

# **THE NEVER-WAS-NEUTRAL NET AND WHY INFORMED END USERS CAN END THE NET NEUTRALITY DEBATES**

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*[M]essages received from any individual, company, or corporation, or from any telegraph lines connecting with this line at either of its termini, shall be impartially transmitted in the order of their reception, excepting that the dispatches of the government shall have priority . . .<sup>1</sup>*

—Pacific Telegraph Act of 1860

## I. INTRODUCTION

As each generation of the telecommunications market has reached critical mass, regulators have joined the debate and taken special note of network neutrality concerns. The internet service market has proven no different. Internet service providers and their customers have debated the concepts of net neutrality, tiered access, and limited “unlimited” services since the beginning of the era of dial-up bulletin board systems. However, the legal and regulatory communities joined this generation’s debate in earnest only after the Supreme Court’s decision in *National Cable & Telecommunications Ass’n v. Brand X Internet Services*<sup>2</sup> empowered the Federal Communications Commission (FCC) to create regulatory structures to

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1. Pacific Telegraph Act of 1860 § 3, 12 Stat. 41, 42. In other words: network neutrality (except when we decree otherwise). This Act represents quite possibly the first attempt to tamper with a telecommunications market under the rubric of neutrality.

2. 545 U.S. 967 (2005).

govern telephony, broadband internet services, and cable television as necessary.

Proponents of net neutrality regulation generally argue that internet access providers threaten the innovative, largely regulation-free internet, and that government action is necessary to prevent the destruction of the global network's benefits. Opponents tend to argue that regulations would ruin innovation, fail in practice, or be doomed in principle. While commentators have alternately argued for or against the nebulous "net neutrality" concept, the vast majority have done so from theoretical perspectives rather than technical ones. As a result, the debates have discussed nonexistent "end-to-end" network models,<sup>3</sup> discussed purely theoretical monopoly-controlled networks,<sup>4</sup> or made economic arguments about whether non-neutrality or government intervention causes the most "harm" to internet consumers.<sup>5</sup>

Relatively few treatments come from technical perspectives that explain the history of non-neutrality on the internet or the enduring power of end users and technological innovation. This Article does not attempt to answer every question or address every point in the net neutrality debate. Such an ambitious undertaking would require a series of books, not a journal article. Instead, this Article refocuses the net neutrality debate on end users rather than networks. By analyzing internet history, testing monopolist theories against real-world internet markets, and exploring important economic arguments, this Article attempts to illuminate the value of a uniform disclosure solution that protects network and content provider innovation yet leaves significant power in the hands of consumers.

Commentators on both sides of the net neutrality debate simultaneously raise valid points while misapplying or misconstruing other, more critical ones. On the side of ex post regulation, Professor Christopher Yoo's recent economic analysis<sup>6</sup> provides an excellent foundation for this Article. While this Article agrees with Professor Yoo's analysis that net neutrality requirements are increasingly irrelevant in a competitive, dy-

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3. See Lawrence Lessig, *The Architecture of Innovation*, 51 DUKE L.J. 1783, 1789 (2002) ("First articulated by network architects Jerome Saltzer, David Reed, and David Clark, [end-to-end] says to build the network so that intelligence rests in the ends . . . . The fundamental feature of this network design was neutrality among packets.")

4. See Barbara van Schewick, *Towards an Economic Framework for Network Neutrality Regulation*, 5 J. ON TELECOMM. & HIGH TECH. L. 329 (2007).

5. See Christopher S. Yoo, *Network Neutrality and the Economics of Congestion*, 94 GEO. L.J. 1847 (2006). Nearly all of these treatments take a uniformly U.S.-centric view of internet networks, an enforcement problem that is outside the scope of this discussion.

6. *Id.*

namic last mile provider market,<sup>7</sup> it also probes some of Yoo's misconceptions that lead him to a solution that differs only slightly from those on the side of proactive net neutrality regulation. On the side of preemptory regulation, Dr. Barbara van Schewick uses theoretical economic analysis that—by her own admission—does not reflect past or current internet access markets to justify regulatory intervention.<sup>8</sup> This Article will discuss why vertical foreclosure theory has failed in fact online, and introduce potential alternative explanations.

Legislators and administrative agencies have no way to predict future technologies or their impacts. Net neutrality legislation as envisioned by Professor Lawrence Lessig, Professor Tim Wu, Dr. van Schewick, and others ignores the history of consumer power, which suggests that it will continue to foster innovation and prevent access provider harms. Further, asking Congress or the FCC to regulate network architecture practices to prevent any "specific harm[s] to competition,"<sup>9</sup> as Professor Yoo advocates, or even enforcing antitrust law principles, as others have suggested,<sup>10</sup> may prove similarly futile. Regulatory approaches that aim to stifle particular practices or network architectures often make little technical sense and are unacceptably subject to political whims. Instead of adopting specific neutrality regulations—whether narrowly tailored to last mile networks or broadly viewed from the perspective of overall consumer welfare—this Article advocates a uniform disclosure regime. Categorized, detailed disclosures would enable the market to choose technologies and business models dynamically, yet still provide regulators with a potential enforcement mechanism.

This Article proceeds in eight parts. Part II provides a brief overview of the current net neutrality debate. It highlights both the muddled definition of the term and the positions of the three specific commentators whose positions this Article discusses. Part III describes historical and technological non-neutrality on the internet, and the history of past neutrality and tiered access debates. Part IV describes the evolution of advanced non-neutral service differentiation tools used to operate last mile

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7. *Id.* at 1854.

8. van Schewick, *supra* note 4, at 345 (under the heading "Application to the Internet," discussing "the hypothetical [monopolist-controlled] network that is the focus of this analysis" rather than the internet); *see also infra* note 181 (detailing van Schewick's use of theoretical markets, rather than internet markets, to test monopoly theories).

9. Yoo, *supra* note 5, at 1855.

10. *See, e.g.*, Alfred E. Kahn, *Telecommunications: The Transition from Regulation to Antitrust*, 5 J. ON TELECOMM. & HIGH TECH. L. 159 (2006) (advocating deregulation and antitrust oversight of the internet service provider market).

and backbone networks, as well as the non-neutrality of current content providers. Part V discusses the modern internet market's responses to access provider behavior and the failure of vertical foreclosure theory as a regulatory justification. Part VI discusses how commentators often overestimate congestion and transaction costs, leading to solutions premised on theoretical markets rather than the real-world internet. Part VII details both the impact of consumers on internet access and content markets and the inherent enforcement difficulties in preemptive or ex post neutrality regulation. This Part illustrates why consumer-focused, consumer-led policies provide an effective third option for regulators. Part VIII outlines a uniform disclosure approach that encourages—rather than discourages—innovation, and helps to protect consumers by mitigating the problem of imperfect information that sits at the core of net neutrality proponents' concerns.

## II. THE HISTORY OF NETWORK NEUTRALITY AND RELATED DEBATES

The broad concept of net neutrality covers a range of issues over a longer period than most commentators recognize.<sup>11</sup> While the FCC may have only joined the debate in recent years,<sup>12</sup> the internet community, its standards bodies, and market participants have discussed and debated these issues for over two decades. Decisions made before regulators took notice affect today's debate in many ways. Standards bodies built non-neutrality into networking protocols long before the commercialization of the internet. Discussions about acceptable use, user restrictions, tiered access plans, and pay-by-usage are at least as old as the pre-internet bulletin board systems that flourished during the 1980s and early 1990s.<sup>13</sup> By the

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11. Professor Yoo, for example, traces the beginnings of serious debate over net neutrality to February 2002, when the FCC first issued a ruling about the classification of DSL services. Yoo, *supra* note 5, at 1855-56. See also, e.g., Tim Wu, Network Neutrality FAQ, [http://www.timwu.org/network\\_neutrality.html](http://www.timwu.org/network_neutrality.html) ("The Net Neutrality debate grew out of the concerns in the late 1990s about possible threats to the end-to-end nature of the internet."). The debates over net neutrality started in earnest long before that, as this Part explains.

12. See Inquiry Concerning High-Speed Access to the Internet Over Cable and Other Facilities, 17 F.C.C.R. 4798 (2002), *aff'd sub nom.* Nat'l Cable & Telecomm. Ass'n v. Brand X Internet Servs., 545 U.S. 967 (2005).

13. E.g., Posting of Matt Hucke, hucke@ux1.cso.uiuc.edu, to alt.bbs (Sept. 4, 1992, 19:40:11 GMT), available at [http://groups.google.com/group/alt.bbs/browse\\_thread/thread/aaf8a0aabeb73093/ec6c2c8f42b391f0](http://groups.google.com/group/alt.bbs/browse_thread/thread/aaf8a0aabeb73093/ec6c2c8f42b391f0) (advising new BBS owners on when and how to place restrictions on users); see also Posting of Mark Neeley, mneeley@nyx.cs.du.edu, to alt.flame (Nov. 13, 1992 14:56:27 GMT), available at <http://groups.google.com>.

mid-1990s, the burgeoning internet service provider industry had largely replaced the offline BBS as the focal point of neutrality and content filtering debates. As this Article explains, the internet community's successful—and regulation-free—resolution of these difficult neutrality issues not only requires reframing today's discussions about network neutrality, but also provides important lessons for legislators and regulators considering new regulatory regimes.

#### A. Net Neutrality: “Defined!” or “Defined?”

In the internet and telecommunications industries, even casual observers of policy debates will recognize the term “net neutrality.” The literal definition appears in Section 202 of the Communications Act of 1934.<sup>14</sup> Providers of traditional telecommunications services in the United States may not “make any unjust or unreasonable discrimination in charges, practices, classifications, regulations, facilities, or services . . . or . . . make or give any undue or unreasonable preference to any particular person, class of persons, or locality . . .”<sup>15</sup> As with any issue of statutory interpretation, what constitutes “unjust” or “unreasonable” discrimination is the subject of considerable debate.

On one end of the definitional spectrum, Google considers net neutrality as “the principle that Internet users should be in control of what content they view and what applications they use on the Internet.”<sup>16</sup> On the other end, representatives of telecommunications companies and others support non-neutrality as a way of realizing profits and providing better services to consumers.<sup>17</sup> Landing somewhere in the middle, World Wide Web inventor Tim Berners-Lee agrees, but only in part: “If I pay to connect to the Net with a certain quality of service, and you pay to connect with that or greater quality of service, then we can communicate at that [minimum] level.”<sup>18</sup> While Berners-Lee believes that net neutrality historically ex-

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com/group/alt.flame/browse\_thread/thread/5bf4339af24ab034/5ebe660cd43746e4 (discussing the history of the Denver-based Nyx BBS); Postings of W.D. Rolph, a722756@pan.mc.ti.com, to alt.bbs.internet (Jan. 15-16, 1992), available at [http://groups.google.com/group/alt.bbs.internet/browse\\_thread/thread/c6d22b669f9614/03d27f45094048e9](http://groups.google.com/group/alt.bbs.internet/browse_thread/thread/c6d22b669f9614/03d27f45094048e9) (a Usenet newsgroup thread discussing commercial restrictions on the NSFnet versus the lack of restriction on The World, a popular BBS at the time).

14. 42 U.S.C. § 202 (2000).

15. *Id.* § 202(a).

16. Google, Net Neutrality, <http://www.google.com/help/netneutrality.html> (last visited Oct. 14, 2007).

17. See *infra* note 21.

18. Posting of Tim Berners-Lee to Decentralized Information Group (DIG) Breadcrumbs, <http://dig.csail.mit.edu/breadcrumbs/node/144> (June 21, 2006, 16:35 EST).

isted, he also explains, “Net Neutrality is NOT saying that one shouldn’t pay more money for high quality of service. We always have, and we always will.”<sup>19</sup>

Agency employees, company executives, and legislators take positions that land at various points along the spectrum. The FCC’s former chief technologist, David Farber, recently explained his opposition to neutrality, dismissing recent debate as attempting to combine multiple initiatives “under the banner of ‘network neutrality.’”<sup>20</sup> Verizon Communications’ Senior Vice President and Deputy General Counsel, John Thorne, told a recent conference discussing the 1996 Telecommunications Act that neutrality initiatives were simply utopianism, a way for content providers like Google to extend their “free lunch.”<sup>21</sup> Hinting at pending net neutrality legislation, Thorne argued access providers could only “attract the truly huge amounts of capital needed to build out [Internet] networks [by striking] down governmental entry barriers and allow[ing] providers to realize profits.”<sup>22</sup> Senator Jim DeMint (R-S.C.) boiled down the definition of net neutrality “to the government telling network owners that they can’t provide higher speed or more capacity for Internet sites or services that have different needs to serve their consumers.”<sup>23</sup>

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19. *Id.*

20. David Farber & Michael Katz, *Hold Off On Net Neutrality*, WASH. POST., Jan. 19, 2007, at A19.

21. Arshad Mohammed, *Verizon Executive Calls for End to Google’s Free Lunch*, WASH. POST., Feb. 7, 2006, at D01.

22. *Id.*

23. Jim DeMint, *Perspective: Why Net Neutrality Means More Federal Regulation*, CNET NEWS.COM, Jun. 27, 2006, [http://www.news.com/Why-Net-neutrality-means-more-federal-regulation/2010-1028\\_3-6088253.html](http://www.news.com/Why-Net-neutrality-means-more-federal-regulation/2010-1028_3-6088253.html). In the same article, DeMint captured the essence of the net neutrality definitional debate:

This term has become a nebulous catchall for a number of competing public policy issues. To illustrate the current level of confusion: Neither the House Energy and Commerce Committee nor the Senate Commerce Committee could arrive at a conclusion of what Net neutrality really means. Senator Ted Stevens, R-Ark., rightly expressed his frustration that defining it was like “defining a vacuum.” *Id.*

## B. Commentator Positions on Net Neutrality<sup>24</sup>

In recent years, legal commentators have debated the precise definition of net neutrality and the existence and danger of monopolistic actors in internet-related markets. Like others, net neutrality proponents have had considerable difficulty defining the concept or its enforcement. Proponents of net neutrality generally fear that monopolistic internet access providers will monopolize the “last mile” connections to end users, limiting their access to content.<sup>25</sup> Others worry that successful monopolists will also favor their own vertical services by excluding or disfavoring other content providers.<sup>26</sup> Net neutrality is their answer to these threats.

Professor Lawrence Lessig, whose work has tended to focus on the first fear, argues for regulation of a purported monopoly/duopoly in broadband internet access.<sup>27</sup> However, his position on what net neutrality entails and how to regulate it has shifted considerably. Originally concerned about proprietary technology on internet networks, Lessig has moderated his position somewhat in recent years.<sup>28</sup> Under this softer stance, if access providers respected what Lessig called “Internet values,” they could “add whatever technology they like[d] to the basic suite of Internet protocols.”<sup>29</sup> Lessig testified before Congress arguing against “access tiering” by broadband providers<sup>30</sup> while advocating a policy that would allow those providers to offer “consumer-tiered” services, such as bandwidth guarantees. Under this proposal, Lessig recommended that Congress add regulations that would “require network providers to pro-

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24. This subsection briefly synthesizes the major positions of commentators whose work this Article addresses. The summaries herein contain citations to key articles and public statements by each commentator. Readers unfamiliar with each commentator’s positions should refer to the cited material for additional background, rather than relying solely on the summaries here. Subsequent sections will address specific points by each commentator in detail.

25. See *infra* note 27.

26. See generally van Schewick, *supra* note 4.

27. See generally *Net Neutrality: Hearing Before the S. Comm. on Commerce, Science & Transportation*, 109th Cong. 2 (2006) (testimony of Prof. Lawrence Lessig) [hereinafter Lessig Testimony], available at <http://commerce.senate.gov/pdf/lessig-020706.pdf>; Lessig, *supra* note 3; Lawrence Lessig & Mark Lemley, *The End of End-to-End: Preserving the Architecture of the Internet in the Broadband Era*, 48 U.C.L.A. L. REV. 925 (2001).

28. See Lawrence Lessig, *Coase’s First Question*, 27 REGULATION 38, 39 (2004).

29. *Id.*

30. Lessig Testimony, *supra* note 27, at 2-7. See also *infra* note 66 and Section III.B for further discussion of tiered internet access services.

vide [an FCC-defined] ‘basic Internet service’ to all broadband customers.”<sup>31</sup>

Lessig has suggested that “net neutrality” would not constitute “a massive programme of regulation,” but would instead be “a very thin rule for broadband providers that forbids business models that favour scarcity over abundance.”<sup>32</sup> Taking a view of historical *neutrality* on the internet, Lessig now sees “profound implications for the future of growth and innovation” in the practices of cable and DSL providers.<sup>33</sup> With “DSL and cable . . . free of any real obligation to protect the original neutrality of the Internet,”<sup>34</sup> and “[n]o more competition”<sup>35</sup> in broadband, Lessig sees regulation of a cable/DSL monopoly to prevent discrimination as the only way to “protect the promise of the Internet”<sup>36</sup> and ensure continued application competition and innovation.<sup>37</sup>

Dr. van Schewick defines net neutrality as regulations that “forbid network operators to discriminate against third-party applications, content, or portals (‘independent applications’) and to exclude them from their network.”<sup>38</sup> Her focus turns to economic justifications for regulation and the second fear of vertical foreclosure. She fears that without a net neutrality mandate, access providers will likely discriminate against content.<sup>39</sup> Her economic analysis attempts to complement the arguments advanced by commentators like Professor Lessig.

Unlike Lessig, van Schewick does not attempt to address the entire range of topics in the net neutrality debate. She notes that her definition of “net neutrality” is narrower than that of other commentators, encompassing only “markets for applications, content, and portals,” rather than “interconnection, nondiscrimination, rate regulation and the adoption of standardized protocol interfaces such as TCP/IP.”<sup>40</sup> She recognizes that her

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31. Lessig Testimony, *supra* note 27, at 5.

32. Lawrence Lessig, *Congress Must Keep Broadband Competition Alive*, FINANCIAL TIMES (LONDON), Oct. 19, 2006, at 17.

33. Lessig & Lemley, *supra* note 27, at 925.

34. Lessig 2.0, [http://lessig.org/blog/2006/10/21st\\_century\\_reaganomics\\_helpi.html](http://lessig.org/blog/2006/10/21st_century_reaganomics_helpi.html) (Oct. 23, 2006, 0:44 PST).

35. Lessig 2.0, [http://lessig.org/blog/2007/10/things\\_i\\_didnt\\_have\\_time\\_to\\_do\\_1.html](http://lessig.org/blog/2007/10/things_i_didnt_have_time_to_do_1.html) (Oct. 3, 2007, 18:00 PST).

36. Lessig 2.0, [http://lessig.org/blog/2007/08/jamming\\_the\\_pearl.html](http://lessig.org/blog/2007/08/jamming_the_pearl.html) (Aug. 10, 2007, 10:50 PST).

37. See generally Lessig Testimony, *supra* note 27.

38. van Schewick, *supra* note 4, at 333.

39. E.g., *id.* at 329.

40. *Id.* at 333-34.

analysis leaves many open questions in the debate, but acknowledges different goals.<sup>41</sup>

Van Schewick attempts to show why the “one monopoly rent” argument against discrimination might fail in the context of broadband internet services.<sup>42</sup> If internet access providers could extract additional monopoly rents in secondary markets, the traditionally absent incentive to discriminate against services in secondary markets would appear.<sup>43</sup> By applying economic theory to the broadband access market, she hopes to provide policymakers with a “framework within which calls for network neutrality regulation can be analyzed.”<sup>44</sup>

On the opposite side of the debate, Professor Christopher Yoo has argued against net neutrality regulation in favor of his concept of network diversity.<sup>45</sup> Like van Schewick, Yoo relies primarily on a sophisticated economic analysis.<sup>46</sup> His opposition to net neutrality draws from economic theory involving congestion, club goods, public goods, and other economic subdisciplines. Yoo focuses on the negative externalities of congestion generated by users. By looking at broader network considerations than end-user access policy, he finds that “the key regulatory question is whether the restrictions criticized by network neutrality proponents are so pernicious and unjustifiable that experimentation should not be permitted.”<sup>47</sup> By focusing on congestion<sup>48</sup> and the transaction costs<sup>49</sup> associated with metering usage, Yoo concludes “that deviations from network neutrality might well enhance economic welfare” rather than reduce it as Lessig, van Schewick, and other net neutrality proponents surmise. Yoo also quibbles with the definition of net neutrality, finding the current debate framed too narrowly.<sup>50</sup>

As the vast range of definitions and scopes of debate suggest, net neutrality is less a definable term than one view of how things ought to be on

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41. *E.g.*, *id.* at 333 n.9, 390.

42. *E.g.*, *id.* at 378-82.

43. *Id.* at 340-68.

44. *Id.* at 390.

45. See generally Yoo, *supra* note 5; Christopher S. Yoo, *Beyond Network Neutrality*, 19 HARV. J.L. & TECH. 1 (2005); Christopher S. Yoo, *Would Mandating Network Neutrality Help or Hurt Broadband Competition?: A Comment on the End-to-End Debate*, 3 J. ON TELECOMM. & HIGH TECH. L. 23 (2004).

46. See generally sources cited *supra* note 45.

47. Yoo, *supra* note 5, at 1852.

48. *Id.* (“The key to understanding why [non-neutrality might enhance economic welfare] is recognizing the fact that the Internet is subject to congestion.”).

49. *Id.* at 1864-65.

50. *Id.* at 1851.

the internet—though not necessarily how they are or ever were. Historical and technical confusion have confounded the net neutrality debate, rendered the analyses of commentators such as Lessig, van Schewick, and Yoo suspect, and have obscured an important consumer-focused solution. To understand why disclosure—rather than draconian regulation, ex post enforcement, or entirely laissez-faire approaches—represents the most sensible step, this Article explores the balance between fair outcomes for consumers and protection of technical innovation in the internet access and content markets. An understanding of history helps cut through the confusion of high economic theory.

### III. HISTORICAL NON-NEUTRALITY ON THE INTERNET

The fight to keep the internet unregulated began in earnest in the mid-1990s as the nascent commercial internet took hold. In 1996, John Perry Barlow published his “Declaration of the Independence of Cyberspace.”<sup>51</sup> Barlow argued that the internet was an empty space that should be free of government regulation. Barlow’s declaration was one of the first to extend Saltzer, Reed, and Clark’s mid-1980s arguments for “dumb” communications networks to regulatory neutrality on the internet.<sup>52</sup> Barlow directed his comments at government regulation, but also described his ideal internet as a neutral commune that hoped to create solutions by the Golden Rule and eschew prejudice caused by, among other sources, “economic power.”<sup>53</sup> Saltzer, Reed, and Clark reasoned that networks’ primary function was to pass raw data from source to destination without inquiring as to that data’s actual content.<sup>54</sup> In a “dumb” network, only the servers and workstations at the edges (ends) of the network perform intelligent functions.

Unfortunately, a free, deregulated internet and a dumb internet backbone network did not exist even in 1984 when Saltzer, Reed, and Clark weighed the concepts. The debates about Department of Commerce con-

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51. JOHN PERRY BARLOW, A DECLARATION OF THE INDEPENDENCE OF CYBERSPACE, <http://homes.eff.org/~barlow/Declaration-Final.html> (1996) (“[Y]ou weary giants of flesh and steel . . . you have no sovereignty where we gather.”).

52. *Id.* (describing the internet as “a world that all may enter without privilege or prejudice”).

53. *Id.*

54. Jerome H. Saltzer et al., *End-to-End Arguments in System Design*, 2 ACM TRANSACTIONS IN COMPUTER SYS. 277 (1984), available at [http://portal.acm.org/ft\\_gateway.cfm?id=357402&type=pdf](http://portal.acm.org/ft_gateway.cfm?id=357402&type=pdf). See also Lessig, *supra* note 3 (summarizing the end-to-end theory).

trol and influence first over InterNIC<sup>55</sup> and later ICANN,<sup>56</sup> FCC debates about common carrier requirements for DSL services, and network neutrality itself illustrate that the internet has faced the same regulatory pressures as any other telecommunications service.

Although commentators have invoked Saltzer's paper to argue that the internet is neutral,<sup>57</sup> the specification for the internet's communications protocol, TCP/IP, was never dumb or neutral. IP packets, the data "envelopes" that carry pieces of actual content, reserve space in those "envelopes" that helps to identify how network devices should process those packets.<sup>58</sup> Prepared for a Defense Advanced Research Project Agency (DARPA) project, the original TCP/IP standards "treat[ed] high precedence traffic as more important than other traffic" and defined informational flags for prioritization of packets traveling on TCP/IP networks.<sup>59</sup> The standards document outlined the process for automatically enforcing one of several separately defined policies including minimizing delays in

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55. See, e.g., *Internet Domain Names, Part I: Hearing Before the Subcomm. on Basic Research of the H. Comm. on Science*, 105th Cong. (1997) (considering domain name system reform). InterNIC, the Internet Network Information Center, was the private organization primarily responsible for domain name and IP address allocations until September 18, 1998 when this role was assumed by ICANN (Internet Corporation for Assigned Names and Numbers). ICANN is a non-profit corporation created on September 18, 1998 to oversee domain name assignments and IP addressing, among other tasks delegated to it, under an agreement with the Department of Commerce.

56. See, e.g., *Internet Domain Names and Intellectual Property Rights Hearing Before the Subcomm. on Courts and Intellectual Property of the H. Comm. on the Judiciary*, 106th Cong. 50 (1999) (testimony of Andrew J. Pincus, General Counsel, Department of Commerce) (stating that the Department of Commerce's goal for cession of power to ICANN was to create a private body that "would operate according to the policy principles that the United States Government felt were important."); Joe Wilcox, House Subcommittee Gives NSI a Grilling, CNET NEWS.COM, Jul. 22, 1999, [http://news.com.com/House+subcommittee+gives+NSI+a+grilling/2100-1023\\_3-228906.html](http://news.com.com/House+subcommittee+gives+NSI+a+grilling/2100-1023_3-228906.html).

57. Neutrality proponents often recite this false "dumb network" or "historical neutrality" maxim. For example, Professor Tim Wu claimed that "[t]he existing design of the Internet is neutral" in justifying his pro-neutrality stance. Tim Wu, *The Broadband Debate: A User's Guide*, 3 J. ON TELECOMM. & HIGH TECH. L. 69, 91 (2004).

58. To extend the analogy, if a complete data packet is an envelope, the reserved space (packet header) is the addressee's delivery information written on the outside. The actual payload of data is the letter sealed inside the envelope.

59. INFO. SCIS. INST., UNIV. S. CAL., RFC 791: INTERNET PROTOCOL DARPA INTERNET PROGRAM PROTOCOL SPECIFICATION 11 (Jon Postel ed., 1981), available at <http://www.ietf.org/rfc/rfc791.txt>. An RFC is a best practices document developed as part of the standards-making process of the IETF. See IETF, ION: The IETF Process: An Informal Guide, <http://www.ietf.org/IESG/content/ions/ion-procdocs.html> (last visited Oct. 28, 2007). For an overview of the IETF and its role in defining standards, see IETF, Overview of the IETF, <http://www.ietf.org/overview.html> (last visited Oct. 28, 2007).

transmission, maximizing throughput, and maximizing reliability.<sup>60</sup> Expanded by subsequent Internet Engineering Task Force (IETF) standards documents,<sup>61</sup> the “smart” traffic filtering and prioritization system pre-dated Saltzer’s “dumb” design suggestion by several years. The Internet Assigned Numbers Authority (IANA), the body that administers common numeric value standards, still describes the standard Type of Service values as ways to enforce different standards for different types of content. IANA suggests, “[g]enerally, protocols which are involved in direct interaction with a human should select low delay, while data transfers which may involve large blocks of data . . . need high throughput. Finally, high reliability is most important for datagram-based internet management functions.”<sup>62</sup>

The 1990s also saw the first major carrier and consumer skirmishes over net neutrality issues. The battles tread familiar ground: disputes over equal access<sup>63</sup> and arbitrary consumer content restrictions. With the continued rapid growth of the number of internet-connected networks, major providers started to balk at passing traffic for smaller providers and carriers. In the major content battle of the time, providers often restricted access to the bandwidth-hogging “alt.binaries” Usenet newsgroups or refused to carry those groups altogether.<sup>64</sup>

#### A. The Genesis of Net Neutrality Debates

A short technical and history lesson will help explain the debate over access to the major backbone provider networks, and the birth of tiered access.<sup>65</sup> Many prominent commentators, such as Professor Lessig,<sup>66</sup> se-

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60. Internet Assigned Numbers Authority (IANA), IP Option Numbers, <http://www.iana.org/assignments/ip-parameters> (last visited Oct. 28, 2007).

61. STEVEN BLAKE ET AL., IETF NETWORK WORKING GROUP, REQUEST FOR COMMENTS 2475: AN ARCHITECTURE FOR DIFFERENTIATED SERVICES (1998) [hereinafter RFC 2475], available at <http://www.ietf.org/rfc/rfc2475.txt>; KATHLEEN NICHOLS ET AL., IETF NETWORK WORKING GROUP, REQUEST FOR COMMENTS 2474: DEFINITION OF THE DIFFERENTIATED SERVICES FIELD (DS FIELD) IN THE IPV4 AND IPV6 HEADERS (1998), available at <http://www.ietf.org/rfc/rfc2474.txt>.

62. IANA, *supra* note 60.

63. See *infra* Section III.B.

64. E.g., Banned Newsgroups, CNN, Dec. 29, 1995, [http://www.cnn.com/TECH/9512/compuserve/pm/banned\\_list.html](http://www.cnn.com/TECH/9512/compuserve/pm/banned_list.html) (listing Usenet newsgroups censored by CompuServe, a leading national internet provider).

65. This summary omits certain technical details and vastly simplifies others. A detailed technical explanation of Classless Inter-Domain Routing (CIDR) and its impact on IP address allocations and routing table growth would not be possible here. Since the early 1990s, noted internet networking engineer Hank Nussbacher has maintained a detailed explanation of CIDR, and the discussion in this section draws from that document.

lectively choose which “tiers” of access to discuss, while ignoring others. Broadly defined, “tiered access” refers to discrimination by a provider based on *any* criteria, including the price paid, the speed of the service requested, the geographical location of the service, or the nature of the traffic transmitted and received. Interpretations that ignore some tiers of discrimination in order to emphasize others make little sense given the non-neutrality built into the internet’s underlying technological structure.

Every device connected to the internet must have an associated IP address to communicate with other networks, servers, and devices.<sup>67</sup> In the days before widespread use of firewalls helped to conserve the limited IP address space available, every connected device needed one of roughly 4 billion addresses. IANA and its sister regional registries originally allocated addresses to providers, universities, and even individuals in large, contiguous blocks. Before the IETF developed new standards for address allocation,<sup>68</sup> IANA and its regional authorities could only allocate addresses along “classful” IP address boundaries: Class A (approximately 17 million addresses), Class B (65,536 addresses), or Class C (256 addresses). For many providers, Class C allocations were insufficient, but Class B allocations were far too large. The IETF resolved this inefficiency by creating a system of classless IP subnetworks that created allocations not just along the traditional boundaries of Class A, B, and C, but of virtu-

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Interall, CIDR FAQ Version 7.2 (Hank Nussbacher ed., 2007), <http://www.interall.co.il/cidr.html> (last visited Dec 24, 2007).

66. See, e.g., Lessig Testimony, *supra* note 27. Professor Lessig prefers the term “access tiering,” but the term has essentially the same meaning as the less awkwardly phrased “tiered access.” This Article refers to tiered access, except in direct quotations by other commentators that prefer Professor Lessig’s term.

67. Non-technical users can conceptualize an IP address as the digital “postal address” that enables other online devices to contact you, much in the way that the postal mail system delivers items to your physical address.

68. NETWORK WORKING GROUP, INTERNET ENG’G TASK FORCE, REQUEST FOR COMMENTS 1517: APPLICABILITY STATEMENT FOR THE IMPLEMENTATION OF CLASSLESS INTER-DOMAIN ROUTING (CIDR) (Robert M. Hinden ed., 1993), *available at* <http://www.ietf.org/rfc/rfc1517.txt>; IETF NETWORK WORKING GROUP, RFC 1518: AN ARCHITECTURE FOR IP ADDRESS ALLOCATION WITH CIDR (Yakov Rekhter & Tony Li eds., 1993), *available at* <http://www.ietf.org/rfc/rfc1518.txt>; VINCE FULLER ET AL., IETF NETWORK WORKING GROUP, REQUEST FOR COMMENTS 1519: CLASSLESS INTER-DOMAIN ROUTING (CIDR): AN ADDRESS ASSIGNMENT AND AGGREGATION STRATEGY (1993), *available at* <http://www.ietf.org/rfc/rfc1519.txt>; YAKOV REKHTER & CLAUDIO TOPOLCIC, IETF NETWORK WORKING GROUP, REQUEST FOR COMMENTS 1520: EXCHANGING ROUTING INFORMATION ACROSS PROVIDER BOUNDARIES IN THE CIDR ENVIRONMENT (1993), *available at* <http://www.ietf.org/rfc/rfc1520.txt>.

ally any size.<sup>69</sup> While this addressed a major source of allocation inefficiency, it also further accelerated the growth of address allocations, triggering a round of predictions that the internet could soon melt down.<sup>70</sup> The creation of variably sized IP address allocations dramatically increased the number of different allocations that internet-connected devices had to store in memory as routing tables, helping to create the first major net neutrality debate.<sup>71</sup> As the associate administrative and hardware costs of maintaining these routing tables increased, so did the pressure on providers to collect revenue to offset them.<sup>72</sup>

### B. History Lesson #1: The Genesis of Tiered Access

By 1991, the “privatization” of the former National Science Foundation NSFnet had spawned commercial services on the nascent internet. Along with commercialization came the tiered access structure that defines the internet today. Founded in 1991 to manage commercial access to the former NSFnet, the Commercial Internet eXchange (CIX) provided a peering site where its members agreed to exchange network traffic (“peer”) free of charge.<sup>73</sup> Internet providers that connected at CIX’s interchange benefited from increased interconnectivity that today’s providers—not to mention legal scholars—take for granted when discussing net neutrality. As commercial internet services expanded over the next three years, the CIX peering point produced a tiered access hierarchy. The largest of the backbone providers, including Sprint, UUNET, Advanced Network Services (ANS), BBN Planet, and later MCI and AT&T, banded together to form the core internet backbone, agreeing to peer with each other and resell services to small providers.<sup>74</sup> These decisions quickly created a tiered network.

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69. CIDR identifies a block of contiguous addresses based on the number of bits, out of 32 possible, that the particular subnetwork contains. This allows allocations of variably sized subnetwork blocks from a single IP address to an entire Class A. For a table of all possible subnetworks and an explanation of the conversion from binary to IP addresses, see Wikipedia, *Classless Inter-Domain Routing*, [http://en.wikipedia.org/wiki/Classless\\_Inter-Domain\\_Routing](http://en.wikipedia.org/wiki/Classless_Inter-Domain_Routing) (last visited Jan. 11, 2007).

70. E.g., David L. Wilson, *Internet’s Shallow Pool*, AUSTIN AM.-STATESMAN, Aug. 23, 1997, at D4.

71. For an historical view of the growth of internet routes, see BGP Reports, BGP Routing Table Analysis Reports, <http://bgp.potaroo.net/> (last visited Oct. 28, 2007).

72. Padmanabhan Srinagesh, Internet Cost Structures and Interconnection Agreements, Presentation at the MIT Workshop on Internet Economics (Mar. 10, 1995), available at <http://www.press.umich.edu/jep/works/SrinCostSt.html>.

73. FRED GOLDSTEIN, THE GREAT TELECOM MELTDOWN 65-67 (2005).

74. *Id.* at 67.

The top-tier providers built national networks interconnecting with other national networks at CIX and at a handful of other traffic exchanges around the country. Each of these national “Tier 1” providers agreed to peer with each other and pass traffic on behalf of downstream customers that used them for internet connectivity.<sup>75</sup> “Tier 2” providers typically maintained smaller national or super-regional networks and agreed to peer with the major Tier 1 providers and, sometimes, each other. Tier 2 providers often had to pay to connect and to peer with Tier 1 providers.<sup>76</sup> Local and regional internet providers who purchased bandwidth from Tier 1 providers found themselves a step removed from the equal access of the internet’s “backbone.”

Price and service level agreements differentiated the tiers. Providers with the desire and money to build large national networks or negotiate expensive peering agreements with CIX or Tier 1 providers could receive guarantees about traffic and connectivity unavailable to smaller providers. The price of internet service depended on capacity, but with fewer pricing models than today. In the early 1990s, providers typically paid a flat fee either per Megabit (Mbps)<sup>77</sup> or based on the type of physical interface (DS1, DS3, Ethernet, etc.) that they purchased.

At the same time, Tier 1 and Tier 2 providers had begun testing a variety of service and pricing models for end users. For example, Skye/net, an internet provider in northern Indiana, prevented users from running “programs designed to keep a connection up by sending regular amounts of data through the dial-up connection,” and banned practices including the use of servers or mailing list software on dial-up connections and the display of business information on personal websites.<sup>78</sup> The company offered

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75. The definition of a “Tier 1” provider proved nebulous even then. Discussions and publications at the time typically cited the six providers named above as the “Tier 1” providers. *See supra* text accompanying note 74. Numerous other providers joined the ranks of “Tier 1” providers with national peering agreements over the next decade.

76. Dozens of providers, including the author’s own company, *see infra* note 78, qualified as Tier 2 providers under this definition during the mid-1990s. The Tier 2 distinction tended to be transitory. Super-regional and small national networks often either grew into Tier 1 providers or became acquisition targets.

77. The abbreviations “Mbps” and “Kbps” will appear frequently throughout this paper. “Mbps” stands for Megabits (one million bits) per second. “Kbps” stands for Kilobits (one thousand bits) per second. For reference, Major League Baseball’s MLB.tv Premium service delivers broadcast-quality full-motion video at 700 Kbps (0.7 Mbps). Major League Baseball, Subscription Access FAQs, [http://www.mlb.com/mlb/help/faq\\_subscriptions.jsp](http://www.mlb.com/mlb/help/faq_subscriptions.jsp) (last visited Oct. 28, 2007).

78. Skye/net Network Servs., Inc., Skye/net Account Guidelines Overview, [http://support.skyenet.net/Use\\_Policy.html](http://support.skyenet.net/Use_Policy.html) (last visited Oct. 28, 2007), *available at* [http://web.archive.org/web/19980109033327/support.skyenet.net/Use\\_Policy.html](http://web.archive.org/web/19980109033327/support.skyenet.net/Use_Policy.html). As

a range of tiered access plans from 100 hours of dial-up access to dedicated modems and high bandwidth leased lines such as T1s and DS3s. Leased-line customers received both higher speed connections and preferred access to Skye/net's network and multipoint backbone compared to non-leased-line or non-dedicated-access customers with identical connection speeds.<sup>79</sup>

Warning that “[a]ccess tiering will create an obvious incentive among [broadband providers to] . . . restrict the opportunity to compete in providing new Internet service,”<sup>80</sup> Professor Lawrence Lessig argued that tiered access charges represented a fundamental change in the internet networking environment.<sup>81</sup> To make this point, Professor Lessig necessarily takes an overly narrow definition of tiered access, considering only potential tiered service offerings targeting specific content.<sup>82</sup> He also creates a meaningless distinction between types of customers.<sup>83</sup> Even if a bandwidth-hungry content provider or a next-generation-service-hungry (and, consequently, bandwidth-hungry) consumer sits at the network’s “edge,” access providers have offered those customers a wide range of services based on price tiers and types of service for many years. As this Article explains,<sup>84</sup> the opposite of Lessig’s prediction has come true as improved tools and technologies have allowed for new internet services and more differentiated service offerings.

Professor Lessig’s testimony repeats a common refrain. Various pundits and experts have offered similar doomsday warnings for years. In 1997, a group of internet providers argued that termination of peering agreements “may be just the opening . . . skirmish in the long-predicted move [by Tier 1 providers] acting as a closed cartel to change the fundamental economics of the Internet . . . [that] will cascade down to the pocketbooks of all users and smaller . . . ISPs.”<sup>85</sup> In 1994, internet journalist

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Skye/net’s Vice President, the author managed network operations and, along with two partners, owned the company until 1998.

79. Skye/net Network Servs., Inc., Skye/net Dedicated Internet Services, <http://skyenet.net/Dedicated.html> (last visited Oct. 28, 2007), available at <http://web.archive.org/web/19971224192532/skyenet.net/Dedicated.html>.

80. Lessig Testimony, *supra* note 27, at 2.

81. *Id.* at 5-10.

82. *Id.*

83. *Id.*

84. See *infra* Section IV.A and the discussion later in this section regarding lower costs and new service offerings compared to a decade ago.

85. See, e.g., Postings of Dennis Brumm, dennisbr@hooked.net, et al. to ba.internet (May 4, 1997), available at [http://groups.google.com/group/ba.internet/browse\\_thread/thread/99c7a3a80b74d0de/](http://groups.google.com/group/ba.internet/browse_thread/thread/99c7a3a80b74d0de/).

Gordon Cook warned that Tier 1 providers would soon dominate the market and force higher usage-based pricing and the elimination of free peering points like CIX.<sup>86</sup> Legislators, too, have fanned these fears. In 2006, Senator Ron Wyden (D-Ore.) used similar language to claim that “[c]reating a two-tiered system could have a chilling effect on small mom and pop businesses that can’t afford the priority lane, leaving these smaller businesses no hope of competing against the Wal-Marts of the world.”<sup>87</sup>

Net neutrality proponents such as Lessig ignore the long history of tiered access when arguing for stringent neutrality regulations. Today’s providers, while enjoying other niche options, still follow the same tiered access model that CIX and backbone providers created in the early 1990s. Providers that want better service guarantees or direct peering arrangements pay for this added service, just as they have since the U.S. government privatized the NSFnet.

In addition, today’s consumers, access providers, and businesses can choose from a host of broadband options and dozens of providers of bandwidth and other niche services. A 10 Mbps co-located connection that cost \$7,500 annually in the heart of Silicon Valley in 1997<sup>88</sup> is available in smaller markets like South Bend, Indiana for less than half that cost today.<sup>89</sup> Consumers who need broadband connectivity are no longer limited to leased, private-line 1.5 Mbps T1 service, but can choose from among DSL, cable, fiber optic, satellite, cellular, and fixed wireless options at vastly reduced prices. The proliferation of services has continued even though providers use backbone-to-backbone, backbone-to-provider, and provider-to-end-user tiers of all types. A market once in *actual* danger of domination by a handful of founding players has evolved into an innovative marketplace replete with services and players of all types and sizes.

Tiered access, present from the commercialization of the internet, does not represent a fundamental change to business models or internet economics. Cook and others in the mid-1990s may not have foreseen the power of individuals to shape internet governance, given the compara-

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86. COOK Network Consultants, *Executive Summary: CIX Board Enforces Routing—Path Routing Filters to Go Up Nov. 1, 1994*, THE COOK REPORT, Aug. 1994, at 23, available at <http://cookreport.com/backissues/august94newsletter.pdf>.

87. Press Release, Senator Ron Wyden, Wyden Moves To Ensure Fairness of Internet Usage With New Net Neutrality Bill (March 6, 2006), available at [http://wyden.senate.gov/media/2006/03022006\\_net\\_neutrality\\_bill.html](http://wyden.senate.gov/media/2006/03022006_net_neutrality_bill.html).

88. Commercial Internet Exchange, CIX Router Information, available at <http://web.archive.org/web/19980130083449/cix.org/CIXInfo/router-services.html>.

89. Colostore, Colocation, <http://www.colostore.com/colocation.shtml> (last visited Oct. 28, 2007).

tively limited scope of the commercial internet at the time. However, both Professor Lessig and Senator Wyden have the benefit of history. Neither of their scenarios explains clearly how the “Wal-Marts of the world” could hope to buy discriminatory access on thousands of local, national, and international provider networks to create a worldwide priority lane. Lessig, Wyden, and others fail to explain why a meshed, worldwide network would eschew opportunities to circumvent any discriminatory “lanes” that individual carriers tried to build.<sup>90</sup> As the next section recounts, organizations like CIX have found that creating a discriminatory lane leads to irrelevance, not dominance. Professor Lessig’s warnings of impending domination by a telecommunications oligopoly have not materialized at any point in the existence of the tiered access model. Despite almost two decades of dire predictions,<sup>91</sup> the tiered access model has arguably fostered—or at worst failed to hinder—innovation in internet networking.<sup>92</sup>

### C. History Lesson #2: CIX, AOL, and the Absence of Monopoly Power

Net neutrality proponents fear that permitting tiered access will transform providers into monopolists with significant incentive to block access to content.<sup>93</sup> These fears of a tiered access monopoly have endured despite historical evidence to the contrary. The relatively few attempts to impose blocks have had no measurable effect on the innovation and growth of internet networks, services, and content. Three events illustrate this absence of power: CIX’s 1994 attempt to isolate non-members, the 2006 decision by AOL to eliminate its walled garden content, and the separate

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90. For example, University of Colorado Law School Professor Phil Weiser suggests that a nondiscriminatory priority lane already exists with companies such as Akamai and that lack of competition, not tiered access, is the problem. Posting of Phil Weiser to Public Knowledge, <http://www.publicknowledge.org/node/646> (Sept. 22, 2006, 15:15 EST). *See also infra* notes 135-140 and accompanying text.

91. This Article looks at internet history after the debate about commercialization of the internet had run its course. Similar Armageddon scenarios were commonplace in the days before the NSF relinquished control of NSFnet, too. The haunting chimera back then was the innovation-destroying force of commercialization. In the software world, fears of commercialization in the 1980s and early 1990s gave rise to the Free Software Foundation and the open source software community, another powerful individual-led movement. Like the internet access debate, the open source community is rife with dire, but unsubstantiated, predictions of dominance by commercial companies. *See generally* Douglas A. Hass, *A Gentlemen’s Agreement: Assessing the GNU General Public License and its Adaptation to Linux*, 6 CHI.-KENT J. INTELL. PROP. 213 (2007).

92. The proposition that innovation happens at the network edge is one of two assumptions that both network neutrality opponents and proponents implicitly accept. *See infra* note 184.

93. *See, e.g.*, Lessig Testimony, *supra* note 27, at 2.

panic over a technical glitch at Craigslist that same year. This section discusses the demise of CIX. Section V.A addresses the two more recent events in light of Dr. van Schewick's vertical foreclosure arguments.

In 1994, CIX decided that the rapidly expanding size of routing tables—lists of instructions stored by routers and other internet-connected devices about the available paths to different networks—would soon overwhelm the capacity of their routers to store them.<sup>94</sup> CIX provided a few basic services for its internet provider members: lobbying efforts, public forums, policy committees to propose legislation or regulation, and other information services.<sup>95</sup> Most importantly, CIX provided connectivity for its members. All members were required “to interconnect with all other CIX members . . . directly or indirectly through the CIX router—at no additional cost to member networks.”<sup>96</sup> Prior to November 1994, non-CIX members could still exchange routing tables at the CIX router and with other CIX members without paying CIX’s \$7,500 annual membership fee.<sup>97</sup>

After CIX members considered filtering proposals during the summer, they voted against filtering non-CIX members’ routing information at their September 1994 meeting. Despite the vote, the CIX Board of Directors decided to impose route filtering for unspecified legal reasons.<sup>98</sup> CIX President Bob Collet announced on November 1st that CIX would impose filtering beginning on November 15th.<sup>99</sup> A key member of CIX resigned in

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94. Posting of Gene Hastings to North American Network Operators Group (NANOG) Mailing List (Nov. 2, 1994, 12:15:35 EST), *available at* <http://merit.edu/mail.archives/nanog/1994-11/msg00020.html>. Hastings forwarded a copy of CIX President Bob Collet’s e-mail to the NANOG list. In the e-mail, Collet referred to “the inherent scaling limitations of the CIX router-based interconnection point” as a factor in making the filtering decision and recommending that providers pay to join CIX or to interconnect elsewhere.

95. CIX, About the Commercial Internet eXchange, *available at* <http://web.archive.org/web/19970413033334/cix.org/CIXInfo/about-cix.html>. Without reading this section further, readers can deduce from this citation’s URL the result of CIX’s routing policy decision. The only available link to this information about CIX comes from archive.org, a non-profit archive of historical webpages and other digital collections, and not a current CIX site.

96. *Id.*

97. COOK Network Consultants, *CIX On Again Off Again Filtering: What’s at Stake?*, THE COOK REPORT, Dec. 1994, at 1, 4, *available at* <http://cookreport.com/backissues/dec94newsletter.pdf>.

98. *Id.*

99. Hastings, *supra* note 94; Ellen Messmer, *IP Service Providers Face Traffic Shutdown*, NETWORK WORLD, Aug. 22, 1994, at 5. Bob Collet was also an internet product manager for Tier 1 provider Sprint.

protest on the same day, and the announcement fueled a significant debate.<sup>100</sup> COOK Report editor Gordon Cook warned providers that failure to pay CIX's membership fee to avoid the filtering amounted to "a double barreled round of Russian roulette. . . . Joining the CIX is obvious [sic] the safest thing for non-member ISPs to do."<sup>101</sup>

The commercial internet community in 1994 was minuscule compared to today's global network of providers. As the primary exchange point for commercial internet traffic in 1994, customers and backbone providers depended on CIX. However, the company quickly learned that it had little power to impose filters, despite its dominant market position.<sup>102</sup> On November 16th, one day after the supposed imposition of the filters, a member of the network user group mailing list Com-Priv noted that nothing had changed, and that the CIX router was still sharing routing information for both CIX and non-CIX members. Collet admitted that CIX had encountered trouble implementing its filter, and the COOK Report's December issue described the filtering as "on again off again."<sup>103</sup>

CIX quickly faded into obscurity. Its decision served to encourage the major backbone providers to build new platforms and to offer downstream customers ways to interconnect and bypass CIX's network altogether. As the COOK Report explained, "with the CIX router foundering and seen as a place to avoid, many providers began to get interested in MAE-East [another routing information exchange point] as an alternative."<sup>104</sup> By 1997, CIX membership had stalled at approximately 150 members, and it faced

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100. Postings of Rich Braun, richb@pioneer.ci.net, et al., to ne.org.neci.general (Nov. 2-16, 1994), available at [http://groups.google.com/group/ne.org.neci.general/browse\\_thread/thread/f02eec7dd620501b/](http://groups.google.com/group/ne.org.neci.general/browse_thread/thread/f02eec7dd620501b/) (a Usenet newsgroup thread debating the decision and including the text of key CIX member Net99's resignation).

101. COOK Network Consultants, *supra* note 86, at 7.

102. See *Management of NSF Network Hearing Before the H. Subcomm. on Science of the H. Comm. on Science, Space, & Technology*, 102d Cong. (testimony of Mitchell Kapor, Pres. of Electronic Frontier Foundation and Chairman of CIX) (discussing NSFNet and CIX's roles), available at [http://www.eff.org/Infrastructure/NREN\\_NSFNET\\_NPN/nsfnet\\_hr\\_sst-s\\_920312.testimony](http://www.eff.org/Infrastructure/NREN_NSFNET_NPN/nsfnet_hr_sst-s_920312.testimony). In a testament to CIX's pivotal early role, the Smithsonian Museum of American History in 2006 acquired the router that once powered the CIX network along with documents and private notes from CIX's inception. See Farooq Hussain, Projects, <http://www.farooqhussain.org/projects> (last visited Oct. 28, 2007).

103. COOK Network Consultants, *supra* note 97. Sadly, the debate on the popular Com-Priv mailing list operated by internet provider PSI was never archived publicly, and most of the original discussions are no longer available online.

104. *Id.* at 4.

defections by major founding members MCI and UUNET.<sup>105</sup> By 2001, CIX had decommissioned its router and exchange point.<sup>106</sup> CIX needed content and customers to survive—a network truth as important today as it was then.

#### IV. MODERN NON-NEUTRALITY ON THE INTERNET

Although technologies have changed considerably and evidence of an increasingly competitive internet access market driven by content is strong, the concept of creating a free and unfettered internet by regulating incumbent common carriers and cable providers has persisted. More recently, commentators have turned to prioritization of particular applications or types of traffic as the primary neutrality problem.<sup>107</sup> Under this theory, network neutrality advocates worry that providers will prioritize preferred traffic or applications to the detriment of non-preferred content, rather than merely charging discriminatory “tiered access” rates for carrying specific content. As with tiered access, the prioritization debate has raged for years, and has had a similar non-effect on innovation and growth of internet networks, services, and content.

##### A. Quality of Service Tools for Service Differentiation

Access providers’ implementation of tools to control individual applications, such as voice, video, or e-mail is not a recent phenomenon. In 1998 and 1999, network access providers began to “tier” and “prioritize” applications and individual traffic flows within networks. Using the Linux operating system, manufacturing startup ImageStream released a line of router products<sup>108</sup> that provided service differentiation tools for network administrators.<sup>109</sup> Open source software developers of the Linux Differentiated Services (commonly called “DiffServ”) tools did not create them in

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105. Kenneth Cukier, *CIX Unfazed as ISPs Shun its Router*, COMM. WEEK INT’L, Mar. 10, 1997, at 16.

106. E-mail from Farooq Hussain, CIX, to Randy S. Whitney, UUNET (Jan. 11, 2002, 09:36:02 EST), *quoted in* E-mail from Randy S. Whitney, UUNET, to Farooq Hussain, CIX (Jan. 11, 2002 11, 2002 13:27:21 EST), *available at* <http://www.farooqhussain.org/projects/Shutdown%20email.pdf>.

107. Yoo, *supra* note 5, at 1880-81 (discussing net neutrality proponents’ criticisms of discrimination against applications).

108. ImageStream Internet Solutions, Inc., Products & Services, <http://www.imagestream.com/Products.html> (last visited Oct. 28, 2007).

109. The word “discrimination” carries negative connotations. Differentiation of network services may create significant positive externalities or have plausible justifications. Rather than use a word with pejorative meaning, this article uses the industry standard term “service differentiation” whenever possible.

a surreptitious attempt to eliminate competition or destroy internet growth and innovation. The DiffServ utilities allowed access and content providers to control the different types of data and applications that passed through their systems. With this suite of tools, network administrators could easily prioritize favored, or de-emphasize disfavored, applications or traffic. In addition to tiers of access at the provider level, DiffServ gave providers a way to implement Quality of Service (QoS) by introducing tiers at the individual application level of a network.

Far from Lessig's neutral network of innovation,<sup>110</sup> the internet of the late 1990s had increased its focus on tiered access and service differentiation from end to end on internet networks, without harming innovation or growth. With DiffServ, Linux developers implemented an existing standards document, the DiffServ RFC, that created a framework to allocate "traffic streams by service provisioning policies which govern how traffic is marked and conditioned upon entry to a differentiated services-capable network, and how that traffic is forwarded within that network."<sup>111</sup> With this suite of tools, network administrators could easily prioritize favored, or de-emphasize disfavored, applications or traffic.

Non-neutrality extended far beyond emerging companies, open source operating systems, and esoteric standards documents. Cisco, the largest networking equipment manufacturer, followed the DiffServ RFC with its own offering in 1999. Cisco's more advanced successor technologies provide the same ability to "identify a subscriber, classify an application, apply application-level performance, and meter and charge for the application or service bundle" offered by Linux-based solutions.<sup>112</sup> The IETF has continued to innovate and improve the ability to control access from end-to-end on a network, maintaining multiple active working groups<sup>113</sup> and creating dozens of refined standards for tiered network access.<sup>114</sup> Today, the ability to control data for policy or business reasons is a central feature

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110. See Lessig, *supra* note 3.

111. RFC 2475, *supra* note 61.

112. CISCO SYS., INC., CREATING NEW BROADBAND TIERS OF SERVICE USING CISCO SERVICE CONTROL TECHNOLOGY (2005), [http://www.cisco.com/application/pdf/en/us/guest/products/ps6150/c1031/cdccont\\_0900aecd8024525f.pdf](http://www.cisco.com/application/pdf/en/us/guest/products/ps6150/c1031/cdccont_0900aecd8024525f.pdf). (last visited Oct. 28, 2007).

113. MPLS-RC, MPLS Standards, <http://www.mplsrc.com/standards.shtml> (last visited Oct. 28, 2007) (listing related IETF Working Groups and other industry forums).

114. IETF Multiprotocol Label Switching (mpls) Working Group, Charter, <http://www.ietf.org/html.charters/mpls-charter.html> (last visited Oct. 28, 2007).

of ImageStream<sup>115</sup> and Cisco<sup>116</sup> products. Other successful companies have emerged to market products designed solely to control and prioritize traffic,<sup>117</sup> and the open source software community maintains a powerful suite of free tools for service differentiation.<sup>118</sup>

Yet many commentators cling to a belief that implementing Quality of Service (QoS) is still the expensive, difficult proposition that it was in 1995. According to Jon Peha, Professor of Electrical Engineering and Public Policy at Carnegie Mellon, “[T]he cost per bit of a stream with strict QoS requirements is greater than the cost per bit when QoS requirements are lax.”<sup>119</sup> While this statement is theoretically correct, the “cost per bit” of a stream of QoS-limited traffic is realistically infinitesimal—both in terms of actual cost and opportunity cost—and requires little more than creating a configuration and enabling the QoS features on network equipment.<sup>120</sup> When balanced against the harms of undifferentiated, non-conforming network traffic<sup>121</sup> and their significant negative effects on a network, the minuscule cost of QoS becomes an asset.

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115. See ImageStream, Implementing Quality of Service with iptables CLASSIFY Rules, [http://support.imagestream.com/QOS\\_with\\_iptables\\_CLASSIFY.html](http://support.imagestream.com/QOS_with_iptables_CLASSIFY.html) (last visited Oct. 28, 2007).

116. See CISCO SYS., INC., *supra* note 112.

117. E.g., *Insider: P2P Drives Use of DPI*, LIGHT READING, Sept. 6, 2006, [http://www.lightreading.com/document.asp?doc\\_id=103020](http://www.lightreading.com/document.asp?doc_id=103020) (discussing report comparing quality of service products from Allot Communications, Caspian Networks, Ellacoya Networks, Narus, and Sandvine).

118. Bert Hubert et al., Linux Advanced Routing & Traffic Control, <http://www.lartc.org/> (last visited Oct. 28, 2007).

119. Jon M. Peha, *The Benefits and Risks of Mandating Network Neutrality, and the Quest for a Balanced Policy*, 1 INT'L J. COMM'N 652 (2007); see also *infra* notes 258-66, 279-97 and accompanying text (providing more examples of inaccurate QoS cost estimates).

120. See, e.g., David Newman, *Filters on Routers: The Price of Performance*, NETWORK WORLD, Jul. 14, 2003, at 35 (finding that, aside from the Cisco routers tested, most routers and switches exhibited virtually no significant performance difference with advanced filtering and routing enabled); see also THE TOLLY GROUP, TEST SUMMARY NO. 205121, AVAYA, INC. “TRIPLE PLAY” CONVERGED NETWORK BENCHMARK (2005), <http://www.tolly.com/ts/2005/Avaya/Convergence/TollyTS205121AvayaIncTriple-PlayConvergedNtwkBenchmarkAugust2005.pdf> (test report showing that enabling QoS on Avaya switches was costless); Press Release, 3Com Corp., 3Com Outperforms Cisco in Independent Test Conducted by the Tolly Group (Jan. 17, 2006), available at <http://www.tolly.com/NewsDetail.aspx?NewsID=52> (test certifying 3Com equipment as able to “enforce both security and application service levels” and provide “higher security and Quality of Service for VoIP traffic” by merely turning on the QoS features of the equipment).

121. Worms, viruses, spam, spyware, adware, denial of service attacks, abusive use of network resources, and many other types of traffic fall into this category.

Even net neutrality proponents concede this proposition. In a draft of his proposed neutrality legislation, Professor Wu makes broad exceptions for QoS used to: “[p]revent physical harm” to the network; “[p]revent Broadband users from interfering” with others by implementing bandwidth limits, spam, worm, and virus protection, and limits on denial of service attacks; and “[p]revent violations of the security” of the network, including a broad anti-hacking provision.<sup>122</sup> The broad exceptions would likely nullify any regulatory effect of Wu’s proposed legislation, since virtually any QoS limitation on the network could fit one of these broadly defined categories. Providers could simply classify QoS policies that reclassify video or voice over IP traffic as preventing “violations of security” or protecting mission-critical voice and video traffic from denial of service attacks and other abuses. If couched as a service enhancement, providers would have the regulatory imprimatur to charge more for this premium service, a non-egalitarian, non-neutral outcome distinctly different from the one Wu’s rhetoric anticipates. As Section VII.B discusses *infra*, Wu’s model internet provider, with completely neutral, nondiscriminatory policies,<sup>123</sup> is just as likely to face regulatory scrutiny as a provider that surreptitiously implements policies detrimental to particular types of traffic. Most importantly, Wu’s inclusion of extensive allowances for QoS illustrates both the utility and ubiquity of QoS tools and policies on today’s networks.

Providers can easily implement access control policies, content filters, and prioritization schemes on their networks. Companies, websites, and mailing lists offer assistance with implementation. The techniques used to implement tiered access and service differentiation are frequent topics at industry trade shows.<sup>124</sup> Content filters and prioritization schemes on internet networks are in wide use and generally focused on the last mile between the provider’s equipment and the consumer.

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122. Wu, *supra* note 57, at 95.

123. *See id.*

124. E.g., John Bartlett, Vice Pres., NetForecast, Inc., Address at Interop New York 2006: WAN Acceleration Technologies: Which One Is For Me? (Sept. 20, 2006) (discussing available application acceleration and performance options for network deployment); Douglas A. Hass, Dir. of Bus. Dev., ImageStream Internet Solutions, Inc., Address at the LinuxWorld Conference & Expo: Quality of Service & Firewalls (Apr. 5, 2006) (discussing open source tools for service differentiation and application security); Cristophe D. Masiero, Head of IP VPN Prod. Mgmt., Equant, Address at the MPLScon 2004: MPLS VPNs: Drivers & the Road Ahead (May 25, 2004) (discussing emerging application and service differentiation technologies).

## B. Content and Application Provider Non-Neutrality

As discussed earlier, much of the current commentary on net neutrality focuses on internet access providers. However, access providers are not the only non-neutral actors. Vonage, with over two million subscribers,<sup>125</sup> offers branded equipment for use with its Voice-over-IP (VoIP) telephony service. On its technical support website, Vonage details a configuration using equipment that prioritizes voice traffic for Vonage services over other data traffic, including data destined for other VoIP providers.<sup>126</sup> While the site touts how the configuration will provide “high-quality [Vonage] telephone service,” it does not mention that the configuration could degrade other services.<sup>127</sup> Even though Vonage openly advocates configuration settings that prioritize its own traffic without informing customers of the consequences, Congress and the telecommunications industry have welcomed the company to the forefront of net neutrality advocacy.<sup>128</sup>

Google’s Image Search is an example of a content provider putting controls on the content it offers.<sup>129</sup> Although Google markets Image Search as the “most comprehensive image search on the web,” the search’s default setting is a “moderate” filter that “excludes most explicit images.”<sup>130</sup> Although the search results page contains the innocuous statement that “Moderate SafeSearch is on,” users only learn about the filter *after* the search, and must click on the “Preferences” link to learn about the filter’s function.<sup>131</sup> Even if they notice and disable the filters, users still cannot avoid decisions that Google has made to exclude content due to

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125. Vonage, About Us, [http://www.vonage.com/corporate/index.php?lid=footer\\_corporate](http://www.vonage.com/corporate/index.php?lid=footer_corporate) (last visited Oct. 28, 2007) (“Vonage is a leading provider . . . with over 2.2 million subscriber lines as of December 31, 2006.”).

126. Vonage, Linksys WRT54GP2: Installation with Multiple Computers, <http://vonage.com/help.php?article=61&category=43&nav=3> (last visited Oct. 28, 2007).

127. *Id.*

128. See, e.g., *Net Neutrality: Hearing Before the S. Comm. on Commerce, Science & Transportation*, 109th Cong. 2 (2006) (Jeffrey Citron, Chairman & CEO, Vonage Holdings Corp. among witnesses testifying); Progress & Freedom Foundation, Aspen Summit 2005 Agenda, <http://www.pff.org/aspensummit/aspensummit2005/agenda.html> (last visited Oct. 25, 2007) (Citron included in roundtable discussion of net neutrality and other telecommunications reforms); Progress & Freedom Foundation, Aspen Summit 2007, <http://www.pff.org/aspensummit/> (last visited Oct. 25, 2007) (Citron named as important “technology pioneer” appearing as a speaker at past events).

129. Google Image Search, <http://images.google.com/> (last visited Oct. 28, 2007).

130. Google Help: Search Preferences, <http://images.google.com/intl/en/help/customize.html> (last visited Oct. 28, 2007).

131. Google, Preferences, <http://images.google.com/preferences?hl=en> (last visited Oct. 28, 2007).

political pressures or other issues.<sup>132</sup> The response that users could locate the content another way, perhaps by using a different search engine, uses the same “just switch providers” rationale rejected by net neutrality proponents who claim that access providers maintain monopoly or duopoly power.<sup>133</sup> In Google, net neutrality proponents have their doomsday scenario: a consumer’s inability to access content through a “monopoly” provider due to that provider’s arbitrary and hidden decision to restrict access. Except on the internet, unlike in the theoretical models, this “monopolistic” actor is a *content* provider, not an access provider.<sup>134</sup>

The most prominent example of technological non-neutrality on today’s internet is not an access provider, but a successful content delivery service provider. Akamai Technologies delivers content on behalf of its customers using a widely dispersed network of servers. Akamai’s acceleration services improve both performance and reliability for content providers by delivering content to end users with enforced QoS and distributed delivery.<sup>135</sup> Akamai’s site accelerator service can cache a content provider’s data on Akamai’s worldwide network of servers.<sup>136</sup> Its enhanced QoS service provides customers with “high performance and reliability”<sup>137</sup> that it has described as critical to user experiences.<sup>138</sup> The de-

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132. See Michael Liedtke, *Google Agrees to Censor Results in China*, ASSOCIATED PRESS, Jan. 24, 2006, available at <http://www.breitbart.com/news/2006/01/24/D8FBCF686.html>.

133. E.g., Lessig Testimony, *supra* note 27.

134. The market power of companies like Google, Yahoo!, and Microsoft and the applicability of major net neutrality theories to these “oligopoly” providers is worthy of further exploration. If net neutrality proponents are fearful of monopolistic control of internet content, then the dominant content providers would be a logical starting point for application of monopoly/oligopoly and vertical foreclosure theories.

135. Akamai Techs., Dynamic Site Accelerator, <http://www.akamai.com/html/technology/products/dsa.html> (last visited Oct. 28, 2007) (describing Akamai’s QoS-enabled content acceleration offerings).

136. *Id.* Akamai does not maintain its own networks. It typically co-locates its servers on access provider networks, hence the designation as a content, rather than access, provider. See Akamai, Accelerated Network Program, [http://www.akamai.com/html/partners/network\\_program.html](http://www.akamai.com/html/partners/network_program.html) (“Akamai servers are located at the edges of the Internet.”). Several other companies also provide similar content acceleration services. E.g., AT&T, Enterprise Business: Intelligent Content Distribution Service, [http://www.business.att.com/services.jsp?repoid=ProductCategory&segment=ent\\_biz](http://www.business.att.com/services.jsp?repoid=ProductCategory&segment=ent_biz) (Follow the link on left side for “Hosting Services” and then the link for “Intelligent Content Distribution Service.”) (last visited Oct. 28, 2007); SAVVIS, Intelligent Hosting, <http://www.savvis.net/corp/Products+Services/Hosting/Intelligent+Hosting.htm> (last visited Oct. 28, 2007).

137. Akamai Techs., *supra* note 135.

mand for Akamai's services is significant. The company reported over 2,300 customers under long-term contract and enjoyed a fifty-one percent increase in revenues in 2006 to \$428.7 million.<sup>139</sup>

Akamai's successful, paid QoS service further supports the conclusions that the broadband access and content markets are competitive, and that non-neutrality is integral to content providers' offerings.<sup>140</sup> Net neutrality regulation advocates' embrace of Akamai, Google, Vonage, and others for the same products and services deemed verboten when offered by access providers is puzzling. Despite Professor Lessig's concerns about the effects of differentiation, QoS, and content filtering, content providers continue torrid growth, and innovative new QoS-enabled converged voice/video/data equipment and services have flourished since the introduction of advanced traffic control tools.

Lessig claims "innovation has come primarily from the 'edge' or 'end' of the network through application competition."<sup>141</sup> In making this claim, he overlooks innovation on the network—such as the flourishing distributed content delivery market, integrated voice/video/data platforms, and advanced QoS capabilities—and ignores the internet's historic lack of net neutrality. In a 2003 joint filing to the FCC, Lessig and Wu presented another example of edge-focused reasoning to justify their position in favor of net neutrality regulation:

The question an innovator, or venture capitalist, asks when deciding whether to develop some new Internet application is not just whether discrimination is occurring today, but whether restrictions might be imposed when the innovation is deployed. If the innovation is likely to excite an incentive to discrimination, and such discrimination could occur, then the mere potential *imposes a burden on innovation today* whether or not there is dis-

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138. Press Release, Akamai Techs., Inc., Akamai Supports EA.com's Highly Interactive Internet Suspense Thriller, *Majestic* (Aug. 17, 2001), available at [http://www.akamai.com/html/about/press/releases/2001/press\\_081701.html](http://www.akamai.com/html/about/press/releases/2001/press_081701.html) (last visited Oct. 28, 2007) (describing the interactive multimedia used in the Majestic game, and its dependence on Akamai's QoS-enabled distributed network).

139. Press Release, Akamai Techs., Inc., Akamai Reports Fourth Quarter 2006 and Full-Year 2006 Financial Results (Feb. 7, 2007), available at [http://www.akamai.com/dl/press/press\\_020707.pdf](http://www.akamai.com/dl/press/press_020707.pdf).

140. The emergence of Akamai and similar competitive services in the market supports my assertion that innovation is largely the province of content providers. The primacy of content, evidenced not only by Akamai but also by the success of multiplayer online games, further supports the idea that the access market may be the secondary market and not the primary one. See *infra* note 184.

141. Lessig Testimony, *supra* note 27, at 3.

crimination now. The possibility of discrimination in the future dampens the incentives to invest today.<sup>142</sup>

Lessig and Wu would impose regulations on existing providers in the name of protecting innovation, but their justification depends on overlooking innovations on the network, ignoring the historical lack of neutrality on the internet from edge to edge, and characterizing the access market as a broadband duopoly.<sup>143</sup> Their justification ignores the future as well.<sup>144</sup> Lessig's conclusions about the lack of internet network innovation are unwarranted. Fifteen years ago, most consumers had never heard of the internet, much less demanded the ability to share their homemade videos, publish daily journals, or communicate via voice and video online. No commentator, legislator, or regulator can be certain how networks and technologies will evolve over the next decade, especially when they misunderstand how those networks evolved over the last one.

Even commentators who oppose regulatory intervention assume away network innovation and structural non-neutrality in favor of other, weaker justifications. Professor Christopher Yoo argues for restraint until regulators can demonstrate a "concrete harm to competition."<sup>145</sup> His position ultimately differs little from those of Lessig and Wu. Because of potential unforeseen consequences of regulation and the "economics of congestion," Yoo urges a policy that requires regulators to demonstrate concrete harms to competition before acting.<sup>146</sup> However, in focusing on congestion and transaction costs<sup>147</sup>—and overlooking imperfectly informed consumers—he leaves the concept of "concrete harm" undefined, giving regulators the power to twist the definition according to current political

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142. Ex Parte Submission in CS Docket No. 02-52 from Tim Wu, Associate Professor, University of Virginia School of Law & Lawrence Lessig, Professor of Law, Stanford Law School, to Marlene H. Dortch, Secretary, Federal Communications Commission (Aug. 22, 2003) (emphasis in original), *available at* [http://faculty.virginia.edu/timwu/wu\\_lessig\\_fcc.pdf](http://faculty.virginia.edu/timwu/wu_lessig_fcc.pdf).

143. Lessig Testimony, *supra* note 27; Ex Parte Communication in CS Docket No. 02-52 from Coalition of Broadband Users and Innovators to Michael K. Powell, Chairman, Federal Communications Commission, et al. (Jan. 8, 2003), *available at* [http://gullfoss2.fcc.gov/prod/ecfs/retrieve.cgi?native\\_or\\_pdf=pdf&id\\_document=6513401671](http://gullfoss2.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6513401671) (calling for regulation of the "broadband duopoly" that will "define the Internet for some time").

144. See *infra* note 368 and accompanying text.

145. Yoo, *supra* note 5, at 1851.

146. *Id.* at 1907-08.

147. See *infra* Part VI.

tastes.<sup>148</sup> Absent a shift in policy to consumer-focused rather than provider-focused regulation, the definition of “concrete” or “harm” would depend on which net neutrality faction held power at the time.

## V. DEBUNKING VERTICAL FORECLOSURE: WHY CIX COULD NEVER HAPPEN TODAY

Despite repeated failures by supposed internet access monopolists to exert vertical pressure on internet content providers, net neutrality proponents cling to monopolist theories. Monopoly power has yet to emerge. Recent research advocating neutrality regulation makes erroneous assumptions about the market power of broadband access providers, while evidence shows that today’s providers wield far less power than the failed CIX did in the days of the nascent commercial internet. Markets have adequately addressed harmful provider actions and developed innovative, competitive services. As this Part explains, regulation would address a nonexistent problem, unnecessarily squelching market responses and innovations.

Professor Lessig worries that a lack of competition among broadband providers threatens neutrality and the availability of content.<sup>149</sup> In testimony before Congress, Lessig argued that an “effective duopoly” controlled broadband access in the United States, and that the duopoly “has now led network owners to openly advocate changes in network policy designed to vest new control in the network owner over the applications and content that flow over their network.”<sup>150</sup> Lessig relies on FCC statistics as the basis for his duopoly argument,<sup>151</sup> which Professor Yoo refutes by citing his own competing research and statistics.<sup>152</sup> Before sorting through various statistical analyses and market definitions, however, regu-

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148. Senator DeMint identified three categories of net neutrality advocates and “a number of competing public policy issues,” any of which could pull the definition in different directions. DeMint, *supra* note 23.

149. Lessig Testimony, *supra* note 27, at 5. Part IV, *supra*, further illustrates that providers have long exercised the detailed level of control over applications and content that Lessig fears as being new.

150. *Id.*

151. Fed. Commc’ns Comm’n, High-Speed Services for Internet Access: Status as of December 31, 2005 (2006), available at [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DOC-266596A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-266596A1.pdf).

152. Yoo, *supra* note 5, at 1892 (“It is a common misperception that the broadband markets are sufficiently concentrated to justify regulatory intervention. On the contrary . . . the concentration levels fall short of those traditionally associated with anticompetitive concern.”) (citations omitted).

lators can first turn to historical evidence that such monopolies have yet to emerge.

#### A. The Modern Response to Puffs of Smoke: Assume a Raging Forest Fire

Broadband providers would face a public relations and economic disaster similar to the one that CIX endured if they attempted to completely block or even severely restrict access to sites or services that their customers desired. Researchers Anton Wahlman and Brian Coyne of Needham & Company, a private asset management firm, argue, “[c]onsumers will gravitate to pipe providers that do not restrict their activities. . . . Any pipe provider who tries to restrict uses of the pipe to favored services (voice, video or data) in a ‘walled garden’ will likely be at a severe or impossible disadvantage, with consumers leaving for other pipes.”<sup>153</sup>

While Wahlman and Coyne make their argument in the context of the value of a “dumb pipe” in the broadband market, their argument applies equally to any pipe: smart or dumb, edge or backbone. Broadband networks exhibit strong direct and indirect network externalities<sup>154</sup> and bandwagon effects.<sup>155</sup> Under these theories, a network’s value increases proportionally with the number of its users.<sup>156</sup> The increased interconnectivity of the internet generates substantial benefits for users, broadband providers, and content providers.

Time Warner’s AOL unit exemplifies the disadvantages of Wahlman and Coyne’s “walled garden.” AOL, after peaking at 26.7 million subscribers in 2002, slid to under 18 million in 2006.<sup>157</sup> The company, famous for its proprietary, subscriber-only content, abandoned its pay-for-content model as its former users increasingly migrated to other dial-up and broadband providers. By jettisoning its internet access business and releasing its content freely, AOL has built a business model better positioned to succeed on an increasingly large and interconnected internet. AOL’s deci-

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153. ANTON WAHLMAN & BRIAN COYNE, NEEDHAM & CO., SCIENTIFIC-ATLANTA (SFA/NYSE) 5 (2003), available at [http://www.vonage.com/media/pdf/res\\_12\\_15\\_03.pdf](http://www.vonage.com/media/pdf/res_12_15_03.pdf).

154. Brett Frischmann, *An Economic Theory of Infrastructure and Commons Management*, 89 MINN. L. REV. 917, 971-72 (2005) (describing network effects as applied to infrastructure).

155. JEFFREY H. ROHLFS, BANDWAGON EFFECTS IN HIGH-TECHNOLOGY INDUSTRIES 30-31 (2001).

156. As Professor Yoo explains, net neutrality proponents tend to overlook portions of this theory. Yoo, *supra* note 5, at 1891.

157. Anick Jesdanun, *AOL Shifts Strategy with Free Offerings*, ASSOCIATED PRESS, Aug. 2, 2006, available at <http://abcnews.go.com/Technology/wireStory?id=2264677>.

sion perfectly illustrates the substantial benefits to users, broadband providers—and even AOL itself—that increased numbers of users provide.

The fate of erstwhile internet giants CIX<sup>158</sup> and AOL provide two concrete examples, but the market has swiftly addressed even the *hint* of restriction as well. In early June 2006, writer Tom Foremski wrote on his popular Silicon Valley Watcher blog that Cox Cable—one of Professor Lessig’s “duopoly” providers—had blocked access to popular classified advertisement site Craigslist.<sup>159</sup> Other online net neutrality activists immediately jumped on the story to criticize both Cox for its alleged actions and lawmakers for failing to protect net neutrality.<sup>160</sup> Senator Wyden, a sponsor of net neutrality legislation,<sup>161</sup> went even further. He penned a *Wall Street Journal* editorial on net neutrality that cited Cox as an example of why legislation was necessary.<sup>162</sup> He claimed, as bloggers had, that Cox was blocking access to Craigslist to boost its own classified advertising business.<sup>163</sup> Cox had not blocked Craigslist, however, and quickly announced the real reason for the inaccessibility: a technical glitch in the way Craigslist served data from its website coupled with a bug in third-party security software distributed by Cox to its customers.<sup>164</sup> The Cox/Craigslist incident was one of several protests over allegedly discriminatory behavior in 2006.<sup>165</sup> Unwanted regulatory attention aside, even the hint of inaccessibility or overly restricted access creates a fire-

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158. See *supra* Section III.C.

159. Tom Foremski, *Craigslist is Being Blocked by Cox Interactive—Is This a Net Neutrality Issue?*, SILICON VALLEY WATCHER, June 6, 2006, [http://www.siliconvalleywatcher.com/mt/archives/2006/06/craigslist\\_is\\_b.php](http://www.siliconvalleywatcher.com/mt/archives/2006/06/craigslist_is_b.php). Foremski originally claimed that Cox was using a purposefully configured “blacklist” to block access to Craigslist. He retracted his statement in an update to the post, admitting that he had no information about why Craigslist was inaccessible.

160. See, e.g., Matt Stoller, *Please Lie to Me About Net Neutrality*, MYDD, June 14, 2006, <http://www.mydd.com/story/2006/6/14/214831/479>; Posting of tkarr to Save The Internet.com, <http://www.savetheinternet.com/blog/2006/06/14/discrimination-in-disguise/> (June 14, 2006, 23:07 EST).

161. Wyden, *supra* note 87.

162. Sen. Ron Wyden, Editorial, *Why We Must Protect Internet Neutrality*, WALL ST. J., June 17, 2006, at A11.

163. *Id.* (“Cox Communications, a broadband provider that also has a large classified advertising business, is currently blocking access to craigslist.org, a large, free classified Web site that competes with Cox.”).

164. See The Great American Blog, <http://bennett.com/blog/index.php/archives/2006/06/17/know-nothing-claims-about-site-blocking/> (June 17, 2006, 22:20 EST).

165. E.g., Mark Hachman, *BellSouth Says It's Not Blocking MySpace*, PC MAG., June 2, 2006, <http://www.pc当地/2006/06/17/bellsouth-not-blocking-myspace.aspx>; Caroline McCarthy, *Did Comcast Really Sensor the 'Sleepy Repairman' Video from 'Nightline'?*, CNET NEWS.COM, Jul. 18, 2006, [http://news.com.com/2006/07/18/comcast-sensor-video-nightline\\_3-6095431.html](http://news.com.com/2006/07/18/comcast-sensor-video-nightline_3-6095431.html).

storm of negative publicity today.<sup>166</sup> As it did with CIX and threatened to do with Cox, the market would correct or bypass any discriminatory practice. Faced with an inability to deliver content to customers, major content providers would seek alternate delivery avenues.

### B. The Failure of Vertical Foreclosure Theory

Commentators including Daniel Rubenfeld and Hal Singer<sup>167</sup> and, more recently, Barbara van Schewick<sup>168</sup> have suggested that—despite the experiences of CIX, AOL, and Cox—broadband providers could exert vertical pressure on content providers. Rubenfeld, Singer, and van Schewick merely state an implicit tautology: if vertical foreclosure of markets is harmful, and broadband providers vertically foreclose markets, their actions would harm the market. Under this theory, Cox would use its theoretical monopoly power to force Craigslist, Google, eBay, or other similar

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166. Professor Lessig unwittingly provided an example of both the firestorm of publicity and the market's immediate, non-regulatory correction on his blog in August 2007. Posting of Lawrence Lessig to Lessig Blog, [http://lessig.org/blog/2007/08/jamming\\_the\\_pearl.html](http://lessig.org/blog/2007/08/jamming_the_pearl.html) (Aug. 10, 2007, 10:50 EST). Lessig posted about supposed "censorship" by AT&T of anti-President Bush lyrics in a Pearl Jam song webcast from the Lollapalooza tour. Calling it a "censoring event" that was "precisely the behavior we [net neutrality] advocates have been warning about," Lessig links to a Los Angeles Times op-ed article about the incident.

The article recounts the *actual* story and the aftermath of the publicity. As it does for all of its webcasts, AT&T "hire[d] contractors to monitor the performances, and the broadcasts are delayed slightly to enable monitors to bleep off-color material." Jon Healey, *AT&T Drops Pearl Jam's Call*, L.A. TIMES, available at <http://opinion.latimes.com/bitplayer/2007/08/att-drops-pearl.html> (last visited Oct. 30, 2007). "But those monitors aren't supposed to edit songs, just the stage patter between them." *Id.* Despite this directive, the contractors had bleeped two lines from one of Pearl Jam's songs. The op-ed noted "AT&T wants to post an unexpurgated version" of the song, and that the band "says it will post the video on its own site soon." *Id.* The piece also cited Craig Aaron, spokesman for net neutrality advocate Free Press, admitting that no one could know if it was a glitch or not. *Id.*; see also Section VII.B (discussing this exact problem in applying regulatory oversight).

Despite Lessig's cries of censorship, AT&T's action looked much like either the innocuous Cox/Craigslist incident recounted in this section or, cynically, like the Sinister Cable hypothetical in Section VII.B. Regardless, as the Free Press spokesman correctly noted, "there's no way . . . to know" what really happened and the negative publicity caused by the disclosure led to the elimination of any intentional or unintentional "censorship." Rather than make a case for them, Lessig illustrated the extreme difficulty in implementing any net neutrality regulations and lent support to an alternate disclosure regime.

167. See generally Daniel L. Rubenfeld & Hal J. Singer, *Vertical Foreclosure in Broadband Access*, 49 J. INDUS. ECON. 299, 310-13 (2001).

168. See van Schewick, *supra* note 4. Dr. van Schewick cites Rubenfeld and Singer's vertical foreclosure theory with approval throughout her article. E.g., *id.* at 334 n.13.

content aggregators and providers out of the market in favor of Cox-provided services. Once again, the theoretical model differs greatly from the real world. While broadband providers have launched limited services into content aggregation markets, such as search engines,<sup>169</sup> their efforts have met with high inherent barriers to entry. In February 2007, end users conducted nearly seven billion searches on the internet, nearly half with market leader Google.<sup>170</sup> The current search engine industry leaders—Google, Yahoo!, Microsoft (MSN.com), and IAC/Interactive's Ask.com—dominate the market with 91.7% of all searches in comScore's February 2007 qSearch rankings.<sup>171</sup> TimeWarner, including its AOL subsidiary, led all other search providers with a paltry 4.9% of searches.<sup>172</sup> Even Time-Warner's position as the leader among broadband providers is somewhat misleading. Its AOL unit outsourced its search engine to Google in 2002,<sup>173</sup> illustrating the poor applicability of the vertical foreclosure theory as applied to highly profitable,<sup>174</sup> highly desirable markets such as content aggregation. When highlighting potential threats to the Google juggernaut, industry pundits focus not on broadband providers but social network sites and start-up search providers.<sup>175</sup>

Despite a lack of evidence that vertical foreclosure has emerged in the access provider market, monopolist theories still find favor among proponents of net neutrality regulation. Dr. van Schewick<sup>176</sup> depends largely on

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169. *The Un-Google*, ECONOMIST, June 17, 2006, at 65 (“But because barriers to entry in the search business are high . . . most analysts think that the four big search engines will stay ahead of the tiny ones.”).

170. Press Release, comScore, comScore Releases February U.S. Search Engine Rankings, (Mar. 21, 2007), available at <http://www.comscore.com/press/release.asp?press=1255>.

171. *Id.*

172. *Id.*

173. *AOL to Use Google Searches*, WASH. POST, May 2, 2002, at E2.

174. Paid search advertising generated nearly 99 percent of Google's total \$3.21 billion in fourth quarter 2006 revenue, with over \$1 billion in GAAP operating income. Press Release, Google Inc., Google Announces Fourth Quarter and Fiscal Year 2006 Results (Jan. 31, 2007), available at [http://investor.google.com/pdf/2006Q4\\_earnings\\_google.pdf](http://investor.google.com/pdf/2006Q4_earnings_google.pdf).

175. E.g., Access Intelligence, Inc., *Storming the Googleplex*, MIN'S B2B, Feb. 12, 2007, available at <http://www.minonline.com/b2b/363.html> (“And don't forget how Google attacked the social networking market and crushed the competition. Wait, that was MySpace, now owned by News Corp.”); Sunshine Mugrabi, *Wikipedia Founder's Google Killer*, RED HERRING, Dec. 25, 2006, <http://www.redherring.com/Home/20453> (“Wikipedia founder Jimmy Wales is planning to launch a new search engine that he hopes can compete with top search engines Google and Yahoo.”).

176. van Schewick, *supra* note 4, at 335, 342.

the theory of “internalizing complementary efficiencies” (ICE),<sup>177</sup> the research of Joseph Farrell and Michael Katz into rent extraction in systems markets<sup>178</sup> and Michael Whinston’s economic study of monopolists’ ability to exclude competitors from complementary markets through tying.<sup>179</sup> Her synopsis of Farrell and Weiser’s theory is sound:

If the presence of independent producers of complementary products generates additional surplus, the monopolist may be able to capture some of that surplus through its pricing of the primary good. In this case, the monopolist will earn greater profits when its rivals are in the market than when they are not. In this case, the monopolist does not wish to steal sales in the secondary market, but takes its profits by charging a higher price for the primary good.<sup>180</sup>

However, Dr. van Schewick’s application of this theory is not. While van Schewick applies this and other theories to the internet, her applications focus entirely on theories of what *could* happen in a monopolist-controlled network rather than what *does* happen on the competitive internet.<sup>181</sup> Her theory makes two fatal assumptions about the internet access market, according to Dennis Carlton’s research into monopolists’ exclu-

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177. Joseph Farrell & Philip J. Weiser, *Modularity, Vertical Integration, and Open Access Policies: Towards a Convergence of Antitrust and Regulation in the Internet Age*, 17 HARV. J.L. & TECH. 85, 114 (2003). Professor Wu cites this same monopolist presumption in an attempt to justify regulation. See also Wu, *supra* note 57, at 84-85.

178. Joseph Farrell & Michael L. Katz, *Innovation, Rent Extraction, and Integration in Systems Markets*, 48 J. INDUS. ECON. 413 (2000).

179. Michael D. Whinston, *Tying, Foreclosure, and Exclusion*, 80 AM. ECON. REV. 837, 840, 850-52, 855 (1990).

180. van Schewick, *supra* note 4, at 341 (citing Farrell & Weiser, *supra* note 177).

181. See, e.g., van Schewick, *supra* note 4, at 344 (under the heading “Application to the Internet,” discussing the “the hypothetical [monopolist-controlled] network that is the focus of this analysis” rather than the internet); *id.* at 346 (under the heading “Application to the Internet,” discussing a hypothetical local telephone company and its revenue sources); *id.* at 356 (under the heading “Application to the Internet,” discussing situations under which providers “may be able to force” rivals from the market and citing hypothetical example); *id.* at 359 (under the heading “Application to the Internet,” suggesting “conditions underlying this theory may well be present in the Internet context” and that monopolists, if they exist, “may be able to drive [their] rivals” from the market, but citing no evidence of this actually occurring). Dr. van Schewick mentions the *Madison River* case in passing as the first instance of anticompetitive—and possibly monopolistic—behavior by a provider. *Id.* at 346. This first instance, Madison River Commc’ns, LLC, 20 F.C.C.R. 4295 (2005), is also the only instance. Its existence did not evidence monopoly control of the internet access market, and represented an easy case for regulators to resolve. See *infra* text accompanying note 340.

sionary conduct.<sup>182</sup> Carlton explained that monopolists could only extract profits from the secondary market if the secondary market is subject to economies of scale.<sup>183</sup> As applied to broadband internet access providers, van Schewick's theory fails both of Carlton's tests: existence of a monopoly and economies of scale in the secondary market.

The failure of AOL's walled garden and the emergence of Google and other search engines illustrates that the secondary market in internet content<sup>184</sup> is not subject to economies of scale in the traditional sense. Economies of scale (or, more correctly, economies of *demand*) apply to indi-

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182. See, e.g., Dennis W. Carlton, *A General Analysis of Exclusionary Conduct and Refusal to Deal—Why Aspen and Kodak are Misguided*, 68 ANTITRUST L.J. 659, 664-65 (2001) [hereinafter Carlton, *Exclusionary Conduct*]; Dennis W. Carlton & Michael Waldman, *The Strategic Use of Tying to Preserve and Create Market Power in Evolving Industries*, 33 RAND J. ECON. 194, 205 (2002).

183. Carlton, *Exclusionary Conduct*, *supra* note 182 at 664-68. Carlton also adds a third element beyond the existence of a monopoly and economies of scale in secondary markets. He suggests that some segment of consumers must also demand *only* the secondary goods. *Id.* at 667-68 (Case 3b). Under the broadest view, all consumers demand only the “secondary” internet content (e-mail, web content, voice over IP, etc.). Given this formulation, Carlton’s third requirement is likely met. However, satisfying this third element does not affect the analysis here.

184. The view that content is a complementary market to the primary access market is the second assumption made by proponents and opponents of net neutrality. See *supra* note 92. For purposes of discussing a regulatory middle ground and responding to views on both the pro-regulation and anti-regulation sides of the debate, this paper must concede both the idea that innovation happens primarily at the network’s edges (and, therefore, regulation should target that part of the network) and that content is a secondary market.

This concession does not indicate *acceptance* of either assumption, though. Although better left for a separate discussion, neither assumption is unassailable. The “edge” of the network has no black-letter definition. Innovation has long been the province of content providers far from the traditional “edge” of the last mile broadband network. To the extent that content providers innovate in the “middle” of the internet to foster demand for content and services, the assumption that content is the secondary market probably fails as well. More likely, content is the primary good and access its complement. As demand for content increases, demand for access increases with it. However, the converse is not necessarily true: the mere availability of a bigger broadband pipe does not necessarily create demand for content to fill it.

At an even more basic level, intellectual property systems exist in part to *encourage* innovation. Patents and copyrights force subsequent market entrants to innovate to avoid infringing those rights. To relate this argument to the offline world, we can turn to architecture. Architects often design the most innovative and recognizable works when they are presented with challenging plots where they must design around limitations imposed by terrain, costs, governments, and even terrorists. On this point, even if net neutrality proponents are entirely correct, monopolies at the network edge may foster more—not less—innovation.

vidual market participants as well as the internet market—access companies, content providers, and consumers—as a whole. The standardization of online contracts to eliminate costly bilateral negotiations,<sup>185</sup> courts’ tendencies to give a structural pass<sup>186</sup> on potential intellectual property violations to content and access providers like Google,<sup>187</sup> Netcom,<sup>188</sup> and Network Solutions,<sup>189</sup> and similar phenomena illustrate the broader economies of demand that apply to the entire internet. The drive to lower search and transaction costs to increase network effects overshadows any particular firm’s drive to exploit narrow economies of scale within individual markets.

More importantly, van Schewick’s model requires that internet access providers hold a monopoly in the primary market. Net neutrality proponents often cite the “broadband duopoly” in support of this element of Carlton’s exclusionary theory.<sup>190</sup> However, van Schewick, Lessig, and others mistakenly conflate *market power* with *monopoly power*.

Carlton explains the difference by using the example of a monopoly resort owner.<sup>191</sup> Guests at the hypothetical island resort are required to purchase all meals at the resort. As long as the resort holds a monopoly, it

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185. For example, users do not negotiate the terms of use for every website they visit online. These online contracts of adhesion are preferable to the exceedingly high transaction costs associated with individually negotiating each contract term.

186. The “structural pass” refers to the unwritten rule that modern courts tend to give great latitude to internet content and access providers to ensure the continued functionality and structure of the web and the internet. The three cases cited as examples at notes 187-189, *infra*, illustrate this trend.

187. Gov’t. Emps. Ins. Co. v. Google, Inc., 77 U.S.P.Q.2d (BNA) 1841 (E.D. Va. 2005) (rejecting Lanham Act claims by GEICO for Google’s use of trademarked terms in sponsored search engine results).

188. Religious Tech. Ctr. v. Netcom On-Line Commc’n Servs., 907 F. Supp. 1361 (N.D. Cal. 1995) (rejecting direct and vicarious copyright infringement claims by plaintiffs against Netcom, despite Netcom’s eleven-day storage of infringing material, and rejecting plaintiff’s request for an injunction based on contributory infringement by Netcom).

189. Lockheed Martin Corp. v. Network Solutions, Inc., 141 F. Supp. 2d 648 (N.D. Tex. 2001) (refusing to hold Network Solutions liable under the Anti-Cybersquatting Protection Act for allowing trademark-infringing domain name registrations); Lockheed Martin Corp. v. Network Solutions, Inc., 194 F.3d 980 (9th Cir. 1999) (refusing to hold Network Solutions liable for contributory infringement under the Lanham Act for allowing registration of trademark-infringing domain names).

190. Lessig Testimony, *supra* note 27, at 5; Network Neutrality Act of 2006, H.R. 5273, 109th Cong. § 2.8 (2006) (“The overwhelming majority of residential consumers take broadband service from one of only two wireline providers, namely, from the cable operator or the local telephone company.”).

191. Carlton, *Exclusionary Conduct*, *supra* note 182, at 667-68.

fully exploits the secondary meal market. The resort exploits economies of scale by requiring guests to purchase all meals at the resort, rendering any non-resort restaurants unprofitable and forcing them out of the market.<sup>192</sup> The monopoly resort then can exploit island residents who did not demand the primary good (lodging at the resort) but are nonetheless subjected to the monopolist resort owner's control of the supply of meals.<sup>193</sup> However, Carlton's model requires that the firm be a monopolist in the resort market. If the resort did not hold a monopoly, it could not exclude outside restaurants from the market. Guests could simply stay at another resort that did not have the onsite meal requirement. In an island resort "duopoly," resort owners would hold *some* pricing power but lack the *significant* (i.e. monopoly) power over meal pricing to exclude all restaurants.<sup>194</sup>

### C. The Failure to Foreclose Primary Markets

Lessig's duopoly has not only failed to control secondary markets in content,<sup>195</sup> but the primary access market as well. The access market shows signs of increasing competition as various providers combine voice, video, and data services. Commentators have decried competition from alternative providers as "border[ing] on laughable"<sup>196</sup> and unrealistic.<sup>197</sup> Derek Turner, for example, argues that the FCC significantly overesti-

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192. *Id.*

193. *Id.*

194. The same argument holds true if the number of "monopolist" resorts increases. As soon as a resort appears that does not have an onsite meal requirement, the monopolists' significant power over meal pricing disappears.

195. See, e.g., *supra* notes 167-175. In an ever-increasing number of urban and rural areas, Lessig's duopoly is at worst an oligopoly, if not fully competitive. See *infra* notes 196-204, 207.

196. Bill D. Herman, *Opening Bottlenecks: On Behalf of Mandated Network Neutrality*, 59 FED. COMM. L.J. 103, 112 (2006). Herman cites the Free Press's outdated statistic that "cable and DSL providers control almost 98 percent of the residential and small-business broadband market." *Id.* at 126 (citing S. DEREK TURNER, FREE PRESS, BROADBAND REALITY CHECK: THE FCC IGNORES AMERICA'S DIGITAL DIVIDE 3 (2005), [http://www.freepress.net/docs/broadband\\_report.pdf](http://www.freepress.net/docs/broadband_report.pdf)). Turner's statements were roughly accurate in 2005. FCC, HIGH-SPEED SERVICES FOR INTERNET ACCESS: STATUS AS OF DECEMBER 31, 2006 at 6 tbl. 1, 8 tbl. 3 (2007) [hereinafter FCC HIGH-SPEED SERVICES], available at [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DOC-277784A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-277784A1.pdf). Turner's statements predated the significant increase in mobile wireless penetration. The 98% statement, when later cited in 2006 by Herman, was outdated. The release of the latest FCC report shows that DSL and cable providers have continued to experience pronounced market share declines, as this section discusses.

197. S. DEREK TURNER, FREE PRESS, BROADBAND REALITY CHECK II: THE TRUTH BEHIND AMERICA'S DIGITAL DECLINE 32 (2006) (criticizing the FCC's use of the zip code measure).

mates broadband availability,<sup>198</sup> especially in rural areas.<sup>199</sup> The FCC's 2004 decision to revamp its reporting requirements because previous standards "exempted some carriers from filing [broadband deployment reports] with the commission" resulting in undercounts, especially in "rural and underserved markets,"<sup>200</sup> undermines this claim. DSL and cable providers have been unable to exclude competitors, an indication that they do not wield monopoly power. The FCC's latest broadband internet service report illustrates the market share losses sustained by DSL and cable providers.<sup>201</sup> According to the report, cable modem providers, the most popular type of broadband internet access provider, accounted for just 38.9% of all high-speed lines in the United States as of December 31, 2006, down from 59.3% in December 2003.<sup>202</sup> ADSL providers' market share, roughly flat as a percentage of residential subscribers,<sup>203</sup> slid from 38.5% overall in June 2005 to 35.5% in December 2006, the first decline in DSL provider market share recorded by the FCC's high-speed services reports.<sup>204</sup> The big winners appear to be mobile wireless providers. Sprint Nextel, Verizon Wireless, and AT&T's wireless arm (formerly Cingular) market 3G voice and data technologies to businesses and consumers.<sup>205</sup> The FCC did not separately categorize mobile wireless providers until 2005. In that short

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198. *Id.*

199. *Id.* at 33. Turner erroneously cites a ConnectKentucky consumer survey that showed 23% of users were *unaware* of any available broadband options while the FCC showed 95% *availability*. *Id.* at 33 (internal citation omitted). ConnectKentucky, however, estimates that actual broadband *availability* in Kentucky is approximately 90%. CONNECTKENTUCKY, 2007 PROGRESS REPORT 4, [http://connectkentucky.org/\\_documents/connectkentucky\\_2007.pdf](http://connectkentucky.org/_documents/connectkentucky_2007.pdf). The latest FCC study zip code estimate is 97% availability, a far smaller difference than suggested by Turner. FCC HIGH-SPEED SERVICES, *supra* note 196, at 24 tbl.17.

200. Press Release, FCC, FCC Improves Data Collection to Monitor Nationwide Broadband Rollout (Nov. 9, 2004), *available at* [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DOC-254115A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-254115A1.pdf).

201. FCC HIGH-SPEED SERVICES, *supra* note 196, at 5 tbl.1, 7 tbl.3.

202. *Id.* at 6 tbl.1. Cable modem providers slipped in the narrower group of residential high speed line providers as well, dropping from 77.2% in December 2003 to just 53.3% in December 2006. *Id.* at 8 tbl.3.

203. *Id.* (showing that after an increase from 37.3% in June 2005 to 39.5% in December 2005, the residential market share for ADSL providers fell to 39.1% in December 2006).

204. *Id.* at 6 tbl.1.

205. Sprint Mobile Broadband Network, <http://powervision.sprint.com/mobilebroadband/> (last visited Apr. 14, 2007); Verizon Wireless, Broadband Access Wireless Internet Access, <http://solutions.vzwshop.com/bba/> (last visited Oct. 28, 2007); AT&T EDGE, <http://www.wireless.att.com/learn/why/technology/edge.jsp> (last visited Dec. 7, 2007).

time, though, these providers have blossomed from a 0.89% share in June 2005 to 26.5% in December 2006.<sup>206</sup> Over that period, wireless providers dramatically increased their service areas<sup>207</sup> and announced significant expansion plans.<sup>208</sup> The rapid growth in wireless broadband also blunts the criticism of net neutrality proponents that the FCC's use of a zip code-based measure provides an unrealistic picture of where broadband is available within the zip code.<sup>209</sup> Additionally, mobile and fixed wireless technologies, as well as satellite broadband, overcome many of the physical reach limitations of wired cable and DSL services, meaning that broader coverage of rural zip codes is possible.

Competitiveness extends beyond the traditional players and even the access market. Largely blocked by regulatory hurdles from directly entering cable TV markets, Verizon and AT&T have both released IPTV services to compete with entrenched cable TV service.<sup>210</sup> Google has bypassed both cable and DSL technologies to invest in a broadband over power line provider.<sup>211</sup> HughesNet offers satellite broadband.<sup>212</sup> Fixed wireless technologies have gained increasing traction in many urban and

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206. FCC HIGH-SPEED SERVICES, *supra* note 196, at 6 tbl.1.

207. Compare INDUS. ANALYSIS & TECH. DIV., FED. COMM'CNS COMM'N, HIGH-SPEED SERVICES FOR INTERNET ACCESS: STATUS AS OF JUNE 30, 2005 at 21 tbl.16 (2006), available at [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/DOC-264744A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-264744A1.pdf) (showing that mobile wireless providers did not serve 47.3% of zip codes in June 2005) with FCC HIGH-SPEED SERVICES, *supra* note 196, at 22 tbl.16 (only 12.8% of zip codes not served by a mobile wireless provider in December 2006).

208. See, e.g., Press Release, Sprint Nextel, Sprint Sets Its Sights on 2007 After Continuing to "Power Up" Networks in 2006 (Dec. 20, 2006), available at [http://www2.sprint.com/mr/news\\_dtl.do?id=14801](http://www2.sprint.com/mr/news_dtl.do?id=14801) (noting that Sprint's wireless broadband coverage was available to 188 million people, and announcing further speed and coverage upgrades in 2007 and 2008); Press Release, Cingular Wireless, Cingular 3G Coverage in More than 160 Markets (Dec. 20 2006), available at <http://att.centralcast.net/cingularnewsarchive/Release.aspx?ID=4191>; Juliette Fardulis, *Verizon Goes Into High Gear*, FORT COLLINS COLORADOAN, April 3, 2007, at 6B (discussing Verizon Wireless's expansion plans and noting that Verizon's wireless broadband coverage was available to 200 million people).

209. See TURNER, *supra* note 197.

210. Marguerite Reardon, *Verizon's TV Dreams*, CNET NEWS.COM, Oct. 13, 2005, [http://news.com.com/Verizons+TV+dreams/2100-1034\\_3-5894645.html](http://news.com.com/Verizons+TV+dreams/2100-1034_3-5894645.html); Marguerite Reardon, *Laying a New Path to Your TV*, CNET NEWS.COM, Dec. 28, 2006, [http://news.com/Laying+a+new+path+to+your+TV/2100-1034\\_3-6146207.html](http://news.com/Laying+a+new+path+to+your+TV/2100-1034_3-6146207.html) (describing AT&T's plans "to deliver its TV service en masse in 2007.").

211. Dawn Kawamoto, *Google Invests in Power-Line Broadband*, CNET NEWS.COM, July 7, 2005, [http://news.com.com/Google+invests+in+power-line+broadband/2100-1036\\_3-5777917.html](http://news.com.com/Google+invests+in+power-line+broadband/2100-1036_3-5777917.html).

212. HughesNet Services, <http://www.hughesnet.com/> (last visited Oct. 28, 2007).

rural markets,<sup>213</sup> often aided by government grants in rural areas with limited broadband choices.<sup>214</sup> Manufacturers aid in limiting the power of the traditional cable and DSL providers as well. Cellular chipset maker Qualcomm recently announced a new chipset for their market-leading EV-DO broadband wireless technology that offers 9.3 Mbps speeds,<sup>215</sup> rivaling the fastest of the wired broadband services. Intel, Motorola, and Samsung have backed the new WiMAX wireless standard, leading to Sprint's 2006 announcement of its impending deployment of a new nationwide network based on WiMAX.<sup>216</sup>

The decline in cable and DSL provider market share strongly suggests that this purported duopoly lacks the monopolist's ability to exclude rivals. While broadband providers undoubtedly have some market power to set prices, evidence shows that the market exhibits significant innovative flexibility and pricing power that falls well short of a monopoly. Even a purely price-based analysis supports the conclusion that broadband providers lack the prerequisite monopoly pricing power. The price of DSL

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213. FCC HIGH-SPEED SERVICES, *supra* note 196, at 5 tbl.1. Fixed wireless providers reported a 72.97% increase in subscribers from June 2005 to June 2006. The FCC report notes that many “[s]mall providers of high-speed connections . . . serve rural areas with relatively small populations.” *Id.* at 2.

214. The USDA's Rural Utilities Service program has funded numerous fixed wireless deployments in markets underserved or unserved by incumbent cable and DSL providers. See, e.g., USDA Rural Development, Utilities Programs, <http://www.usda.gov/rus/> (last visited Oct. 28, 2007) (announcing recent grants and loans); Press Release, Mt. Vernon Net, Closing the Gap on the Digital Divide (Sept. 23, 2003), available at <http://www.part-15.org/news/092603.html> (announcing USDA Rural Utilities Service grant to Mt. Vernon Net, a rural Illinois internet service provider); USDA, Veneman Announces \$11.3 Million in Broadband Technology Grants (Sept. 23, 2003), available at <http://www.usda.gov/documents/NewsReleases/2003/09/0328.doc>; USDA, Broadband Grants—September 2003, <http://www.rurdev.usda.gov/rd/newsroom/2003/sept03bbandgrants.html> (list of recipients including Mt. Vernon Net). See also Gerry Blackwell, *A WISP with a Vision*, ISP-PLANET, Jan. 5, 2007, [http://www.isp-planet.com/fixed\\_wireless/business/2007/mt.vernon.net.html](http://www.isp-planet.com/fixed_wireless/business/2007/mt.vernon.net.html) (“We can't build [fixed wireless] fast enough to serve everyone.” (quoting Mt. Vernon Net CEO John Scrivner)).

215. Press Release, Qualcomm Inc., Qualcomm Demonstrates Significant EV-DO Milestones with High-Capacity VoIP Over Rev. A and High-Speed Data Over Rev. B (Mar. 23, 2007), available at [http://www.qualcomm.com/press/releases/2007/070323\\_demonstrates\\_significant\\_ev\\_print.html](http://www.qualcomm.com/press/releases/2007/070323_demonstrates_significant_ev_print.html) (announcing the successful live demonstration of EV-DO chipsets achieving 114 simultaneous VoIP calls and 9.6 Mbps of peak throughput over a CDMA-based wireless network).

216. Press Release, Sprint Nextel, Sprint Nextel Announces 4G Wireless Broadband Initiative with Intel, Motorola and Samsung (Aug. 8, 2006), available at [http://www2.sprint.com/mr/news\\_dtl.do?id=12960](http://www2.sprint.com/mr/news_dtl.do?id=12960) (announcing the planned deployment that “will use [Sprint Nextel's] extensive 2.5GHz spectrum holdings, which cover 85 percent of the households in the top 100 U.S. markets”).

service from Verizon has decreased from \$49.95 per month for a 768 Kbps download ADSL service in 2001 (plus the cost of a modem rental)<sup>217</sup> to just \$14.99 per month (with a free modem) for the same 768 Kbps connection in 2007.<sup>218</sup> AT&T cable broadband pricing has fallen from \$45.95 in 2001<sup>219</sup> to as little as \$33 per month in 2007 with AT&T successor Comcast.<sup>220</sup> The price of cable modem service in 2007, priced per Mbps based on the bandwidth offered to customers, has declined to less than twenty-five percent of 2002 levels.<sup>221</sup>

While today's dominant content providers depend on broadband providers for content delivery to customers, broadband providers could not survive without content from Google, eBay, or Yahoo! driving demand for broadband service. Companies like Cox and Verizon have far less market power and influence today than CIX or other early commercial providers once had. Markets have adequately addressed, and will continue to address, harmful provider actions. Markets will continue to develop innovative service offerings, provided regulators do not squelch market responses with onerous regulation.

## VI. WHY CONGESTION AND TRANSACTION COSTS FAIL AS ANTI-REGULATION ARGUMENTS

Internet access and content markets have never been neutral. The failure of monopoly theories to describe real world, non-neutral internet markets undermines pro-regulation arguments. However, laissez-faire approaches proposed by commentators have significant flaws as well. In his

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217. Tom Spring, *Verizon Joins Broadband Price Hike Parade*, PC WORLD, May 2, 2001, <http://www.pcworld.com/article/id,48945-page,1/article.html>. See *supra* note 77 for definitions of Kbps and Mbps.

218. Verizon, *Verizon High Speed Internet Plans*, <http://www22.verizon.com/content/consumerdsl/plans/all+plans/all+plans.htm> (last visited Nov. 20, 2007).

219. Spring, *supra* note 217.

220. Comcast, *The Comcast Triple Play*, <http://www.comcast.com/tripleplay-s/> (last visited Nov. 20, 2007). Comcast offers the \$33 per month package for customers ordering a voice, video, and data package. *Id.* Comcast also offers a package at the same price for the first year for data-only subscribers who subscribe online. ComcastOffers.com, <http://www.comcastoffers.com/> (last visited Nov. 20, 2007) (offering \$19.99 per month for 6 months, \$42.95 per month thereafter).

221. The standard rate for Comcast service is \$42.95 per month for 6 Mbps, or \$7.16 per Mbps. Comcast Help, FAQ: What speeds are available with the Comcast High-Speed Internet or Comcast Home Networking services?, <http://www.comcast.net/help/faq/index.jsp?faq=Connection118073> (last visited Nov. 20, 2007) (detailing the speed/price packages available for customers). AT&T Broadband limited its customers to 1.5 Mbps for \$45.95—nearly \$31 per Mbps. Larry Dignan, *AT&T Broadband Opt's for Tiered Pricing*, CNET NEWS.COM, Aug. 1, 2002, <http://news.com/2100-1033-947559.html>.

recent article, Professor Yoo focused on network congestion and related economic concepts to explain why he favors less proactive neutrality regulation aimed at correcting concrete harms ex post.<sup>222</sup> Yoo argued, “flat-rate pricing results in excessive consumption of club resources,”<sup>223</sup> claiming that the “thirty-year old suite of protocols around which [the] Internet is currently designed . . . [is] an increasingly obsolete technology” that cannot address the bandwidth demands of today’s broadband users.<sup>224</sup> Yoo relies in part on his own research<sup>225</sup> and on a statement of the FCC’s former chief technologist, David Farber.<sup>226</sup>

Yoo, Farber, and others overlook the market’s technological response to the inadequacies of best-effort networking technologies,<sup>227</sup> as Section IV.A describes *supra*. More importantly, Yoo also overestimates the effect of congestion on the internet. Usage, traffic, and demand for service guarantees are growing, making network management more complex. However, complexity does not equate to difficulty or impossibility. Because of innovation at the network edge, both in service differentiation schemes and in the variety of last mile technologies, the internet does not neatly fit either economist James Buchanan’s “club goods” definition or economists’ definition of pure public goods.<sup>228</sup> Yoo’s arguments rely heavily on excessive consumption evidenced by widespread, constant congestion and

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222. Yoo, *supra* note 5, at 1907-08.

223. *Id.* at 1864.

224. *Id.* at 1863.

225. Daniel F. Spulber & Christopher S. Yoo, *On the Regulation of Networks as Complex Systems: A Graph Theory Approach*, 99 NW. U. L. REV. 1687 (2005).

226. Carol Wilson, *Point of No Return*, TELEPHONY, Apr. 3, 2006 (quoting former FCC Chief Technologist and Carnegie Mellon Professor David Farber to the effect that the current internet architecture is “getting old” and is increasingly unable to satisfy the demand for new functionality and services). While wrong on this point, as this section argues, Farber opposes net neutrality regulation for other reasons. See Farber & Katz, *supra* note 20.

227. A “best effort” network is one that makes no guarantees about delivering a particular piece of data, using a particular quality of service, or ensuring delivery time. A real-world analogy to best-effort delivery online is postal mail. A first-class letter carries no guarantee of delivery or time for delivery. A first class letter sent from California to New York during the summer would likely arrive at its destination more quickly than the same letter sent during the Christmas rush. A best-effort network does not necessarily fail to deliver lost data: some protocols used on internet networks—such as TCP—have provisions to “resend” a copy of your data in another “envelope” if the protocol does not receive an acknowledgement of delivery, while others—like UDP—work more like first class mail and do not resend your data in another envelope. See also *supra* note 58 (explaining the “envelope” analogy).

228. See Yoo, *supra* note 5, at 1863-64.

left unremedied due to high transaction costs.<sup>229</sup> The lack of actual congestion and high transaction costs undermine his laissez-faire position on neutrality.

### A. Overemphasizing Congestion

Using an example that follows the network path of downloading a webpage, Yoo implies that increases in complexity have led to increases in congestion.<sup>230</sup> However, as network use has grown, providers have addressed congestion problems.<sup>231</sup> While transient latency undoubtedly exists in certain places from time to time, widespread, significant congestion of the type that “gives rise to a number of important policy implications”<sup>232</sup> has decreased, not increased, over the past decade.<sup>233</sup> At Senate hearings in 2006, the Internet2<sup>234</sup> project’s Gary Bachula explained how expansion relegates congestion to largely isolated incidents. He testified that Internet2 engineers originally assumed that their new network would need advanced tools to differentiate among various types of data. However, their remedy for network-wide congestion of the type Yoo posits did not rely on QoS deployment. Bachula testified that “all of [their] research and practical experience supported the conclusion that it was far more cost effective to simply provide more bandwidth.”<sup>235</sup> Broadband technologies including fixed and mobile wireless and technologies not yet on the market may well render the congestion debate moot in the future.

Future technological advances aside, however, several studies expose the myth of increased congestion in today’s broadband era. Several organizations have undertaken long-term end-to-end performance measurement of internet connectivity since the mid-1990s.<sup>236</sup> The longest-running and most comprehensive of these studies is the Stanford Linear Accelerator Center’s Internet End-to-end Performance Monitoring (IEPM) pro-

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229. See *infra* Section VI.B.

230. *Id.* at 1861-63.

231. See *infra* note 250.

232. *Id.* at 1863.

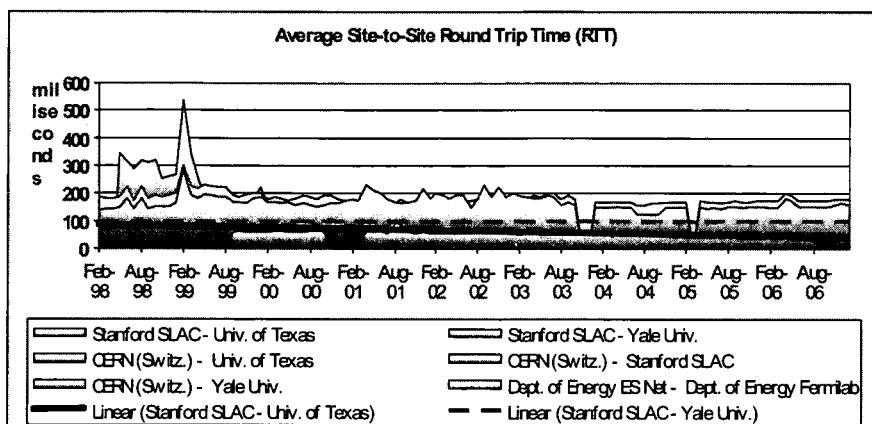
233. See *infra* notes 236-246 and accompanying text.

234. Internet2 is a non-profit advanced networking consortium of universities, commercial vendors, and government agencies. Internet2, About Internet2, <http://www.internet2.edu/about/> (last visited Nov. 20, 2007).

235. *Net Neutrality: Hearing Before the S. Comm. on Commerce, Science & Transportation*, 109th Cong. 2 (2006) (testimony of Gary R. Bachula), available at <http://commerce.senate.gov/pdf/bachula-020706.pdf>.

236. Les Cottrell et al., Comparison of Some Internet Active End-to-end Performance Measurement Projects, <http://www.slac.stanford.edu/comp/net/wan-mon/iepm-cf.html> (last visited Nov. 20, 2007).

ject.<sup>237</sup> The IEPM project maintains monitoring stations in nearly a dozen different countries, and many of the monitors have observed internet connectivity twice an hour since 1998. IEPM averages these readings together over the course of a month. While some monitor sites show significant, but transient, variability, the sites trend toward less congestion, not more.<sup>238</sup> Samples from the longest running monitor-to-monitor measurements illustrate that increased congestion has never materialized.<sup>239</sup>



The European non-profit internet infrastructure organization RIPE NCC also maintains a similar project, called Test Traffic Measurements (TTM).<sup>240</sup> RIPE's TTM project reports similar results between various worldwide sites,<sup>241</sup> whether testing between U.S. sites<sup>242</sup> or from European

237. Internet End-to-end Performance Monitoring, <http://www-iepm.slac.stanford.edu/> [hereinafter IEPM] (last visited Nov. 20, 2007).

238. See IEPM, PingER Site-by-monthly History Table, <http://www-iepm.slac.stanford.edu/cgi-wrap/pingtable.pl> (last visited Nov. 20, 2007) (Select "WORLD" from the "From" drop-down box, and retain other default form settings to replicate the data set.).

239. *Id.* The graph draws its data from the raw dataset provided by the IEPM project's data reporting engine. *Id.* The Microsoft Excel spreadsheet used to generate the graph is on file with the author.

240. RIPE NCC, Test Traffic Measurements, <http://www.ripe.net/ttm/> (last visited Nov. 20, 2007).

241. See, e.g., RIPE NCC, TTM summaries for tt01.ripe.net, <http://www.ripe.net/ttm/Plots/summary.cgi?sortfield=marked+cells&sortkey=relative+change&sortorder=descending&format=html&threshold=+40.0&unit=percent&boxname=tt01&file=summary.xml> (last visited Oct. 28, 2007) (displaying detailed latency, throughput, and transit times from RIPE NCC's monitor in Amsterdam to various worldwide sites). Each site shows six-month trend data. Long-term data is available from a search form.

to U.S. sites across the heavily trafficked trans-Atlantic connections.<sup>243</sup> U.S.-based internet traffic analyst Keynote Systems maintains website performance indices of popular consumer and business sites. Keynote's performance ratings of these major consumer<sup>244</sup> and business sites<sup>245</sup> have barely budged since their 2005 inception, despite the added textual and graphic complexity of most of its index sites over that same period.<sup>246</sup>

Despite staggering growth in users and bandwidth demands,<sup>247</sup> the deteriorating club good has yet to materialize. Professor Yoo mistakenly labels service differentiation as a provider response "to mitigate the problems of congestion and latency on the Internet."<sup>248</sup> While differentiating between applications can mitigate some congestion, no amount of reshuffling of traffic priorities can substitute for adequate bandwidth capacity. At the same time, Yoo notes that networks often "maintain a certain level of excess capacity" that can make them always appear slack.<sup>249</sup> Given this network engineering maxim, long-term evidence that belies sustained congestion problems may be less surprising. Yoo's focus on congestion

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242. See, e.g., RIPE NCC, Test Traffic Delay Plots: TT87—CERN at Starlight [Networks, a Chicago-based internet provider], Chicago, IL, US to TT84—XO Comms., Inc. Reston, Va., [http://www.ripe.net/ttm/Plots/plots.cgi?ipv=4&url=map\\_index.cgi&base=tt84&src=tt87&dst=tt84#trends](http://www.ripe.net/ttm/Plots/plots.cgi?ipv=4&url=map_index.cgi&base=tt84&src=tt87&dst=tt84#trends) (last visited Oct. 28, 2007) (displaying detailed monitor data between test sites in Chicago and Reston). Note that the six-month trend line is flat-to-declining.

243. See, e.g., RIPE NCC, Test Traffic Delay Plots: TT84—XO Comms., Inc. Reston, Va. to TT01—RIPE NCC at AMX-IX, Amsterdam, NL, [http://www.ripe.net/ttm/Plots/plots.cgi?ipv=4&url=map\\_index.cgi&base=tt01&src=tt84&dst=tt01#trends](http://www.ripe.net/ttm/Plots/plots.cgi?ipv=4&url=map_index.cgi&base=tt01&src=tt84&dst=tt01#trends) (last visited Oct. 28, 2007) (displaying detailed monitor data between test sites in Reston and Amsterdam). Again, the six-month trend line is flat-to-declining.

244. Compare Keynote Consumer 40 Internet Performance Index (KC40): Week of 08-15-2005, [http://www.keynote.com/solutions/performance\\_indices/consumer\\_index/consumer\\_40-081505.html](http://www.keynote.com/solutions/performance_indices/consumer_index/consumer_40-081505.html) (last visited Nov. 20, 2007) (reporting a KC40 Index of 30.98 seconds) with KC40: Week of 09-25-2006, [http://www.keynote.com/solutions/performance\\_indices/consumer\\_index/consumer\\_40-092506.html](http://www.keynote.com/solutions/performance_indices/consumer_index/consumer_40-092506.html) (last visited Nov. 20, 2007) (reporting a KC40 Index of 32.49 seconds). From October 2005 through October 2006, the KC40 Index rarely moved outside the range of 32 to 34 seconds.

245. Compare Keynote Business 40 Internet Performance Index (KB40): Week of 01-02-2006, [http://www.keynote.com/keynote\\_competitive\\_research/performance\\_indices/business\\_index/business-010206.html](http://www.keynote.com/keynote_competitive_research/performance_indices/business_index/business-010206.html) (last visited Nov. 20, 2007) (reporting a KB40 Index of 1.8 seconds) with KB40: Week of 01-01-2007, [http://www.keynote.com/solutions/performance\\_indices/consumer\\_index/consumer\\_40-092506.html](http://www.keynote.com/solutions/performance_indices/consumer_index/consumer_40-092506.html) (last visited Nov. 20, 2007) (reporting a KB40 Index of 1.84 seconds).

246. See generally Internet Archive Wayback Machine, <http://www.archive.org/web/web.php>, and dated archives of sites used in the KC40 and KB40 indices.

247. Yoo, *supra* note 5, at 1862-63.

248. *Id.* at 1881.

249. *Id.* at 1870.

does not explain decisions to implement application differentiation policies on networks with a surplus of bandwidth. Service differentiation tools respond not to supposedly pervasive, internet-wide congestion or latency, but to a wealth of *individual provider* needs, not the least of which is to align network resource usage with business objectives.<sup>250</sup>

Internet users owe the remarkable stability of end-to-end performance to innovations in service differentiation and management<sup>251</sup> and in last mile technologies. Companies announce new technologies for delivering content<sup>252</sup> and expansions of non-cable, non-DSL broadband platforms<sup>253</sup> on an almost daily basis. Supply keeps pace with demand due to invest-

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250. See, e.g., Press Release, NetScout Systems, Inc., Survey Reveals Users of Sophisticated Network Monitoring Tools Diagnose Network Performance Problems 69 Percent Faster (May 22, 2007), available at <http://www.netscout.com/news/07/0522b.asp> (showing broad use of QoS policies and noting that neither of the two most cited reasons for implementing QoS—representing nearly two-thirds of QoS deployments in the survey—were related to system-wide congestion); TELECHOICE, ENABLING CONTENT SERVICES: A SERVICE PROVIDER PERSPECTIVE 6 (2003), <http://www.telechoice.com/whitepapers/BCDFPaper-F.pdf> (“Each of the [broadband] providers we spoke with has spent a considerable amount of time and effort developing and implementing QoS mechanisms for their networks” to ensure service quality for both bandwidth-intensive and low-bandwidth applications, not to address network-wide congestion.); EDUCAUSE CTR. FOR APPLIED RESEARCH, INFORMATION TECHNOLOGY NETWORKING IN HIGHER EDUCATION: CAMPUS COMMODITY AND COMPETITIVE DIFFERENTIATOR 84 (2005) (finding more than three-quarters of responding bachelor’s-degree-granting educational institutions had implemented QoS for packet shaping purposes).

251. See *supra* notes 108-118 and accompanying text (discussing the development of service differentiation tools).

252. See, e.g., Jefferson Graham, *Verizon Wireless Goes Prime Time with TV Simulcasts via Cellphone*, USA TODAY, Jan. 8, 2007, at 1A (noting that Qualcomm, which provides the chipsets to Verizon Wireless for its TV service, “has invested more than \$800 million in its ambitious cell phone TV network.”); Li Yuan, *Cellphone Video Gets On the Beam: Samsung’s New Technology Enables Reception Of Digital TV Broadcasts*, WALL ST. J., Jan. 4, 2007, at B3 (describing Samsung’s new chipset enabling digital TV signal broadcasts to cellular telephones).

253. See, e.g., *Broadband via power lines to be offered in Onondaga*, WATERTOWN DAILY TIMES, Jan. 8, 2007, at B2 (“National Grid and a Syracuse company announced an agreement Thursday that will provide for a high-speed broadband over-the-power-line connection in some Syracuse suburbs.”); Press Release, Sprint Nextel, Sprint Nextel Cites WiMAX Network Progress for 2007 (Jan. 8, 2007), available at [http://www2.sprint.com/mr/news\\_dtl.do?id=15000](http://www2.sprint.com/mr/news_dtl.do?id=15000) (announcing intention “to launch Mobile WiMAX broadband services in initial markets by year-end 2007 with a larger roll-out encompassing at least 100 million people by year-end 2008.”); Press Release, Wisper Telecommunications, Inc., WisperTel Brings Wireless High-Speed Internet to Summit County (Jan. 9, 2007), available at <http://www.prnewswire.com/cgi-bin/stories.pl?ACCT=104&STORY=/www/story/01-09-2007/0004503185&EDATE=> (announcing broadband wireless service expansion).

ment in additional bandwidth capacity, such as Verizon's late 2006 announcement of a \$500 million capacity expansion from the U.S. to China.<sup>254</sup> As capacity demands increase in China, other bandwidth providers like AT&T, who "is in talks with Telekom Malaysia and . . . StarHub," race to take advantage.<sup>255</sup> Providers repeat this network investment spree all over the world. When coupled with long-term data reflecting a lack of overall network congestion,<sup>256</sup> this investment further undercuts Yoo's theory of a congested internet suffering from an "excessive consumption of club resources."<sup>257</sup>

### B. Overemphasizing Transaction Costs

Adam Thierer explained that providers facing potential excessive consumption "might need to configure network architectures differently or even restrict certain online activities."<sup>258</sup> Buchanan's theory of club goods holds that flat-rate pricing will induce club members (internet users in this case) to maximize personal consumption, since the marginal cost of another unit of usage is zero.<sup>259</sup> Taken together, these individual decisions increase overconsumption of the club good, building an economic case for usage-sensitive pricing, rather than restrictions.<sup>260</sup> Yoo theorizes that providers cannot rely on usage-sensitive pricing due to high transaction costs that Buchanan's theory necessarily assumes away.<sup>261</sup> Yoo agrees that network reconfiguration or restriction is the only option for access providers, since "the transaction costs associated with metering internet traffic are likely to be even more significant than those associated with local telephone service."<sup>262</sup>

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254. See, e.g., *Verizon Teams with Asian Companies for High-speed Cable to China*, USA TODAY, Dec. 19, 2006, at 3B.

255. *Id.*

256. See *supra* notes 236-246 and accompanying text.

257. Yoo, *supra* note 5, at 1864.

258. Adam Thierer, *Are "Dumb Pipe" Mandates Smart Public Policy? Vertical Integration, Net Neutrality, and the Network Layers Model*, 3 J. ON TELECOMM. & HIGH TECH. L. 275, 296 (2005).

259. See generally James Buchanan, *An Economic Theory of Clubs*, 32 ECONOMICA 1 (1965); RICHARD CORNES & TODD SANDLER, *THE THEORY OF EXTERNALITIES, PUBLIC GOODS, AND CLUB GOODS* 351-52 (1996).

260. Yoo, *supra* note 5, at 1864.

261. *Id.* at 1865 (Buchanan's model showing a preference for usage-based pricing "depends on the assumption that exclusion and metering is costless.").

262. *Id.* at 1875.

However, Yoo's justification relies on outdated information<sup>263</sup> and overemphasizes transaction costs in an attempt to support his arguments against network neutrality. Professor Yoo bases much of his economic argument for "allow[ing] network providers to pursue alternative pricing regimes" on flawed, and now extremely outdated, research by economists Jeffrey MacKie-Mason and Hal Varian. As this section explains, their research into pricing mechanisms on internet networks reflected a deep misunderstanding of the internet's connection-oriented traffic and the traffic accounting and management tools available to providers in 1995. MacKie-Mason and Varian also arrived at conclusions about the future that overlooked the potential for technological advances. Yoo compounded each of these misunderstandings. Yoo cited their work without acknowledging the *actual* technological advances in traffic accounting and management since 1995, much less the erroneous 1995-era assumptions in the original.<sup>264</sup> Like MacKie-Mason, he erred in applying the concept of a dynamic, "connectionless" internet to the connection-oriented data streams that flow over it.<sup>265</sup> Relying on this flawed foundation, Yoo concluded transaction costs in metering and monitoring internet traffic were "likely to be even more significant than those associated with local telephone service."<sup>266</sup>

### *1. Theoretical Congestion Solutions*

Jeffrey MacKie-Mason and Hal Varian first applied Buchanan's congestion pricing model to the internet, proposing a market-priced approach to resource allocation on congested networks.<sup>267</sup> In MacKie-Mason and Varian's model, each packet on a network would carry a bid value indicating how much the packet owner would pay to pass the packet through a congested device.<sup>268</sup> The router would compare the values of all incoming packets in an auction format, admitting the highest bidders. Provided the

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263. *E.g.*, *id.* at 1854 n.24, 1868 n.94, 1875 n.125, 1883 n.168, 1884 n.171 (citing Jeffrey K. MacKie-Mason & Hal R. Varian, *Some FAQs About Usage-Based Pricing*, 28 COMPUTER NETWORKS & ISDN SYS. 257, 263 (1995)); *see also infra* notes 285-297 (addressing the shortcomings of MacKie-Mason & Varian's work and its inapplicability to modern networks).

264. *E.g.*, Yoo, *supra* note 5, at 1875 (citing MacKie-Mason and Varian and repeating their mistaken assumption that "multiple records are required to account for every Internet-based communication" because of supposedly untraceable packet-by-packet internet communication).

265. *Id.* ("In addition, the Internet is connectionless, in that it does not establish a closed, dedicated circuit between the originating and the terminating computers.").

266. *Id.*

267. Jeffrey K. MacKie-Mason & Hal R. Varian, *Pricing the Internet*, in PUBLIC ACCESS TO THE INTERNET 269 (Brian Kahin & James Keller eds., 1995).

268. *Id.* at 293.

bids accurately reflected owner preferences, the congestion market would theoretically internalize the congestion externalities.<sup>269</sup>

The system devised by the two economists has several practical shortcomings, though. Bids need updates to avoid packet loss when bid “money” runs out after traversing several congested networks successfully. While computing power and programming ingenuity could overcome some of the transaction costs of processing messages in such a system, the signaling required to notify packet owners would further burden the already congested links and result in additional delays for packet delivery. Worse, network operators would effectively lose control of their network operations under a protocol-based congestion resolution mandate.

While theoretical solutions, such as MacKie-Mason and Varian’s, preferred usage-based pricing, they traditionally assumed that any necessary metering carried no costs.<sup>270</sup> Later research relaxed this assumption, finding that competitive sellers could achieve the same equilibrium by offering a flat-rate price that equaled the base price in a usage-sensitive model plus the unit costs at the Pareto optimal consumption.<sup>271</sup> As Yoo noted, under this relaxed model, providers can “choose the pricing regime that imposes the fewest transaction costs.”<sup>272</sup>

In this sense, engineering concerns have a significant effect on a provider’s choice to price-discriminate. Instead of a market-pricing approach, providers have approximated a congestion-prevention solution at the network’s edges (likely inflaming the net neutrality debate in part). This split-edge pricing framework<sup>273</sup> attempts to solve the problems created by settling payments for each individual packet in the MacKie-Mason and Varian model.<sup>274</sup> Rather than force packet owners to make individual pay-

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269. *Id.*

270. Robert W. Helsley & William C. Strange, *Exclusion and the Theory of Clubs*, 24 CAN. J. ECON. 888, 889, 895-96 (1991) (noting that earlier research found Pareto efficiency only if exclusion or metering were costless).

271. Robert J. Barro & Paul M. Romer, *Ski-Lift Pricing, with Applications to Labor and Other Markets*, 77 AM. ECON. REV. 875, 876-79 (1987).

272. Yoo, *supra* note 5, at 1866.

273. The term “split-edge pricing,” and the theory behind its modified congestion model, first appeared in a paper presented by British Telecom researcher Bob Briscoe in 1999. Bob Briscoe, British Telecom Networks Research Ctr., The Direction of Value Flow in Connectionless Networks: Address before the First Annual Workshop on Networked Group Communication (Nov. 19, 1999), available at [http://www.cs.ucl.ac.uk/staff/bbriscoe/projects/charging/qos-based/e2char/valflow\\_ngc99.html](http://www.cs.ucl.ac.uk/staff/bbriscoe/projects/charging/qos-based/e2char/valflow_ngc99.html).

274. Several technical approaches to address congestion exist in addition to split-edge pricing. IP packet headers include, though rarely use, an explicit congestion mechanism (ECN) to signal network congestion explicitly to end users. On frame relay networks, devices regularly use similar notifications (Forward and Backward ECN, or FECN and

ments at each congested network device, owners in a split-edge-priced network pay only at the network's edge. Each edge provider sets the cost of delivering packets across its network based on its internal costs, the costs of transferring traffic to other networks, and "one of possibly many classes of service."<sup>275</sup>

In the split-edge pricing framework, both senders and receivers pay a charge for transmissions, with potentially different prices in each direction.<sup>276</sup> Briscoe's framework presents several models for payments, advocating the use of third-party clearinghouses that iteratively settle interdomain charges between providers. He notes, however, that there is "nothing to stop providers or customers [from] assuming the clearinghouse role."<sup>277</sup> The third-party clearinghouse has never materialized on the internet. As discussed in Section III.B, providers have instead entered into pairs of financial agreements at each point: end users with last mile providers, last mile providers with backbone providers, etc.<sup>278</sup>

## 2. *Correcting MacKie-Mason, Varian, and Yoo's Misunderstandings*

If the internet suffers from transient and isolated congestion, then high transaction costs would theoretically explain the pervasive flat-rate prices in broadband and dial-up internet access. Yoo turns to traditional telecommunications metering regimes in an attempt to explain internet pricing mechanisms.<sup>279</sup> However, parties in the net neutrality debate should avoid equating the evolution of service and pricing in the largely unregulated internet sector with that of the highly regulated telecommunications sector.

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BECN) to signal congestion. ATM networks offer built-in classes of service that can allow congestion (unspecified bit rate, or UBR), reserve bandwidth for a particular ATM user (constant bit rate, or CBR), or provide a way to eliminate congestion by allowing the ATM network to recapture unused bandwidth (variable bit rate, or VBR). As built-in features of standard protocols and data encapsulations, their use does not result in transaction costs. These technical approaches are beyond the scope of this article.

275. Briscoe, *supra* note 273, at § 5. Briscoe notes that this model is general enough to include specific tools such as "RSVP and diffserv." *Id.* The latter term refers to the technical name for the open source Linux tools described at notes 109-111, *supra*, and accompanying text.

276. Briscoe, *supra* note 273, at §§ 5, 9.

277. *Id.* at § 7.

278. Briscoe describes this system in one of his example scenarios: "A price needs to be set and settlement made between each pair of parties. If this is achieved, end-to-end, between the parties involved there are no further engineering implications—the pairs of parties clearly trust each other enough to enter into a financial arrangement and are willing to accept the cost of the transaction." *Id.* at § 9.1.

279. Yoo, *supra* note 5, at 1866-70.

As Yoo noted later, "Internet-based communications operate on fundamentally different principles."<sup>280</sup> Despite this, he still assumed that "the transaction costs associated with metering Internet traffic are likely to be even more significant than those associated with local telephone service."<sup>281</sup>

The underlying reasons for price discrimination and usage-based pricing help illustrate why the reverse is increasingly true. Internet providers' attraction to service and price discrimination will likely increase for two reasons.<sup>282</sup> Just as a pharmaceutical drug costs millions to develop but dramatically less to manufacture and distribute, the total cost of providing internet service consists increasingly of capital expenditures and one-time expenses rather than marginal costs.<sup>283</sup> Accordingly, the effect of transaction costs on the bottom line of service providers is gradually decreasing. At the same time, technology has made price discrimination simpler and less costly. In 2000, Amazon created a stir when it experimented with dynamic pricing.<sup>284</sup> Brick-and-mortar booksellers had few tools in the pre-internet days to create similar schemes. Internet service providers, too, benefit from advancements in technology that enable detailed levels of control over traffic.

The overemphasis on transaction costs may stem from rapid advancement in technologies. A decade ago, commentators differentiated between the connection-oriented telephony network and a "connectionless" internet. MacKie-Mason and Varian wrote that "if telephone-style accounting were implemented [for the Internet], the equivalent of a one-minute local phone call would generate about 2500 accounting records, and a ten-

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280. *Id.* at 1875.

281. *Id.*

282. Studies have long held that "generally, discriminatory prices [are] required for an optimal allocation of resources in real life situations." See LOUIS PHLIPS, THE ECONOMICS OF PRICE DISCRIMINATION 1 (1983) (emphasis omitted).

283. See, e.g., *supra* notes 88-89 and accompanying text. The advent of fixed wireless technologies, the widespread availability of co-location and shared web hosting facilities, and the emergence of niche application providers have lowered the variable costs of providing internet service.

284. David Streitfeld, *On the Web, Price Tags Blur; What You Pay Could Depend on Who You Are*, WASH. POST, Sept. 27, 2000, at A1. Customers reported similar activity in the spring of 2000, and a summer 2000 academic study found evidence of dynamic pricing on Amazon's site. Coca-Cola also reportedly experimented with soda machines that could dynamically price drinks based on the temperature. *Id.*; see also Robert M. Weiss & Ajay K. Mehrotra, *Online Dynamic Pricing: Efficiency, Equity, and the Future of E-Commerce*, 6 VA. J. L. & TECH. 11 (2001). Should Amazon resurrect the use of discriminatory pricing, it too would make an interesting case study for the application of Dr. van Schewick's monopoly theories. See *supra* note 134 and accompanying text.

minute call would require 25,000 records.”<sup>285</sup> The authors used the analogy of web server logs recording an accounting record or “hit” for each individual file accessed on a webpage. If usage analysis required examining a “hit” in a log for every packet, then providers attempting usage analysis would struggle under a deluge of data. With incredulity, MacKie-Mason and Varian wrote that low-quality compressed video required “about 45 Mbs—which is the entire capacity of the NSFNet backbone.”<sup>286</sup> Today’s users can watch compressed video feeds from YouTube, professional sports leagues, and video blogs with considerably lower speed connections, just as traffic accounting technologies have improved.<sup>287</sup>

However, MacKie-Mason, Varian, and Professor Yoo misunderstand what engineers and technical commentators meant by “connectionless.” The internet’s underlying architecture is connectionless “in that it does not establish a closed, dedicated circuit between the originating and the terminating computers. Instead, each packet is allowed to move independently.”<sup>288</sup> However, the data streams running over this dynamic internet have never been “connectionless,” even in 1995. The path *between* a particular source and destination on the internet can change dynamically, but the source and destination endpoints remain the same regardless of the particular network path selected. An end user who connects to a particular website will create a distinct, connection-oriented stream of communication between their computer and the web server hosting the site. The user-to-server connection, regardless of the number of files actually downloaded from the site, has a distinct, recognizable “signature.”<sup>289</sup> Even at the time of MacKie-Mason and Varian’s article, the free Linux operating system supported rudimentary filtering.<sup>290</sup> Modern tools allow provid-

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285. MacKie-Mason & Varian, *supra* note 263, at 263 (1995).

286. *Id.* at 260. “Mbs” means “Mbps.” See *supra* note 77.

287. E.g., Major League Baseball, *supra* note 77.

288. Yoo, *supra* note 5, at 1875. Although he does not cite it directly, Professor Yoo cites the same (correct) definition used by MacKie-Mason and Varian. See MacKie-Mason & Varian, *supra* note 263, at 263.

289. More technically, the “signature” of a TCP or UDP connection consists of a wealth of potential information: IP addresses, port numbers, connection “states,” packet sizes, types of information, and more. See INFO. SCIS. INST., UNIV. OF S. CAL., RFC 793: TRANSMISSION CONTROL PROTOCOL (TCP) DARPA INTERNET PROGRAM PROTOCOL SPECIFICATION (Jon Postel ed., 1981), available at <http://www.ietf.org/rfc/rfc793.txt>; JON POSTEL, RFC 768: USER DATAGRAM PROTOCOL (UDP) (1980), available at <http://www.ietf.org/rfc/rfc768.txt>. The discussion that follows draws primarily from those two technical standards documents.

290. Mark Stone, *A Linux Firewall Primer*, LINUX.COM, Oct. 14, 2004, <http://security.linux.com/security/04/10/11/2030249.shtml?tid=100&tid=35> (“Firewall code has been included in standard Linux distributions from early on.”).

ers to identify traffic based on any portion of the data stream signature without inspecting each packet.<sup>291</sup> Those same tools permit providers to classify, police, mark, and re-queue packets for delivery based on their service differentiation policies.<sup>292</sup> These filtering mechanisms' abilities to identify streams of traffic are unaffected by the "connectionless" path between the streams' source and destination, a crucial distinction that fatally undermines MacKie-Mason, Varian, and Yoo's conclusions about accounting costs for those data streams.<sup>293</sup>

Providers can now generate reports and bill customers based on bandwidth usage as well, something virtually impossible in 1995. Cisco's NetFlow software enables providers to perform "network traffic accounting, *usage-based network billing*, network planning, security, Denial of Service monitoring capabilities, and network monitoring."<sup>294</sup> The company touts its NetFlow software in customer usage-based billing case studies.<sup>295</sup> Popular internet provider billing software supports not just Cisco's NetFlow, but other service differentiation products on the market as well.<sup>296</sup> Internet providers with more available technical knowledge than available capital can download less expensive, or free, utilities to provide similar functionality.<sup>297</sup>

### *3. A Forward-Looking Justification for Ex Post Regulation*

Professor Yoo may find justification for his ex post regulatory stance, however, by looking forward at the possibilities of innovation, rather than backward at misunderstood internet technologies. Game theory research

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291. See RUSTY RUSSELL, LINUX 2.4 PACKET FILTERING HOWTO § 7 (2002), <http://www.netfilter.org/documentation/HOWTO/packet-filtering-HOWTO-7.html>.

292. See generally Hubert et al., *supra* note 118.

293. See Stone, *supra* note 290; RUSSELL, *supra* note 291.

294. Cisco Systems, Cisco IOS Netflow, [http://www.cisco.com/en/US/products\\_ps6601/products\\_ios\\_protocol\\_group\\_home.html](http://www.cisco.com/en/US/products_ps6601/products_ios_protocol_group_home.html) (last visited Nov. 20, 2007) (emphasis added).

295. CISCO SYS., INC., GTE INTERNETWORKING (2006), [http://www.cisco.com/warp/public/cc/pd/iosw/ietf/nefclt/profiles/gtent\\_cp.pdf](http://www.cisco.com/warp/public/cc/pd/iosw/ietf/nefclt/profiles/gtent_cp.pdf).

296. Rodopi Software, Bandwidth Management Devices, <http://www.rodopi.com/index.php?page=20701> (last visited Nov. 20, 2007).

297. See, e.g., ntop.org, network top, <http://www.ntop.org/news.html> (last visited Nov. 20, 2007); NetUP Inc., UTM 5: Universal ISP Billing System, <http://www.netup.biz/article-utm5-billing-system-modules.php> (last visited Nov. 20, 2007); FreeSide Billing and Trouble Ticketing, <http://www.sisd.com/freeside/> (last visited Nov. 20, 2007). The ntop project also includes a lightweight probe called "nprobe" that uses Cisco's NetFlow protocol, and therefore integrates with any commercial or non-commercial billing package that supports NetFlow. ntop.org, nProbe, <http://www.ntop.org/nProbe.html> (last visited Nov. 20, 2007).

applied to internet protocol design may obviate any debate about high transaction costs for usage-based billing and provide the essentially cost-free transactions necessary for Buchanan's theory to appear in internet access pricing.<sup>298</sup> Existing solutions described above, while low-cost compared to MacKie-Mason and Varian's packet-by-packet accounting, carry much higher costs than a future dynamic pricing protocol—such as their “bid” method<sup>299</sup>—would. When used to remove adverse user incentives,<sup>300</sup> the theory of mechanism design could allow a new internet protocol developed through game theory research to capture usage automatically without the need for external billing systems or analysis software.<sup>301</sup>

Several researchers have reported their practical experiences applying mechanism design and game theory to internet networking.<sup>302</sup> While some of these researchers encountered difficulties applying theory to networking models,<sup>303</sup> any application that improves upon the current add-on external reporting schemes such as NetFlow—for example, by adding a dynamic, internal component or by replacing external reporting completely—could lower transaction costs dramatically. One of the shortcomings of Dr. van Schewick's theories is their inapplicability to the real internet.<sup>304</sup> To provide a foundation for Professor Yoo's ex post regulation, game theory and mechanism design must overcome this same barrier. Harvard researchers Jeffrey Shneidman and David Parkes have made progress toward ensuring that game theory can apply to real-world distributed internet networks. In a 2004 symposium paper, Shneidman and Parkes presented methods to prove that an implementation of a mechanism in a real-world distributed

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298. See *supra* notes 258-261 and accompanying text.

299. See *supra* text accompanying notes 268-270.

300. See *infra* Part V.A.

301. Mechanism design takes game theory to “game reality” by ensuring that a game's design achieves a particular outcome. In this case, game theory would develop the protocol, and mechanism design would ensure that the real world outcome matched the intended result. See generally ERIC RASMUSSEN, GAMES AND INFORMATION (4th ed. 2006).

302. E.g., Elgan Huang et al., *Rethinking Incentives for Mobile Ad Hoc Networks*, in PROCEEDINGS OF THE ACM SIGCOMM WORKSHOP ON PRACTICE AND THEORY OF INCENTIVES IN NETWORKED SYSTEMS 191 (2004); Ratul Mahajan et al., *Experiences Applying Game Theory to System Design Networks*, in PROCEEDINGS OF THE ACM SIGCOMM WORKSHOP ON PRACTICE AND THEORY OF INCENTIVES IN NETWORKED SYSTEMS 183 (2004).

303. Mahajan, *supra* note 302, at 183-90.

304. See *supra* note 181 and accompanying text.

system will match a designer's specification.<sup>305</sup> Just as MacKie-Mason and Varian scoffed at the idea of accounting for traffic flows in real time in 1995, the currently implausible idea of an internet protocol that automatically manages usage-based pricing may prove simplistic by 2015.

Commentators outside of internet service provider and engineering research circles, unfortunately, have not always kept pace with these technological advances, and sometimes rely on outdated research<sup>306</sup> or misunderstandings of technical issues.<sup>307</sup> However, the innovative internet market does not wait for theoretical research. With transaction costs for service differentiation low, capacity problems transient at worst, and internet providers free from common carrier regulation or legacy billing practices of telephony providers, usage-based pricing already should have emerged. However, despite a myriad of possible pricing schemes,<sup>308</sup> flat-rate prices still dominate the broadband access sector.<sup>309</sup> This pricing phenomenon has a simple explanation: the power of end users. End users also hold the key to a uniform disclosure solution that avoids market regulation while encouraging the market to bypass any future discriminatory burdens on new innovators.<sup>310</sup>

## VII. THE HUMAN ELEMENT

### A. End User Effects on Pricing and Service

All internet service pricing schemes share a common element: end users. Especially in the United States, end users view unlimited, flat-rate

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305. Jeffrey Shneidman & David C. Parkes, *Specification Faithfulness in Networks with Rational Nodes*, in 23 ACM SYMPOSIUM ON PRINCIPLES OF DISTRIBUTED COMPUTING 88 (2004).

306. See, e.g., Yoo, *supra* note 5, at 1854 n.24 (citing MacKie-Mason & Varian, *supra* note 263); *id.* at 1868 n.95 (citing a January 1998 article about telecommunications billing practices); *id.* at 1875 n.125 (citing MacKie-Mason & Varian, *supra* note 263).

307. See, e.g., *id.* at 1875. Drawing from MacKie-Mason & Varian, *supra* note 263, Yoo writes that "multiple records are required to account for every Internet-based communication," when networking equipment today no longer inspects data in this way.

308. Yoo, *supra* note 5, at 1870-72 (describing the various pricing schemes used in telecommunications, including peering exchanges and wireless telephony service).

309. See, e.g., Consumers Union of U.S., Inc., *Internet Service: Fiber Joins the Fray*, CONSUMER REP., Feb. 2007, at 24. The report lists a flat-rate price for all twenty-nine providers rated.

310. This addresses a central concern of net neutrality proponents like Professor Lessig. See Lessig Testimony, *supra* note 27, at 2 ("The incentives in a world of access-tiering . . . will only burden new innovators.").

internet access as the standard.<sup>311</sup> As Andrew Odlyzko of the University of Minnesota's Digital Technology Center notes, “[p]eople react extremely negatively to price discrimination. They also dislike the bother of fine-grained pricing, and are willing to pay extra for simple prices, especially flat-rate ones.”<sup>312</sup> Judging from pervasive flat-rate wireline and wireless telephone service in the United States,<sup>313</sup> users appear willing to avoid complex pricing schemes, even if they pay a premium for a simple, more predictable plan.

Few actual usage-based pricing studies of broadband internet access exist, since users have generally insisted on flat-rate pricing. Instead, economic theory and applied mathematics have helped to explain the market's adoption of flat-rate pricing. Rather than provider transaction costs or internet congestion, small-scale economic studies and game theory research have found that users *themselves* have the greatest effect on the market's pricing choices.

In an early study from the late 1990s, the Internet Demand Experiment (INDEX) project studied user responses to usage-based pricing for access to different levels of service.<sup>314</sup> The project tested approximately seventy users, giving them access via ISDN at speeds up to 128 Kbps. Users could select a free low-speed connection, or pay per minute and per byte for higher speed connections. The project's results supported the idea that users preferred flat-rate pricing, even when researchers required users to pay a premium for it.<sup>315</sup> The study had a limited scope, given the small sample size and the tendency of subjects to be early adopters and heavy users of the internet.<sup>316</sup> Furthermore, the study did not test service differentiation within a broadband connection. However, other studies of user responses to application differentiation indicate that users prefer the stable service

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311. Thierer, *supra* note 258, at 299 (“[T]he web-surfing public has come to view ‘all you can eat’ buffet-style, flat-rate pricing as a virtual inalienable right.”).

312. ANDREW ODLYZKO, PRICING AND ARCHITECTURE OF THE INTERNET: HISTORICAL PERSPECTIVES FROM TELECOMMUNICATIONS AND TRANSPORTATION 29 (2004), <http://www.dtc.umn.edu/~odlyzko/doc/pricing.architecture.pdf>.

313. Yoo, *supra* note 5, at 1868, 1870.

314. Richard J. Edell & Pravin P. Varaiya, *Providing Internet Access: What We Learn from INDEX*, 13 IEEE NETWORK, Sept./Oct. 1999, at 18-25.

315. HAL R. VARIAN, THE DEMAND FOR BANDWIDTH: EVIDENCE FROM THE INDEX PROJECT (2002), available at <http://www.sims.berkeley.edu/~hal/Papers/brookings.pdf>.

316. *Id* at 5. (“This is indicated by the following statistics: 91% had used the Internet for more than 3 years [in 1998], 86% had used computers for more than 5 years, 58% characterized their Internet use as ‘above average,’ 56% considered themselves ‘computer professionals’”) (alteration in original).

levels of discrimination, even when allowing bandwidth to vary would result in more average bandwidth over time.<sup>317</sup>

Game theory researchers have suggested that users will take action to enforce their preferences for flat-rate pricing. Congestion or usage-based pricing mechanisms may encourage users to “cheat” to gain better access. Steven Bauer and Peyman Faratin’s analysis applied game theory to internet networking directly. Their results showed that usage-based pricing created incentives for users to implement strategies to increase overall network capacity and decrease their long-term costs:

[U]sers can lower their own overall long-term contribution to a capacity expansion cost by paying smaller penalties (i.e. smaller congestion charges) earlier . . . thereby enabling their later and larger amounts of traffic to enjoy the benefit (i.e. a congestion free expanded network capacity). By causing congestion in earlier time periods a selfish user can induce other players that would have been “free riders”—sending traffic while there was no congestion—to now contribute to the capacity expansion cost.<sup>318</sup>

By using congestion-creating strategies earlier, users could force providers to increase capacity, making congestion-based charges unlikely in the future. While Bauer and Faratin doubted that users would be sophisticated enough to execute congestion avoidance strategies, “the capability of classes of applications to exhibit strategic behaviors makes understanding the incentives created by congestion pricing a very relevant issue.”<sup>319</sup>

Despite Bauer and Paratin’s doubts, users have employed strategies in the past to defeat usage-based pricing and instead force providers to increase capacity. When faced with insufficient capacity, dial-up users often used programs that sent periodic traffic across a modem to avoid provider-imposed limits on inactivity or connection duration. By evading these lim-

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317. E.g., Anna Bouch et al., *Of Packets and People: A User-Centered Approach to Quality of Service*, in PROCEEDINGS OF THE 8TH INT’L WORKSHOP ON QUALITY OF SERVICE 189 (2000); see also Tony Hallett, *Broadband Users “Would Pay More For Quality”*, ZDNET.CO.UK, Oct. 13, 2003, <http://news.zdnet.co.uk/communications/0,1000000085,39117081,00.htm> (detailing a survey of 6,000 broadband users in the U.K. finding “over half of all broadband users . . . would be willing to pay a premium for QoS”).

318. Steven Bauer & Peyman Faratin, *Analyzing Provider and User Incentives Under Congestion Pricing on the Internet*, in 1 PROCEEDINGS OF THE CSAIL STUDENT WORKSHOP 9, 10 (2005), available at <http://projects.csail.mit.edu/csw/2005/proceedings/Proceedings.pdf>.

319. *Id.*

its, users kept more provider telephone lines in use, requiring the provider to add capacity.<sup>320</sup> Dial-up service providers regularly banned any “programs designed to keep a connection up by sending regular amounts of data through the dial-up connection” in standard terms of service agreements with users.<sup>321</sup> One popular software download site still lists forty-four different dial-up internet service tools to prevent connection terminations or to reconnect automatically to a provider.<sup>322</sup> Large broadband providers, server co-location and web hosting providers, educational institutions, and even smaller local access providers ban many peer-to-peer applications, spam, or systematic downloads.<sup>323</sup> Websites discuss end-user strategies for using quality of service tools to increase download speeds and interactivity at the expense of other users by defeating access providers’ queuing techniques used to improve download capacity for all users.<sup>324</sup> The use of various congestion-creating strategies to force providers

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320. For example, Skye/net’s user-to-modem ratio in South Bend, Indiana was 4-to-1 before implementing these rules, with 100% usage during peak late afternoon and early evening periods. After implementing inactivity and duration limits, Skye/net was able to maintain a ratio closer to 8-to-1 with approximately 85% peak usage without adding additional capacity. *See supra* note 78 (author managed Skye/net’s network operations).

321. Skye/net Network Servs., Inc., *supra* note 78; *see also* Cyberlink International, Member Agreement: Terms and Services, <http://www.cyberlinkint.com/agreement.asp> (last visited Nov. 20, 2007) (banning any method “to defeat the network inactivity termination” of fifteen minutes).

322. Free Downloads Center, Keep Alive Tools, [http://www.freedownloadscenter.com/Network\\_and\\_Internet/Keep\\_Alive\\_Tools/](http://www.freedownloadscenter.com/Network_and_Internet/Keep_Alive_Tools/) (last visited Nov. 20, 2007).

323. E.g., AT&T, High Speed Internet and Dial Terms of Service, <http://home.bellsouth.net/csbellassouth/s/s.dll?spage=cg/legal/att.htm&leg=tos> (last visited Nov. 20, 2007) (Users “agree that [AT&T’s] Service is not to be used to host peer-to-peer application [sic] [the user is] not actively using” and are prohibited from “[s]ystematic retrieval of data or other content” from AT&T’s service.); Bluefish Web Hosting, Acceptable Use Policy, <http://www.bluefishhosting.com/policyAcceptUse.html> (last visited Nov. 20, 2007) (banning unsolicited commercial e-mail—spam—not only because of its negative consumer effects, but also “because it can overload BlueFish’s network and disrupt service to its Customers subscribers”); Binghamton Univ., Issues and Practices Concerning Peer-to-Peer Programs, <http://training.binghamton.edu/navdisplay.asp?navfilename=NAV-P2P2> (last visited Nov. 20, 2007) (limiting peer-to-peer traffic through the use of quotas and system-wide caps in large part because of its congestive effects); Fordham Univ., Peer-to-Peer Policy, [http://www.fordham.edu/campus\\_resources/administrative\\_office/legal\\_counsel/university\\_policies/information\\_technology/peer\\_to\\_peer\\_policy\\_17245.asp](http://www.fordham.edu/campus_resources/administrative_office/legal_counsel/university_policies/information_technology/peer_to_peer_policy_17245.asp) (last visited Nov. 20, 2007) (same); UpHi.net, LLC, Service Agreement, [http://uphi.net/service\\_agreement.htm](http://uphi.net/service_agreement.htm) (last visited Nov. 20, 2007) (local New Mexico provider reserving the right to terminate customer accounts without notice for use for numerous congestion-causing events).

324. E.g., Hubert et al., *supra* note 118, <http://lartc.org/howto/lartc.cookbook.ultimate-tc.html>.

to increase capacity would help explain the lack of long-run congestion in the IEPM project's results.<sup>325</sup>

The studies and empirical evidence summarized here suggest that users are reluctant to accept complex, usage-based pricing schemes. As recent research indicates, they may prefer a simpler, more predictable mechanism, even if that flat-rate mechanism allocates resources less economically or fairly. Users with sufficient power to enforce pricing levels, who influence provider capacity decisions and choose from among multiple competitive broadband options, need better information about broadband services, not the illusory "protection" of neutrality regulation.<sup>326</sup>

### B. Why Doing Nothing Now, or Acting Post-Harm, Could Fail

The net neutrality issue is not a simple two-sided coin. The internet's tumultuous history, economies of demand, Coase's lighthouses, and macroeconomic theories of libertarian government, among others, provide justification for embracing network competition and avoiding regulation. Judging by user awareness of terms such as "spam," "firewall," "spyware," "Internet cookies," and "adware" in a recent Pew Research study,<sup>327</sup> and the proliferation of spam, virus, and spyware filtering appliances for internet providers, users may actually *expect* certain types of non-neutrality from their providers. Historical lessons of user power support a market solution without government regulation.

However, while a regulation-free environment may avoid certain consequences, total government inaction or even ex post remedies may result in other, less desirable ones. Net neutrality advocates are right to rely on the same ex post justifications in Section VI.B.3 *supra* in worrying that network providers will discriminate against users at the first opportunity. If game theory research someday produces an internet protocol that pushes the balance of power in favor of providers, discrimination may be both difficult to identify and difficult to stop.<sup>328</sup> As Lemley and Lessig wrote: "To say there is no reason to use a seatbelt because there is always the

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325. See *supra* notes 237-246 and accompanying text.

326. See *infra* Section VII.B for a discussion of why neutrality regulation as envisioned by Lessig, Wu, and van Schewick or Yoo could easily fail.

327. Memorandum from Lee Rainie, PIP Director, Pew Internet & American Life Project (July 2005), available at [http://www.pewinternet.org/pdfs/PIP\\_Data\\_Techterm\\_aware.pdf](http://www.pewinternet.org/pdfs/PIP_Data_Techterm_aware.pdf).

328. Scott Carlson, *Managing Bandwidth: Packet Shapers Control the Flow*, CHRON. HIGHER EDUC., Jan. 30, 2004, at 7 ("In the future, packet shapers will probably become ubiquitous, easier to use, and smarter about how they manage traffic on networks . . .").

care of an emergency room is to miss the extraordinary cost of any ex post remedy.”<sup>329</sup>

Ex post remedies such as antitrust law or alternative regulatory remedies that can address concrete harms to competition have the same intuitive appeal as regulations “guaranteeing” a nondiscriminatory internet. Ex post remedies and neutrality regulation, however, present similar difficulties in application, such as distinguishing anticompetitive behavior from technical issues, the difficult task of defining “neutrality,” and political capture of regulators. Acting preemptively or ex post, legislators and FCC commissioners would struggle to identify and measure the effects of innovation that never happened,<sup>330</sup> whether due to the unintended effects of regulatory mandates or to laissez-faire approaches to net neutrality.

A simple hypothetical illustrates the difficulty that regulators would face applying either net neutrality regulations or Yoo’s ex post enforcement. Any regulatory regime would need to separate actual discrimination that harms the market from inevitable transient performance issues that users encounter online daily. Assume that regulators discover that Sinister Cable’s customers can no longer access internet television service from NetTube, a popular upstart content provider, due to excessive jitter.<sup>331</sup> Among partisan regulatory commission members,<sup>332</sup> two theories emerge. One side believes that Sinister Cable has configured software on their set-top boxes to inject network delay with the goal of derailing NetTube’s service in favor of its own. If true, Sinister Cable’s actions would violate the net neutrality regulations and cause a concrete harm in the market.

Other regulators argue that Sinister Cable is not behind the problems for NetTube subscribers. They point to evidence that Sinister Cable’s service configurations are nondiscriminatory, and that a bug in third-party software licensed by Sinister Cable caused unforeseen problems with NetTube’s unique IP television protocol. In fact, Sinister Cable has

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329. Lemley & Lessig, *supra* note 27, at 956.

330. See *supra* note 184 (postulating that like intellectual property systems, the never-was-neutral internet may foster greater innovation); *supra* note 104 and accompanying text (discussing the innovative market response to CIX’s attempt to leverage their near-monopoly position in 1994).

331. In lay terms, jitter simply refers to the gaps in delivery times between data packets. Services such as IP voice and video are sensitive to delays between packet deliveries. Repeated half-second pauses in packet delivery, for example, would render video streams unwatchable. Excessive jitter would be akin to having a conversation with someone who stopped talking for a few seconds after every third or fourth word.

332. Unfortunately, partisan wrangling is often *not* hypothetical—another danger in leaving the definition of “concrete harm” to the political capriciousness of Congress or the FCC.

worked for months with the third-party software developer and posted software patches long before any of its customers complained to regulators. The company and some of its cable provider brethren also present the agency with a wealth of peer-reviewed scientific evidence showing that, while its shared cable architecture offers higher speeds, it suffers from more variability in packet delivery as a result. With the software problem fixed, the jitter problems appear to dissipate enough for the NetTube service to function. These regulators argue that net neutrality and concrete harm regulations should not hold Sinister Cable liable for software bugs and architecture limitations beyond its control.

The debate quickly devolves into a political power struggle, a non-neutral outcome that could result in significant concrete harm of its own. Worse yet for policymakers, Sinister Cable's motives remain private. While the company might not have taken any deliberate or obvious steps to create the problem, it did not fret over NetTube's service problems. The company took several months to release a patch, and then did so without fanfare, leaving NetTube customers without service until media attention revealed the patch's existence. Sinister Cable could return to quietly managing its cable network so that jitter remains a problem.

This situation closely mirrors the Cox/Craigslist situation described earlier.<sup>333</sup> The combination of Craigslist's non-standard server configuration and a bug in the third-party security software prevented Cox customers from accessing Craigslist. Craigslist configured their servers in a non-standard way, exploiting a third party's software bug. Cox released a full patch months after its third-party provider found the bug,<sup>334</sup> and Cox customers have not reported similar problems since. For its part, Cox denied that it had ever considered interfering with Craigslist, just as Comcast claimed that its selective edit of a *Nightline* broadcast was an encoding error by ABC.<sup>335</sup> A network provider that wants to cause network disruptions to gain an advantage over competitors can easily do so and present plausible reasons for its decisions. Laws and regulations cannot act as divining rods, locating the true intentions of an internet service or content provider. While courts might fairly adjudicate intent in other contexts, internet service presents a special case. Sinister Cable is unlikely to pro-

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333. See *supra* notes 159-164.

334. The original fix was just an unsupported beta patch. David A. Utter, *Authentium Responds to Craigslist Flap*, WEBPRONEWS, June 8, 2006 ("The beta of the fix was made available almost immediately—in mid-March." (quoting John Sharp, CEO of Authentium)). The full release came out several months later. See Foremski, *supra* note 159.

335. McCarthy, *supra* note 165.

vide a “smoking gun” by openly blocking or degrading service.<sup>336</sup> Assuming Sinister Cable is sinister and conceals its motives, courts will face the impossible task of determining whether a transient problem with the fictional NetTube’s service was due to the service itself, a transient problem over internet networks on that day, a casualty of best-effort internet networks generally,<sup>337</sup> or a specific action by Sinister Cable.

On the other hand, providers who choose an entirely “neutral” policy and perform no service differentiation could easily violate net neutrality regulations. For example, a company with no QoS policies could degrade VoIP by intermingling that traffic with other data. VoIP packets are typically small (often 64 bytes) to minimize the effects of any potential data loss on a conversation.<sup>338</sup> Web or e-mail servers typically optimize for efficiency and break data down into the largest packet size possible (often between 1400 and 1500 bytes). In a network that does nothing to differentiate between VoIP streams and other packets, the 64-byte packets could be queued for transmission behind larger 1500-byte packets. On slower or congested networks, the delay caused by the time to transmit larger 1500-byte packets introduces jitter.<sup>339</sup> The delays caused by commingling data would have a similar effect on VoIP as a purposely induced transmission delay. To regulators, Sinister Cable and the “neutral policy” provider would look the same.

In some cases, such as the FCC’s decision to sanction Madison River Communications for openly blocking VoIP,<sup>340</sup> regulators would easily discern anticompetitive strategies and weak technical justifications. Hard cases, such as the Cox/Craigslist issue and the hypothetical situations posed above, would result in arbitrary—and possibly incorrect—decisions.

The potential for eventual networking technology advancements to give regulators the ability to distinguish between harmful discrimination and sound network operations practices provides another excellent justifi-

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336. E.g., Madison River Commc’ns, LLC, 20 F.C.C.R. 4295 (2005).

337. See *supra* note 227 (defining “best effort”).

338. The discussion of VoIP packet sizes, queuing, and quality of service issues in this section is adapted from Douglas A. Hass, Dir. of Bus. Dev., ImageStream Internet Solutions, Inc., Address at the LinuxWorld Open Solutions Summit: Open Source Tools for Quality of Service (Feb. 14, 2007).

339. In non-technical terms, think of an undifferentiated broadband network as a crowded interstate highway tollbooth. Your car has an automated toll payment transceiver, so you can clear the booth without slowing down. Unfortunately, you are sandwiched among several large tractor-trailers that must stop at the booth, pay cash, and make change. Even though the interstate system is completely neutral, the nature of the traffic on the road nonetheless affects your ability to avoid travel delays (“jitter”).

340. Madison River Commc’ns, LLC, 20 F.C.C.R. 4295 (2005).

cation for leaving the never-was-neutral status quo in place. If future regulators develop effective tools that identify harmful discrimination by access or content providers *and* non-neutrality harms have moved beyond Dr. van Schewick's theoretical models<sup>341</sup> and into real-world internet markets, then policy makers could take a fresh look at potential net neutrality regulations. Until then, regulators will struggle to distinguish between Cox Communications, which had no intention of discriminating but implemented a software update that nonetheless caused discrimination, and "Sinister Cable," which might falsely claim that it follows nondiscriminatory practices but in fact seeks out reasons to discriminate.

### VIII. ENCOURAGING CONSUMER-LED REGULATION

Pro-regulation arguments rely heavily on theoretical markets that have never existed in the access and content market. Approaches such as Professor Yoo's depend on incorrect or outdated understandings of internet networking technologies. As Part VII discusses, consumers can influence the market and make informed decisions about internet services. These realities point to a third, consumer-focused approach to the net neutrality debate: a disclosure system that fully and clearly informs users about non-neutral policies. Consumer-led evaluation of non-neutral policies through meaningful disclosure requirements can best balance innovation and consumer protection.

The idea that consumers of internet access and content services should have better information about these services is not new. Law and economics theory traditionally found a market failure "when [market] players do not have symmetric and full information relevant to their market activities."<sup>342</sup> However, commentators and policy makers have often overlooked the power that such information can give consumers. The solution outlined in this section proposes a standard information disclosure model based on the Fair Credit and Charge Card Disclosure Act.

In 2004, then-FCC Chairman Michael Powell famously labeled "clear and meaningful information" as the fourth "Internet Freedom" to which consumers are entitled.<sup>343</sup> Two years earlier, state regulators had identified

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341. See *supra* note 181.

342. Niva Elkin-Koren & Eli M. Salzberger, *Law and Economics in Cyberspace*, 19 INT'L REV. L. & ECON. 553, 555 (1999).

343. Michael K. Powell, *Preserving Internet Freedom: Guiding Principles for the Industry*, 3 J. ON TELECOMM. & HIGH TECH. L. 5, 12 (2004) ("Finally, and most importantly, consumers must receive clear and meaningful information regarding their service plans and what the limits of those plans are. Simply put, information is absolutely necessary to ensure that the market is working.").

the same need for accurate and complete consumer information about internet services. The National Association of Regulatory Utility Commissioners (NARUC), which represents state regulatory agencies and officials, adopted a resolution at its November 2002 meeting recognizing the possibility that “some providers of broadband service or facilities may have an incentive to restrict internet access to favored news sources, and if they chose to do so, it could significantly harm free and open information exchange in the marketplace of ideas.”<sup>344</sup> Therefore, NARUC resolved that broadband “users should: 1. Have a right to access to the Internet that is unrestricted as to viewpoint and that is provided without unreasonable discrimination as to lawful choice of content (including software applications); and 2. *Receive meaningful information regarding the technical limitations of their broadband service . . .*”<sup>345</sup>

The same year, internet standards makers also recognized the importance of meaningful information. RFC 3260,<sup>346</sup> released in April 2002, clarified several terms in the original Differentiated Services RFC that created a framework for dissemination of technical information about QoS policies.<sup>347</sup> Specifically, the RFC noted the importance and function of the Traffic Conditioning Agreement (TCA). “A TCA is ‘an agreement specifying classifier rules and any corresponding traffic profiles and metering, marking, discarding and/or shaping rules which are to apply . . .’”<sup>348</sup> The RFC drafters separated the TCA from other concepts, since the term “implied considerations that were of a pricing, contractual, or other business nature, as well as those that were strictly technical.”<sup>349</sup>

The TCA concept, if adopted by regulators, would both avoid onerous government regulation and address the concerns of net neutrality advocates that providers could act discriminatorily.<sup>350</sup> Throughout internet his-

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344. Nat'l Ass'n of Regulatory Util. Comm'ns, Resolution Regarding Citizen Access to Internet Content (2002), available at [http://www.naruc.org/Resolutions/citizen\\_access.pdf](http://www.naruc.org/Resolutions/citizen_access.pdf).

345. *Id.* (emphasis added).

346. DAN GROSSMAN, IETF NETWORK WORKING GROUP, REQUEST FOR COMMENTS 3260: NEW TERMINOLOGY AND CLARIFICATIONS FOR DIFFSERV (2002) [hereinafter RFC 3260], available at <http://www.ietf.org/rfc/rfc3260.txt>.

347. See *supra* note 111 and accompanying text.

348. RFC 3260, *supra* note 346.

349. *Id.*

350. Although neither Professor Wu nor Professor Lessig have ever developed the concept, both have signaled their interest in—and potential agreement with—the idea of increased disclosure, whether voluntary or regulatory. E.g., Posting of Tim Wu to Public Knowledge, <http://www.publicknowledge.org/node/494> (June 28, 2006, 11:38 EST) (“The proposed Net Neutrality rules haven’t done enough to force network providers to disclose what, exactly, they are selling their customers. There is no argument against

tory—squabbles with CIX, the rise of spam filters and antivirus software, complaints about discriminatory actions by providers, and the net neutrality debate—users have held the greatest sway over the market. While innovators and entrepreneurs have shaped tastes, users have governed officially and unofficially. Providing detailed information to users about traffic policies that could affect internet service on their connections would ensure that the balance of power remained on the side of consumers.

Regulators or legislators could model a “Traffic Control Disclosure Act” (TCDA) on the Fair Credit and Charge Card Disclosure Act.<sup>351</sup> That Act emphasizes a “more detailed and uniform disclosure . . . with respect to information.”<sup>352</sup> A proposed TCDA should require providers to furnish detailed information about their practices and policies. Internet service providers and content providers alike would consistently disclose the specifics of their service offerings and traffic control policies in a uniform table. If designed correctly, this disclosure would help consumers more easily compare different service offerings. Given the vociferous and vocal opposition to the most egregious differentiation policies, public disclosures would likely discourage all but a few standard classes of service differentiation.

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broadband disclosure rules that has any strength . . . .”); Lessig 2.0, [http://lessig.org/blog/2007/10/things\\_i\\_didnt\\_have\\_time\\_to\\_do\\_1.html](http://lessig.org/blog/2007/10/things_i_didnt_have_time_to_do_1.html) (Oct. 3, 2007, 18:00 PST) (“Sure, these companies MAY BE extraordinarily inept. They MAY BE just tripping up all over the place. *They may be simply signaling their own non-neutral position in a competitive market for networks, allowing consumers to select other networks that are more neutral.*”) (emphasis added). Lessig chose to strike out the portion of his post in italics to protest what he perceives as a lack of competition. *Id.*

351. Fair Credit and Charge Card Disclosure Act, Pub. L. No. 100-583, 102 Stat. 2960 (1988) [hereinafter Fair Credit Act]; *see also* 12 C.F.R. § 226.5a (disclosures for credit and charge card applications and solicitations). The Fair Credit Act is enforced by the FTC. For an argument for FTC enforcement of net neutrality mandates, see Raymond L. Gifford, *Let The FTC Do It! Maybe It Already Can*, PROGRESS SNAPSHOT, Apr. 2006, <http://www.pff.org/issues-pubs/ps/2006/ps2.12ftc.pdf>. FTC action is not without precedent. The FTC has taken action against internet companies in the past. *See, e.g.*, Petco Animal Supplies, Inc., No. C-4133 (Fed. Trade Comm'n Mar. 4, 2005) (final decision and order), *available at* <http://www.ftc.gov/os/caselist/0323221/00308do0323221.pdf> (enforcing the Federal Trade Commission Act, 15 U.S.C. § 45, and resolving FTC claims that Petco had violated federal law and its own stated policies by failing to implement reasonable safeguards to protect customers' personal information); Federal Trade Commission, Privacy Initiatives—Unfairness & Deception: Enforcement, [http://www.ftc.gov/privacy/privacyinitiatives/promises\\_enf.html](http://www.ftc.gov/privacy/privacyinitiatives/promises_enf.html) (last visited Nov. 20, 2007) (listing FTC enforcement actions against online and offline companies for violations of consumer privacy).

352. Fair Credit Act, at preamble.

With public comment and regulatory oversight, the disclosure table can evolve as technology advances and consumer tastes change. For example, the proliferation of unsolicited commercial e-mail (spam) has led providers to block external access to the ports used by mail servers,<sup>353</sup> a type of filtering developers of the mail protocols likely did not foresee.

A TCDA must accomplish three primary goals:

### 1. *Notice*

The Fair Credit Act's provisions provide sensible guidelines for the TCDA framework. Content or internet service providers must post their disclosures conspicuously and prominently on their websites. Solicitations by internet service providers for dial-up or broadband access, or by content providers for pay services, must include the disclosures in a tabular format determined by regulators.<sup>354</sup> During telephone or in-person solicitations for internet service, "the person making the solicitation shall orally disclose the information described" in the table.<sup>355</sup> Providers offering a pay service must notify customers of any changes to their policies.

### 2. *Choice*

The TCDA must require providers to inform consumers of the choices available to discontinue service penalty-free after a short trial period. The provider must also notify customers of their rights to reject any changes in network policy and cancel penalty-free, regardless of contract duration or prepayment.

### 3. *Education*

Disclosures under the TCDA will enable consumers to obtain easily understandable and accurate information about traffic control policies, applications, and technology advancements. Companies that implement service differentiation schemes will have an opportunity to explain the benefits of the technologies to consumers. The regulatory oversight agency can act as a forum for information and education about technologies and con-

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353. E.g., Declan McCullagh, *Feds to Fight the Zombies*, CNET NEWS.COM, May 23, 2005, [http://news.com.com/Feds+to+fight+the+zombies/2010-1071\\_3-5715633.html](http://news.com.com/Feds+to+fight+the+zombies/2010-1071_3-5715633.html) ("The FTC also wants Internet providers to prevent e-mail from leaving their network unless it flows through their own internal servers" by blocking port 25); Cox High Speed Internet FAQ: SPAM, <http://www.cox.com/sandiego/highspeedinternet/spamfaq.asp>, (last visited Nov. 20, 2007); Univ. of Notre Dame Office of Info. Tech., SMTP (Port 25) Blocking, [http://oit.nd.edu/email/port25\\_block.shtml](http://oit.nd.edu/email/port25_block.shtml) (last visited Nov. 20, 2007).

354. See Fair Credit Act § 2(a) (amending 15 U.S.C. 1637 § 127(c)(1)(A)).

355. *Id.* (amending § 127(c)(2)(A)).

sumer options. In addition, regulators can address any failures by providers to disclose and maintain policies accurately and clearly.

Unlike approaches that attempt to react after the fact to market failures, or cumbersome regulations that try to determine institutional intent or dictate network policies, a TCDA would embrace openness and transparency. A disclosure regime would compel providers to make public their service differentiation policies and practices. Individuals do not have a right to neutrality, but have a right to know how service differentiation policies could affect the services they purchase from internet service or content providers.

The IETF's Network Working Group has released a document that outlines a disclosure foundation aimed in part at regulators and provides insight into how the TCDA might address different types of service differentiation. RFC 4084<sup>356</sup> attempts to standardize terminology used to describe internet services. As the abstract to the RFC notes:

[M]any types of arrangements have been advertised and sold as "Internet connectivity." Because these may differ significantly in the capabilities they offer, the range of options, and the lack of any standard terminology, the effort to distinguish between these services has caused considerable consumer confusion. This document provides a list of terms and definitions that may be helpful to providers, consumers, and, potentially, regulators in clarifying the type and character of services being offered.<sup>357</sup>

The RFC lists five types of internet connectivity organized by access level.<sup>358</sup> For regulatory purposes, these classifications, when combined with others for content providers and other types of network services, could serve as useful delineations between different types of disclosures. Content providers such as Yahoo! or Google would have fewer opportunities to implement service differentiation, and regulators would likely require different disclosures from them than from internet service providers like AT&T.

More importantly, sections three and four of the RFC list multiple terms "that a service provider might choose to provide to complement

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356. JOHN C. KLENSIN, IETF NETWORK WORKING GROUP, REQUEST FOR COMMENTS 4084: TERMINOLOGY FOR DESCRIBING INTERNET CONNECTIVITY (2005), available at <http://www.ietf.org/rfc/rfc4084.txt>.

357. *Id.*

358. *Id.* at § 2 (Web connectivity; Client connectivity only, without a public address; Client only, with a public address; Firewalled internet connectivity; Full internet connectivity).

those general definitions” about its service differentiation policies,<sup>359</sup> focusing primarily on e-mail filtering issues. A similar TCDA disclosure would need to touch on at least four other general service differentiation categories as well: classification, policing, queuing, and shaping.<sup>360</sup> These four categories cover each major aspect of service differentiation by providers.<sup>361</sup>

Classification happens even at basic levels, such as the analysis of a data packet’s ultimate destination. For disclosure purposes, however, providers should disclose any policies of identifying and sorting traffic into different classes, whether for monitoring purposes<sup>362</sup> or for actual service differentiation. For example, Professor Yoo notes the “natural response” of network owners to give “time-sensitive applications . . . a higher priority.”<sup>363</sup> Classification also couples with traffic queuing. For maximum performance, providers may choose to queue traffic for delay-sensitive VoIP ahead of e-mail or web traffic, regardless of the actual bandwidth allocated to each service.<sup>364</sup> Niche providers today focus service differentiation policies on gaming performance,<sup>365</sup> application hosting,<sup>366</sup> interactive voice response and call center hosting,<sup>367</sup> and any number of other vertical services.

Policing, as the name suggests, typically involves discarding nonconforming traffic to maintain network integrity. Much of RFC 4084, not to

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359. *Id.* at §§ 3-4.

360. These categories adapted from Douglas A. Hass, Dir. of Bus. Dev., ImageStream Internet Solutions, Inc., Address at the LinuxWorld Open Solutions Summit: Open Source Tools for Quality of Service (Feb. 14, 2007).

361. Cisco uses similar categories in describing its products’ quality of service capabilities. See Cisco, Cisco IOS Quality of Service Solutions Configuration Guide, Overview (2007), [http://cisco.com/univercd/cc/td/doc/product/software/ios121/121cgr/qos\\_c/qcdintro.htm](http://cisco.com/univercd/cc/td/doc/product/software/ios121/121cgr/qos_c/qcdintro.htm).

362. Monitoring and logging traffic with tools such as NetFlow potentially implicates privacy as well as net neutrality concerns and may require additional scrutiny.

363. Yoo, *supra* note 5, at 1880.

364. See *supra* note 338 and accompanying text. For a detailed discussion of service differentiation that arises from business decisions by content and internet service providers, see Craig McTaggart, *Was the Internet Ever Neutral?*, in PROCEEDINGS OF THE 34TH RESEARCH CONFERENCE ON COMMUNICATION, INFORMATION, AND INTERNET POLICY 4 (2007), available at <http://web.si.umich.edu/tprc/papers/2006/593/mctaggart-tprc06rev.pdf>.

365. E.g., INXGaming, About, <http://www.inx-gaming.co.uk/about/> (last visited Nov. 20, 2007).

366. E.g., Connectria, Citrix Hosting Services, <http://www.connectria.com/citrix.html> (last visited Nov. 20, 2007).

367. E.g., Voxeo, VoiceCenter IVR Hosting, <http://www.voxeo.com/products/voicexml-ivr-hosting.jsp> (last visited Nov. 20, 2007).

mention the debate over discriminatory provider practices, focuses on this aspect of service differentiation. Disclosure of policing policies would encompass a range of practices from spam, virus, and spyware filtering to e-mail traffic blocking, server hosting, or the use of wireless access points.

The queuing and shaping steps in service differentiation control traffic bursts and allocate bandwidth to traffic flows according to a provider's business policies. Providers can use bandwidth allocations to guarantee bandwidth for a particular mission-critical application, or to ensure efficient operation of various applications in a multi-service network. As last mile networks change, any of the aforementioned niches could organize vertically. A gaming provider may offer consumers a wireless connection built for maximum performance with every major online gaming network, but otherwise offering degraded performance for other applications or content providers. A TCDA would give consumers clear, concise information about that vertical integration and the choices they necessarily make when selecting one service over another. Net neutrality regulations banning service differentiation would block this type of vertical innovation.<sup>368</sup>

The proposed disclosure act would not in and of itself prevent service differentiation or tiered access. Instead, disclosure requirements make provider decisions more transparent to customers. Focusing regulation on empowering consumers to make informed decisions recognizes that those end users do not passively receive content at the network edge, but drive service development, improvement, and change.

Under this disclosure regime, operators are free to pursue policies that align their network policies with their business objectives, and can respond to ever-changing network conditions. The approach is not completely laissez-faire, though. A disclosure requirement aids the countervailing market forces that curb truly discriminatory actions and makes those actions far less appealing to access and content providers.

## IX. CONCLUSION

The largely academic NSFnet did not evolve into the commercial internet because of neutrality or nondiscrimination. Entrepreneurs, scientists, academics, and a wave of consumer demand beginning with early technology adopters drove network expansion and the proliferation of broadband technologies—despite technological discrimination and priori-

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368. As Thierer writes, net neutrality regulations "seem to ignore market evolution and the potential for sudden technological change by adopting a static mindset preoccupied with micro-managing an existing platform regardless of the implications for the development of future networks." Thierer, *supra* note 258, at 290.

tization from the internet's earliest days. Both history and economic evidence suggest that this innovative culture will continue unabated, provided regulators resist the urge to tinker. The internet's content and service suppliers have developed numerous new technologies and industry sectors over the past twenty years. Innovation has often required, and customers have increasingly demanded, non-neutrality, tiered access, and other service differentiation. Net neutrality regulation, in the direct form of neutrality mandates or in the indirect form of a ban on concrete harms, will discourage innovators and strip consumers of their power to shape service offerings.

Consumers in the internet's non-neutral markets have efficiently policed providers' service differentiation choices without the heavy hand of government regulation. Such freedom has fostered continued innovation. Regulators should create incentives for consumers to continue to govern. Government enforcement, therefore, should focus on disclosure of provider practices. This Article presents the framework for a simple, clear, uniform disclosure regime modeled on existing law that can address the concerns of net neutrality proponents without jeopardizing regulators' agnosticism for the market's direction.

As Andrew Odlyzko concluded in 1999:

While the Internet should appear as a simple network, it will need sophisticated technical controls . . . as well as the right economic incentives . . . . The future of the Internet will be a competition between simplicity and novelty, and while simplicity will be essential to enable novelty, it is never likely to win completely. The blame for this belongs to us, the users, as we allow our requirements to grow.<sup>369</sup>

Tomorrow's networks will need a combination of simplicity and complexity, openness and differentiation. As they have since the invention of TCP/IP, networks will also need end users to strike the proper balance between that openness and differentiation. By improving available information, government regulators can foster a robust market governed by well-informed consumers.

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369. ANDREW ODLYZKO, THE STUPID NETWORK: ESSENTIAL YET UNATTAINABLE (1999), <http://www.dtc.umn.edu/%7Eodlyzko/doc/stupid.unattainable.txt>.

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