

# BROADBAND COMPETITION AND INNOVATION POLICY

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## CHAPTER 4



**TWENTY-FIVE YEARS AGO, THE WORLD WIDE WEB DID NOT EXIST.** Very few Americans had even seen a mobile phone, and broadband networks were available only to a few businesses and research institutions.

Today, innovations such as broadband and others like it drive the creation of a wide variety of products and services. The competitive forces that sparked these breakthroughs need to be nurtured, so that the United States can continue to reap the benefits of its unrivaled culture of innovation.

This chapter examines innovation and competition in the broadband ecosystem. First, it discusses each of the three elements of the broadband ecosystem—networks, devices and applications. Then it addresses competition for value across the ecosystem, the transition from a circuit-switched network to an all-Internet Protocol (IP) network and the leveraging of the benefits of innovation and investment internationally.

Section 4.1 approaches network competition in three ways. First, it addresses the state of competition in residential broadband and makes recommendations to bolster consumer benefits by developing data-driven competition policies for broadband services. Second, it makes recommendations intended to ensure that consumers have the information they need to make decisions that maximize benefits from these services. Increased transparency will likely drive service providers to deliver better value to consumers through better services. Third, it focuses on competition in the wholesale broadband market—including issues associated with high-capacity circuits, copper retirement, interconnection and data roaming. All are crucial for enabling competition in the small business and enterprise customer segments, in mobile services and in deployment of services in high-cost areas.

Section 4.2 addresses devices, with a particular focus on set-top boxes. Of the three main categories of broadband devices—mobile devices, personal computing devices and set-top boxes—set-top boxes is the category with the least competition: two manufacturers control more than 90% of the U.S. market and have controlled comparable market shares for many years. Congress recognized the need for change in the set-top box market when it enacted Section 629 of the Telecommunications Act, but the FCC's attempts to meet Congress's objectives have been unsuccessful. As video becomes an increasingly important element of broadband applications, driving usage and adoption, it is crucial that the FCC takes steps that will foster increased innovation in set-top boxes and video navigation devices to bring more competition and choice for consumers.

Section 4.3 addresses applications, focusing on the management of personal data and privacy. The number and variety of applications and content available over broadband connections

has exploded over the last few years. Competition within different types of applications and content services must be looked at on a case-by-case basis. However, the importance of digital personal data is a common thread among current and emerging content and application services. Personal data, often aggregated into “digital profiles,” are often used to provide consumers with personalized services and to target them with more relevant advertising. These increasingly detailed digital profiles offer both an opportunity and a challenge. The opportunity is to increase the innovations and convenience provided to end-users, who may enjoy better targeted, more customized services and applications, many of them free of charge. The challenge is to enable consumers to take advantage of such innovations while ensuring that they can retain control of their personal data, protect their privacy and manage how the information collected on them is used.

## RECOMMENDATIONS

### Networks

- The federal government, including the FCC, the National Telecommunications and Information Administration (NTIA) and Congress, should make more spectrum available for existing and new wireless broadband providers in order to foster additional wireless-wireline competition at higher speed tiers.
- The FCC and the U.S. Bureau of Labor Statistics (BLS) should collect more detailed and accurate data on actual availability, penetration, prices, churn and bundles offered by broadband service providers to consumers and businesses, and should publish analyses of these data.
- The FCC, in coordination with the National Institute of Standards and Technology (NIST), should establish technical broadband performance measurement standards and methodology and a process for updating them. The FCC should also encourage the formation of a partnership of industry and consumer groups to provide input on these standards and this methodology.
- The FCC should continue its efforts to measure and publish data on actual performance of fixed broadband services. The FCC should publish a formal report and make the data available online.
- The FCC should initiate a rulemaking proceeding by issuing a Notice of Proposed Rulemaking (NPRM) to determine

- performance disclosure requirements for broadband.
- The FCC should develop broadband performance standards for mobile services, multi-unit buildings and small business users.
  - The FCC should comprehensively review its wholesale competition regulations to develop a coherent and effective framework and take expedited action based on that framework to ensure widespread availability of inputs for broadband services provided to small businesses, mobile providers and enterprise customers.
  - The FCC should ensure that special access rates, terms and conditions are just and reasonable.
  - The FCC should ensure appropriate balance in its copper retirement policies.
  - The FCC should clarify interconnection rights and obligations and encourage the shift to IP-to-IP interconnection where efficient.
  - The FCC should move forward promptly in the open proceeding on data roaming.

#### Devices

- The FCC should initiate a proceeding to ensure that all multi-channel video programming distributors (MVPDs) install a gateway device or equivalent functionality in all new subscriber homes and in all homes requiring replacement set-top boxes, starting on or before Dec. 31, 2012.
- On an expedited basis, the FCC should adopt rules for cable operators to fix certain CableCARD issues while development of the gateway device functionality progresses. Adoption of these rules should be completed in the fall of 2010.

#### Applications

- Congress, the Federal Trade Commission (FTC) and the FCC should consider clarifying the relationship between users and their online profiles.
- Congress should consider helping spur development of trusted “identity providers” to assist consumers in managing their data in a manner that maximizes the privacy and security of the information.
- The FCC and FTC should jointly develop principles to require that customers provide informed consent before broadband service providers share certain types of information with third parties.
- The federal government, led by the FTC, should put additional resources into combating identity theft and fraud and help consumers access and utilize those resources, including bolstering existing solutions such as OnGuard Online.
- FCC consumer online security efforts should support broader national online security policy, and should be coordinated

with the Department of Homeland Security (DHS), the FTC, the White House Cyber Office and other agencies. Federal agencies should connect their existing websites to OnGuard Online to provide clear consumer online security information and direction.

- The federal government should create an interagency working group to coordinate child online safety and literacy work, facilitate information sharing, ensure consistent messaging and outreach and evaluate the effectiveness of governmental efforts. The working group should consider launching a national education and outreach campaign involving governments, schools and caregivers.
- The federal government should investigate establishing a national framework for digital goods and services taxation.

## 4.1 NETWORKS

### Competition in Residential Broadband Markets

Competition is crucial for promoting consumer welfare and spurring innovation and investment in broadband access networks. Competition provides consumers the benefits of choice, better service and lower prices. This section begins by analyzing the available data to assess the current state of competition among wireline broadband services and mobile wireless broadband services, and the competitive dynamics across different broadband technologies. It does not analyze the market power of specific companies or reach definitive conclusions about the current state of competition for residential broadband services. The section then discusses how new technologies and network upgrades present both opportunities and challenges to competition in the near future. It concludes with several recommendations to promote competition and to improve the data the government collects to assess the state of competition in broadband markets in the future.

### Competition in industries with high fixed costs

Building broadband networks—especially wireline—requires large fixed and sunk investments. Consequently, the industry will probably always have a relatively small number of facilities-based competitors, at least for wireline service. Bringing down the cost of entry for facilities-based wireline services may encourage new competitors to enter in a few areas, but it is unlikely to create several new facilities-based entrants competing across broad geographic areas.<sup>1</sup> Bringing down the costs of entry and expansion in wireless broadband by facilitating access to spectrum, sites and high-capacity backhaul may spur additional facilities-based competition. Whether wireless competition is sustainable in driving innovation, investment and consumer welfare will depend on the evolution of technology

and consumer behavior among many other factors.

The lack of a large number of wireline, facilities-based providers does not necessarily mean competition among broadband providers is inadequate. While older economic models of competition emphasized the danger of tacit collusion with a small number of rivals, economists today recognize that coordination is possible but not inevitable under such circumstances. Moreover, modern analyses find that markets with a small number of participants can perform competitively;<sup>2</sup> however, those analyses do not tell us what degree of competition to expect in a market with a small number of wireline broadband providers combined with imperfect competition from wireless providers.<sup>3</sup> In addition, as the Department of Justice (DOJ) describes the issue, the critical question is not “some abstract notion of whether or not broadband markets are ‘competitive’” but rather “whether there are policy levers [around competition policy] that can be used to produce superior outcomes.”<sup>4</sup> Given that approximately 96% of the population has at most two wireline providers, there are reasons to be concerned about wireline broadband competition in the United States. Whether sufficient competition exists is unclear and, even if such competition presently exists, it is surely fragile. To ensure that the right policies are put in place so that the broadband ecosystem benefits from meaningful competition as it evolves, it is important to have an ongoing, data-driven evaluation of the state of competition.

New data from the FCC’s Form 477 combined with several other sources make possible certain general observations about the state of competition in broadband services today, though additional data are needed to more rigorously evaluate broadband competition.<sup>5,6</sup>

In general, broadband subscribers appear to have benefited from the presence of multiple providers. Broadband providers have invested in network upgrades to deliver faster broadband speeds and enter new product markets—cable companies providing telephony and telephone companies offering multichannel video—but the data available only provide limited evidence of price competition among providers.

**Fixed broadband service**

Unlike many countries, the majority of U.S. broadband subscribers do not connect to the Internet via local-access infrastructure owned by an incumbent telephone company. The U.S. cable infrastructure was advanced and ubiquitous enough to allow cable companies to offer broadband access services to large portions of the country, in many cases before the telephone companies. As a result, the U.S. market structure is relatively unique in that people in most parts of the country have been able to choose from two wireline, facilities-based broadband platforms for many years. Approximately 4% of

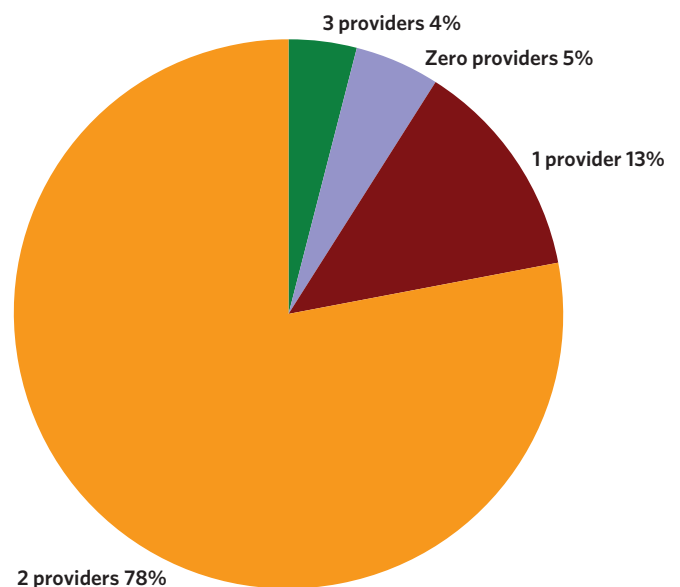
housing units are in areas with three wireline providers (either DSL or fiber, the cable incumbent and a cable over-builder), 78% are in areas with two wireline providers, about 13% are in areas with a single wireline provider and 5% have no wireline provider (see Exhibit 4-A).

These data do not necessarily mean that 82% (78% + 4%) of housing units have two or three competitive options for wireline broadband service—the data used here do not provide adequate information on price and performance to determine if multiple providers present in a given area compete head-to-head.

Additionally, the data show that rural areas are less likely to have access to more than one wireline broadband provider than other areas. The data also show that low-income areas are on average somewhat less likely to have more than one provider than higher-income areas.

There are other types of fixed broadband providers. For instance, satellite-based broadband service is available in most areas of the country from two providers, while hundreds of small fixed wireless Internet service providers (WISPs) offer service to more than 2 million people<sup>8</sup> and Clearwire offers WiMAX service in a number of cities.<sup>9</sup> These providers compete for customers as well, although their services tend to be either more expensive or offer a lower range of speeds than today’s wireline offerings.<sup>10</sup>

*Exhibit 4-A:  
Share of Housing Units in Census Tracts with 0, 1, 2, and 3 Wireline Providers<sup>7</sup>*



The presence of a facilities-based competitor impacts investment. Indeed, broadband providers appear to invest more heavily in network upgrades in areas where they face competition. Exhibit 4-B shows that controlling for housing density, household income and state-specific factors that affect supply and demand, providers of broadband over any given wireline technology—Digital Subscriber Line (DSL), cable or fiber—generally offer faster speeds when competing with other wireline platforms. So, for example, available cable speeds are higher in areas in which cable competes with DSL or fiber than in areas where cable is the only option. DSL and fiber show similar results. Available speeds are even higher where three wireline providers compete (e.g., where a cable over-builder is also present).<sup>11</sup>

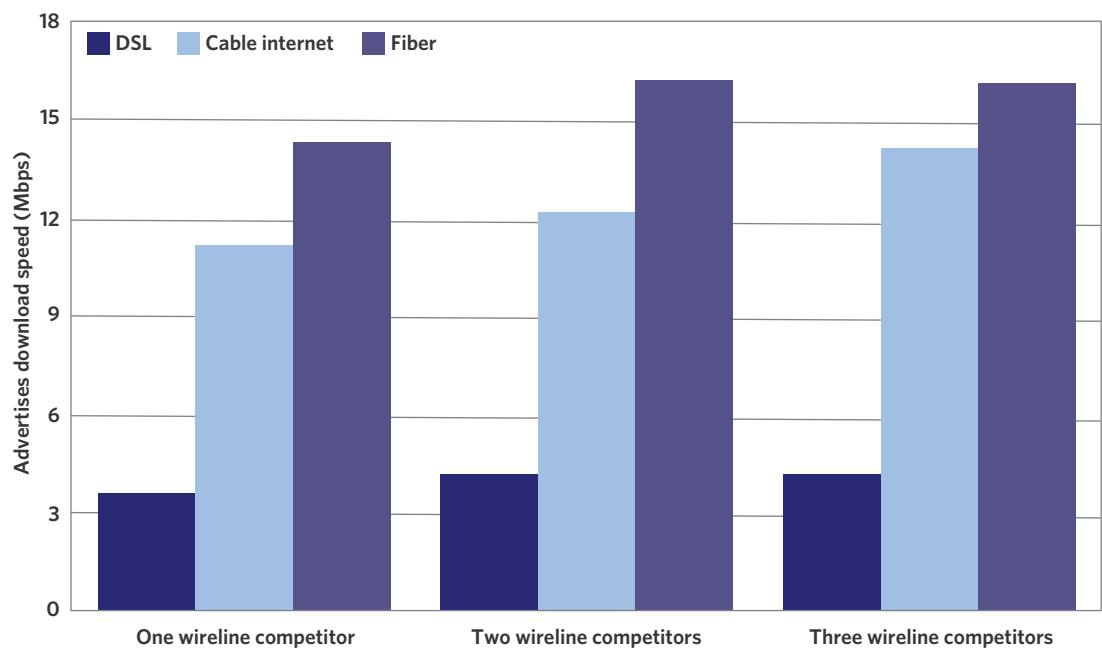
Indeed, competition appears to have induced broadband providers to invest in network upgrades.<sup>13</sup> Cable and telephone companies invested about \$48 billion in capital expenditures (capex) in 2008 and about \$40 billion in 2009. While it is very difficult to accurately disaggregate service provider capital expenditures into broadband and other areas, a review of analyst reports at Columbia Institute for Tele-Information (CITI) suggests that of this total, wireline broadband capital expenditures were about \$20 billion in 2008 and expected to be about \$18 billion in 2009.<sup>14</sup> Companies channeled these investments into network upgrades in recent years, as detailed in Exhibit 4-C.<sup>15</sup>

Consumers are benefiting from these investments. Top advertised speeds available from broadband providers have increased in the past few years. Additionally, typical advertised download speeds to which consumers subscribe have grown at approximately 20% annually for the last 10 years.<sup>17</sup>

New choices—at new, higher speeds—are becoming available, as well. Clearwire offers download speeds of up to 2 Mbps service in several cities and plans to have its WiMAX service available to about 120 million people by 2011.<sup>18</sup> Two satellite providers plan to launch new satellites in 2011 and 2012, with ViaSat (WildBlue) expecting to advertise download speeds of up to 2–10 Mbps and Hughes Communications planning to advertise download speeds of up to 5–25 Mbps.<sup>19</sup>

In principle, providers can compete on price as well as on service. Unfortunately, the dearth of consistent, comprehensive and detailed price data makes it difficult to evaluate price competition. The data that do exist are imperfect. First, some focus on the price of broadband when not bundled with any other services even though the vast majority of consumers purchase broadband bundled with voice, video or both.<sup>20</sup> Second, sources that have data on bundles do not provide sufficient information to determine the incremental price of the broadband component. Third, broadband providers frequently offer promotions to attract new customers. No data source consistently captures the relevant details of those promotions, including details such as how long the promotional price lasts, the length of the contract the consumer signs to get the promotional price, the price once the promotion expires and any early termination fee. Some international comparisons suggest the number of retail broadband providers may be positively correlated with advertised download speeds, at least at the high end of the market, and with affordability.<sup>21</sup> Others rank the United States high in affordability of broadband, despite the fact that 96% of consumers have two or fewer choices, and suggest that consumers

*Exhibit 4-B:  
Average Top  
Advertised Speed  
in Areas with 1,  
2 and 3 Wireline  
Competitors<sup>12</sup>*



may not be willing to pay as much for high speeds as they are for other functionality.<sup>22</sup>

Nevertheless, the available data can be analyzed to see if they yield consistent results. Merging comprehensive cross-sectional data on prices<sup>23</sup> with Form 477 data makes possible econometric analyses of the effects of competition on prices, controlling for income, density and region-specific factors. These analyses yield some weak evidence that monthly prices are lower when more wireline providers are in a census tract, but the data limitations discussed above make it difficult to draw robust conclusions.

A fundamental question related to competition is how prices paid by consumers evolve as underlying costs change. While the data do not allow us to examine competition in detail, it is possible to examine certain aspects of prices over time. In particular, Greenstein and McDevitt (2010) analyzed about 1,500 broadband contracts<sup>24</sup> to construct price indices (see Exhibit 4-D).<sup>25</sup> The exhibit shows that the price index for standalone nominal prices, adjusted for upload and download speeds, changed modestly between 2006 and 2009 while the index for bundled prices remained relatively constant.<sup>26</sup>

Other data reach similar conclusions. The Internet service provider (ISP) price index compiled by BLS shows a slight increase in Internet service prices between 2007 and 2009.<sup>28</sup> The available time-series data, therefore, show, at best, a small decline in quality-adjusted nominal broadband prices while the econometrics reveal weak evidence that providers compete on

prices. One clear conclusion from the analysis, however, is that better data for analyzing price competition would be helpful.

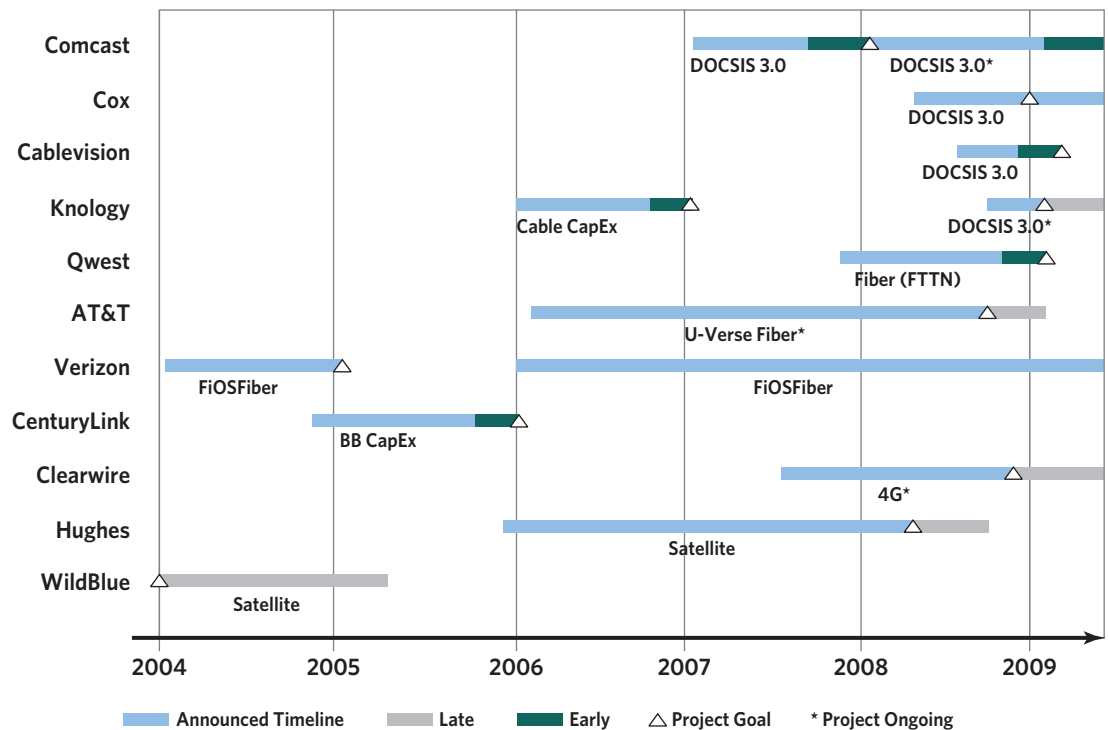
**Mobile broadband competition<sup>29</sup>**

As discussed in Chapter 3, as of November 2009, according to data from American Roamer, third-generation (3G) wireless service covers roughly 60% of U.S. landmass.<sup>30</sup> In addition, approximately 77% of the U.S. population lived in an area served by three or more 3G service providers, 12% lived in an area served by two, and 9% lived in an area served by one. About 2% lived in an area with no provider (see Exhibit 4-E).<sup>31</sup>

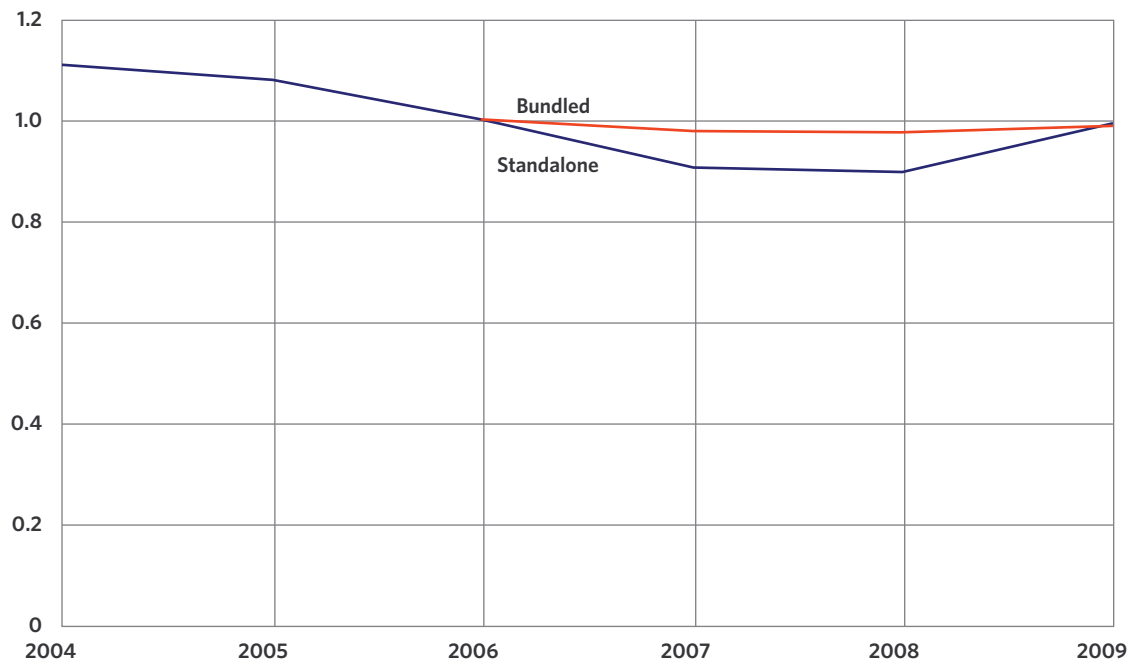
These measures likely overstate the coverage actually experienced by consumers, since American Roamer reports *advertised* coverage as reported by many carriers who all use different definitions of coverage. In addition, these measures do not take into account other factors such as signal strength, bitrate or in-building coverage, and they may convey a false sense of consistency across geographic areas and service providers.<sup>32</sup> As with fixed broadband, most areas without mobile broadband coverage are in rural or remote areas. Nonetheless, the data can help benchmark mobile broadband availability nationwide. In total, while United States service providers are building out mobile broadband coverage, the U.S. is far from having “complete” coverage.

Mobile data users typically receive download speeds ranging from hundreds of kilobits per second to about one megabit per second.<sup>34</sup> Several competing firms offer mobile broadband. In

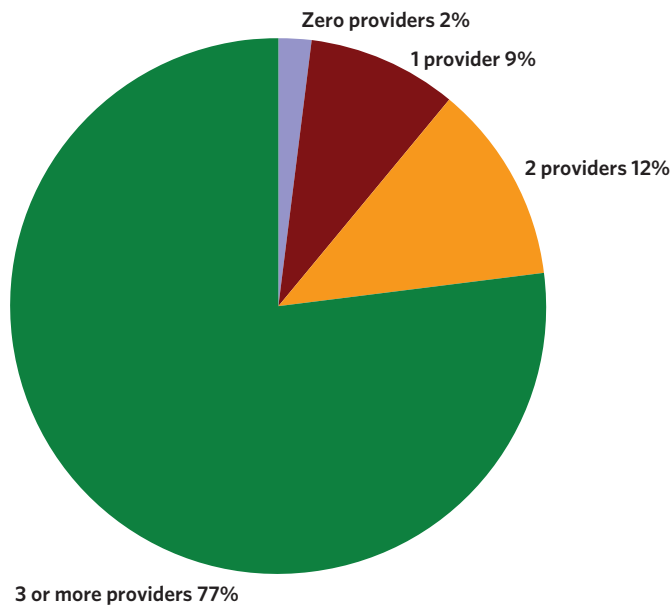
*Exhibit 4-C:  
Select Fixed  
Broadband  
Infrastructure  
Upgrades<sup>16</sup>*



**Exhibit 4-D:**  
Price Indices  
for Broadband  
Advertised as a  
Standalone Service  
and as Part of a  
Bundle (2006 = 1)<sup>27</sup>



**Exhibit 4-E:**  
Share of Population Living in Census Tracts with 0, 1, 2, 3 or More  
3G Mobile Providers<sup>33</sup>



In addition to the nationwide service providers AT&T, Verizon, Sprint and T-Mobile (two of which are also leading providers of wireline broadband), new competitors such as Leap Wireless and MetroPCS have emerged in metropolitan areas in recent years. Like wireline broadband providers, these firms may compete along many dimensions including coverage, device

selection, roaming and services. Many service providers have focused on network upgrades to 3G services.<sup>35</sup>

As mentioned earlier, identifying broadband-specific capital expenditures is very difficult, but the CITI report indicates that total capital expenditures by major wireless firms were about \$21 billion in 2008, of which about \$10 billion was for broadband. In 2009 wireless companies were expected to have incurred about \$20 billion in capital expenditures, \$12 billion of which was for broadband services.<sup>36</sup> While projections should be viewed cautiously, wireless broadband capital expenditures are expected to be about \$12 billion in 2010 and increase steadily to \$15 billion in 2015 as service providers roll out their 4G services.<sup>37</sup> Mobile broadband services are relatively new and their competitive dynamics are changing rapidly. As new technologies such as High Speed Packet Access (HSPA), WiMAX and Long Term Evolution (LTE) are introduced and rolled out by different carriers, new devices support different uses and consumers turn to different applications.

**Wireline-wireless competition**

Whether wireless broadband, either fixed or mobile, can compete with wireline broadband is an important question in evaluating the status of broadband services competition. The answer depends on how technology, costs and consumer preferences evolve, as well as on the strategic choices of firms that control wireline and wireless assets,<sup>38</sup> including firms that offer both fixed and mobile broadband.

Consumers' preferences differ depending on how they use their broadband connections and how much they are willing to pay for



such use. Some value download speeds more than any other attribute, some value mobility and new converts from dial-up may still even value the simple “always on” connection. A user who values little more than e-mail and browsing news sites has, in principle, many choices—nearly any broadband access technology will do. But a user who streams high-definition video and enjoys gaming probably requires high download and upload speeds and low latency. That user will likely have few choices.

Most consumers’ preferences are not so extreme—they tend to value some factors more than others. If a sufficiently large segment of consumers are relatively indifferent about the attributes, performance and pricing of mobile and fixed platforms, then mobile and fixed providers are likely to compete for consumers. Today, however, most consumers who do not value mobility when purchasing broadband, or want high download or upload speeds, face only two choices for their fixed broadband service.<sup>39</sup>

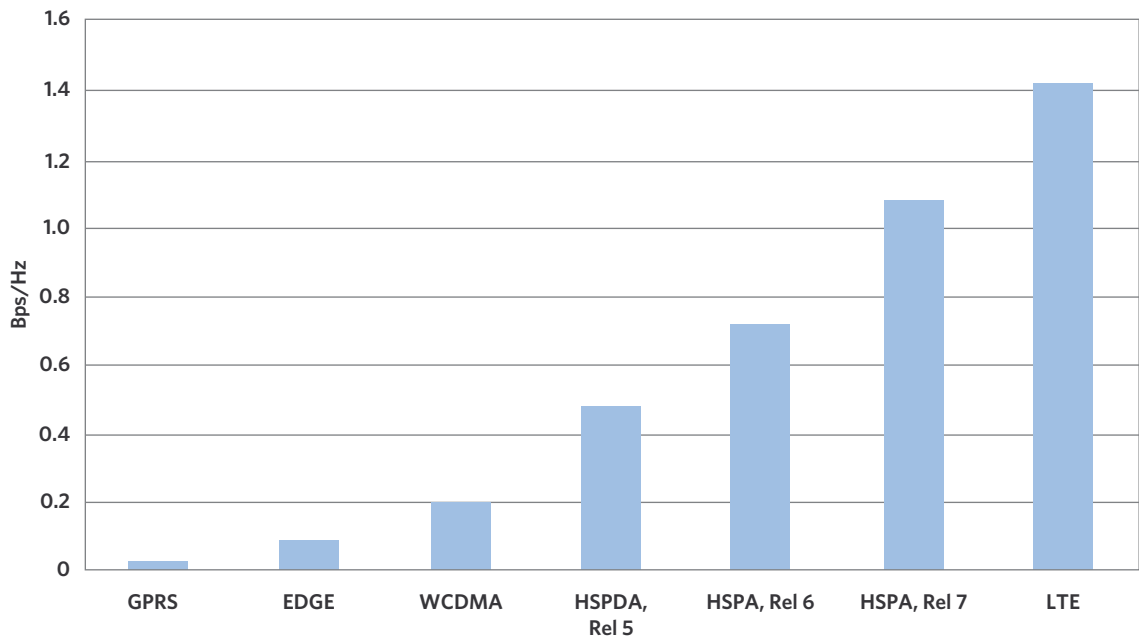
It is not yet clear how that might change. The spectral efficiency of wireless technologies has increased by a factor of roughly 40 or more since the early days of second-generation (2G) wireless (see Exhibit 4-F).<sup>40</sup> These technologies—often deployed for mobile services—can deliver even higher download speeds by replacing mobile devices with fixed terminals. Indeed, terrestrial, fixed wireless access solutions have already been deployed as a substitute for wired access technologies; for example, in the United States by Clearwire with WiMAX and Stelera with HSPA.

Wireless broadband may not be an effective substitute in the foreseeable future for consumers seeking high-speed connections at prices competitive with wireline offers.<sup>42</sup> Given enough spectrum, however, a variety of engineering

techniques—including higher transmitter power, high-gain directional antennas and multiple externally mounted antennae—may make wireless a viable price/performance competitor to wired solutions at far higher speeds than are possible today, further increasing consumer choice.

The ongoing upgrade of the wireless infrastructure is promising because of its potential to be a closer competitor to wireline broadband, especially at lower speeds. For example, if wireless providers begin to advertise, say, 4 Mbps home broadband service, wireline providers may be forced to respond by lowering prices of their broadband offerings. This could be true even if wireless services are more expensive, especially if the service is also mobile. Such an outcome is a possibility—for instance, according to CITI, LTE could offer speeds between 4 and 12 Mbps, with sustained speeds of up to 5 Mbps. Further, as with most goods, consumers choose broadband by trading off price and features. Providers offering a product with fewer features may have to reduce prices in order to remain competitive, even if the superior product charges more. Consider, for example, computer monitors. LCD flat-screen monitors were introduced at prices many multiples higher than older and once-standard CRTs. Even though the typical LCD did not offer as clear a picture as the typical CRT, its advantages in terms of weight, the space it took up on a desk, and its rapid technological improvements were such that it quickly put downward price pressure on the already much cheaper CRT.<sup>43</sup>

*Exhibit 4-F:  
Evolution of  
Spectral  
Efficiency<sup>41</sup>*



There is no guarantee, however, that competition will necessarily evolve this way. Technologies, costs and consumer preferences are changing too quickly in this dynamic part of the economy to make accurate predictions. Regardless of how those develop, affordability will remain a principle policy concern. The FCC should therefore carefully monitor affordability of low-end offerings and, if affordability does not improve in light of ongoing wireless upgrades, take further steps beyond those already described in this plan to address the issue.

**Potential future issues for fixed broadband competition**

Analysts project that within a few years, approximately 90% of the population is likely to have access to broadband networks capable of peak download speeds in excess of 50 Mbps as cable systems upgrade to DOCSIS 3.0. About 15% of the population is likely to be able to choose between two robust high-speed service services—cable with DOCSIS 3.0 and upgraded services from telephone companies offering fiber-to-the-premises (FTTP).

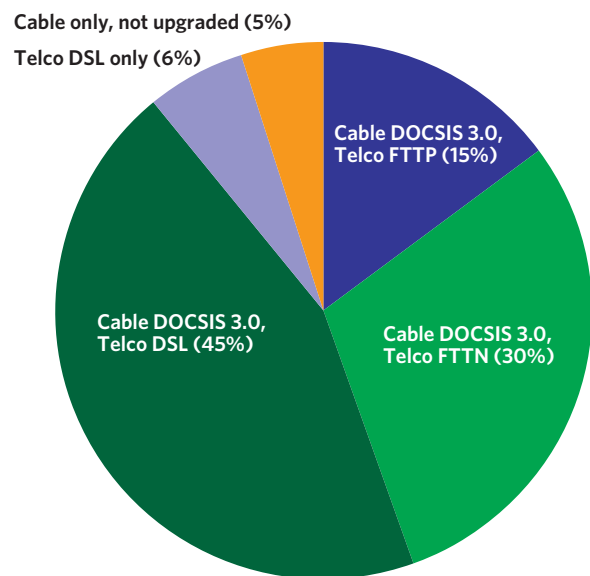
These upgrades represent a significant improvement to the U.S. broadband infrastructure, and consumers who value high download and upload speeds will benefit by having a service choice they did not have before the upgrade. The upgrades may, however, change competitive dynamics. Prior to cable's DOCSIS 3.0 upgrade, more than 80% of the population could choose from two reasonably similar products (DSL and cable). Once the current round of upgrades is complete, consumers interested in only today's typical peak speeds can, in principle, have the same choices available as they do today. Around 15%

of the population will be able to choose from two providers for very high peak speeds (providers with FTTP and DOCSIS 3.0 infrastructure). However, providers offering fiber-to-the-node and then DSL from the node to the premises (FTTN), while potentially much faster than traditional DSL, may not be able to match the peak speeds offered by FTTP and DOCSIS 3.0.<sup>44</sup> Thus, in areas that include 75% of the population, consumers will likely have only one service provider (cable companies with DOCSIS 3.0-enabled infrastructure) that can offer very high peak download speeds (see Exhibit 4-G).

Some evidence suggests that this market structure is beginning to emerge as cable's offers migrate to higher peak speeds. Exhibit 4-H shows that in 2004 the mean advertised download peak speeds of cable and DSL were similar, and the maximum and minimum advertised peak speeds were identical. By 2009, the mean advertised cable speed was about 2.5 times higher than DSL, while the maximum peak advertised speed was three times higher than DSL.<sup>45</sup> The minimum peak advertised speeds remained identical. While the exhibit does not contain information about demand or uptake of the higher-speed offers, or actual speeds delivered, it shows that the upgrade in network performance for cable companies from DOCSIS 3.0 is likely to continue or accelerate the trend where offers to end-users of traditional DSL cannot keep pace.

As with fixed-mobile substitution, how the evolution of network capabilities affects competition depends on how pricing, consumer demand, technology and costs evolve over time. For example, if users continue to value primarily applications that do not require very high speeds (e.g., speeds in excess of 20 Mbps), and are not willing to pay much for vastly increased speeds,<sup>47</sup> then a provider may not gain much of an advantage by offering those higher speeds. In contrast, if typical users require high speeds and only one provider can offer those speeds, and expected returns to telephone companies do not justify fiber upgrades, then users may face higher prices, fewer choices and less innovation. Because of this risk, it is crucial that the FCC track and compare the evolution of pricing in areas where two service providers offer very high peak speeds with pricing in areas where only one provider can offer very high peak speeds. The FCC should benchmark prices and services and include these in future reports on the state of broadband deployment.

*Exhibit 4-G:  
Projected Share of Households with Access to Various Wireline  
Broadband Technologies in 2012*



**Recommendations**

Two sets of recommendations address the current and expected nature of competition in broadband network services in the United States. First, the FCC should take specific steps to make more spectrum available to ease entry into broadband markets and reduce the costs for current wireless providers to offer higher-speed services that can compete with wireline offers for a larger segment of end-users. Second, the FCC and BLS should collect data that enable more detailed analyses of the market and

competition and make that data more publicly available to ensure visibility into competitive behavior of firms.<sup>48</sup>

**RECOMMENDATION 4.1:** The federal government, including the FCC, the National Telecommunications and Information Administration (NTIA) and Congress, should make more spectrum available for existing and new wireless broadband providers in order to foster additional wireless-wireline competition at higher speed tiers.

Chapter 5 discusses why additional spectrum is crucial to accommodate growing wireless broadband use. Additional spectrum is also critical for increasing competition along two interrelated dimensions.

First, additional spectrum for mobile competitors is likely to enhance mobile competition. Second, more spectrum makes possible faster download speeds, which would allow new and existing companies to use wireless technologies to serve as closer substitutes to fixed broadband providers for consumers seeking more than just low-end plans.

**RECOMMENDATION 4.2:** The FCC and the U.S. Bureau of Labor Statistics (BLS) should collect more detailed and accurate data on actual availability, penetration, prices, churn and bundles offered by broadband service providers to consumers and businesses, and should publish analyses of these data.

- Improve current Form 477 data collection.
- Collect location-specific subscribership data.
- Collect price, switching costs, customer churn and market share information.
- Make more data and FCC analyses publicly available.
- BLS should fully resume its computer and Internet use supplement.

The FCC should revise Form 477 to collect data relevant to broadband availability, adoption and competition. Specifically, it should collect broadband availability data at the census *block* level, by provider, technology and offered speed. Availability for mobile service should be defined in terms of coverage specifications to be determined by the FCC and include information on spectrum used by facilities-based providers. In addition, the FCC should collect broadband service provider ownership and affiliation data and clarify and refine all reporting standards to ensure data consistency and comparability.

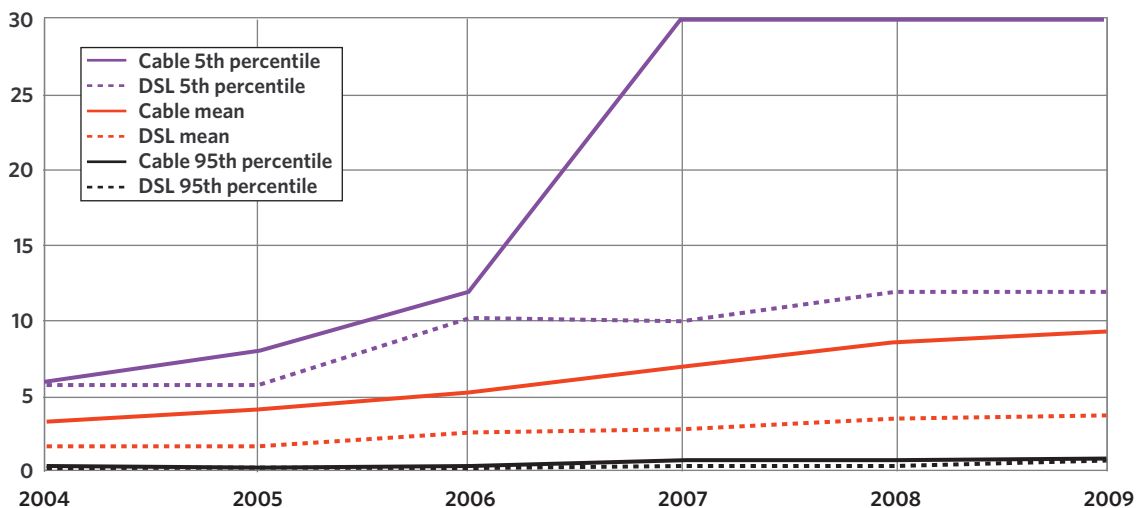
To improve its ability to make informed policy decisions and to track deployment, adoption and competition issues, the FCC should transition as quickly as practical to collecting location-specific subscribership data by provider, technology, actual speed and offered speed. Such data would make it possible for the FCC to aggregate the data to any geographic level rather than relying on providers to allocate subscribers by census tract or block. The FCC should also continue to utilize consumer-driven data collection methods, such as voluntary speed tests and broadband unavailability registries.

The FCC is fully cognizant of its obligations under the Electronic Communications Privacy Act (ECPA). To comply with the Act and protect citizens' privacy, the FCC should investigate using a third-party to collect location-specific subscribership data, and aggregate and anonymize it before submitting it to the FCC.

The FCC should collect data on advertised prices, prices actually paid by subscribers, plans, bundles and promotions of fixed and mobile broadband services that have material penetration among users, as well as their evolution over time, by provider and by geographic area.

Collecting information on advertised and promotional prices, rather than only prices current subscribers pay, is very

*Exhibit 4-H:*  
Broadband Speeds  
Advertised by Cable  
and Telco (5th  
percentile, mean  
and 95th  
percentile),  
2004-2009<sup>46</sup>



helpful for analyzing competition because advertised prices focus on winning new customers or keeping customers considering switching providers and can offer important insights into how firms compete. In addition, it is important that the FCC collect information about the pricing plans to which customers are actually subscribing. Pricing plans that are available to customers but are not de facto marketed by service providers tend to have more limited competitive impact.

The FCC should also collect information related to switching barriers, such as early termination fees and contract length. To complement this information, the FCC should collect data on customer churn, as well as providers' share of gross subscriber additions.

Finally, the FCC should collect data required to determine whether broadband service is being denied to potential residential customers based on the income of the residents in a particular geographic area.<sup>49</sup>

The data collection should be done in a way that makes possible statistically significant, detailed analyses of at least metropolitan service area (MSA) or rural service area (RSA) levels, thus allowing the FCC to understand the effect of bundles and isolate the evolution of effective pricing and terms for broadband services.

The FCC should have a general policy of making the data it collects available to the public, including via the Internet in a broadband data depository, except in certain circumstances such as when the data are competitively sensitive or protected by copyright. Further, the FCC should implement a process to make additional data that is not accessible by the public available to academic researchers and others, subject to appropriate restrictions to protect confidentiality of competitively sensitive materials.<sup>50</sup>

An analysis of this data should be published and made available through annual existing reports such as the wireless competition report and the 706 report, and through semi-annual reports such as the Form 477 data collection. The FCC should investigate if additional methods of providing this data and analyses are necessary.

Finally, BLS should be encouraged to fully resume its computer and Internet use supplement to its current population survey. Better data on adoption and use will facilitate analyses of the effects of competition as well as make it possible to track the effectiveness of adoption programs.

### Transparency in the Retail Broadband Market

Collecting better data and allocating spectrum are only the first steps in driving competition. Putting more information in the hands of consumers is a proven method to promote meaningful competition and spur innovation, both of which will generate more and better consumer choices. If customers

make well-informed choices, companies will likely invest in new products, services and business models to compete more aggressively and offer greater value.

For example, the U.S. Environmental Protection Agency's miles-per-gallon (mpg) label for cars encouraged automakers to improve fuel economy and design. That in turn helped boost average auto mileage in the United States from less than 15 mpg in 1975 to more than 25 mpg in 1985.<sup>51</sup> Or to take another example, the nutrition label by the U.S. Food and Drug Administration (FDA) has proven both useful and flexible. For example, when the negative health impact of trans fats surfaced, the FDA changed the nutrition label. It supplied the most current and important information to consumers and helped jumpstart the introduction of a wave of healthier food products.<sup>52</sup> With more consumers obtaining information online, the concept of a label should evolve.

Fixed broadband consumers, however, have little information about the actual speed and performance of the service they purchase.<sup>53</sup> Marketing materials typically feature "up to" peak download and upload speeds, although actual performance experienced by consumers is often much less than the advertised peak speed.<sup>54</sup> This disparity confuses consumers and makes it more difficult for them to compare the true performance of different offers. That hinders consumer choice and competition. It also reduces incentives for service providers to invest in better performing networks. Consumers need more information about the speed and overall performance<sup>55</sup> of the services they receive and of competitive offers in their area, and about the gap between actual and advertised speeds and the implications of that difference.

Some providers have added information in advertisements and other communications about what applications different broadband offers will support. But the lack of standards makes it nearly impossible for consumers to compare providers and their offers. For example, describing a specific broadband offer as capable of supporting an application such as video may not be enough to ensure that all consumers clearly understand the capabilities of the offer, as there are many different types of video (e.g., varying standard and high-definition formats and compression techniques).

Four steps must be taken to close this transparency gap.

**RECOMMENDATION 4.3:** The FCC, in coordination with the National Institute of Standards and Technology (NIST), should establish technical broadband measurement standards and methodology and a process for updating them. The FCC should also encourage the formation of a partnership of industry and consumer groups to provide input on these standards and this methodology.

The FCC, in coordination with NIST, should determine the technical standards and methodology to measure performance of fixed broadband connections with the objective of giving consumers a more accurate view of the performance of their broadband service. This would include what speeds and quality-of-service metrics should be tracked and how they should evolve with new consumer applications and uses.

The FCC should encourage industry and consumer interest representatives to create a Broadband Measurement Advisory Council (BMAC) to provide input for the measurement of broadband services.<sup>56</sup> The BMAC would focus on the most difficult issues, including where exactly to measure service performance in a network, the timing and frequency of measurements and the standard set of protocols and applications that may be used to establish benchmarks.

The key characteristics to be measured may include (see Exhibit 4-I):

- Actual speeds and performance over the broadband service provider's network (from point 2 to point 5 in Exhibit 4-I) and the end-to-end performance of the service (from point 1 to point 6 in the exhibit).<sup>57</sup>
- Actual speeds and performance at peak use hours.<sup>58</sup>
- Actual speeds and performance achieved with a given probability (e.g., 95%) over a set time period (e.g., one hour) that includes peak use times.<sup>59</sup>
- Actual speeds and performance tested against a given set of standard protocols and applications.<sup>60</sup>

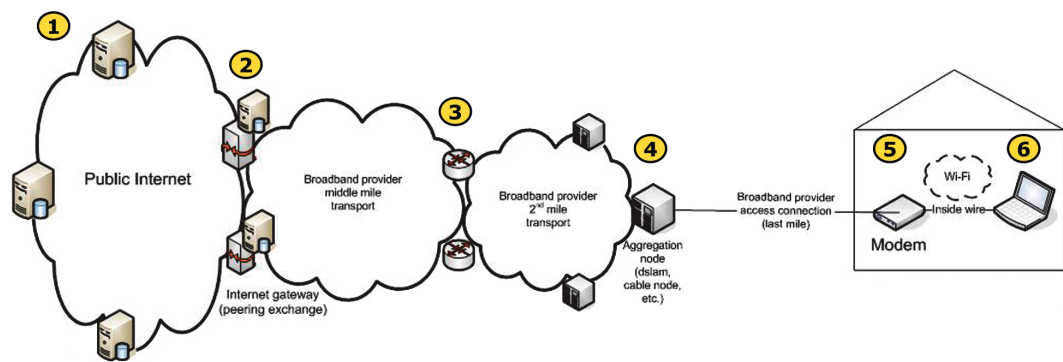
**RECOMMENDATION 4.4:** The FCC should continue its efforts to measure and publish data on actual performance of fixed broadband services. The FCC should publish a formal report and make the data available online.

The FCC should continue its efforts to measure and report on fixed broadband connections and, similar to the approach taken by the United Kingdom regulator (the Office of Communications, or Ofcom), the FCC should explore contracts with third parties as a means of doing so.<sup>61</sup> These measurement efforts would make data on actual performance easily accessible to all interested parties, especially consumers, and create a mechanism for checking service provider broadband performance claims. The FCC should also use these efforts to conduct pilot projects on different measurement and reporting approaches.

Experience in the United Kingdom, New Zealand, Singapore and elsewhere shows it is possible to provide consumers with information that helps them compare service providers in meaningful ways.<sup>62</sup>

All data should be made available to consumers and interested parties on a public website offering a searchable database. But the process should ensure the privacy of households that voluntarily participate in the measurement study. In addition, the FCC should publish a formal "State of U.S. Broadband Performance" report. This report should include detailed information about the actual performance of the country's top broadband service providers in different geographic markets (e.g., by county, city or MSA) and across all the metrics defined by the FCC.

*Exhibit 4-I:  
Simplified View of  
Internet Network  
and Connections*



**DEFINITIONS**

- ➊ **Public Internet content:** public Internet content that is hosted by multiple service providers, content providers and other entities in a geographically diverse (worldwide) manner
- ➋ **Internet gateway:** closest peering point between broadband provider and public Internet for a given consumer connection
- ➌ **Link between 2<sup>nd</sup> mile and middle mile:** broadband provider managed interconnection between middle and last mile
- ➍ **Aggregation node:** First aggregation point for broadband provider (e.g. DSLAM, cable node, satellite, etc.)
- ➎ **Modem:** Customer premise equipment (CPE) typically managed by a broadband provider as the last connection point to the managed network (e.g. DSL modem, cable modem, satellite modem, optical networking terminal (ONT), etc.)
- ➏ **Consumer device:** consumer device connected to modem through internal wire or Wi-Fi (home networking), including hardware and software used to access the Internet and process content (customer-managed)



**RECOMMENDATION 4.5:** The FCC should initiate a rule-making proceeding by issuing a Notice of Proposed Rule-making (NPRM) to determine performance disclosure requirements for broadband.

The FCC should issue an NPRM to determine appropriate disclosure obligations for broadband service providers, including disclosure obligations related to service performance. These obligations should include simple and clear data that a “reasonable consumer” can understand, while providing more detailed disclosure for more interested parties such as tech-savvy consumers, software developers and entrepreneurs designing products for the network.<sup>63</sup>

The purpose of disclosure for consumers is to help foster a competitive marketplace. Consumers need access to information at four different decision-making points in the process: when they are choosing a service provider, when they are choosing a plan, when they are evaluating their billed costs and if and when they decide to change providers.<sup>64</sup>

For broadband today, speed, price and overall performance are important factors in consumer decision-making. Consumers need to understand what broadband speed they actually need for the applications they want to use; how the speeds advertised by a broadband service provider compare to the actual speed a consumer will experience; and what broadband service provider and plan will give them the best value overall. The decision is especially complex because the actual performance of broadband service can vary significantly across geographic areas.

Given these factors, the FCC should look for better ways to improve information availability for consumer decision-making. One example would be to investigate developing or supporting the development by third parties of an online decision-making tool for choosing a broadband ISP, similar to those being developed for cell-phone services.

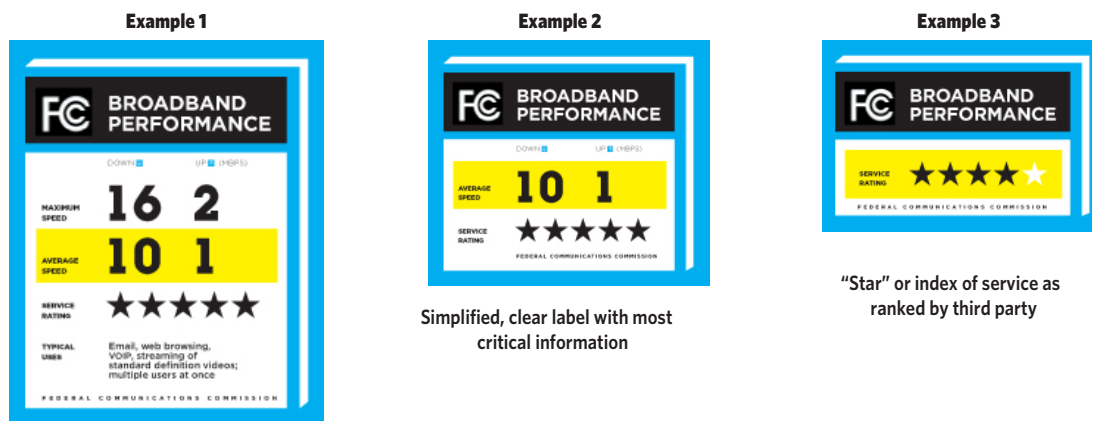
Some consumers will want a simpler way to gauge performance of different broadband service offers. For them, the FCC should develop a “broadband digital label” that will summarize broadband service performance concisely. Disclosure labels are among the most common tools used to ensure consumers have information about a product or service. They often come in two parts: a simple and clear standard “page 1” and a “page 2” listing more detail. The broadband digital label should take this concept and bring it to the online world. Illustrative examples of the front page of a possible broadband digital label can be found in Exhibit 4-J.

In Example 1 in Exhibit 4-J, consumers would know maximum and average upload/download speeds, along with an aggregated quality of service rating incorporating uptime, delay and jitter, as well as a list of standard applications that can be used with that service. Example two includes only actual upload and download speeds and a quality of service rating. Example three, similar to what has been proposed by Cisco and Corning,<sup>65</sup> would create a weighted average “Broadband Quality Index” rating for a service, from zero to five stars. This scoring system would evolve based on input from consumer and industry groups.

The FCC should also consider a broadband service performance disclosure item with the required speeds for different applications. Broadband service providers now claim different required speeds for the same applications in their advertising. A standard and evolving list would help consumers know what they really need—the first step in making an informed decision.

Finally, as noted in the FCC’s August 2009 consumer disclosure NOI, consumers need full disclosure of the contractual commitments they are undertaking. These include clear, understandable, and reasonably precise estimates of the likely price of different broadband service offers and plans before they sign-up, as well as all fees and taxes.<sup>66</sup> The FCC should establish appropriate disclosure standards for contractual commitments as part of a rulemaking.

*Exhibit 4-J:  
Illustrative  
Broadband Speed  
and Performance  
Digital Labels*



Detail that is still clear and focused; list of common applications and what can be delivered with this service

The FCC should conduct consumer research, potentially in collaboration with the FTC, to identify the disclosure obligations that would be most useful for consumers as critical input to a rulemaking proceeding.

**RECOMMENDATION 4.6: The FCC should develop broadband performance standards for mobile services, multi-unit buildings and small business users.**

**Mobile**

For mobile broadband services, the FCC should create standards of measurement by location, carrier and spectrum band usage as input to a potential future rulemaking. The FCC should maintain and expand initiatives to capture user-generated data on coverage, speeds and performance. The FCC has launched a user-installed, self-testing application on mobile devices that can be used to both aggregate data about mobile broadband and publish the information on a public website. The FCC should continue to work with measurement companies, applications designers, device manufacturers and carriers to create an online database to help consumers make better choices for mobile broadband and spur competition, while ensuring privacy protections.<sup>67</sup>

The FCC should also encourage industry to create more transparent and standard disclosures of coverage, speeds and performance for mobile networks. The FCC should work with industry to identify the unique challenges of mobile disclosure—which requires reporting on speed and performance but also coverage and reliability—to decrease consumer confusion. Standards on disclosure would apply to data disclosed to regulators, to third party aggregators of coverage, and to consumers, with varying levels of detail for different audiences. The FCC should follow the same roadmap as created for fixed broadband disclosures, including the identification of consumer needs, the standardization of technical measurements and the creation of clear and simple consumer disclosure obligations.<sup>68</sup>

**Buildings and small business**

The FCC should also investigate better ways to improve transparency about the quality of broadband connectivity in residential multi-dwelling buildings and, potentially, in commercial and industrial buildings. The FCC should study the benefits of initiatives such as South Korea's program to institute a voluntary system of building ratings for broadband connectivity.<sup>69</sup> A program in the United States, if created, should carry incentives for developers to put more high-speed connections in new buildings, to upgrade existing structures and to encourage better internal wiring of all buildings, much in the same way that the Leadership in Energy and Environmental Design (LEED) certification program has

encouraged developers to incorporate more environmental features into new buildings.

As small and medium-sized businesses (SMBs) use more sophisticated broadband applications, it is important to ensure they have the right performance. Speed, security, reliability and availability requirements may differ greatly from one SMB to another and are often very different from those for consumers. The FCC should determine the appropriate metrics and standards for transparency in SMB broadband to help in purchasing decisions and to encourage innovation among broadband providers.

**Competition in Wholesale Broadband Markets**

Residential broadband competition—as important as it is—is not the only type of competition we must foster to lay the foundation for America's broadband future. Ensuring robust competition not only for American households but also for American businesses requires particular attention to the role of wholesale markets, through which providers of broadband services secure critical inputs from one another. Because of the economies of scale, scope and density that characterize telecommunications networks, well functioning wholesale markets can help foster retail competition, as it is not economically or practically feasible for competitors to build facilities in all geographic areas. Therefore, the nation's regulatory policies for wholesale access affect the competitiveness of markets for retail broadband services provided to small businesses, mobile customers and enterprise customers.<sup>70</sup>

Unfortunately, the FCC's current regulatory approach is a hodgepodge of wholesale access rights and pricing mechanisms that were developed without the benefit of a consistent, rigorous analytic framework. Similar network functionalities are regulated differently, based on the technology used. Therefore, while networks generally have been converging to integrated, packet-mode, largely-IP networks, regulatory policy regarding wholesale access has followed the opposite trajectory. This situation undermines longstanding competition policy objectives. In some cases it limits the ability of smaller carriers—often those specializing in serving niche markets such as SMBs—to gain access to the necessary inputs to compete.

While facilities such as end-user loops and other point-to-point data circuits often serve as critical inputs to retail broadband services for business, mobile and residential customers, competitors' access to those inputs currently depends on factors that have little bearing on the economics of facilities-based competitive entry. For example, some wholesale access policies vary based on technology—including whether the facility or service operates using a circuit- or packet-based mode or is constructed from copper or fiber—regardless of the economic viability of replicating the physical facility.<sup>71</sup> Similarly, the FCC's wireless roaming policies

vary based on the services offered; roaming is only required for voice telephone calls and not mobile data services.<sup>72</sup> As a result, mobile customers may not be able to use all functions of their Smartphone devices when roaming, even in situations where it is technically feasible for all of those functions to work.

In other cases, FCC rules draw distinctions based on the capacity of the facility, or by using various proxies to measure existing or potential competitive entry.<sup>73</sup> The FCC has also been criticized for not collecting better data or monitoring the impact of its current approach to competition.<sup>74</sup> The lack of a consistent analytical framework hinders the FCC's ability to promote competition. Accordingly, the FCC should comprehensively review its current policies and develop a cohesive and effective approach to advancing competition through its wholesale access policies.

**RECOMMENDATION 4.7: The FCC should comprehensively review its wholesale competition regulations to develop a coherent and effective framework and take expedited action based on that framework to ensure widespread availability of inputs for broadband services provided to small businesses, mobile providers and enterprise customers.**

An effective analytical framework for the FCC's wholesale access competition policies will enable efficient collection of any necessary data, evaluation of current rules and determination of what actions are necessary to achieve the FCC's goals for robust competition in business and consumer markets. The FCC has already taken steps in this direction with regard to the regulation of "special access" services, which encompass a broad array of dedicated, high-capacity transmission services.<sup>75</sup>

Recent filings at the FCC highlight additional dimensions of the FCC's wholesale regulatory framework that deserve attention, including competitive access to local fiber facilities,<sup>76</sup> copper retirement rules and implementation of Section 271 of the Communications Act of 1934 as amended.<sup>77</sup> The FCC should act on these proceedings within the context of rigorous analytic frameworks that establish coherent sets of conditions under which such rules should be applied and appropriately balance the benefits of competitive entry with incentives for carriers to invest in their networks.<sup>78</sup>

**RECOMMENDATION 4.8: The FCC should ensure that special access rates, terms and conditions are just and reasonable.**

Special access circuits are usually sold by incumbent local exchange carriers (LECs) and are used by businesses and competitive providers to connect customer locations and networks with dedicated, high-capacity links.<sup>79</sup> Special access circuits play a significant role in the availability and pricing of

broadband service. For example, a competitive provider with its own fiber optic network in a city will frequently purchase special access connections from the incumbent provider in order to serve customer locations that are "off net."<sup>80</sup> For many broadband providers, including small incumbent LECs, cable companies and wireless broadband providers, the cost of purchasing these high-capacity circuits is a significant expense of offering broadband service, particularly in small, rural communities.<sup>81</sup>

The FCC regulates the rates, terms and conditions of these services primarily through interstate tariffs filed by incumbent LECs. However, the adequacy of the existing regulatory regime in ensuring that rates, terms and conditions for these services be just and reasonable has been subject to much debate.<sup>82</sup>

Much of this criticism has centered on the FCC's decisions to deregulate aspects of these services. In 1999, the FCC began to grant pricing flexibility for special access services in certain metropolitan areas. Since 2006, the FCC has deregulated many of the packet-switched, high-capacity Fast Ethernet and Gigabit Ethernet transport services offered by several incumbent LECs.<sup>83</sup> Business customers, community institutions and network providers regard these technologies as the most efficient method for connecting end-user locations and broadband networks to the Internet.<sup>84</sup>

The FCC is currently considering the appropriate analytical framework for its review of these offerings.<sup>85</sup> The FCC needs to establish an analytical approach that will resolve these debates comprehensively and ensure that rates, terms and conditions for these services are just and reasonable.

**RECOMMENDATION 4.9: The FCC should ensure appropriate balance in its copper retirement policies.**

Competitive carriers are currently using copper to provide SMBs with a competitive alternative for broadband services. Incumbent carriers are required to share (or "unbundle") certain copper loop facilities, which connect a customer to the incumbent carrier's central office. By leasing these copper loops and connecting them to their own DSL or Ethernet over copper equipment that is collocated in the central office, competitive carriers are able to provide their own set of integrated broadband, voice and even video services to consumers and small businesses.<sup>86</sup>

FCC rules permit incumbents that deploy fiber in their loops to "retire" or remove redundant outside-plant copper facilities after notifying competitive carriers that may be affected.<sup>87</sup> Retirement of these copper facilities affects both existing broadband services and the ability of competitors to offer new services.<sup>88</sup>

There are countervailing concerns, however. Incumbent deployment of fiber offers consumers much greater potential speeds and service offerings that are not generally possible over



copper loops. In addition, fiber is generally less expensive to maintain than copper. As a result, requiring an incumbent to maintain two networks—one copper and one fiber—would be costly, possibly inefficient and reduce the incentive for incumbents to deploy fiber facilities.

The FCC should ensure appropriate balance in copper retirement policies as part of developing a coherent and effective framework for evaluating its wholesale access policies generally.

**RECOMMENDATION 4.10: The FCC should clarify interconnection rights and obligations and encourage the shift to IP-to-IP interconnection where efficient.**

For consumers to have a choice of service providers, competitive carriers need to be able to interconnect their networks with incumbent providers. Basic interconnection regulations, which ensure that a consumer is able to make and receive calls to virtually anyone else with a telephone, regardless of service provider, network configuration or location, have been a central tenet of telecommunications regulatory policy for over a century. For competition to thrive, the principle of interconnection—in which customers of one service provider can communicate with customers of another—needs to be maintained.<sup>89</sup>

There is evidence that some rural incumbent carriers are resisting interconnection with competitive telecommunications carriers, claiming that they have no basic obligation to negotiate interconnection agreements.<sup>90</sup> One federal court agreed with the rural carriers' arguments and concluded that the Act does not require certain rural carriers to negotiate interconnection agreements with other carriers.<sup>91</sup> This decision, which is based on a misinterpretation of the Act's rural exemption and interconnection requirements, has since been followed by several state commissions.<sup>92</sup> Without interconnection for voice service, a broadband provider, which may partner with a competitive telecommunications carrier to offer a voice-video-Internet bundle, is unable to capture voice revenues that may be necessary to make broadband entry economically viable.

Accordingly, to prevent the spread of this anticompetitive interpretation of the Act and eliminate a barrier to broadband deployment, the FCC should clarify rights and obligations regarding interconnection to remove any regulatory uncertainty. In particular, the FCC should confirm that all telecommunications carriers, including rural carriers, have a duty to interconnect their networks.<sup>93</sup> The FCC should also determine what actions it could take to encourage transitions to IP-to-IP interconnection where that is the most efficient approach.<sup>94</sup>

**RECOMMENDATION 4.11: The FCC should move forward promptly in the open proceeding on data roaming.**

To achieve wide, seamless and competitive coverage, the FCC should encourage mobile broadband providers to construct and build networks. Few, if any, of these networks will provide ubiquitous nationwide service entirely through their own facilities, particularly in the initial stages of construction and in rural areas. In order for consumers to be able to use mobile broadband services when traveling to areas outside their provider's network, their provider likely will need to enter into roaming arrangements with other providers. Roaming arrangements enable a customer to stay connected when traveling beyond the reach of their provider's network by using the network of another provider.

Data roaming is important to entry and competition for mobile broadband services and would enable customers to obtain access to e-mail, the Internet and other mobile broadband services outside the geographic regions served by their providers. For example, small rural providers serve customers that may be more likely to roam in areas outside their providers' network footprints. The industry should adopt voluntary data-roaming arrangements. In addition, the FCC should move forward promptly in its open proceeding on roaming obligations for data services provided without interconnection with the public-switched network.<sup>95</sup>

## 4.2 DEVICES

Innovative devices fundamentally change how people use broadband. Smartphones have allowed millions of Americans to use mobile e-mail, browse the Internet on-the-go, and—more recently—to use hundreds of thousands of mobile applications that did not exist a few years ago. Before smartphones, personal computers with graphical user interfaces and growing processing power enabled the emergence of the Web browser, which led to the widespread adoption of the Internet.

Competition, often from companies that were not market leaders, has driven innovation and investment in devices in the past and must continue to do so in the future. When one examines the three main types of devices that connect to broadband service provider networks—mobile devices, computing devices and set-top boxes—one finds that there are many mobile and computing device manufacturers offering hundreds of devices with a dizzying assortment of brands, features and price levels. Whole new device classes, such as tablets, e-book readers and netbooks continue to emerge, shifting firms' market positions and enabling entrants to capture market share. Mobile devices are rapidly incorporating technology such as Global Positioning System, accelerometers, Bluetooth, Wi-Fi, enhanced graphics and multi-touch screens. By any measure, innovation is thriving in mobile and computing devices.

The same is not true for set-top boxes, which are becoming increasingly important for broadband as video drives more broadband usage (see Chapter 3).<sup>96</sup> Further innovation in set-top boxes could lead to:

- Greater choice, lower prices and more capability in the boxes, including applications.<sup>97</sup>
- More competition among companies offering video content (MVPDs).<sup>98</sup>
- Unlimited choice in the content available—whether from traditional television (TV) or the Internet—through an integrated user interface.<sup>99</sup>
- More video and broadband applications for the TV, possibly in conjunction with other devices, such as mobile phones and personal computers (PCs).<sup>100</sup>
- Higher broadband utilization.<sup>101</sup>

Congress wanted to stimulate competition and innovation in set-top boxes and other video navigation devices in 1996 when it added Section 629 to the Communications Act. Section 629 directed the FCC to ensure that consumers could use commercially available navigation devices to access services from MVPDs.<sup>102</sup> Lawmakers pointed to innovative uses of the telephone network, related to new phones, faxes and other equipment, and said they wanted to create a similarly vigorous retail market for devices used with MVPD services.<sup>103</sup>

The FCC adopted its First Report and Order to implement the provisions of Section 629 in 1998.<sup>104</sup> The order established rules requiring MVPDs to separate the system that customers use to gain access to video programming, called the conditional element, from the device customers use to navigate the programming. Section 629 nominally applies to all MVPDs. The FCC, however, has applied its rules only to cable operators. It

either directly exempted other MVPDs, such as satellite TV operators, or implicitly excluded them by taking “no action” against an operator.<sup>105</sup>

Operators and other stakeholders agreed on a proposed solution for cable—called CableCARD—to separate the conditional access element. The CableCARD is about the size of a credit card and roughly similar in function to the Subscriber Identity Module (SIM) card used in mobile phones. Cable operators supply the CableCARD, which is inserted into a set-top box or television set that a consumer buys at a store to authenticate the subscriber. To ensure adequate support for CableCARDS, the FCC required cable operators to use CableCARDS for set-top boxes leased to consumers.

The first devices from third-party manufacturers using CableCARDS hit the retail market in August 2004, six years after the FCC’s First Report and Order. Three years later, in July 2007, cable operators began using CableCARDS in their leased set-top boxes.<sup>106</sup> Despite Congressional and FCC intentions, CableCARDS have failed to stimulate a competitive retail market for set-top boxes. The top two cable set-top box manufacturers in North America, Motorola and Cisco, together captured a 95% share of unit shipments over the first three quarters of 2009. That’s up from 87% in 2006.<sup>107</sup> A national or global market with relatively low costs of entry, like that for many consumer electronics markets, should support more than two competitors over time.<sup>108</sup> The two companies continue to control both the hardware and the security on the cable set-top box through their proprietary conditional access systems. By contrast, the top two cable set-top box manufacturers in Europe, the Middle East and Asia (EMEA) where open standards are used for conditional access accounted for a market share of approximately 39% between 2006 and the third

**BOX 4-1:**

**Broadband Modems as an Analog for Innovation in Set-Top Boxes**

Broadband modems offer an example of how to unleash competition, investment and innovation in set-top boxes and other video navigation devices for consumer benefit. For standard residential broadband connections, even though there are numerous delivery technologies (including cable, fiber, DSL, satellite and fixed wireless broadband), a customer must use an

interface device, such as a cable modem. That device performs all network-specific functions. It also connects via a standardized Ethernet port to numerous devices consumers can buy at the store—including PCs, game consoles, digital media devices and wireless routers. Innovation can happen on either “side” of that device without affecting the other side. Service providers are free to invest and innovate in their networks and the services they deliver. Because the

interface device communicates with consumer devices through truly open, widely used and standard protocols, manufacturers can create devices independently from service providers or any related third parties (e.g., CableLabs). For example, PC manufacturers do not need to sign non-disclosure agreements with broadband service providers, license any intellectual property selected or favored by broadband service providers or get approval from any

broadband service providers or any non-regulatory certification bodies to develop or sell their PCs at retail or enable consumers to attach them to service provider networks through the interface device.

Establishing an interface device for video networks that serves a similar purpose to modems for broadband networks could spark similar levels of competition, investment and innovation.

quarter of 2009.<sup>109</sup> There are 0.5 million CableCARDs deployed in retail devices today,<sup>110</sup> which represents roughly 1% of all set-top boxes deployed in cable homes.<sup>111</sup> Only two manufacturers, TiVo and Moxi, continue to sell CableCARD-enabled set-top boxes through retail outlets.

Other alternatives are starting to emerge. For example, several innovators are attempting to bring Internet video to the TV.<sup>112</sup> Their devices often cannot access traditional TV content that consumers value—content that is not available or difficult to access online. Without the ability to seamlessly integrate Internet video with traditional TV viewing, Internet video devices like Apple TV and Roku have struggled to gain a foothold in U.S. homes.<sup>113</sup>

Retail set-top boxes have been competing on an uneven playing field. The barriers have been well-documented in multiple proceedings<sup>114</sup> and have prompted some companies not to enter the market at all.<sup>115</sup> To level the field, the FCC should adopt the recommendation that follows. To maximize the likelihood that the recommendation will succeed, it should apply to all MVPDs. Extending the rule to all MVPDs will enable consumer electronics manufacturers to develop products for a larger customer base and allow consumers to purchase retail devices that will continue to function even if the consumer changes providers. Today, four out of the top 10 MVPDs are not cable companies and represent 41% of MVPD subscribers.<sup>116</sup>

**RECOMMENDATION 4.12:** The FCC should initiate a proceeding to ensure that all multichannel video programming distributors (MVPDs) install a gateway device or equivalent functionality in all new subscriber homes and in all homes requiring replacement set-top boxes, starting on or before Dec. 31, 2012.

To facilitate innovation and limit costs to consumers, the gateway device must be simple. Its *sole* function should be to bridge the proprietary or unique elements of the MVPD network (e.g., conditional access, tuning and reception functions) to widely used and accessible, open networking and communications standards. That would give a gateway device a standard interface with televisions, set-top boxes and other in-home devices and allow consumer electronics manufacturers to develop, market and support their products independently of MVPDs.

The following key principles apply:

- ▶ A gateway device should be simple and inexpensive, both for MVPDs and consumers. It should be equipped with only those components and functionality required to perform network-specific functions and translate them into open, standard protocols. The device should not support any other functionality or components.<sup>117</sup>
- ▶ A gateway device should allow consumer electronics manufacturers to develop, sell and support network-neutral

devices that access content from the network *independently* from MVPDs or any third parties.<sup>118</sup> Specifically, third-party manufacturers should not be limited in their ability to innovate in the user interface of their devices by MVPD requirements. User-interface innovation is an important element for differentiating products in the consumer electronics market and for achieving the objectives of Section 629.

Similar to broadband modems (see Box 4-1), the proposed gateway device would accommodate each MVPD's use of different delivery technologies and enable them to continue unfettered investment and innovation in video delivery. At the same time, it would allow consumer electronics manufacturers to design to a stable, common open interface and to integrate multiple functions within a retail device. Those functions might include combining MVPD and Internet content and services, providing new user interfaces and integrating with mobile and portable devices such as media players and computers. It could enable the emergence of completely new classes of devices, services and applications involving video and broadband.

To ensure a competitive market for set-top boxes, the open gateway device:

- ▶ Should use open, published standards for discovering, signaling, authenticating and communicating with retail devices.<sup>119</sup>
- ▶ Should allow retail devices to access all MVPD content and services to which a customer has subscribed and to display the content and services without restrictions or requirements on the device's user interface or functions and without degradation in quality (e.g., due to transcoding).<sup>120</sup>
- ▶ Should not require restrictive licensing, disclosure or certification. Any criterion should apply equally to retail and operator-supplied devices. Any intellectual property should be available to all parties at a low cost and on reasonable and non-discriminatory terms.<sup>121</sup>
- ▶ Should pass video content through to retail devices with existing copy protection flags from the MVPD.<sup>122</sup>

Requiring that the gateway device or equivalent functionality be developed and deployed by the end of 2012 is reasonable given the importance of stimulating competition and innovation in set-top boxes, the extensive public record established in this subject area<sup>123</sup> and the relatively simple architectures proposed to date.<sup>124</sup>

The FCC should establish interim milestones to ensure that the development and deployment of a gateway device or equivalent functionality remains on track. In addition, the FCC should determine appropriate enforcement mechanisms for MVPDs that, as of Dec. 31, 2012, have not begun deploying gateway device functionality in all new subscriber homes and in all homes requiring replacement set-top boxes.

Enforcement mechanisms would be determined with public input as part of the rulemaking proceeding. They could include, for example, issuing fines against non-compliant operators or denying extensions of certain CableCARD waivers like those granted for Digital Transport Adapters (DTAs). The FCC could also reach agreements with operators to provide set-top boxes for free to new customers until a gateway device is deployed.

The FCC should establish up front the criteria for the enforcement mechanisms. The FCC may want, for instance, to grant small operators more time to deploy the gateway device to take account of unique operational or financial circumstances. Transparency in the criteria for the enforcement mechanisms will establish more regulatory certainty in the market and help limit the number of waiver requests.

**RECOMMENDATION 4.13:** On an expedited basis, the FCC should adopt rules for cable operators to fix certain CableCARD issues while development of the gateway device functionality progresses. Adoption of these rules should be completed in the fall of 2010.

Four factors hinder consumer demand to purchase CableCARD devices and manufacturers' willingness to produce those devices. First, retail CableCARD devices cannot access all linear channels in cable systems with Switched Digital Video (SDV) unless cable operators voluntarily give customers a separate set-top box as an SDV tuning adapter.<sup>125</sup> Second, consumers perceive retail set-top boxes to be more expensive than set-top boxes leased at regulated rates from the cable operator. This perception is partially driven by a lack of transparency in CableCARD pricing for operator-leased boxes and by the bundling of leased boxes into package prices by operators.<sup>126</sup> Third, consumers who buy retail set-top boxes can encounter more installation and support costs and hassles than those who lease set-top boxes from their cable operators.<sup>127</sup> Fourth, the current retail CableCARD device certification process, run through CableLabs, incurs incremental costs of at least \$100,000 to \$200,000 during product development. The process also currently introduces other negative elements, including complexity, uncertainty and delays.<sup>128</sup>

Specifically, the proposed rules should address the four CableCARD issues. They should:

- ▶ Ensure equal access to linear channels for retail and operator-leased CableCARD devices in cable systems with SDV by allowing retail devices to receive and transmit out-of-band communications with the cable headend over IP.<sup>129</sup>
- ▶ Establish transparent pricing for CableCARDs and operator-leased set-top boxes. Consumers should see the appropriate CableCARD charge, whether they purchase a retail device or lease one from the operator, and they should receive a comparable discount off packages that include

the operator-leased set-top box if they choose to purchase one instead.<sup>130</sup>

- ▶ Standardize installation policies for retail and operator-leased CableCARD devices to ensure consumers buying CableCARD-enabled devices at retail do not face materially different provisioning hurdles than those using operator-leased set-top boxes.<sup>131</sup>
- ▶ Streamline and accelerate the certification process for retail CableCARD devices.<sup>132</sup> For example, the rules could restrict the certification process to cover hardware only, similar to the certification required for cable-ready TVs, to ensure retail CableCARD devices do not harm a cable operator's network.

Addressing these issues will not require large investments in either headend or customer premise infrastructure.<sup>133</sup>

In fact, fixing these four CableCARD issues will sustain the current retail market for set-top boxes, enable companies that have invested in CableCARD-based products in accordance with current rules to compete effectively until the gateway device is deployed at scale, encourage more innovation until the gateway device is widely deployed and potentially allow for competition in the provision of the gateway device.

## 4.3 APPLICATIONS

Over the last 10 years, there has been phenomenal growth in the applications and content available over broadband networks. Whole new markets have emerged, while others have migrated—partially or totally—online. Innovation in applications and content is transforming the way Americans communicate, shop, bank, study, read, work, use maps to find their way as they drive or walk, and are entertained. They have also changed the ways businesses interact with one another and market to their customers. Applications, content and the services they enable are bundled, sold, priced and monetized in many different ways. The nature and intensity of competition in applications and content varies tremendously and must be evaluated on a case-by-case basis.

The collection, aggregation and analysis of personal information are common threads among, and enablers of, many application-related innovations. The data that businesses collect have allowed them to provide increasingly valuable services to end-users, such as customized suggestions for movie rentals or books—often free of charge. These data have also become a source of value to businesses—e.g., as an enabler of more targeted and relevant advertising and increased user loyalty.<sup>134</sup> These data collection and monetization activities are a major driver of innovation for the Internet today and have benefited consumers in many ways.

However, many users are increasingly concerned about their

lack of control over sensitive personal data. As aspects of individuals' lives become more "digitized" and accessible through or gleaned from broadband use, the disclosure of previously private, personal information has made many Americans wary of the medium. Innovation will suffer if a lack of trust exists between users and the entities with which they interact over the Internet. Policies therefore must reflect consumers' desire to protect sensitive data and to control dissemination and use of what has become essentially their "digital identity." Ensuring customer control of personal data and digital profiles can help address privacy concerns and foster innovation.

### **Personal Data, Innovation and Privacy**

Historically, many firms have used personal data offline to create consumer profiles that have spawned multibillion dollar industries. The credit rating industry, for instance, tracks personal information including payment history, loan balances and income levels, which it sells to third parties to facilitate critical decisions such as approval of mortgages, loans and credit cards. The credit card industry, advertising industry and telemarketers have always relied on personal profiles of customers to better tailor their products and services. However, the impact has not always been positive for consumers. This fact has led to government actions like the creation of the "do not call" list for telemarketers and the FTC's work on combating fraud and identity theft.

The emergence of broadband and the growing use of the Internet makes aggregation of detailed personal data much easier and more valuable (see Box 4-2). As a result, single firms may be able over time to collect a vast amount of detailed personal information about individuals, including web searches, sites visited, click-stream, e-mail contacts and content, map searches, geographic location and movements, calendar appointments, mobile phone book, health records, educational records, energy usage, pictures and videos, social networks, locations visited, eating, reading, entertainment preferences, and purchasing history.

These data are giving rise to something akin to a "digital identity," which is a major source of potential innovation and opens up many possibilities for better customization of services and increased opportunities for monetization. The value of a targeted advertisement based on personal data can be several times higher than the value of an advertisement aimed at a broad audience. For example, the going rate for some targeted advertising products can be several times the rate for a generic one<sup>135</sup> because consumers can be six times more likely to "click through" a targeted banner advertisement than a non-targeted one.<sup>136</sup> This differential will likely increase as targeting becomes more refined and more capable of predicting preferences, intentions and behaviors.

Firms' ability to collect, aggregate, analyze and monetize personal data has already spurred new business models, products and services, and many of these have benefited consumers. For example, many online content providers monetize their audience through targeted advertising. Whole new categories of Internet applications and services, including search, social networks, blogs and user-generated content sites, have emerged and continue to operate in part because of the potential value of targeted online advertising.<sup>137</sup>

The ability to collect and store increasing amounts of personal data to develop these "digital identities" is accentuated by potential network effects. Firms with more predictive profiles and larger audiences will be able to offer increasingly better-targeted products and services that generate more advertising and consumer usage. This, in turn, enables the firms to collect more and better consumer personal data and develop even more predictive profiles. Those data and profiles are often so valuable for firms that they increasingly offer their products and services free of any monetary charges. Consumers gain access to a valuable service, and businesses gain valuable information.

However, new firms without access to detailed profiles of individual consumers, large audiences or subscriber pools may face competitive challenges as they try to monetize their innovations. They may face competitors offering an inferior service free of charge, and they may not have sufficient information about enough consumers to monetize their "audience" through advertising.

One way to encourage innovation in applications is to give individuals control of their digital profiles.<sup>138</sup> Giving consumers control of their digital profiles and personal data, including the ability to transfer some or all of it to a third party of their choice, may enable the development of new applications and services, and reduce barriers to entry for new firms. Giving customers increased control of their profiles would also help address growing concerns about privacy and anonymity.

### **Privacy and Anonymity**

Today, consumers may have limited knowledge (if any) about how their personal data are collected and used. The fiduciary and legal responsibilities of those who collect and use that data are also unclear. Once consumers have shared their data, they often have limited ability to see and influence what data about them has been aggregated or is being used.<sup>142</sup> Further, it is difficult for consumers to regain control over data once they have been released and shared. As a result, privacy concerns can serve as a barrier to the adoption and utilization of broadband. A recent FCC survey showed that almost half of all consumers are concerned about privacy and security online.<sup>143</sup> Clear and strong privacy protections that disclose how and when users



can delete or manage data shared with companies will help develop a market for innovative online applications.

Anonymity also must be addressed—both because it can be a positive factor online and because it can be a negative one. Anonymity is critical for allowing Internet users to exercise fundamental rights such as whistleblowing and engaging in activism. However, anonymity could also have negative consequences, such as allowing cybercriminals to go undetected.

**Framework for Federal Involvement**

Several laws grant the FTC, FCC and other agencies regulatory authority over online privacy. The FTC has used its authority to prohibit unfair or deceptive practices and enforce promises made in corporate privacy statements on websites.<sup>144</sup> The FCC, for its part, typically works with the providers of broadband access to the Internet—phone, cable and wireless network providers—and the Communications Act contains various provisions outlining consumer privacy protections.<sup>145</sup> However, existing regulatory frameworks provide only a partial solution to consumer concerns and consist of a patchwork of potentially confusing regulations.<sup>146</sup> For instance, online communications are subject to ECPA,<sup>147</sup> but the privacy protections in ECPA may not apply to the information that websites collect from individual website visitors.<sup>148</sup> The Gramm-Leach-Bliley Act's protections for personal financial data apply only to financial institutions (such as banks, credit institutions and non-bank lenders), even though non-financial institutions (such as data

brokers) may possess comparable information not subject to protections.<sup>149</sup> And while traditional telephone and cable TV networks are subject to privacy protections, ISPs operating in an unregulated environment can theoretically obtain and share consumer data through technologies such as deep packet inspection.<sup>150</sup>

In terms of anonymity, communications privacy laws,<sup>151</sup> health privacy regulations<sup>152</sup> and financial privacy laws<sup>153</sup> all prohibit disclosure of some analog to “personally identifiable information.” However, defining “personally identifiable information” is not simple. In some cases, a single piece of information could be enough to identify an individual; in other cases, multiple facts might be required. For example, some claim that an aggregate of gender, ZIP code and birth date are unique for about 87% of the U.S. population.<sup>154</sup>

The right to speak anonymously without fear of government reprisal is protected by a number of laws, including federal whistleblower laws<sup>155</sup> and the First Amendment.<sup>156</sup> The protections for anonymous speech are broad. People who are actually engaging in expressive or political speech are afforded even fuller protections.<sup>157</sup> As a result, anonymity is a complex issue.

As the FTC has stated, existing regulations are not enough in today's rapidly evolving world.<sup>158</sup> However, steps are being taken at the federal level to improve privacy protections, even in the absence of *comprehensive* privacy protections.<sup>159</sup> In particular, the FTC has addressed a wide variety of privacy issues since the 1990s. It has brought enforcement actions

**BOX 4-2:**

**Online Personal Data Collection**

Online data collection can be either passive or active. Passive data collection occurs without any overt consumer interaction and generally includes capturing user preferences and usage behavior, including location data from personal mobile devices. The best-known example is the use of “cookies” on a user's computer to capture Internet browsing history.<sup>139</sup> Passive data collection and the sharing of this data among third parties is poorly understood by consumers and often not communicated transparently by websites and applications. Consumers have

some tools at their disposal, such as “private” browsing capabilities provided in the latest version of popular Web browsers or tools that allow them to see what passive activity is being captured, but the tools are limited.<sup>140</sup>

Active data collection requires a user to deliberately share personal data—for instance, when completing an online retail transaction or downloading an application on a mobile device. It often includes some disclosure of the use of the data being collected, although disclosures are frequently complex and written for lawyers, limiting how effective they are

at conveying information to consumers.<sup>141</sup> Additionally, active data collection disclosure forms can fail to divulge policies on data sharing with third parties; when a consumer enters personal information, it is not clear whether these data might become part of a “digital profile” on a third party site.

Once personal data are collected, either passively or actively, they can be aggregated through third parties. Large firms, with enough interactions with consumers and sufficient information about them, may aggregate the data on their own. Profiles may be simple

“contextual” maps, drawing just on immediate actions that consumers take on a page; for instance, someone searching for a flight may see a travel ad generated. Profiles may also be based on complex “behavioral” relationships that are not apparent to consumers; for example, someone may see a more tailored travel offer on that same website based on purchases they made at a retail store a month earlier and on their subsequent spending. These more sophisticated profiles allow for targeting of products to individuals in a predictive fashion.

against spammers, makers of spyware and those who fail to protect sensitive consumer data. The FTC has also encouraged websites to post privacy policies that describe how personal information is collected, shared, used and secured. Today, nearly all of the top 100 commercial sites post such privacy policies.<sup>160</sup> Several years ago, the FTC launched an initiative to encourage greater transparency and consumer control with respect to online behavioral advertising. As part of that initiative, FTC staff issued a set of “principles” to guide industry self-regulation, including:

- Provide a clear, concise, consumer-friendly, prominent statement about behavioral advertising practices and a choice to consumers about whether to allow the practice.
- Provide reasonable security and have limited data retention.
- Obtain consent for material changes to existing privacy promises.
- Collect sensitive data for behavioral advertising only after obtaining consent from the consumer to receive such advertising.<sup>161</sup>

Following the issuance of these principles, individual companies, industry organizations and privacy groups have taken steps to address the privacy issues raised by behavioral advertising.<sup>162</sup> At the time of this plan’s release, the FTC is hosting a series of public roundtables to examine existing privacy frameworks and whether they are adequate to address the vast array of technologies, business models and privacy challenges in today’s world.<sup>162</sup> The goal of the roundtables is to explore how best to protect consumer privacy while supporting beneficial uses of information and technological innovation.

Finally, Congress and NTIA have taken an active interest in privacy and personal data protection. Several congressional committees have held hearings, and members have introduced bills that address various aspects of online privacy, from the brokerage of online information to deep packet inspection. NTIA, as part of its statutory obligation to advise the President, has worked closely with other parts of government on these issues.

**RECOMMENDATION 4.14: Congress, the Federal Trade Commission (FTC) and the FCC should consider clarifying the relationship between users and their online profiles.**

In particular, several questions need to be addressed:

- What obligations do firms that collect, analyze or monetize personal data or create digital profiles of individuals have to consumers in terms of data sharing, collection, storage, safeguarding and accountability?
- What, if any, new obligations should firms have to transparently disclose their use of, access to and retention of personal data?
- How can informed consent principles be applied to personal data usage and disclosures?

**RECOMMENDATION 4.15: Congress should consider helping spur development of trusted “identity providers” to assist consumers in managing their data in a manner that maximizes the privacy and security of the information.**

Standard safe harbor provisions could allow companies to be acknowledged as trusted intermediaries that properly safeguard information, following appropriately strict guidelines and audits on data protection and privacy (see Box 4-4). Congress should also consider creating a regime that provides insurance to these trusted intermediaries.<sup>166</sup>

**BOX 4-3:**

**Critical Legislation—  
Reforming the Privacy Act**

This plan contains many recommendations, including some directed to Congress, for how to achieve the Congressional goals of access, affordability, utilization and achieving national purposes. In analyzing barriers to achieving these goals, a recurring theme emerges around privacy and control of personal data. The current legal landscape for how consumers control their

personal data, when applied to the online world, may hold back new innovation and investment in broadband applications and content. These applications and content, in turn, are likely the most effective means to advance many of Congress’s goals for broadband. New generations of applications and devices in sectors such as health care, energy and education will collect critical data that will help drive the next generation of American innovation, even

as they raise important security and privacy considerations.<sup>164</sup>

While it is beyond the scope of this plan to address the details of how the legal landscape should be reformed, it is likely that revising the current Privacy Act to give consumers more control over their personal data and more confidence in the security of their personal data is a positive action Congress could take to improve the broadband ecosystem. Done correctly, this would

increase innovation, rather than stifling it, by allowing consumers to transparently understand and choose how their government data are used. Updating the Act for the 21st century reality of digital interaction and seamless content sharing could drive more Americans online, increase their utilization of the Internet and help American businesses and organizations develop deeper and more trusted relationships with their customers and clients.

**RECOMMENDATION 4.16:** The FCC and FTC should jointly develop principles to require that customers provide informed consent before broadband service providers share certain types of information with third parties.<sup>167</sup>

This information should include customers' account and usage information such as patterns of Internet access use and other personally identifiable information. This should not limit the ability of the provider to render reasonable service. Consent to allow sharing of personal information should not be a prerequisite to receiving service.

**Identity Theft and Fraud**

Identity theft is not a new risk—in fact, it is significantly more common offline than online.<sup>168</sup> However, with increases in electronic communications and online commerce, and the aggregation of information in databases, identity theft has become a growing concern.<sup>169</sup> In 2000, the FTC Consumer Sentinel Network received 31,000 identity theft complaints; by 2008, this number had risen to 314,000.<sup>170</sup> According to the FTC:

“Credit card fraud (20%) was the most common form of reported identity theft followed by government documents/benefits fraud (15%), employment fraud (15%) and phone or utilities fraud (13%). Other significant categories of identity theft reported by victims were bank fraud (11%) and loan fraud (4%).”

In 2008, the FTC's network collected 1.2 million consumer complaints (up from roughly 900,000 in 2006) involving both online and offline transactions. Fraud and identity theft accounted for nearly 80% of these complaints.<sup>171</sup> Consumer risks like fraud and identity theft create a disincentive for individuals to engage in online transactions, increase the costs of doing business online and create law enforcement challenges.<sup>172</sup> Ensuring growing adoption and utilization of broadband requires that Internet users feel that they can connect and interact safely online.

Recently, fraud has been growing. A separate report by the Internet Crime Complaint Center (IC3) showed a 33.1% increase in fraud from 2007 to 2008.<sup>173</sup> The IC3 found that non-delivered merchandise or payment was, by far, the most reported offense (32.9%) while Internet auction fraud (25.5%) and credit/debit card fraud (9.0%) were also common offenses.

Several federal agencies have authority and responsibility for identity theft. In 1998, Congress passed the Identity Theft and Assumption Deterrence Act, making identity theft a federal crime. By 2002, most states had followed the federal example and enacted identity theft statutes.<sup>174</sup>

The Act called on the FTC to act as a clearinghouse for identity theft complaints and to provide consumer information to potential victims.<sup>175</sup> The FTC has produced several guidebooks with step-by-step information on actions consumers can take if they believe they are victims of identity theft. Those materials are available through the [FTC.gov/idtheft](http://FTC.gov/idtheft) website and the [OnGuardOnline.gov](http://OnGuardOnline.gov) project.

Beyond existing regulations, the 111th Congress has multiple bills in development that specifically address identity theft and security breaches.<sup>176</sup>

**RECOMMENDATION 4.17:** The federal government, led by the FTC, should put additional resources into combating identity theft and fraud and help consumers access and utilize those resources, including bolstering existing solutions such as OnGuard Online.

- **Put more resources into OnGuard Online.** The federal government should put additional resources into OnGuard Online, ensuring that it is easily accessible to consumers and provides them with information on risks, solutions and who they can contact for further action. Federal agencies should connect their existing online websites to OnGuard Online and direct consumers to its resources.

**BOX 4-4:**

**The FDIC as an Analog to Trusted “Identity Providers”**

Many government-backed entities have been created to help protect the public interest. The Federal Deposit Insurance Corporation (FDIC) provides one example of how government assists private companies in protecting and better serving consumers. Founded in 1933, the FDIC is an independent agency

created by Congress to guarantee the deposits of individuals up to certain levels, thereby increasing trust in the banking system. Since the launch of FDIC insurance on Jan. 1, 1934, no depositor has lost a single cent of insured funds as a result of a failure.<sup>165</sup>

The FDIC fulfills its mission:

- By acting as a private entity with the implicit backing of the government

but that is fully self-funded through bank insurance payments.

- By creating minimum levels of security for depositors, giving Americans incentives to invest their personal funds in the banking system while limiting risk.
- By providing oversight of banks, assuring depositors

that standards for good business and thoughtful risk taking are created and enforced.

Congress could explore the creation of mechanisms similar to those used by the FDIC to foster the emergence of trusted “identity providers” to secure and protect consumer data.



- **Maintain and publicize a database of agencies with responsibility. The FTC should maintain and publicize a database of agencies responsible for identity theft and fraud information, with clear information and directions available to consumers.**
- **Continue education efforts around identity theft and fraud. The federal government should continue educational efforts that clarify for consumers and businesses that personal information should only be collected when necessary and that entities should take reasonable measures to protect information from unauthorized access.**
- **Encourage broadband service providers to link to OnGuard Online. All agencies should encourage broadband service providers to link to OnGuard Online to direct potential victims of identity theft or fraud to necessary resources.**

### Consumer Online Security

In 1988, Robert Morris unleashed the Morris Worm on the Internet, bringing approximately 10% of the network to a halt.<sup>177</sup> In response, the Defense Advanced Research Projects Agency set up the first national cybersecurity effort—the CERT Coordination Center at Carnegie Mellon University.<sup>178</sup> Today, the Department of Homeland Security (DHS) leads federal cybersecurity activities supported by numerous efforts such as the FTC's OnGuard Online program and DOJ legal actions. Consumer online security issues such as viruses, spam and malware are closely related to cybersecurity activities.

In October 2009, spam accounted for 87% of all e-mail messages, and 1.9% of these spam messages contained malware.<sup>179</sup> According to the Anti-Phishing Working Group, the number of computers infected with malware viruses rose more than 66% between the fourth quarter of 2008 and the second quarter of 2009, representing more than half of their total sample of scanned computers. The incidence of malware such as password-stealing software directed at banking and financial accounts increased more than 186% in the same period.<sup>180</sup>

DHS is the government agency with primary responsibility for cybersecurity, although the FTC often handles “consumer online security” complaints. DHS, DOJ and the Executive Branch have taken the lead in promoting cybersecurity. Other agencies such as the National Security Agency, the U.S. Department of Defense (DoD), NIST, the National Science Foundation and the FCC have all had active roles. Recently, these agencies have tried to enable simpler communication to the public about where to go in the case of online security issues, while also detailing strategies for protecting the online environment.<sup>181</sup>

Broadband service providers have an incentive to offer security to customers to protect the network. Some offer antivirus

software for free, although installation and control still primarily reside with the consumer. Application providers like Google also help consumers by providing information on vulnerabilities, such as by flagging sites that are security risks. This is a start, but there is a critical need for more consumer education on what threats they face, how to protect their connections and where to turn in case of emergency.

**RECOMMENDATION 4.18:** FCC consumer online security efforts should support broader national online security policy, and should be coordinated with the Department of Homeland Security (DHS), the FTC, the White House Cyber Office and other agencies. Federal agencies should connect their existing websites to OnGuard Online to provide clear consumer online security information and direction.

### Child Protection

In the FCC's recent study of broadband adopters and non-adopters, 74% of broadband users strongly agreed that it is important for children to learn how to use the Internet. In fact, technology has already become integral to children's lives.<sup>182</sup> While children can benefit from being online (*e.g.*, through access to novel educational opportunities), they can also be exposed to risks.<sup>183</sup>

Last year's Internet Safety Technical Task Force Report concluded that simply being online does not automatically put youth at risk for online predation.<sup>184</sup> Research also found that “there was no evidence that online predators were stalking or abducting unsuspecting victims based on information they posted at social networking sites.”<sup>185</sup>

Still, there is a growing consensus that children need to be taught the critical skills necessary to succeed in an online environment. As stated by the National Academies of Sciences: “Swimming pools can be dangerous for children. To protect them, one can install locks, put up fences and deploy pool alarms. All of these measures are helpful, but by far the most important thing that one can do for one's children is to teach them to swim.”<sup>186</sup>

**RECOMMENDATION 4.19:** The federal government should create an interagency working group to coordinate child online safety and literacy work, facilitate information sharing, ensure consistent messaging and outreach and evaluate the effectiveness of governmental efforts. The working group should consider launching a national education and outreach campaign involving governments, schools and caregivers.

### Content and Online Copyright Protection

The Internet is revolutionizing the production and distribution of creative works, lowering barriers to entry and enabling far

broader and faster access to culture and ideas than previously possible.<sup>187</sup> But the Internet's value as a platform for content—and the ability of online content to drive increased adoption and use of broadband<sup>188</sup>—depends on creators' incentives to create and disseminate their works online, which are in turn at least partly dependent on copyright protection. The Internet must be a safe, trusted platform for the lawful distribution of content. At the same time, copyright protection efforts must not stifle innovation; overburden lawful uses of copyrighted works; or compromise consumers' privacy rights.

The Plan's recommendations regarding content and online copyright protection are limited to a few discrete suggestions regarding educational uses and public media (see Chapters 11 and 15).

### Digital Goods and Services Taxation

**RECOMMENDATION 4.20:** The federal government should investigate establishing a national framework for digital goods and services taxation.

The National Broadband Plan is focused on increasing beneficial use of the Internet, including e-commerce and new innovative business models. The current patchwork of state and local laws and regulations relating to taxation of digital goods and services (such as ringtones, digital music, etc.) may hinder new investment and business models.<sup>189</sup> Entrepreneurs and small businesses in particular may lack the resources to understand and comply with the various tax regimes.

Recognizing that state and local governments pursue varying approaches to raising tax revenues, a national framework for digital goods and services taxation would reduce uncertainty and remove one barrier to online entrepreneurship and investment.

## 4.4 COMPETITION FOR VALUE ACROSS THE ECOSYSTEM

“The Internet's openness, and the transparency of its protocols, [has] been critical to its success.”<sup>190</sup> As the FCC's NPRM on Preserving the Open Internet explains, broadband is a powerful engine for innovation and investment in America in part because the Internet is an open platform, where anyone can communicate and do business with anyone else on a level playing field.<sup>191</sup> The

open Internet “ensures that users are in control of the content that they send and receive,”<sup>192</sup> and that inventors and entrepreneurs “do not require the securing of permission” to innovate.<sup>193</sup>

The NPRM notes that these characteristics have made the Internet vibrant, and its continued health and growth—as well as broadband's ability to drive the many benefits discussed in this plan—depend on its continued openness “[B]roadband providers' ability to innovate and develop valuable new services must co-exist with the preservation of the free and open Internet that consumers and businesses of all sizes have come to depend on.”<sup>194</sup>

In the latest step in a longstanding effort to ensure these interests remain balanced, the FCC adopted the NPRM on Preserving the Open Internet in October 2009, which launched a rulemaking process that is currently underway.<sup>195</sup> The NPRM asked for public comment on six proposed principles:

1. *Content.* Subject to reasonable network management, a provider of broadband Internet access service may not prevent any of its users from sending or receiving the lawful content of the user's choice over the Internet.
2. *Applications and services.* Subject to reasonable network management, a provider of broadband Internet access service may not prevent any of its users from running the lawful applications or using the lawful services of the user's choice.
3. *Devices.* Subject to reasonable network management, a provider of broadband Internet access service may not prevent any of its users from connecting to and using on its network the user's choice of lawful devices that do not harm the network.
4. *Competitive Options.* Subject to reasonable network management, a provider of broadband Internet access service may not deprive any of its users of the user's entitlement to competition among network providers, application providers, service providers and content providers.
5. *Nondiscrimination.* Subject to reasonable network management, a provider of broadband Internet access service must treat lawful content, applications and services in a nondiscriminatory manner.
6. *Transparency.* Subject to reasonable network management, a provider of broadband Internet access service must disclose such information concerning network management and other practices as is reasonably required for users and content, application and service providers to enjoy the protections specified in this part.

The proposed rules also make clear that the principles would not supersede any obligation or limit the ability of broadband providers to deliver emergency communications or address the needs of law enforcement, public safety or homeland security authorities, consistent with applicable law.

## 4.5 TRANSITION FROM A CIRCUIT-SWITCHED NETWORK

Increasingly, broadband is not a discrete, complementary communications service. Instead, it is a platform over which multiple IP-based services—including voice, data and video—converge. As this plan outlines, convergence in communications services and technologies creates extraordinary opportunities to improve American life and benefit consumers. At the same time, convergence has a significant impact on the legacy Public Switched Telephone Network (PSTN), a system that has provided, and continues to provide, essential services to the American people.<sup>196</sup>

Convergence raises a number of critical issues. Consumers benefit from the options that broadband provides, such as Voice over Internet Protocol. But as customers leave the PSTN, the typical cost per line for Plain Old Telephone Service (POTS) increases, given the high fixed costs of providing such service.<sup>197</sup> Between 2003 and 2009, the average cost per line increased almost 20 percent.<sup>198</sup>

Regulations require certain carriers to maintain POTS—a requirement that is not sustainable—and lead to investments in assets that could be stranded.<sup>199</sup> These regulations can have a number of unintended consequences, including siphoning investments away from new networks and services. The challenge for the country is to ensure that as IP-based services replace circuit-switched services, there is a smooth transition for Americans who use traditional phone service and for the businesses that provide it.

This is not the first time the United States has overseen a transition in communications. In the past, the country transitioned mobile service from analog to digital and, more recently, transitioned broadcast television from analog to digital. In each case, government policies helped ensure that legacy regulations and services did not become a drag on the transition to a more modern and efficient use of resources, that consumers did not lose services they needed and that businesses could plan for and adjust to the new standards.

As with earlier transitions, the transition from a circuit-switched network will take a number of years. But to ensure that the transition does not dramatically disrupt communications or make it difficult to achieve certain public policy goals, the country should start considering the necessary elements of this transition in parallel with efforts to accelerate broadband deployment and adoption. As such, the FCC should start

a proceeding on the transition that asks for comment on a number of questions, including whether the FCC should set a timeline for a transition and, if so, what the timeline should be,<sup>200</sup> quality of service requirements<sup>201</sup> and safeguarding emergency communications.<sup>202</sup> This proceeding should consider questions of jurisdiction,<sup>203</sup> regulatory structure<sup>204</sup> and legacy voice-specific regulations, including interconnection, numbering and carrier of last resort obligations.<sup>205</sup> It should consider the impact of the transition on employment in the communications industry, particularly given the historic role of the sector in providing high-skill, high-wage jobs.<sup>206</sup> In the proceeding, the FCC should also look at whether there are requirements from other federal entities, such as tax requirements, that would affect the path of the transition.

Finally, a number of recommendations in this plan will affect the path of the transition, including recommendations about universal service and intercarrier compensation (Chapter 8) and recommendations related to access for people with disabilities (Chapter 9). The proceeding should examine how best to proceed with a transition in light of these other recommendations.

## 4.6 LEVERAGING THE BENEFITS OF INNOVATION AND INVESTMENT INTERNATIONALLY

While the National Broadband Plan focuses on developing the domestic broadband ecosystem, broadband policy also unfolds in an interdependent international market full of opportunities and challenges. Global trade in information and communications technology (ICT) is almost \$4 trillion and growing.<sup>207</sup> U.S. companies have played a leading role in bringing technologies to market that support a worldwide ICT ecosystem through the development of software, devices, applications, semiconductors and network equipment. This trade and investment is supporting tremendous growth in international Internet traffic, which increased at a compound annual growth rate of 66% over the past five years, supported by a 22% compound annual reduction in international transit port prices over that same period.<sup>208</sup> Further investment and innovation in U.S. broadband networks will provide U.S. businesses and consumers with the infrastructure they need to continue to compete in the rapidly changing ICT market. However, to realize the tremendous

promise of a networked world, U.S. leadership and international cooperation are needed to encourage Internet freedom and strengthen cybersecurity.

The United States took a leading role in the global Internet revolution of the 1990s by contributing to the technological and policy developments that enabled the Internet. The breakup of AT&T in the 1980s and the Telecommunications Act of 1996 served as catalysts for the spread of pro-competition policies around the world.<sup>209</sup> In addition, with the adoption of the World Trade Organization's Basic Telecommunications Agreement and Reference Paper in 1996, the world community took steps to adopt important liberalization principles that remain relevant and influential today.<sup>210</sup>

The National Broadband Plan recognizes that making the right policy choices at home that result in domestic market success is essential for the United States to advocate effectively in the debate on policies and practices for the global communications network. The policies contained in the plan form the basic foundations of the U.S. international telecommunications agenda. These principles include support for regulatory frameworks that are pro-competitive, transparent and technology-neutral.

Ubiquitous availability of broadband and universal connectivity enable people and entities in the United States to communicate worldwide, which increases productivity and enables innovation. The National Broadband Plan's emphasis on the promotion of the use of broadband for national priorities, such as education, energy, health care, economic development, e-government, civic engagement and public safety, demonstrates the possibilities for progress that can result from access to broadband. Even for the many people whose access to the global network is limited to mobile phones, there are still innovative examples of how mobile broadband can serve national priorities, such as providing access to health care information through mobile handsets.<sup>211</sup>

Competitive communication policies have facilitated network development around the world. The trends are encouraging, with 1.7 billion Internet users and 4.6 billion mobile phone subscribers in the world today.<sup>212</sup> Mobile networks now constitute the world's largest distribution platform. And today's mobile users will be the next generation of Internet users, as Smartphones enable those with mobile access to experience the benefits of connectivity. But more needs to be done to encourage mobile broadband access. About 40% of the world's population still does not have mobile phones and about three-quarters are not using the Internet.<sup>213</sup>

The United States should continue to support policies that hasten the rollout and uptake of telecommunications technology that bridges the international digital divide. Integrating ICT deployment and utilization into broader regional economic development strategies is as important abroad as it is at home.<sup>214</sup>

Policies that support the uptake of telecommunications technologies not only provide incentives for needed connectivity but also allow U.S. innovations to flourish in a rapidly developing world market. In turn, Americans benefit from a parallel stream of innovations coming from abroad.

As more people gets access to mobile communications services, innovative uses of mobile technology are increasing. But proliferation of mobile phones not only allows people to share more information, it has also spurred innovation and investment in other sectors that would be impossible without global access to broadband. From health care to banking, entrepreneurs have recognized that the commonality and wide distribution of mobile communications devices make them ideal tools for launching a variety of services and applications.

For example, in many developing countries, an entire segment of the population that previously had no access to banks is taking advantage of the convenience and availability of mobile banking. Mobile banking includes a variety of technology and business strategies to leverage mobile communications networks for the provision of transactional and informational financial services. Emerging markets are embracing mobile banking as a more effective means of reaching more people than traditional bricks-and-mortar banks. Access to banking for the previously "unbanked" can have a dramatic impact on individuals, families and small businesses as it increases safety, prevents monetary loss, enables savings and makes business more efficient and successful.<sup>215</sup>

The United States also needs to provide continued leadership to ensure that the Internet will continue to evolve in ways that are cooperative, collaborative and maximally beneficial for the collective community of users, managers and investors. The three primary streams of cooperation—intergovernmental cooperation, cooperation through non-governmental organizations and cooperation through technical bodies—have served the world and the Internet well. The United States needs to provide continued leadership in all of these fora—particularly by working (as recommended in Chapter 5) with the international community, including the ITU, to develop innovative and flexible global spectrum allocation.<sup>216</sup> Global harmonization across spectrum usage, along with international standards-setting, can reduce per-unit costs and lead to increased adoption and usage of the Internet around the world.

Today, as in the 1990s, the changing capabilities of ICT are forcing the world to make critical policy choices. The great achievement of a near-ubiquitous global network is being threatened by curtailed Internet freedom and decreased network security.

The global communications network has created an era in which information is perhaps freer than ever before. Maximizing the benefits of broadband worldwide will require

increased attention to policies that promote universal and unrestricted access to the Internet. The United States should lead in efforts to create a global consensus on how to define and guarantee basic rights of openness, access to and creation of information and connection to the global Internet community.

Cybersecurity, as discussed in Chapters 14 and 16,<sup>217</sup> is an important element of the National Broadband Plan. Cybersecurity attacks can be generated from anywhere in the world. The importance of cybersecurity as a policy objective cannot be underestimated. Engaging counterparts in international fora, as appropriate, will be crucial to successfully implementing cybersecurity policies.



## CHAPTER 4 ENDNOTES

- 1 See, for example, Howard Shelanski, *Adjusting Regulation to Competition: Toward a New Model for U.S. Telecommunications Policy*, 24 YALE J. ON REG. 56 (2007), for a discussion. Even in the early days of high-speed access some recognized that the high-speed retail ISP market structure would differ from that of dialup ISP. Faulhaber and Hogendorn, for example, estimated that demand would support two or three wireline providers. See Gerald R. Faulhaber & Christiaan Hogendorn, *The Market Structure of Broadband Telecommunications*, 48 J. INDUST. ECON. 305, 321 (2000). Atkinson argues that the economics of “ultrabroadband” points to more concentration. Robert Atkinson, *Market Structure for Ultrabroadband*, COMM’N’S & STRATEGIES, Special Issue 2008, at 35, 49 (2008).
- 2 Bresnahan and Reiss’s seminal article developed the model and tested its implications in a number of industries. See Timothy F. Bresnahan & Peter C. Reiss, *Entry and Competition in Concentrated Markets*, 99 J. POL. ECON. 977 (1991). Similarly, Sutton introduced the concept of “endogenous sunk costs” (ESC) in which firms can choose how much to invest in sunk costs. See JOHN SUTTON, SUNK COSTS AND MARKET STRUCTURE: PRICE COMPETITION, ADVERTISING, AND THE EVOLUTION OF CONCENTRATION (1991). The key insight is that in such industries the total number of firms is likely to be limited and may even shrink as the market grows. As Bresnahan and Greenstein state, “when ESC are important, demand growth does not lead to fragmentation; a larger market will have higher ESC, not more firms, in equilibrium.” Timothy Bresnahan & Shane Greenstein, *Technological Competition and the Structure of the Computer Industry*, 47 J. INDUST. ECON. 1, 6 (1999). Xiao and Orazem extend the Bresnahan-Reiss analysis to the broadband access market and find no additional competitive effects beyond a third competitor. See Mo Xiao & Peter F. Orazem, *Do Entry Conditions Vary over Time? Entry and Competition in the Broadband Market: 1999–2003* (Iowa State Univ., Working Paper No. 06004, 2006), available at [http://www.econ.iastate.edu/research/webpapers/paper\\_12500\\_06004.pdf](http://www.econ.iastate.edu/research/webpapers/paper_12500_06004.pdf). While suggestive, the research relies on the FCC’s ZIP code counts from the old Form 477 data. Those data, discussed elsewhere, show that most ZIP codes have multiple high-speed providers, but those providers do not always serve the same area within the ZIP code.
- 3 Imperfect competition occurs when goods or services are not perfect substitutes yet can impose some competitive discipline on each other due to the multidimensional nature of consumer preferences. For example, in this case, mobile broadband could provide some competitive pressure if enough people are willing to trade off speed for mobility.
- 4 Department of Justice *Ex Parte* in re National Broadband Plan NOI, filed Jan. 4, 2010, at 11 (“We do not find it especially helpful to define some abstract notion of whether or not broadband markets are ‘competitive.’ Such a dichotomy makes little sense in the presence of large economies of scale, which preclude having many small suppliers and thus often lead to oligopolistic market structures. The operative question in competition policy is whether there are policy levers that can be used to produce superior outcomes, not whether the market resembles the textbook model of perfect competition. In highly concentrated markets, the policy levers often include: (a) merger control policies; (b) limits on business practices that thwart innovation (e.g., by blocking interconnection); and (c) public policies that affirmatively lower entry barriers facing new entrants and new technologies.”).
- 5 Department of Justice *Ex Parte* in re National Broadband Plan NOI, filed Jan. 4, 2010, at 7; Gregory L. Rosston, Deputy Director, Stanford Institute for Economic Policy Research, Remarks at FCC Benchmarks Workshop 5–17 (Sept. 2, 2009), available at [http://www.broadband.gov/docs/ws\\_20\\_benchmarks.pdf](http://www.broadband.gov/docs/ws_20_benchmarks.pdf); James Priege, Professor of Pub. Policy, Pepperdine Univ., Remarks at FCC Economic Growth, Job Creation and Private Investment Workshop 4–15 (Aug. 26, 2009), available at [http://broadband.gov/docs/ws\\_16\\_economy.pdf](http://broadband.gov/docs/ws_16_economy.pdf); Ryan McDevitt, Lecturer, Dep’t of Manag. & Strat., Northwestern Univ., Remarks at FCC Economic Growth, Job Creation and Private Investment Workshop 23–34 (Aug. 26, 2009), available at [http://broadband.gov/docs/ws\\_16\\_economy.pdf](http://broadband.gov/docs/ws_16_economy.pdf); Joseph Farrell, Director, Bureau of Econ., FTC, Remarks at FCC Economic Issues in Broadband Competition Workshop 55–66 (Oct. 9, 2009), available at [http://broadband.gov/docs/ws\\_28\\_economic.pdf](http://broadband.gov/docs/ws_28_economic.pdf); Carl Shapiro, Deputy Ass’t Attorney General for Economics, Antitrust Div., DOJ, Remarks at FCC Economic Issues in Broadband Competition Workshop 66–83 (Oct. 9, 2009), available at [http://broadband.gov/docs/ws\\_28\\_economic.pdf](http://broadband.gov/docs/ws_28_economic.pdf).
- 6 See FCC, 2008 Form 477 database (accessed Dec. 2009) (on file with the FCC) (Form 477 database). While much improved from past years, the new 477 data are not ideal for analyzing competition because the data identify providers that operate anywhere in a Census tract and not whether their service areas overlap geographically. We improve the 477 provider counts in two ways. First, we do not count providers with less than one percent of broadband subscriptions in a given Census tract under the assumption that a provider with such a small number of subscribers is probably not available to a large part of the tract. Second, we identify cable overbuilders (such as RCN) in the data, which allows us to make reasonable assumptions about where cable companies actually provide service to the same geographic areas. Specifically, we assume that any given area is served by a maximum of one facilities-based DSL provider and one cable provider unless a cable overbuilder is present, in which case we count both cable providers. We also count fiber-specific competitors, but do not double-count telco providers that offer both DSL and fiber in the same tract (i.e., Verizon DSL and FiOs). Finally, we do not count CLECs providing service over another company’s lines because we focus on facilities-based providers, and their inclusion would overstate the extent of competition.
- 7 The limited useful data on availability make it difficult to estimate these figures with precision. The OBI team has used multiple inputs and analyses to better estimate the availability figures, as discussed *infra* Chapter 8. See OMNIBUS BROADBAND INITIATIVE, OBI, THE BROADBAND AVAILABILITY GAP (forthcoming) (OBI, THE BROADBAND AVAILABILITY GAP).
- 8 ROBERT C. ATKINSON & IVY E. SCHULTZ, COLUMBIA INST. FOR TELE-INFORMATION, BROADBAND IN AMERICA: WHERE IT IS AND WHERE IT IS GOING (ACCORDING TO BROADBAND SERVICE PROVIDERS) 24 (2009) (ATKINSON & SCHULTZ, BROADBAND IN AMERICA).
- 9 According to Clearwire’s November 10, 2009 earnings report, it expected to provide service in the following cities by the end of 2009: Atlanta, GA; Baltimore, MD; Boise, ID; Chicago, IL; Las Vegas, NV; Philadelphia, PA; Charlotte, Raleigh, and Greensboro, NC; Honolulu and Maui, HI; Seattle and Bellingham, WA; Portland and Salem, OR; and Dallas/Ft. Worth, San Antonio, Austin, Abilene, Amarillo, Corpus Christi, Killeen/Temple, Lubbock, Midland/Odessa, Waco and Wichita Falls, TX. Clearwire, *Clearwire Reports Third Quarter 2009 Results* (press release), Nov. 10, 2009, <http://investors.clearwire.com/phoenix.zhtml?c=198722&p=irol-newsArticle&ID=1353840>.
- 10 Satellite-based broadband providers, because of limited satellite capacity, have Fair Access Policies (often termed usage caps) for their customers: the Hughes current limit is as low as 200 MB per day, while WildBlue’s cap is as low as 7,500 MB per month. Next-generation satellites will have much higher capacities, in excess of 100 Gbps each, with download speeds per user of up to 25 Mbps. Larger capacities could allow for usage patterns that more closely mirror terrestrial usage. However, the high fixed costs of designing, building and launching a satellite mean that satellite-based broadband is likely to be cheaper than terrestrial service only for the most expensive-to-serve areas. ATKINSON & SCHULTZ, BROADBAND IN AMERICA at 57. As the report notes, however, actual speeds will depend on several factors, including intensity of use in any given area. For examples of commercial services with usage caps today, see HughesNet, Fair Access Policy, <http://web.hughesnet.com/sites/legal/Pages/FairAccessPolicy.aspx> (last visited Mar. 4, 2009) and WildBlue Communications, WildBlue Fair Access Policy, <http://wildblue.com/legal/fair.jsp> (last visited Mar. 4, 2009).
- 11 See Form 477 database. The figure is derived from econometric analysis of the FCC’s December 2008 Form 477 data and controls for housing density, household income, and state fixed effects. Simple correlations between the number of providers and any particular outcome are not necessarily meaningful because some factors that affect the number of providers in an area may also affect outcomes. For example, providers may offer faster speeds in wealthier areas, and wealthier areas may tend to have more providers. A positive correlation between the two might therefore be an income, not a competition, effect. We handle this issue through econometric analyses, including modeling the number of firms in a market before estimating the effects of the number of firms on outcomes.
- 12 See Form 477 database. This table is derived from FCC analysis of Form 477 data dated December 2008.

## CHAPTER 4 ENDNOTES

- Analysis controls for household income, housing density, and state-specific effects. The figure may understate the competitive effects due to the way Form 477 categorizes connection speeds our method of estimating speeds from those categories. In particular, rather than reporting actual advertised speeds, Form 477 identifies each connection as being in one of 8 groupings (200–768 Kbps, 768 Kbps–1.5 Mbps, 1.6–3 Mbps, 3.1–6 Mbps, 6.1–10 Mbps, 10.1–25 Mbps, 25–100 Mbps, and greater than 100 Mbps). We estimate speeds from these groupings by using the midpoint of each category as the advertised speed in our analyses. Therefore, increases in the figure may not appear to be especially large unless a large number of connections move from one category to another. For example, a connection that increases from 3.5 Mbps to 5.5 Mbps would not appear as an increase in our analysis. “Fiber” includes fiber-to-the-home connections (such as Verizon FiOS), but excludes fiber-to-the-node connections (such as AT&T U-verse). Furthermore, the analysis is based on advertised speeds, not actual delivered speeds. The highest available fiber speed in areas with three wireline providers is not statistically different from the speed in areas with two providers. This result is an artifact of the way Form 477 aggregates speed data. In particular, about two-thirds of all fiber connections in areas with two or three wireline competitors are grouped into the 10–25 Mbps tier. A 10 Mbps connection, therefore, would appear in the data identical to a 20 Mbps connection. As a result, we observe too little variation in the fiber speed data to identify differences in speeds between areas with two and three wireline providers
- 13 Broadband providers can compete for customers in a number of ways. They can offer similar products and compete on price, they can improve their product so that people are willing to pay more for it, and they can offer products targeted to different groups. Chen and Savage find evidence that cable and DSL providers may compete by targeting different types of consumers rather than by lowering prices if preferences in the target population are sufficiently diverse. Yongmin Chen & Scott J. Savage, *The Effects of Competition on the Price for Cable Modem Internet Access* (NET Institute, Working Paper No. 07-13, 2007). Research on CLECs has found that they tend to target different types of consumers rather than lower prices. See generally Shane M. Greenstein & Michael J. Mazzeo, *The Role of Differentiation Strategy in Local Telecommunication Entry and Market Evolution: 1999–2002*, 54 J. INDUSTRY ECON. 323 (2006); Nicholas Economides et al., *Quantifying the Benefits of Entry into Local Telephone Service*, 39 RAND J. ECON. 699 (2008).
- 14 2009 figures are estimates. See ATKINSON & SCHULTZ, BROADBAND IN AMERICA at 66, tbl. 15.
- 15 ATKINSON & SCHULTZ, BROADBAND IN AMERICA at 4; see also *supra* Chapter 3.
- 16 ATKINSON & SCHULTZ, BROADBAND IN AMERICA at 24.
- 17 OMNIBUS BROADBAND INITIATIVE, BROADBAND PERFORMANCE (forthcoming).
- 18 ATKINSON & SCHULTZ, BROADBAND IN AMERICA at 24.
- 19 As noted, satellite-based broadband providers, because of limited satellite capacity, have Fair Access Policies (often termed usage caps) for their customers: the Hughes current limit is as low as 200 MB per day, while WildBlue’s cap is as low as 7,500 MB per month. Next-generation satellites will have much higher capacities, in excess of 100 Gbps each, with download speeds per user of up to 25 Mbps. Larger capacities could allow for usage patterns that more-closely mirror terrestrial usage. However, the high fixed costs of designing, building and launching a satellite mean that satellite-based broadband is likely to be cheaper than terrestrial service only for the most expensive-to-serve areas. ATKINSON & SCHULTZ, BROADBAND IN AMERICA at 57. As the report notes, however, actual speeds will depend on several factors, including intensity of use in any given area. For examples of commercial services with usage caps today, see HughesNet, Fair Access Policy, <http://web.hughesnet.com/sites/legal/Pages/FairAccessPolicy.aspx> (last visited Mar. 4, 2009) and WildBlue Communications, WildBlue Fair Access Policy, <http://wildblue.com/legal/fair.jsp> (last visited Mar. 4, 2009).
- 20 No definitive data source tracks whether consumers purchase broadband as a standalone product or as a bundle, but estimates of the share of subscribers with some type of bundle range from 65% (Yankee Group) to 90% (TNS). See TNS Bill Harvesting and other specific database (accessed Oct 2009) (on file with the FCC) (representing a custom, proprietary database of survey answers and corresponding household bills for a variety of products including voice, data and video services, including data from Q1 2002 to Q2 2009). See, Yankee Group, 2009 Consumer Survey Suite database (on file with the FCC). Both the Yankee Group and UBS estimate that about 21% of subscribers have a triple-play bundle. John Hodulik et al., UBS Securities, Q4 2009 Triple Play Consumer Model database (on file with the FCC).
- 21 BERKMAN CENTER FOR INTERNET AND SOCIETY, HARVARD UNIVERSITY, NEXT GENERATION CONNECTIVITY: A REVIEW OF BROADBAND INTERNET TRANSITIONS AND POLICY FROM AROUND THE WORLD (2010) (BERKMAN BROADBAND REPORT), available at [http://cyber.law.harvard.edu/sites/cyber.law.harvard.edu/files/Berkman\\_Center\\_Broadband\\_Final\\_Report\\_15Feb2010.pdf](http://cyber.law.harvard.edu/sites/cyber.law.harvard.edu/files/Berkman_Center_Broadband_Final_Report_15Feb2010.pdf).
- 22 GREGORY ROSSTON ET AL., HOUSEHOLD DEMAND FOR BROADBAND INTERNET SERVICE (2010), available at [http://siepr.stanford.edu/system/files/shared/Household\\_demand\\_for\\_broadband.pdf](http://siepr.stanford.edu/system/files/shared/Household_demand_for_broadband.pdf); INT’L TELECOMMS. UNION, MEASURING THE INFORMATION SOCIETY: THE ICT DEVELOPMENT INDEX 66 (2009), available at [http://www.itu.int/ITU-D/ict/publications/idi/2009/material/IDI2009\\_w5.pdf](http://www.itu.int/ITU-D/ict/publications/idi/2009/material/IDI2009_w5.pdf).
- 23 Telogical High-Speed Internet Service Plans Offered database (Nov. 2009) (accessed Dec. 2009) (on file with the FCC) (representing data on high-speed Internet service plans offered in all select geographies covered by telogical clients).
- 24 See Shane Greenstein & Ryan McDevitt, *Evidence of a Modest Price Decline in US Broadband Services 1* (CSIO, Working Paper No. 0102, 2010) (Greenstein & McDevitt, *Evidence of a Modest Price Decline*), available at <http://www.wcas.northwestern.edu/csio/Papers/2010/CSIO-WP-0102.pdf>.
- 25 See Greenstein & McDevitt, *Evidence of a Modest Price Decline*.
- 26 Specifically, Greenstein and McDevitt estimated a regression in which the dependent variable was the monthly price of the plan, and independent variables included upload speed, download speed, region dummy variables, and time dummy variables. Greenstein & McDevitt, *Evidence of a Modest Price Decline, passim*. The coefficients on the time dummies indicate the quality-adjusted change in price. The bundled price index cannot be calculated prior to 2006 due to the lack of available data on bundled plans. It is likely that some DSL plans that Point Topic did not identify as bundled prior to 2006 were, in fact, bundled with telephone service when the provider did not offer naked DSL service.
- 27 Fisher price indices as calculated by Greenstein & McDevitt, *Evidence of a Modest Price Decline* tbls. 5a–b. The indices are based on all advertised plans recorded by Point Topic from 2004 through 2009 and calculated by regressing the advertised price on upload speed, download speed, and year dummy variables separately for DSL and cable plans and then using the number of subscriptions to each type of service as the weight for creating a single broadband index. The indices were set to 1 in 2006 to facilitate comparison.
- 28 Bureau of Labor Statistics, Consumer Price Index: Internet Services and Electronic Information Providers (Series CUUR0000SEEE03), <http://www.bls.gov/cpi/> (last visited Mar. 6, 2009). It is difficult to compare BLS Internet price indices before and after 2007 for at least two reasons. First, BLS’s sampling method means that once included in the index a provider retains its weight for four years. Thus, AOL’s decision to stop charging for its dialup service in 2006 caused the index to show a nearly 25% price decrease. Shane M. Greenstein & Ryan McDevitt, *The Broadband Bonus: Accounting for Broadband Internet’s Impact on U.S. GDP* (Nat’l Bureau of Econ. Research, Working Paper No. 14758, 2009), available at <http://www.nber.org/papers/w14758.pdf>. Second, as the previous point hints, the index includes dialup Internet service providers. The share of dialup ISPs presumably decreases steadily, but the further back in time one follows the index the more dialup ISPs were likely to be included.
- 29 The forthcoming FCC Mobile Wireless Competition Report will provide a longer treatment of mobile broadband competition.
- 30 See American Roamer Advanced Services database (accessed Aug. 2009) (aggregating service coverage boundaries provided by mobile network operators) (on file with the FCC) (American Roamer database); see also Geolytics Block Estimates and Block Estimates Professional databases (2009) (accessed Nov. 2009) (projecting Census populations by year to 2014 by Census block) (on file with the FCC) (Geolytics databases). The approximate of 60% is based on total landmass area. In 2008, this figure was 39.6%. *Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993: Annual Report and*

## CHAPTER 4 ENDNOTES

- Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services*, WT Docket No. 08-27, Thirteenth Report, 24 FCC Rcd 6185, 6257, tbl. 9 (WTB 2009).
- 31 Data from American Roamer show geographic coverage by technology. The actual service quality of data connections experienced by end-users will differ due to a large number of factors, such as location and mobility. Further, the underlying coverage maps do not include information on the level of service (i.e., signal quality and the speed of broadband service) provided; nor is coverage defined by providers in the same way. Thus, coverage as measured here does not correspond to a specific minimum signal quality or user experience. See American Roamer database; see also *infra* Chapter 4, Section 4.1 (Competition in Residential Broadband Networks) (discussing the American Roamer methodology). Population is based on projected Census block figures from Geolytics. See Geolytics databases.
- 32 See *infra* Chapter 4, Section 4.1 (Transparency in the retail broadband market) (discussing details on a possible new approach to measurement and disclosure of mobile services).
- 33 See American Roamer database.
- 34 comScore, Inc., Jan.–June 2009 Consumer Usage database (sampling 200,000 machines for user Web surfing habits) (on file with the FCC) (comScore database), see also CHETAN SHARMA & SARLA SHARMA, STATE OF THE (MOBILE) BROADBAND NATION: A BENCHMARKING STUDY (2009), available at <http://www.chetansharma.com/State%20of%20the%20Broadband%20Nation%20-%20Chetan%20Sharma%20Consulting.pdf> (Reprinted with permission. Copyright © 2009 Chetan Sharma Consulting. All rights reserved. Based on data compiled by Root Wireless, Inc.).
- 35 ATKINSON & SCHULTZ, BROADBAND IN AMERICA at 24. Note that some providers (such as AT&T) were not included in the report, although their networks have been upgraded. See also *supra* Chapter 3, Exhibit 3-H.
- 36 ATKINSON & SCHULTZ, BROADBAND IN AMERICA at 66.
- 37 ATKINSON & SCHULTZ, BROADBAND IN AMERICA at 66.
- 38 Some of the largest providers of wireline broadband services have ownership stakes or commercial, go-to-market relationships with wireless broadband service providers. For example, Verizon is the controlling shareholder of Verizon Wireless; AT&T owns AT&T Wireless; and several cable companies have ownership stakes or commercial relationships with Clearwire.
- 39 As noted elsewhere in the plan, satellite coverage is available from two providers nearly everywhere. With prices exceeding \$50 per month for 1 Mbps advertised download speeds usage caps as low as 200 MB per day, however, the current generation of satellite broadband is not ideal for consumers who live in areas with wireline access; for examples of usage caps see HughesNet, Fair Access Policy, <http://web.hughesnet.com/sites/legal/Pages/FairAccessPolicy.aspx> (last visited Mar. 4, 2009) and WildBlue Communications, WildBlue Fair Access Policy, <http://wildblue.com/legal/fair.jsp> (last visited Mar. 4, 2009).
- 40 While technology will continue to improve, spectral efficiency of current OFDM-based 4G solutions is approaching the theoretical limit set by information theory.
- 41 The chart only displays the GSM/3GPP family of technologies. Performance of EV-DO standards is comparable with HSPA. See Letter from Dean R. Brenner, Vice Pres., Gov't Aff., Qualcomm Inc., to Marlene H. Dortch, Secretary, FCC, GN Docket No. 09-51 (Dec. 9, 2009) Attach. A at 2. Figure shows downlink capacities calculated for 2x10MHz spectrum availability. Estimates of spectral efficiency calculated for each technology with the following antenna configuration: WCDMA, 1x1 and 1x2; HSPDA, Rel.5, 1x1; HSPA Rel. 6, 1x2; HSPA, Rel. 7, 1x1 and 1x2; LTE, 1x1 and 1x2.
- 42 ATKINSON & SCHULTZ, BROADBAND IN AMERICA at 7 (“Wireless broadband service providers expect to offer wireless access at advertised speeds ranging up to 12 mbps downstream (but more likely 5 mbps or less due to capacity sharing) to about 94% of the population by 2013.”).
- 43 ATKINSON & SCHULTZ, BROADBAND IN AMERICA at 7, 23–24.
- 44 See OBI, THE BROADBAND AVAILABILITY GAP. It is difficult to compare and categorize performance of different broadband access technologies. For example, in certain scenarios, some technologies may have better download performance than others but worse upload. In addition, the performance of different technologies will depend on different variables such as oversubscription levels at different aggregation points in the network such as number of users per node in the hybrid-fiber coax plant or oversubscription rates in the backhaul circuits of remote DSLAMs, loop lengths for FTTN, and specific technology choices. For example, there are material performance differences between G-PON, B-PON and other architectures, and FTTN networks performance will vary substantially depending on the specific type of DSL technology used, and whether or not copper pair bounding is used. For the purpose of these analyses, it is assumed that FTTP deployments such as Verizon FiOS provide a “robust” competitor to DOCSIS 3.0, even though the performance of different technologies may not be the same.
- 45 The disparity would likely appear even larger if the data did not exclude plans above the 95th percentile, which would show 50 Mbps and 100 Mbps plans offered by some cable providers.
- 46 The figure is derived from data provided in Greenstein & McDevitt, *Evidence of a Modest Price Decline*, tbls. 3a–b, and shows the 5th percentile, mean, and 95th percentile of all prices advertised by cable and DSL providers and collected by the consultancy Point Topic from 2004–2009. The 95th percentile filter means that the figure does not show 50 Mbps and 100 Mbps plans offered by some cable providers.
- 47 GREGORY ROSSTON ET AL., HOUSEHOLD DEMAND FOR BROADBAND INTERNET SERVICE (2010), available at [http://siepr.stanford.edu/system/files/shared/Household\\_demand\\_for\\_broadband.pdf](http://siepr.stanford.edu/system/files/shared/Household_demand_for_broadband.pdf).
- 48 The U.S. Department of Justice, in its filing to the FCC on the national broadband plan also recommends additional spectrum, better data collection, and more transparency of that data to help promote competition. Department of Justice *Ex Parte* in re National Broadband Plan NOI, filed Jan. 4, 2010, at 21–27.
- 49 See 47 U.S.C. § 541 (a)(3).
- 50 For example, certain U.S. Census data are made available to researchers in a controlled fashion at the U.S. Census Bureau’s Center for Economic Studies and Research data center. See U.S. Census Bureau Ctr. for Econ. Studies, Research Program Overview, <http://www.ces.census.gov/index.php/ces/researchprogram> (last visited Feb. 14, 2010).
- 51 PEW CAMPAIGN FOR FUEL EFFICIENCY, HISTORY OF FUEL ECONOMY: ONE DECADE OF INNOVATION, TWO DECADES OF INACTION 1 (2006), [http://www.pewfuelefficiency.org/docs/cafe\\_history.pdf](http://www.pewfuelefficiency.org/docs/cafe_history.pdf). For more detail on EPA’s MPG disclosure actions, see Fueleconomy.gov, <http://www.fueleconomy.gov/> (last visited Feb. 12, 2010). See also U.S. DEP’T OF ENERGY & U.S. ENV’TAL PROTECTION AGENCY, 2010 MPG FUEL ECONOMY GUIDE, <http://www.fueleconomy.gov/feg/FEG2010.pdf>.
- 52 American Heart Ass’n, A History of Trans Fat, <http://www.americanheart.org/presenter.jhtml?identifier=3048193> (last visited Feb. 11, 2010); N.Y.C. DEP’T OF HEALTH & MENTAL HYGIENE, THE REGULATION TO PHASE OUT ARTIFICIAL TRANS FAT (2007), <http://www.nyc.gov/html/doh/downloads/pdf/cardio/cardio-transfat-bro.pdf>
- 53 New America Foundation Comments in re NBP PN #24 (*Comment Sought on Broadband Measurement and Consumer Transparency of Fixed Residential and Small Business Services in the United States—NBP Public Notice #24*, GN Docket Nos. 09-51, 09-47, 09-137, 24 FCC Rcd 14120 (2009) (*NBP PN #24*)), filed Dec. 14, 2009, at 2; DHARMA DAILEY ET AL., SOC. SCI. RESEARCH COUNCIL (SSRC), BROADBAND ADOPTION IN LOW-INCOME COMMUNITIES at 25 (2010), (“No one seemed sure that they were getting what they are paying for (for example, if they were getting the speed that they should) or that charges were accurate.”). The FCC has conducted some initial research regarding the information provided to consumers regarding—and consumers’ understanding of—broadband speed, performance, pricing, and service terms and conditions. This research has implications for transparency issues as well as for the barriers consumers face to switching providers. To address gaps in the FCC’s understanding of these issues, the FCC has prepared a consumer survey that will be launched later this spring (for a number of reasons, it was not possible to conduct the survey earlier). The results of this survey would ideally have been used as part of the formal report to Congress, as they are critical points in recommendations, but will now be concluded after the formal report is delivered. The FCC will obtain and analyze survey results and will present its analysis to Congress and the public during Fiscal Year 2010 as a supplement to the Plan.
- 54 comScore database. The FCC, as part of the National Broadband Plan, will issue an RFP to potentially contract with a third party and conduct a six-month consumer panel to gather more detail on actual



## CHAPTER 4 ENDNOTES

- connection speeds and performance of U.S. broadband services. The results of this panel would ideally have been used as part of the formal report to Congress, as they are critical data points in recommendations, but will now be concluded after the formal report is delivered (for a number of reasons, it was not possible to conduct this panel earlier). Panel results will therefore be finalized after the formal report is delivered, and the FCC will submit results of this panel publicly and to Congress during Fiscal Year 2010 as a supplement to the Plan. Public comments on the record and data filed with the FCC, as noted, are sufficient for creating recommendations, but this panel will bolster and provide more detail necessary to complete the Plan's congressional charter.
- 55 Speed (download and upload) is only one measure of performance—others include, but are not limited to, latency, jitter, availability, packet loss, etc.
- 56 Verizon Comments in re NBP PN #24, filed Dec. 14, 2009, at 14–18; US Telecom Ass'n Comments in re NBP PN #24, filed Dec. 14, 2009, at 1–3; Intel Comments in re NBP PN #24, filed Dec. 14, 2009, at 2; New America Foundation Comments in re NBP PN #24, filed Dec. 14, 2009; Epiitiro Comments in re NBP PN #24, GN Docket No. 09-137, filed Dec. 14, 2009; SamKnows Comments in re NBP PN #24, GN Docket No. 09-47, filed Dec. 16, 2009.
- 57 Verizon Comments in re NBP PN #24, filed Dec. 14, 2009, at 14; SamKnows Comments in re NBP PN #24, GN Docket No. 09-47, filed Dec. 16, 2009, at 5; Epiitiro Comments in re NBP PN #24, GN Docket No. 09-137, filed Dec. 14, 2009, at 7–14; NCTA Comments in re NBP PN #24, filed Dec. 14, 2009, at 9; Time Warner Cable Comments in re NBP PN #24, filed Dec. 14, 2009, at 5–6.
- 58 Sandvine Comments in re NBP PN #24, filed Dec. 14, 2009, at 5–6.
- 59 Epiitiro Comments in re NBP PN #24, GN Docket No. 09-137, filed Dec. 14, 2009; SamKnows Comments in re NBP PN #24, GN Docket No. 09-47, filed Dec. 16, 2009; New America Foundation Comments in re NBP PN #24, filed Dec. 14, 2009.
- 60 Verizon Comments in re NBP PN #24, filed Dec. 14, 2009, at 15 (“tests conducted using representative Internet file sizes”).
- 61 SamKnows Comments in re NBP PN #24, GN Docket No. 09-47, filed Dec. 16, 2009, at 4. As noted in many public notice comments, this measurement and reporting would focus on consumer fixed broadband connections by technology and provider, with geographic data provided at an aggregated level. As noted, this panel recruitment and measurement will be finalized during Fiscal Year 2010 but are critical to the recommendations of the plan and the completion of the plan's congressional charter.
- 62 *See, e.g.*, Epiitiro Comments in re NBP PN #24, GN Docket No. 09-137, filed Dec. 14, 2009, Attachs.
- 63 Gerald Faulhaber, Professor, Univ. of Penn. Wharton School, Presentation at the Open Internet Transparency Workshop (Jan. 19, 2010).
- 64 In August 2009, the FCC issued a Notice of Inquiry on Consumer Information and Disclosure, which began a wide-ranging review of transparency in all communications services including broadband. *See Consumer Information and Disclosure*, CG Docket No. 09158, CC Docket No. 98-170, WC Docket No. 04-36, Notice of Inquiry, 24 FCC Rcd 11380 (2009).
- 65 Letter from Thomas Cohen, Counsel, Fiber-to-the-Home Council, to Marlene H. Dortch, Secretary, FCC, GN Docket Nos. 09-47, 09-51, 09-137 (Dec. 14, 2009) (FTTH Council GN Docket No. 09-137, filed Dec. 14, 2009 *Ex Parte*), Attach. at 24–25; Dr. Robert Pepper, Vice Pres. of Global Tech. Policy at Cisco, Presentation at FCC International Workshop (Aug. 18, 2009), available at [http://www.broadband.gov/docs/ws\\_int\\_lessons/ws\\_int\\_lessons\\_pepper.pdf](http://www.broadband.gov/docs/ws_int_lessons/ws_int_lessons_pepper.pdf).
- 66 Ron Dicklin, Root Wireless, Presentation at the Open Internet Transparency Workshop (Jan. 19, 2010), available at <http://openinternet.gov/workshops/docs/ws-consumers-transparency-and-the-open-internet/FCC%20Round%20Table%20Root%20Wireless.pdf>.
- 67 Many respondents to Public Notice #24 on measurement of fixed broadband commented on the potential for measurement of wireless mobile broadband as well. *See, for example*, Epiitiro Comments in re NBP PN #24, GN Docket No. 09-137, filed Dec. 14, 2009, Attachs., for examples of UK mobile broadband measurement.
- 68 FTTH Council Dec. 14, 2009 *Ex Parte* at 55.
- 69 The FCC continues to take action on retail entry and on competition. As a recent example of the FCC's actions to support competition, when Comcast proposed to acquire Cimco, a midwestern CLEC, for the purpose of entering SMB broadband markets, the FCC put forth an expedited process, consistent with the underlying provision of the Communications Act, for Comcast to obtain the required approvals from Local Franchising Authorities. *See* 47 U.S.C. § 572(d)(6)(B); *Application Filed for the Acquisition of Certain Assets and Authorizations of CIMCO Communications, Inc. by Comcast Phone LLC, Comcast Phone of Michigan, LLC and Comcast Business Communications, LLC*, WC Docket No. 09-183, Public Notice, 24 FCC Rcd 14815 (Dec. 1, 2009), clarified by Public Notice, DA 10-211 (WCB rel. Jan. 29, 2010).
- 70 *See, e.g.*, *Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers; Implementation of the Telecommunications Act of 1996; Deployment of Wireline Services Offering Advanced Telecommunications Capability*, CC Docket Nos. 01-338, 96-98, 98-147, Report and Order and Order on Remand and Further Notice of Proposed Rulemaking, 18 FCC Rcd 16978, 17141–54, paras. 272–97 (2003) (subsequent history omitted); *Petition of AT&T Inc. for Forbearance Under 47 U.S.C. § 160(c) from Title II and Computer Inquiry Rules with Respect to Its Broadband Services; Petition of AT&T Inc. for Forbearance Under 47 U.S.C. § 160(c) from Title II and Computer Inquiry Rules with Respect to Its Broadband Services*, WC Docket No. 06-125, Memorandum Opinion and Order, 22 FCC Rcd 18705 (2007) (*AT&T Fiber and Packet Services Forbearance Order*). Lack of appropriate wholesale access to packet-based facilities in particular serves as a constraint on competition in broadband services, which can typically be provided more efficiently using packet-based inputs.
- 71 *See Reexamination of Roaming Obligations of Commercial Mobile Radio Service Providers*, WT Docket No. 05-265, Report and Order and Further Notice of Proposed Rulemaking, 22 FCC Rcd 15817, 15836–39, paras. 52–60 (2007). Roaming is not available to mobile providers in markets in which they hold a spectrum license. *Id.* at 15835–36, paras. 48–51.
- 72 *See, e.g.*, *Unbundled Access to Network Elements; Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers*, WC Docket No. 04-313, CC Docket No. 01-338, Order on Remand, 20 FCC Rcd 2533 (2005); *Access Charge Reform; Price Cap Performance Review for Local Exchange Carriers; Interexchange Carrier Purchases of Switched Access Services Offered by Competitive Local Exchange Carriers; Petition of U.S. West Communications, Inc. for Forbearance from Regulation as a Dominant Carrier in the Phoenix, Arizona MSA*, CC Docket Nos. 98-157, 96-262, 94-1, CCB/CPD File No. 98-63, Fifth Report and Order and Further Notice of Proposed Rulemaking, 14 FCC Rcd 14221 (1999).
- 73 *See, e.g.*, GAO, FCC NEEDS TO IMPROVE ITS ABILITY TO MONITOR AND DETERMINE THE EXTENT OF COMPETITION IN DEDICATED ACCESS SERVICES, GAO 07-80 (2006), available at <http://www.gao.gov/new.items/d0780.pdf>.
- 74 *See Parties Asked to Comment on Analytical Framework Necessary to Resolve Issues in the Special Access NPRM*, WC Docket No. 05-25, Public Notice, 24 FCC Rcd 13638 (WCB 2009).
- 75 *See Pleading Cycle Established for Comments on Petition for Expedited Rulemaking Filed by Cbeyond, Inc.*, WC Docket No. 09-223, Public Notice, 24 FCC Rcd 14517 (WCB 2009) (requesting a rulemaking to provide competitive carriers with access to packetized bandwidth of incumbent LEC hybrid fiber-copper loops, fiber-to-the-home (FTTH) loops and fiber-to-the-curb (FTTC) loops at the same rates that incumbent LECs charge their own retail customers).
- 76 *Pleading Cycle Established For Comments On Petition For Expedited Rulemaking Regarding Section 271 Unbundling Obligations*, WC Docket No. 09-222, Public Notice, 24 FCC Rcd 14514 (WCB 2009); *Comment Sought On Maine Public Utilities Commission Petition For Declaratory Ruling Regarding Section 271 Access To Dark Fiber Facilities And Line Sharing*, WC Docket No. 10-14, Public Notice, 25 FCC Rcd 372 (WCB 2010).
- 77 *See* 47 U.S.C. § 271
- 78 A critical issue in establishing wholesale obligations is determining the appropriate price for wholesale access rights. Wholesale prices that are too high may deter efficient competitive entry, while prices that are too low may deter efficient investment by both incumbents and new entrants.
- 79 A recent study by the National Regulatory Research Institute commissioned by NARUC provides a general discussion of special access services and a history of the FCC and state regulatory approach to these services.

## CHAPTER 4 ENDNOTES

- Peter Bluhm & Dr. Robert Loube, *Competitive Issues in Special Access Markets, Rev. Ed.* (Nat'l Reg. Research Institute, Working Paper No. 09-02, 2009). For a discussion of potential, non-incumbent alternatives, see generally Patrick Brogan & Evan Leo, *High-Capacity Services: Abundant, Affordable and Evolving* (2009), attached to Letter from Glenn T. Reynolds, Vice President, Policy, USTelecom, to Marlene H. Dortch, Secretary, FCC, WC Docket No. 05-25, GN Docket 09-51 (Jul. 16, 2009) at 8–41.
- 80 For example, XO, a fiber-based competitive provider, reports that special access costs represent a “substantial portion” of their costs for serving customer that are not on their fiber network. XO Comments in re NBP PN #11 (*Comment Sought on Impact of Middle and Second Mile Access on Broadband Availability and Deployment—NBP Public Notice # 11*, GN Docket Nos. 09-47, 09-51, 09-137, Public Notice, 24 FCC Rcd 12470 (WCB 2009) (*NBP PN #11*)), filed Nov. 4, 2009, at 24; see also Letter from Thomas Jones, Counsel, tw telecom inc., to Marlene H. Dortch, Secretary, FCC, GN Docket Nos. 09-47, 09-51, 09-137 (Dec. 22, 2009) (tw telecom Dec. 22, 2009 *Ex Parte*).
- 81 The Western Telecommunications Alliance estimates that these connections typically constitute 20–40% of the cost of providing broadband service for its small, incumbent LEC members in the Western United States. Western Telecommunications Alliance Comments in re NBP PN #11, filed Nov. 4, 2009, at 6; see also Verizon Comments in re NBP PN #11, filed Nov. 4, 2009, at 4–5 (noting that “the cost and availability of middle- and second-mile facilities—generally together with other factors—have hindered the deployment of broadband in some instances” and that “high per-unit costs” for these connections “if passed on to consumers, would make broadband too expensive for most” consumers in low-density areas).
- 82 See, e.g., XO Comments in re NBP PN #11, filed Nov. 4, 2009, at 15–21 (arguing that restrictive terms and conditions on availability of certain pricing plans can effectively lock out customers from seeking competitive alternatives); tw telecom Dec. 22, 2009 *Ex Parte* at 9–11; GAO, FCC NEEDS TO IMPROVE ITS ABILITY TO MONITOR AND DETERMINE THE EXTENT OF COMPETITION IN DEDICATED ACCESS SERVICES, GAO 07-80 (2006), available at <http://www.gao.gov/new.items/d0780.pdf>.
- 83 See, e.g., *Qwest Petition for Forbearance Under 47 U.S.C. § 160(c) from Title II and Computer Inquiry Rules with Respect to Broadband Services*, WC Docket No. 06-125, Memorandum Opinion and Order, 23 FCC Rcd 12260 (2008); *Petition for of the Embarq Local Operating Companies for Forbearance Under 47 U.S.C. § 160(c) from Title II and Computer Inquiry Rules with Respect to Broadband Services; Petition of the Frontier and Citizens ILECs for Forbearance Under 47 U.S.C. § 160(c) from Title II and Computer Inquiry Rules with Respect to Broadband Services*, WC Docket No. 06-147, Memorandum Opinion and Order, 22 FCC Rcd 19478 (2007); *AT&T Fiber and Packet Services Forbearance Order*, 22 FCC Rcd 18705 (2007); *Petition of ACS of Anchorage, Inc. Pursuant to Section 10 of the Communications Act of 1934, as Amended (47 U.S.C. § 160(c)), for Forbearance from Certain Dominant Carrier Regulation of Its Interstate Access Services, and for Forbearance from Title II Regulation of Its Broadband Services, in the Anchorage, Alaska, Incumbent Local Exchange Carrier Study Area*, WC Docket No. 06-109, Memorandum Opinion and Order, 22 FCC Rcd 16304 (2007); *Verizon Telephone Companies' Petition for Forbearance from Title II and Computer Inquiry Rules with Respect to their Broadband Services Is Granted by Operation of Law*, WC Docket No 0440, News Release (rel. Mar. 20, 2006). Broadband providers have also asserted that as a result of these decisions, high-capacity Ethernet transport services have not been rolled out swiftly enough and at appropriate prices. See, e.g., tw telecom Dec. 22, 2009 *Ex Parte* at 10–11 (“In the absence of effective regulation of incumbent LEC wholesale Ethernet prices, the incumbent LECs charge prices that are so high that they effectively preclude TWTC and other competitors from relying on these facilities to serve off-net locations.”).
- 84 CenturyLink notes that “Ethernet is rapidly replacing special access circuits, offering more capacity for less.” Letter from Jeffrey S. Lanning, Director, Fed. Reg. Aff., CenturyLink, to Marlene H. Dortch, Secretary, FCC, WC Docket No. 05-25 (Nov. 4, 2009) Attach.; see also Letter from Thomas Jones, Counsel, tw telecom inc., to Marlene H. Dortch, Secretary, FCC, GN Docket No. 09-51 (Oct. 14, 2009) Attach.; tw telecom Dec. 22, 2009 *Ex Parte* at 2 (“The remarkable efficiencies of Ethernet make high-bandwidth business applications as well as telemedicine and remote job training programs affordable”).
- 85 See *Parties Asked to Comment on Analytical Framework Necessary to Resolve Issues in the Special Access NPRM*, WC Docket No. 05-25, Public Notice, 24 FCC Rcd 13638 (WCB 2009).
- 86 Estimates indicate that approximately 80% of business locations are served by copper because they are located in buildings that do not have fiber facilities. See Letter from Jerry Watts, Vice Pres., Gov’t and Indus. Aff., DeltaCom, to Marlene H. Dortch, Secretary, FCC, GN Docket Nos. 09-29, 09-47, 09-51 (Oct. 20, 2009) Attach. 2 at 4 (citing Vertical Systems Group); XO Comments in re NBP PN #11, filed Nov. 4, 2009, at 10.
- 87 See 47 C.F.R. §§ 51.325–51.335.
- 88 See, e.g., XO Comments in re NBP PN #11, filed Nov. 4, 2009, at 9; Letter from Karen Reidy, COMPTTEL, to Marlene H. Dortch, Secretary, FCC, GN Docket Nos. 09-47, 09-51, 09-137, RM-11358 (Dec. 7, 2009). When a copper facility is retired, to continue providing service a competitor needs to redesign its network or purchase special access circuits from the incumbent LEC. These special access connections are typically more expensive, may have different service characteristics, and may limit the competitor’s ability to differentiate its service.
- 89 See, e.g., GERALD W. BROCK, THE TELECOMMUNICATIONS INDUSTRY, THE DYNAMICS OF MARKET STRUCTURE 148 (1981); 47 U.S.C. § 251(a), (c)(2).
- 90 Letter from Matthew A. Brill, Counsel for Time Warner Cable, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 09-51 (Nov. 12, 2009) (TWC Nov. 12, 2009 *Ex Parte*) (outlining examples where Time Warner Cable has had difficulty obtaining basic interconnection rights in rural areas); Letter from Jeremy M. Kissel, MetroCast Cablevision of New Hampshire, LLC, to Marlene H. Dortch, Secretary, FCC, GN Docket Nos. 09-51, 09-137 (Dec. 18, 2009); Time Warner Cable Comments in re NBP PN #256 (*Comment Sought on Transition from Circuit-Switched Network to All IP-Network—NBP Public Notice #5*, GN Docket Nos. 09-47, 09-51, 09-137, Public Notice, 24 FCC Rcd 14272 (WCB 2009) (*NBP PN #25*)), filed Dec. 22, 2009, at 5–8; National Cable & Telecommunications Association Comments in re NBP PN #25, filed Dec. 22, 2009, at 5 n.12.
- 91 TWC Nov. 12, 2009 *Ex Parte* at 2–3 (Nov. 12, 2009) (citing *Sprint Commc’ns Co. L.P. v. Pub. Util. Comm’n of Tex.*, No. A-06-CA-065-SS, 2006 U.S. Dist. LEXIS 96569 (W.D. Tex. Aug. 14, 2006)).
- 92 See, e.g., TWC Nov. 12, 2009 *Ex Parte* at 3 (citing a decision by the Maine Public Utilities Commission); Letter from Jeremy M. Kissel, MetroCast Cablevision of New Hampshire, LLC, to Marlene H. Dortch, Secretary, FCC, GN Docket Nos. 09-51, 09-137 (Dec. 18, 2009) Attach. 2 at 15 (citing decisions in Texas, Maine, and North Dakota); Time Warner Cable Comments in re NBP PN #25, filed Dec. 22, 2009, at 5–8 (describing difficulties Time Warner Cable has had obtaining basic interconnection rights in rural areas).
- 93 See *Time Warner Cable Request for Declaratory Ruling that Competitive Local Exchange Carriers May Obtain Interconnection Under Section 251 of the Communications Act of 1934, As Amended, to Provide Wholesale Telecommunications Services to VoIP Providers*, WC Docket No. 06-55, Memorandum Opinion and Order, 22 FCC Rcd 3513 (2007). All telecommunications carriers have a basic duty to interconnect under Section 251(a). See 47 U.S.C. § 251(a). A rural carrier’s rural exemption under Section 251(f) does not impact this obligation. See 47 U.S.C. § 251(f)(1).
- 94 IP-to-IP interconnection is addressed in the inter-carrier compensation discussion in Chapter 8 *infra*.
- 95 See *Reexamination of Roaming Obligations of Commercial Mobile Radio Service Providers*, WT Docket No. 05-265, Report and Order and Further Notice of Proposed Rulemaking, 22 FCC Rcd 15817 (2007).
- 96 “Set-top box” is one example of video navigation devices, which are defined in 47 C.F.R. § 76.1200 as interactive communications equipment used by consumers to access multichannel video programming and other services offered over multichannel video programming systems. We use “set-top box” to broadly include set-top boxes, digital video recorders (DVRs), and home theater PCs (HTPCs).
- 97 TiVo Comments in re NBP PN #27 (*Comment Sought on Video Device Innovation—NBP Public Notice #27*, GN Docket Nos. 09-47, 09-51, 09-137, Public Notice, 24 FCC Rcd 14280 (MB 2009) (*NBP PN #27*)), filed Dec. 22, 2009, at 12; Consumer Electronics Association Comments in re NBP PN #27, filed Dec. 21, 2009, at 15; Public Knowledge et al., *Petition for Rulemaking*, CS Docket No. 97-80, GN Docket Nos. 09-47, 09-51,

## CHAPTER 4 ENDNOTES

- 09-137, at 12–14 (Dec. 18, 2009) (Public Knowledge et al. Video Device Competition Petition) (asking “that the Commission initiate a rulemaking to address the lack of competition in the video device market”); Verizon Comments in re NBP PN #27, filed Dec. 22, 2009, at 6.
- 98 Public Knowledge et al. Video Device Competition Petition at 11–12; Consumer Electronics Association Comments in re NBP PN #27, filed Dec. 21, 2009, at 15; Sony Electronics Inc. (Sony) Comments in re NBP PN #27, filed Dec. 21, 2009, at 3.
- 99 TiVo Comments in re NBP PN #27, filed Dec. 22, 2009, at 4, 9; Public Knowledge et al. Video Device Competition Petition, filed Dec. 18, 2009, at 20–21; Consumer Electronics Association Comments in re NBP PN #27, filed Dec. 21, 2009, at 15.
- 100 For example, innovation in computing devices, such as the creation of graphical user interfaces, contributed to the proliferation of software applications developed for the PC. Furthermore, innovation in mobile devices, such as the introduction of the iPhone and Android, has led to the development and launch of hundreds of thousands of new mobile applications.
- 101 Consumer Electronic Retailers Coalition Comments in re NBP PN #27, filed Dec. 21, 2009, at 11–12; Sony Comments in re NBP PN #27, filed Dec. 21, 2009, at 3.
- 102 Section 629 covers equipment used to receive video programming—including cable set-top boxes, televisions, and DVRs—as well as equipment used to receive other services offered over MVPD systems, including cable modems. See 47 U.S.C. § 549 (codifying section 629 of the Telecommunications Act of 1996).
- 103 See 142 CONG. REC. H1170 (daily ed. Feb. 1, 1996) (statement of Rep. Markey: “[The provision would] help to replicate for the interactive communications equipment market the success that manufacturers of customer premises equipment (CPE) have had in creating and selling all sorts of new phones, faxes, and other equipment subsequent to the implementation of rules unbundling CPE from common carrier networks.”).
- 104 *Implementation of Section 304 of the Telecommunications Act of 1996; Commercial Availability of Navigation Devices*, CS Docket No. 97-80, Report and Order, 13 FCC Rcd 14775 (1998).
- 105 The FCC directly exempted satellite operators (e.g., DirecTV and DISH Network), since they operate throughout the United States and offer devices for retail sale through unaffiliated vendors, and certain Internet Protocol TV (IPTV) providers, primarily small telephone cooperatives. AT&T (an IPTV provider) has neither requested nor received a waiver for its U-Verse service. Verizon FiOS is considered a cable service for regulatory purposes and is not exempted from Section 629.
- 106 *Implementation of Section 304 of the Telecommunications Act of 1996; Commercial Availability of Navigation Devices*, CS Docket No. 97-80, Second Report and Order, 20 FCC Rcd 6794, 6802–03, 6814, paras. 13, 31 (2005).
- 107 DELL’ORO GROUP, SET-TOP BOX REPORT 89 (3Q 2009).
- 108 The Hirfindahl-Hirschman Index (HHI) for cable set-top boxes in North America exceeds 5100, well above the threshold of 1800 for “concentrated” markets. See DELL’ORO GROUP, SET-TOP BOX REPORT 89 (3Q 2009). This is not typical for consumer electronics markets, which have relatively lower fixed costs when compared, for example, with network services markets. For example, the 2002 U.S. Census Economic Survey estimated that the four largest audio and video equipment manufacturers (NAICS 3343) held about 46% of the market and the HHI to be about 894, well below the DOJ’s threshold of 1000 for “unconcentrated” markets. U.S. CENSUS BUREAU, CONCENTRATION RATIOS 2002, 2002 ECONOMIC CENSUS: MANUFACTURING 51–52 (2006), available at <http://www.census.gov/prod/ec02/ec0231sr1.pdf>.
- 109 DELL’ORO GROUP, SET-TOP BOX REPORT 89 (3Q 2009). Annual figures from 2006 to 2009 (through Q3). The top two manufacturers in the European cable set-top box market during that time period were Thomson and Pace; three other manufacturers—Motorola, Cisco, and ADB Group—also each captured more than a 10% share.
- 110 456,000 CableCARDS have been deployed by the top 10 operators, who collectively have 90% share of overall cable customers. NAT’L CABLE & TELECOMM. ASS’N, FCC CABLECARD QUARTERLY REPORT, SEPT.–NOV. 2009 (2009).
- 111 41.5 million digital cable subscribers, see SNL KAGAN (A DIVISION OF SNL FINANCIAL LC), CABLE MSO INDUSTRY BENCHMARKS (June 2009), multiplied by a conservative range of 1.2–1.5 set-top boxes per household, totals 49.8–62.3 million set-top boxes.
- 112 Examples include: gaming systems (e.g., Sony Playstation 3, Xbox 360), blu-ray DVD players, Internet video devices (e.g., AppleTV, Roku), Internet sites/applications (e.g., Google, Amazon, Netflix, Hulu), hybrid broadcast-broadband content providers (e.g., Sezmi).
- 113 Estimated share of US households with Apple TV or Roku is 1%. Letter from Bruce Leichtman, President, Leichtman Research Group (LRG), to Marlene H. Dortch, Secretary, FCC, GN Docket Nos. 09-47, 09-51, 09-137 (Jan. 4, 2010) (LRG Jan. 4, 2010 *Ex Parte*).
- 114 TiVo Comments in re NBP PN #27, filed Dec. 22, 2009, at 2–6; Public Knowledge et al. Video Device Competition Petition at 2–3, 6–10, 25–26; Consumer Electronics Association Comments in re NBP PN #27, filed Dec. 21, 2009, at 6–10, 13; Consumer Electronic Retailers Coalition Comments in re NBP PN #27, filed Dec. 21, 2009, at 4–9; Verizon Comments in re NBP PN #27, filed Dec. 22, 2009, at 10–11; Letter from Kyle McSlarrow, President and CEO, NCTA, to Carlos Kirjner, Senior Advisor to the Chairman on Broadband, and William Lake, Chief, Media Bureau, FCC, GN Docket Nos. 09-47, 09-51, 09-137, CS Docket No. 97-80 (Dec. 4, 2009) (NCTA Dec. 4, 2009 *Ex Parte*) at 3; Letter from Jeffrey Kardatzke, CTO & Founder, and Mike Machado, CEO, SageTV to Marlene H. Dortch, Secretary, FCC, GN Docket Nos. 09-47, 09-51, 09-137 (Jan. 29, 2010) (SageTV Jan. 29, 2010 *Ex Parte*).
- 115 For example, Steve Jobs explains Apple’s decision not to produce Apple TV as a set-top box with access to traditional TV content through MVPDs: “The minute you have an STB you have gnarly issues, CableCARD, OCAP . . . that just isn’t something we would choose to do ourselves. We couldn’t see a go-to-market strategy that makes sense.” Ryan Block, *Steve Jobs Live from D 2007*, ENGADGET, May 30, 2007, <http://www.engadget.com/2007/05/30/steve-jobs-live-from-d-2007>; see also Auction Network Comments in re NBP PN #27, filed Dec. 18, 2009, at 1–3.
- 116 All totals as of Sept. 30, 2009. See SNL KAGAN (A DIVISION OF SNL FINANCIAL LC), TOP CABLE MSOs (2009) (providing cable company totals), available at <http://www.snl.com/InteractiveX/TopCableMSOs.aspx> (requires registration); DirecTV, *The DirecTV Group Announces Third Quarter 2009 Results* (press release), Nov. 5, 2009, <http://investor.directv.com/releasedetail.cfm?ReleaseID=422185> (providing DirecTV totals); DISH Network, *DISH Network Corporation Reports Third Quarter 2009 Financial Results* (press release), Nov. 9, 2009, <http://dish.client.shareholder.com/releasedetail.cfm?ReleaseID=422698> (providing DISH Network totals); VERIZON, VERIZON COMMUNICATIONS INVESTOR QUARTERLY (3Q 2009) (providing Verizon FiOS totals), available at <http://investor.verizon.com/financial/quarterly/vz/3Q2009/3Q2009.pdf>; AT&T, AT&T FINANCIAL AND OPERATIONAL RESULTS 13 (4Q 2009) (providing AT&T U-Verse totals), available at [http://www.att.com/Investor/Growth\\_Profile/download/master\\_Q4\\_09.pdf](http://www.att.com/Investor/Growth_Profile/download/master_Q4_09.pdf).
- 117 TiVo Comments in re NBP PN #27, filed Dec. 22, 2009, at 9–10; Public Knowledge et al. Video Device Competition Petition at 36.
- 118 Verizon Comments in re NBP PN #27, filed Dec. 22, 2009, at 10–12; Sony Comments in re NBP PN #27, filed Dec. 21, 2009, at 5; Netmagic Solutions Inc. (Netmagic) Comments in re NBP PN #27, filed Dec. 21, 2009, at 3; Nagravision Comments in re NBP PN #27, filed Dec. 21, 2009, at 2–3.
- 119 The standards for the gateway device should be determined by industry standard-setting bodies, in consultation with the FCC. TiVo Comments in re NBP PN #27, filed Dec. 22, 2009, at 11, 13–15; Public Knowledge et al. Video Device Competition Petition at 31–33, 35; Verizon Comments in re NBP PN #27, filed Dec. 22, 2009, at 3, 5; Sony Comments in re NBP PN #27, filed Dec. 21, 2009, at 3.
- 120 TiVo Comments in re NBP PN #27, filed Dec. 22, 2009, at 2, 5, 17; Consumer Electronics Association Comments in re NBP PN #27, filed Dec. 21, 2009, at 18; Public Knowledge et al. Video Device Competition Petition at 36. Retail devices may transcode or otherwise degrade the quality of the video signal as necessary to ensure compatibility with specific screen sizes, functionality, and form factors.
- 121 TiVo Comments in re NBP PN #27, filed Dec. 22, 2009, at 2–3, 18–19; Public Knowledge et al. Video Device Competition Petition at 8–9, 34–35; Consumer Electronics Association Comments in re NBP PN #27, filed Dec. 21, 2009, at 16; SageTV *Ex Parte* in re NBP PN #27, filed Feb. 16, 2010, at 7, 12.
- 122 Sony Comments in re NBP PN #27, filed Dec. 21, 2009, at 3.
- 123 See *Implementation of Section 304 of the*



## CHAPTER 4 ENDNOTES

- Telecommunications Act of 1996; Commercial Availability of Navigational Devices*, GN Docket No. 97-80, Notice of Proposed Rulemaking, 12 FCC Rcd 5639 (1997); *Implementation of Section 304 of the Telecommunications Act of 1996; Commercial Availability of Navigational Devices*, GN Docket No. 97-80, Further Notice of Proposed Rulemaking and Declaratory Ruling, 15 FCC Rcd 18199 (2000); *Implementation of Section 304 of the Telecommunications Act of 1996; Commercial Availability of Navigational Devices and Compatibility Between Cable Systems and Consumer Electronics Equipment*, GN Docket Nos. 97-80, 00-67, Further Notice of Proposed Rulemaking, 18 FCC Rcd 518 (2003); *Implementation of Section 304 of the Telecommunications Act of 1996; Commercial Availability of Navigational Devices and Compatibility Between Cable Systems and Consumer Electronics Equipment*, GN Docket Nos. 97-80, 00-67, Third Further Notice of Proposed Rulemaking, 22 FCC Rcd 12024 (2007); *A National Broadband Plan for Our Future*, GN Docket No. 09-51, Notice of Inquiry, 24 FCC Rcd 4342 (2009) (*National Broadband Plan NOI*).
- 124 Public Knowledge Comments in re NBP PN #30 (*Reply Comments Sought in Support of National Broadband Plan—NBP Public Notice #30*, GN Docket Nos. 09-47, 09-51, 09-137, Public Notice, 25 FCC Rcd 241 (WCB 2010) (*NBP PN #30*)), filed Jan. 27, 2010, at 11–13. We note that there are open questions to resolve as part of the rulemaking proceeding regarding the gateway architecture. See, e.g., National Cable & Telecommunications Association Comments in re NBP PN #30, filed Jan. 27, 2010, at 11–15; Sage TV *Ex Parte* in re NBP PN #27, filed Feb. 16, 2010, at 1–11; TiVo Reply in re NBP PN #27, filed Feb. 17, 2010, at 9–15.
- 125 TiVo Comments in re NBP PN #27, filed Dec. 22, 2009, at 4 (filed by Matthew Zinn); Public Knowledge et al. Video Device Competition Petition, filed Dec. 18, 2009, at 10.
- 126 Public Knowledge et al. Video Device Competition Petition, filed Dec. 18, 2009, at 14, 26–27; Consumer Electronics Association Comments in re NBP PN #27, filed Dec. 22, 2009, at 14–15; Consumer Electronics Retailers Coalition Comments in re NBP PN #27, filed Dec. 22, 2009, at 9.
- 127 Public Knowledge et al. Video Device Competition Petition, filed Dec. 18, 2009, at 6–7; Consumer Electronics Retailers Coalition Comments in re NBP PN #27, filed Dec. 22, 2009, at 7.
- 128 TiVo Comments in re NBP PN #27, filed Dec. 22, 2009, at 3 (filed by Matthew Zinn); Public Knowledge et al. Video Device Competition Petition, filed Dec. 18, 2009, at 3, 9, 26; SageTV Jan. 29, 2010 *Ex Parte* at 1–2.
- 129 TiVo Comments in re NBP PN #27, filed Dec. 22, 2009, at 4, 7 (filed by Matthew Zinn); Public Knowledge et al. Video Device Competition Petition, filed Dec. 18, 2009, at 10, 25–26; Consumer Electronics Association Comments in re NBP PN #27, filed Dec. 22, 2009, at 13; Letter from Matthew Zinn, Senior Vice President, General Counsel, Secretary & Chief Privacy Officer, TiVo, to Marlene H. Dortch, Secretary, FCC, GN Docket Nos. 09-47, 09-51, 09-137, CS Docket No. 97-80 (Feb. 17, 2010) (TiVo Feb. 17, 2010 *Ex Parte*), at 2–4. Cable headends with SDV would need to install a server that translates between standard IP signals from the retail CableCARD device and the operator's proprietary network. The FCC may consider a two-step process in its rules: first, cable systems with SDV would need to deploy SDV tuning adapters immediately to support all retail CableCARD devices; second, within three to six months, those cable systems would need to install the servers required to allow IP communication without SDV tuners. Cable operators could voluntarily skip the first step if they are prepared to deploy servers in their headends immediately.
- 130 Public Knowledge et al. Video Device Competition Petition, filed Dec. 18, 2009, at 14; Consumer Electronic Association Comments in re NBP PN #27, filed Dec. 21, 2009, at 3; Consumer Electronic Retailers Coalition Comments in re NBP PN #27, filed Dec. 21, 2009, at 9.
- 131 Consumer Electronic Retailers Coalition Comments in re NBP PN #27, filed Dec. 21, 2009, at 12. For example, operators should make a self-install option available for retail CableCARD devices if such an option is available for leased set-top boxes.
- 132 Public Knowledge et al. Video Device Competition Petition at 8–9; SageTV *Ex Parte* in re NBP PN #27, filed Feb. 16, 2010, at 9.
- 133 TiVo Feb. 17, 2010 *Ex Parte* at 3.
- 134 Network Advertising Initiative Comments in re NBP PN #29 (*Comments Sought on Privacy Issues Raised by the Center for Democracy and Technology—NBP Public Notice #29*, GN Docket Nos. 09-47, 09-51, 09-137, Public Notice, 25 FCC Rcd 244 (WCB 2010) (*NBP PN #29*)), filed Jan. 22, 2010, at 1–4.
- 135 While online advertising rates are highly variable, this calculation is based on “generic” ad “cost per thousand impressions” (CPMs) being roughly \$1–3, while targeted advertisements are estimated to command above \$10 CPMs. Even more specialized types of advertising, such as targeted “cost-per-click” and search-based advertising, have been estimated at even higher rates. For example, according to eMarketer, Credit Suisse estimated average CPM at \$2.39 in 2009 and \$2.46 in 2008. *How Much Ads Cost*, EMARKETER.COM, April 23, 2009, <http://www.emarketer.com/Article.aspx?R=1007053>. JP Morgan forecasted aggregate (generic and targeted) CPM of \$3.05 in 2009, down from a high of \$3.50 in 2006. Erick Schonfeld, *JPMorgan Forecasts A 10.5 Percent Rebound In U.S. Display Advertising in 2010*, TECHCRUNCH, Jan. 4 2010, <http://techcrunch.com/2010/01/04/jpmorgan-advertising-2010/>. The ad tracking firm Adify estimates CPM rates across several verticals from \$3–12 CPM, although this is not split between behavioral and generic advertising. *The Average CPM Rates Across Different Verticals*, DIGITALINSPIRATION, Nov. 25, 2009, <http://www.labnol.org/internet/average-cpm-rates/11315/>. However, more targeted advertising, such as video or search results, commanded far higher overall “per thousand impression” rates of \$20–70 or more. *How Much Ads Cost*, EMARKETER.COM, Apr. 23, 2009, <http://www.emarketer.com/Article.aspx?R=1007053>.
- While dated, Advertising.com's study of non-targeted impressions versus targeted impressions demonstrated similar results of 3–6x benefits from targeting. See Robyn Greenspan, *Behavioral Targeting Study Reveals CPM Lift*, CLICKZ, Aug. 17, 2004, <http://www.clickz.com/3396431>. For an easily readable overview of online advertising, see *Online Advertising: The Ultimate Marketing Machine*, ECONOMIST, July 6, 2006, available at [http://www.economist.com/businessfinance/displaystory.cfm?story\\_id=7138905](http://www.economist.com/businessfinance/displaystory.cfm?story_id=7138905).
- 136 Charter Communications Comments in re NBP PN #29, filed Jan. 22, 2010, at 3; National Advertising Initiative Comments in re NBP PN #29, filed Jan. 22, 2009, at 6.
- 137 Industry has realized the challenges of responsibly collecting this data and delivering targeted ads, and many groups have worked to create voluntary self-regulation standards, often alongside or spurred through FTC initiatives. See, e.g., AM. ASS'N OF ADVERTISING AGENCIES ET AL., SELF REGULATORY PRINCIPLES FOR ONLINE BEHAVIORAL ADVERTISING (2009), available at <http://www.iab.net/media/file/ven-principles-07-01-09.pdf>
- 138 See, e.g., Center for Democracy and Technology Comments in re NBP PN #29, filed Jan. 22, 2009, at 4, 19–26 (discussing “Trusted Identity Providers”); AT&T Comments in re NBP PN #29, filed Jan. 22, 2009, at 6 (discussing “OpenID” and Information Cards).
- 139 See Network Advertising Initiative Comments in re NBP PN #29, filed Jan. 22, 2010, at 6 (providing more detail on “cookies”); CDT Comments in re NBP PN #29, filed Jan. 22, 2010; Data Foundry Comments in re NBP PN #29, filed Jan. 22, 2010, at 2–3.
- 140 The latest version of the two most common browsers, Microsoft's Internet Explorer and Mozilla's Firefox, offer “secure” or “private” browsing that limits cookie activity. See Microsoft, Stay Safer Online, <http://www.microsoft.com/windows/internet-explorer/features/safer.aspx> (last visited Mar. 6, 2010); Mozilla, Private Browsing, <http://support.mozilla.com/en-US/kb/Private+browsing> (last visited Mar. 6, 2010). Other companies also help consumers track and understand data collection. See Ghostery, <http://www.ghostery.com/> (last visited Mar. 6, 2010). But this is limited today. See AT&T Comments in re NBP PN #29, filed Jan. 22, 2010, at 6 (citing PrivacyChoice.org Comments, Analysis of Ad-Targeting Privacy Policies and Practices, Federal Trade Commission Exploring Privacy Roundtable Series, Dec. 4, 2009).
- 141 David Vladeck, Director, Fed. Trade Comm'n Bureau of Consumer Protection, Privacy: Where Do We Go From Here?, Remarks at the International Conference of Data Protection and Privacy Commissioners 4 (Nov. 6, 2009) (Vladeck, Privacy: Where Do We Go From Here?) (“Disclosures are now as long as treatises, they are written by lawyers—trained in detail and precision, not clarity—so they even sound like treatises, and like some treatises, they are difficult to comprehend, if they are read at all. It is not clear that consent today actually reflects a conscious choice by consumers.”), available at <http://www.ftc.gov/speeches/vladeck/091106dataprotection.pdf>; Center for Democracy and Technology Comments in re NBP PN

## CHAPTER 4 ENDNOTES

- #29, filed Jan. 22, 2010, at 9–10.
- 142 Center for Democracy and Technology Comments in re NBP PN #29, filed Jan. 22, 2010, at 8.
- 143 John B. Horrigan, *Broadband Adoption and Use in America* 17 (OBI Working Paper No. 1, 2010) (Horrigan, *Broadband Adoption and Use in America*).
- 144 See FED. TRADE COMM'N, PROTECTING PERSONAL INFORMATION: A GUIDE FOR BUSINESS, available at <http://www.ftc.gov/bcp/edu/pubs/business/idtheft/bus69.pdf> (2008). For example, the FTC has found violations of Section 5 of the Federal Trade Commission Act, 15 U.S.C. § 45, because a company's privacy practices were false and misleading, see, e.g., In re Gateway Learning Corp., 2004 WL 1632833 (FTC July 7, 2004); In re GeoCities, 1998 WL 473217 (FTC Aug. 13, 1998), and for failure to implement reasonable and appropriate measures to protect personal information, see, e.g., In re Life Is Good, Inc., 2008 WL 258309 (FTC Jan. 17, 2008); In re Petco Animal Supplies, Inc., 2004 WL 2682593 (FTC Nov. 8, 2004); In re MTS, Inc. d/b/a/ Tower Records/Books/Video, 2004 WL 963226 (FTC Apr. 21, 2004); In re Guess?, Inc., 2003 WL 21406017 (FTC June 18, 2003); In re Eli Lilly, 133 F.T.C. 20 (2002). The FTC also has found violations of Section 5 and the Gramm-Leach-Bliley Act, 15 U.S.C. §§ 6801–6809, for failure to provide reasonable and appropriate security for consumers' sensitive personal information, see, e.g., In re Goal Financial, LLC, 2008 WL 625340 (FTC Mar. 4, 2008); In re Premier Capital Lending, Inc., 2008 WL 4892987 (FTC Nov. 6, 2008).
- 145 47 U.S.C. §§ 222, 551.
- 146 Center for Democracy and Technology Comments in re NBP PN #29, filed Jan. 22, 2010, at 4.
- 147 18 U.S.C. §§ 2510–2521 (protecting against acquisition of the content of communications without the consent of one of the parties to the communication).
- 148 See *In re DoubleClick, Inc. Privacy Litigation*, 154 F. Supp. 2d 497 (S.D.N.Y. 2001), available at [http://www.hbbllc.com/courses/infosec/ecpa/154\\_fsupp2d\\_497.pdf](http://www.hbbllc.com/courses/infosec/ecpa/154_fsupp2d_497.pdf); see also Cybertelecom, Electronic Communications Privacy Act (ECPA), <http://www.cybertelecom.org/security/ecpaexception.htm> (last visited Feb. 17, 2010) (explaining the ECPA).
- 149 15 U.S.C. § 6801 et seq.
- 150 For example, a cable operator must inform its subscribers what personally identifiable information it collects, how it is used and for how long it is kept, and the cable operator may not disclose such information without the prior consent of the subscriber. See 47 U.S.C. § 551. Similarly, customers of telecommunications carriers have statutory protections against the non-consensual disclosure of information about the telecommunications service or habits of the customer, such as to or from whom the customer makes or receives calls, call location (if mobile), and the times that calls are made. See 47 U.S.C. § 222. Although privacy protections exist for traditional services and have even been applied to newer services like interconnected VoIP, see 47 C.F.R. § 64.2003(k), it is unclear whether, and to what extent, these protections apply to broadband ISPs. See, e.g., *Klimas v. Comcast Cable, Inc.*, 465 F.3d 271, 276 (6th Cir. 2006) (finding that section 631 does not apply to the broadband ISP services offered by a cable operator).
- 151 See 47 U.S.C. §§ 222, 531.
- 152 See generally 45 C.F.R. Part 164, Subpart E (Privacy of Individually Identifiable Health Information).
- 153 See 15 U.S.C. § 6809 (defining “nonpublic personal information”).
- 154 Wendy Davis, *Court: IP Addresses Are Not Personally Identifiable Information*, MEDIAPOST, July, 6, 2009, [http://www.mediapost.com/publications/?fa=Articles.showArticle&art\\_aid=109242](http://www.mediapost.com/publications/?fa=Articles.showArticle&art_aid=109242).
- 155 See, e.g., 18 U.S.C. § 1514A (protecting employees who blow the whistle on publicly traded companies); 42 U.S.C. § 7622 (protecting employees who disclose possible violations of the Clean Air Act); 49 U.S.C. § 31105 (protecting employees who disclose possible violations of safety regulations for commercial motor vehicles); see also WhistleBlowerLaws, [http://whistleblowerlaws.com/index.php?option=com\\_content&task=view&id=141&Itemid=54](http://whistleblowerlaws.com/index.php?option=com_content&task=view&id=141&Itemid=54) (last visited Feb. 17, 2010) (login is required).
- 156 See, e.g., *McIntyre v. Ohio Elections Comm'n*, 514 U.S. 334, 357 (1995) (“Anonymity is a shield from the tyranny of the majority.”).
- 157 *Reno v. ACLU*, 521 U.S. 844, 870 (1997).
- 158 Vladeck, Privacy: Where Do We Go From Here? at 4.
- 159 The FTC has begun a series of public roundtable discussions to explore the privacy challenges posed by the vast array of 21st century technology and business practices that collect and use consumer data. The first roundtable discussion took place on December 7, 2009. The second took place on January 29, 2010. The third is scheduled to take place on March 17, 2010. See Federal Trade Commission Comments in re NBP PN #21 (*Comment Sought on Data Portability and Its Relationship to Broadband—NBP Public Notice #21*, GN Docket Nos. 09-47, 09-51, 09-137, 24 FCC Red 13816 (WCB 2009) (*NBP PN #21*)), filed Dec. 9, 2009, at 2–3; FTC Comments in re NBP PN #29, filed Jan. 22, 2010; see also Fed. Trade Comm'n, Exploring Privacy: A Roundtable Series, <http://www.ftc.gov/bcp/workshops/privacyroundtables/index.shtml> (last visited Mar. 5, 2010).
- 160 See Fed. Trade Comm'n, Enforcing Privacy Promises: Section 5 of the FTC Act, <http://www.ftc.gov/privacy/privacyinitiatives/promises.html> (last visited Mar. 5, 2010).
- 161 See FED. TRADE COMM'N, FTC STAFF REPORT: SELF-REGULATORY PRINCIPLES FOR ONLINE BEHAVIORAL ADVERTISING 11–12, 46–47 (2009) (FTC STAFF REPORT 2009), available at <http://www.ftc.gov/os/2009/02/P085400behavareport.pdf>.
- 162 For example, a number of online search companies have developed policies and procedures to inform consumers about online tracking and provide additional protections and controls. See FTC STAFF REPORT 2009 at 12 (noting that Yahoo! and Google allow consumers to opt out of targeted advertising). And industry coalitions and trade associations, including the largest online advertising networks, have developed self-regulating principles for online data management practices and begun cooperative efforts. See NETWORK ADVERTISING INITIATIVE, 2008 NAI PRINCIPLES, THE NETWORK ADVERTISING INITIATIVE'S SELF-REGULATORY CODE OF CONDUCT (2008), available at [http://www.networkadvertising.org/networks/2008%20NAI%20Principles\\_final%20for%20website.pdf](http://www.networkadvertising.org/networks/2008%20NAI%20Principles_final%20for%20website.pdf); see also CTIA, BEST PRACTICES AND GUIDELINES FOR LOCATION BASED SERVICES (2008), available at [http://files.ctia.org/pdf/CTIA\\_LBS\\_BestPracticesandGuidelines\\_04\\_08.pdf](http://files.ctia.org/pdf/CTIA_LBS_BestPracticesandGuidelines_04_08.pdf); FTC STAFF REPORT 2009 at 14; K.C. Jones, *Agencies to Self-Regulate Online Behavioral Ads*, INFO. WEEK, Jan. 13, 2009, <http://www.informationweek.com/news/showArticle/jhtml?articleID=212900156>; Interactive Advertising Bureau, Privacy Principles, [http://www.iab.net/iab\\_products\\_and\\_industry\\_services/508676/508813/1464](http://www.iab.net/iab_products_and_industry_services/508676/508813/1464) (last visited Feb. 18, 2010).
- 163 See Federal Trade Commission Comments in re NBP PN #21, filed Dec. 9, 2009, at 2–3; Federal Trade Commission Comments in re NBP PN #29, filed Jan. 22, 2010; see also Fed. Trade Comm'n, Exploring Privacy: A Roundtable Series, <http://www.ftc.gov/bcp/workshops/privacyroundtables/index.shtml> (last visited Mar. 5, 2010).
- 164 For details on how the Privacy Act and the collection of personal data impact other aspects of the broadband ecosystem, see *infra* Chapters 10 11, 12, and 14.
- 165 See, e.g., Center for Democracy and Technology Comments in re NBP PN #29, filed Jan. 22, 2010, at 4, 19–26 (discussing “Trusted Identity Providers”); AT&T Inc. Comments in re NBP PN #29, filed Jan. 22, 2010, at 6 (discussing “OpenID” and Information Cards).
- 166 See Fed. Deposit Ins. Corp., Who is the FDIC?, <http://www.fdic.gov/about/learn/symbol/index.html> (last visited Mar. 5, 2010) (providing the history of the FDIC).
- 167 As part of any rulemaking or processing, the FTC and FCC would also need to define “third parties” to account for the complex relationships of companies with affiliates, other subsidiaries and trusted intermediaries.
- 168 In fact, according to data from the Technology Policy Institute, only 11% of identity fraud cases involve the Internet. THOMAS M. LENARD & PAUL H. RUBIN, TECH. POL'Y INST., IN DEFENSE OF DATA: INFORMATION AND THE COSTS OF PRIVACY 7 (2009), available at <http://www.techpolicyinstitute.org/files/in%20defense%20of%20data.pdf>.
- 169 Gartner, *Gartner Says Number of Identity Theft Victims Has Increased More Than 50 Percent Since 2003* (press release), Mar. 6, 2007, <http://www.gartner.com/it/page.jsp?id=501912>; ConnectSafely, Online Safety 3.0: Empowering and Protecting Youth, Connect Safely, <http://www.connectsafely.org/Commentaries-Staff/online-safety-30-empowering-and-protecting-youth.html> (last visited Feb. 18, 2010).
- 170 FED. TRADE COMM'N, CONSUMER SENTINEL NETWORK DATA BOOK FOR JANUARY–DECEMBER 2008 5 (2009) (FTC, CONSUMER SENTINEL NETWORK DATA BOOK 2008); see also INTERNET CRIME COMPLAINT CENTER (IC3), 2008 INTERNET CRIME REPORT 4 (2008) (IC3, 2008 INTERNET CRIME REPORT) (showing that identity theft represented 2.5% of the total complaints received in 2008 by the Internet Crime Complaint Center), available at <http://www.ic3>.

## CHAPTER 4 ENDNOTES

- gov/media/annualreport/2008\_ic3report.pdf.
- 171 FTC, CONSUMER SENTINEL NETWORK DATA BOOK 2008 at 3.
- 172 A.F. Salam et al., *Consumer-Perceived Risk in E-Commerce Transactions*, 23 COMM'NS OF THE ACM 325 (2003), available at <http://www.som.buffalo.edu/isinterface/papers/Consumer-Perceived%20Risk%20in%20E-Commerce.pdf>.
- 173 IC3, 2008 INTERNET CRIME REPORT at 1.
- 174 GAO, IDENTITY THEFT: PREVALENCE AND COST APPEAR TO BE GROWING II, GAO-02-363 (2002) ("Regarding state statutes, at the time of our 1998 report, very few states had specific laws to address identity theft. Now, less than 4 years later, a large majority of states have enacted identity theft statutes.").
- 175 See Fed. Trade Comm'n, ID Theft, Privacy, & Security: Identity Theft, <http://www.ftc.gov/bcp/menus/consumer/data/idt.shtm> (last visited Mar. 5, 2010).
- 176 The Data Accountability and Trust Act, H.R. 2221, 111th Cong. (2009), would require entities that store personal information to protect the data through security policies and procedures and to provide nationwide notice in the event of a security breach while the Personal Data Privacy and Security Act of 2009, S. 1490, 111th Cong. (2009), would increase criminal penalties for identity theft involving electronic personal data and make it a crime to intentionally or willfully conceal a security breach involving personal data.
- 177 *U.S. v. Morris*, 928 F.2d 504 (2d Cir. 1991).
- 178 CERT, Meet CERT, [http://www.cert.org/meet\\_cert/](http://www.cert.org/meet_cert/) (last visited Mar. 5, 2010).
- 179 APWG, PHISHING ACTIVITY TRENDS REPORT: 1ST HALF 2009 (2009) (APWG, PHISHING ACTIVITY TRENDS REPORT), available at [http://www.antiphishing.org/reports/apwg-report\\_h1\\_2009.pdf](http://www.antiphishing.org/reports/apwg-report_h1_2009.pdf).
- 180 APWG, PHISHING ACTIVITY TRENDS REPORT.
- 181 WHITE HOUSE, CYBERSPACE POLICY REVIEW: ASSURING A TRUSTED AND RESILIENT INFORMATION AND COMMUNICATIONS INFRASTRUCTURE NSPD-54/HSPD23 (May 2009), available at [http://www.whitehouse.gov/assets/documents/Cyberspace\\_Policy\\_Review\\_final.pdf](http://www.whitehouse.gov/assets/documents/Cyberspace_Policy_Review_final.pdf).
- 182 Horrigan, *Broadband Adoption and Use in America* at 17.
- 183 TANYA BYRON, SAFER CHILDREN IN A DIGITAL WORLD: THE REPORT OF THE BYRON REVIEW 2 (2008), available at <http://www.dcsf.gov.uk/byronreview/pdfs/Final%20Report%20Bookmarked.pdf>.
- 184 BERKMAN CTR. FOR INTERNET & SOC'Y, ENHANCING CHILD SAFETY & ONLINE TECHNOLOGIES: FINAL REPORT OF THE INTERNET SAFETY TECHNICAL TASK FORCE 5 (2008), available at [http://cyber.law.harvard.edu/sites/cyber.law.harvard.edu/files/ISTTF\\_Final\\_Report.pdf](http://cyber.law.harvard.edu/sites/cyber.law.harvard.edu/files/ISTTF_Final_Report.pdf).
- 185 Anne Collier, *It's Time to Get Smart About Online Safety*, SCH. LIBR. J., Nov. 1, 2009, available at <http://www.schoollibraryjournal.com/article/CA6703696.html>.
- 186 COMPUTER SCI. & TELECOMM. BD., YOUTH, PORNOGRAPHY, AND THE INTERNET 9 (Dick Thornburgh & Herbert S. Lin, eds., 2002), available at <http://www.nap.edu/openbook.php?isbn=0309082749> (requires purchase).
- 187 Letter from Susan L. Fox, Vice Pres. of Gov't Relations, Disney, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 09-191, WC Docket No. 07-52 (Dec. 11, 2009) at 1; Letter from Harold Feld, Legal Dir., Public Knowledge, to Marlene H. Dortch, Secretary, FCC, CB Docket No. 97-80, MB Docket No. 08-82, GN Docket No. 09-51, MB Docket No. 09-168 (Oct. 28, 2009) at 1.
- 188 VERIZON, REFORMING FEDERAL AND STATE TAX POLICIES WILL INCREASE INVESTMENT IN BROADBAND AND CONSUMER ADOPTION 1-4, attached to Letter from Ann D. Berkowitz, Dir., Fed. Reg. Aff., Verizon, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 09-51 (Feb. 12, 2010).
- 189 *Preserving the Open Internet; Broadband Industry Practices*, GN Docket No. 09-191, WC Docket No. 07-52, Notice of Proposed Rulemaking, 24 FCC Rcd 13064, 13065, para. 3 (2009) (*Preserving the Open Internet NPRM*).
- 190 See *Preserving the Open Internet NPRM*, 24 FCC Rcd at 13067, para. 4 ("As a platform for commerce, [the Internet] does not distinguish between a budding entrepreneur in a dorm room and a Fortune 500 company. As a platform for speech, it offers the same potential audience to a blogger on her couch and to a major newspaper columnist.").
- 191 *Preserving the Open Internet NPRM*, 24 FCC Rcd at 13067, para. 95 ("The first principle in the Internet Policy Statement, and the first rule we propose to codify here, ensures that users are in control of the content that they send and receive.").
- 192 *Preserving the Open Internet NPRM*, 24 FCC Rcd at 13067, para. 18.
- 193 See *Preserving the Open Internet NPRM*, 24 FCC Rcd at 13067, para. 4 ("Because of the historically open architecture of the Internet, it has been equally accessible to anyone with a basic knowledge of its protocols. The Internet's accessibility has empowered individuals and companies at the edge of the network to develop and contribute an immense variety of content, applications, and services that have improved the lives of Americans. Such innovation has dramatically increased the value of the network, spurring—in a virtuous circle—investment by network operators, who have improved the Internet's reach and its performance in many areas."); cf. *id.* at 13067, para. 9 ("[B]roadband Internet access service providers may have both the incentive and the means to discriminate in favor of or against certain Internet traffic . . . in ways that negatively affect consumers, as well as innovators trying to develop Internet-based content, applications, and services. Such practices have the potential to change the Internet from an open platform that enables widespread innovation and entrepreneurship to an increasingly closed system with higher barriers to participation and reduced user choice and competition.").
- 194 See *Preserving the Open Internet NPRM*, 24 FCC Rcd at 13067, para. 9.
- 195 Chairman Genachowski and Commissioners Copps and Clyburn voted to adopt the NPRM. Commissioners McDowell and Baker concurred in part and dissented in part. See *Preserving the Open Internet NPRM*, 24 FCC Rcd at 13064.
- 196 See NBP PN #25.
- 197 AT&T Comments in re NBP PN #25, filed Dec. 22, 2009, at 11.
- 198 AT&T Comments in re NBP PN #25, filed Dec. 22, 2009, at 11.
- 199 AT&T Comments in re NBP PN #25, filed Dec. 22, 2009, at 12.
- 200 AT&T Comments in re NBP PN #25, filed Dec. 22, 2009, at 14; OPASTCO Comments in re NBP PN #25, filed Dec. 17, 2009, at 3.
- 201 Skype Comments in re NBP PN #25, filed Dec. 22, 2009, at 9; California Public Utilities Commission in re NBP PN #25, filed Dec. 18, 2009, at 10; OPASTCO Comments in re NBP PN #25, filed Dec. 17, 2009, at 3; Communications Workers of America Reply in re NBP PN #30, filed Jan. 27, 2010, at 3.
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- 203 Skype Comments in re NBP PN #25, filed Dec. 22, 2009, at 9; CTIA Comments in re NBP PN #25, Dec. 22, 2009, at 4; Massachusetts Department of Telecommunications and Cable Comments in re NBP PN #25, filed Dec. 22, 2009, at 1-6.
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- 208 Specifically, TeleGeography reports a 66% compound annual growth rate in average global traffic over Internet bandwidth connected across international borders over the past five years (2005-2009) and a 22% unweighted average compound annual price decrease for median IP transit prices per Mbps, Gigabit Ethernet, for select cities (Hong Kong, London, Los Angeles, New York, Sao Paulo, and Singapore) over the past five years (2005-2009). TELEGEOGRAPHY RESEARCH, GLOBAL INTERNET GEOGRAPHY (2010).
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## CHAPTER 4 ENDNOTES

- page/portal/DICE\_Content/INFRASTRUCTURE/COMMUNICATION\_NETWORKS/Liberalisation%20Process/history-telecom-liber.pdf (last visited Mar. 5, 2010).
- 210 *See generally* WTO, Post-Uruguay Round Negotiations on Basic Telecommunications, [http://www.wto.org/english/tratop\\_e/serv\\_e/telecom\\_e/telecom\\_posturuguay\\_neg\\_e.htm](http://www.wto.org/english/tratop_e/serv_e/telecom_e/telecom_posturuguay_neg_e.htm) (last visited Feb. 26, 2010); WTO, Telecommunications Services: Reference Paper, Negotiating Group on Basic Telecommunications, Apr. 24, 1996, [http://www.wto.org/english/tratop\\_e/serv\\_e/telecom\\_e/tel23\\_e.htm](http://www.wto.org/english/tratop_e/serv_e/telecom_e/tel23_e.htm); WTO, Services: Agreement, Annex on Telecommunications, [http://www.wto.org/english/tratop\\_e/serv\\_e/12-tel\\_e.htm](http://www.wto.org/english/tratop_e/serv_e/12-tel_e.htm) (last visited Mar. 5, 2010).
- 211 DataDyne has had success leveraging the mobile penetration rate in Africa, which approaches 50%, to create applications that allow real time data collection by health care workers and more effective mobilization of public health responses. Specifically, DataDyne designed an application that allowed public health workers in the rural areas of Kenya to collect patient health information using a form on their basic mobile phones and then sending it back to the main office in Nairobi where there is dependable broadband access to be included in a comprehensive database. *See generally* DataDyne, <http://www.datadyne.org/> (last visited Feb. 26, 2010).
- 212 There are over 1.7 billion Internet users worldwide. MINIWATTS, INTERNET WORLD STATS, INTERNET WORLD USERS BY LANGUAGE: TOP TEN LANGUAGES (chart) (Sept. 30, 2009), <http://www.internetworldstats.com/stats7.htm> (Copyright © 2009, Miniwatts Marketing Group, all rights reserved worldwide). There are about 4.6 billion mobile phone subscriptions in the world. INT'L TELECOMM. UNION, THE WORLD IN 2009: ICT FACTS AND FIGURES 1 (2009) (INT'L TELECOMM. UNION, ICT FACTS), available at [http://www.itu.int/ITU-D/ict/material/Telecom09\\_flyer.pdf](http://www.itu.int/ITU-D/ict/material/Telecom09_flyer.pdf).
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- 214 *See infra* Chapter 13, Section 13.4 (discussing broadband and local and regional economic development).
- 215 *See* Suzanne Choney, *Mobile Banking On the Rise During Recession*, MSNBC, Oct. 5, 2009, [http://www.msnbc.msn.com/id/33079970/ns/technology\\_and\\_science-tech\\_and\\_gadgets/](http://www.msnbc.msn.com/id/33079970/ns/technology_and_science-tech_and_gadgets/); Gautam Bandyopadhyay, *Banking the Unbanked: Going Mobile in Africa*, AFRICAN EXEC., Sept. 17, 2008, available at <http://www.africanexecutive.com/modules/magazine/articles.php?article=3541>; *Mobile money in the poor world*, ECONOMIST, Sept. 24, 2009, available at [http://www.economist.com/printedition/displayStory.cfm?Story\\_ID=14505519](http://www.economist.com/printedition/displayStory.cfm?Story_ID=14505519).
- 216 *See infra* Chapter 5.
- 217 *See infra* Chapters 14 and 16.