

UC Berkeley

Berkeley Undergraduate Journal

Title

The Future of Network Neutrality

Permalink

<https://escholarship.org/uc/item/5k28n8dn>

Journal

Berkeley Undergraduate Journal, 22(1)

Author

Guttentag, Mikhail

Publication Date

2009

DOI

10.5070/B3221007666

Copyright Information

Copyright 2009 by the author(s). All rights reserved unless otherwise indicated. Contact the author(s) for any necessary permissions. Learn more at <https://escholarship.org/terms>

Peer reviewed|Undergraduate



The Future of Network Neutrality

By Mikhail Guttentag

On November 1, 2007, the Federal Communications Commission (FCC) faced the task of evaluating whether Comcast, an Internet Service Provider (ISP), was violating principles of network neutrality, a Darwinian theory of Internet innovation that makes ISPs treat all Internet traffic the same. Because this FCC case acted as the front lines for the battle over network neutrality, the FCC's final ruling a year later can give us a good idea about what the future holds for network neutrality in the United States. This paper examines the basic workings of the Internet, theories of innovation the Internet was built upon, levels of potential neutrality regulation and, finally, an analysis of the FCC's ruling. This paper argues that while the FCC did not designate a clear long-term future for network neutrality, President Barack Obama's strong stated support of network neutrality bodes well for a stronger FCC commitment to its preservation.

Table of Contents

Introduction	2
The FCC–Comcast Case	2
Introduction to the Network	2
<i>Figure 1.1 – Basic Data Sequencing</i>	2
<i>Figure 1.2 – Multiple Packets Squeezing Through a Router</i>	2
Trafficking Packets Through BitTorrent.....	2
Network Neutrality – Theory and Application	2
Ideas of Internet Innovation – The End-to-End Principle	2
Ideas of Internet Innovation – Evolutionary Theory of Innovation.....	2
Network Neutrality – Levels of Regulation	2
Absence of Regulation	2
Full Regulation.....	2
Non-Discrimination Rules.....	2
Lessons from the FCC–Comcast Ruling–A Way Forward?	2
Outlining the FCC Ruling	2
The Case-By-Case Precedent.....	2
The Comcast Appeal, and a Potentially Nebulous Future	2
Concluding Thoughts – President Obama’s Network Vision	2
References	2

Introduction

In its *Internet Policy Statement* released September 23, 2005, the Federal Communications Commission (FCC) recognized that “the availability of the Internet has had a profound impact on American life.”¹ In order to “preserve and promote the open and interconnected nature of the public Internet,”² the FCC outlined its Internet regulatory principles and asserted its jurisdiction to ensure “Internet access or Internet Protocol-enabled services are operated in a neutral manner.”³ On November 1, 2007, the FCC’s *Internet Policy Statement* was put to the test. The FCC was asked to evaluate whether Comcast, an Internet Service Provider (ISP), was violating these neutrality principles in their distribution of Internet service to its customers. This paper will use the FCC’s August 20, 2008 ruling (FCC-Comcast ruling) on Comcast’s network management practices as a guide by which we can navigate the debate over network neutrality.

Network neutrality itself is decidedly complex. As a Congressional Research Service Report noted, “there is no single accepted definition of ‘net neutrality.’”⁴ Edward Felten, writing for the Center for Information Technology Policy at Princeton University, explains that “one of the reasons the network neutrality debate is so murky is that relatively few people understand the mechanics of network discrimination.”⁵ The basic idea behind network neutrality is that ISPs are currently bound by a system whereby they are obligated, through FCC Internet policy, to move all data across the Internet in the order it is received (that is, to treat all data “neutrally”). Instead, many ISPs would prefer to reserve the right to charge different prices and prioritize the transfer of information based on ability to pay or the type of information being transferred.

In this paper, I do not seek to present a technical analysis of network neutrality. As Felton notes, to answer every question about network neutrality “would require a book, not an essay.”⁶ Instead, I seek to use the FCC’s ruling to explain some of the core principles of the Internet, take a more in-depth look at the network neutrality debates and the degrees of regulation proposed, and speculate what this ruling means for the future of network neutrality in the United States.

In his book *The Future of Ideas*, Lawrence Lessig asserts that “at just the time that the Internet is reminding us about the extraordinary value of freedom, the Internet is being changed to take that freedom away...our social and political institutions are

¹ Federal Communications Commission. *Internet Policy Statement*. Washington, D.C., September 23, 2005. Print. 1.

² *Ibid.*, 3.

³ *Ibid.*, 3.

⁴ Angele A. Gilroy, Specialist in Telecommunications--Resources, Science and Industry Division. *Net Neutrality: Background and Issues*. Washington, D.C.: Congressional Research Service, September 16, 2008. Print. 1.

⁵ Edward W. Felten. *Nuts and Bolts of Network Neutrality*. Princeton University, July 6, 2006. Print. Center for Information Technology Policy, Department of Computer Science, and Woodrow Wilson School of Public and International Affairs, Princeton University, 1.

⁶ *Ibid.*, 1.

ratifying changes in the Internet that will reestablish control, and, in turn, reduce innovation on the Internet and in society generally.”⁷ Drawing upon the work and ideas of Lessig and other Internet legislation scholars and pioneers, I seek to bridge the overall network neutrality debate to the recent FCC-Comcast ruling in order to answer the research question, “What is the future of network neutrality?” And, perhaps more importantly, “What should it be?”

The FCC-Comcast Case

At its most basic level, the FCC-Comcast case was an evaluation of user complaints that Comcast was selectively interfering with connections of specific Internet applications, thus violating consumer freedom to operate applications and services of their choice. This is, admittedly, an oversimplification of a complex case. A more complex understanding of how Internet connections operate is necessary in order to truly analyze the case. Here, I walk a fine line, between attempting explain the Internet’s complexity enough so that readers can thoroughly understand the case and the network neutrality debate, but not being so technical that I lose the reader in a sea of technical terminology.

Introduction to the Network

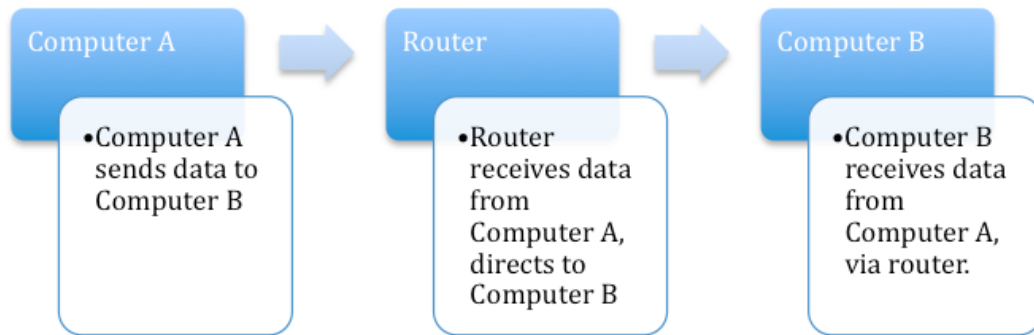
The FCC-Comcast ruling itself tries to paint a simplified version of information transfer on the Internet. It explains that “when an Internet user opens a web page, sends an email, or shares a document with a colleague, the user’s computer usually establishes a connection with another computer (such as a server or another end users’ computer) using, for example, the Transmission Control Protocol (TCP).”⁸ However, this explanation implies that data is directly transferred from one computer to another. This is not the case. As Felten explains, the “infrastructure is basically a set of routers (think: metal boxes with electronics inside) connected by links (think: long wires). Packets of data get passed from one router to another, via links. A packet is forwarded from router to router, until it arrives at its destination.”⁹ So now our understanding of data transfer on the Internet should look something like this:

⁷ Lawrence Lessig, *The Future of Ideas*. New York, NY: Random House, 2001. Print. 15.

⁸ Kevin J. Martin, Chairman. "Formal Complaint of Free Press and Public Knowledge Against Comcast Corporation for Secretly Degrading Peer-To-Peer Applications." *Federal Communications Commission Ruling*. August 20, 2008. Print. 2.

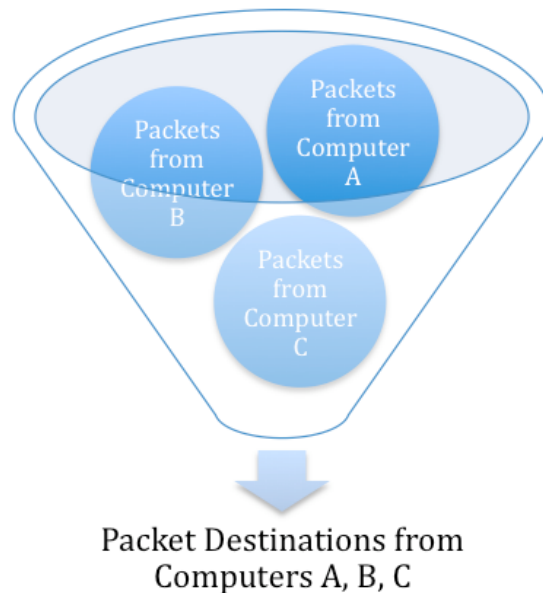
⁹ Felten, *Nuts and Bolts of Network Neutrality*, 1.

Figure 1.1 – Basic Data Sequencing



This model of the Internet works fine so long as there is only one piece of data (known as a packet) for every available router. But what happens in a situation where there are two or more packets attempting to be directed by the same router? Depicting such a scenario graphically would look something like this:

Figure 1.2 – Multiple Packets Squeezing Through a Router



This diagram depicts multiple packets assigned to the same router, all of which are trying to get to different destinations. How should a router decide which packet to let through first? Some say the router should address packets in the order they arrive, but others argue that the routers should be able to prioritize packets based on their content (for example, letting through e-mail packets before YouTube video packets). This situation represents the core question of the network neutrality debate. As scholars Victoria Kocsis and Paul Bijl explain, “The Internet as we currently know it is based on a simple network architecture...all packets are treated in the same way, and in case of congestion, packets are treated on a first-in/first-out basis (‘best effort’ routing

practice).”¹⁰ So, given Figure 1.2, the router first deals with the packet from Computer C. When the packet from Computer B arrives, since the router is busy, the packet has to wait—to be “buffered in the router’s memory, waiting its turn until the outgoing link is free.”¹¹ When the packet from Computer A arrives, as in the diagram above, the router buffers that packet into its memory and puts it in line right behind the packet from Computer B. Problems arise when packets arrive faster than they can be sent out. The number of packets will grow and eventually the router will run out of memory. For example, if no additional packets can fit into the router in Figure 1.2, the “the router has no choice but to discard a packet. It can discard the newly arriving packet, or it can make room for the new packet by discarding an older packet waiting in the buffer, but something has to be discarded.”¹² Another way to think about packet prioritization is as packet discrimination. Some ISPs would like the ability to look at these packets and decide for themselves which packets to discard and which to prioritize. As profit-maximizing firms, they might like to monetize this prioritization, charging different prices to different packets. Thus much of debate revolves around whether an ISP retains this right to prioritize one packet over another—that is, to discriminate between packets—and thus circumvent principles of complete network neutrality.

Trafficking Packets Through BitTorrent

Complaints about Comcast centered on Comcast’s treatment of packets originating from BitTorrent applications, as opposed to, for example, email or general website loading. The way BitTorrent applications work is that instead of that single TCP connection between a single computer and a single server, “BitTorrent employs a decentralized distribution model: Each computer in a BitTorrent ‘swarm’ is able to download content from the other computers...all via TCP connections.”¹³ Although, as FCC 08-183 notes, BitTorrent once largely served “unlawful purposes, BitTorrent and other peer-to-peer technologies...have entered the mainstream.”¹⁴ As such, consumers using BitTorrent applications to download legal TV shows, movies, or any sort of file using BitTorrent applications expect their transfer speeds to be faster than the traditional one-to-one TCP connections, simply because they can get little pieces of the data from so many different TCP connections.

However, Comcast subscribers did not find this to be the case, and throughout 2007 they complained of slow speeds using BitTorrent applications. On August 17, 2007, the BitTorrent-tracking website TorrentFreak published a blog post accusing Comcast of “throttling”, or slowing, BitTorrent web activity, or “traffic.”¹⁵ In order to test the

¹⁰ Viktória Kocsis and Paul W.J. de Bijl. "Network Neutrality and Competition Between Networks: a Brief Sketch of the Issues." *Intereconomics* 43.1 (January, 2008): 15-24. Print. 15.

¹¹ Felten, *Nuts and Bolts of Network Neutrality*, 2

¹² *Ibid.*, 2-3.

¹³ Martin. "Formal Complaint of Free Press," 2.

¹⁴ *Ibid.*, 3.

¹⁵ Ernesto. "Comcast Throttles Bittorrent Traffic, Seeding Impossible." TorrentFreak. August 17, 2007. Web. <<http://torrentfreak.com/comcast-throttles-bittorrent-traffic-seeding-impossible/>>.

veracity of these claims, the Associated Press (AP) conducted tests on Comcast's network in order to see if Comcast was, indeed, interfering with BitTorrent traffic. On October 17, 2007, the AP announced its test results, asserting that "Comcast Corp. actively interferes with attempts by some of its high-speed Internet subscribers to share files online, a move that runs counter to the tradition of treating all types of Net traffic equally."¹⁶ What drew additional ire from network experts was just how Comcast allegedly interfered with its users' connections.

In a given TCP connection, if either computer detects a problem with this connection "it sends a 'reset packet' or 'RST packet' to the other, signaling that the current connection should be terminated and a new connection established if 'reliable communication is to continue.'"¹⁷ When Comcast interfered with BitTorrent traffic, each computer receives a RST packet from the other computer, terminating the connection. Only it was Comcast, and not either computer, sending both RST packets. As the AP article explains, "If it were a telephone conversation, it would be like the operator breaking into the conversation, telling each talker in the voice of the other: 'Sorry, I have to hang up. Good bye.'"¹⁸ The Electronic Frontier Foundation (EFF) would corroborate these findings in its own study one month later. However, before these findings were published, the first lawsuit had already been filed.

On November 1, 2007, Free Press, a nonpartisan media reform organization, filed a formal complaint with the FCC against Comcast, asking the Commission to rule "that an Internet Service Provider violates the [Commission's] *Internet Policy Statement* when it intentionally degrades a targeted application."¹⁹ On January 11, 2008, the FCC requested a Comcast response, thereby agreeing to take on the major task of outlining its true commitment, or lack thereof, to the preservation of network neutrality.

Instead of simply jumping into the FCC final ruling, this paper takes an in-depth look at the scope of the network neutrality debate—a debate whose core is built from philosophical ideas regarding Internet freedoms and innovation. In addition, the subsequent section draws upon the work of scholars across the telecommunications spectrum to examine the benefits and drawbacks of three potential paths the FCC might take in regulating network neutrality, and hints at a particularly interesting fourth possibility that may reflect the immediate future of network neutrality regulation.

Network Neutrality – Theory and Application

In its ruling, the FCC argued that "the innovation and explosive growth of the Internet [has been] directly linked to its particular architectural design."²⁰ Behind the

¹⁶ Peter Svensson. "Comcast Blocks Some Internet Traffic, AP Testing Shows." *Associated Press*. 19 Oct. 2007. Print.

¹⁷ Martin, "Formal Complaint of Free Press," 2.

¹⁸ Svensson, "Comcast Blocks Some Internet Traffic."

¹⁹ "Formal Complaint of Free Press and Public Knowledge Against Comcast Corporation for Secretly Degrading Peer-To-Peer Applications." Free Press Complaint. File No. EB-08-IH-1518. November 1, 2007. Print.

²⁰ Martin, "Formal Complaint of Free Press," 13.

Internet's design lie two crucial principles: the "end-to-end" principle built into the Internet's infrastructure and the evolutionary approach to innovation. An understanding of these two ideas is crucial to understanding the various approaches scholars take on the issue of network neutrality, as their approaches are heavily influenced by early Internet principles.

Ideas of Internet Innovation – The End-to-End Principle

Lessig describes the end-to-end principle as a "design philosophy about how networks should be built. It counsels that a network should be kept as simple as possible and that the intelligence required in a network be vested in the edge, or ends of a network."²¹

In other words, you allow the core infrastructure of the network to be the one doing the narrow task of packet transfer discussed in the earlier section, while computers tapped into the edges of the network design and run the more complex applications that make up the Internet (that is, web browsers, e-mail, etc.). One consequence of the end-to-end design, Lessig explains, is that it "embeds a value that encourages innovation in applications for the network"²² (that is, encourages the creation of applications that run on the Internet). Because application creators do not need to seek permission to run their applications on the Internet, and because network owners are unable to selectively decide which programs to allow on their network, consumers are free to choose which applications they want to use.

In that respect, consumer choices—not network permission—determine which applications succeed and which do not. Felten argues that the entire network neutrality debate can be traced back to debates over the value of the end-to-end principle. Felten explains that "neutrality regulation is generally supported by companies that provide services at the edge of the network, and is generally opposed by companies that manage the middle of the network."²³ This is because the end-to-end principle establishes a network where the true opportunities to innovate lie in tapping into the network from the edge, rather than pushing applications from the network core. Thus, as Lessig asserts, it "disables the potentially most powerful actor in the network, the network owner, from interfering"²⁴ with innovation at the individual level. David Clark and Marjory Blumenthal, two of the original architects of the end-to-end principle, explain that it is "premature to predict the final form [of the Internet]. What we can do now is push in ways that tend toward certain outcomes."²⁵ To that end, the preservation of the end-to-end principle is a preservation of Internet values, because, as Lessig asserts, "which architecture we encourage is a choice about which policy we encourage."²⁶ The preservation of end-to-end architecture speaks to the commitment to a continuation of the

²¹ Lawrence Lessig. *Code 2.0*. 2 ed. New York, NY: Basic Books, 2006. Print. 111.

²² *Ibid.*, 111.

²³ Felten, *Nuts and Bolts of Network Neutrality*, 10.

²⁴ Lessig, *Code 2.0.*, 112.

²⁵ David D. Clark and Marjory S. Blumenthal. "Rethinking the Design of the Internet: the End to End Arguments Vs. the Brave New World." *Transactions on Internet Technology* 1.1 (August, 2001). Print.

²⁶ Lessig, *Code 2.0.*, 112.

policies that have led to the remarkable Internet innovations we see today. E-mail, web browsers, and the other applications that have come to define our understanding of the Internet all came not from the network, but from innovators tapped into the “edge” of the network.

Ideas of Internet Innovation – Evolutionary Theory of Innovation

In his analysis of network neutrality proponents, Tim Wu, Professor of Law at the University of Virginia, noted that “network neutrality adherents view the innovation process as a survival-of-the-fittest competition.”²⁷ The basic idea behind this philosophy is that users should be the ultimate arbiters of competition between applications, where the “fittest” applications, the ones most users choose to use, survive. Such a philosophy, Wu notes in a letter he penned to the FCC with Lessig, “encourages policies to ensure a fair fight among competing innovations.”²⁸ Without the assurance that all applications are given equal chance to compete, the entire survival-of-the-fittest idea falls apart.

In particular, Nicholas Economides is concerned with the anti-competitive concerns a profit-maximizing ISP has if left unrestrained by neutrality legislation: “[ISPs] have incentives to favor their own services, applications and content and kill competing services... Thus, the access providers will be able to determine who will be the winner in search, content and many other applications and services.”²⁹ Wu also stresses the importance of the consumer in this philosophy, arguing that the basic principle behind anti-discrimination rules is to “give *users* the right to use non-harmful network attachments or applications, and give innovators the corresponding freedom to supply them.”³⁰ Kocsis and Bijl assert that if network neutrality were to be repealed, “consumer choice in the applications market is likely to be curtailed... in the new situation the choice for a network may imply constrained access to some types of content.”³¹

The connection between this evolutionary theory of innovation and the fight for network neutrality is clear—in order for consumers to properly choose the “fittest” applications, they must be able to choose their applications freely, rather than just from which applications have negotiated deals with ISPs. In order to preserve the meritocracy upon which this evolutionary theory relies, the platform—that is, the network—must remain neutral.

One could argue that the declaration that this evolutionary innovation theory led to the Internet’s growth engages in a bit of a *post hoc, ergo propter hoc* fallacy of causation. However, as Wu asserts, “Internet Darwinians argue their innovation theory is

²⁷ Tim Wu. "Network Neutrality, Broadband Discrimination." *Journal of Telecommunications and High Technology Law* 2 (June 5, 2003): 141-180. Print. 146.

²⁸ Lawrence Lessig and Tim Wu. "Re: Ex Parte Submission in CS Docket No. 02-52." August 22, 2003. Print. 5.

²⁹ Nicholas Economides, 'Net Neutrality', Non-Discrimination and Digital Distribution of Content Through the Internet. New York, NY: New York University -Stern School of Business, NET Institute., March 1, 2007. Print. 20.

³⁰ Wu, "Network Neutrality, Broadband Discrimination," 142.

³¹ Kocsis, Viktória, and Paul W.J. de Bijl. "Network Neutrality and Competition Between Networks: a Brief Sketch of the Issues." *Intereconomics* 43.1 (January, 2008): 15-24. Print. 22.

embodied in the ‘end-to-end’ design argument.”³² To proponents of the evolutionary theory of innovation, the extraordinary growth of the Internet, “the fastest growing communications network in history, [serves] as evidence of the superiority of a network designed along evolutionary principles.”³³ Thus far, the Internet and the evolutionary principles behind its growth have been inseparable. These scholars argue that separating the two would undercut its survival-of-the-fittest innovation and, by extension, the Internet’s original architectural design.

Network Neutrality – Levels of Regulation

Assessing the roots of the network neutrality debate, Scott Marcus argues that the very notion that neutrality must be discussed in the first place implies a failure in network competition. Marcus argues that the debate shows that “underlying broadband competition in the US has been eroded to the point where content providers and end-users are no longer convinced that competition is sufficient to inhibit anticompetitive conduct on the part of network operators.”³⁴ Marcus argues that in an environment where there is only one ISP behaving as a monopoly in a given area, they lack incentives to ensure network neutrality, without regulation intervention. Thus, he argues that the real problem in regulating networks lies not in “[adjudicating] the structure of payments, but rather the decline in effective competition for...Internet access in the United States.”³⁵ Marcus may indeed be right in his assertion that the lack of competition between ISPs creates these problems of neutrality violations. However, without a drastic increase in broadband competition, the FCC must rule based on what the network currently looks like, not what it should look like.

Early debates over network neutrality framed the issue largely dichotomously, with neutrality either sustained or eliminated. Johannes Bauer, writing for the *International Journal of Communication* in 2007, explains that over time, “the positions became more nuanced, with a stronger emphasis on the contingencies under which network neutrality rules might make sense and the limits of such policies.”³⁶ Recent network neutrality regulation suggestions have ranged from allowing ISPs to self-regulate their packet discrimination, to highly constraining regulation of ISP investment, prices and quality. In between these two extremes lie a “range of possible non-discrimination rules that constrain but do not fully eliminate network platform providers’ ability to

³² Wu, "Network Neutrality, Broadband Discrimination," 146.

³³ *Ibid.*, 146.

³⁴ J. Scott Marcus, "Network Neutrality: the Roots of the Debate in the United States." *Intereconomics* 43.1 (January, 2008): 30-37. Print. 33.

³⁵ *Ibid.*, 33. For more information on broadband competition and the economic models for ISPs operating in monopolist environments, consider Kocsis and de Bijl’s examination of competition between networks (*Intereconomics*, January 2008), and Economides’ analysis of vertical anti-competitive concerns (NET Institute, March 2007).

³⁶ Johannes M. Bauer, "Dynamic Effects of Network Neutrality." *International Journal of Communication* 1 (2007): 531-547. Print. 532.

discriminate.”³⁷ Analyses of these three approaches, as well as the recognition of uncertainty regarding their ultimate consequences, sets the stage for a fourth approach for the FCC: ruling on a case-by-case basis, committing permanently neither to ISP discrimination nor network neutrality.

Absence of Regulation

In this scenario, no specific neutrality regulations exist, and ISPs are unrestrained in packet discrimination, constrained only by general antitrust law.³⁸ For the purposes of this paper, we assume the ISP operates as a monopoly in its given market; that is, there are no competitors offering consumers rival Internet service. As Economides suggests, this would change Internet pricing schemes such that ISPs would impose “price discrimination on the provider side of the market and not on the subscriber, that is, it will be a version of *two-sided* pricing.”³⁹ As Edward Whitacre, Chief Executive of AT&T, told *BusinessWeek* magazine in 2005, “Why should [applications such as Google] be allowed to use my pipes? The Internet can’t be free in that sense...for a Google or Yahoo or Vonage or anybody to expect to use these pipes [for] free is nuts!”⁴⁰ This clear statement of ISP intention to charge applications for Internet use supports the assertion that the network neutrality debate serves largely as a “proxy for the deeper, but stalled, debate over overall competition in the electronic communications services sector,”⁴¹ between “the large content providers (like Google) and the large network providers (like Verizon and Comcast).”⁴² Christopher Yoo, Professor of Law at Vanderbilt University, asserted in a debate with Wu that even if the debate is a battle over the division of Internet profits, this alone does not mean government should allow network providers to regulate themselves, and thus dominate the debate.

In order to illustrate what a commitment to an absence of regulation would mean for a given network, Economides posits a situation where a telephone company was not bound by law to treat each call equally. Economides argues that “a telephone company with no non-discrimination requirements could charge a high price for 911 emergency calls since the willingness to pay for these calls is obviously high.”⁴³ Wu argues that a complete absence of regulation could have anticompetitive consequences; depending on how ISPs choose to manage their networks. Wu asserts that “methods, like bans on certain forms of applications, [likely] distort the market and the future of application development,”⁴⁴ which undercuts the evolutionary theory of innovation.

³⁷ *Ibid.*, 532.

³⁸ *Ibid.*, 537.

³⁹ Economides, *'Net Neutrality'*, 6.

⁴⁰ Patricia O'Connell, "At SBC, It's All About "Scale and Scope"." *Businessweek* 7 Nov. 2005: n. pag. Print.

⁴¹ Marcus, "Network Neutrality: the Roots of the Debate in the United States," 32.

⁴² Timothy Wu and Christopher S. Yoo. "Keeping the Internet Neutral? Tim Wu and Christopher Yoo Debate." *Federal Communications Law Journal* 59.3 (November 3, 2007). Print. 590.

⁴³ Economides, *'Net Neutrality'*, 8.

⁴⁴ Wu, "Network Neutrality, Broadband Discrimination," 143.

Until recently, University of Pennsylvania Professor Gerald Faulhaber's assertion that "at this point, it would appear that the problems [with absence of regulation] are all potential problems, not actual problems"⁴⁵ held some merit. However, the results of AP and EFF tests on Comcast's network suggest that the concern held by network neutrality advocates—that ISPs left unregulated would actively throttle traffic from certain applications—is no longer a "potential" problem. As Bauer asserts, "in services for which they are vertically integrated, platform operators (ISPs) may compete aggressively,"⁴⁶ granting their applications speeds far faster than their competitors'. In sum, as Wu succinctly notes, "the recent historical record gives good reason to question the efficacy of self-regulation in this area."⁴⁷

Full Regulation

Full regulation encompasses "detailed regulation of investment, prices, and the quality and conditions of access to the network,"⁴⁸ where ISPs would be forbidden from even the slightest packet prioritization, even if necessary due to a "clogged" network overburdened with packets. Stanford Law Professor Bruce Owen argues that network neutrality policies "could only be implemented through detailed price regulation, an approach that has often failed, in the past, to improve consumer welfare relative to what might have been expected under an unregulated monopoly."⁴⁹ Other scholars have called network neutrality regulations, in their strongest incarnation, "laudable in many respects, [but] not practical nor desirable."⁵⁰ Yet the arguments against full regulation are not limited to network neutrality opponents—Wu assesses the use of full structural restrictions to promote network neutrality as "potentially counterproductive."⁵¹

However, Bauer asserts that the idea that full regulation is "the inevitable outcome of any form of network neutrality policy" is not necessarily true; besides, it is "rarely promoted as a desirable policy choice."⁵² Faulhaber suggests that full network neutrality regulation would create a government oversight environment where "the focus of competition shifts from pleasing the customer to manipulating the regulator"⁵³ and creates an incumbency advantage that discourages competition at the ISP level. Owen, opposed to any neutrality regulation whatsoever, argues that, as a result, consumers are "better-served by unregulated (and therefore hopefully shorter-lived) monopoly than by

⁴⁵ Gerald R. Faulhaber, "Net Neutrality: the Debate Evolves." *International Journal of Communication* 1 (May 6, 2007): 680-700. Print. 697.

⁴⁶ Bauer, "Dynamic Effects of Network Neutrality," 538.

⁴⁷ Wu, "Network Neutrality, Broadband Discrimination," 143.

⁴⁸ Bauer, "Dynamic Effects of Network Neutrality," 532.

⁴⁹ Bruce M. Owen, *The Net Neutrality Debate: Twenty-Five Years After United States V. AT&T and 120 Years After the Act to Regulate Commerce*. Stanford, CA: Stanford Institute for Economic Policy Research, February, 2007. Print. 11.

⁵⁰ Paul Ganley and Ben Allgrove. "Net Neutrality: A User's Guide." *Computer Law and Security Report* 22.6: 454-465. Print. 463.

⁵¹ Wu, "Network Neutrality, Broadband Discrimination," 142.

⁵² Bauer, "Dynamic Effects of Network Neutrality," 542.

⁵³ Faulhaber, "Net Neutrality: the Debate Evolves," 693.

regulated (and therefore likely semi-permanent) monopoly.”⁵⁴ The inherent difficulty in setting pricing that encourages application innovation and proper network behavior makes full regulation neither ideal nor a practical possibility in this debate.

Non-Discrimination Rules

As outlined above, many of even the most ardent network neutrality supporters recognize the need for some form of discrimination in managing a network. Wu explains that nobody really believes in systems that completely ban discrimination. He explains that in employment, “you want to be able to fire people who are lousy—to discriminate on the basis of ability.”⁵⁵ This statement serves to counter the network neutrality opponents who think network neutrality serves as a “mandate to roll-out a dumb network infrastructure.”⁵⁶ Wu does not believe that “the fact that an absolute ban on discrimination would be ridiculous undermines the case for discrimination laws.”⁵⁷ Thus, non-discrimination rules can prove to be an effective compromise between the two regulatory extremes, preserving the “best-effort” principles of packet transfer without imposing pricing regulations that might impede Internet growth and innovation.

To be fair, of the three regulatory paths, non-discrimination rules are the hardest to strictly define. As Bauer notes, “whether non-discrimination rules are meaningful will depend on the...specification of the rules.”⁵⁸ In a joint report laying out possible “Scenarios for the Network Neutrality Arms Race,” several scholars conclude “Some sort of network neutrality rules may make sense to protect against obvious abuses of market power, to discipline the arms race, and to provide uncertainty-reducing guidance...as to what the rules of the road will be.”⁵⁹ Opponents of non-discrimination laws, in some respects, rely upon good-faith ideas about ISP practices that the AP and EFF reports on Comcast’s network management directly contradict. For example, writing for the CATO Institute, Hal Singer argues that “it is not clear that even a reasonable non-discrimination rule is required for Internet services, given the fact that broadband service providers acting unilaterally lack the ability to foreclose content providers.”⁶⁰ Comcast’s throttling of BitTorrent traffic, in essence, forecloses BitTorrent content providers. Similarly, Owen’s pronouncement that “access discrimination in broadband service [is] a doubtful proposition at best,”⁶¹ is itself an increasingly doubtful proposition.

I return now to the FCC-Comcast ruling, where the FCC was given the opportunity to choose which one of these levels of regulation it wanted to pursue in

⁵⁴ Owen, *The Net Neutrality Debate*, 11.

⁵⁵ Wu and Yoo, “Keeping the Internet Neutral?” 577.

⁵⁶ Bauer, “Dynamic Effects of Network Neutrality,” 532.

⁵⁷ Wu and Yoo, “Keeping the Internet Neutral?” 577.

⁵⁸ Bauer, “Dynamic Effects of Network Neutrality,” 540.

⁵⁹ William H. Lehr, Sharon E. Gillet, Marvin A. Sirbu, and Jon M. Peha. Scenarios for the Network Neutrality Arms Race. 34th Research Conference on Communication, Information and Internet Policy, August 31, 2006. Print. 32.

⁶⁰ Singer, Hal J. “Net Neutrality: A Radical Form of Non-Discrimination.” *Regulation: The CATO Review of Business and Government* 30.2 (June 17, 2007): 36-41. Print. 41.

⁶¹ Owen, *The Net Neutrality Debate*, 11.

examining Comcast's BitTorrent packet discrimination. A ruling that Comcast could continue this packet discrimination would be a serious setback for the preservation of network neutrality and would set a precedent that would likely lead other ISPs to engage in similar practices, without the threat of federal intervention. By contrast, a ruling against Comcast could set a strong precedent for the role of the FCC, policing the network to ensure the continued respect of network neutrality. The following section analyzes the FCC's ruling, and details the some potential implications of its decision.

Lessons from the FCC-Comcast Ruling—A Way Forward?

On August 20, 2008, by a 3-2 vote along party lines, with Republican Chairman Kevin Martin acting as the swing vote, the Federal Communications Commission ordered Comcast to stop throttling peer-to-peer traffic.⁶² The Commission concluded that Comcast's "discriminatory and arbitrary practice [of throttling BitTorrent packets] unduly squelches the dynamic benefits of an open and accessible Internet and does not constitute reasonable network management."⁶³ The Commission ordered Comcast to disclose its network management practices within 30 days, end its packet discrimination by the end of the year, and detail the new management practices it promises to follow. This section analyzes the FCC Ruling and its connections to the philosophical arguments surrounding Internet innovation, as well as the precedent the ruling sets for future network neutrality cases.

Outlining the FCC Ruling

Like many of the scholars cited in the network neutrality section of this paper, the FCC ruling expresses particular concerns over what packet discrimination might mean for Internet competition. In particular, the FCC ruling noted that BitTorrent video distribution "poses a particular competitive threat to Comcast's video-on-demand ('VOD') Service,"⁶⁴ so Comcast has competitive incentives to throttle its traffic. Further, the Commission found that Comcast's packet discrimination constitutes a violation of their *Internet Policy Statement*—and that their practices are "not 'minimally intrusive' but invasive and outright discriminatory."⁶⁵

In arguing against network neutrality principles, Singer says that "in laymen's terms, network neutrality is about the politics of envy: if a website cannot afford certain bells and whistles, then its rivals should not be allowed to acquire such enhancements."⁶⁶ By contrast, the Commission asserts that "in laymen's terms, Comcast opens its customers' mail (BitTorrent packets) because it wants to deliver mail not based on the

⁶² David Kravets, "Comcast Ordered to Allow Free Flow of File Sharing Traffic." Wired Magazine's "Threat Level" Blog. August 1, 2008. Web. <<http://blog.wired.com/27bstroke6/2008/08/fcc-declares-co.html>>.

⁶³ FCC Ruling 08-183, 2008. 1.

⁶⁴ *Ibid.*, 3.

⁶⁵ *Ibid.*, 24.

⁶⁶ Singer, "Net Neutrality: A Radical Form of Non-Discrimination," 41.

address or type of stamp on the envelope but on the type of letter contained therein.”⁶⁷ The numerous experts who submitted testimony to the FCC, who argued that the practices Comcast employed “are ill-tailored to the company’s professed goal of combating network congestion”⁶⁸, contradicted Comcast’s assertions that its BitTorrent packet discrimination is necessary. It is incredibly important to examine just how the FCC chose to evaluate the Comcast case—not through the establishment of permanent principles but instead through a choice to “adjudicate disputes regarding federal Internet policy on a case-by-case basis.”⁶⁹

The Case-By-Case Precedent

The FCC gave three specific reasons for ruling on a case-by-case basis, noting that the Commission “has often relied on adjudications rather than rulemakings to enunciate and enforce new federal policy[.]”⁷⁰

First, the Commission defends a case-by-case ruling because it argues that the fact that the Internet is in its early stages means the FCC hopes to provide some guidance to consumers and the industry “without unduly tying our hands should the known facts change.” Second, the FCC asserts that because Internet networks are so complex, they are not confident that a “one-size-fits-all approach is good policy.” Finally, the FCC argues that the restraint a case-by-case approach brings best complement’s the Commission’s recognition that “broadband services should exist in a minimal regulatory environment that promotes investment and innovation in a competitive market.”⁷¹

The FCC’s arguments presented here tell us two important things about how they view the network neutrality debate. First, that the Commission cares about the preservation of the end-to-end principle, the architectural design that ensures the “open character and efficient operation of the Internet,”⁷² and so rejects the idea of an absence of any regulation. At the same time, the FCC shows a similar reluctance to engage in any strict, permanent establishment of neutrality regulation, perhaps recognizing that “a full set of network neutrality rules is nearly impossible to design.”⁷³ In adjudicating case-by-case, the FCC continues to look to its *Internet Policy Statement* as a temporary, general set of anti-discrimination rules. To Felten, such a policy is ideal. He argues that “if it is possible to maintain the threat of regulation while leaving the issue unresolved, time will teach us more about what regulation, if any, is needed.”⁷⁴

The Comcast Appeal, and a Potentially Nebulous Future

On September 4, 2008, just two weeks after the FCC released its full ruling, Comcast filed an appeal with the U.S. Court of Appeals for the District of Columbia

⁶⁷ FCC Ruling 08-183, 2008. 24.

⁶⁸ *Ibid.*, 31.

⁶⁹ *Ibid.*, 18.

⁷⁰ *Ibid.*, 18.

⁷¹ *Ibid.*, 19.

⁷² *Ibid.*, 31.

⁷³ Bauer, "Dynamic Effects of Network Neutrality," 545.

⁷⁴ Felten, *Nuts and Bolts of Network Neutrality*, 10.

Circuit, arguing that the FCC overstepped its jurisdiction in rejecting how an ISP chooses to prioritize packets on its network.⁷⁵ In filing its appeal, Comcast maintained that it did not throttle traffic—but two weeks later, on September 19, 2008, Comcast complied with the first part of the FCC’s original ruling and detailed to the FCC how its network throttled and targeted BitTorrent traffic. Still, Comcast asserts that it never inspects the contents of a particular packet—only which application a packet originated from.⁷⁶ Lessig, in a letter penned to the FCC following its Comcast ruling, argues that the very fact that the FCC “has identified statements made by Comcast that were, at a minimum, not true, raises significant questions about Comcast’s behavior...[Comcast] has an ethical obligation to deal truthfully with the regulator charged primarily with protecting that infrastructure from harmful behavior.”⁷⁷

Even though this ruling protected network neutrality, the FCC’s declining to commit to a set outline of network neutrality regulation policies means network neutrality is protected only in this instance. Without a guarantee that neutrality will be protected for future case-by-case examinations of ISP regulatory policies, the long-term future of network neutrality, at least given the context of this FCC ruling, is not entirely clear. Nevertheless, as this paper’s conclusion suggests, the political climate of the 2008 elections, and most notably the election of Barack Obama on November 4, 2008, bodes well for a more firmly established FCC commitment to the principles of network neutrality.

Concluding Thoughts – President Obama’s Network Vision

Any credible assessment of the future of network neutrality requires an examination of where it has been. To that end, in this paper I examined both the technical underpinnings of network neutrality, as well as its history seen through two major ideas of Internet innovation—the end-to-end principle and the evolutionary model. In addition, my analysis of the FCC-Comcast decision did not seek to simply jump into which regulations the FCC chose to propose; instead, it analyzed the work of many Internet scholars across the network neutrality spectrum, in order to lay out which three regulatory principles the FCC *could* have chosen.

That the FCC’s ruling did not ultimately answer network neutrality’s future in the United States does not mean the issue will forever hang in limbo. During the course of his Presidential campaign, Barack Obama proposed using the Internet to increase government transparency and promised to preserve network neutrality. Speaking at

⁷⁵ David Kravets, "Comcast Appeals FCC Throttling Order." Wired Magazine's "Threat Level" Blog. September 4, 2008. Web.
<<http://blog.wired.com/27bstroke6/2008/09/comcast-appeali.html>>.

⁷⁶ David Kravets, "Comcast Discloses Throttling Practices - Bittorrent Targeted." Wired Magazine's "Threat Level" Blog. September 19, 2008. Web.
<<http://blog.wired.com/27bstroke6/2008/09/comcast-disclos.html>>.

⁷⁷ "Re: Broadband Industry Practices, WC Docket No. 07-52." Letter to Federal Communications Commission. Stanford, CA: Stanford Law School, August 20, 2008. Print. 5.

Google's campus in Mountain View, California in late 2007, Obama firmly stated that he would "take a backseat to no one in [his] commitment to network neutrality."⁷⁸ After his victory on November 4, 2008, his campaign's "Technology Agenda" turned up on the Obama-Biden transition team website. Among other goals, the agenda pledges to "support the principle of network neutrality to preserve the benefits of open competition on the Internet."⁷⁹

As for how this pledge will translate to the FCC, on November 14, 2008, Obama's transition team appointed two long-time network neutrality advocates, Susan Crawford and Kevin Werbach, to head his FCC Review team. Their roles will be to review the FCC and advise the President with all the information he needs regarding its decisions. A *Wired* magazine writer argues that "The choice of the duo strongly signals an entirely different approach to the incumbent-friendly telecom policymaking that's characterized most of the past eight-years at the FCC."⁸⁰ This, coupled with the fact that "every single major Democratic candidate [16 in all] running for a Senate seat in 2008 recognized it as a fundamentally important issue that underlies the future of ideas and the economy,"⁸¹ means network neutrality advocates have a right to feel optimistic about the current political climate.

A secondary part of this paper's research question seeks to answer the question of what network neutrality regulation *should* be in place. I think it is tempting to fall on the side of Felten, Bauer, and the other scholars who believe the wait-and-see approach is an ideal situation. At the same time, I find compelling Commissioner Michael J. Copps' concurrence in the FCC-Comcast decision, affirming that "a clearly stated commitment of non-discrimination would make clear that the Commission is not having a one-night stand with net neutrality, but an affair of the heart and a commitment for life."⁸² Copps supports case-by-case analysis based on a clear policy of reasonable network management. Copps' argues that "something so precious as this technology [the Internet] deserves" the commitment to network neutrality.⁸³ Lessig argues that the questions network neutrality raises are part of a "struggle about an ideal—about what rules should govern the freedom to innovate."⁸⁴

What Thurgood Marshall once said of the Constitution could just as easily be applied to the Internet: "We will see that the true miracle was not the birth of the

⁷⁸ Sarah Lai Stirland, "Obama Woos Silicon Valley." *Wired Magazine's "Threat Level" Blog*. November 14, 2007. Web. <<http://blog.wired.com/27bstroke6/2007/11/obama-unveils-s.html>>.

⁷⁹ "Technology Agenda." *Change.Gov: the Office of the President-Elect*. Web. <http://change.gov/agenda/technology_agenda/>.

⁸⁰ Sarah Lai Stirland, "Net Neutrality Advocates in Charge of Obama Team Review of FCC." *Wired Magazine's "Threat Level" Blog*. November 14, 2008. Web. <<http://blog.wired.com/27bstroke6/2008/11/net-neutrality.html>>.

⁸¹ Sarah Lai Stirland, "Net Neutrality Gains Traction in 2008 Senate Races." *Wired Magazine's "Threat Level" Blog*. July 24, 2008. Web. <<http://blog.wired.com/27bstroke6/2008/07/net-neutrality.html#previouspost>>.

⁸² FCC Ruling 08-183, 2008. 53.

⁸³ *Ibid.*, 53.

⁸⁴ Lessig and Wu, "Re: Ex Parte Submission in CS Docket No. 02-52," 11.

[Internet], but its life, a life nurtured through...our own making”⁸⁵ To that end, we have a responsibility to ensure we meet the Internet’s promise with policies that will help it continue to grow without hurting competition. In a speech promising to reverse most of the Bush Administration’s technology policies, Obama made his own argument for network neutrality:

“Once providers start to privilege some applications or web sites over others, then the smaller voices get squeezed out, and we all lose. The Internet is the most open network in history. We have to keep it that way.”⁸⁶

I choose to end my paper with Obama’s remarks because I feel they speak to the passion that lies at the core of the network neutrality debate, a debate over how best to nurture the Internet’s growth. President Obama’s stated commitment to network neutrality suggests that, at least for the time being, we will continue to keep the network “open,” watching ISPs closely to ensure that they allow consumers, not network operators, to determine the Internet’s future.

⁸⁵ Thurgood Marshall, Bicentennial Remarks at the Annual Seminar of the San Francisco Patent and Trademark Law Association. Maui, HI: May 6, 1987.

⁸⁶ Stirland, "Obama Woos Silicon Valley."

References

- Bauer, Johannes M. "Dynamic Effects of Network Neutrality." *International Journal of Communication* 1 (2007): 531-547. Print.
- Clark, David D., and Marjory S. Blumenthal. "Rethinking the Design of the Internet: the End to End Arguments Vs. the Brave New World." *Transactions on Internet Technology* 1.1 (August, 2001). Print.
- Economides, Nicholas. *'Net Neutrality', Non-Discrimination and Digital Distribution of Content Through the Internet*. New York, NY: New York University - Stern School of Business, NET Institute., March 1, 2007. Print.
- Ernesto. "Comcast Thrttoles Bittorrent Traffic, Seeding Impossible." *Torrentfreak*. August 17, 2007. Web. <<http://torrentfreak.com/comcast-throttles-bittorrent-traffic-seeding-impossible/>>.
- Faulhaber, Gerald R. "Net Neutrality: the Debate Evolves." *International Journal of Communication* 1 (May 6, 2007): 680-700. Print.
- Federal Communications Commission. *Internet Policy Statement*. Washington, D.C., September 23, 2005. Print.
- Felten, Edward W. *Nuts and Bolts of Network Neutrality*. Princeton University, July 6, 2006. Print. Center for Information Technology Policy, Department of Computer Science, and Woodrow Wilson School of Public and International Affairs, Princeton University.
- "Formal Complaint of Free Press and Public Knowledge Against Comcast Corporation for Secretly Degrading Peer-To-Peer Applications." *Free Press Complaint*. File No. EB-08-IH-1518. November 1, 2007. Print.
- Ganley, Paul, and Ben Allgrove. "Net Neutrality: A User's Guide." *Computer Law and Security Report*. 22.6: 454-465. Print.
- Gilroy, Angele A., Specialist in Telecommunications--Resources, Science and Industry Division. *Net Neutrality: Background and Issues*. Washington, D.C.: Congressional Research Service, September 16, 2008. Print.
- Kocsis, Viktória, and Paul W.J. de Bijl. "Network Neutrality and Competition Between Networks: a Brief Sketch of the Issues." *Intereconomics* 43.1 (January, 2008): 15-24. Print.
- Kravets, David. "Comcast Appeals FCC Throttling Order." *Wired Magazine's "Threat Level" Blog*. September 4, 2008. Web. <<http://blog.wired.com/27bstroke6/2008/09/comcast-appeali.html>>.

- . "Comcast Discloses Throttling Practices - Bittorrent Targeted." *Wired Magazine's "Threat Level" Blog*. September 19, 2008. Web.
<<http://blog.wired.com/27bstroke6/2008/09/comcast-disclos.html>>.
- . "Fears Swirl Over Whether FCC Will Enforce Comcast Throttling Decision." *Wired Magazine's "Threat Level" Blog*. September 5, 2008. Web.
<<http://blog.wired.com/27bstroke6/2008/09/fears-swirling.html>>.
- Lehr, William H., Sharon E. Gillet, Marvin A. Sirbu, and Jon M. Peha. *Scenarios for the Network Neutrality Arms Race*. 34th Research Conference on Communication, Information and Internet Policy, August 31, 2006. Print.
- Lessig, Lawrence. *Code 2.0*. 2 ed. New York, NY: Basic Books, 2006. Print.
- . *The Future of Ideas*. New York, NY: Random House, 2001. Print.
- Lessig, Lawrence, and Tim Wu. "Re: Ex Parte Submission in CS Docket No. 02-52." August 22, 2003. Print.
- Marcus, J. Scott. "Network Neutrality: the Roots of the Debate in the United States." *Intereconomics* 43.1 (January, 2008): 30-37. Print.
- Marshall, Thurgood. Remarks of Thurgood Marshall at the Annual Seminar of the San Francisco Patent and Trademark Law Association. Maui, HI: May 6, 1987.
<http://www.thurgoodmarshall.com/speeches/constitutional_speech.htm>
- Martin, Kevin J., Chairman. "Formal Complaint of Free Press and Public Knowledge Against Comcast Corporation for Secretly Degrading Peer-To-Peer Applications." *Federal Communications Commission Ruling*. August 20, 2008. Print.
- O'Connell, Patricia. "At SBC, It's All About "Scale and Scope"." *BusinessWeek* 7 Nov. 2005: Print.
- Owen, Bruce M. *The Net Neutrality Debate: Twenty-Five Years After United States V. AT&T and 120 Years After the Act to Regulate Commerc.* Stanford, CA: Stanford Institute for Economic Policy Research, February, 2007. Print.
- "Re: Broadband Industry Practices, WC Docket No. 07-52." *Letter to Federal Communications Commission*. Stanford, CA: Stanford Law School, August 20, 2008. Print.
- Singer, Hal J. "Net Neutrality: A Radical Form of Non-Discrimination." *Regulation: The CATO Review of Business and Government* 30.2 (June 17, 2007): 36-41. Print.
- Stirland, Sarah Lai. "Net Neutrality Advocates in Charge of Obama Team Review of FCC." *Wired Magazine's "Threat Level" Blog*. November 14, 2008. Web.

- <http://blog.wired.com/27bstroke6/2008/11/net-neutrality.html>>.
- . "Net Neutrality Gains Traction in 2008 Senate Races." *Wired Magazine's "Threat Level" Blog*. July 24, 2008. Web. <http://blog.wired.com/27bstroke6/2008/07/net-neutrality.html#previouspost>>.
- . "Obama Woos Silicon Valley." *Wired Magazine's "Threat Level" Blog*. November 14, 2007. Web. <http://blog.wired.com/27bstroke6/2007/11/obama-unveils-s.html>>.
- Svensson, Peter. "Comcast Blocks Some Internet Traffic, AP Testing Shows." *Associated Press*. 19 Oct. 2007. Print.
- "Technology Agenda." *Change.Gov: the Office of the President-Elect*. Web. http://change.gov/agenda/technology_agenda/>.
- Wu, Tim. "Network Neutrality, Broadband Discrimination." *Journal of Telecommunications and High Technology Law* 2 (June 5, 2003): 141-180. Print.
- Wu, Timothy, and Christopher S. Yoo. "Keeping the Internet Neutral? Tim Wu and Christopher Yoo Debate." *Federal Communications Law Journal* 59.3 (November 3, 2007). Print.