

# **ATTACHMENT C**

# **Broadband Competition and Network Neutrality Regulation**

**GN Docket 09-191, WC Docket No. 07-52**

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# Table of Contents

I.	Introduction and Summary .....	1
II.	Wireline Broadband Competition.....	4
A.	There is Significant Head-to-Head Competition between Cable and Telco Providers of Broadband Access.....	5
1.	Cable and DSL Broadband Service .....	5
2.	Cable-DSL Overlap .....	6
3.	Head-to-Head Competition for Subscribers.....	9
B.	Telcos and Cable Companies are Competing to Innovate and Deploy Advanced Technologies .....	11
1.	Telco Investment and Deployment of Fiber-Based Broadband Services .....	12
2.	Cable Company Investment and Deployment .....	13
C.	Other Indicia of Vigorous Competition in the Provision of Broadband Access .....	15
1.	Prices Have Fallen and Service Quality Has Improved.....	15
2.	Cable Companies and Telcos Target Each Other’s Broadband Service in Their Advertising.....	18
3.	All Sectors of the Wireline Broadband Ecosystem Are Thriving.....	19
III.	Wireless Broadband Competition.....	20
A.	Consumers Have Many Choices for Mobile Broadband Service.....	21
B.	Mobile Broadband Has Experienced Tremendous Growth .....	23
C.	Mobile Broadband Prices Have Declined .....	24
D.	Mobile Wireless Advertising Specifically Promotes Broadband Services and Quality.....	25
E.	Mobile Subscribers Can and Do Switch Providers .....	25
F.	Wireless Providers have been Innovating and Investing in Next-generation Technologies .....	26
G.	Competition, Innovation and Investment in Other Parts of the Mobile Wireless Ecosystem.....	31
IV.	Mobile Wireless Providers and Firms Using Other Intermodal Technologies Increasingly Compete with Wireline Broadband .....	37
1.	3G and 4G Technology.....	39
2.	Other Developments Further Increase Competition Between Wireless and Wireline Broadband Services. ....	40
3.	Competition from Providers Using Other Wireless Technologies .....	42

V.	Implications of the Competitive Environment for Network Neutrality Regulation .....	47
A.	Network Neutrality Regulations are Unwarranted in the Current Broadband Market Environment .....	48
B.	The Proposed Network Neutrality Rules Are Likely To Harm Consumer Welfare	50
C.	Specific Concerns Raised in the NPRM.....	53
1.	Market Forces Will Deter Inefficient Pricing .....	54
2.	Collective Action Problems Regarding Prioritization Fees Are Not a Rationale for Network Neutrality Regulation.....	56
3.	Market Forces Will Prevent Best-Efforts Access from Languishing .....	58
4.	Anticompetitive Exclusion is Unlikely in the Competitive Broadband Environment.....	60
5.	There is not a Terminating Monopoly Problem in Broadband Provision.....	61
VI.	Conclusion .....	63

## **I. Introduction and Summary**

1. I am Vice President and Head of the Antitrust & Competition Practice at Cornerstone Research. I have been a faculty member in the Department of Economics at the College of William & Mary, and a lecturer in the Department of Economics at Stanford University. While at William & Mary and Stanford, I taught courses in microeconomics, econometrics, and antitrust economics. I have a Ph.D. and an M.A. in Economics from Stanford University. I also received a B.S. in Systems Engineering from the University of Virginia and an M.S. in Engineering Economic Systems from Stanford University.
2. Before receiving my doctorate in economics, I worked as an engineering economist at Bell Laboratories and Bell Communications Research. In my fifteen years at Cornerstone Research, my consulting work has focused on the application of microeconomics, econometrics, and quantitative analysis to litigation and regulatory matters. I have worked on numerous consulting projects involving the telecommunications industry, including with respect to competition and antitrust issues, merger review, spectrum policy, intellectual property, contracts, and securities issues. My complete CV is included here as Attachment A.
3. I have been asked by Verizon to assess the competitiveness of the current market environment for the provision of broadband access services to consumers, and the implications of the current market environment for the “network neutrality” proposals contained in the Federal Communications Commission’s recent Notice of Proposed Rulemaking (NPRM) in the Matter of Preserving the Open Internet.<sup>1</sup>
4. In summary, my findings are:
  - The Internet ecosystem generally and broadband Internet access in particular are still nascent businesses. These businesses have been and are continuing to develop in a competitive manner, and that competition appears to be increasing. Thus, the usual “monopoly” precondition for regulation that restricts provider conduct is absent.
  - Broadband Internet access is a capital intensive business. There has been massive private investment to deploy broadband networks, and that investment is continuing as wireline and wireless broadband providers deploy next-generation technology.

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<sup>1</sup> FCC, Notice of Proposed Rulemaking, In the Matter of Preserving the Open Internet, GN Docket No. 09-191, released October 22, 2009, ¶16. (“NPRM”)

- As in other capital-intensive industries – ranging from voice telephony to transportation – competition in broadband access has developed across platforms. In particular, there is extensive and growing cross-platform competition for both wireline broadband and wireless broadband service, and increasingly between wireline and wireless broadband alternatives. This cross-platform competition is founded not only on the functional similarities between and among different platforms, but also on the unique features of each, such that even platforms that are not perfect substitutes exert substantial competitive pressure on other platforms.
- Cable companies were the early leaders in providing broadband service. Local telephone companies began competing aggressively in broadband once regulatory restrictions that inhibited their broadband deployment were lifted. Today, there is vigorous competition between cable television companies and local telephone companies to provide broadband services to consumers, and both are investing heavily in next-generation broadband technology to improve the broadband experience. Telcos are deploying fiber deeper in their networks, while cable companies are implementing new DOCSIS 3.0 technology. As a result of this competition, wireline broadband access has been characterized by falling prices, much faster access speeds, improvements in service quality, and significant customer churn.
- Wireless companies also have begun to expand aggressively into the provision of data and broadband services. The added feature of mobility of these services makes them a competitive alternative to wireline broadband even at relatively lower throughput speeds, but wireless broadband providers are rapidly improving their networks to compete with respect to speed as well. Wireless companies initially offered relatively low-speed data services using technologies such as 1xRTT, but have more recently implemented Third Generation (“3G”) technology that permits much higher speeds. There is aggressive competition between wireless companies, and throughout all aspects of the wireless sector, from service, to handsets and other devices, to operating systems, applications and content.
- Wireless providers are now moving aggressively to deploy Fourth Generation (“4G”) technology such as Long-Term Evolution (“LTE”) and WiMAX and to further expand the broadband capabilities of their networks. This will enable even more robust cross-platform competition between wireless and wireline broadband.
- The current broadband marketplace has brought numerous benefits to consumers, including lower prices, faster speeds, higher quality service, and new ways to access broadband content. Competition has prompted extensive innovation and investment in technology, which in turn have been key drivers of many of these consumer benefits. The current environment, which relies on market forces, creates incentives for broadband providers, device manufacturers, software developers and content providers to experiment with different business models, vertical relations, network management approaches, and service offerings that are attractive to consumers.
- Given current levels of broadband competition and the nascent and rapidly changing broadband environment, network neutrality regulation is unwarranted. In a competitive

market setting, consumers have the ability to choose among different service providers, creating strong incentives for broadband providers to employ business practices that benefit consumers. In such a market setting, provider practices such as network management, differential pricing, and vertical contracting with applications and content providers are typically motivated by procompetitive reasons and providers have neither the ability nor the incentive to engage in anticompetitive practices that harm consumers.

- Imposing network neutrality regulation that restricts provider conduct imposes considerable costs and can have many unintended consequences that render such regulation counterproductive to its intended purpose. Regulation, however well intended, can distort market outcomes and reduce incentives to invest in new technologies. In a competitive, dynamic market setting it is particularly difficult to craft regulations that achieve their intended benefits and avoid imposing large and unintended costs. Rapid technological change, entry by new players, the wide variety of broadband content, diverse consumer preferences, and innovative new business models make the effective use of regulatory power without unintended consequences virtually impossible. By potentially limiting flexibility in pricing, network management, and the development of business models, network neutrality rules would reduce the ability and incentives of broadband providers to innovate and invest and distort the competitive process.
- In the NPRM, the Commission voices concern that effective broadband competition may not be sufficient to protect against certain market failures, and proposes network neutrality regulations to address those concerns. However, there is no evidence of such market failure to date, there are procompetitive justifications for the challenged broadband provider practices, and competition among broadband providers reduces the ability and incentives of providers to engage in anticompetitive pricing, network management, or vertical practices. Moreover, the available evidence suggests that broadband is growing more, not less, competitive. As a result, the risk of anticompetitive conduct continues to fall.
- Given the current competitive environment in broadband access and the Internet ecosystem generally, competitive forces create incentives for broadband providers to offer services that meet consumer demands. A better approach than broad, ex-ante network neutrality regulation is to rely on industry players disclosing their practices and government intervention only when presented with evidence of anticompetitive behavior arising from service provider practices that threatens to harm consumers.

5. Support for these opinions is provided in the remainder of this paper. Section II reviews wireline broadband competition, and in particular the intense rivalry between cable companies and local exchange carriers. Section III assesses competition for wireless broadband services and the wireless ecosystem generally. Section IV explains that increasing cross-platform competition is emerging between mobile wireless providers and wireline providers for the provision of broadband services. I also review several other technologies, such as WiFi and satellite, which provide additional broadband access alternatives for consumers. Section V assesses the

implications of the competitive environment for proposed network neutrality regulation and addresses several specific concerns raised in the NPRM regarding harms that might arise even amidst competition. Section VI provides a brief conclusion.

## II. Wireline Broadband Competition

6. The broadband ecosystem generally and broadband Internet access in particular are still nascent businesses. Broadband access providers and other companies are racing to grow and develop the marketplace by attracting new subscribers. Even with broadband providers' great success over the past few years, many households still do not have a broadband connection. And even households with an existing broadband connection are expected to upgrade those connections to higher-speed technologies over the next several years. From an economic perspective, this is significant because in nascent industries that are undergoing rapid technological change, it is particularly difficult for even the most capable regulator to keep up with the market's evolution.<sup>2</sup>

7. Although broadband is still in its early stages, economic indicators suggest it is developing in a competitive manner, as the Commission itself has previously and repeatedly concluded.<sup>3</sup> In particular, competition is developing as economics would predict given the capital-intensive nature of providing broadband services – that is, competition is developing across platforms. Just as such cross-platform or “intermodal” competition has transformed industries such as transportation (where trucks, railroads, shipping, and planes all compete with each other) and voice telephony (where telephone carriers, cable operators, wireless companies, and VoIP providers all compete with each other), the same is now occurring with broadband.

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<sup>2</sup> See, e.g., Stephen Breyer (1982), *Regulation and Its Reform*, pp. 286–287; Alfred E. Kahn (1971), *The Economics of Regulation*, p. 127; John C. Panzar and Robert D. Willig (1977), “Free Entry and the Sustainability of Natural Monopoly,” *Bell Journal of Economics*, Vol. 8, p. 21; Richard A. Posner (1969), “Natural Monopoly and Its Regulation,” *Stanford Law Review*, Vol. 21, pp. 548, 636.

<sup>3</sup> See, e.g., Appropriate Framework for Broadband Access to the Internet over Wireline Facilities, Report and Order and Notice of Proposed Rulemaking, 20 FCC Rcd 14853, ¶ 44 (2005); Appropriate Regulatory Treatment for Broadband Access to the Internet over Wireless Networks, Declaratory Ruling, 22 FCC Rcd 5901 (2007); United Power Line Council's Petition for Declaratory Ruling Regarding the Classification of Broadband over Power Line Internet Access Service As an Information Service, Memorandum Opinion and Order, 21 FCC Rcd 13281 (2006); Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers, Report and Order and Order on Remand and Further Notice of Proposed Rulemaking, 18 FCC Rcd 16978, ¶ 272 (2003); Petition for Forbearance of the Verizon Telephone Companies Pursuant to 47 U.S.C. § 160(c), Memorandum Opinion and Order, 19 FCC Rcd 21496, ¶ 19 (2004).

**A. There is Significant Head-to-Head Competition between Cable and Telco Providers of Broadband Access**

**1. Cable and DSL Broadband Service**

8. Most U.S. consumers that subscribe to wireline broadband service currently obtain that service either from a cable company or from a local exchange carrier (“telco”). Cable companies were the early leaders in providing broadband Internet access directly to the home. Today, cable modem service typically offers maximum download speeds of between 768 Kbps and 20 Mbps,<sup>4</sup> although maximum speeds of 101 Mbps or more are possible with recently implemented DOCSIS 3.0 technology.<sup>5</sup>

9. Cable broadband access is widely available across the U.S. The National Cable & Telecommunications Association (“NCTA”) estimates that as of 2008, cable modem service was available to more than 92 percent of U.S. households, up from 46 percent in 2000.<sup>6</sup> The vast majority of urban and suburban consumers have access to cable broadband service, and many rural consumers also have access. Specifically, as of 2009, cable operators offered broadband service to approximately 15-20 million rural households.<sup>7</sup> According to the Commission’s annual High-Speed Services for Internet Access Reports (“High-Speed Services Report”), cable modem lines with speeds of over 200 kbps in both directions (“advanced services lines”) have risen from about 6.8 million in 2002 to 37.8 million in 2008.<sup>8</sup>

10. Telephone companies are competing aggressively with cable companies in the provision of broadband access, having been freed from regulatory restrictions that initially hampered such deployment for several years. DSL service, which relies on twisted pair copper wire “telephone lines,” has traditionally been the most common way for telcos to provide broadband access. Like cable modem service, most DSL service offered to consumers is asymmetrical, with faster download speeds than upload speeds; these asymmetrical services are often called ADSL.

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<sup>4</sup> UBS Investment Research, *Telecommunications and Pay TV*, September 3, 2009, p. 9. (“UBS Telecom and Pay TV”)

<sup>5</sup> UBS Telecom and Pay TV, p. 9; “Cablevision Pushes DOCSIS 3.0 Needle to 101 Mbps,” *CEDMagazine.com*, April 28, 2009 (“CED Cablevision 2009”) available at <http://www.cedmagazine.com/News-Cablevision-DOCSIS30-101-Mbps-042809.aspx>.

<sup>6</sup> National Cable & Telecommunications Association Comments, A National Broadband Plan for Our Future, GN Docket No. 09–51, filed June 8, 2009, p. 10.

<sup>7</sup> Letter from Steven Morris, NCTA, to Marlene Dortch, FCC, Regarding Rural Broadband Strategy, GN Docket No. 09–29, April 10, 2009, p. 1. (“Letter Re Rural Broadband Strategy”)

<sup>8</sup> See FCC Industry Analysis & Technology Division, Wireline Competition Bureau, High-Speed Services for Internet Access: Status as of June 30, 2008, July 2009, Table 2. (“FCC High-Speed Services 2009”)

Average download speeds of DSL service are comparable to those of cable and typically range from 768 Kbps to 12 Mbps,<sup>9</sup> although more advanced technology such as ADSL2+ and VDSL can deliver maximum download speeds of 24 Mbps and higher.<sup>10</sup> Typical upload speeds range from 128 to 896 Kbps.<sup>11</sup> I discuss more recent telco deployment of fiber-based broadband service below in Section II.B.1.

11. DSL broadband service is widely available across the U.S. According to the Commission's High-Speed Services Report, as of June 2008, DSL service was available to 83% of U.S. residential households who have local telephone access, up from 76% in June of 2005.<sup>12</sup> According to the same report, ADSL "advanced services" lines have risen from about 1.9 million in 2002 to 26.1 million in 2008, with another 3.8 million ADSL lines with speeds of over 200 kbps in just one direction. In addition, telco-provided SDSL and "traditional wireline" broadband service account for another 900,000 "advanced services" lines.<sup>13</sup>

12. DSL service is widely available to urban and suburban consumers, and many rural consumers also have access to DSL service. As of 2008, the smallest rural incumbent local exchange carriers had already upgraded 91% of their lines to provide at least 200 Kbps of broadband access.<sup>14</sup> The National Exchange Carrier Association confirms these figures, finding that broadband availability to customers served by this group of carriers increased to 92% in 2008 from 79% in 2005.<sup>15</sup>

## 2. Cable-DSL Overlap

13. The increased availability of both cable and DSL service represents a dramatic shift from a decade ago, when dial-up was the most prevalent technology for consumers to access the Internet. Today, DSL has evolved to be a full-fledged competitor to cable modem service, which was the

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<sup>9</sup> Bank of America Merrill Lynch, *Battle for the Bundle: Pressure Eases as Discounts Rolled Back*, October 21, 2009, p. 13. ("Bank of America Pressure Eases 2009")

<sup>10</sup> Merrill Lynch, *Everything Over IP*, March 12, 2004, p. 39.

<sup>11</sup> Bank of America Pressure Eases 2009, p. 13.

<sup>12</sup> FCC High-Speed Services 2009, Table 14; FCC Industry Analysis & Technology Division, Wireline Competition Bureau, High-Speed Services for Internet Access: Status as of June 30, 2005, April 2006, Table 14.

<sup>13</sup> FCC High-Speed Services 2009, Table 2.

<sup>14</sup> FCC Presentation for the September Commission Meeting on Broadband.gov, the National Broadband Plan," September 29, 2009, p. 47 ("FCC Presentation 2009")

<sup>15</sup> National Exchange Carrier Association Comments, Report on Rural Broadband Strategy, GN Docket No. 09-29, filed March 25, 2009, pp. 2-3. These figures are for the NECA's Traffic Sensitive Pool which is a group of 1,119 rural carriers from 47 states. See NECA, "Trends 2008," available at [https://www.neca.org/cms400min/NECA\\_Templates/ResourceInterior.aspx?id=100](https://www.neca.org/cms400min/NECA_Templates/ResourceInterior.aspx?id=100).

early leader in the wireline broadband industry. As of 2003, cable modem lines accounted for 75.6% of wireline advanced services lines nationwide, while ADSL and other telco technologies held 24.5% of this share.<sup>16</sup> However, given improvements in DSL technology, changes in the regulatory environment, and telco deployment of fiber-to-the-home, telcos have become a robust competitor to cable. By 2008, cable's share of wireline advanced services lines had fallen to 56.3% while the share of wireline telcos had risen to 43.7%.<sup>17</sup>

14. Most consumers have a choice in broadband access between cable and DSL, forcing providers to respond to competitive forces. According to the Commission, as of June 2008, 68.1% of U.S. zip codes had two or more cable or DSL providers.<sup>18</sup> In addition, the national statistics cited above show that cable broadband covers 92% of U.S. households and DSL covers 83% of households with access to a local telephone line. This suggests that, at minimum, 75% of U.S. households have access to both types of providers.<sup>19</sup>

15. In regions where Verizon is the local exchange carrier, there is almost complete overlap between Verizon's provision of DSL and cable companies' provision of cable broadband. Verizon maintains data on the availability of its DSL service by wire center. It has obtained data regarding the availability of cable modem service from a third party source and has calculated the number of households in its service areas that can receive both DSL and cable broadband service for the states with the highest concentration of Verizon lines.<sup>20</sup> There are about 27 million households in Verizon's local service territory, and 96.5% of them are in areas that have access to both Verizon's DSL service and cable modem broadband. See Attachment B. The coverage is 100% in states such as Connecticut, New Jersey, and the District of Columbia and over 99% in Delaware, Florida, Massachusetts, Pennsylvania, and Rhode Island.

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<sup>16</sup> FCC High-Speed Services 2009, Table 2. Telco technologies include ADSL, SDSL, Traditional Wireline, and Fiber. In 2003, figures for fiber included a small number of non-telco broadband over power lines.

<sup>17</sup> These figures exclude the rapid growth in mobile wireless lines offering broadband access, which I discuss in more detail below.

<sup>18</sup> FCC High-Speed Services 2009, Table 16. The Commission's High-Speed Services Reports are based on provider Form 477 filings. Although some have suggested that more precise and granular data would be better, (See FCC High-Speed Services 2009, p. 1) they are the most comprehensive public data currently available.

<sup>19</sup> 83% of households with access to a local telephone line have DSL access, and virtually all households have access to a local telephone line. If all of the 17% of households without DSL access have cable access, the total percent of U.S. households with both is 75%. If some households without DSL also do not have access to cable broadband, then the total percentage of households will be higher.

<sup>20</sup> Verizon obtained data from a third party source derived from *Warren's Television & Cable TV Factbook* (2009) on cable modem service by each cable modem's franchise area. Verizon then compared its wire center boundaries with the boundaries of cable franchises. It then calculated the percentage of households in each of its wire centers that had access to both Verizon and cable modem services. For purposes of this analysis, where Verizon broadband or cable modem was available anywhere in the wire center, it was assumed to be available throughout the wire center.

16. This examination of market structure provides a broad contour of cable company and telco participation in the broadband marketplace. Although market structure can establish the framework of competition, an analysis of market structure by itself is insufficient in assessing the competitiveness of a market. That is particularly true for a nascent business like broadband. Given that many consumers still do not have broadband, and that many consumers with broadband will be upgrading those connections going forward, it makes little sense from an economic perspective to conclude that any broadband provider or group of providers has a durable (much less dominant) share of the evolving broadband marketplace in any economically meaningful sense. In any case, even in highly concentrated markets, producer rivalry can lead to competitive outcomes. For example, an increase in concentration can reflect vigorous competition as a more efficient or innovative firm takes market share away from rivals. Similarly, economists recognize that the action of a single provider who chooses to expand its sales aggressively can thwart the potential for collusion even in concentrated markets.<sup>21</sup> Thus, an assessment of competition must also account for price and non-price rivalry between providers, the ability of consumers to switch providers in response to better prices or service, and the potential for innovation by firms inside and outside the industry to change the competitive landscape.<sup>22</sup>

17. Even if one were to assume that cable companies and telcos were the only broadband alternatives, which ignores the increasing platform competition from wireless broadband and other technologies that I discuss below, this does not imply a lack of competition, and certainly does not represent the type of “market failure” that would generally be necessary to justify regulation. It is well recognized in economics that the number of competitors that can efficiently serve a market depends on the size of the market relative to the minimum efficient scale (“MES”) of production and distribution.<sup>23</sup> In a recent filing in this proceeding, the U.S. Department of Justice states, for example, that “[i]n markets such as [broadband], with differentiated products subject to large economies of scale (relative to the size of the market), the Department does not expect to see a large number of suppliers.”<sup>24</sup> Broadband is a capital-intensive industry and the dramatic

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<sup>21</sup> Jonathan Baker (2002), “Mavericks, Mergers, and Exclusion: Proving Coordinated Competitive Effects under the Antitrust Laws,” *New York University Law Review*, Vol. 77.

<sup>22</sup> This is the approach taken by the Commission in its analysis of the mobile wireless industry. See, e.g., FCC, Thirteenth Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services, January 16, 2009. (“Thirteenth CMRS Competition Report”)

<sup>23</sup> See e.g., Dennis Carlton and Jeffrey Perloff (2005), *Modern Industrial Organization*, 4th ed., p. 76.

<sup>24</sup> *Ex Parte* Submission of the United States Department of Justice in the Matter of Economic Issues in Broadband Competition, GN Docket No. 09-51, January 4, 2010, p. 7. (“Economic Issues in Broadband Competition”)

improvements in coverage and capabilities of last-mile broadband provision have required substantial fixed investment. What economics would predict in such capital-intensive industries is for cross-platform competition to develop, as is the case in transportation and wireline telephony, as noted above, and as is occurring today in broadband.<sup>25</sup> Such cross-platform or intermodal competition offers significant consumer benefits as competitors that operate different technological platforms are able to offer highly differentiated packages of price, quality, and functionality. Cross-platform competitors have strong incentives to maintain and expand their subscriber base to spread their fixed costs over a large network of users. When a cable company or telco loses a subscriber to its competitors, it loses both the variable profit contribution from that subscriber as well as the subscriber's contribution to its fixed costs of building and maintaining its network. This creates a strong incentive for providers to maintain services and prices that appeal to consumers, and to continuously invest and innovate to provide better service.<sup>26</sup>

### **3. Head-to-Head Competition for Subscribers**

18. The number of U.S. households subscribing to wireline broadband service has grown rapidly in recent years. A Pew Internet study found that fewer than 5% of all adult Americans had wireline broadband access in 2000. In 2009, the figure is over 60%.<sup>27</sup> Industry analysts confirm these figures; for example, Oppenheimer estimated wireline broadband penetration to be about 60% in 2008.<sup>28</sup> Despite the rapid growth in broadband subscribers, there are still many households that have access to broadband but have chosen not to subscribe. In fact, the same Pew Internet study found that 33% of Americans had access to broadband but chose not to adopt it.<sup>29</sup>

19. This large potential wireline broadband market, along with significant turnover caused by the fact that numerous households move each year, has resulted in broadband providers competing aggressively for new broadband consumers. UBS Investment Research estimated that in the first quarter of 2009, cable companies and telcos evenly split new broadband subscribers between

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<sup>25</sup> See Alfred Kahn (2007), "Network Neutrality," *AEI-Brookings Joint Center for Regulatory Studies*, March 2007, p. 2.

<sup>26</sup> See e.g., Howard Shelanski (2007) "Adjusting Regulation to Competition: Toward a New Model for U.S. Telecommunications Policy," *Yale Journal of Regulation*, p. 85.

<sup>27</sup> "Home Broadband Adoption 2009," *Pew Internet and American Life Project*, June 2009, p. 11. ("Pew Internet June 2009")

<sup>28</sup> Oppenheimer Equity Research, "Key Takeaways from 3Q09," November 18, 2009, Exhibit 14.

<sup>29</sup> Pew Internet June 2009, pp. 3, 8. This is calculated by knowing that 37% of Americans did not subscribe to broadband at home and only 4% blamed it on lack of availability.

them,<sup>30</sup> and Morgan Stanley Research estimated that cable garnered 55% of new wireline broadband subscribers in 2008 and 46% of new wireline broadband subscribers in 2007.<sup>31</sup>

20. Competition for new subscribers also benefits existing broadband subscribers, who can and do switch providers in response to better deals and better service. Switching providers entails a relatively small cost, and data from independent sources show that broadband subscriber churn is considerable and rising. A 2009 IDC study found that 9% of broadband subscribers had changed providers within one year. The same study found that 28.7% of subscribers had changed providers within three years, indicating that consumers switch providers in response to more attractive service packages.<sup>32</sup> Churn rates have also been increasing over time. The one year churn rate reported by IDC in 2007 was 6.9% and the three year churn rate 20.4%, a rise of over 8% in just two years.<sup>33</sup>

21. The ability and propensity for consumers to switch providers creates incentives for cable companies and telcos to offer attractive combinations of price and service and to invest in their networks to improve service offerings. In addition, in order to attract and retain subscribers, cable and telco providers must offer access to a wide variety of content and do so using network management practices that consumers accept. In contrast, a provider that implements network management techniques or limits access to content in ways that consumers do not appreciate will quickly find itself faced with high levels of customer defection. In this way, competition provides a powerful signal to broadband providers about network management practices and open access to content.

22. Although there is substantial overlap in DSL and cable broadband coverage areas, the pro-consumer effects of such competition is not limited to just the overlap areas. Competition in these regions of overlap also protects consumers living in pockets without such overlap. Cable companies and telcos do not tailor their plans, services, or prices differently in pockets without overlap, and there would likely be considerable logistical and other difficulties in doing so. For example, uniform marketing and advertising is typically used across fairly broad geographic areas

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<sup>30</sup> UBS Investment Research, *Cable Making Gains in Broadband*, May 14, 2009, p. 3. (“UBS Cable Making Gains 2009”)

<sup>31</sup> Morgan Stanley Research, *Cable/Sat & Telecom Broadband Outlook: 1Q Subscriber Growth ‘Less Bad,’ Pricing Watch On*, April 17, 2009, p. 2.

<sup>32</sup> Presentation on Profile of U.S. Broadband Consumers – 2009 Survey, Amy Lind of IDC Consumer Broadband and Mobile Services, 2008, p. 20. (“IDC”)

<sup>33</sup> IDC p. 20.

(such as a DMA in the case of television advertising), and it would be difficult to conduct effective marketing campaigns that distinguish between overlap and non-overlap areas. Thus, even customers in areas who do not have access to both cable and DSL do have access to the improved plans and prices that are wrought by the competition in other areas.<sup>34</sup>

**B. Telcos and Cable Companies are Competing to Innovate and Deploy Advanced Technologies**

23. The substantial investment and deployment of new technology provides further evidence of vigorous competition among telcos and cable companies to attract and retain subscribers. Economists recognize that in markets where innovation and investment in technology are important, consumer welfare is highly dependent on firms competing to develop and deploy new and better services. In competitive markets, providers are forced to innovate and invest to meet changing consumer demands as those who do not will be weakened with consumer defections and a slowdown in new subscribers. As the Antitrust Modernization Commission has stated, “[i]nnovation provides a significant share of the consumer benefits associated with competition, particularly in the most dynamic industries. New and improved products and services, as well as new business methods and production processes, are created through innovation.”<sup>35</sup> Dynamic competition and fast-paced innovation are central features of the wireline broadband access industry. As broadband content has evolved and become more bandwidth intensive, consumers have demanded faster, more reliable, higher-quality services. Telcos and cable companies have met this demand for increased bandwidth with expensive and extensive deployment of new technologies and expanded services. Telcos are in the process of deploying fiber infrastructure at costs into the tens of billions of dollars. Cable companies are undertaking expensive investment to upgrade their infrastructure to DOCSIS 3.0.

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<sup>34</sup> A similar point has been made by other economists. See, e.g., Jerry Brito and Jerry Ellig (2007), “A Tale of Two Commissions: Net Neutrality and Regulatory Analysis,” *CommLaw Conspectus*, p. 19.

<sup>35</sup> *Antitrust Modernization Commission Report and Recommendations*, April 2007, pp. 39–40. (“AMC Report”) See also, Richard Gilbert (2005), “New Antitrust Laws for the ‘New Economy’?” Testimony before the AMC, November 18, 2005, p. 1. (“Dynamic competition to develop new products and to improve existing products can have much greater impacts on consumer welfare than static price competition”)

## 1. Telco Investment and Deployment of Fiber-Based Broadband Services

24. Telcos have invested heavily in deploying high speed fiber optic cable to improve the speed and reliability of their broadband services.<sup>36</sup> As of March 2009, fiber brought directly into the home (“FTTH”) (excluding fiber which reaches close to the premises but not into the home (fiber to the node, or “FTTN”)), passed 14.9 million U.S. households.<sup>37</sup> As of 2009, FTTH service was available to 13% of all U.S. households, and 4% of homes were actually subscribing to FTTH services.<sup>38</sup> Growth has been significant as fiber to the home was essentially non-existent in 2002.<sup>39</sup> The Commission has estimated that, as of 2008, there were 2.3 million advanced services fiber lines in service the U.S.<sup>40</sup> Industry analysts expect that total fiber, which includes FTTH and FTTN, to reach nearly 50 million households by 2012.<sup>41</sup>

25. Verizon has been the leader in deployment of FTTH and is in the middle of its plans to spend \$23 billion to bring its FiOS network to 19 million homes.<sup>42</sup> As of 3Q 2009, Verizon had already deployed FiOS to pass over 14.5 million premises covering more than 45% of its footprint.<sup>43</sup> Verizon advertises that its fiber network can deliver Internet download speeds of about 50 Mbps and upload speeds of 20 Mbps.<sup>44</sup>

26. AT&T has been deploying its U-verse service, which relies on fiber to the node (“FTTN”) technology.<sup>45</sup> In early 2008, analysts estimated that AT&T invested \$5.6 billion in 2007 and 2008 to deploy its U-verse service.<sup>46</sup> As of 2009, U-verse passed more than 19 million housing units,<sup>47</sup>

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<sup>36</sup> The telcos have also made improvements to their DSL service, often in combination with deployment of fiber technology.

<sup>37</sup> RVA LLC, Fiber-to-the-Home: North American Market Update, for the FTTH Council, April 2009, p. 6, available at [http://www.ftthcouncil.org/sites/default/files/RVA.FTTH\\_Apr09.060109.pdf](http://www.ftthcouncil.org/sites/default/files/RVA.FTTH_Apr09.060109.pdf) (“RVA 2009”)

<sup>38</sup> RVA 2009 p. 10.

<sup>39</sup> RVA 2009 p. 10.

<sup>40</sup> FCC High-Speed Services 2009, Table 2.

<sup>41</sup> Bernstein Research, U.S. Telecommunications, Cable & Satellite: The Dumb Pipe Paradox, Revisited, June 11, 2009, pp. 4–5.

<sup>42</sup> “Verizon’s FiOS: A Smart Bet or a Big Mistake,” *The New York Times*, August 19, 2008.

<sup>43</sup> Verizon, Q3 *Investor Quarterly 2009*, October 26, 2009, p. 8. (“Verizon 3Q Investor Quarterly 2009”)

<sup>44</sup> Verizon FiOS website available at <http://www22.verizon.com/Residential/FiOSInternet/FiOSvsCable/FiOSvsCable.htm> accessed on December 7, 2009.

<sup>45</sup> “AT&T U-verse TV Ranks Highest in J.D. Power and Associates Study in South and West Regions for Second Year in a Row,” *AT&T Press Release*, October 7, 2009. (“AT&T U-verse 2009”) Bear Stearns, *December Broadband Buzz: A Monthly Update on Critical Broadband Issues*, January 2, 2008, p. 2. (“Bear Stearns January 2008”)

<sup>46</sup> Bear Stearns January 2008, p. 2.

<sup>47</sup> AT&T U-verse 2009.

and AT&T plans to deploy U-verse to 30 million units by the end of 2011.<sup>48</sup> AT&T advertises maximum download speeds of 24 Mbps for its U-verse service.<sup>49</sup>

27. Qwest has started to roll out its high speed fiber-optic Internet footprint to various cities, including Denver, Phoenix, Tucson, Salt Lake City, and Minneapolis/St. Paul.<sup>50</sup> By the end of 2009, Qwest expected its fiber footprint to cover more than three million homes.<sup>51</sup> Qwest advertises that its fiber network can deliver Internet download speeds of up to 40 Mbps and upload speeds of 20 Mbps.<sup>52</sup>

28. Fiber deployment has not been limited to the largest ILECs. According to one study, as of March 2009, in addition to Verizon there were “a total of 681 other providers of FTTH in America which represents over 1.1 million total connections.”<sup>53</sup> Among tier 3 rural incumbent local exchange carriers, which represent roughly 8 million households, one market analyst noted that half of these rural carriers have already started providing FTTH to some of their customers and another quarter plan on building out FTTH over the next three years.<sup>54</sup>

## **2. Cable Company Investment and Deployment**

29. Cable companies are in the midst of their own technological upgrade, and invested more than \$14.6 billion in their total infrastructure (including non-broadband related access), during 2008. This figure was \$14.4 billion in 2009.<sup>55</sup> Some of this investment has been directed toward transitioning from DOCSIS 2.0 to DOCSIS 3.0 technology. DOCSIS 3.0 increases the efficiency of cable spectrum via channel bonding, which allows cable operators to share channels across

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<sup>48</sup> “AT&T Reports Fourth-Quarter and Full-Year Results Highlighted by Robust Wireless Data Growth, Accelerated U-verse TV Ramp, Continued Double-Digit Growth in IP Data Service,” *AT&T Press Release*, January 28, 2009.

<sup>49</sup> “AT&T U-verse High Speed Internet” available at <http://www.att.com/u-verse/explore/internet-landing.jsp> last accessed January 1, 2010.

<sup>50</sup> “Qwest Unveils 40 Mbps Downstream, 20 Mbps Upstream High-Speed Internet Service,” *Qwest Press Release*, July 20, 2009. (“Qwest 2009”)

<sup>51</sup> Qwest, Shareholders Meeting: Chairman’s (Ed Mueller) Remarks, 2009, p. 4. “Qwest has indicated total capital investment of \$1.6 billion or lower in 2009.” Joe Euteneuer, Qwest Executive Vice President – Chief Financial Officer, “Qwest Bank of America Merrill Lynch 2009 Credit Conference Presentation,” December 3, 2009, p. 14 available at <http://investor.qwest.com/index.php?s=19>.

<sup>52</sup> Qwest 2009.

<sup>53</sup> RVA 2009, pp. 9–10.

<sup>54</sup> Michael Render (2009), “Overview: ILEC vs. Muni-Fiber Builds,” *The FTTH Prism*, Vol. 6, No. 2, March 2009 available at <http://www.chaffeefiberoptics.com/nwsltr/ftthprismvol6no2.pdf>. (“Render 2009”)

<sup>55</sup> See NCTA, “Investments in Infrastructure,” available at <http://www.ncta.com/Statistics.aspx> accessed December 24, 2009 and January 8, 2009.

subscribers.<sup>56</sup> DOCSIS 3.0 can achieve downstream speeds of 100 Mbps,<sup>57</sup> allowing cable operators to compete with the speeds of the telcos' fiber networks. In comparison, DOCSIS 2.0 provides maximum downstream speeds from approximately 30 to 43 Mbps.<sup>58</sup>

30. Cablevision has already deployed DOCSIS 3.0 technology across its entire footprint, and launched service on May 11, 2009.<sup>59</sup> Comcast has deployed DOCSIS 3.0 to 50% of its footprint and planned to cover 80% of its footprint by the end of 2009.<sup>60</sup> Cox has planned to provide DOCSIS 3.0 service to more than two thirds of its systems across the country by the end of 2010.<sup>61</sup> Similarly, in September 2009, Time Warner Cable offered DOCSIS 3.0 technology in New York City<sup>62</sup> and plans to continue its DOCSIS 3.0 rollout through 2010.<sup>63</sup>

31. Rural cable companies are also upgrading to DOCSIS 3.0. For example, Sjoberg Inc., which provides cable broadband services to towns in Northwest Minnesota with populations ranging from 89 to 8,400, plans to offer DOCSIS 3.0 technology by the first quarter of 2010. BendBroadband which operates in central Oregon planned to deploy DOCSIS 3.0 throughout its footprint during 2009.<sup>64</sup> Analysts estimate that DOCSIS 3.0 will be available to almost 99 percent of all U.S. homes that are passed by cable by 2013.<sup>65</sup>

32. The fact that the cable companies and telcos are investing so heavily in new technologies confirms that the current wireline broadband market structure, with two firms aggressively competing head-to-head, is delivering the benefits of dynamic competition to consumers.

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<sup>56</sup> Bear Stearns, *March Broadband Buzz: A Monthly Update on Critical Issues*, April 1, 2008, p. 3. ("Bear Stearns April 2008")

<sup>57</sup> For example, see Cablevision's DOCSIS 3.0 speeds. CED Cablevision 2009 and UBS Cable Making Gains 2009, p. 5.

<sup>58</sup> Ron Hranac (2006), "DOCSIS 3.0," *Communications Technology*, March 1, 2006 available at <http://www.cable360.net/ct/strategy/emergingtech/14944.html>.

<sup>59</sup> "Cablevision Breaks the Century Mark – Introduces Nation's First 101-Megabits-Per-Second High-Speed Internet Service, Optimum Online Ultra," *Cablevision Press Release*, April 28, 2009.

<sup>60</sup> "Q2 2009 Comcast Corporation Earnings Conference Call – Final," *FD (Fair Disclosure) Wire*, Transcript 080609a2285950.750, August 6, 2009 (statement by Comcast EVP and CFO, Michael Angelakis).

<sup>61</sup> "Cox Ups Internet Speeds, Boards ESPN360.com Train," *CEDMagazine.com*, September 24, 2009 available at <http://www.cedmagazine.com/News-Cox-Internet-speeds-ESPN360-092409.aspx>.

<sup>62</sup> "Time Warner Cable Launches Its Fastest Internet Yet in New York City with Time Warner Cable Wideband Internet & Business Class Wideband Internet", *Time Warner Cable News Release*, Sept. 24, 2009.

<sup>63</sup> "Time Warner Cable, Inc. at Goldman Sachs Communacopia Conference New York – Final," *FD (Fair Disclosure) Wire*, Transcript 091509a2435064.764, September 15, 2009 (statement by Time Warner Cable CFO & Senior EVP Rob Marcus).

<sup>64</sup> Letter Re Rural Broadband Strategy.

<sup>65</sup> "Report: DOCSIS 3.0 To Blanket U.S. by 2013," *Multichannel News*, May 1, 2009 available at [http://www.multichannel.com/article/231033-Report\\_DOCSIS\\_3\\_0\\_To\\_Blanket\\_U\\_S\\_By\\_2013.php](http://www.multichannel.com/article/231033-Report_DOCSIS_3_0_To_Blanket_U_S_By_2013.php) (citing statistics from Pike & Fischer).

### C. Other Indicia of Vigorous Competition in the Provision of Broadband Access

33. Other marketplace evidence also demonstrates that cable companies and telcos are competing aggressively for subscribers, that competitive rivalry between cable companies and telcos is increasing, and that this competition is benefitting consumers with better broadband services and lower prices.<sup>66</sup>

#### 1. Prices Have Fallen and Service Quality Has Improved

34. The available evidence shows that broadband access prices have declined over time, while speed and quality of service have increased considerably.<sup>67</sup> In some cases, prices for the same level of service have fallen outright. In other instances, the consumer receives better and faster service, often significantly better and faster, for the same price. From an economic perspective, both of these are an indication that quality-adjusted prices have fallen.

35. A 2008 USTelecom analysis calculated that, industry wide, prices for telco plans ranging from 768 kbps to 1.5 Mbps dropped from about \$50 per month in 2001 to \$25 in 2007, and that a 15 Mbps plan, which was not even available in 2001, could be purchased for \$51 in 2007.<sup>68</sup> In other words, by 2007 consumers could obtain basic broadband service for 50% of the price they were paying in 2001, and for the same 2001 price they could get 10 to 20 times the maximum download speed by 2007.<sup>69</sup> Price declines have continued since then. Litan and Singer (2007) documented that the price of Verizon broadband service with 768 kbps of download speed had fallen from \$49.95 in 2001 to \$19.99 in 2007.<sup>70</sup> In 2009, a \$19.99 price from Verizon offered download speeds of up to 1 Mbps.<sup>71</sup> SBC (the precursor to the current AT&T) offered a 3 Mbps

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<sup>66</sup> In its 2007 report on the broadband Internet access industry, the FTC noted that “[t]here is evidence that the broadband Internet access industry is moving in the direction of more, not less, competition, including fast growth, declining prices for higher-quality service, and the current market-leading technology (i.e., cable modem) losing share to the more recently deregulated major alternative (i.e., DSL).” “Broadband Connectivity Competition Policy,” *FTC Staff Report*, June 2007, p. 10. (“FTC Staff Report 2007”)

<sup>67</sup> Price comparisons are complicated by significant improvements in speed, reliability, and quality of service over time. Price comparisons are also complicated by temporary promotions, contract terms, and bundled packages. See, e.g., Barclay’s Capital Equity Research, *Cable & Satellite Communications*, January 12, 2009. Nonetheless, comparisons of pricing offers over time still provides a useful guide to provider behavior.

<sup>68</sup> USTelecom, *Wireline Broadband Pricing 2001–2007 Presentation*, June 2008 available at <http://www.ustelecom.org/uploadedFiles/Learn/Broadband.Pricing.Document.pdf>.

<sup>69</sup> 15 Mbps is 10 times 1.5 Mbps and approximately 20 times 768 kbps.

<sup>70</sup> Robert Litan and Hal Singer (2007), “Unintended Consequences of Net Neutrality Regulation,” *Journal on Telecommunications and High Technology Law*, p. 17.

<sup>71</sup> Verizon website <http://www22.verizon.com/Residential/HighSpeedInternet/Plans/Plans.htm> last accessed on December 7, 2009.

month-to-month broadband plan for \$59.95 in 2005.<sup>72</sup> In 2009, AT&T offered a 3 Mbps month-to-month plan for \$30 per month.<sup>73</sup>

36. Cable companies have been boosting the speed of their access without increasing price over this same time period. In 2005, Comcast increased the download speed of its service from 3 Mbps to 4 Mbps at no extra cost. Its premium 4 Mbps service experienced a 50% increase in speed to 6 Mbps, also at no extra cost.<sup>74</sup> Time Warner Cable and Cox Communications upgraded their services at about the same time.<sup>75</sup> To get a sense of actual prices, in 2005 Comcast offered a 4 Mbps plan at \$42.95 per month.<sup>76</sup> In 2009, Comcast advertises a 15 Mbps plan for the same \$42.95 per month.<sup>77</sup> This represents a decline from \$10.74 per megabit in 2005 to \$2.86 per megabit in 2009. In 2005, Cox advertised a 5 Mbps plan for \$64.95 per month.<sup>78</sup> In 2009, Cox advertises speeds of up to 20 Mbps for the same \$64.95 price.<sup>79</sup> This represents a decline from \$12.99 per megabit in 2005 to \$3.25 per megabit in 2009.

37. Many providers also offer economy broadband Internet service plans for budget-conscious consumers. For example, Comcast currently offers a 1 Mbps plan for only \$24.95 per month.<sup>80</sup> Cox offers its “Essential” cable Internet plan with speeds up to 3Mbps for \$31.99 per month.<sup>81</sup> Verizon offers DSL service at 1 Mbps, 3 Mbps, and 7.1 Mbps for \$19.99, \$29.99, and \$39.99 per month, respectively.<sup>82</sup>

38. Beyond competing strictly on monthly prices, wireline broadband providers also routinely offer various promotions and discounts. Providers offer special low prices for a limited period. They also have given away free hardware like modems, routers, and, recently, new netbooks. For

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<sup>72</sup> Bear Stearns Equity Research, *June Broadband Buzz: Pricing Actions, WiMAX, and Cable Privatization*, June 22, 2005, p. 2. (“Bear Stearns 2005”)

<sup>73</sup> See <http://www.att.com/gen/general?pid=10891> last accessed December 10, 2009.

<sup>74</sup> “Comcast to Raise Broadband Speed,” *CNet News*, January 16, 2005 available at [http://news.cnet.com/2100-1034\\_3-5537306.html](http://news.cnet.com/2100-1034_3-5537306.html). (“CNet News 2005”)

<sup>75</sup> CNet News 2005.

<sup>76</sup> Bear Stearns 2005, p. 2.

<sup>77</sup> See <http://www.comcast.com> for pricing information. Pricing information was found for Palo Alto, CA and last accessed on December 7, 2009.

<sup>78</sup> Bear Stearns 2005, p. 2.

<sup>79</sup> See <http://ww2.cox.com/residential/santabarbara/internet/premier-internet.cox> last accessed on December 10, 2009.

<sup>80</sup> See <http://www.comcast.com/> for internet prices last accessed on January 8, 2010.

<sup>81</sup> See <http://ww2.cox.com/residential/santabarbara/internet/premier-internet.cox> last accessed on December 10, 2009.

<sup>82</sup> See <http://www22.verizon.com/Residential/HighSpeedInternet/Plans/Plans.htm> last accessed on December 7, 2009.

example, Verizon recently ran a promotion that included a “Free Netbook/Camcorder.”<sup>83</sup> Cash back promotions are also popular.<sup>84</sup> The trend of lower prices and faster speeds demonstrates an environment where cable and telco companies are vigorously competing to attract and retain subscribers.

39. Consumers are also benefitting from having an increasing array of service options available from their cable and telco providers. Both cable and telco broadband providers typically offer a range of different pricing tiers that correspond to different speeds of service. For example, Comcast currently offers five different types of service plans based on speed: 1, 15, 20, 30 and 50 Mbps.<sup>85</sup> Verizon currently offers three types of plans, with speeds at 1 Mbps, 3 Mbps, and 7.1 Mbps.<sup>86</sup> Other wireline providers offer similar selections. Cable and telco providers also offer broadband as part of bundles of services, which typically offer consumers additional discounts as well as added convenience. Consumers can often choose to purchase broadband service with any combination of voice and television service, usually with an accompanying discount. This provides consumers with another dimension of choice – and greater price competition.

40. While quality-adjusted broadband prices have been declining, broadband service quality has also been improving, which is yet another sign of vigorous competition between cable and telco providers. Consumer Reports concluded in a 2009 report that subscribers were very satisfied with their broadband service from telcos and cable providers.<sup>87</sup> JD Power and Associates reported that overall satisfaction for residential high-speed internet service has increased relative to 2008 with improvement in performance and reliability.<sup>88</sup> TM Forum, an industry group for the communications and media industries, found that customer service for residential broadband has

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<sup>83</sup> Bank of America Pressure Eases 2009, p. 1. Also, see Verizon’s Neighbor Awareness 60 \$119 Rev 2 YVCF9102000.mov.

<sup>84</sup> See e.g., Bear Stearns April 2008, pp. 6–7.

<sup>85</sup> See Comcast internet plans available at <http://www.comcast.com> last accessed on December 15, 2009 for a Palo Alto, CA address.

<sup>86</sup> See <http://www22.verizon.com/Residential/HighSpeedInternet/Plans/Plans.htm> last accessed on December 7, 2009.

<sup>87</sup> See ConsumerReports.org report on Bundled Services posted in January 2009 available at <http://www.consumerreports.org/cro/electronics-computers/tvs-services/bundled-services/overview/bundling-ov.htm> last accessed on December 15, 2009.

<sup>88</sup> “J.D. Power and Associates Reports: Improvements in Performance and Reliability Drive Increase in Overall Customer Satisfaction with Residential Internet Service Providers,” *J.D. Power and Associates Press Release*, October 28, 2009.

increased dramatically since 2006. The group credits this improvement to more consumer choice and increasing competition.<sup>89</sup>

## **2. Cable Companies and Telcos Target Each Other's Broadband Service in Their Advertising**

41. Recent advertising campaigns by cable companies and telcos comparing their broadband services and prices provide further evidence of vigorous head-to-head competition between the two. Economists recognize that a main purpose of advertising is to increase demand for a firm's product.<sup>90</sup> Aggressive advertising that directly compares prices and services is strongly indicative of firms' attempts to change market perceptions and to increase market share. Many empirical studies have shown that advertisements about prices tend to reduce the average price consumers pay.<sup>91</sup>

42. Cable companies such as Cablevision, Brighthouse, Comcast, and Time Warner Cable have campaigns that emphasize cable's purportedly faster speeds,<sup>92</sup> lower prices,<sup>93</sup> better service and customer satisfaction,<sup>94</sup> and overall better value<sup>95</sup> in direct comparison to telcos generally and Verizon, specifically. Cox even has a campaign describing the experience of actual customers who have switched from telcos back to Cox,<sup>96</sup> and Cablevision has unleashed promotions giving away a free iPod Touch or cash back to consumers who make a switch.<sup>97</sup> Verizon has countered with similar advertisements trumpeting its offerings as the "best value in broadband."<sup>98</sup> Such aggressive advertising is not limited to telcos and cable. For example, Clearwire, a recent entrant into the broadband market, which I will discuss later, also markets itself on its website as an

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<sup>89</sup> The report specifically looked at customer service during service activation, response times to customer service requests, and incidents of repeated problems. "Residential Broadband Service Providers Have Improved Service Delivery and Problem Resolution Speed, Says New TM Forum Report," *M2 PressWire*, October 13, 2009.

<sup>90</sup> See Carlton and Perloff (2005), p. 477.

<sup>91</sup> See Carlton and Perloff (2005), p. 481.

<sup>92</sup> See Cablevision's *Woman Talks About Offer With No Hidden Fees.wmv*. See also Time Warner's *TMWCCA-16193a.mp3*.

<sup>93</sup> See Comcast's *COMCA-22818a.wmv* and *Attention Verizon Internet Customers.wmv*.

<sup>94</sup> See Cablevision's *GTAD81901.mp3*.

<sup>95</sup> See Brighthouse's *BRTHCA-1188a.mp3*.

<sup>96</sup> See Cox's *Customers Tell Us Why They're Switching.wmv*.

<sup>97</sup> See Cablevision's *CABVCA-1747a.wmv* and *CABVCA-1841a.wmv*.

<sup>98</sup> See Verizon's *Poster Revised Final 4[2].3.09.pdf*.

alternative to DSL and cable in home broadband provision,<sup>99</sup> and many observers including the Department of Justice see Clearwire as a viable alternative for wireline broadband customers.<sup>100</sup>

43. As I discussed above, Verizon has been extensively deploying and marketing its fiber-based FiOS broadband service. This has led to additional comparative advertising by Verizon and cable companies. Verizon has been heavily promoting FiOS by offering cash back deals or free netbooks for switching to FiOS.<sup>101</sup> Its advertisements have criticized cable broadband technology.<sup>102</sup> Cable companies such as Comcast, Cox, and Time Warner have responded by specifically targeting FiOS in their advertisements underscoring their allegedly better customer service,<sup>103</sup> emphasizing their better value,<sup>104</sup> and highlighting FiOS customers who have returned to cable.<sup>105</sup> Comcast and Cablevision have offered their own cash back promotions.<sup>106</sup>

### **3. All Sectors of the Wireline Broadband Ecosystem Are Thriving**

44. Another sign that competition for wireline broadband access is thriving is the massive innovation and investment that is taking place at all levels of the wireline broadband ecosystem. Innovation in content is evident through the development and popularity of Google, YouTube, iTunes, Facebook, Twitter, Hulu, and much more. Innovation has occurred in hardware as well; gaming consoles such as the Nintendo Wii rely on wireline broadband connections to bring online gaming and online content to consumers,<sup>107</sup> and the Vudu box allows users to watch movies from the Internet directly on their television.<sup>108</sup> The massive investment that occurs to promote this innovation reflects investor and marketplace confidence in the ability of consumers to obtain access to the broadband services necessary to access these content, applications, and devices. And the fact that this great success in the development and use of broadband applications, content, and devices has occurred in the absence of network neutrality regulation provides strong evidence that such regulation is unnecessary for the broadband ecosystem to develop and thrive.

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<sup>99</sup> See <http://www.clear.com/shop/services/home> last accessed on December 15, 2009.

<sup>100</sup> Economic Issues in Broadband Competition, p. 9.

<sup>101</sup> See CCT90024 Drop Cable Advo FSI 25-F-1.pdf; See Neighbor Awareness 60 \$119 Rev 2 YVCF9102000.mov.

<sup>102</sup> See More HD National YVZH8184.mov.

<sup>103</sup> See Cox's Employee Reads Quotes From Returning Customers.pdf.

<sup>104</sup> See Time Warner Cable 0197BAXZ\_PA0.wmv.

<sup>105</sup> See Comcast COMCA-24590a.mp3.

<sup>106</sup> See Comcast's Mike and Sarah are Back with 150 offer.pdf. See Bank of America Merrill Lynch, *Battle for the Bundle: Cable Chips Away at Bell Pricing Gap*, July 15, 2009, pp. 2–3. Cablevision's offer was for a \$200 American Express card.

<sup>107</sup> See <http://us.wii.com/connect/> last accessed on January 9, 2010.

<sup>108</sup> "High-Speed Video Store in the Living Room," *The New York Times*, September 6, 2007.

### III. Wireless Broadband Competition

45. Increasingly, cable and wireline telco are not the only platforms over which consumers receive broadband access. Wireless providers initially began to expand into data and broadband several years ago, with technologies such as 1xRTT. With the subsequent deployment of 3G and 4G technologies, consumers are increasingly using mobile wireless broadband for email, Internet access, social networking, access to streaming media, and other uses that had previously been available predominantly from wireline providers. Consumers can access broadband content via a variety of mobile devices, including smartphones, netbooks and laptops. Indeed, mobile broadband has become such an integral part of the broadband experience, that applications and content are now being developed specifically for mobile access. In this section, I document the competition among mobile wireless providers to provide broadband services.

46. The Commission has already assembled substantial evidence that there is vigorous competition within the mobile wireless ecosystem, of which mobile broadband is an increasingly important component. It has repeatedly concluded that the mobile wireless industry is competitive. In its most recent CMRS Competition Report, released on January 16, 2009, the Commission stated that “U.S. consumers continue to benefit from effective competition in the CMRS marketplace.”<sup>109</sup>

47. Since then, the Commission has initiated a Notice of Inquiry<sup>110</sup> on mobile wireless competition, seeking “to expand and enhance [its] analysis of competitive conditions, both to improve [its] assessment of the current state of competition in the entire mobile wireless market ecosystem and to better understand the net effects on the American consumer.” The record established in response again demonstrated the competitive nature of the mobile wireless industry, including the provision of mobile broadband services. Many parties submitted evidence regarding the vigor of competition, the high level of innovation, and the variety of business models within the mobile wireless ecosystem.

48. I submitted a declaration on behalf of Verizon Wireless, concluding that:

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<sup>109</sup> Thirteenth CMRS Competition Report, ¶274.

<sup>110</sup> Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, WT Docket No. 09-66, Notice of Inquiry, FCC 09-67, released August 27, 2009.

“The wireless market [including mobile broadband], while not perfectly competitive according to the textbook model, shows many signs of vigorous competition – low prices, numerous customer choices, new services and features, improved quality, and significant innovation. Most consumers have numerous choices when purchasing wireless service; switching between providers has gotten easier; service packages offering various bundles of services are available to consumers with different needs; there has been robust price competition for voice and data plans; wireless devices and mobile operating systems are evolving rapidly; and large numbers of new applications are available and in widespread use.”<sup>111</sup>

49. Similarly, in the Commission’s recent Mobile Wireless Innovation NOI proceeding, Gerald Faulhaber and David Farber filed a declaration that stated: “[W]e find that the three segments of the wireless marketplace (applications, devices, and core network) [including mobile broadband] have exhibited very substantial innovation and investment since inception... Further we find that the three segments of the industry are also highly competitive. There are many players in each segment, each of which aggressively seeks out customers through new technology and new business methods.”<sup>112</sup>

50. And, in the few months since the filing of these reports, developments have only served to reinforce the fact that competition to provide mobile broadband services is vigorous and evolving to meet varied consumer demands. In this section I discuss various market evidence related to the provision of mobile broadband services.<sup>113</sup>

#### **A. Consumers Have Many Choices for Mobile Broadband Service**

51. Market structure evidence shows that the majority of consumers have considerable choice in where and how they purchase and use mobile broadband services. All four “nationwide” facilities-based providers (AT&T, Verizon Wireless, Sprint, T-Mobile), several large regional facilities-based providers (MetroPCS, Leap, U.S. Cellular), and many smaller regional providers

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<sup>111</sup> Michael Topper (2009), “Assessing the Competition of Mobile Wireless: An Economic Analysis,” White Paper Regarding the FCC’s Mobile Wireless Competition NOI, September 30, 2009, p. 3.

<sup>112</sup> Gerald Faulhaber and David Farber (2009), “Innovation in the Wireless Ecosystem: A Customer-Centric Framework,” White Paper Regarding the FCC’s Mobile Wireless Innovation NOI, p. 2.

<sup>113</sup> For additional information, see my declaration for the Mobile Wireless Competition NOI proceeding (Topper (2009)), and other submissions to the Mobile Wireless Competition NOI and Mobile Wireless Innovation NOI proceedings.

provide mobile broadband services, along with voice, email and other services.<sup>114</sup> In addition, recent experience demonstrates that new entry is possible on a wide scale. For example, Clearwire – which is backed by Sprint as well as powerful industry players such as Intel, Google, and several cable companies – has recently entered the market as a mobile broadband provider. Finally, some MVNOs such as Virgin Mobile, Beyond Mobile and Credo Mobile also provide mobile broadband along with their voice services, further increasing the number of providers.<sup>115</sup>

52. Several new developments in the wireless industry have strengthened and expanded the provision of wireless broadband service. Recent acquisitions have enabled the facilities-based nationwide providers to expand their footprints and increase the capacity of their existing networks. Expansion from regional to nationwide footprints and aggregation of spectrum has allowed providers to achieve better economies of scale. These operating efficiencies have, in turn, allowed for expansion of 3G networks and deployment of 4G networks at speeds that greatly facilitate wireless broadband.

53. According to the Commission, as of May 2008, 92.3% of the population lived in census blocks with one or more provider of 3G wireless, 72.5% of the population lived in census blocks with two or more providers of 3G wireless, and 50.7% of the population lived in census blocks with three or more providers of 3G wireless.<sup>116</sup> This compares favorably to May 2007, when only 82.0% of the population lived in census blocks with one or more provider of 3G, 64.0% of the population lived in census blocks with two or more providers of 3G, and 41.0% of the population lived in census blocks with three or more providers of 3G.<sup>117</sup> Furthermore, as I discuss in detail below, wireless providers have continued to deploy next-generation technologies since 2008, suggesting that the penetration numbers reported for 19 months ago likely are a significant underestimate of current conditions.

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<sup>114</sup> For example, small regional carriers like Cincinnati Bell Wireless, NTELOS, SouthernLINC, Corr Wireless, Pocket Communications, and Cellular South, have mobile broadband services, just like their larger competitors.

<sup>115</sup> See Verizon Wireless Comments to Competition NOI, WT Docket No. 09-66, filed September 30, 2009, p. 33 for a list of MVNO's. ("Verizon Comments to Competition NOI") See Beyond Mobile's website <http://www.cbeyond.net/services/mobile/wireless-laptop-access.htm> accessed November 30, 2009. See Credo Mobile's website <http://www.credomobile.com/plan/extras.aspx> last accessed December 14, 2009. See Virgin Mobile's website <http://www.virginmobileusa.com/mobile-broadband> last accessed on December 14, 2009. Virgin Mobile is owned by Sprint.

<sup>116</sup> Based on American Roamer data at the census block level, with "mobile broadband" defined as WCDMA/HSDPA or EV-DO technologies. The U.S. Census Bureau uses census blocks as the smallest geographic unit in which to tabulate the census. Census blocks generally contain fewer than 3,000 people and are more granular than zip codes. Thirteenth CMRS Competition Report, ¶¶37–38, 146.

<sup>117</sup> Twelfth Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services, February 4, 2008, ¶144.

54. The market structure of the mobile wireless industry, with numerous providers competing to offer a range of mobile broadband services to consumers, is one indicator of vigorous competition. Other pieces of market evidence, including increasing output, declining prices, diverse service offerings and business practices, significant investment in network infrastructure, highly competitive adjacent markets for wireless devices, mobile operating systems, applications, and broadband content, and significant innovation throughout the mobile wireless ecosystem also points to fierce rivalry among wireless providers. This market evidence, which I review in the next several sections, strongly suggests a well-functioning and rapidly evolving competitive marketplace that has delivered numerous consumer benefits and in which market forces are leading providers to adopt business and network management practices that benefit consumers.

### **B. Mobile Broadband Has Experienced Tremendous Growth**

55. Mobile broadband has become an integral part of the wireless experience, with tremendous growth in mobile broadband usage in recent years. The number of mobile advanced services lines has increased from about 21,000 in 2005 to 20 million in 2008.<sup>118</sup> According to CTIA, data revenue per user<sup>119</sup> accounted for 25.7% of total wireless revenue per user in the first half of 2009, up from 6.8% in the last half of 2005.<sup>120</sup> Marketing and survey figures confirm that Americans are increasingly using mobile broadband services.<sup>121</sup> For example, a 2009 Pew Internet Survey indicated that 19% of all Americans reported accessing the Internet from their mobile device “yesterday.” In 2007 this same figure was 11%.<sup>122</sup>

56. With respect to specific applications, the marketing company comScore noted that the number of daily users assessing news and information from the Internet on their mobile device increased 107% in one year alone, from 10.8 million in 2008 to 22.4 million in 2009. Mobile broadband users accessing social networking and blogging sites increased by 427% over the same time frame.<sup>123</sup>

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<sup>118</sup> FCC High-Speed Services 2009, Table 2.

<sup>119</sup> This includes revenue from text messaging and emails.

<sup>120</sup> CTIA's *Wireless Industry Indices: Mid-Year 2009 Results*, November 2009, p. 116.

<sup>121</sup> According to Chetan Sharma Consulting, the U.S. wireless data market grew 27 percent from third quarter 2008 to 2009 and exceeded \$11.3 billion in mobile data service revenues in third quarter 2009. Chetan Sharma Consulting, *US Wireless Data Market - Q3 2009 Update Presentation*, November 2009 available at <http://chetansharma.com/usmarketupdateq309.htm>.

<sup>122</sup> “Wireless Internet Use,” *Pew Internet & American Life Project*, July 2009, p. 4. (“Pew Wireless 2009”)

<sup>123</sup> “Mobile Internet Becoming a Daily Activity for Many,” *comScore Press Release*, March 16, 2009.

### C. Mobile Broadband Prices Have Declined

57. Declining quality-adjusted prices provide further evidence of vigorous competition among mobile broadband providers. In addition, providers offer a large variety of broadband services and plans to fit different consumer needs, and many of these services were not available even just a few years ago.

58. In 2004, AT&T offered a data plan of \$19.99 for the first 8MB of data.<sup>124</sup> In 2009, AT&T offered a 200 MB mobile broadband plan for \$40, a reduction from \$2.50 per MB to \$0.20 per MB. In 2004, Sprint offered a \$40 data plan for 20MB. In 2009, Sprint's 5GB mobile broadband plan was priced at \$60, a reduction from \$2 per MB to \$0.12 per MB. Analogously, Verizon's unlimited data plan was priced at \$80 in 2004. Its 5 GB plan was priced at \$60 in 2009,<sup>125</sup> an amount of data that could not be conceivably used in 2004. Of course, these prices do not incorporate the improvements in service quality that has occurred over these years, which is itself reflected in the large increases in the usage allowances of mobile data plans.

59. In competitive markets, providers will seek to differentiate themselves from their rivals, often by targeting different types of consumers. Thus, beyond competing by offering lower prices, providers are also competing by offering a range of plans to better fit customer needs. Providers have high usage plans, low usage plans, plans for smartphones, plans for laptops and netbooks, and tethering options where a smartphone can be used to provide Internet access to another device, often a laptop or netbook.<sup>126</sup> For example, Verizon Wireless currently offers plans ranging from as low as 75MB for a day of use to 5GB monthly plans.<sup>127</sup> T-Mobile and AT&T each offer both a 200 MB and 5 GB per month plans, and T-Mobile also offers an unlimited data plan.<sup>128</sup>

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<sup>124</sup> Precise price comparisons over time are hampered by the dramatic improvements in mobile broadband services, making it difficult to find the same type and quality of plan offered over time. For example, in 2004, data plans were primarily for email and text operated at much slower speeds, and much less mobile broadband content was available.

<sup>125</sup> Data from 2004 comes from Gerard Brosnan (2005), "Trends in the Mobile Data Services Market," *The Telecommunications Review*, p. 4. Data for 2009 comes from Verizon Comments to Competition NOI, p. 72.

<sup>126</sup> For example, AT&T offers a smartphone data plan that allows tethering; see <http://www.wireless.att.com/cell-phone-service/cell-phone-plans/pda-personal-plans.jsp> last accessed on December 16, 2009.

<sup>127</sup> See <http://www.verizonwireless.com/b2c/mobilebroadband/?page=plans&lid=//global/plans//mobile+broadband+plan> last accessed on December 14, 2009.

<sup>128</sup> For AT&T see <http://www.wireless.att.com/cell-phone-service/cell-phone-plans/data-connect-plans.jsp>; for T-Mobile see [http://www.t-mobile.com/shop/plans/Cell-Phone-Plans.aspx?catgroup=Internet-Email-cell-phone-plan&WT.z\\_shop\\_plansLP=Internet\\_email](http://www.t-mobile.com/shop/plans/Cell-Phone-Plans.aspx?catgroup=Internet-Email-cell-phone-plan&WT.z_shop_plansLP=Internet_email) last accessed on December 15, 2009.

#### **D. Mobile Wireless Advertising Specifically Promotes Broadband Services and Quality**

60. Mobile wireless providers frequently advertise,<sup>129</sup> and much of this advertising is focused on comparing their broadband networks and the smartphones and other wireless devices available for use on their networks against other providers' service packages. As mentioned above, advertising's general purpose is to increase demand for a firm's products, and these comparative advertising campaigns indicate that wireless providers are promoting their network and device capabilities in an effort to retain and attract subscribers. Key points of competitive differentiation include network coverage, speed, and quality, and providers have been prominently advertising these distinctions to consumers. For example, Verizon is currently running a campaign showing that its footprint of 3G coverage is five times larger than AT&T's.<sup>130</sup> In response, AT&T is running ads claiming to have the nation's fastest 3G network,<sup>131</sup> and Sprint is touting itself as "America's most Dependable 3G network."<sup>132</sup> Clearwire's website claims that its mobile Internet speeds are four times faster than 3G.<sup>133</sup> Smartphones are also prominently featured in wireless provider advertising and marketing efforts, with recent examples including Verizon's Motorola and other Android handsets, Sprint's Palm Pre and Samsung and HTC Android handsets, T-Mobile's Android devices, and AT&T's next-generation iPhones.

#### **E. Mobile Subscribers Can and Do Switch Providers**

61. Wireless subscribers have many options for mobile broadband and other services, and market evidence indicates that they frequently switch providers. Most wireless providers have been reporting churn rates in the range of 1.5% to 3.0% per month, with an average churn rate of 1.9% in first quarter 2008,<sup>134</sup> implying annual churn of more than 22%. This suggests that approximately 60 million subscribers leave their providers each year, providing evidence that subscribers can and do switch providers. Although these churn statistics are for mobile wireless overall, and not specifically for mobile broadband, voice and data plans are often bundled

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<sup>129</sup> See CTIA Comments to Competition NOI, WT Docket No. 09-66, filed September 30, 2009, pp. 52-55. ("CTIA Comments to Competition NOI")

<sup>130</sup> "AT&T Loses First Legal Battle Against Verizon Ads," *CNet News*, November 18, 2009.

<sup>131</sup> See <http://www.att.com/truthabout3g/> last accessed on December 24, 2009.

<sup>132</sup> Sprint homepage, <http://www.sprint.com/index.html> (click on the 'Coverage' tab) last accessed on December 24, 2009.

<sup>133</sup> See <http://www.clear.com/discover> last accessed on December 10, 2009.

<sup>134</sup> Thirteenth CMRS Competition Report ¶181.

together. Clearwire predominately provides mobile broadband, and its churn rates are consistent with those given above, at about 2.6% per month.<sup>135</sup>

62. Consumers switch wireless providers for a variety of reasons, including the pursuit of lower prices, new cutting-edge devices, new features, specialized content, and improved network quality. The ability of consumers to switch providers has several implications for the current debate about network neutrality regulation. First, wireless providers can attract subscribers by developing attractive services, including services targeted to particular types of consumers. The market has already produced bountiful examples of this differentiation – from cell services designed specifically for children to services aimed at older Americans or teenagers. With respect to access to broadband content, consumers likely vary in the degree to which they want their provider to manage their Internet environment and protect them from harmful Internet content such as malware and viruses. In response, providers offer a range of smartphones, some that provide a more controlled environment where the network operator has vetted the available applications and others where consumers have more unfettered choice to download any applications and take on more responsibility for their own Internet security. Second, if a provider were to adopt network management practices or limit content in ways that were not appealing to consumers, consumers could – and would – switch to other providers. This competitive pressure creates a strong disincentive for providers to implement network management and business practices that are not valued by consumers.

#### **F. Wireless Providers have been Innovating and Investing in Next-generation Technologies**

63. As I described above in my discussion of network investment by wireline broadband providers, economists recognize the importance of innovation and investment in technology industries. Deployment of next-generation technologies is a very important indicator of mobile broadband competition. Recent and ongoing technology upgrades have allowed wireless providers to significantly improve the coverage, bandwidth, and the capabilities of their networks and respond to consumer demand for access to more bandwidth-intensive broadband content.

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<sup>135</sup> Macquarie Equities Research, *Clearwire Upgrading to Outperform*, October 15, 2009, Fig. 11. (“Macquarie Clearwire Upgrading 2009”)

64. Since 2001, America's wireless providers have made an average combined investment of more than \$22.8 billion per year to upgrade their networks.<sup>136</sup> Wireless providers have been aggressively expanding their deployment of 3G and 4G technologies and, in the past four years alone, have invested more than \$32.7 billion in acquiring the new spectrum required to implement these technologies.<sup>137</sup> Wireless providers continued to make substantial investments in their networks in 2009, and plan to continue to do so in 2010 and future years. These networks with their increased data throughput allow for expansion in the range of devices, applications, and content accessible to consumers.

65. Verizon Wireless has been heavily investing in next-generation technologies, averaging over \$5.5 billion in infrastructure investment per year.<sup>138</sup> The Verizon Wireless 3G network footprint now covers more than 284 million people,<sup>139</sup> including many who live in rural areas. With respect to 4G, Verizon is relying on LTE, which will permit downloads at peak rates of at least 100 Mbps with low latency. The company already has completed test calls over its 4G network in Boston and Seattle.<sup>140</sup> Verizon also has announced plans to launch 4G service in 30 markets covering a population of 100 million in 2010 and covering its entire 3G footprint by 2013.<sup>141</sup>

66. Other wireless providers have also invested heavily in new technologies. AT&T has spent more than \$38 billion in the past two years to upgrade its wireline and wireless networks,<sup>142</sup> and expected to spend between \$11 and \$12 billion in 2009 on its wireline and wireless infrastructure, part of it going to expand and upgrade its 3G network to HSPA at 7.2 Mbps speeds.<sup>143</sup> As of summer 2009, AT&T provided 3G coverage in about 350 metropolitan areas.<sup>144</sup> Since September

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<sup>136</sup> *Ex Parte* Letter from Christopher Guttman-McCabe, CTIA, to Chairman Julius Genachowski et al., FCC, GN Docket No. 09-51, WT Docket Nos. 08-165, 09-66, July 9, 2009, Attachment, p. 3.

<sup>137</sup> See "Auction of 700 MHz Band Licenses Closes; Winning Bidders Announced for Auction 73," *Public Notice*, DA 08-595, March 20, 2008. "Auction of Advanced Wireless Services Licenses Closes; Winning Bidders Announced for Auction 66," *Public Notice*, DA 06-1882, September 20, 2006. Auction 73's net winning bids were \$18.958 billion. Auction 66's net winning bids were \$13.7 billion.

<sup>138</sup> See [http://aboutus.vzw.com/bestnetwork/network\\_facts.html](http://aboutus.vzw.com/bestnetwork/network_facts.html) last accessed December 24, 2009.

<sup>139</sup> "Verizon Reports Revenue Growth and Continued Improvement in Cash Flow in 2Q," *Verizon Wireless Press Release*, July 27, 2009; Verizon Wireless website available at [http://aboutus.vzw.com/bestnetwork/network\\_facts.html](http://aboutus.vzw.com/bestnetwork/network_facts.html) last accessed January 1, 2005.

<sup>140</sup> Verizon 3Q Investor Quarterly 2009, p. 7; see also archive of Verizon Wireless press releases available at <http://news.vzw.com/news/index.html>.

<sup>141</sup> "Verizon Completes Initial 4G Wireless Test," *CNet News*, August 14, 2009 available at [http://news.cnet.com/8301-1035\\_3-10310232-94.html](http://news.cnet.com/8301-1035_3-10310232-94.html).

<sup>142</sup> "Rinne: AT&T Ready for 4G Jump," *WirelessWeek.com*, September 15, 2009 available at <http://www.wirelessweek.com/News/2009/09/Rinne--AT-T-Ready-for-4G-Jump/>.

<sup>143</sup> "AT&T to Make Faster 3G Technology Available in Six Major Cities This Year," *AT&T Press Release*, September 9, 2009 available at <http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=27068>.

<sup>144</sup> AT&T Comments to Fourteenth Report Public Notice, WT Docket No. 09-66, filed June 15, 2009, p. 25.

2009, AT&T has brought or improved its 3G network to dozens of communities in Virginia, Wisconsin, Vermont, upstate New York, Kentucky, Connecticut, Florida, South Carolina, and others.<sup>145</sup> AT&T will be starting LTE trials in 2010,<sup>146</sup> with commercial deployment beginning in 2011.<sup>147</sup>

67. Sprint's mobile broadband network covered more than 271 million people as of August 2009,<sup>148</sup> and Sprint has recently brought 4G to 27 markets,<sup>149</sup> including Honolulu, Maui, San Antonio, Seattle, and Chicago.<sup>150</sup> The company plans to bring service to multiple additional markets during 2010, including Boston, Houston, New York, San Francisco and Washington, D.C.<sup>151</sup>

68. T-Mobile planned to spend \$5 billion in 2009<sup>152</sup> and expand its 3G network to reach a potential 200 million wireless users by the end of 2009.<sup>153</sup> T-Mobile also expects to have HSPA+ on a nationwide basis by 2010, making it the operator with "the highest data speeds in the largest footprint."<sup>154</sup>

69. Clearwire is entering the market principally as a mobile broadband provider and is a current market leader in providing 4G service. It is backed by a total investment of over \$3.2 billion from Comcast, Time Warner Cable, Bright House Networks, Intel, and Google.<sup>155</sup> Clearwire provides 4G WiMAX mobile broadband, relying on significant spectrum resources in most of the major

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<sup>145</sup> See archive of AT&T's press releases available at [http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsfunction=searchresults&beginning\\_month=9&beginning\\_year=2009&ending\\_month=11&ending\\_year=2009](http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsfunction=searchresults&beginning_month=9&beginning_year=2009&ending_month=11&ending_year=2009).

<sup>146</sup> "AT&T to Speed Its Network in 6 Cities by Year-End," *The New York Times*, September 10, 2009.

<sup>147</sup> "AT&T to Deliver 3G Mobile Broadband Speed Boost," *AT&T Press Release*, May 27, 2009. ("AT&T Speed Boost 2009")

<sup>148</sup> "HTC Touch Pro2 from Sprint Pairs a Dynamic Must-Have Business Device with the Best Value in Wireless," *Sprint Press Release*, August 31, 2009. This figure is inclusive of data roaming.

<sup>149</sup> "Sprint 4G Rollout Blazes on with Maui Launch," *Sprint Nextel Press Release*, December 1, 2009 available at [http://newsreleases.sprint.com/phoenix.zhtml?c=127149&p=irol-newsArticle\\_newsroom&ID=1360459](http://newsreleases.sprint.com/phoenix.zhtml?c=127149&p=irol-newsArticle_newsroom&ID=1360459). ("Sprint Maui Launch 2009")

<sup>150</sup> See archive of Sprint's press releases available at [http://newsreleases.sprint.com/phoenix.zhtml?c=127149&p=irol-news\\_newsroom&nyo=0](http://newsreleases.sprint.com/phoenix.zhtml?c=127149&p=irol-news_newsroom&nyo=0).

<sup>151</sup> Sprint Maui Launch 2009.

<sup>152</sup> See T-Mobile Comments to Competition NOI, WT Docket No. 09-66, 09-157, and 09-51, filed September 30, 2009, p. 9.

<sup>153</sup> "T-Mobile USA Unveils High-Speed Plans, New Device," *Reuters*, March 25, 2009 available at <http://www.reuters.com/article/ousivMolt/idUSTRE52O0WV20090325>.

<sup>154</sup> "Will T-Mobile USA Become the Dark Horse Mobile Broadband Leader?" *FierceWireless*, September 20, 2009 available at <http://www.fiercewireless.com/node/49583/print>.

<sup>155</sup> "Clearwire Completes Transaction with Sprint Nextel and \$3.2 Billion Investment To Launch 4G Mobile Internet Company," *Clearwire Press Release*, December 1, 2008. Sprint Nextel has a majority stake in Clearwire. See "Sprint CEO Sees Keeping Majority Clearwire Stake," *Reuters*, December 9, 2009. Other investors in Clearwire include Intel, Google, Comcast, Time Warner Cable, and Bright House Networks.

markets.<sup>156</sup> It also offers fixed access for customers who are willing to forego mobility and only want broadband access at home.<sup>157</sup> Clearwire also offers voice services, and, as such, can serve as an alternative to customers needing both voice and data.<sup>158</sup> By September 2009, Clearwire had launched CLEAR 4G WiMAX mobile broadband service in 14 markets with over 10 million people.<sup>159</sup> It plans to cover 120 million people in 80 markets by the end of 2010,<sup>160</sup> and some analysts expect it to expand to cover roughly 155 million people by 2011.<sup>161</sup>

70. Clearwire is also reselling its services to cable companies, enabling them to offer mobile broadband in addition to their other offerings. For example, Clearwire is reselling its 4G services to Comcast and Time Warner Cable. Both cable companies bundle mobile wireless service along with cable broadband in order to add mobility to their traditional wireline offerings.<sup>162</sup> This not only enhances the ability of cable broadband to compete with wireless but also its ability to compete with DSL.<sup>163</sup>

71. Regional providers are also deploying 3G technologies. US Cellular planned on making \$575 million in capital expenditures in 2009. US Cellular had conducted an EV-DO upgrade,<sup>164</sup> and planned to bring this upgrade to 60% of its total cell sites by the end of 2009.<sup>165</sup> MetroPCS planned to spend more than \$700 million in capital expenditures in 2009,<sup>166</sup> and also plans to begin

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<sup>156</sup> "Clearwire's Wolff Embraces 4G as a Whole but Touts Spectrum Position," *Telephony Online*, April 2, 2009.

<sup>157</sup> See <http://www.clear.com/shop/services/home> last accessed December 15, 2009.

<sup>158</sup> See <http://www.clear.com/shop/services/bundles> last accessed December 15, 2009.

<sup>159</sup> "Clearwire Introduces Clear™ 4G WiMAX Internet Service in 10 New Markets," *Clearwire Press Release*, September 1, 2009.

<sup>160</sup> Morgan Stanley, Clearwire Corporation 2Q09 Preview: Market Rollout and Wholesale Launches Progressing, August 10, 2009, p. 4.

<sup>161</sup> UBS Investment Research, Clearwire Corp.: Upgrade to Neutral, Funding Opens the Window a Little Wider, December 1, 2009, p. 2.

<sup>162</sup> "Comcast Begins National Rollout of High-Speed Wireless Data Service," *Comcast Press Release*, June 29, 2009 available at <http://www.comcast.com/About/PressRelease/PressReleaseDetail.ashx?PRID=887&fss=Portland>; "Time Warner Cable to Resell WiMAX Service," *CNet News*, July 30, 2009 available at [http://news.cnet.com/8301-1035\\_3-10300017-94.html](http://news.cnet.com/8301-1035_3-10300017-94.html).

<sup>163</sup> "Comcast COO Says Wireless Internet Snags DSL Users," *The Associated Press*, August 6, 2009 available at <http://www.cnbc.com/id/32318015>.

<sup>164</sup> Zacks Equity Research, *US Cellular Dragged Down by Low Sales*, November 6, 2009 available at <http://www.zacks.com/stock/news/27006/US+Cellular+Dragged+Down+by+Low+Sales?print=print>.

<sup>165</sup> "US Cellular accelerates EV-DO push, weighing LTE trial," *Telephony Online*, May 6, 2009 available at <http://telephonyonline.com/wireless/news/us-cellular-evdo-upgrade-0506>.

<sup>166</sup> "MetroPCS Reports Third Quarter 2009 Results," *MetroPCS Press Release*, November 5, 2009 available at <http://investor.metropcs.com/phoenix.zhtml?c=177745&p=irol-newsArticle&ID=1351455>.

to deploy LTE technology by the second half of 2010.<sup>167</sup> Leap Wireless introduced 3G service in Washington, D.C., Maryland, and Louisiana in the second half of 2009.<sup>168</sup>

72. Rural wireless providers are also pursuing 3G upgrades. Cellular South continued its multi-million dollar 3G deployment in 2009<sup>169</sup> and planned to add “324 new 3G cell sites in Mississippi alone” by the end of 2009.<sup>170</sup> Stelera Wireless expected to deploy HSPA<sup>171</sup> data services to 55 cities by the end of 2009, specifically to underserved rural communities.<sup>172</sup> Alaska Communications System Group and GCI, both of which provide mobile broadband to Alaska, both announced in 2008 that they had launched EV-DO Rev A technology and services.<sup>173</sup> Other rural providers, like Bluegrass Cellular, which operates in rural Kentucky,<sup>174</sup> and nTelos<sup>175</sup> which operates in Virginia, West Virginia, Kentucky, Ohio, Tennessee, Maryland, and North Carolina have also deployed 3G technology.

73. Beyond demonstrating the competitive rivalry of wireless providers in trying to improve their networks, the ongoing deployment of 3G and 4G technologies highlights the importance of investment incentives to the competitive dynamic. Mobile broadband is an evolving technology that involves expensive investment well ahead of demand, and proper incentives must be in place to encourage deployment of new and more efficient technology. As the Commission recognizes,

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<sup>167</sup> “MetroPCS Taps Samsung, Ericsson for network”, *Dallas Morning News*, September 16, 2009 available at <http://www.dallasnews.com/sharedcontent/dws/bus/industries/techtelecom/stories/091609dnbusmetropcs.1861a9b69.html>.

<sup>168</sup> For New Orleans see “Leap Brings Cricket Unlimited Wireless Services to Lake Charles, La.,” *Leap Wireless International Press Release*, November 17, 2009 available at [http://investor.leapwireless.com/phoenix.zhtml?c=95536&p=irol-newsArticle\\_Print&ID=1356548](http://investor.leapwireless.com/phoenix.zhtml?c=95536&p=irol-newsArticle_Print&ID=1356548); for Washington, DC and Maryland see “Leap Brings Cricket Unlimited Wireless Services to Washington D.C. and Baltimore,” *Leap Wireless International Press Release*, June 23, 2009 available at <http://phx.corporate-ir.net/phoenix.zhtml?c=191722&p=irol-newsArticle&ID=1301347&highlight=>.

<sup>169</sup> “Cellular South to Expand Availability of Advanced 3G Mobile Broadband Services Throughout Much of Mississippi”, *Cellular South Press Release*, March 10, 2009 available at <https://www.cellularsouth.com/news/2009/20090310.html>.

<sup>170</sup> “Cellular South Expands Advanced 3G Mobile Broadband Network in Carroll County,” *Cellular South Press Release*, December 9, 2009, <https://www.cellularsouth.com/news/2009/20091209.html>.

<sup>171</sup> The combination of HSUPA and HSDPA is commonly referred to as HSPA. See RYSAVY Research, *EDGE, HSPA, and LTE: The Mobile Broadband Advantage*, September 2007, p. 3.

<sup>172</sup> “Stelera Selects Ceragon IP Solutions to Backhaul Wireless Broadband in Rural America,” *PR Newswire*, May 4, 2009 available at [http://www.breitbart.com/article.php?id=prnw.20090504.UKSU004B&show\\_article=1](http://www.breitbart.com/article.php?id=prnw.20090504.UKSU004B&show_article=1).

<sup>173</sup> “ACS Launches Rev A Technology; Provides Fastest Mobile Data Speeds Available in the Nation,” *Alaska Communications System Press Release*, July 31, 2008 available at <http://www.acsalaska.com/assets/releases/2008-07-31.pdf>; “GCI Achieves Wireless Milestone with 100,000 Customers,” *General Communication, Inc. Press Release*, February 3, 2009 available at <http://www.gci.com/investors/wirelessmilestoneannouncement.pdf>; GCI announced that it spent more than \$85 million on total capital expenditures through the first three quarters of 2009. “GCI Issues Third Quarter 2009 Earnings,” *GCI Press Release*, November 4, 2009 available at <http://www.gci.com/investors/investors.htm>.

<sup>174</sup> “Bluegrass Cellular Announces New 3G Coverage In Cumberland County,” *Bluegrass Cellular Press Release*, April 22, 2009 available at [http://bluegrasscellular.com/about/news/bluegrass\\_cellular\\_announces\\_new\\_3g\\_coverage\\_in\\_cumberland\\_county/](http://bluegrasscellular.com/about/news/bluegrass_cellular_announces_new_3g_coverage_in_cumberland_county/).

<sup>175</sup> “NTELOS Holdings Corp. Reports Third Quarter 2008 Operating Results,” *nTelos Press Release*, November 4, 2008 available at <http://www.ir-site.com/images/library/ntelos/11-04-08.html>.

regulations that reduce incentives for wireless providers to invest in their networks will be welfare reducing in the long term.

#### G. **Competition, Innovation and Investment in Other Parts of the Mobile Wireless Ecosystem**

74. Competition among wireless broadband providers is linked to a “mobile value chain” that includes wireless devices, operating systems, and applications. As I describe in the next several sections, within each of these segments of the mobile wireless ecosystem there is vigorous competition among existing players and new entrants, significant innovation and investment, and considerable experimentation, evidenced by a variety of business models.<sup>176</sup>

75. Moreover, as with the broadband ecosystem as a whole, these segments of the wireless industry are still nascent, and as a result the imposition of net neutrality regulation is not only unnecessary but also threatens to undermine the consumer benefits that market forces have produced. Competition and innovation in these segments has greatly increased the capabilities of mobile broadband service and provided consumers with a wide range of innovative products and services. In addition, wireless devices, operating systems and applications have become an important part of the competitive rivalry among wireless providers, with providers entering into a range of business relationships with device makers and operating system and applications developers. This competitive environment has provided consumers with a wide range of options for using wireless devices to access broadband content.

76. **Smartphones:** Smartphones are increasingly sophisticated devices that can access a wide range of broadband content, and their capabilities have been steadily increasing. For example, this past summer, both Sprint and Verizon Wireless indicated that all of their future phones would include WiFi capability.<sup>177</sup>

77. The smartphone business is still in its very early stages yet is highly competitive, with major consumer electronics manufacturers (Motorola, Samsung, LG, Nokia, RIM, Apple, and many others) operating in a global market and competing aggressively against each other for market

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<sup>176</sup> For additional discussion of innovation and competition in these segments of the wireless ecosystem see Topper (2009) and CTIA Comments to Competition NOI.

<sup>177</sup> “Sprint, Verizon to Include Wi-Fi in all Future Phones,” *Wired*, July 10, 2009 available at <http://www.wired.com/gadgetlab/2009/07/sprint-verizon/>. (“Wired 2009”)

share.<sup>178</sup> There has been considerable entry into the device marketplace by new manufacturers, including the notable recent example of Apple, and manufacturer market shares have changed considerably over time.<sup>179</sup> Search giant Google has also announced its own entry into the smartphone market, offering the Nexus One handset, which it will sell both directly to consumers and through wireless provider partners.<sup>180</sup>

78. Smartphone sales have grown rapidly, and consumers have considerable choice in smartphones. As of December 2009, each of the four nationwide providers offered about 17 different smartphones. According to CTIA, regional providers offered anywhere from 4 to 9 different smartphones as of May 2009,<sup>181</sup> and many of these are state of the art.<sup>182</sup> As noted above, Google is also independently marketing its own Android-based phone

79. Smartphones are an important dimension of competition among wireless broadband providers. Indeed, an early 2009 Bernstein Research study found that 34% of people switching providers cited devices as their primary reason for switching.<sup>183</sup> AT&T's initial success with the Apple iPhone has led other wireless providers and device makers to develop a wide range of competing smartphones, including several high-profile offerings in the second half of 2009. For example, the Apple 3Gs iPhone was launched on AT&T's network in June 2009,<sup>184</sup> the Blackberry Tour was unveiled in June 2009 and is now available on several different networks,<sup>185</sup> Palm

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<sup>178</sup> U.S. wireless providers do not own equity in any of the major smartphone manufacturers.

<sup>179</sup> For an analysis of the change in worldwide manufacturer shares over time, see Robert Hahn and Hal Singer (2009), "Why the iPhone Won't Last Forever and What the Government Should Do to Promote its Successor," *Georgetown Center for Business and Public Policy Working Paper*, p. 11.

<sup>180</sup> "Google Offers New Model for Consumers to Buy a Mobile Phone," *Google Press Release*, January 5, 2010.

<sup>181</sup> CTIA Comments to the Fourteenth Report Public Notice, WT Docket No. 09-66, filed June 15, 2009, p. 33.

<sup>182</sup> The Blackberry Curve is available on regional networks like Cellular South, U.S. Cellular, MetroPCS, and NTELOS. See the BlackBerry Curve 8300 website indicating where to buy the device.

<http://na.blackberry.com/eng/devices/blackberrycurve8300/> last accessed December 9, 2009. The BlackBerry Tour is available on the U.S. Cellular and Cellular South networks. See [http://na.blackberry.com/eng/devices/blackberrytour/tour\\_where\\_tobuy.jsp](http://na.blackberry.com/eng/devices/blackberrytour/tour_where_tobuy.jsp), last accessed December 9, 2009. The HTC Hero is available on the Cellular South network. See "Cellular South Announces Launch of the HTC Hero; Android-Powered Smartphones Poised for Success," *Cellular South Press Release*, September 21, 2009.

<sup>183</sup> "US Telecom: Defensive or Cyclical? A Sector View for 2009," *Bernstein Research Conference Call Transcript*, January 26, 2009, p. 14.

<sup>184</sup> "Apple Announces the New iPhone 3GS - The Fastest, Most Powerful iPhone Yet," *Apple Press Release*, June 8, 2009.

<sup>185</sup> "RIM Introduces the Blackberry Tour Smartphone," *Blackberry Press Release*, June 16, 2009. See [http://na.blackberry.com/eng/devices/blackberrytour/tour\\_where\\_tobuy.jsp](http://na.blackberry.com/eng/devices/blackberrytour/tour_where_tobuy.jsp) last accessed December 9, 2009.

introduced its Pixi for the Sprint network in September of 2009,<sup>186</sup> and Motorola unveiled the DROID for Verizon Wireless in October 2009.<sup>187</sup>

80. Wireless providers and device makers are experimenting with a variety of business models and vertical relationships. For example, some devices such as the Apple iPhone are sold exclusively on one network, while other devices such as the Blackberry Tour are sold on multiple networks. Smartphones also vary in their “openness”, with some providing a more controlled environment where the network operator has vetted the available applications and others permitting more unfettered choice to download any applications and take on more responsibility for their own Internet security. Consumers thus have numerous choices, with the ability to choose various options from a given provider or to switch providers to take advantage of a device that better meets their needs. Proposed network neutrality regulations may limit the flexibility of wireless providers to offer different options to different types of consumers and, in so doing, disrupt the competitive process within both the wireless provider and smartphone segments.

81. **Mobile Operating Systems:** Mobile operating systems serve as the platform for other applications. Currently, there are a large number of different operating systems including Apple’s, Microsoft’s, Blackberry’s, Palm’s, Google’s Android, Nokia’s Symbian, and Linux’s LiMo. Already, competition between these systems has been fierce,<sup>188</sup> and this variety in operating systems serves as another point of differentiation for wireless broadband providers.

82. Mobile operating systems, like devices, have experienced considerable innovation. Open operating systems like LiMo and Android are relatively new, and Android has already been deployed on devices introduced by HTC, Samsung and Motorola, including the new Motorola Droid.<sup>189</sup> In a relatively short period of time, two of the newest operating systems – Apple’s iPhone OS and Google’s Android – have obtained a combined market share of 15%.<sup>190</sup>

83. **Applications:** Improvements in mobile operating systems have facilitated another significant development in the mobile wireless value chain – the growing use of applications from

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<sup>186</sup> “Thin Palm Pixi Phone Puts Fast, Intuitive Communication at Fingertips,” *Palm Press Release*, September 9, 2009.

<sup>187</sup> “Hello Humans: DROID by Motorola Arrives Next Week,” *Motorola Press Release*, October 28, 2009. (“Motorola 2009”)

<sup>188</sup> “The Battle for the Smart-Phones Soul,” *The Economist*, November 22, 2008.

<sup>189</sup> Motorola 2009.

<sup>190</sup> Combined market share as of 2Q 2009. See CTIA Comments to Innovation NOI, GN Docket Nos. 09-157 and 09-51, filed September 30, 2009, p. 36.

wireless provider, device manufacturer, and third-party stores associated with various operating systems. Applications have exploded in terms of sheer product diversity. As of November 2009, the Apple App Store alone had a selection of over 100,000 applications and total downloads of well over 2 billion.<sup>191</sup> Apple's success has spurred application initiatives for Google's Android platform, Nokia's Symbian platform,<sup>192</sup> Palm's PalmOS platform,<sup>193</sup> Palm's WebOS platform,<sup>194</sup> and Research in Motion's BlackBerry platform.<sup>195</sup> For example, Google's Android application store has doubled to 20,000 total apps available in just five months.<sup>196</sup> As reported, Verizon is planning its own Vcast App Store,<sup>197</sup> and Microsoft is planning a store for its Windows Mobile platform.<sup>198</sup> Although in some cases the same application is available over multiple operating systems, difference in applications available for devices are another form of product differentiation for devices and ultimately mobile broadband providers.

84. Although most applications have been developed by outside parties, providers are involved in this market as well. For example, AT&T has collaborated with other developers to create applications that let customers pay bills from their handsets. AT&T is also working on applications that will allow users to view the location of the handsets of other family members on a map that can be accessed either on the computer or on the user's own handset.<sup>199</sup>

85. Applications have become an increasingly important dimension of competition among wireless providers, and provide consumers with the ability to customize their wireless broadband experience. Notably, the rapid development of applications has occurred in a market environment where providers and device makers have had flexibility to experiment with different business practices. Although any developer can create software for the iPhone, distribution of the

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<sup>191</sup> "Apple Announces Over 100,000 Apps Now Available on the App Store," *Apple Press Release*, November 4, 2009.

<sup>192</sup> "Nokia's Gigantic App Store," *Forbes*, May 7, 2009 available at <http://www.forbes.com/2009/05/07/nokia-ovi-store-technology-wireless-nokia.html>.

<sup>193</sup> See Palm application store websites [http://software.palm.com/us/html/top\\_products\\_treo.jsp?device=10035300025](http://software.palm.com/us/html/top_products_treo.jsp?device=10035300025) and <http://appstore.pocketgear.com/palm/> last accessed on December 25, 2009.

<sup>194</sup> See <http://developer.palm.com/> last accessed on December 25, 2009.

<sup>195</sup> See BlackBerry App World Website <http://na.blackberry.com/eng/services/appworld/?> last accessed on December 25, 2009.

<sup>196</sup> "Google Android App Market Catching Up," *RedHerring.com*, December 16, 2009 available at <http://redherring.com/Home/26255>.

<sup>197</sup> "Verizon challenges Apple with Vcast app store," *CNet News*, July 28, 2009 available at [http://news.cnet.com/8301-1035\\_3-10297904-94.html](http://news.cnet.com/8301-1035_3-10297904-94.html).

<sup>198</sup> "Microsoft Windows Mobile 6.5 Will Debut on 3 LG Electronics Smartphones," *eWeek.com*, September 3, 2009 available at <http://www.eweek.com/c/a/Mobile-and-Wireless/Microsoft-Windows-Mobile-65-Will-Debut-on-3-LG-Electronics-Smartphones-120351/>.

<sup>199</sup> See AT&T Comments to the Innovation NOI, GN Docket Nos. 09-157 and 09-51, September 30, 2009, p. 38.

application must meet Apple's approval. In this way, Apple can offer customers security and can ensure that applications meet a certain minimum level of quality. Android, however, has adopted an open publication process. Developers need only to register, upload, and then publish their applications.<sup>200</sup> There is no approval process. This flexibility with respect to business practices gives consumers a range of options: Apple's process, which guarantees a minimum level of quality and security, or Android's process, which will allow for a greater amount of variety and flexibility. The Commission should be careful about adopting network neutrality regulations that would take these decisions outside the realm of marketplace competition and put them in the hands of regulators.

86. **Aircard Devices:** Nationwide wireless providers and many regional providers also offer aircard devices that provide mobile broadband access when coupled with a computer. Netbooks, a relatively recent development, are small, light-weight computers that can access wireless broadband. They are starting to be sold in packages with mobile broadband plans, and customers can subsidize the price of a netbook with a corresponding wireless broadband contract.<sup>201</sup> Even without the purchase of a packaged plan, a user can purchase wireless broadband access for her own separately purchased netbook simply through the use of a wireless USB device. Some providers, such as Cincinnati Bell, offer a rebate when a separately purchased netbook is used with their service plans.<sup>202</sup> Bandwidth requirements for laptops and netbooks will pressure wireless providers to continue to improve the capabilities of their network. Both aircards and netbooks are manufactured by third parties, setting the stage for competitive forces similar to those currently experienced by smartphone manufacturers.

87. Mobile broadband access with netbooks and other computers using aircards is starting to resemble wireline broadband capabilities. As I discuss in the next section, these developments, along with the deployment of 3G and 4G technology, are increasing the overlap of wireless and wireline broadband capabilities.

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<sup>200</sup> Eric Chu, "Android Market: A User-Driven Content Distribution System," *Android Developers Blog*, August 8, 2008 available at <http://android-developers.blogspot.com/2008/08/android-market-user-driven-content.html>.

<sup>201</sup> See "Dell and AT&T Energize On-The-Go Lifestyles with Special Offer for Select \$99 Inspiron Mini 9," *Dell Press Release*, January 9, 2009.

<sup>202</sup> See for example [http://www.cincinnati-bell.com/shared\\_content/pdf/zoomtown/netbook\\_012410.pdf](http://www.cincinnati-bell.com/shared_content/pdf/zoomtown/netbook_012410.pdf) last accessed on December 14, 2009.

88. **Other Devices:** Providers are also involved in developing applications for devices beyond smartphones and personal computers – devices that will further alter the competitive landscape, advance important public policy goals, and foster further investment and innovation. Verizon Wireless has launched its Open Development Initiative, to provide customers on its nationwide network the option to use wireless devices, software and applications not offered by the company.<sup>203</sup> Similarly, Alcatel-Lucent has helped launch the NG Connect Program to bring together infrastructure, device, application and content companies to develop next-generation services and applications.<sup>204</sup> Finally, Sprint, through its Open Device Initiative has certified more than 300 third-party devices for use on its mobile broadband network.<sup>205</sup>

89. Beyond these openness initiatives, there are specific examples of providers moving beyond the smartphone market to combine mobile data capability with special-use devices to respond to marketplace demand. Amazon’s Kindle device initially utilized Sprint’s mobile broadband network for users to download books, newspapers, and other media. For its next-generation Kindle, Amazon switched to AT&T’s network,<sup>206</sup> and Kindle’s success has led to rival e-book offerings.<sup>207</sup> AT&T has collaborated with Garmin in bringing to market a GPS device with built in wireless capabilities so that users will have mobile broadband access to Google search, weather, and traffic information.<sup>208</sup> T-Mobile has developed a new type of durable SIM card for use in building smart electrical grids.<sup>209</sup>

90. In the health care space, Verizon Wireless has launched an innovation center and has already approved a wireless tablet on its network that helps health care providers access patient

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<sup>203</sup> See Welcome to Open Development, Verizon Wireless available at <https://www22.verizon.com/opendev/> last accessed on December 25, 2009.

<sup>204</sup> See NG Connect Program available at <http://www.ngconnect.org/about-us/index.htm> last accessed on December 25, 2009.

<sup>205</sup> “Sprint, M2M DataSmart, Partner to Push Wireless Applications,” *Kansas City Business Journal*, September 1, 2009 available at <http://kansascity.bizjournals.com/kansascity/stories/2009/08/31/daily16.html>.

<sup>206</sup> Bernstein Research, *US Wireless Industry Scorecard: The Haves and the Have-Nots Diverge Industry Growth Stabilizes at 4.2% in Q3*, November 6, 2009, p. 17.

<sup>207</sup> See the Nook by Barnes and Nobles available at <http://www.barnesandnoble.com/nook/compare/?cids2Pid=30195> last accessed on December 24, 2009. See also the Archos available at [http://www.archos.com/products/imt/archos\\_5it/index.html?country=us&lang=en](http://www.archos.com/products/imt/archos_5it/index.html?country=us&lang=en) last accessed December 24, 2009.

<sup>208</sup> “Garmin nuvi 1690 and nuLink! to Connect Drivers to Real Time Data through AT&T Wireless Network”, *AT&T Press Release*, Sept. 17, 2009 available at <http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=27141>.

<sup>209</sup> “T-Mobile Goes for Smart Grids,” *CNet News*, April 23, 2009 available at [http://news.cnet.com/8301-1035\\_3-10226418-94.html](http://news.cnet.com/8301-1035_3-10226418-94.html).

data from a portable medical chart.<sup>210</sup> Sprint also has teamed with GE Healthcare, a division of GE, to offer in-building voice and data transmission.<sup>211</sup>

91. As the building of wireless networks involves large fixed costs, it appears that providers have entered the applications market in connection with devices outside of smartphones in order to expand their customer base and distribute costs over a larger base. This is also a way for wireless providers to differentiate their services in order to enhance their competitiveness. In addition, these developments have occurred in an environment without network neutrality regulations, where providers have had the flexibility to enter into various business arrangements with other firms in the broadband ecosystem. Network neutrality regulations that limit the flexibility of wireless providers and other firms could hamper future development of such products.

#### **IV. Mobile Wireless Providers and Firms Using Other Intermodal Technologies Increasingly Compete with Wireline Broadband**

92. Mobile wireless broadband services are a competitive alternative to wireline broadband even at relatively lower throughput speeds; many consumers will choose wireless broadband in order to have the flexibility to use their service outside their home or office, and the prospect of that occurring constrains the behavior of wireline broadband providers.<sup>212</sup> Moreover, wireless broadband providers are rapidly improving their networks to increase speeds, further increasing their competitive role. With 3G and 4G capabilities complemented by a wide range of mobile devices and applications, wireless broadband is becoming a viable alternative to wireline providers for a larger range of broadband users and uses.

93. The history of mobile voice services is instructive. In its early stages, wireless voice served more as an add-on to wireline voice, but, as wireless technologies improved, many consumers cut the cord and viewed wireless voice as a replacement for wireline or, alternatively, have shifted more of their voice calling from wireline to wireless. In early 2005, about 6.7% of households were wireless-voice only; this has grown to 21.1% by the end of 2008,<sup>213</sup> and this trend is likely to

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<sup>210</sup> “@CTIA: Verizon on mHealth 4G,” *MobileHealthNews*, April 1, 2009 available at <http://mobihealthnews.com/1112/ctiaverizon-on-mhealth-4g/>.

<sup>211</sup> “Hospitals Becoming Wireless Hotbeds,” *Telephony Online*, September 23, 2009 available at <http://telephonyonline.com/3g4g/news/hospitals-becoming-wireless-0923/>.

<sup>212</sup> This increasing competition has been recognized by the Justice Department. See *Economic Issues in Broadband Competition*, pp. 8-11.

<sup>213</sup> Blumberg, Stephen, and Julian Luke, “Wireless Substitution: Early Release of Estimates from the National Health Interview Study, January – June 2009,” National Center for Health Statistics, Center for Disease Control, December 16,

continue.<sup>214</sup> In addition, households who have not cut the cord often have a choice of whether to make calls from home using wireless or wireline service. A recent CDC report finds that of all American homes with a landline, 14.7% primarily used their wireless phones for calls.<sup>215</sup> This substitution may also be occurring for certain types of data as the popularity of mobile email and text messaging grows. A Pew Internet Study finds that 43% of cell phone/PDA owners sent or received text messages and that 15% sent or received email on a typical day in 2009. This contrasts to 31% who sent or received text messages and 8% who sent or received email on a typical day in 2007.<sup>216</sup>

94. From the perspective of economics, wireless broadband services do not need to be perfect substitutes for wireline broadband services to exert competitive pressure on wireline services.<sup>217</sup> As wireless broadband services continue to improve, one way for consumers to substitute wireless broadband service for wireline is to “cut the cord” and rely on their wireless devices for access to broadband content. Another way for consumers to substitute wireless broadband service for wireline is to shift more of their broadband usage from wireline providers to wireless providers. Competition for both these types of consumers can serve as a powerful incentive for providers to offer attractive prices, improved services and open access to content. If a user can access content with her wireless broadband service that she can’t get with wireline service, then she’ll use her wireless for that, which makes her wireline broadband service less valuable (and vice versa). That is a form of competitive discipline that helps ensure that wireline and mobile providers alike make open access available.<sup>218</sup>

95. Already, recent growth in wireless broadband subscribers has greatly exceeded growth in wireline broadband. The number of mobile wireless advanced services lines has increased from 21,000 in 2005 to 20.2 million in 2008, a 1,000 fold increase.<sup>219</sup> In comparison, wireline telco advanced services lines grew about 100% and cable advanced services lines grew by about 66% in

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2009. (“CDC 2009”); Blumberg, Stephen, and Julian Luke, “Wireless Substitution: Early Release of Estimates from the National Health Interview Study, January – June 2008,” National Center for Health Statistics, Center for Disease Control, December 17, 2008.

<sup>214</sup> “Cutting the Cord,” *The Economist*, August 15, 2009.

<sup>215</sup> CDC 2009.

<sup>216</sup> Pew Wireless 2009, p. 24.

<sup>217</sup> See, e.g., Carlton and Perloff (2005), pp. 644-648.

<sup>218</sup> Some consumers also have access to broadband services at work or at school.

<sup>219</sup> FCC High-Speed Services 2009, Table 2.

that time.<sup>220</sup> As the capabilities of wireless broadband continue to improve, current wireline-only broadband customers represent a large potential market for wireless providers.

### 1. 3G and 4G Technology

96. Upgrades to 3G and 4G technologies have greatly enhanced the mobile data capabilities of wireless networks and are making wireless broadband an even more effective alternative for wireline broadband. 3G networks offer appealing data speeds for many Internet uses. WCDMA, the 3G technology used by AT&T, T-Mobile and other providers, allows maximum data transfer speeds of 2 Mbps<sup>221</sup> and when combined with HSPA technology like those deployed by AT&T can allow maximum speeds of 7.2 Mbps.<sup>222</sup> EV-DO Rev. A, the 3G technology used by Verizon Wireless, Sprint, and others, allows maximum throughput speeds of 3.1 Mbps.<sup>223</sup>

97. 4G technology is significantly faster than 3G technology, and exceeds the speeds of some DSL and cable broadband offerings. WiMAX, the 4G technology used by Sprint and Clearwire, can support maximum download speeds of 63 Mbps and maximum upload speeds of 28 Mbps.<sup>224</sup> In terms of actual performance, Clearwire advertises its 4G service speed to have average download speeds of 3 to 6 Mbps with peak spikes of 10 Mbps,<sup>225</sup> and directly markets itself as an alternative to wireline providers in the home.<sup>226</sup> LTE, the 4G technology being deployed by Verizon Wireless, AT&T, T-Mobile and others, supports speeds up to 173 Mbps and 58 Mbps for downloads and uploads, respectively.<sup>227</sup> Verizon's initial 4G tests demonstrated peak download speeds of 50 to 60 Mbps.<sup>228</sup>

98. Consumer demand for broadband access is heterogeneous, depending on the span of content and applications used by different consumers. For most users, the speeds provided by 3G are sufficient for regular use of many online tasks. According to the Pew Internet Project, the most popular online activities include sending email (58% of adult internet users do this daily), using a

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<sup>220</sup> FCC High-Speed Services 2009, Table 2. Wireline telco numbers include ADSL, SDSL, Traditional Wireline, and Fiber.

<sup>221</sup> Thirteenth CMRS Competition Report, ¶¶ 131-132.

<sup>222</sup> AT&T Speed Boost 2009.

<sup>223</sup> Thirteenth CMRS Competition Report, ¶¶ 131-132.

<sup>224</sup> Thirteenth CMRS Competition Report, ¶ 133.

<sup>225</sup> Clearwire Website <http://www.clear.com/discover/network> last accessed on December 9, 2009.

<sup>226</sup> See <http://www.clear.com/shop/services/home> last accessed on December 15, 2009.

<sup>227</sup> Thirteenth CMRS Competition Report, ¶ 133.

<sup>228</sup> "Verizon Expects 4G Launch Next Year," *CNet News*, February 18, 2009 available at [http://reviews.cnet.com/8301-13970\\_7-10166622-78.html](http://reviews.cnet.com/8301-13970_7-10166622-78.html).

search engine (50%), getting news (38%), checking the weather (33%), and using social networking sites (27%).<sup>229</sup> Another study from Mediamark Research & Intelligence confirms this finding that the most popular online activities are using email and getting news.<sup>230</sup> These online activities function well at common 3G wireless speeds.<sup>231</sup> Thus consumers find wireless access to these activities – with the added feature of mobility – to be a reasonable substitute for wired access. As of 2007, for example, 6 Mbps for wireline broadband was considered more than sufficient for the average user.<sup>232</sup> A more recent presentation from the Commission’s Omnibus Broadband Initiative team documents that 5 Mbps is generally sufficient for web browsing, audio streaming, voice over internet, some online games, and even varying video conferencing and streamed video technologies.<sup>233</sup> Thus, even 3G speeds are more than sufficient for the common user and offer a viable substitute to wireline broadband in most cases. And in the very near future, the deployment of 4G services will make the mobile broadband experience that much faster and more in line with today’s wireline broadband offerings.

## **2. Other Developments Further Increase Competition Between Wireless and Wireline Broadband Services.**

99. In addition to the added feature of mobility and rapidly increasing speeds, other recent developments have contributed to the increasing competition between wireline and wireless broadband alternatives. First, deployment of next-generation technology has enabled wireless providers to increase mobile broadband usage allowances to levels that meet the needs of most broadband users. In 2008, Comcast noted that the median residential user of its wireline broadband service consumed between 2 GB and 3 GB per month.<sup>234</sup> Currently, Sprint, Verizon Wireless, and AT&T mobile broadband plans for netbooks and laptops allow a maximum of 5 GB per month,<sup>235</sup> with additional data transfer available for purchase. Data plans associated with

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<sup>229</sup> Pew Research Center’s Internet & American Life Project, *Online Activities, Daily* available at: <http://www.pewinternet.org/Static-Pages/Trend-Data/Online-Activities-Daily.aspx> last accessed on December 25, 2009. These results were based on September 2009 and April 2009 surveys.

<sup>230</sup> “Research: Time Spent Online - What do we do Most, Which Activities Grow Fastest?” *Copypaste Media.com*, January 28, 2009 available at <http://www.copypaste.nl/747/research-time-spent-online-what-do-we-do-most-which-activities-grow-fastest/> last accessed on December 25, 2009.

<sup>231</sup> FCC Presentation 2009, p. 23 (showing that basic download usage, which includes email and web browsing, requires 0.1-0.3 Mbps to perform well).

<sup>232</sup> “More Bandwidth than You Can Use,” *BusinessWeek*, May 29, 2007.

<sup>233</sup> FCC Presentation 2009, p. 23.

<sup>234</sup> “Comcast to Cap Monthly Consumer Broadband,” *CNet News*, August 28, 2008 available at [http://news.cnet.com/8301-17939\\_109-10028506-2.html](http://news.cnet.com/8301-17939_109-10028506-2.html).

<sup>235</sup> See carrier websites for more information. Last accessed December 14, 2009.

smartphones generally do not have usage allowances. Sprint, AT&T and T-Mobile offer smartphone data plans with unlimited Internet access.<sup>236</sup> Verizon Wireless smartphone plans currently have a 5 GB per month usage allowance, and extra data exceeding the allowance can also be purchased.<sup>237</sup> The increasing deployment of 4G technology should lead to even higher usage allowances as network capacity grows. Wireless providers have also been expanding usage allowances at lower levels of usage. For example, in May 2009 Verizon Wireless increased its data usage allowances on its entry level plan from 50MB to 250MB.<sup>238</sup>

100. Second, the emergence of licensed-spectrum aircards brings wireless broadband directly to netbooks and laptops, making them an even more viable alternative to a wireline-broadband-connected computer. Given the comparable speeds of 4G and even 3G to the most common wireline offerings, the distinction between wireline and wireless broadband has begun to blur. The main advantage of wireless broadband for consumers is obviously mobility. As the speed capabilities of wireless broadband improve, consumers who highly value mobility will forego wireline broadband even if it offers somewhat higher speeds. In addition, mobility will likely become more prized as more applications are developed that utilize location data and customize information for users. Moreover, smartphones have made it easy for consumers to integrate voice, messaging, email, and broadband onto one device. The growing importance of mobility and the ease with which consumers can add mobile broadband to existing devices is putting competitive pressure on wireline providers to improve service and lower prices to compensate.

101. Third, a new group of wireline broadband providers are beginning to develop additional mobile broadband capabilities of their own in recognition of the importance of mobility to their customers' experience. As mentioned previously, Comcast and Time Warner either plan to resell or are already reselling Clearwire's wireless 4G services through bundles with their own wireline

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<sup>236</sup> For Sprint see [http://nextelonline.nextel.com/NASApp/onlinestore/en/Action/DisplayPlans?filterString=Any\\_Mobile\\_Anytime\\_Filter&id12=UHP\\_PlansTab\\_Link\\_AnyMobileAnyTime](http://nextelonline.nextel.com/NASApp/onlinestore/en/Action/DisplayPlans?filterString=Any_Mobile_Anytime_Filter&id12=UHP_PlansTab_Link_AnyMobileAnyTime); For AT&T see <http://www.wireless.att.com/cell-phone-service/cell-phone-plans/pda-personal-plans.jsp>; For T-Mobile see [http://www.t-mobile.com/shop/plans/Cell-Phone-Plans.aspx?catgroup=Internet-Email-cell-phone-plan&WT.z\\_shop\\_plansLP=Internet\\_email](http://www.t-mobile.com/shop/plans/Cell-Phone-Plans.aspx?catgroup=Internet-Email-cell-phone-plan&WT.z_shop_plansLP=Internet_email) last accessed on December 15, 2009.

<sup>237</sup> See <http://www.verizonwireless.com/b2c/mobilebroadband/?page=plans&lid=//global//plans//mobile+broadband+plan> last accessed on December 14, 2009.

<sup>238</sup> "Verizon Wireless Changes Mobile Broadband Plans and Introduces its Portable WiFi Hotspot," *Current Analysis Competitive Intelligence Report*, May 11, 2009 available at <http://www.currentanalysis.com/h/2009/VZW-MiFi2200-Hotspot.asp> last accessed on December 14, 2009.

broadband offerings, most recently in Dallas, Chicago and Seattle.<sup>239</sup> Comcast is testing its own WiFi service at NJ Transit stations.<sup>240</sup> Cox Communications has plans to build its own cellular network,<sup>241</sup> potentially at the 4G level.<sup>242</sup> In the meantime, Cox intends to utilize Sprint's network to provide wireless service.<sup>243</sup> Cablevision has spent \$300 million to deploy WiFi access points across its footprint.<sup>244</sup> Cable companies have understood the threat of mobility and are already taking steps to remain competitive.

102. Fourth, content providers of every variety are adapting their offerings for the unique aspects of wireless – such as mobility and smaller screens – and therefore further blurring the lines between wireline and wireless broadband. For example, the New York Times, YouTube, ESPN, and many other websites have applications and online access that is optimized for smartphones.<sup>245</sup> The evolution of this “mobile web” also is significant because it heightens consumer awareness about differences across broadband services, including differences in access to content, and enables consumers to make comparisons between wireline and wireless broadband services in terms of access to content. Even for consumers who do not have both types of service, comparative information is available in the marketplace from other consumers, industry publications, and consumer reporting groups to help facilitate these comparisons. In addition, as the current marketplace dynamic demonstrates, competitors are likely to use advertising to bring any disadvantage of a particular service provider – whether wireline or wireless -- to light.

### **3. Competition from Providers Using Other Wireless Technologies**

103. In addition to mobile wireless services, providers using several other wireless technologies provide intermodal competition with wireline and traditional licensed wireless broadband

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<sup>239</sup> “WiMax Blooms in Chicago, Seattle, Dallas,” *Multichannel News*, December 1, 2009 available at [http://www.multichannel.com/article/391314-WiMax\\_Blooms\\_In\\_Chicago\\_Seattle\\_Dallas.php](http://www.multichannel.com/article/391314-WiMax_Blooms_In_Chicago_Seattle_Dallas.php).

<sup>240</sup> “Comcast, Cablevision Turn to WiFi to Retain Customers,” *nj.com*, February 28, 2009 available at [http://www.nj.com/business/index.ssf/2009/02/comcast\\_turns\\_to\\_wifi\\_to\\_retai\\_1.html](http://www.nj.com/business/index.ssf/2009/02/comcast_turns_to_wifi_to_retai_1.html).

<sup>241</sup> “Cox Plans to Launch a Cellular Network,” *The Wall Street Journal*, April 8, 2009.

<sup>242</sup> “Cox to Launch Next Generation Bundle with Wireless in 2009,” *Cox Enterprises Press Release*, Oct. 27, 2008 available at <http://coxenterprises.mediaroom.com/index.php?s=43&item=19>. (“Cox 2009”)

<sup>243</sup> Cox 2009.

<sup>244</sup> Morgan Stanley Research, *Cable/Satellite Downgrade: This Defense Not the Best Offense*, January 23, 2009, p. 19; “Q4 2008 Cablevision Systems Corp. Earnings Conference Call,” *FD (Fair Disclosure) Wire*, February 26, 2009, p. 6; “Cablevision’s Optimum WiFi Arrives in New Jersey,” *Cablevision News Release*, March 3, 2009.

<sup>245</sup> For the New York Times see <http://www.nytimes.com/services/mobile/index.html> last accessed on January 2, 2010; for YouTube see <http://www.google.com/mobile/products/youtube.html#p=default> last accessed on January 2, 2010; for ESPN see <http://espn.go.com/mobileespn/products?productid=3059185> last accessed on January 2, 2010.

provision.<sup>246</sup> These other technologies are in various stages of development and deployment. For some of them, one reason for their lack of full deployment is the already existing competitive environment within the wireless and wireline industries. However, the prospect of fuller deployment of these technologies can apply competitive pressure and constrain the behavior of current wireline and wireless broadband providers. If wireline and wireless providers begin engaging in practices that consumers dislike, these technologies may be ready to grow and become a viable alternative to the current prevailing providers. The recent entry of providers using new technologies – such as Clearwire with WiMAX – demonstrates the relative speed with which such new competition can occur. Some analysts expect Clearwire to grow to over 15 million total subscribers by 2015.<sup>247</sup> This entry demonstrates the competitive discipline that emerging technologies may provide.

104. One prominent alternative technology is WiFi. WiFi relies on unlicensed spectrum to provide short-distance, portable broadband access, and unlicensed WiFi services and devices continue to proliferate. Many business establishments, such as cafes, restaurants, and hotels, currently offer free or inexpensive WiFi hotspots. Consumers can access the Internet at a WiFi hotspot by using a WiFi equipped smartphone, or by using a netbook or laptop computer. It is also available in other devices, such as the Apple iPod Touch. WiFi capability is an increasingly common feature of consumer electronics. It is a standard feature in laptop computers and is showing up in many wireless handsets. As noted earlier, Sprint and Verizon Wireless have both stated that all of their handsets going forward will support WiFi.<sup>248</sup>

105. WiFi is a growing and evolving segment. Consumers are still learning how to incorporate its growing benefits into their broadband needs. In 2008 analysts reported that T-Mobile has experienced 20% to 30% growth in customers and a 50% to 70% growth in usage of its WiFi hotspots.<sup>249</sup> Although for most consumers these hotspots cannot fully substitute for dedicated wireline or wireless access, they offer useful broadband access services to many consumers, with

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<sup>246</sup> There also is additional actual or potential competition from other wireline sources. Broadband delivered over power lines (“BPL”) has been under development for several years. According to the United Power Line Council and the Utilities Telecom Council, at last count in December 2009 there were about 150 BPL providers. See <http://www.bpldatabase.org/> last accessed December 16, 2009. Some consumers with relatively simple Internet browsing needs are still using narrowband dial-up Internet service. To the extent that narrowband remains an option for some consumers, it may serve as a constraint on the pricing of lower end broadband services.

<sup>247</sup> Macquarie Clearwire Upgrading 2009, Figure 7.

<sup>248</sup> Wired 2009.

<sup>249</sup> Yankee Group, *Hotspotting Along the Track to Anywhere*, July 2008, p. 10. (“Yankee Group 2008”)

the benefit of mobility. And as WiFi technology continues to develop, at least some consumers may choose to be WiFi only or shift more of their broadband usage to WiFi, putting pricing pressure on broadband providers.

106. WiFi hotspots are also proliferating. AT&T maintains hotspot locations in many businesses such as Starbucks locations where customers can access the Internet through AT&T's WiFi network. Increasingly, many businesses are offering free Wi-Fi to consumers. McDonalds has recently announced that it will offer free WiFi to 11,000 locations starting in January 2010,<sup>250</sup> and since July, Borders<sup>251</sup> and Barnes & Noble<sup>252</sup> have both announced free WiFi at more than 1,200 locations nationwide.<sup>253</sup> Airport authorities in Philadelphia, San Jose, Denver, and other locations also provide free WiFi for travelers.<sup>254</sup> JiWire, a firm that helps companies advertise to consumers when they log onto a public WiFi network, counts almost 71,767 public WiFi hotspots in the U.S. within its registry.<sup>255</sup> Among regular internet users in 2008, 7% access it regularly through a public WiFi hotspot.<sup>256</sup>

107. Many universities also provide campus-wide WiFi connections to students, faculty, staff, and guests.<sup>257</sup> Dartmouth College installed campus-wide WiFi several years ago,<sup>258</sup> and the University of South Carolina plans to extend campus-wide WiFi by August 2010.<sup>259</sup> In Summer 2009, Northern Michigan University deployed one of the largest active regional WiMAX networks in the country, providing nearly 100% coverage of the City of Marquette, Michigan.<sup>260</sup> Paired with its longstanding laptop program, the network provides wireless broadband access to nearly

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<sup>250</sup> Tony Bradley (2009), "McDonald's Free Wi-Fi a No-Brainer Win-Win," *PCWorld BizFeed*, December 17, 2009 available at [http://www.pcworld.com/businesscenter/article/184939/mcdonalds\\_free\\_wifi\\_a\\_nobrainier\\_winwin.html](http://www.pcworld.com/businesscenter/article/184939/mcdonalds_free_wifi_a_nobrainier_winwin.html).

<sup>251</sup> "Borders Signs Agreement with Verizon to Offer Free Wi-Fi," *Borders Group Press Release*, September 29, 2009 available at [http://www.borders.com/online/store/BGIView\\_irnewsreleases](http://www.borders.com/online/store/BGIView_irnewsreleases).

<sup>252</sup> "Barnes & Noble Stores Nationwide to Offer Complimentary AT&T Wi-Fi In-Store Access to Over 700,000 eBooks on World's Largest eBookstore," *Barnes and Noble Press Release*, July 28, 2009 available at [http://www.barnesandnobleinc.com/press\\_releases/2009\\_july\\_27\\_wi-fi.html](http://www.barnesandnobleinc.com/press_releases/2009_july_27_wi-fi.html).

<sup>253</sup> Borders has announced free WiFi at 500 stores, and Barnes and Noble has announced free WiFi at over 700 stores.

<sup>254</sup> See <http://www.wififreespot.com/airport.html> last accessed on December 9, 2009.

<sup>255</sup> See <http://v4.jiwire.com/search-hotspot-locations.htm> last accessed on December 21, 2009.

<sup>256</sup> Yankee Group 2008, p. 12.

<sup>257</sup> See, e.g., "AT&T Brings Wi-Fi Access to Pennsylvania State University Campuses," *AT&T Inc. Press Release*, August 24, 2009 available at <http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=27046>.

<sup>258</sup> "Dartmouth: Creating a Wi-Fi Monster," *Wi-FiPlanet.com*, April 20, 2005 available at <http://www.wi-fiplanet.com/columns/article.php/3499271>.

<sup>259</sup> "USC to Have Campus-Wide Wi-Fi," *Dailygamecock.com*, November 4, 2009 available at <http://www.wi-fiplanet.com/columns/article.php/3499271>. See also "University of South Carolina Chooses AT&T to Provide Campus Wi-Fi Access," *AT&T Press Release*, July 30, 2009 available at <http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=26980>.

<sup>260</sup> "NMU Launches New WiMAX Network," *Presidents Council State Universities of Michigan Press Release*, August 20, 2009 available at <http://www.pcsum.org/currentnews/mid/374/newsid374/156/>.

the entire student population, on campus and across town. Campus-wide and municipal WiFi programs offer users another platform for broadband access, and when it is available provides competitive discipline for wireline and wireless service providers.

108. Broadband access is also provided by wireless Internet service providers (WISPs) who use fixed wireless technology to provide broadband service. Although I have been unable to find aggregate industry-wide data, the Wireless Internet Service Providers Association estimates that Wireless ISPs “[u]sing primarily license-free frequencies authorized under Part 15 of the Commission’s Rules ... provide fixed wireless broadband services to more than 2,000,000 people in residences, businesses, hospitals, first responders and educational facilities.”<sup>261</sup> Some of these WISPs have actively acquired other providers in order to expand their footprints and take advantage of returns to scale and scope. ERF Wireless, a Texas based WISP, expanded its footprint into the Texas panhandle with the acquisition of Centramedia Inc. in 2008.<sup>262</sup> In addition, it appears that establishing new WISPs may not require very large startup costs. Pasty.net, a wireless provider in Michigan’s Upper Peninsula, was started in 1999 by a man and his son unhappy with their Internet access. With the help of a mini-grant, the two helped their county purchase wireless relay stations. Most recently, with a \$1 million grant from the federal government, the company is expanding to adjacent counties.<sup>263</sup> Some industry analysts expect the number of fixed wireless broadband subscribers to grow to over 5.5 million by 2011.<sup>264</sup>

109. Satellite is another alternative technology for providing broadband. Satellite broadband services are currently available nationwide from at least two providers, Hughes and Wild Blue (which ViaSat recently agreed to purchase for more than \$565 million).<sup>265</sup> Hughes advertises

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<sup>261</sup> WISPA Comments to NBP Public Notice #6, GN Docket Nos. 09-47 and 09-137, filed October 23, 2009, p. 2.

<sup>262</sup> “ERF Wireless Continues Aggressive Acquisition Strategy with Acquisition of Centramedia, Inc.,” *ERF Press Release*, January 6, 2009.

<sup>263</sup> “Pasty.Net Turns 10,” *Great Lakes IT Report*, May 18, 2009 available at <http://www.wvj.com/Pasty-Net-Turns-10/4418733>.

<sup>264</sup> In-Stat, *In-Depth Analysis Broadband Gets Big: Global Broadband Subs hit 285 Million*, May 2007, p. 21. (“In-Stat 2007”)

<sup>265</sup> For Hughes see <http://www.hughesnet.com/> last accessed December 20, 2009. For Wild Blue see <http://wildblue.com/about/Wildblue/index.jsp> last accessed December 20, 2009. For ViaSat purchase see “ViaSat to Buy WildBlue for \$568 Million,” *SpaceNews.com*, October 1, 2009. Other providers of satellite broadband service include: VSAT Systems, Spacenet, Skycasters, and Ground Control. For VSAT Systems see <http://www.vsat-systems.com/high-speed-internet/index.html> last accessed December 20, 2009. For Spacenet see SpaceNet brochure available at <http://www.spacenet.com/pdfs/about.pdf> last accessed December 20, 2009. For Skycasters see <http://www.skycasters.com/the-company.html> last accessed on December 20, 2009. For Ground Control see “Ground Control Systems, Inc., Awarded Oregon Satellite Contract,” *Ground Control Press Release*, October 26, 2009. For Skycasters, see <http://www.skycasters.com/the-company.html> last accessed on December 20, 2009.

download speeds of 1 to 5 Mbps, and Wild Blue advertises download speeds of 1.5 Mbps and upload speeds of 256 Kbps.<sup>266</sup> According to Hughes, there are “[a]pproximately one million US customers being served by Hughes and WildBlue.”<sup>267</sup> The capability of satellite broadband is increasing. Current generation satellites support 10 Gbps total bandwidth, and next-generation satellites such as Hughes’ Jupiter and ViaSat-1 will be able to support 100+ Gbps.<sup>268</sup> The Satellite Industry Association states that as of 2Q2009, “over 1 million Americans” use satellite broadband services.<sup>269</sup> Some industry analysts predict that U.S. satellite broadband subscribers will reach about 1.5 million by 2011.<sup>270</sup>

110. The Commission has granted authority for several Mobile Satellite Service (“MSS”) operators to provide terrestrial service. Ancillary Terrestrial Component (ATC) systems allow satellite service to be combined with terrestrial services, so that satellite broadband providers can augment their service in places with weak signals.<sup>271</sup> Current terrestrial offerings by MSS operators are primarily targeted at commercial, government, and maritime customers. But some providers also offer data services for retail consumers. For example, StarBand – which offers satellite broadband service throughout the U.S.<sup>272</sup> – recently partnered with Omnicity, a WISP operating in the Midwest, to allow Omnicity to rebrand and resell its satellite internet broadband services as Omnicity’s own.<sup>273</sup> AT&T and Terrestrial Networks announced plans earlier this year to offer an integrated solution combining AT&T’s primary cellular wireless connectivity with the

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For Ground Control, see “Ground Control Systems, Inc., Awarded Oregon Satellite Contract,” *Ground Control Press Release*, October 26, 2009.

<sup>266</sup> For Hughes see <http://www.hughesnet.com/> last accessed December 20, 2009. For Wild Blue see <http://wildblue.com/about/Wildblue/index.jsp> last accessed December 20, 2009.

<sup>267</sup> Dean Mason, Senior VP & General Counsel, Hughes, *Satellite Broadband: Presentation to the Federal Communications Bar Association*, October 16, 2009, p. 2. (“Hughes FCBA Presentation”) See also NRTC Comments, *Rural Broadband Strategy*, GN Docket No. 09-29, FCC filed March 25, 2009. (WildBlue serves over 340,000 homes and businesses, including 82,000 served by NRTC members.)

<sup>268</sup> Hughes FCBA Presentation p. 5.

<sup>269</sup> Satellite Industry Association, Ex Parte Presentation, GN Docket No. 09-51, filed November 20, 2009, p. 2.

<sup>270</sup> In-Stat 2007, p. 24. Pike and Fischer estimate satellite broadband will serve 1.3 million people by 2012. “Satellite Broadband to Serve Nearly 1.3 Million by 2012, Report Concludes,” *MarketWire.com*, February 13, 2008 available at [http://www.marketwire.com/mw/rel\\_us\\_print.jsp?id=820809&lang=E1](http://www.marketwire.com/mw/rel_us_print.jsp?id=820809&lang=E1).

<sup>271</sup> “Satellite’s Time Has Come,” *Telephony Online*, January 22, 2007 available at [http://telephonyonline.com/access/commentary/telecom\\_satellites\\_time/index.html](http://telephonyonline.com/access/commentary/telecom_satellites_time/index.html).

<sup>272</sup> See StarBand’s website for a description of its services. <http://www.starband.com/about/> last accessed on December 14, 2009.

<sup>273</sup> “Omnicity Inks ‘No Home Left Behind’ Comprehensive Satellite Internet Delivery Deal,” *Omnicity Press Release*, October 7, 2009. Omnicity has plans to offer this satellite service to households where its wireless broadband services are currently not available.

ability to connect to Terrestrial's satellite network as a backup, using one phone number and one smartphone device.<sup>274</sup>

## V. Implications of the Competitive Environment for Network Neutrality Regulation

111. Economists and policy makers have long recognized that competitive markets best serve consumers, and that regulation can distort economic decision making.<sup>275</sup> Economists' concerns about the costs of regulation are heightened in competitive market settings where consumer demand, underlying technologies, and business models are rapidly changing.<sup>276</sup> In competitive markets, prices and the characteristics of service offerings are determined by the decision-making of many market participants, and consumers can "vote with their feet" about the business practices of service providers. The competitive process determines which provider practices will succeed. Consistent with these views, the bipartisan Antitrust Modernization Committee ("AMC") recently concluded that "public policy should favor free-market competition over industry-specific regulation of prices, costs, and entry... In general, Congress should be skeptical of claims that economic regulation can achieve an important societal interest that competition cannot achieve."<sup>277</sup> Likewise, a 1999 policy paper authored by a member of the Commission's Office of Plans and Policy noted that "[t]he Commission's instinct, as it has always been, should be to permit market forces to work, because competition leads to the widest variety of consumer choices."<sup>278</sup>

112. In regulated markets, by contrast, explicit decisions must be made by the regulators about their vision for appropriate prices, service offerings, business practices, and other dimensions of the marketplace. Network neutrality regulations of the sort proposed here would place the

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<sup>274</sup> "AT&T Announces Agreement with TerreStar to Offer Integrated Cellular / Satellite Solution," *AT&T Press Release*, September 30, 2009 available at <http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=27180>; see also "TerreStar Announces Distribution Agreement with AT&T," *TerreStar Press Release*, September 30, 2009 available at <http://www.TerreStar.com/press/20090930.html>.

<sup>275</sup> For some of the costs associated with regulation see Paul Joskow and Nancy Rose (1989), "The Effects of Economic Regulation," in R. Schmalensee and R. Willig (eds.) *Handbook of Industrial Organization*, North Holland, Ch. 25, Vol. 2, p. 1477: "When regulation is less than ideal, as it necessarily is in practice, its implementation may give rise to a host of production distortions." See also Roger Noll (1989), "Economic Perspectives on the Politics of Regulation," in R. Schmalensee and R. Willig (eds.) *Handbook of Industrial Organization*, North Holland, Ch. 22, Vol. 2.

<sup>276</sup> For example, see Shelanski (2007), p. 77: "[T]he benefits of regulation diminish as markets become competitive, while the costs of regulation remain and even increase as that transition occurs. Also, see William Baumol, et al (2007), "Economists' Statement on Network Neutrality Policy," AEI-Brookings Joint Center for Regulatory Studies, Related Publication 07-08, March 2007, p. 1: "Regulation of prices and services has often resulted in costs that exceed benefits, especially in competitive markets. Highly dynamic markets, such as those for high-speed Internet services, pose particular problems because they change so quickly."

<sup>277</sup> AMC Report, p. 22.

<sup>278</sup> Jason Oxman (1999), "The FCC and the Unregulation of the Internet," *Office of Plans and Policy Working Paper*, July 1999, p. 26.

Commission in the position of selecting the broadband provider practices that will prevail. These decisions are difficult to make in general, because regulators inevitably operate with limited, imperfect information about the demand and cost conditions that characterize an industry.<sup>279</sup> In the broadband context, rapid technological change, entry by new players, the wide variety of broadband content, diverse consumer preferences, and innovative new business models make targeted application of new regulation, without unintended consequences, virtually impossible. The FTC has specifically cautioned about this and has warned that the consequences of regulatory errors can be long lasting: “Further, such regulatory schemes inevitably will have unintended consequences, some of which may not be known until far into the future. Once a regulatory regime is in place, moreover, it may be difficult or impossible to undo its effects.”<sup>280</sup> Moreover, some of the proposed network neutrality regulations amount to regulation of product quality, which economists view as very difficult to regulate.<sup>281</sup>

113. For these reasons, even if the Commission were to find, contrary to the marketplace evidence, that there is not effective broadband competition, it does not follow that network neutrality regulation should necessarily be implemented because the costs associated with any regulatory misstep may well exceed any incremental value to the market delivered by the regulation.

**A. Network Neutrality Regulations are Unwarranted in the Current Broadband Market Environment**

114. The Notice of Proposed Rulemaking states that the purpose of the proposed network neutrality regulations is to “preserv[e] a free and open Internet.”<sup>282</sup> Thus, by its terms, the Notice of Proposed Rulemaking recognizes that the current competitive environment has already provided broadband consumers with options to openly access a wide range of Internet content, as well as options to access broadband content in more controlled environments. Marketplace evidence

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<sup>279</sup> See W. Kip Viscusi, Joseph Harrington, and John Vernon (2005), *Economics of Regulation and Antitrust*, 4<sup>th</sup> ed., p 552: “Even in a static setting, a regulatory agency must attempt to set the socially optimal price in spite of having very limited information about cost and demand conditions. The problems become even more difficult when the environment changes in significant ways over time.”

<sup>280</sup> FTC Staff Report 2007, p. 11.

<sup>281</sup> See, e.g., Viscusi, Vernon and Harrington (2005), pp. 361–362: “One reason for the minimal use of quality regulation is the cost of implementing it. To control any variable, the relevant economic agents have to be able to agree on what the variable is and what restrictions are placed on it.... However, quality is typically neither so well defined nor so easily observed.... Generally, economic regulation has not placed severe restrictions on the quality of products or services that firms offer with the notable exception of product safety.”

<sup>282</sup> NPRM, ¶ 16.

bears this out and demonstrates that network neutrality regulation is not necessary to preserve a free open and Internet, because market forces are doing so successfully.

115. Competition and innovation by broadband providers, device makers, applications developers and content providers have resulted in new and faster services, new access devices (such as smartphones, aircards and netbooks), access to a wide range of content and applications, falling prices, and improved service quality. Next-generation technologies, including wireline telco FTTH, cable DOCSIS 3.0, wireless 3G and 4G, and WiFi are rapidly being developed and deployed, providing more broadband choices and better broadband capabilities to the majority of consumers. In short, the current broadband environment, which has relied primarily on market forces rather than regulation, has delivered rapid innovation, consumer choice, and substantial consumer benefits.

116. The current broadband market environment, relying on market forces and with limited regulation, also has created incentives for industry players to adapt to changes in technology, changes in the way broadband content is accessed, and changes in the role of complementary devices, applications, and content. One hallmark of the current market environment is that providers, device makers, software developers, and content providers have been able – or forced by the market – to experiment with a variety of business and pricing models, as they seek to differentiate their products and attract consumers. This flexibility has led to product differentiation in many dimensions and has allowed users to extensively customize and improve their individual experiences. There is no single pricing plan for broadband access. Instead, broadband access can be postpaid, prepaid, bundled, unlimited, or sold for just a few hours. There is also no single business model. Users can sign long term contracts for subsidized devices or buy their own device and bring it to a network.

117. Consumers also face real choices with respect to “openness” as a result of current broadband competition. Personal computers offer many advantages as devices to access broadband content, but they can be threatened with malware and viruses that disable applications. Some smartphones, such as the Apple iPhone, operate in a more controlled network environment, with a provider and/or operating system developer vetting all applications before distribution. Other smartphones, such as those running Android, require no approval, and developers simply develop, upload, and publish. This provides consumers with a choice of environments, ranging from completely open

where the consumer takes primary responsibility for security to an environment where more security features are handled by the broadband provider but user flexibility may be more limited.

118. As these various marketplace developments show, existing competition for broadband services has created incentives for broadband providers, device makers and applications developers to experiment with different business arrangements and to innovate and invest in new technologies in order to attract consumers to their networks. The fact that the broadband marketplace is already providing consumers with open access to the Internet, as well as a range of other options, suggests that competitive forces are working properly and that expansion of the Commission's current Internet Policy Statement into a set of prescriptive regulatory rules is not necessary.

#### **B. The Proposed Network Neutrality Rules Are Likely To Harm Consumer Welfare**

119. Network neutrality regulations are not only unnecessary given the current competitive environment for broadband, but, by limiting flexibility, they may also jeopardize future broadband investment and innovation, limit consumer options, and harm consumer welfare. Given the dynamism of the broadband marketplace, there is still considerable uncertainty regarding what the range of best practices will be, and those efficient practices are likely to evolve over time. Experimentation and observing the corresponding consumer response has been and will be an essential business practice for competitors in this space.<sup>283</sup> Economists and competition authorities are particularly skeptical of claims of the need for prophylactic regulation in advance of competitive problems.<sup>284</sup>

120. There are many varieties of network neutrality. Many of the network neutrality proposals in the NPRM would restrict the business practices of broadband network providers in ways that could lead to consumer welfare harms. Proposals to adopt restrictions on network management,

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<sup>283</sup> Other economists have made similar points. See, e.g., Shelanski (2007), p. 102: "[C]ompetition drives networks away from anticompetitive, anti-consumer vertical discrimination. But competition would allow discriminatory deals where they are in the interests of consumers and new producers that consumers would like to see in the marketplace. Competition is therefore preferable to regulation for determining the appropriate degree of net neutrality." See, also, Robert Hahn and Scott Wallsten (2006), "The Economics of Net Neutrality," *AEI-Brookings Joint Center for Regulatory Studies*, June 2006, p. 5; Christopher Yoo (2008), "Network Neutrality, Consumers, and Innovation," *The University of Chicago Legal Forum*; Michael Katz (2009), "Investment, Innovation, and Competition in the Provision of Broadband Infrastructure," attachment to Comments of Verizon and Verizon Wireless, GN Docket 09-51, filed June 8, 2009.

<sup>284</sup> For example, the FTC noted: "[I]ndustry-wide regulatory schemes - particularly those imposing general, one-size-fits-all restraints on business conduct - may well have adverse effects on consumer welfare, despite the good intentions of their proponents. FTC Staff Report 2007, p. 11.

pricing and vertical contractual relationships with device, applications, and content providers all raise such risks. The economics literature recognizes that network operator practices such as network management, differential pricing, and vertical contracting can be procompetitive, solve incentive problems, and promote investment, even when the network operator is a monopolist.<sup>285</sup>

121. Network neutrality proposals that prescribe a “one size fits all” approach to network management are likely to reduce consumer welfare. Given heterogeneity in consumer preferences and broadband technologies, one choice in network architecture, network management, or business model will not best fit the needs for all consumers or uses of broadband content. As such, it is harmful to consumer welfare for the Commission to mandate a particular network neutrality regime as “the approach” to broadband provision. For example, some consumers might prefer open access to the Internet with little security management, while other consumers might prefer that broadband providers manage access and address Internet security issues. Some consumers might prefer a service with different speeds available for different types of content and applications, while other consumers might prefer one-speed-fits-all broadband service. Network neutrality regulations will artificially limit providers’ ability to tailor services to different consumers needs and therefore can harm consumer welfare.<sup>286</sup>

122. Restrictions on network management practices also may cause harms by precluding broadband providers from dealing effectively with network congestion. Network congestion is a significant and growing problem for broadband providers,<sup>287</sup> particularly wireless providers, and requires business flexibility to ensure quality consumer service experiences. For example, AT&T is reportedly considering ways to encourage customers to use less data as it struggles with congestion on its wireless network.<sup>288</sup> Network neutrality regulations may well restrict the ability of providers to manage their networks and remove potential tools for providers to address

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<sup>285</sup> See, e.g., Farrell and Weiser (2003), “Modularity, Vertical Integration, and Open Access Policies: Towards a Convergence of Antitrust and Regulation in the Internet Age,” *Harvard Journal of Law and Technology*, Vol. 17; James Cooper, Luke Froeb, Dan O’Brien, and Michael Vita (2005), “Vertical Antitrust Policy as a Problem of Inference,” *International Journal of Industrial Organization*, September 2005, Vol. 23. The economics literature also recognizes that in certain circumstances a platform monopolist may have the incentive and ability to engage in practices can harm competition and consumers. See, e.g., Farrell and Weiser (2003). But virtually all of the scenarios where vertical relationships theoretically may harm consumers arise when there is significant market power at one level in the vertical chain of production. Here, given the increasingly vigorous competition between broadband providers, carrier practices are far more likely to be procompetitive and pro-consumer than anticompetitive.

<sup>286</sup> Benjamin Hermalin and Michael Katz (2006), “The Economics of Product-Line Restrictions with an Application to the Network Neutrality Debate,” *UC Berkeley Competition Policy Center Working Paper*, July 28, 2006.

<sup>287</sup> Gerald Faulhaber (2007), “Network Neutrality: The Debate Evolves,” *International Journal of Communication*, Vol. 1, p. 684.

<sup>288</sup> “AT&T to Urge Customers to Use Less Wireless Data,” *The New York Times*, December 10, 2009.

congestion. Economists recognize that the ability to price differentially could be particularly useful for content providers who would like to achieve priority delivery of their content.<sup>289</sup> With a differential price, the broadband provider could ensure high priority delivery even in periods of peak congestion, which also is a way for the provider to differentiate its service.

123. Network neutrality regulations would also have the adverse consequence of deterring network investment by broadband access providers. In order to recoup their large investment costs and spread the costs among more parties, broadband providers may seek to offer new types of services to content and applications providers, such as prioritized access.<sup>290</sup> By prohibiting broadband providers from collecting differential revenues, or in some proposals any revenues at all, from content providers who would benefit from these new services, network neutrality rules proposed in the NPRM have the potential to diminish the returns associated with a carrier's network investment.<sup>291</sup> This ultimately reduces the incentives for innovation and investment for both incumbents and potential new entrants. In addition, given the virtuous cycle that exists where next-generation broadband networks stimulate innovation in applications and content, requiring more bandwidth, and in turn encouraging even more advanced networks, a reduction in network infrastructure investment can potentially stifle content and application innovation, as well. Moreover, prohibiting pricing to content providers shifts the burden of supporting new investment onto the shoulders of end consumers.

124. Beyond the effects of the virtuous cycle, network neutrality regulation can thwart innovation in other ways. With regulations prohibiting differential pricing for quality of service, broadband providers would be less able to guarantee quality of service for certain types of content.<sup>292</sup> A variety of broadband applications may benefit from quality of service guarantees, including streaming video, voice over Internet protocol telephony (VOIP), and telemedicine. For example, Hahn and Wallsten (2006) point to telemedicine as a specific example, asking “[W]ho wants to risk remote surgery or emergency medical advice if the video stream is sluggish and jerky because

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<sup>289</sup> See, e.g., Gregory J. Sidak (2006), “A Consumer-Welfare Approach to Network Neutrality Regulation of the Internet,” *Journal of Competition Law and Economics*, Vol. 2, p. 353.

<sup>290</sup> Philip Weiser (2008), “The Next Frontier for Network Neutrality,” *Administrative Law Review*, Vol. 60, p. 11.

<sup>291</sup> See, e.g., Robert Atkinson and Philip Weiser (2006), “A ‘Third Way’ on Network Neutrality,” The Information Technology and Innovation Foundation, May 30, 2006, pp. 5–6 available at <http://www.itif.org/files/netneutrality.pdf>.

<sup>292</sup> For a discussion of quality of service (QoS) in broadband networks, see Litan and Singer (2007). See also Bruce Owen and Gregory Rosston (2003), “Local Broadband Access: Primum Non Nocere or Primum Processi? A Property Rights Approach,” Stanford Law School Working Paper No. 263, July 2003, p. 20.

of congestion caused by an online game of Doom?”<sup>293</sup> The development of new and enhanced broadband applications such as telemedicine will likely require significant coordination among network providers, content providers and applications developers, and regulations restricting quality of service pricing will make such coordination harder to achieve.

125. Network neutrality regulations could also negatively impact competition in broadband service. Reducing the flexibility for broadband providers to act in creative ways could homogenize broadband service and make all the broadband providers look more like one another. Homogenization could lead to increased market concentration, as this industry is characterized by high fixed costs and increasing returns to scale. If providers are unable to differentiate themselves from one another except through price, the largest provider will tend to prevail in an industry with increasing returns to scale.<sup>294</sup> Therefore, in considering network neutrality regulations, regulators need to weigh the possibility of such regulation decreasing the extent of competition which in turn could raise prices, reduce access, and impede expansion and innovation.

### C. Specific Concerns Raised in the NPRM

126. The NPRM raises several specific concerns about broadband provider practices that network neutrality regulations are intended to address, noting that “[s]upporters of open Internet policies contend that market forces alone are unlikely to ensure that broadband Internet access service providers will discriminate in socially efficient ways.”<sup>295</sup> First, the issues that the NPRM raises are hypothetical possibilities rather than features of the current broadband marketplace. Since the Commission adopted its Internet Policy Statement in 2005, there has been just one instance in which the Commission found it necessary to enforce its policy principles. In that case, Comcast was blocking certain BitTorrent peer-to-peer applications. Comcast discontinued the practices under dispute following public disclosure – even in the absence of prescriptive rules of the sort at issue here. Thus, specific violations of the Internet Policy Statement principles have been few and far between, as market forces have led providers to adopt network management and business practices that are procompetitive and benefit consumers.

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<sup>293</sup> See Hahn and Wallsten (2006), p. 4.

<sup>294</sup> George Ford, Thomas Koutsky and Lawrence Spiwak (2006), “Network Neutrality and Industry Structure,” Phoenix Center Policy Paper, No. 24, p. 2: “[P]olicymakers should avoid mandates that may ‘commoditize’ broadband access services since such a policy approach is likely to deter facilities-based competition, reduce the expansion and deployment of advanced communications networks, and increase prices.” See, also, Yoo (2008), p. 213. Jean Tirole (2000), “The Theory of Industrial Organization,” MIT Press, Ch. 7.

<sup>295</sup> NPRM, ¶ 67.

127. Moreover, the broadband provider practices at issue have procompetitive justifications, and are unlikely to be anticompetitive given the current competitive environment for broadband provision. I discuss below several of the specific concerns raised in the NPRM and explain why they are misplaced from an economic perspective.

### **1. Market Forces Will Deter Inefficient Pricing**

128. The NPRM expresses the concern that, absent network neutrality regulation, broadband service providers may charge prices to content and applications that are inefficiently high.<sup>296</sup> The NPRM posits that even with market competition, inefficient pricing could still exist. These concerns are misguided.

129. In addressing this issue it is useful to consider the economics of two-sided markets. Broadband providers operate in a two-sided market with consumers on one side and application and content providers on another.<sup>297</sup> Broadband providers are eager to attract as many consumers as possible, since more consumers provide more subscription fees and make the broadband network more attractive to applications and content providers. Under current pricing arrangements, broadband providers charge only the consumer side of the market for the delivery of content of applications.<sup>298</sup>

130. Currently, the price charged by network providers to the other side of the market, content and application providers for delivery or downloads of content or application to end users over the Internet, is effectively zero. However, this zero price may not be the most efficient. Contractual pricing arrangements between broadband providers and application and content providers may result in the provision of new and better services. A two-sided pricing model where both consumers and content providers pay fees may also be a more efficient way for network providers to recover the substantial fixed costs of building, improving, and maintaining broadband access networks.<sup>299</sup> In addition, charging content providers a fee may well shift costs away from the

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<sup>296</sup> “Even where there is effective competition in the Internet access market, individual broadband Internet access providers may charge inefficiently high prices to content, application, and service providers ...”, NPRM, ¶ 68.

<sup>297</sup> For further discussion of two-sided markets, see David Evans (2003), “The Antitrust Economics of Multi-Sided Markets,” Yale Journal of Regulation; Jean-Charles Rochet and Jean Tirole (2007), “Two-Sided Markets: A Progress Report,” Rand Journal of Economics.

<sup>298</sup> Broadband providers charge end-user subscribers for Internet access and also charge content providers that are directly connected to the broadband provider. However, a broadband provider generally does not charge a content provider for access to its end-user subscribers.

<sup>299</sup> See, e.g., Sidak (2006), p. 362: “[E]ach party in a two-sided market can contribute to the recovery of the sunk costs required to build a broadband network. There is certainly no basis in economic theory to presume that it would be

consumer market, which may prove appealing to many end users and open the door to more innovative pricing regimes for the end user market.

131. Moreover, competition among broadband providers alleviates concerns about inefficient pricing. Consider a hypothetical broadband access provider A that charges a content provider a price that is “too high” for priority delivery. The content provider can choose to have its content delivered by provider A at lower access speeds or quality of service, while delivering its content with priority delivery via other broadband access providers. By charging a “too high” price, provider A will be at a competitive disadvantage in attracting and retaining consumers who value that content. Competition among broadband service providers allows end users to choose the broadband provider who delivers the appropriate mix of content, speed, and service quality. In this way, competition imposes pricing discipline on providers and creates incentives for them to offer competitive prices to content providers and end-users.

132. The NPRM also raises the concern that “[i]f allowed to do so, broadband Internet service providers may attempt to extract some of the profit earned by content, applications, and service providers by charging them fees for providing access (or prioritized access) to the broadband Internet access service providers’ subscribers,”<sup>300</sup> thus reducing incentives for content and applications providers to innovate. It is important to remember that broadband content/applications and broadband access are complements, and that in addition to innovation by content/applications providers, the provision of content/applications to end-users also involves significant investment and innovation on the part of broadband providers. In this case, one would expect broadband providers and upstream content and applications providers to enter into mutually advantageous contractual agreements, with bargaining over the division of potential future profits. Vertical contracting can promote investment by both broadband providers and upstream applications providers. Economists recognize that vertical contracts can align incentives and promote pro-consumer activities. For example, if both broadband providers and content/applications providers need to make relationship specific investments in order to deliver services to the end user, an *ex ante* contract between the content provider and carrier will ensure

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socially optimal for end-users to pay for all of the cost of building a high-speed broadband network while the companies that deliver content or applications to those same end-users over that network – and therefore derive substantial economic advantage from its use – pay nothing.”

<sup>300</sup> NPRM, ¶ 68.

the best outcome for the consumer.<sup>301</sup> Far from being a problem, a sharing of profits among contractual parties is a central feature of an efficient market system.<sup>302</sup>

## **2. Collective Action Problems Regarding Prioritization Fees Are Not a Rationale for Network Neutrality Regulation**

133. The NPRM voices the concern that it might be in the collective interest of competing broadband providers not to implement prioritization fees to content or applications providers, but that it might be in the self-interest of an individual broadband provider to charge a prioritization fee to content or applications provider.<sup>303</sup> The NPRM calls this a collective action problem.

134. First, as discussed above, it is far from economically obvious that a regime with no prioritization fees would benefit consumers, content/applications providers, or broadband providers. Competitive forces deliver strong incentives for broadband providers to offer attractive access arrangements to content providers. Contractual pricing arrangements between broadband providers and application and content providers can result in the provision of new and better services that benefit the broadband provider, the content provider, and consumers. As competing broadband providers strive to differentiate their networks and offer attractive service packages to consumers, and as competing content/applications providers attempt to differentiate themselves in the marketplace, the ability to enter into contracts for prioritized service can increase competitive rivalry. Because consumers can “vote with their feet” which broadband provider supplies the best access to content, competition will allow prioritization fees when they are in the interest of consumers. Network neutrality regulation that sets prioritization fees at zero would be replacing market choices by broadband providers, content/applications providers, and consumers with choices made by the regulator.<sup>304</sup>

135. Collective actions problems can arise in markets when there are externalities – that is, when consumers or firms do not bear the full costs or realize the full benefits of their actions on

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<sup>301</sup> Patrick Bolton and Mathias Dewatripont, (2005) *Contract Theory*, p. 560–564. For further discussion of the benefits of vertical contracting, see Patrick Rey and Jean Tirole (2007), “A Primer on Foreclosure,” *Handbook of International Organization*, Vol. III, Ch. 33.

<sup>302</sup> See Bolton and Dewatripont (2005).

<sup>303</sup> “Although it might be in the collective interest of competing broadband Internet access service providers to refrain from charging access or prioritization fees to content, application, and service providers, it is in the interest of each individual access provider to charge a fee, and given multiple providers, it is unlikely that access providers could tacitly agree not to charge such fees.” NPRM, ¶ 69.

<sup>304</sup> As noted by Shelanski (2007), p. 102: “Competition is therefore preferable to regulation for determining the appropriate degree of net neutrality.”

others.<sup>305</sup> Externalities can be negative, as in the case of drivers causing congestion for other drivers on local highways, or positive, as in the case of a homeowner who fixes up the exterior of her home and her yard, providing benefits to her neighbors. Positive externalities arise in the context of broadband access because of network effects;<sup>306</sup> the decision by consumers to subscribe to broadband access depends on the content that is made available by content providers, and the decision by content providers to invest in and provide content depends on the number of broadband subscribers that they can reach. Negative externalities can also arise in the broadband context, such as when a bandwidth-intensive user causes congestion for other users.

136. Externalities typically arise because of a lack of well defined property rights. For example, network resources like bandwidth are a resource that is shared across users, and, no one user has exclusive right to a certain amount of bandwidth. A bandwidth-intensive user on an all-you-can-eat broadband access plan is claiming a temporary right to these shared network resources that may prevent other users from having adequate network capacity. While some externalities may require government solutions, in many situations the market can solve externality problems through various forms of pricing or contracting. This is especially true when property rights are well defined, as they are in the case of content and broadband access. For example, usage-based pricing can force those who use the most network resources to bear the costs they impose on other users.

137. As another example, consider a new broadband application that requires innovation and investment both by a broadband provider and by a complementary applications provider.<sup>307</sup> Consumer value is created only if both parties undertake complementary investments. Positive externalities can arise when the broadband provider's investment benefits applications providers, and the application provider's investments benefit other broadband providers. Because the broadband (applications) provider does not account for the benefit that accrues to the applications (broadband) provider, investment might not take place that would benefit both parties, and would benefit consumers. Because property rights are well defined both for the broadband and

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<sup>305</sup> See, e.g., Carlton and Perloff (2005), p. 82.

<sup>306</sup> For additional discussion of network effects, see Joseph Farrell and Paul Klemperer (2007), "Coordination and Lock-In: Competition with Switching Costs and Network Effects," *Handbook of Industrial Organization*, Vol. III, Ch. 31.

<sup>307</sup> For discussion of the relationship between Apple and AT&T that led to the iPhone, see Michael Katz (2009), "An Economic Analysis of the Rural Cellular Association's Petition for Rulemaking Regarding Exclusivity Arrangements Between Commercial Wireless Carriers and Handset Manufacturers," Attached to AT&T Comments, In the Matter of Petition for Rulemaking Regarding Exclusivity Arrangements Between Commercial Wireless Carriers and Handset Manufacturers, RM-11497, February 2, 2009.

content/applications provider, the economics literature recognizes that various forms of vertical contracting between firms can solve this externality problem and otherwise align incentives, without the need for government intervention.<sup>308</sup>

138. The specific collective action problem raised in the NPRM is that if broadband providers do not take into account the effect of prioritization fees on the incentives of content/applications providers, then the quality and quantity of Internet content/applications may be reduced, reducing the overall value of the Internet, and the demand for broadband Internet services.<sup>309</sup> As discussed above, in a competitive market setting, prioritization fees are likely to arise when they benefit content providers, broadband providers and consumers. Broadband providers and content/applications providers will enter into contractual arrangements that align incentives and solve externality problems. Other contractual arrangements may also arise. For example, content delivery networks such as Akamai cache frequently requested web content at many locations throughout the Internet, allowing faster delivery of content and reducing problems with latency.<sup>310</sup> Content and applications providers pay Akamai for this service, which is a form of prioritized access. Economics predicts that firms will enter into a variety of arrangements to solve incentive problems, and in a competitive market setting, such arrangements are almost always pro-consumer. In today's (and tomorrow's) broadband marketplace, the best public policy is to allow firms to experiment with a variety of business arrangements and pricing schemes, and not impose a regulatory pricing rule on prioritized service.

### **3. Market Forces Will Prevent Best-Efforts Access from Languishing**

139. The Commission's NPRM also raises the possibility that, if broadband providers are able to charge content suppliers, broadband providers may have incentives to improve access that is paid for, but allow best-effort access that is not paid for to languish.<sup>311</sup> The NPRM voices the concern that this problem could manifest itself even with market competition. This concern also is misplaced from an economic perspective.

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<sup>308</sup> See Hahn and Singer (2009); Carlton and Perloff (2005), Ch. 12.

<sup>309</sup> NPRM, ¶ 69.

<sup>310</sup> For additional discussion of content delivery networks and Akamai, see Yoo (2008), p. 199.

<sup>311</sup> "[B]roadband Internet access service providers generally, and particularly broadband Internet access service providers with market power, may have the incentive and ability to reduce or fail to increase the transmission capacity available for standard best-effort Internet access service, particularly relative to other services they offer, in order to increase the revenues obtained from content, application, and service providers or individual users who desire a higher quality of service." NPRM, ¶ 71.

140. As an initial matter, there is no reason to believe that all consumers want or are willing to pay for the same broadband speeds. The marketplace evidence I summarize above demonstrates that broadband providers offer multiple tiers of service to consumers, with the tiers often varying by access speed. This reflects the fact that consumer demand for broadband service is not homogenous, but instead varies considerably depending on many factors.

141. Just as this is true with respect to consumers, it also is true with respect to content providers. There is no economic reason that all applications should be subject to the same quality of service. Some services, such as streaming video, VOIP, and online gaming may require low latency and higher quality of service. Other services such as email or web browsing may work fine with standard best-efforts access. Here, too, there presumably would be a difference in the willingness and ability of various actors to pay for prioritized access, which should be encouraged – not prohibited – in order to maximize consumer welfare.<sup>312</sup>

142. Despite wide variance in demand for bandwidth and other performance characteristics among both consumers and content providers, marketplace evidence also demonstrates that there is significant demand for best-efforts service. Far from allowing such service to languish, wireline and wireless broadband access providers have been steadily increasing the speeds with which they offer standard best-efforts Internet access. Given competition among broadband providers, there is every reason to expect standard best-efforts offerings to continue improving going forward.

143. Competition creates incentives for broadband providers to provide high quality service to all content providers. Quite simply, a broadband provider who delivers faster access to higher quality content will attract and retain more consumers to its network. Consumers benefit when they have access to more content and applications. In a competitive environment, a provider has no incentive to let its best-efforts service languish. If it did, it would lose subscribers and subscriber revenue. This effect is only strengthened as more broadband competition emerges.<sup>313</sup>

144. Rules that prohibit everything but best-efforts service are not only unnecessary given competitive forces, but would limit the flexibility of broadband providers to provide services that may be valuable to consumers. In a world where certain content, such as telemedicine or streaming video, requires higher priority bandwidth, the possibility of network congestion

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<sup>312</sup> See, e.g., Weiser (2008), p. 10: “For the Internet to develop effectively, it is important for policymakers to appreciate that QoS assurances are not an unfortunate development, but a necessary one that may well be good for customers.”

<sup>313</sup> Shelanski (2007), p. 102.

problems create incentives for broadband providers to offer more reliable, high-speed service.<sup>314</sup> For example, streaming video requires reduced latency to function most effectively, and in the absence of sufficiently high quality of service, an online video service may not be of sufficient quality to be viable. Similarly, certain telemedicine applications may require a high quality of service to function effectively.

145. Multiple tiers of service exist in other industries, as well, such as parcel delivery. For example, both UPS and FedEx have many different levels of service, with various delivery speeds and guarantees. However, they have incentives to compete on all levels of service and, as such, have ensured high quality even at the least expensive levels.<sup>315</sup> Similarly, airlines offer different levels of service, and compete for consumers at all their service levels.

#### **4. Anticompetitive Exclusion is Unlikely in the Competitive Broadband Environment**

146. The NPRM also expresses a concern that vertically integrated or affiliated broadband providers may have the incentive and ability to exclude services offered by competing, unaffiliated content and application providers.<sup>316</sup> As discussed above, economists recognize that vertical integration and vertical contracting is often motivated by procompetitive and pro-consumer reasons. For example, vertical integration or contracting can align investment incentives between a network operator and a content developer. In addition, virtually all scenarios where vertical integration or vertical contracting harms consumers arise when there is significant market power at one level.<sup>317</sup> Even in a monopoly market setting, anticompetitive exclusion only occurs under specific conditions.<sup>318</sup> Moreover, although some broadband providers may have ownership interests in content businesses or have entered into vertical contracts with certain content businesses, none has even come close to achieving a dominant position. Further, the competitiveness of the content and applications markets, with a multitude of choices available to consumers, means that a broadband provider's upstream affiliate would benefit little from any

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<sup>314</sup> See Hahn and Wallsten (2006), p. 4 and Sidak (2006), p. 353.

<sup>315</sup> Faulhaber (2007), p. 690 makes a similar point.

<sup>316</sup> "Broadband Internet access service providers have an incentive to use this gatekeeper role to make it more difficult or expensive for end users to access services competing with those offered by the network operator or its affiliates." NPRM, ¶ 72.

<sup>317</sup> Daniel Spulberand and Christopher Yoo (2008), "Rethinking Broadband Internet Access," *Harvard Journal of Law and Technology*, Fall 2008, p. 34.

<sup>318</sup> See Farrell and Weiser (2003).

restrictions on unaffiliated content. In sum, given that the markets for broadband providers, applications developers, and content providers are competitive, vertical integration is far more likely to be procompetitive and pro-consumer than anticompetitive.

## **5. There is not a Terminating Monopoly Problem in Broadband Provision**

147. The NPRM also raises the concern that after an end user has chosen her Internet service provider, that provider has an effective “terminating monopoly” on this end user and can leverage this power to collect monopoly profits from content and application providers.<sup>319</sup> Again, the competitive environment of the broadband industry alleviates these concerns.

148. For background, it is helpful to consider terminating access fees charged by local exchange carriers to complete voice calls. Once a consumer subscribes to local telephone service from a local exchange carrier (LEC), that LEC was viewed as a “monopolist” for anyone who wants to reach that consumer over the wireline telephone network.<sup>320</sup> The access charges are levied on the interexchange carrier (IXC) that originates the call, and passed on to the calling party, but the called party does not face these access charges and has little incentive to switch to a competing LEC with lower access fees. The ability and incentives of LECs to, in certain situations, charge high terminating access fees was known as the “terminating monopoly” problem.

149. The local telephone service regulatory environment exacerbates these issues. First, basic local telephone service is subject to price regulation that may hold prices below profit maximizing levels. In addition, regulation requires IXCs to rate average across consumers, so that an IXC cannot charge higher rates to customers that make more calls that face high terminating access fees. As a result, access charges are averaged among all IXC’s subscribers. As a result of the regulatory environment, there is little competitive pressure on an LEC that charges high terminating access fees. Economists and Commission staff have raised a number of ways in which a terminating monopoly for voice calls could harm consumers.<sup>321</sup> For these reasons, Commission staff have proposed a “bill and keep” regime where carriers interconnect, but where terminating

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<sup>319</sup> “[E]ven if there is competition among broadband Internet access service providers, once an end-user customer has chosen to subscribe to a particular broadband Internet access service provider, this may give that broadband Internet access service provider the ability, at least in theory, to favor or disfavor any traffic destined for that subscriber.” NPRM, ¶73.

<sup>320</sup> This discussion draws on the analysis in Brito and Ellig (2007).

<sup>321</sup> Patrick DeGraba (2002), “Central Office Bill and Keep as a Unified Inter-Carrier Compensation Regime,” *Yale Journal on Regulation*; Jerry Ellig (2005), “Inter-carrier Compensation and Consumer Welfare,” *Journal of Law, Technology & Policy*.

LECs could not impose access charges on other telecommunications carriers, but instead only collect revenue from its own subscribers.<sup>322</sup>

150. Network neutrality regulation proponents have posited that a similar situation could arise in the broadband context if broadband providers could charge content providers fees for accessing consumers.<sup>323</sup> However, the regulatory environment for broadband provision is very different from that of local telephone service, and competitive forces are likely to deter any effort by a broadband provider to charge inefficiently high access charges for delivering broadband content to a consumer.<sup>324</sup> No such rate averaging regulation exists, and most consumers have access to several choices for broadband service. If a broadband provider attempted to charge “inefficiently high” prices to content suppliers to serve certain consumers, the content provider could choose to pass this cost on to the users of their services who subscribe to the broadband provider. Consumers would be directly impacted by the price increase, and could switch to another broadband provider. Or the content provider could choose not to offer its content to consumers of that broadband provider. Again, consumers would be directly impacted by the loss of content, and could switch to another broadband provider. A competing broadband service provider who charges a lower price to the same content providers will be able to make that content available to end users at higher speeds or quality of service. As evidenced by the high churn rates of wireline and wireless broadband providers, consumers can and do switch providers when faced with more attractive options, and this competitive discipline deters providers from charging “inefficiently high” prices.

151. Network neutrality proponents also worry that content/applications providers may be reluctant to pass on access charges to subscribers or refuse to deliver traffic to a broadband provider that charges access fees, thus limiting the ability of competition to discipline inefficient access fees.<sup>325</sup> However, in a two-sided market setting, competition on both sides of the market can discipline prices. Broadband providers operate as intermediaries, with subscribers on one side and content/applications providers on the other side. Parties on both sides can contribute to the significant costs of building and maintaining a broadband network, and by having the flexibility to contract with content/applications providers, competing broadband providers will have an

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<sup>322</sup> DeGraba (2002).

<sup>323</sup> FTC Staff Report, p. 77.

<sup>324</sup> See, Faulhaber (2007), fn. 24.

<sup>325</sup> NPRM, fn. 160.

incentive to lower subscription fees to consumers. As described by Brito and Ellig (2007), “it is difficult to understand why any rents the access providers might earn from charges on content or applications providers would not be returned to consumers in the form of lower prices for Internet access.”<sup>326</sup>

## VI. Conclusion

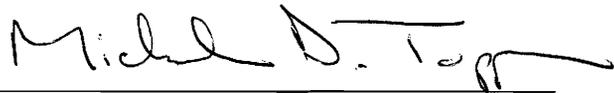
152. My review of the marketplace evidence suggests that network neutrality regulations of the type at issue here are not warranted. The broadband provider practices challenged by proponents of network neutrality regulation have many procompetitive justifications, and vigorous competition among broadband providers creates a strong disciplining effect on potentially anticompetitive broadband provider practices. As economists have long recognized, competitive markets create proper incentives for investment, innovation, pricing and entry.

153. Moreover, proposed network neutrality regulations have the potential to reduce incentives to innovate and invest, and to distort the current competitive process. Among other drawbacks, network neutrality regulations are likely to reduce incentives for investment, restrict network management practices in ways that could exacerbate network congestion, and bind the hands of broadband providers when faced with changes in technology or the nature of Internet traffic. Given the current competitive environment, and the potential consumer welfare costs of *ex ante* network neutrality regulation, a better approach than broad, *ex ante* network neutrality regulation is to rely on industry players disclosing their practices and government intervention only when faced with evidence of anticompetitive behavior arising from service provider practices that threatens to harm consumers.

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<sup>326</sup> See Brito and Ellig (2007), p. 29. See also, Sidak (2006), pp. 361–362.

I declare under penalty of perjury that the foregoing is true and correct.

A handwritten signature in black ink that reads "Michael D. Topper". The signature is written in a cursive style with a horizontal line extending from the end of the name.

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Michael D. Topper  
Executed January 14, 2010

**Declaration of Michael D. Topper**  
**Attachment A**

**MICHAEL D. TOPPER**  
**Vice President**

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**ACADEMIC BACKGROUND**

- 1991      **Stanford University**      Stanford, California  
*Ph.D., Economics, 1991; M.A., Economics, 1989*  
Specialized in labor economics, public finance, industrial organization and econometrics.
- 1982      **Stanford University**      Stanford, California  
*M.S., Engineering-Economic Systems*
- 1981      **University of Virginia**      Charlottesville, Virginia  
*B.S., Systems Engineering, with Highest Distinction*  
Member, Tau Beta Pi

**PROFESSIONAL EXPERIENCE**

- 1994 – Present      **Cornerstone Research, Inc.**      Menlo Park, California  
*Vice President (Partner)*  
*Head, Antitrust & Competition Practice*  
Manage and conduct economic analysis for complex business litigation, regulatory and public policy matters, with specialization in antitrust, intellectual property, class certification and breach of contract.  
Industry expertise includes telecommunications, media, Internet, information technology, energy, transportation, and financial services.  
Expertise includes econometrics, analysis of large datasets and consumer survey design and analysis.  
Services to clients include expert testimony, identifying experts, clarifying economic and financial issues, identifying and analyzing data, supporting experts in the preparation of expert reports and testimony, and analyzing opposing expert reports and testimony.
- 1993 – 2003      **Stanford University**      Stanford, California  
*Lecturer in Economics*  
Taught courses in microeconomics and antitrust policy for the Department of Economics.
- 1991 – 1994      **College of William and Mary**      Williamsburg, Virginia  
*Assistant Professor of Economics*  
Conducted academic research on the economics of education and training programs. Developed new courses in labor and development economics. Helped launch the new graduate program in public policy. Taught core courses in economics and statistics. Supervised graduate and undergraduate students.

**MICHAEL D. TOPPER**  
**Vice President**

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**PROFESSIONAL EXPERIENCE (CONT.)**

- Summer 1986 **Rand Corporation** Santa Monica, California  
*Summer Research Intern, Telecommunications Policy Group*  
Developed models for estimating the demand for telecommunications services.
- Summer 1985 **International Institute for Applied Systems Analysis (IIASA)** Vienna, Austria  
*Summer Research Intern, Systems Modeling Group*  
Programming and analysis for dynamic simulation models.
- 1981 – 1984 **Bell Laboratories/Bell Communications Research** Holmdel, New Jersey  
*Systems Engineer*  
Conducted cost/benefit, technical feasibility and economic cost analyses for advanced switching services based on caller ID.

**PUBLICATIONS**

- “3G Standards Policy: Government Shouldn’t Intervene in Debate,” *Wireless Week*, December 21, 1998.
- “Student Loans, Debt Burdens, and Choice of Major,” *New Directions for Higher Education*, 85, pp. 115–124, 1994.
- “The Impact of the Demographic Transition on Government Spending,” with John Shoven and David Wise, In David Wise, ed., *Economics of Aging*, University of Chicago Press, 1994.
- “The Cost of Capital in Canada, the U.S. and Japan,” with John Shoven, In John Shoven and John Whalley, eds. *Canada-U.S. Tax Policy Issues*, University of Chicago Press, 1992.

**WORKING PAPERS**

- “An Antitrust Analysis of the Case for Wireless Network Neutrality,” with Gregory L. Rosston, *Stanford Institute for Economic Policy Research Discussion Paper 08-040*, July 2009. Accepted, *Information, Economics and Policy*
- “Economic White Paper on National Third Generation Wireless Standards,” with Joseph Farrell, *Mimeo*, November, 1998.

**CONFERENCE PARTICIPATION, PANEL PARTICIPATION AND INVITED TALKS**

- “Modernization of Antitrust Law,” Stanford University Conference, May 29–30, 2008, Panelist/Discussant.
- “Third Generation Wireless Standards Policy,” Presentations in Washington D.C., December 1998.
- “Higher Education and the American Worker,” Christopher Wren Society, Williamsburg, VA, April 1993.
- “The Impact of the Demographic Transition on Government Spending on Individuals,” with John Shoven and David Wise, NBER Conference on the Economics of Aging, July 1992.

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**Vice President**

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**CONFERENCE PARTICIPATION, PANEL PARTICIPATION AND INVITED TALKS (CONT.)**

“Ethnic Differences in Schooling Attainment in Malaysia—A Difference in Differences Approach,”  
Paper presented at Southeast Asian Educators Workshop, Stanford University, July 1991.

“The Cost of Capital in Canada, the U.S. and Japan,” with John Shoven, NBER Conference on  
Canada–U.S. Tax Comparisons, July 1990.

**EXPERT TESTIMONY**

*Federal Communications Commission, Mobile Wireless Competition Notice of Inquiry, WT Docket  
No. 09-66. Filed declaration on behalf of client Verizon Wireless, September 2009.*

*Copyright Royalty Board, In the Matter of Distribution of the 2004 and 2005 Cable Royalty Funds,  
Docket No. 2007-3 CRB CD 2004-2005. Filed testimony on behalf of client National Association of  
Broadcasters, December 2009.*

**FELLOWSHIP AND AWARDS**

Center for Economic Policy Research, Stanford University  
*Visiting Scholar, 1993–1994*

Department of Economics, Stanford University  
*Distinguished Teaching Award, 1989*

Rand Corporation  
*Graduate Student Summer Fellowship, 1986*

International Institute for Applied Systems Analysis  
*American Academy of Sciences Young Scientists’ Summer Program Fellowship, 1985*

Bell Laboratories  
*Graduate Fellowship, 1981–1982*

**Declaration of Michael D. Topper**  
**Attachment B**

**ATTACHMENT B**  
**Wireline Broadband Availability in Verizon's Local Service Territory**  
**(as of 2009)**

State	Total Households (HH) in VZ Territory	Total HH in Wire Centers with VZ BB or Cable Modem	Total HH in Wire Centers with VZ Broadband	Total HH in Wire Centers with Both VZ BB and Cable Modem
CA	2,859,458	2,825,393	2,782,637	2,718,958
CT	13,559	13,559	13,559	13,559
DC	241,212	241,212	241,212	241,212
DE	326,791	326,791	326,256	326,256
FL	1,539,312	1,539,312	1,539,312	1,533,476
MA	2,483,041	2,483,041	2,483,041	2,460,642
MD	2,123,195	2,123,195	2,123,184	2,077,753
NJ	3,090,218	3,090,218	3,090,218	3,090,218
NY	6,413,509	6,412,094	6,322,021	6,320,682
PA	4,066,232	4,066,232	4,064,874	4,046,420
RI	446,218	446,218	446,218	445,715
TX	1,145,461	1,107,179	839,558	784,818
VA	2,487,682	2,416,465	2,400,317	2,220,398
<b>Total</b>	<b>27,235,887</b>	<b>27,090,909</b>	<b>26,672,406</b>	<b>26,280,106</b>

	% of Total HH	% of Wireline BB HH	% of Wireline BB HH
CA	98.8%	98.5%	96.2%
CT	100.0%	100.0%	100.0%
DC	100.0%	100.0%	100.0%
DE	100.0%	99.8%	99.8%
FL	100.0%	100.0%	99.6%
MA	100.0%	100.0%	99.1%
MD	100.0%	100.0%	97.9%
NJ	100.0%	100.0%	100.0%
NY	100.0%	98.6%	98.6%
PA	100.0%	100.0%	99.5%
RI	100.0%	100.0%	99.9%
TX	96.7%	75.8%	70.9%
VA	97.1%	99.3%	91.9%
<b>Total</b>	<b>99.5%</b>	<b>98.5%</b>	<b>97.0%</b>

*Sources:* Data regarding total households in Verizon's territory and households in wire centers in Verizon's territory with Verizon Broadband (which includes both DSL and FiOS) are from internal Verizon sources; data regarding cable modem broadband were obtained from Communications Media Advisors based on information from *Warren's Television and Cable TV Factbook (2009)*. Communications Media Advisors used mapping software to analyze the overlap between the availability of Verizon broadband (which was available by wire center) and cable modem broadband (which was available by local franchise area). For purposes of this analysis, where Verizon broadband or cable modem was available anywhere in a wire center, it was assumed to be available throughout the wire center.