The Global Commons:
Cooperation and Conflict on the Internet

A freshman seminar proposal for Fall 2006

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Synopsis. The Internet era offers many new ways for people to interact, cooperate, and share information all over the world. As the Internet has grown, it has nurtured many interesting software systems that develop its potential for many-to-many interaction, beyond the simplest and most familiar examples (Web, e-mail, discussion boards, instant messaging). This course explores the underlying technology and structural principles of the Internet and the cooperative networked systems that it supports, as well as the social impacts, public policy issues, and ethical issues surrounding their emergence. A primary focus is the vulnerability of these networked systems to abuse, disruption, and collapse.

Knowledge and inquiry designations. The course involves elements of computer science (networking and distributed systems), graph theory, and game theory, so it could be eligible for **QS**, **SS**, and perhaps **NS**. The most appropriate inquiry designation is Science, Technology, and Society (**STS**). The course may be eligible for Writing credit: approximately 60% of the grade will be based on two short (two-page) writing assignments that will be thoroughly marked, and a longer independent report (6-10 pages).

Outline of Topics. The course will explore the following specific topics (preliminary list):

1. *Today's Internet and its evolution*. Historical antecedents: telegraph, telephone, and broadcast networks. Fundamentals of packet switching and the Internet's "stateless core" architecture. The transition from a centrally managed research network (Arpanet/NSFnet) to a commercial network of interconnected private carriers and organizations. Internet governance: global control of domain names and address assignment by a US nonprofit corporation (ICANN), and the role of the United Nations. Reading: *The Victorian Internet*.
2. *The Web*. Basic technologies for Web access, e-commerce, privacy, and security. Credit cards and "phishing". Search and the rise of Google: crawling, indexing, page ranking, and mega-services. Eavesdropping, encryption, data mining, and national security.
3. *Social networks and network value*. Structure of social networks, "six degrees of separation", club/group formation. Metcalfe's Law and the Reed's Law of the Pack. Identity, reputation, and credibility. Wikipedia and blogging: who owns the truth? Reading: *Linked: the New Science of Networks*.
4. *Traffic and policing*. Congestion and the Tragedy of the Commons. Flash crowds, congestion collapse, and distributed denial of service. Here we will discuss traffic

control and congestion control in today's Internet as a cooperative game, emphasizing the role of incentives and vulnerability to disruption by malicious players.

5. *Peer-to-peer systems and file sharing*. Self-interested computing and the role of incentives. Cooperation and the problem of free riders: BitTorrent. Content ownership and copyright: Digital Millennium Copyrights Act and the RIAA. Vulnerability of centralized systems to attack: the Napster case. Robust content dissemination. Reading: *The Evolution of Cooperation*.
6. *"The Internet's New Borders"* (from *The Economist* 8/9/2001). Government control of information: access blocking, filtering, and censorship. Political discourse in China: Google and Cisco. A French court decision restricts distribution of Nazi-related content from servers outside France's borders. Incentives for carriers to restrict traffic: who benefits and who pays? The curse of spam.

Workload. The course will center on reading, discussion, and writing. The instructor will present technological underpinnings, and will also pose questions and present alternative points of view to consider. Students will come prepared to discuss their positions on specific questions and topics, and to support those positions with ideas and examples from the readings. The reading list will include 6-8 popular books on foundational concepts, technologies, and their impacts, supplemented with reprints of articles from the popular press (e.g., *The Economist, Scientific American, MIT Technology Review*). Writing assignments consist of two short (2-page), persuasive essays, which will be reviewed in depth and rewritten as necessary, and a longer research paper (6-10 pages) exploring a topic of the student's choosing. Students will also submit summaries and position statements to an online discussion forum, and there will be one written examination to motivate them to keep up with reading and discussions.