principle: One size does not fit all allow for multiple "visions" of the Internet to co-exist – e.g., <u>GENI</u>.
- Design for variation in outcome not for a particular outcome.
  - Modularize along tussle boundaries (e.g., naming vs routing, reliability vs anonymity).
  - Design for choice (e.g., circuit switching vs store-andforward).

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# **Closing remarks**

- Computer Scientists have an obligation to educate society about what is possible:
  I don't have to know the ID of a person to check if he/she is entitled to access a building.
- Computer Scientists have an obligation to act as watchdogs and to promote best practices:
  - Open Source Software



