

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)
)
Inquiry Concerning the Deployment of) CC Docket 98-146
Advanced Telecommunications)
Capability to All Americans in a Reasonable)
And Timely Fashion, and Possible Steps)
To Accelerate Such Deployment)
Pursuant to Section 706 of the)
Telecommunications Act of 1996)

THIRD REPORT

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By the Commission: Chairman Powell, Commissioner Abernathy, and Commissioner Martin issuing separate statements; Commissioner Copps dissenting and issuing a statement.

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I. INTRODUCTION

1. In this Third Report, the Commission concludes its third inquiry into the availability of advanced telecommunications capability in the United States.¹ Overall, we find that advanced telecommunications is being deployed to all Americans in a reasonable and timely manner. We are encouraged that the advanced services market continues to grow, and that the availability of and subscribership to advanced telecommunications has increased significantly. We also conclude that although investment trends have slowed recently, investment in infrastructure for advanced telecommunications remains strong. We are also encouraged by technological and industry trends, which indicate that alternative and developing technologies will continue to be made available to consumers. Furthermore, we emphasize our commitment to providing the appropriate regulatory framework that will help promote deployment for all Americans.

2. Congress directed the Commission and the states, in section 706 of the Telecommunications Act of 1996, to encourage deployment of advanced telecommunications capability to all Americans on a reasonable and timely basis. The widespread deployment of advanced services has become a central communications policy goal for the Commission.² In

¹ This inquiry is required by section 706 of the Telecommunications Act of 1996 (1996 Act). See § 706, Pub.L. 104-104, Title VII, Feb. 8, 1996, 110 Stat. 153, reproduced in the notes under 47 U.S.C. §157; see Appendix A.

² See 47 U.S.C. § 254(b)(2) and (6), added to the Communications Act of 1934 (47 U.S.C. §§ 151, *et seq.*) by the 1996 Act. On August 10, 2001, the Commission issued a Notice of Inquiry (NOI) under section 706 of the 1996 Act into "whether advanced telecommunications capability is being deployed to all American in a reasonable and timely fashion." Pursuant to the statute, the Commission must issue its Report 180 days after issuance of the NOI. *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the*

(continued....)

conjunction with this objective, Congress instructed the Commission to conduct regular inquiries concerning the availability of advanced telecommunications capability and, based on our findings, to take action to accelerate deployment, if necessary.³ The Commission's first and second inquiries concluded that the deployment of advanced telecommunications capability was reasonable and timely on a general, nationwide basis.⁴

3. The Commission's *Second Report* cautioned, however, that certain groups of consumers might be particularly vulnerable to not receiving timely deployment of advanced telecommunications capability.⁵ In particular, the Commission identified several groups of consumers as being particularly vulnerable, including low-income consumers, those living in sparsely-populated areas, minority consumers, consumers living on tribal lands, persons with disabilities, and those living in the U.S. territories.⁶ Over the last 18 months, we have monitored each of these groups, and we are pleased to report that the availability of advanced services appears to be more widely available among almost all of the segments of consumers than it was at the time of our *Second Report*. Nevertheless, we will continue to monitor deployment to determine whether these consumers continue to enjoy reasonable and timely deployment of advanced services.

4. In conducting this third inquiry, the Commission used its previous inquiries as a framework for our information collection and analysis. First, we solicited information relating to four primary questions: 1) What is advanced telecommunications capability? 2) Is advanced telecommunications capability being deployed to all Americans? 3) Is deployment reasonable and timely? 4) What actions can accelerate deployment?⁷ Second, we gathered standardized information from providers of advanced telecommunications capability in the United States, including wireline telephone companies, cable providers, terrestrial wireless providers, satellite providers, and any other facilities-based providers of advanced telecommunications capability.⁸ Third, we continued our dialogue with the Joint Federal-State Conference on Advanced Services (Joint Conference).⁹

(...continued from previous page)

Telecommunications Act of 1996, CC Docket No. 98-146, Notice of Inquiry, 16 FCC Rcd 15515 (2001) (*Third Notice of Inquiry*).

³ § 706(b) of the 1996 Act.

⁴ *Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion*, CC Docket No. 98-146, Report, 14 FCC Rcd 2398 (1999) (*First Report*); *Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion*, CC Docket No. 98-146, Report, 15 FCC Rcd 20913 (2000) (*Second Report*).

⁵ *Second Report*, 15 FCC Rcd at 20918.

⁶ *Id.*

⁷ *Third Notice of Inquiry*, 16 FCC Rcd at 15515.

⁸ *Local Competition and Broadband Reporting*, CC Docket No. 99-301, Report and Order, 15 FCC Rcd 7717 (2000) (*Data Gathering Order*).

⁹ *Federal-State Joint Conference on Advanced Telecommunications Services*, Order, 14 FCC Rcd 17622 (1999). The Federal-State Joint Conference on Advanced Services, which is comprised of federal and state representatives, was convened by the Commission on October 8, 1999, to further the vision of section 706 of the 1996 Act.

5. As noted by the Commission in the *Second Report*, section 706 directs the Commission to focus on the *availability* of advanced telecommunications capability.¹⁰ Accordingly, in this Report we consider various market, investment, and technological trends in order to assess whether infrastructure capable of supporting advanced services is being made available to all Americans. We examine where advanced services are being deployed, so that, where necessary, we can develop appropriate public policies that may stimulate the deployment of advanced services to unserved locations or consumers. In addition, we believe that it is appropriate to emphasize availability because we do not believe that adoption rates should necessarily drive government responses. Although regulators can play an important role in educating consumers about the availability and capability of advanced services, consumers and service providers, interacting in the marketplace, are ultimately best suited to determine how and when advanced services should be produced and purchased. Consumer responses to advanced services applications and technologies are continuing to evolve, and we believe that market participants should resolve challenges through technological innovations, marketing, creative financing and other skills.

6. In the following sections, we address the four basic questions asked in the Commission's *Third Notice of Inquiry*.¹¹ We also make our judgment as to whether deployment of advanced services to all Americans is reasonable and timely by looking at three major factors: availability, and how it has changed since the *Second Report*; levels of investment and projections of future growth with advanced telecommunications capability; and finally, various advances in advanced services technology. Although we reach the conclusion in this Report that the deployment of advanced telecommunications capability is reasonable and timely, we emphasize that the further deployment of advanced services is one of the Commission's highest priorities. Accordingly, we are actively engaged in removing barriers and encouraging investment in advanced telecommunications. In this Report, we highlight some of our current efforts to establish a rational regulatory framework for these services, to promote investment through competition and the administration of our universal service support mechanisms, make efficient use of available spectrum and ensure that lack of access to the public rights-of-way do not slow deployment.

II. EXECUTIVE SUMMARY

7. This Report answers the four basic questions we set forth in the *Third Notice of Inquiry*.

1. What is advanced telecommunications capability?

- Consistent with prior Reports, we will use the terms "advanced telecommunications capability" and "advanced services" to describe services and facilities with an upstream (customer-to-provider) and downstream (provider-to-customer) transmission speed of more than 200 kbps in this Report.

¹⁰ See *Second Report*, 15 FCC Rcd at 20916-20917.

¹¹ See *Third Notice of Inquiry*, 16 FCC Rcd at 15515.

- We will also use the term "high-speed" to describe services with over 200 kbps capability in at least one direction. In addition, we will maintain our prior finding that a service may have asymmetrical upstream and downstream paths and still be advanced telecommunications capability as long as both paths provide speeds in excess of 200 kbps to the network demarcation point at the subscriber's premises.

2. Is advanced telecommunications capability being deployed to all Americans?

- In determining whether advanced telecommunications capability is being deployed to all Americans, we discuss the data reported by providers who participated in our data collection program. While our data focuses on subscribership, we believe that it is a useful tool to determine where services are being made available, given that customers can only subscribe where high-speed networks have been deployed. In addition, we consider industry and analyst assessments of investment and various competitive market trends. Finally, we take note of various emerging technologies and how they may affect availability.
- Comparison with data on high-speed subscribership included in the *Second Report* suggests that there has been appreciable growth in the deployment of high-speed services to residential and small business consumers in the past eighteen months. Moreover, these figures reveal that high-speed services are available in many parts of the country and suggest that certain factors -- such as population density and income -- continue to be highly correlated with the availability of high-speed services at this time.
- Subscribers to high-speed services were reported in each of the fifty states, the District of Columbia, Puerto Rico, and the Virgin Islands and in 78 percent of all the zip codes in the United States. Our data further indicate that 97 percent of the country's population lives in those zip codes where high-speed subscribership was reported. We conclude that there were a total of approximately 7.8 million high-speed (including advanced services) residential and small business subscribers, as of June 2001. Approximately 4.3 million of these residential and small business customers subscribed to services that meet the Commission's definition of advanced services.
- With respect to investment, overall, analysts observe that carriers have continued to invest in this sector in a substantial way resulting in increased availability of various high-speed and advanced services platforms for consumers throughout the nation. They predict this trend will continue.
- There have been a number of developments in the technologies capable of supporting advanced services since the *Second Report*. Many of these technologies, including satellite and 3G wireless, appear to have significant potential for expanding the availability of advanced telecommunications to more Americans.

3. Is deployment reasonable and timely?

- Overall, we conclude that the deployment of advanced telecommunications capability to all Americans is reasonable and timely. We are encouraged by the expansion of advanced services to many regions of the nation, and growing number of subscribers. We also conclude that investment in infrastructure for most advanced services markets remains

strong, even though the pace of investment trends has generally slowed. This may be due in part to the general economic slowdown in the nation. In addition, we find that emerging technologies continue to stimulate competition and create new alternatives and choices for consumers.

- While we focus on the availability of advanced services in this Report, we acknowledge that subscription rates may influence business and investment decisions and may consequently have an effect on the further deployment of advanced telecommunications. We consider a variety of factors which may be relevant to the overall subscription rate for advanced services, including: computer ownership, cost, the lack of applications which require advanced telecommunications capability, and marketing techniques.
- We believe that the successful deployment of advanced telecommunications capability in other nations may be instructive to our efforts to provide access to advanced telecommunications services to all Americans. We acknowledge, however, that some of the results may be of limited value due to unique circumstances in a particular nation. A recent report indicates that in June 2001 the United States had a broadband penetration rate of 3.24 per 100 inhabitants. Only three other nations had higher broadband penetration rates -- Korea at 13.91, Canada at 6.22, and Sweden at 4.52.

4. What actions by the Commission will accelerate deployment?

- We have initiated an effort to establish an appropriate regulatory framework to promote investment in infrastructure and increase access to advanced telecommunications services for all Americans. This effort is largely encompassed in four proceedings before the Commission.
- First, the *Cable Modem NOI*, which considers the definitional question of the regulatory classification under the Act of cable modem service; second, the *Broadband NPRM*, which will initiate an inquiry relating to the statutory classification of wireline broadband Internet access services; third, the *Incumbent LEC Broadband Telecommunications Services NPRM* which examines the appropriate regulatory requirements for the incumbent LECs' provision of domestic broadband telecommunications services, including what regulatory safeguards and carrier obligations, if any, should apply when a carrier that is dominant in the provision of traditional local exchange and exchange access services provides broadband service; and fourth, the *Triennial Review NPRM*, which considers the incumbent LECs' wholesale obligations under section 251 to make their facilities available as unbundled network elements to competitive LECs.
- We will promote investment in advanced services infrastructure through our examination of competitor access to remote terminals, our examination of national performance measures, and our consideration of enhancement of our rules on the use of cable inside wiring.
- We will continue to examine the role of our universal service policies through the Joint Boards inquiry into the definition of core services that are eligible for universal service support, and our continuing efforts to improve the Schools and Libraries and Rural Health Care Programs.

- We are examining ways to make more radio spectrum available for advanced services, as well as ways to enable the increased use of radio spectrum, such as the use of DBS spectrum, through our proposals to encourage a secondary market for radio spectrum.
- We are considering the appropriate roles and practices of federal, state, and local governments with respect to rights-of-way management, consistent with applicable legal constraints.

III. WHAT IS ADVANCED TELECOMMUNICATIONS CAPABILITY?

8. In this section, we address the first question asked in our Third Notice of Inquiry: What is advanced telecommunications capability? On a basic level, consumers have generally come to expect that advanced telecommunications capability will allow fast access to a wide range of information and services. More specifically, section 706(b) of the 1996 Act describes advanced telecommunications capability as "high-speed, switched, broadband telecommunications capability that enables users to originate and receive high-quality voice, data, graphics, and video telecommunications using any technology."¹²

9. At this time, we believe that the 200 kbps and 2 Mbps transmission speeds (in technical terms, 'bandwidth') previously designated by the Commission continue to serve as appropriate benchmarks to assess the deployment of advanced services.¹³ As a result, we have continued using the current data collection using those speeds as measuring points for our progress.¹⁴ In addition, consistent with prior Reports, we will use the terms "advanced telecommunications capability" and "advanced services" to describe services and facilities with an upstream (customer-to-provider) and downstream (provider-to-customer) transmission speed of more than 200 kbps in this Report.¹⁵ We will also use the term "high-speed" to describe services with over 200 kbps capability in at least one direction.¹⁶ Thus, high-speed is a larger

¹² § 706(b) of the 1996 Act.

¹³ See *Local Competition and Broadband Reporting*, CC Docket No. 99-301, Report and Order, 15 FCC Rcd 7717, 7752-7753 (2000) (*Data Gathering Order*) ("...[W]e require respondents to report two items of information about the portion of total lines and wireless channels they provide that are particularly "fast." We decide we need this information to assist us in evaluating the evolving market for such services. We require respondents to report, specifically, the percent of broadband lines and wireless channels they provide with information carrying capacity greater than 200 Kbps in both directions, and also the percent of broadband lines and wireless channels they provide with information carrying capacity greater than 2 Mbps in both directions. We understand that, in future years, the appropriate definition of broadband service may change as technology improves and consumer demand grows for more features and functions from residential broadband service. We believe that services at speeds over 200 Kbps and 2 Mbps are currently available through traditional wireline offerings -- though most often deployed to businesses -- and we conclude that the information we require respondents to report will enable us to detect the evolution of supply and demand for such future generations of broadband.")

¹⁴ See *Local Competition and Broadband Reporting*, CC Docket No. 99-301, Second Notice of Proposed Rulemaking, 16 FCC Rcd 2072 (2000) (*Data Gathering Second NPRM*).

¹⁵ *First Report*, 14 FCC Rcd at 2406-2408; *Second Report*, 15 FCC Rcd at 20919-20921. As we previously noted, our inclusion of all technology used for delivery of advanced and high-speed services in our assessment of advanced telecommunications capability does not implicate any determination by this Commission as to the treatment of these services for regulatory purposes under the Act. *Second Report*, 15 FCC Rcd at 20928. Many of these questions are the subject of other proceedings currently before the Commission. See *infra*, paras. 148 - 168.

¹⁶ *Id.*

category than advanced telecommunications, and high-speed consists of those services and facilities with a transmission speed of more than 200 kbps in at least one direction. We also maintain our prior finding that a service may have asymmetrical upstream and downstream paths and still be advanced telecommunications capability as long as both paths provide speeds in excess of 200 kbps to the network demarcation point at the subscriber's premises.¹⁷

10. We acknowledge that there is reasonable debate over what speed should be considered as advanced telecommunications capability and what speeds will be demanded by consumers in the long run.¹⁸ We emphasize that the speeds we have designated for data collection and as points of reference for this Report are not intended to be viewed as an ultimate goal. Instead, they are intended to measure what is happening in the current market, not to drive the market. Nor do these definitions drive any regulatory result outside of this Report, beyond giving us a relatively static point at which to gauge the progress and growth in the advanced services market from one Report to the next. As stated in our prior Reports, we anticipate that our measure of advanced telecommunications capability and advanced services may change as technology continues to evolve.¹⁹ In fact, we recognize that products are beginning to emerge that require high-bandwidth capability, such as high-definition video.²⁰ At this time, however, consumer expectations relating to these products are continuing to develop.²¹ The Commission has launched a number of proceedings that will consider the advanced telecommunications market including any necessary definitional issues.²² We anticipate that these proceedings may inform whether it will be appropriate to adjust the points at which we gauge advanced telecommunications capability in the future.

11. In the *First Report*, the Commission stated several reasons for choosing 200 kbps as a benchmark.²³ First, it appeared that Congress intended advanced telecommunications

¹⁷ *First Report*, 14 FCC Rcd at 2406-2407 (advanced telecommunications capability must be two-way and switched, but upstream and downstream paths need not be in the same self-contained offering; advanced telecommunications capability includes facilities that have been upgraded or otherwise altered in ways that make them capable of high-speed bandwidth); *Second Report*, 15 FCC Rcd at 20921.

¹⁸ See, e.g., NRTC Comments at 1 ("NRTC believes that the FCC should revise its current definition to encourage the growth of faster-than-dial-up, packet-switched Internet technologies that do not fall under the current "advanced telecommunications capability" definition."); Intertainer, Inc. Comments at 1 ("...we would suggest that the definition of "advanced telecommunications capability" ...be revised to a bandwidth in excess of 700 kilobits per second."))

¹⁹ See *First Report*, 14 FCC Rcd at 2407-2408; *Second Report*, 15 FCC Rcd at 20921.

²⁰ See, e.g., Intel Comments at 3 ("...transmission of video requires higher speed access than is available to most households with current generation of broadband access."); Corning Comments at 5 ("Corning...recommends that the FCC define advanced telecommunication capability as 4 Mbps upstream and downstream.").

²¹ See Progress & Freedom Foundation Comments at 15 ("Perhaps more bandwidth than the 200 kbps in both directions that the Commission identified a few years ago will be required, although no one knows with any certainty what elements will make up this new value proposition."); Michael Ching and Tal Liani, Merrill Lynch, *Broadband Access – Speed is of the Essence*, May 15, 2001, at 10 ("Video over the Internet represents only a minuscule amount of the traffic being carried over the Internet. But if it were to gain wider acceptance, or if any other high intensity application were to gain traction, this would substantially increase bandwidth requirements.").

²² See *infra* paras. 151-154.

²³ *First Report*, 14 FCC Rcd at 2406. We note that the Commission used the terms "broadband" and "broadband services" in the *First Report*. In the *Second Report*, the Commission determined that the terms "broadband" and (continued....)

capability to be faster than Basic Rate ISDN service, which operates at a data rate of 144 kbps and was widely available at the time of the 1996 Act.²⁴ Second, 200 kbps is enough to provide the most popular applications, including web-browsing at the same speed as one can flip the pages of a book.²⁵ Finally, the Commission required that both upstream and downstream paths have this capability because section 706(b) uses the words "originate *and* receive."²⁶ Following adoption of the *First Report*, the Commission established a comprehensive reporting requirement for providers of high-speed and advanced services in order to track the growth of advanced telecommunications capabilities.²⁷ Consistent with the initial measuring point designated in the *First Report*, service providers are required to provide the Commission with information about lines that are capable of providing service at 200 kbps in one direction, 200 kbps in both directions, and 2 Mbps in both directions. In the *Second Report*, the Commission was able to use this data to help examine the growth of availability of 200 kbps, or faster, speeds in both the upstream and downstream paths of the last mile.²⁸

12. We recognize that the speed at which we define advanced telecommunications capability has major implications for our analysis of deployment. Were we to use a transmission speed higher than 200 kbps to define advanced telecommunications capability, we would find a correspondingly lower level of availability. The level of availability of higher transmission speeds, in turn, may have implications for adoption rates. As mentioned, certain applications, such as some video products, require transmission speeds in excess of 200 kbps. Some argue that such applications, or others that require speeds in excess of 200 kbps, are the kind of content that will lead consumers to adopt advanced telecommunications capability in greater numbers. As technology continues to evolve, and with it, consumer expectations, it may be appropriate to adopt a higher threshold for advanced telecommunications capability and revisit our analysis of deployment. We will continue to closely monitor this issue.

IV. IS ADVANCED TELECOMMUNICATIONS CAPABILITY BEING DEPLOYED TO ALL AMERICANS?

13. In this section, we address the second question that we asked in our Third Notice of Inquiry: Is advanced telecommunications capability being deployed to all Americans? As an initial matter, we provide a brief overview of the networks used to provide advanced services and the technologies employed in those networks. The network components and technologies are

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"broadband services" had come to include a much broader range of services and facilities and decided to use the terms "advanced telecommunication capability" and "advanced services." *Second Report*, 15 FCC Rcd at 20930.

²⁴ *First Report*, 14 FCC Rcd at 2406, n.13.

²⁵ In comparison, typical business teleconferencing services are 120-250 kbps, conventional televisions are 750 kbps to 1 Mbps, videocassette tapes are 1.5 Mbps, and movie theatre images are several Mbps. *First Report*, 14 FCC Rcd at 2406.

²⁶ Section 706(b) of the 1996 Act; *First Report*, 14 FCC Rcd at 2406-07 & n.17.

²⁷ See *Data Gathering Order*, 15 FCC Rcd at 7717. The Commission requires semi-annual reports by any facilities-based firm that provides at least 250 high-speed service lines or wireless channels in a given state or that has at least 250 high-speed customers in a given state. See also Local Competition and Broadband Reporting Form, OMB 3060-0816 (Sep. 2001) (Form 477).

²⁸ *Second Report*, 15 FCC Rcd at 20920.

discussed in greater detail in an attached appendix.²⁹ We then discuss the data reported by providers who participated in our data collection program.³⁰ This information is a tool that we use to help assess the availability and location of high-speed capable infrastructure. Following the presentation of data, we discuss industry and analyst assessments of investment and various competitive market trends. Finally, we provide an overview of emerging technology and how it may affect availability.

A. Overview of the Networks Used to Provide Advanced Services

14. Advanced services are provided using a variety of public and private networks that rely on different network architectures and transmission paths.³¹ Some of these networks are public in the sense that access to the network is open to all users. Other networks, like those built and maintained by corporations for their internal use, are private in the sense that access to the network may be restricted to a particular class of users, often the corporation's employees. Moreover, depending on the network, data may travel from the sender to the recipient over various architectures and transmission paths such as copper wire, cable, terrestrial wireless radio spectrum, satellite radio spectrum, or a combination of these and other media. In addition, data may be transmitted using different communications protocols that manage and direct traffic at different layers of a particular network.³²

15. Although advanced services are provided over myriad combinations of public and private networks using a variety of transmission paths and protocols, for the purposes of this Report, we focus on the physical components of the network infrastructure. For simplicity, we have divided network infrastructure into four general categories: long haul communications transport facilities,³³ middle mile, last mile, and last 100 feet. In addition, we refer to the points of connection between these components of the network as connection points. These network components are useful for organizing our analysis; however, we recognize that because of the wide variety of network architectures and transmission media that deliver advanced telecommunications capabilities, some of these categories may overlap or be absent in a specific situation.

16. Long haul communications transport facilities provide a long-distance, high-capacity, high-speed transmission path for transporting massive quantities of data.³⁴ Most long

²⁹ See Appendix B.

³⁰ See Form 477.

³¹ See *Second Report*, 15 FCC Rcd at 20922-20939.

³² For instance, the Internet Protocol (Transmission Control Protocol/Internet Protocol suite) supports interconnections across any physical transport medium, including wireline, terrestrial wireless and satellite, at various rates, and can support various applications. Other transmission protocols such as asynchronous transfer mode (ATM) or frame relay exist within other networks capable of supporting advanced telecommunications capabilities.

³³ In our prior Report, we used the term "backbone" to refer to "long haul communications transport facilities." This led to some confusion as to whether we were referring to high-speed physical transport specific to the Internet backbone. The Internet backbone uses high-speed fiber infrastructure, but so do other applications, including conventional voice. See *Second Report*, 15 FCC Rcd at 20923-20924. In this Report, we use the term long haul communications transport facilities to refer to high-speed physical transport, that includes, but is not limited to, facilities used to support the Internet backbone.

³⁴ See Appendix B at paras. 2-4; *Second Report*, 15 FCC Rcd at 20922.

haul transport facilities consist of fiber optic lines, either buried under the ground or laid under the sea. In addition, some of these facilities can be provided using satellite systems and radio spectrum. As its name suggests, middle mile facilities provide relatively fast, large-capacity connections between long haul facilities and last mile.³⁵ Middle mile facilities can range from a few miles to a few hundred miles. They are often constructed of fiber optic lines, but microwave and satellite links can be used as well. The last mile is the link between the middle mile and the last 100 feet to the end-user's terminal.³⁶ A last mile with advanced telecommunications capability provides speeds in excess of 200 kbps in each direction. Last miles may consist of hybrid fiber-coaxial cable,³⁷ copper wire,³⁸ or wireless channels used in terrestrial³⁹ or satellite systems.⁴⁰ Some last-mile segments -- for example those on certain satellite systems -- provide faster downstream speeds than upstream speeds either because their network configurations will not support the higher upstream speed or because they rely on a telephone return path. The last 100 feet is the link between the last mile and the end-user's terminal.⁴¹ The last 100 feet includes the in-house wiring found in a consumer's residence, the wiring in an apartment or office building, the more complex wiring in a wireline local area network, or the wireless links in a local wireless network. Finally, connection points are the places at which the various components of the network interconnect, often with the aid of an electronic or optical device (e.g., switches and routers between the middle mile and national communications transport facilities), so that data can move across the network.⁴²

B. Presentation of Commission's Data Collection

17. In this section of the Report, we discuss data obtained through the Commission's data collection program.⁴³ This program requires any facilities-based firm that provides 250 or more high-speed service lines (or wireless channels) in a given state to report basic information about its service offerings and customers twice yearly.⁴⁴ As part of the Commission's data collection, providers report the total number of high-speed lines (or wireless channels) -- broken down by type of technology -- for each state in which they exceed the reporting threshold. For each of these "technology subtotals," providers report additional detail concerning the percentage of lines that are connected to residential and small business users (as opposed to large business and institutional users) and the percentage of lines that meet the Commission's definition of advanced services (as opposed to one-way high-speed lines), along with the number of lines that

³⁵ See Appendix B at paras. 5-8; *Second Report*, 15 FCC Rcd at 20922.

³⁶ See Appendix B at para. 9; *Second Report*, 15 FCC Rcd at 20923.

³⁷ See Appendix B at paras. 10-23.

³⁸ *Id.* at paras. 24-30.

³⁹ *Id.* at 31-44.

⁴⁰ *Id.* at 45-49.

⁴¹ See Appendix B at 50; *Second Report*, 15 FCC Rcd at 20923.

⁴² See Appendix B at 51; *Second Report*, 15 FCC Rcd at 20923.

⁴³ See *Data Gathering Order*, 15 FCC Rcd at 7717 (adopting FCC Form 477 as a vehicle for collecting this information). The Commission has requested comments on whether various modifications should be made to this data collection. See *Data Gathering Second NPRM*, 16 FCC Rcd 2072.

⁴⁴ See Form 477, available at <<http://www.fcc.gov/formpage.html>>. Filings of December 31 data are due the following March 1, and filings of June 30 data are due the following September 1.

are capable of providing speeds of 2 Mbps.⁴⁵ Finally, these providers also report a list of the zip codes where they have at least one customer of high-speed service.⁴⁶

18. Using data from Commission's data collection, in combination with publicly-available data from high-speed service providers themselves, financial analysts, and the Census Bureau, we are able to develop our understanding of the current deployment of high-speed services. The snapshots derived from our data collection shed light on the availability of high-speed services in different parts of the country and across different demographic variables, such as population density and income. In this Report, we compare data as of June 30, 2001, with similar information, as of December 31, 1999, presented in the *Second Report*. Comparison with data on high-speed subscribership included in the *Second Report* suggests that there has been appreciable growth in the deployment of high-speed services to residential consumers in the past eighteen months. We detail these findings, below.

19. Some participants in the Commission's data collection request non-disclosure of all or portions of their data, asserting that it contains competitively-sensitive information.⁴⁷ In the *Data Gathering Order*, the Commission agreed to publish in its regular reports high-speed data only once it has been aggregated such that it does not reveal individual company data.⁴⁸ Accordingly, the data is presented here, and in the statistical summary that we are releasing simultaneously with this Report, in a manner that does not reveal individual company data.⁴⁹

20. There may be limitations to the conclusions we are able to draw based on data from the Commission's data collection program. Indeed, the Commission is currently considering whether certain modifications should be made to its data collection program, in order to develop more fully our understanding of the deployment and availability of advanced telecommunications.⁵⁰ In particular, the Commission sought comment on how to best collect data on the availability of advanced services to discrete geographic areas and among distinct

⁴⁵ Providers also reported information about: the percentage of lines that were provided solely over their own facilities (as opposed to over leased facilities) and the percentage of lines that they billed directly to the end user (as opposed to another provider or reseller).

⁴⁶ Reflecting concerns about regulatory burden on firms providing high-speed services, the Commission did not require providers to report the specific number of subscribers in a particular zip-code or detailed breakdowns by speed or type of customer. Nor did the Commission require firms to report data concerning states where they provided fewer than 250 high-speed lines. Therefore, our data concerning areas where there are many small providers may understate deployment. In each of our four data collections to date, about 40 entities have made voluntary filings, representing less than 0.1 percent of total reported high-speed lines.

⁴⁷ Cf. 47 C.F.R. § 0.459(d).

⁴⁸ See *Data Gathering Order*, 15 FCC Rcd at 7760.

⁴⁹ *High-Speed Services for Internet Access: Subscribership as of June 30, 2001* (Ind. Anal. Div. rel. Feb. 6, 2002) (Appendix C), available at <<http://www.fcc.gov/Bureaus/CommonCarrier/Reports/FCC-StateLink/comp.html>>. We note that Hughes Network Systems has filed a petition for declaratory ruling seeking to clarify how the Commission will ensure the non-disclosure of information submitted in the FCC Form 477 that filers identify as competitively-sensitive and proprietary. *Petition for Declaratory Ruling on Local Carrier and Broadband Reporting Requirement*, CC Docket 99-301, Petition for Declaratory Ruling, filed May 15, 2000. We do not address Hughes' petition here. In this Report, and in the statistical summary released simultaneously, the Commission uses statistical methods, such as suppression and aggregation, to ensure that individual company-filed broadband data obtained from the Commission's data collection program will not be revealed through the use of released information.

⁵⁰ See *Data Gathering Second NPRM*, 16 FCC Rcd at 2072.

demographic groups.⁵¹ At the same time, the Commission sought comment on ways to eliminate any unnecessary or unduly burdensome aspects to the data collection program.⁵²

1. Geographic Distribution of High-Speed Deployment

21. Overview and methodology. By analyzing the zip codes where there are actual high-speed subscribers, we can gain useful insight into the deployment and location of high-speed-capable infrastructure.⁵³ Subscribership necessarily reflects a combination of factors including: availability of infrastructure, service offerings that are tailored to meet consumer's needs, and affordable pricing. We believe that our data is a useful tool in determining where services are being made available, given the close association between deployment and subscription, and can help us identify issues of concern for further exploration. For instance, the data show areas where at least one customer receives high-speed service *in the last mile* to the customer premises. As a result, consumers in zip codes with no reported subscribers may be differently situated, and therefore may require different solutions to bring them access to services, than consumers in zip codes where last mile infrastructure exists but other barriers prevent them from accessing high-speed services.

22. A substantial majority of the zip codes reporting high-speed subscribership contained services that rely on infrastructure that is generally available to more than a single customer at a time. For instance, cable operators generally do not upgrade their networks on a piecemeal basis: an upgraded cable network can provide high-speed service to all of the homes that it passes.⁵⁴ Accordingly, the presence of a few -- or even one -- cable modem subscribers on a particular system likely indicates that other subscribers to the same system could obtain similar service. Similarly, much of the infrastructure work necessary to provide DSL service occurs in the carrier's central office.⁵⁵ Once that work has taken place, most customers served by that central office typically can obtain DSL service without great additional difficulty.⁵⁶ The presence of satellite service also indicates the likely availability of the signal to nearby customers.⁵⁷

⁵¹ *Id.*

⁵² *Id.*

⁵³ As noted above, the most recently collected zip code data depict where actual high-speed subscribers are located as of the end of June 2001.

⁵⁴ We note that the boundaries of zip codes and cable service areas and wire center boundaries are not identical. Accordingly, the presence in one zip code of a high-speed subscriber does not conclusively indicate the availability of similar service to other residents of that zip code.

⁵⁵ We note, however, that LECs must also "condition" each end-user's line by removing the load coils and bridged taps, while increasing the strength of the signal to maintain the quality of the line's voice traffic. The amount of conditioning necessary may influence a carrier's ability to provide advanced services to customers served by the same central office.

⁵⁶ In this regard, DSL service contrasts with T1 service, subscription to which does not necessarily indicate the availability of supporting infrastructure within the area surrounding a single subscriber.

⁵⁷ We note that high-speed satellite services are currently being offered in all 50 states. *See Q&A StarBand Facts* (visited Feb. 5, 2002) <<http://www.starband.com/faq/starbandfacts.htm#available2>> ("The StarBand service is currently available only in the 48 contiguous U.S., Alaska and Hawaii.").

23. Zip code data from our data collection show the presence of high-speed subscribership and, to some extent, the presence of high-speed-capable last miles. These data do not purport to show all of the infrastructure that is high-speed capable. By collecting data on actual subscribers, we capture part of the overall infrastructure (namely, the last mile) that is currently used to provide high-speed services.⁵⁸ We also know that many providers are deploying or upgrading last mile facilities that will soon be capable of providing high-speed services. We attempt, in other areas of this Report, to describe the capital investment in high-speed infrastructure, plans for growth, and analyst projections for the deployment of high-speed infrastructure. In future years, this investment will be reflected in increased subscribership, which will be captured in our future data collections, including in the zip code data.⁵⁹

24. The results of our data collection give two perspectives into the geographic distribution of high-speed services. First, we are able to calculate the number of high-speed and advanced service lines in each state, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands -- all of which report at least some level of high-speed service.⁶⁰ Second, the zip code data present an elementary view of where high-speed service subscribers are located on a more granular basis. The providers reported a list of each zip code in which they had at least one high-speed service subscriber. These data give insight into whether there are high-speed service subscribers and to some extent facilities in any given zip code.

25. In order to minimize the burden associated with the data collection, the Commission did not require providers to report the *number or type* of high-speed service subscribers in each zip code, but only to identify the zip codes in which they had at least one high-speed service subscriber. Therefore, we cannot determine from our data the full extent to which the presence of high-speed service in a given zip code indicates that high-speed services are widely available, or whether they are restricted to a few customers. Similarly, providers did not distinguish whether the high-speed subscribers in a given zip code are residential or business users. Thus, in some zip codes, high-speed services may be available to some large, primarily business users, but not be available, affordable or marketed to residential users. In addition, service could be marketed to limited neighborhoods, or very localized infrastructure barriers such as inside wiring issues could prevent some customers in a zip code from accessing services available to other customers in the same zip code.

⁵⁸ For example, the map derived from FCC Form 477 data in Appendix C illustrates the location of high-speed subscribers and does not attempt to illustrate the presence of backbone and middle mile facilities used to transport high-speed services or the last mile facilities that may be high-speed capable at some point in the future. *See Appendix C.*

⁵⁹ We note that high-speed providers will complete and file FCC Form 477, again, on March 1, 2002, and semi-annually thereafter during the term of the program. The Commission adopted a five-year sunset provision, which will terminate the program in 2005 unless the Commission takes affirmative steps to preserve the program. *See Data Gathering Order*, 15 FCC Rcd at 7746.

⁶⁰ The Commission's *Data Gathering Order* requires any provider of high-speed services to report data for each state in which it meets the specified reporting thresholds. Under section 3(40) of the Act, the term "state" "includes the District of Columbia and the Territories and possessions." 47 U.S.C. § 153(40). Accordingly, the *Data Gathering Order* applies to data on broadband services that are provided in the District of Columbia and the territories and possessions as well as the fifty states. In the FCC Form 477 filings to date, broadband data has been filed for the fifty states, the District of Columbia, Puerto Rico and the Virgin Islands.

26. The scope of our data collection reflects the Commission's understanding that a data collection that required highly detailed reporting at such fine geographic levels would have created an appreciable regulatory burden for the firms providing high-speed service and a significant administrative burden for firms with a national scope, given that there are over 30,000 zip codes in the United States. State commissions and private institutions may be best positioned to collect highly detailed data in discrete geographic areas and among particular communities of the population. As noted above, we are exploring that question and, more generally, whether some of this additional granularity should be incorporated into our data collection.⁶¹

27. High-Speed Subscribers Across the Country. Results of our most recent data collection indicate that there was at least one customer for high-speed service in each of the fifty states, the District of Columbia, Puerto Rico, and the Virgin Islands and in 78 percent of all the zip codes in the United States. The number of high-speed lines reported in each state varies significantly, with reported high-speed subscribership ranging from a high of 1.7 million lines in California to a low of less than 15,000 lines in four states.⁶² Reported line counts on a state-by-state basis appear in the statistical summary, prepared by the Industry Analysis Division of our Common Carrier Bureau, that we also release today.⁶³ Similarly, in some states there are many providers reporting -- with 20 or more reporting in 12 states -- and in other states there are only one or two providers reporting. The state-by-state number of reporting providers also appears in the statistical summary released today.⁶⁴

28. Again, looking broadly for the presence of high-speed services, the data we collect show that 78 percent of the zip codes in this country have at least one subscriber to high-speed services.⁶⁵ Those zip codes are shown in the map that appears in Appendix C.⁶⁶ The map shows that high-speed service is deployed in many areas in the United States. Our analysis further shows that nearly all of the population of the United States tends to be concentrated in those 78 percent of zip codes where high-speed subscribers are located. More precisely, 97 percent of the country's population lives in those zip codes where high-speed subscribership was reported.

29. To better gauge where competition for high-speed services may be developing, the map in Appendix C also shows the number of high-speed providers reporting data for given zip codes. As indicated by the shadings in the map, there are competing suppliers -- sometimes as many as 18 in a zip code -- in the major population centers of the country. Multiple providers of high-speed services reported having subscribers in 58 percent of the nation's zip codes in June

⁶¹ See *Data Gathering Second NPRM*, 16 FCC Rcd 2072.

⁶² In addition, we do not report the number of high-speed lines in two states, Puerto Rico, and the Virgin Islands in order not to reveal individual provider data.

⁶³ See Appendix C. Again, we note that some charts and tables contain data that have been aggregated or suppressed to prevent the release of information that may be deemed competitively-sensitive.

⁶⁴ *Id.* As noted above, we expect that there many be many other providers that did not meet the reporting threshold for given states and that did not choose to file on a voluntary basis.

⁶⁵ *Id.* at Tbl. 9.

⁶⁶ The map follows Tbl. 9 in Appendix C. Areas with shading indicate the presence of at least one high-speed subscriber in a zip code. *Id.*

2001, compared to 34 percent eighteen months earlier.⁶⁷ During that period, the share of zip codes in which five or more providers reported having customers increased from 6 percent to 19 percent.

30. Residential and Small Business Subscribership.⁶⁸ We note that growth in subscribership for residences and small businesses is consistent with the high level of availability indicated by the Commission's data. Results of the Commission's data collection show that there were a total of approximately 7.8 million high-speed residential subscribers, as of June 30, 2001.⁶⁹ We estimate that approximately 4.3 million of these residential customers subscribed to services that meet the Commission's definition of advanced services.⁷⁰ By comparison, we stated in the *Second Report* that there were approximately 1.8 million high-speed residential subscribers at the end of 1999. We estimated that approximately 1.0 million of these residential customers subscribed to services that meet the Commission's definition of advanced services.⁷¹ As a result, penetration of advanced services quadrupled from 1.0 percent of households at the end of 1999 to 3.8 percent at the end of June 2001.⁷² Looking more broadly at all high-speed services (i.e., not only advanced services), the residential penetration rate was 7.0 percent at the end of June 2001.

⁶⁷ These figures are the percentage of zip codes in which more than one high-speed service provider reported having at least one customer. *See id.* for additional detail.

⁶⁸ The data from the Commission's data collection program concerning deployment of high-speed lines to residential customers includes not only residential users, but also home office and small business users. *See Data Gathering Order*, 15 FCC Rcd at 7760. Thus, in this Report, we combine small business and residential customers and refer to them collectively as "residential customers." We note that we similarly combined small business and residential customers in the *First and Second Reports*. *First Report*, 14 FCC Rcd at 2409; *Second Report*, 15 FCC Rcd at 20941. The Commission's data collection program generally collects data on high-speed lines or wireless channels, rather than customers, *per se*. Our estimates of the number of residential customers, therefore, rely on the assumption that most residential high-speed subscribers tend to purchase only one high-speed line, in contrast to many business customers that may purchase multiple high-speed lines.

⁶⁹ At the end of June 2001, of the 7.8 million residential customers who subscribed to high-speed services, approximately 5.0 million subscribed to services using hybrid fiber-coaxial (HFC) technology (such as cable modem service), approximately 2.5 million subscribed to ADSL services, while the balance subscribed to other media, including satellite and fixed wireless services. *See Appendix C, Tbl. 3.*

⁷⁰ *See Appendix C, Tbl. 4.* Of the 4.3 million residential and small business subscribers to advanced services, there were approximately 3.1 million residential customers subscribed to cable-based services and approximately 0.9 million residential customers subscribed to ADSL, with the balance subscribing to other media. These figures show cable companies increasing their residential advanced services subscribership by 261 percent in eighteen months and local exchange carriers increasing their residential DSL subscription to advanced services by 683 percent. We note that our estimates of residential ADSL subscribers do not include any symmetric forms of DSL, which are typically purchased by business customers.

⁷¹ *Second Report*, 15 FCC Rcd at 20941.

⁷² As of March 2001, there were about 107 million households in the United States FCC Industry Analysis Division, *Telephone Subscribership in the United States*, Tbl. 1 <http://www.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/IAD/subs0301.pdf> (Nov. 2001). At all pertinent times, there have been about 4 million small businesses (establishments with 1-4 employees) in the U.S. U.S. Census Bureau, *Statistical Abstract of the United States* 559, No. 881 (1999) & 547, No. 872 (2000).

31. Business Subscribership.⁷³ In accord with the growth in availability of high-speed and advanced services, our data also indicates that the number of large businesses that subscribe to high-speed and advanced services has increased. In the Commission's data collection, providers reported there were approximately 1.8 million high-speed service (including advanced service) lines in service to large business and institutional customers at the end of June 2001.⁷⁴ We estimate that almost all of these lines satisfy our definition of advanced services;⁷⁵ thus, we conclude that there were approximately 1.7 million advanced service lines in service to business customers at the end of June 2001.⁷⁶ By comparison, in the *Second Report* we estimated there were approximately 1.0 million high-speed in service to business customers at the end of 1999, and that approximately 0.9 million of those lines satisfied our definition of advanced services.⁷⁷

2. Demographic Variables

32. In this section, we use zip code data from our data collection in conjunction with demographic data to try to discern relationships between the presence of high-speed service and the demographic characteristics of areas that have some level of high-speed subscribership.⁷⁸

⁷³ The Commission's data collection allows only a partial view into deployment of high-speed services to large business and institutional customers. *Second Report*, 15 FCC Rcd at 20943. For methodological reasons, the Form 477 does not collect data about all of the high-speed service offerings that are targeted at large business and institutional users. It collects data solely concerning high-speed services that connect end-users to the Internet or other public data networks. This focus excludes high-speed services that are used as part of private networks -- so-called "private line" broadband services. Many businesses and educational and healthcare institutions have for some time used such private lines as part of their internal networks and realized significant benefits from those high-speed services.

⁷⁴ For simplicity, we refer to these customers as "business customers" in this Report.

⁷⁵ Filers of Form 477 do not report directly the number of advanced services lines provided to residential and small business users, as opposed to large business users. In estimating these advanced service counts, staff assume that reported advanced service lines were more likely to be delivered to large business users first and residential and small business users second. This methodology provides the most conservative estimate of the number of residential advanced service lines reported. To get the most precision, estimates are conducted at the individual Form 477 level. Staff conduct a sensitivity analysis against an alternative methodology, which would allocate lines to residential users first. This sensitivity analysis shows that the two methodologies vary by less than 1 percent of total advanced service lines reported.

⁷⁶ The number of advanced service lines in service to large business customers is, for each technology category, the difference between total advanced service lines (see Appendix C, Tbl. 2) and the estimated number of advanced service lines to residential and small business customers (see Appendix C, Tbl. 4). Of the estimated 1.7 million advanced service lines in service to larger business customers at the end of June 2001, slightly over 82,000 were ADSL service, almost 950,000 were other wireline services, and almost 650,000 were other media, including optical carrier, services. By comparison, in the *Second Report* we estimated that of the 0.9 million advanced service lines for larger business customers, advanced services delivered over approximately 70,000 ADSL lines, 560,000 other wireline service lines, and slightly over 300,000 other media, including optical carrier, services. *Second Report*, 15 FCC Rcd at 20944.

⁷⁷ *Second Report*, 15 FCC Rcd at 20943.

⁷⁸ We emphasize that the data in this section are presented in a preliminary and descriptive fashion. Many of the statistics discussed here indicate how or to what extent variables are associated with each other. We caution readers that such associations do not establish cause-and-effect relationships between variables and we decline to draw conclusions about the statistical significance of these demographic variables. Demographic data was obtained from *Demographic Power Pack, Current Year Survey*, MapInfo Corporation (2000 issue).

33. We acknowledge that reliance on marketplace forces may yield deployment that varies by demography at any given point in time. Yet the language and spirit of the Act require that we promote advanced services deployment within a framework that relies significantly on market forces. Information relating to various demographic variables does not, by itself, determine whether deployment is reasonable and timely. As a result, if we are to rely on a market-based system to provide advanced telecommunications capability, the evaluation of whether deployment is reasonable and timely must account for some demographic variation. Thus, some amount of demographic variation in deployment, particularly if it is not persistent, may not be inconsistent with reasonable and timely deployment. Nevertheless, we agree that it is important to continue to monitor demographic relationships in order to identify drivers of deployment in the event government or non-governmental action is warranted.

34. Again, by examining the Commission's data, we seek to gain understanding about the availability of advanced telecommunications infrastructure. As discussed above, the zip code data do not allow us to determine how many customers are subscribing to high-speed service or have access to it in a given zip code.⁷⁹ Despite these limitations, the zip code data provide a simple, and to our knowledge, unique source of information about where high-speed services are being delivered and where high-speed-capable last miles are deployed.

35. Population Density. Our data suggest that there is a great disparity in high-speed subscribership at different population densities with high-speed services reported more often in high-density areas than in less dense areas. Table 11 shows the percentage of zip codes with high-speed subscribers by deciles based on population density.⁸⁰ As it indicates, high population density has a strong positive correlation with the presence of high-speed subscribership and low population density has a strong negative correlation. Nearly all the most densely populated zip codes (well over 90 percent) have one or more high-speed subscribers, but fewer than 40 percent of the most sparsely populated zip codes have high-speed subscribers.⁸¹ We note that this correlation may be accentuated by the fact that high-speed service providers only report when they have 250 or more subscribers in a given state. Thus, many smaller providers that serve discrete communities in sparsely-populated areas may not have reported, thereby creating the impression that there is less high-speed service in rural areas than there may actually be.⁸²

36. Reporting of high-speed subscribership increased notably between December 1999 and June 2001 in more sparsely populated zip codes. The increase was 17 percentage points (from 19.9 percent to 36.8 percent) for the least densely populated zip codes, compared to

⁷⁹ Nor do the zip code data allow us to determine whether high-speed subscribers in a given zip code are residential or business customers.

⁸⁰ See Appendix C, Tbl. 11. Deciles are created by sorting the zip codes into ascending order based on population density. The zip codes are then placed into ten groups (i.e., deciles) containing equal numbers of zip codes.

⁸¹ *Id.* See Table 11 for a more detailed illustration of the relationship between population density and the presence of high-speed service. As illustrated there, even within the most sparsely-populated zip codes, density appears to be a major positive factor, with high-speed service deployed in those areas where the bulk of the population is concentrated.

⁸² For example, the National Telephone Cooperative Association (NTCA) reports that small, rural telephone companies are deploying broadband to rural America in a reasonable and timely manner. In addition, the NTCA states that almost 80 percent of respondents to a recent survey of its members are offering high-speed services to all public centers in the carrier's service territory. See NTCA Comments at 2.

2 percentage points (from 96.1 percent to 98.1 percent) for the most densely populated zip codes. For zip codes in the mid-range of population density, the reported improvement was 24 percentage points.⁸³

37. In our collection of data as of the end of June 2001, the largest number of high-speed providers reported in any single zip code was 18. Though the large concentrations of high-speed providers tend to be located in high-density areas, several of the most sparsely populated zip codes have almost as many high-speed providers. Indeed, some of these zip codes may have few people living in them, but are highly industrialized sections of major metropolitan areas.⁸⁴ For example, several of these low density zip codes with many providers are located in the business districts of large cities, where business demand exists, but there are few, if any, residents. These areas exhibit high demand for high-speed services -- which may or may not be consistent with the demand exhibited by the residents of these areas -- and are able to attract competition for high-speed services. At the same time, the availability of high-speed to business users in these areas does not necessarily indicate availability of high-speed to any residents of these areas.

38. Household Income. Table 12 shows the percentage of zip codes with high-speed subscribers by deciles based on median household income.⁸⁵ Of the highest income zip codes, 96 percent have high-speed subscribers, while of the lowest income zip codes, 59 percent have high-speed subscribers.⁸⁶ By contrast, eighteen months earlier these percentages were 91 percent and 42 percent, respectively. Again, as we observed with the population density data, some of the low-income zip codes that have high-speed subscribers include businesses or industrial areas of major cities that have large demand for high-speed services. Thus, high-speed availability for residential low-income residents in these zip codes may actually be less prevalent than suggested here.

39. Small Towns. Publicly available demographic data, in conjunction with our data collection, allow some general insight into the presence of providers of high-speed services in small towns. In particular, by constructing a sample of zip codes that appear to contain small towns,⁸⁷ we estimate that 86 percent of zip codes in small towns have at least one high-speed services subscriber. These data do not allow us, however, to estimate with confidence the percentage of the U.S. small-town population that resides in such zip codes. In addition, results of our data collection indicate that, even in rural areas, population centers are different than outlying areas. As of June 2001, 61 percent of the population of the most sparsely-populated zip

⁸³ This improvement is the average improvement for zip codes in the fifth and sixth deciles of zip codes. See Appendix C, Tbl. 11 for additional detail.

⁸⁴ These primarily business districts demonstrate that "sparsely populated" areas are not necessarily rural or under-developed.

⁸⁵ See Appendix C, Tbl. 12.

⁸⁶ We treat as the highest income zip codes those that fall into the top decile when zip codes are ranked by median income. Similarly, the lowest income zip codes are those that fall into the bottom decile when zip codes are ranked by median income.

⁸⁷ We consider a "small town" to be a locale with a zip code that meets the following criteria: 1) between 1,000 and 15,000 in population; 2) between the 25th percentile and 75 percentile in population density; 3) no adjacent zip codes have more than 10,000 population; and 3) adjacent zip codes have no more than 80 percent of the population density of the small town's zip code. Our zip code data do not distinguish among communities within a zip code.

codes resided in a zip code in which there was at least some high-speed subscribership. The comparable figure eighteen months earlier was 39 percent.⁸⁸ For zip codes in the mid-range of population density, 95 percent of the population resided in zip codes with high-speed subscribership as of June 2001, compared to 78 percent eighteen months earlier.⁸⁹

40. Indian - Tribal Areas. Our data also show that there is at least one subscriber to high-speed services in 71 percent of the zip codes that contain tribal territories.⁹⁰ This remains below the national figure of 78 percent, described above.⁹¹

41. As noted above, demographic information can provide useful insight to the Commission on deployment drivers to various categories of consumers. Because the availability of many products and services vary with these same demographic variables, however, we do not rely on this information alone to determine whether advanced telecommunications capability is being made available in a reasonable and timely manner.

3. Survey Data By Last Mile Technologies

42. We report, below, available figures on high-speed services by last mile technology based on our data collection and, where indicated, on publicly-available sources. These data show that there are multiple paths for high-speed service in the last mile. Some are clearly still in the early stages of deployment but others -- such as cable and certain wireline technologies -- are more firmly established. In addition to data on subscribership, the data may reflect different strategies for deployment and the strengths and weakness of these last mile technologies. For example, our data collection shows that cable high-speed services are delivered primarily to residential and small business customers, while high-speed services over fiber and other traditional wireline technologies still tend to be delivered to large business and institutional customers.

43. We also report data on the percentage of lines billed directly to end-user customers, as opposed to another provider or retailer, and we report data on the percentage of high-speed lines that providers deliver over their own facilities, as opposed to facilities that they lease from another provider. These data reveal that most reporting firms are selling directly to end-user customers and that most firms provide high-speed services over their own facilities.

⁸⁸ These figures are for the least densely-populated decile of zip codes. See Appendix C, Tbl. 11.

⁸⁹ *Id.* These figures are the average for the fifth and sixth zip code deciles.

⁹⁰ For purposes of this proceeding, we consider "tribal areas," "tribal lands," or "tribal territories" to be American Indian Reservations, as identified by the Bureau of Indian Affairs (BIA). American Indian Reservations are legal entities having boundaries established by treaty, statute, and/or executive or court order over which a federally recognized American Indian tribal group has jurisdiction. American Indian Reservations do not include any of the other types of "Indian lands" such as Alaska Native Village Statistical Areas, Alaska Native Regional Corporations, Public Domain Allotments, Trust Lands, and other designated statistical areas. The source of the BIA Indian reservation boundaries are the Census Bureau TIGER/Line files. The 2000 version of the TIGER/Line Files can be found at <<http://www.census.gov/geo/www/tiger/tiger2k/tiger2k.pdf>> (visited Feb. 5, 2002).

⁹¹ See *supra* para. 27.

a. Cable HFC Systems

44. According to our data collection, high-speed lines delivered over cable HFC systems in the last mile account for 54 percent of the total high-speed lines as of the end of June 2001, compared to the 51 percent we reported in the Second Report.⁹² More specifically, cable companies report almost 5.2 million high-speed lines in service using cable modem technology at the end of June 2001, compared to 1.4 million at the end of 1999. Of the 5.2 million lines reported for June 2001, 64 percent meet the Commission's definition of advanced services, compared to 62 percent eighteen months earlier. As noted above, our data show the number of advanced service lines provided over cable technology to residential customers nearly quadrupled between December 1999 and June 2001.

45. Combining our data with publicly-available sources about the availability of cable modem-ready plant, the 5.2 million cable high-speed lines reported represents a penetration rate of approximately 8 percent of cable modem capable homes as of mid-year 2001.⁹³ By contrast, in the Second Report, we reported a cable modem penetration rate of approximately 3 percent as of the beginning of 2000.⁹⁴ Residential and small business subscribers, not surprisingly, account for over 96 percent of the reported high-speed lines delivered over cable systems. This is consistent with our understanding that most cable systems are currently deployed in primarily residential areas.

46. In addition, our data collection shows that high-speed services using cable technology (such as cable modems) are reported in 49 states and the District of Columbia.⁹⁵ As we illustrated in the *Second Report*,⁹⁶ publicly available information indicates that cable systems capable of providing cable modem service⁹⁷ tend to be located in more densely populated areas,

⁹² See *Second Report*, 15 FCC Rcd at 20952. The FCC Form 477 collects information on high-speed lines delivered over "coaxial carrier systems including hybrid fiber-coaxial systems." In this Report, we refer to these lines as being delivered over "cable modem technology."

⁹³ NCTA estimates that, as of July 2001, more than 60 million households were passed by high-speed cable modem service. NCTA Comments in the *Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming*, CS Docket No. 01-129, Eighth Annual Report, FCC 01-389 (rel. Jan. 14, 2002) (2001 MVPD Competition Report), at 27. However, based on Morgan Stanley year-end estimates, cable modem service was available to as many as 68 million households as of July 2001. See also Richard Bilotti, Benjamin Swinburne, and Megan Lynch, *The Marquis de Broadbandbury – Part Deux*, Morgan Stanley Dean Witter, Jul. 3, 2001, at 46 (Morgan Stanley – Broadband Part Deux). Penetration is the number of subscribers divided by homes passed by cable modem-ready plant.

⁹⁴ See *Second Report*, 15 FCC Rcd at 20952.

⁹⁵ See also Appendix C, Tbl. 6.

⁹⁶ See *Second Report*, 15 FCC Rcd at 20954.

⁹⁷ As we noted in our *Second Report*, the Commission entered into "social contracts" with several large cable operators between 1995 and 1997, which generally required operators to upgrade the majority of their systems to at least 550 MHz and to ensure that at least 50 percent of their subscribers were served by systems having a capacity of at least 750 MHz. Pursuant to these social contracts, operators further agreed to provide free cable modems and high-speed Internet service to public and private schools, and to public libraries passed by their systems. See *Second Report*, 15 FCC Rcd at 20953, n.126.

especially in the East, the Midwest, and on the West Coast. Publicly available sources estimate that cable modem service is now available to about 70 percent of U.S. homes.⁹⁸

47. Although cable modem service typically delivers information to end-user customers at speeds in excess of 2 Mbps, essentially none (0.3 percent) of these connections carry information from customers to the Internet at those speeds.⁹⁹

b. ADSL and Other Traditional Wireline Technologies

48. In this section we have divided traditional wireline technologies into three categories. First, we look at ADSL¹⁰⁰ service, the most popular residential offering. Second, we examine other traditional wireline services, including both T1 and symmetric DSL (SDSL)¹⁰¹ services. This category is primarily used by business customers. Third, we review optical fiber services, which, because of their very high-speed and substantial expense, are of interest mostly to large business users. Together these LEC-delivered services represent a significant share of high-speed subscribers nationwide. As a consequence of its high rate of growth from a relatively small base, ADSL accounted for 28 percent of all high-speed lines as of the end of June 2001, compared to 13 percent eighteen months earlier.¹⁰² Other traditional wireline high-speed services accounted for 11 percent of all high-speed lines, compared to 22 percent at the end of 1999.¹⁰³ Optical fiber accounted 5 percent of all high-speed lines, compared to 11 percent eighteen months earlier.¹⁰⁴

49. ADSL. Our data collection shows that there were 2.7 million ADSL lines in service in the United States at the end of June 2001, compared to just under 0.4 million eighteen

⁹⁸ See *Morgan Stanley – Broadband Part Deux* at 46 (estimating 73 percent availability as of the end of 2001); NCTA estimates, based on separate Morgan Stanley estimates, that cable modem service could be available to as many as 81 million households (of about 106 million total households) at the end of 2001. NTCA Comments in the *2001 MVPD Competition Report* at 27; Communications Daily, Nov. 2, 2001, at 10, cites a Yankee Group estimate that cable modem service would reach 66 percent of U.S. households at the end of 2001 (compared with 45 percent for DSL services).

⁹⁹ Based on discussions with cable modem service providers, we understand that the services marketed to consumers generally offer “upload” speeds that do not exceed 1 Mbps. This is a clarification to information presented in the *Second Report*. See *Second Report*, 15 FCC Rcd at 20953.

¹⁰⁰ We use the term “ADSL” in this Report to refer simply to *asymmetric* DSL services, not to any particular protocol or standard for DSL technology. Asymmetric refers to the asymmetry of up end download speeds.

¹⁰¹ We use the term “SDSL” in this Report to refer simply to *symmetric* DSL services, not to any particular protocol or standard for DSL technology.

¹⁰² This includes all lines purchased to deliver transmissions at speeds in excess, in at least one direction, of 200 kbps.

¹⁰³ We note that the number of traditional wireline high-speed lines increased from almost 610,000 lines in December 1999 to almost 1.1 million in June 2001. The overall percentage of traditional wireline high-speed lines in service decreased only relative to the tremendous growth in other types of technology, such as cable and ADSL.

¹⁰⁴ These are lines in service to end-user customers in which optical fiber extends completely to the subscriber’s premises. Again, we note that the number of optical fiber high-speed lines increased from about 312,000 lines in December 1999 to almost 456,000 in June 2001. The overall percentage of optical fiber high-speed lines in service decreased only relative to the tremendous growth in other types of technology, such as cable and ADSL.

months earlier.¹⁰⁵ Approximately 37 percent of these 2.7 million lines meet the Commission's definition of advanced services. These services were reported in 50 states, the District of Columbia, Puerto Rico, and the Virgin Islands. The number of reporting providers was 86, compared to 28 providers eighteen months earlier.

50. Of the approximately 2.7 million reported ADSL lines, estimates provided by the reporting providers indicate that 92 percent (about 2.5 million lines) serve residential or small business customers. A reported 88 percent of these lines are sold directly to end-user customers, compared to the 90 percent figure we reported in the *Second Report*.¹⁰⁶ Approximately 93 percent are delivered solely over facilities owned by the reporting provider, as we also reported in the *Second Report*.¹⁰⁷ Almost none (0.2 percent) of the ADSL lines were reported to provide an information carrying capacity in excess of 2 Mbps in both directions.

51. Our data collection shows that incumbent LECs serve approximately 93 percent of ADSL subscribers, while the competitive LECs serve about 7 percent.¹⁰⁸ In the *Second Report* we illustrated that DSL deployment closely mirrors reported DSL subscribership. By contrast to the *Second Report*, in which we noted that competitive LECs appeared to be adding customers for DSL services at a faster rate than incumbent LECs,¹⁰⁹ publicly available data indicate that incumbent LECs added customers at a faster rate than competitive LECs between the third quarter of 2000 and the third quarter of 2001.¹¹⁰ Publicly available sources estimate that ADSL service is now available to about 45 percent of U.S. homes, compared to about 25 percent of homes at the end of 1999.¹¹¹

¹⁰⁵ By comparison, and as an example of publicly available estimates, research firm TeleChoice reports 3.3 million DSL lines in service in the U.S. at the end of June 2001. *See TeleChoice DSL Deployment Summary – Updated 11/27/01* (visited Feb. 5, 2002) <http://www.xdsl.com/content/resources/deployment_info.asp> (TeleChoice Deployment Statistics). Note, however, that our count includes only ADSL lines purchased to deliver transmissions at speeds that exceed, in at least one direction, 200 kbps. The 250-lines-per-state reporting threshold in our data collection also tends to reduce our count, as smaller LECs that provide DSL service may not meet the reporting threshold.

¹⁰⁶ *See Second Report*, 15 FCC Rcd at 20956.

¹⁰⁷ *Id.*

¹⁰⁸ *See Appendix C, Tbl. 5, for shares of lines provided by various types of carriers, for the other line technology categories discussed in this Report.*

¹⁰⁹ *See Second Report*, 15 FCC Rcd at 20956.

¹¹⁰ For example, data compiled by TeleChoice indicate that customers of the incumbents LECs and the competitive LECs both increased by over 40 percent during the third quarter of 2000. Each group of providers experienced declining rates of growth in succeeding quarters, but competitive LEC customer growth was down to 6 percent in the third quarter of 2001, compared to 16 percent for incumbent LECs. In the first quarter of 2001, the number of competitive LEC customers actually declined. *See TeleChoice Deployment Statistics, supra* note 105.

¹¹¹ Yankee Group estimates DSL availability to 45 percent of U.S. homes at the end of 2001. *See supra* note 98. Morgan Stanley estimates 49 percent as of the end of 2001 and reports 25 percent availability as of the end of 1999. *See supra* note 98. Also, the Pinkham Group reports that over 70 percent of U.S. households are served by an incumbent LEC central office equipped to offer DSL service, but that over one third of these same households can not utilize DSL due to distance and technical limitations, which implies an availability rate of about 46 percent. *See Broadband Market Study - DSL Current Deployment and Availability Q3, 2001* (visited Feb. 5, 2002) <http://www.pinkhamgroup.com/c_reports.htm>.

52. Other Wireline. Providers reported 1.1 million high-speed lines in this category, which includes services such as T1 and SDSL services, compared to 0.6 million lines reported in the *Second Report*. Of that total, 100 percent of these lines meet the Commission's definition of advanced services. These services were reported in every state, the District of Columbia, Puerto Rico, and the Virgin Islands.

53. Approximately 87 percent of high-speed lines over other traditional wireline technologies were reported to serve larger business and institutional users. Reporting providers indicate that 68 percent of their lines are billed directly to end-users, with the balance billed to other providers or retailers. A reported 75 percent of these lines are provided over the reporting provider's own facilities, indicating that the provider uses its own "local loop" facilities (or the wireless equivalent) to deliver the service to its customer.¹¹² Finally, our data show that 16 percent of these lines deliver an information carrying capacity in excess of 2 Mbps in both directions.

54. Optical Carrier (i.e., Fiber to the End-User Premises). Approximately 460,000 high-speed lines over optical fiber systems are reported in our data collection, compared to the range of 250,000 to 350,000 lines that we reported in the *Second Report*.¹¹³ Essentially, all of these lines meet the Commission's definition of advanced services, and 26 percent are reported to be faster than 2 Mbps in both directions. A very small percentage (0.6 percent) of these lines are reported to be in service to residential customers. Almost all (81 percent) are billed directly to end-user customers and virtually all (98 percent) are delivered over facilities owned solely by the reporting provider.

c. Terrestrial Fixed Wireless Technologies

55. We do not release, at this time, specific line counts for high-speed services delivered over terrestrial fixed wireless technologies. These numbers are aggregated with totals for high-speed lines delivered over satellite technology to address confidentiality concerns.¹¹⁴ In lieu of a precise subscribership total, we report that terrestrial fixed wireless technology accounts for between 50,000 and 150,000 high-speed lines. By contrast, in the *Second Report* we reported that wireless service represented fewer than 50,000 subscribers.¹¹⁵ Of these lines, 89 percent are reported to meet the Commission's definition of advanced services. Most of the reported terrestrial fixed wireless high-speed lines (85 percent) serve residential or small business customers. According to our data collection, virtually none (0.1 percent) are reported to deliver information carrying capacity in excess of 2 Mbps in both directions.

56. Confidentiality concerns preclude us from providing more detailed analyses from the collected terrestrial fixed wireless data and from producing a map based on zip codes where

¹¹² As an example of a "facilities-based" provider that does not use its "own facilities" to deliver service, as reported in our data collection, a competitive LEC might deliver SDSL service to its customer by placing its own electronic equipment on a local loop that it leases from an incumbent LEC as an unbundled network element (UNE) loop.

¹¹³ See Appendix C, Tbl. 1; *Second Report*, 15 FCC Rcd at 20958.

¹¹⁴ To prevent the release of information that may be deemed competitively sensitive, we may aggregate or suppress data in some charts and tables that we release. In other cases, data may be presented as a range of numbers rather than as an exact number.

¹¹⁵ See *Second Report*, 15 FCC Rcd at 20958.

terrestrial fixed wireless subscribers exist. Publicly available information, however, indicates that terrestrial fixed wireless high-speed systems are scattered throughout the country. In addition, our data collection indicates that the nine companies with high-speed terrestrial fixed wireless subscribers reported such subscribers in a total of 25 states.

57. Public estimates of the extent of terrestrial fixed wireless high-speed deployment differ markedly and some industry analysts' estimates generally exceed our reported figure.¹¹⁶ For instance, Strategis Group estimates that there were roughly 100,000 terrestrial fixed wireless high-speed subscribers in the United States as of mid-2001.¹¹⁷ Cahners In-Stat believes there are currently about 300,000 terrestrial fixed wireless subscribers, including businesses, in the United States.¹¹⁸

58. Within the MDS sector, Yankee Group estimated that there were approximately 20,000 MDS-based high-speed Internet access subscribers in the United States at the end of 2000,¹¹⁹ and that this number will have grown to 87,000 by the end of 2001.¹²⁰ Yankee Group also believes that MDS systems currently reach 55 percent of the United States population.¹²¹ Based on various public information sources, it appears that at least 28 companies were offering high-speed Internet access via MDS in approximately 44 separate markets as of the end of 2000.¹²²

59. In addition, many local and regional ISPs use unlicensed spectrum to offer terrestrial fixed wireless high-speed Internet access in a small number of markets apiece. Estimates of the number of companies using unlicensed spectrum for this service vary. One equipment manufacturer estimates there are around 800,¹²³ while another believes there are 50 to 100.¹²⁴ One industry analyst estimates there are just under 200.¹²⁵ Based on obtainable,

¹¹⁶ Several factors may explain these differences. Not all wireless providers met the reporting threshold, either in terms of the number of high-speed subscribers in a state, or the transmission speed of their service. Business customers utilizing wireless under private contractual arrangements similar to private line services are generally not captured in our data. Wireless services with transmission speeds of 128 kbps may be included in some analysts' estimates.

¹¹⁷ Alex Salkever, *Broadband's Next Wave: Wireless?*, Business Week Online, May 17, 2001 (citing Peter Jarich of Strategis Group).

¹¹⁸ Eve Tahmincioglu, *For High-Speed Access to the Web, a Dish-to-Dish Route*, New York Times, Oct. 11, 2001, at G9 (citing Cahners In-Stat Group).

¹¹⁹ Michael Bartlett, *Fixed Wireless System To Join Broadband Access Race – Study*, Newsbytes, Aug. 29, 2001 (citing Yankee Group).

¹²⁰ Denise Pappalardo, *Worldcom Adds Wireless MMDS Area*, Network World, Aug. 20, 2001, at 23 (citing Lindsay Schroth, an analyst at The Yankee Group).

¹²¹ Michael Bartlett, *Fixed Wireless System To Join Broadband Access Race – Study*, Newsbytes, Aug. 29, 2001 (citing Lindsay Schroth, an analyst with Yankee Group).

¹²² See *Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services*, Sixth Report, 16 FCC Rcd 13350, 13452 (2001).

¹²³ *Unlicensed Update – The Service Providers*, Broadband Wireless Business, June/July 2000, at 25 (citing Tom Walusek, BreezeCOM). According to Walusek, the 800 includes ISPs with only one functioning link. *Id.*

¹²⁴ *Id.* (citing Scott Plumlee, C-Spec).

¹²⁵ *Id.* (citing Andy Fuertes, Allied Business Intelligence).

publicly-available information, the Commission estimates there are at least 241 different companies using unlicensed spectrum to provide high-speed terrestrial fixed wireless Internet access in approximately 503 different counties.¹²⁶

d. Satellite Technologies

60. Our data collection confirms that provision of high-speed services over satellite technology is still in the early stages of deployment with less than four providers reporting. High-speed service over satellite technology accounted for between 50,000 and 150,000 high-speed lines as of June 2001.¹²⁷ We note that virtually all of these lines are provided to residential and small business users, and are billed directly to end-user customers. We also note that none of these lines satisfies the Commission's definition of advanced services. Again, confidentiality concerns prevent us from providing information from our data collection on the geographic distribution of satellite service subscribers. Publicly available information, however, indicates that there are satellite high-speed subscribers in every state. StarBand Communications announced that by the end of 2001 it had installed nearly 40,000 paying subscribers in all 50 states, and Hughes Network Systems said it had over 100,000 subscribers for its DIRECTWAY satellite service.¹²⁸

C. Investment in High-Speed Access Technologies

61. Overview. This section reviews the analyses and predictions of various industry analysts with respect to investment in the high-speed and advanced services sector. Overall, analysts observe that carriers have continued to invest in this sector in a substantial way resulting in increased availability of various high-speed and advanced services platforms for consumers throughout the nation. According to one analyst, about 75 percent of households will have high-speed Internet access available from either DSL or cable modem service by the end of 2001, up from 60 percent in 2000.¹²⁹ Another analyst estimates as of the first quarter of 2000, that 81 percent of households had available DSL or cable modem service.¹³⁰ The analyst further estimates that 94 percent of households will have available DSL or cable modem service by 2005.¹³¹ In addition, it appears that other services, such as fixed wireless and satellite, have significantly expanded availability to a large percentage of the United States. For example, high-

¹²⁶ See *Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services*, Sixth Report, 16 FCC Rcd 13350, 13444 (2001).

¹²⁷ Fixed wireless and satellite high-speed services, together, represent 200,000 high-speed lines as of the end of June 2001, compared to 50,000 at the end of 1999. See Appendix C, Tbl. 1.

¹²⁸ *StarBand Wraps Up 2001 as American's Leading Consumer Satellite Internet Provider*, Press Release, Jan. 7, 2001 (visited Feb. 5, 2002) <<http://www.starband.com/whowear/pr/010702.htm>>; *DIRECTWAY Subscribers Break 100,000 Mark*, Press Release, Jan. 9, 2002 (visited Feb. 5, 2002) <<http://www.hns.com/corporate/news/pr/pr9999487460002.htm>>.

¹²⁹ See *Broadband Will be Available to 75 percent of US Homes by Year-Says New Yankee Group Report*, Yankee Group News Releases, Nov. 1, 2001 (Yankee Group Release).

¹³⁰ *Morgan/McKinsey Broadband Report* at 43.

¹³¹ *Id.* at 52.

speed satellite services are now available in all 50 states,¹³² and MMDS systems currently reach 55 percent of the population.¹³³ The percentage of the population reached by MMDS is expected to grow to 90 percent by the end of 2004.¹³⁴ Analysts generally predict this trend will continue. Likewise, they observe that subscription to these services is increasing at a significant rate and predict it will continue to do so in the future. Increases in subscribership suggest a stronger incentive to invest to make high-speed and advanced services available to even more consumers.

62. As the Commission noted in the *Second Report*, industry investment in infrastructure to support high-speed and advanced services has increased dramatically since 1996.¹³⁵ Analysts forecasted at that time that this upward trend would continue, spurred by the introduction of competition into the market.¹³⁶ Although analysts still generally expect this trend to continue, they observe that there has been a recent slowdown in investment caused by the economic downturn generally and, more particularly, over-building by carriers, over-manufacturing by vendors, over-capitalization by financial markets, coupled with unrealistic market expectations by investors.¹³⁷ They conclude that, although it will take some time for the industry to absorb excess bandwidth capacity and increase utilization of existing assets, the recent slowdown in investment has not been caused by a slowdown in consumer demand.¹³⁸ In addition, they conclude that the current contraction in the competitive LEC market, in particular, will likely continue in the near term because the economic opportunity for targeting small-to-medium business markets as an entry strategy, which is where competitive LECs have focused much effort, is not as great as originally expected.¹³⁹

63. The Commission also noted in the previous *Report* that an equally significant factor driving infrastructure investment was the rapidly rising demand for high-speed services.¹⁴⁰ This factor continues to be true. Access to computers and high-speed Internet access has grown dramatically. According to a government survey, 53.9 million households (or 50.5 percent of all

¹³² See, e.g., Q&A StarBand Facts (visited Feb. 5, 2002)

<<http://www.starband.com/faq/starbandfacts.htm#available2>> ("The StarBand service is currently available only in the 48 contiguous U.S., Alaska and Hawaii.").

¹³³ Michael Barlett, *Fixed Wireless System to Join Broadband Access Race – Study*, Newsbytes, Aug. 29, 2001 (citing Lindsay Schroth, an analyst with Yankee Group).

¹³⁴ *Id.*

¹³⁵ See *Second Report*, 15 FCC at 20983.

¹³⁶ *Id.*

¹³⁷ *U.S. Communications Infrastructure at a Crossroads: Opportunities Amid the Gloom*, McKinsey & Company, Goldman, Sachs & Co., Aug. 2001, at 1, 5-7, 11, 37-40. (*McKinsey/Goldman Infrastructure Report*); *TeleChoice Sees Slower but Still Substantial Growth in DSL Market* (visited Feb. 5, 2002) <<http://xDSL.com/content/tcarticles/wp081101.asp>>; *Yankee Group Forecasts 2002 DSL Revenues at Over \$3.3 Billion*, Yankee Group New Releases, Jan. 11, 2002.

¹³⁸ *Id.*

¹³⁹ *Sizing Up the CLECs: A Companion Piece to Broadband 2001*, J.P. Morgan Securities, Inc., Equity Research, Apr. 2, 2001, at 1 (*Morgan CLEC Report*)

¹⁴⁰ *Second Report*, 15 FCC Rcd at 20983.

households) had Internet access as of September 2001.¹⁴¹ The percentage of homes with household Internet access increased rapidly from the 44.5 percent penetration rate in August 2000.¹⁴² Analysts predict that the number of on-line households will continue to increase. Currently, the vast majority (80.0 percent) are narrowband connections, but the percentage of high-speed connections should increase, so that in the next five years, 55.7 percent of access connections are projected to be high-speed or advanced. Analysts predict for residential high-speed or advanced service subscribership to increase from 1.9 million at the beginning of 2000 to 40 million at the end of 2005.¹⁴³ By 2004, analysts expect 28.9 percent of households will access the Internet through cable modem services, 21.1 percent through DSL and 5.7 percent through wireless and satellite technologies.¹⁴⁴

64. Analysts predict that new and unforeseen capacity hungry applications that require advanced service platforms will drive demand, and in turn deployment, in the future. One report forecasts that in 2005, the average broadband household will download about 70 megabits of files, consume more than 20 minutes of streaming per day, and download three two-hour long movies per month.¹⁴⁵ As these new services come on line, analysts expect that the use of the Internet will evolve. For example, they speculate that Internet dot-com web-page traffic will decline in relative importance as new demand such as enterprise driven machine-to-machine and streaming (audio and video) traffic rises.¹⁴⁶

65. Cable: Recent investment in cable infrastructure has been significant. In 2000, the cable industry spent a total of \$15.5 billion on the construction of new plant, upgrades, rebuilds, new equipment, and maintenance of new and existing equipment.¹⁴⁷ This represents a 45.9 percent increase over the \$10.6 billion spent in 1999.¹⁴⁸ Analysts expect that operators will have spent an estimated \$14.7 billion in 2001.¹⁴⁹ Moreover, it appears that the amount invested in cable infrastructure has remained at high levels over the past several years and has resulted in increased availability of cable modem service. As of year-end 2000, cable modem service was

¹⁴¹ U.S. Department of Commerce, Economics and Statistics Administration, National Telecommunications and Information Administration, *A Nation Online: How Americans Are Expanding Their Use of the Internet* (Feb. 2002) (*A Nation Online*).

¹⁴² *Id.*

¹⁴³ *Broadband 2001, A Comprehensive Analysis of Demand, Supply, Economics, and Industry Dynamics in the U.S. Broadband Market*, J.P. Morgan Chase & Co. and McKinsey & Company, Inc., Apr. 2, 2001, at 1. (*Morgan/McKinsey Broadband Report*); TeleChoice Deployment Statistics, *supra* note 105; *Morgan Stanley – Broadband Part Duex* at 46.

¹⁴⁴ *Id.*

¹⁴⁵ *IP! – Summary: How Changes in the Internet are Disrupting the Telecom Services Industry*, JPMorgan H&Q and McKinsey & Company, May 11, 2001, at 1, 16-19, 28-29 (*JPMorgan/McKinsey IP Report*)

¹⁴⁶ *Id.*

¹⁴⁷ Paul Kagan Assocs., Inc., *Estimated Capital Flows in Cable TV*, The Broadband Cable Financial Databook 2001, Jul. 2001, at 138. "New builds" are the construction of new cable plant where none existed before, primarily newly built homes. "Rebuilds" are improvements to existing systems that do not retain much of the old system plant and equipment. Instead, they consist of mostly new plant and equipment. "Upgrades" are improvements to existing cable systems that do not require the replacement of the entire existing plant and equipment.

¹⁴⁸ *Id.*

¹⁴⁹ *Id.*

available to 58.5 million homes, as compared to 35.5 million in 1999.¹⁵⁰ In 2001, cable modem services are estimated to be available to 77.5 million homes.¹⁵¹ Recent progress in network upgrades has allowed cable operators to provide two-way service to the vast majority of cable modem ready homes.¹⁵² One analyst predicts that by 2003 investment spending is expected to result in the upgrade of substantially all of the U.S. cable infrastructure (more than 99.9 million homes) to enable the delivery of new bandwidth-intensive services.¹⁵³ According to one analyst, once the upgrade is completed, the capital expenditures will likely remain high, but should decline.¹⁵⁴

66. Subscribership to cable modem service is also increasing. At the end of 2000 there were approximately 3.9 million cable subscribers.¹⁵⁵ By year-end 2001, an industry analyst estimates that cable modem subscriptions will almost double, to 7.5 million subscribers.¹⁵⁶ In addition, that same analyst expects that over the next five years, cable modem subscriptions will continue to increase dramatically, reaching an average estimate of 28-30 million by 2006 and forecast penetration rates for cable modems to increase to 40 percent by 2006.¹⁵⁷

67. Analysts expect that deployment of other cable-based advanced services will accelerate in the next few years. For example, analysts expect that subscriber demand for video-on-demand (VOD) services, which allow viewers to access TV programming "on demand" from a remote video server and have full VCR functionality, such as pausing, rewinding, and fast forwarding, will increase substantially over the next few years.¹⁵⁸ Analysts predict VOD services may reach 60 percent of total basic cable subscribers, or 42 million units by 2005-06.¹⁵⁹ According to one analyst, VOD will generate revenues of: more than \$65 million by year-end 2001; \$420 million in 2002; \$970 million in 2003; \$1.43 billion in 2004; and will reach \$1.98 billion by year-end 2005.¹⁶⁰ According to another analyst, VOD subscribers are forecasted to grow from 17,000 in 2001 to 365,000 in 2006.¹⁶¹

¹⁵⁰ *Morgan Stanley – Broadband Part Duex* at 46.

¹⁵¹ *Id.*

¹⁵² See NCTA Comments in the 2001 MVPD Competition Report at 26; see also Comcast Comments in the 2001 MVPD Competition Report at 7; *CableLabs DOCSIS Primer* (visited Feb. 5, 2002) <<http://www.cablemodem.com/docsisprimer.html>>.

¹⁵³ Richard Bilotti, Benjamin Swinburne, and Megan Lynch, *Broadband Cable Television, The Past is Prologue to the Future* . . . , Morgan Stanley Equity Research, Oct. 4, 2001, at 33 (*Morgan Stanley Broadband Cable Report*).

¹⁵⁴ *Id.* at 42.

¹⁵⁵ See *Morgan Stanley – Broadband Part Duex* at 46.

¹⁵⁶ *Morgan Stanley Broadband Cable Report* at 28-30.

¹⁵⁷ *Id.*

¹⁵⁸ Spencer Wang, John Martin, Thomas Sheehan, Mark Holmes, *Return on Bandwidth (ROB) Analysis: Interactive TV and Cable Television*, ABN-AMRO, Jun. 2001, at 30 (*ABN-AMRO Report*).

¹⁵⁹ *Morgan Stanley Broadband Cable Report* at 16.

¹⁶⁰ *Video-on-Demand Will Generate Revenues of Nearly \$2 Billion in 2005*, Yankee Group News Releases, Jun. 25, 2001.

¹⁶¹ *ABN-AMRO Report* at 33.

68. DSL: Analysts project continued growth for DSL advanced services technologies and investment. While widespread deployment of DSL began later relative to deployment of cable modem service, overall deployment of DSL is catching up. Analysts differ, however, as to which technology will ultimately take the lead. DSL deployment began in response to the 1996 Act and the presence of competitive access providers.

69. Overall, carriers are investing substantially in the nation's telecommunications network, including the deployment of DSL technologies. In 2000, incumbent LECs invested almost \$29.4 billion in infrastructure.¹⁶² As substantial portion of this investment is in high-speed or advanced data services. For example, Verizon estimates that 25 percent of capital expenditures in 2001 have been on "telecommunications data" up from 22 percent in 2000.¹⁶³ Competitive LECs' have made substantial capital expenditures, spending about \$17 billion in 1999, \$22.6 billion in 2000, and an estimated \$14.2 billion in 2001.¹⁶⁴ Venture capital funding for competitors has also been significant. For example, competitive LECs, integrated communications providers, DSL, and fiber companies received \$3.4 billion of such funding during the first three quarters of 2000.¹⁶⁵ One analyst predicts, however, that competitors will face economic challenges as funding for infrastructure investment has become scarce.¹⁶⁶ It notes that with some stock prices down 90 percent or more from their highs, the industry has lost an estimated \$100 billion in equity capitalization from its peak.¹⁶⁷

70. There have been tremendous recent increases in availability of DSL due to investments in deployment. For example, one analyst estimates availability to 51.5 million homes in 2001, as compared to a reported 37.6 million in 2000 and 25.8 in 1999.¹⁶⁸ Incumbent LECs have increased the number of customers who now have the opportunity to obtain DSL service from 44 percent in 1999 and to an estimated 64 percent in 2001.¹⁶⁹ Some incumbent LECs have been aggressively investing in their networks to make more homes "DSL addressable." Incumbent LECs have chosen a variety of rollout strategies for DSL as a consequence of differences in outside plant. One such strategy, for example, is SBC's Project Pronto, at a cost of \$5 billion.¹⁷⁰ Likewise, Covad Communications had deployed a network that

¹⁶² Multimedia Telecommunications Association, *2001 Multimedia Telecommunications Market Review and Forecast* at 65 (this is total capital investment, only portions of which are allocable to the provision of DSL).

¹⁶³ See Verizon Communications, 2000 Annual Report (2001) (visited Feb. 5, 2002) <http://investor.verizon.com/annual/00VZ_AR.pdf>. In addition, Qwest reports that of total capital investment in 2001, 11 percent was for "local broadband" and 15 percent was for "data." The company projects that in 2002, 9 percent will be for local broadband, and 20 percent will be for data. See Afshin Mohebbi, Presentation at Qwest 2001 Investment Community Conference (Dec. 13, 2001) (visited Feb. 5, 2002) <<http://www.qwest.com/about/investor/meetings/Mohebbi.pdf>>.

¹⁶⁴ Unpublished estimate provided by New Paradigm Resources Group, Chicago, Illinois (Jan. 2002).

¹⁶⁵ Association of Local Telecommunications Services, *Report on the State of the Local Telecom Industry* (2001) (visited Feb. 5, 2002) <<http://www.alts.org/Filings/022001AnnualReport.pdf>>.

¹⁶⁶ Morgan CLEC Report at 8.

¹⁶⁷ *Id.* at 14.

¹⁶⁸ Morgan Stanley – Broadband Part Duex at 46.

¹⁶⁹ Morgan/McKinsey Broadband Report at 40-42.

¹⁷⁰ *Id.* at 68-69, 82.

currently reaches approximately 40 to 45 percent of all homes and businesses in the United States.¹⁷¹

71. Subscription grew as well in 2000 by 1.9 to 2.4 million subscribers, representing annual growth of over 427 percent compared to 1999 subscription rates.¹⁷² While DSL growth has been robust, it has slowed somewhat recently. One analyst notes that during the first two quarters of 2001, growth in DSL subscriptions has slowed to 14 to 20 percent due to three factors: competitive service provider failures, increased service pricing, and the general downturn of economic conditions.¹⁷³ Another analyst anticipates, however, that surviving service providers will continue to add customers.¹⁷⁴ In particular, an analyst predicts that over the next three years, residential DSL subscription will grow to 13.4 million in 2004, a 21.2 percent penetration rate.¹⁷⁵

72. Wireless: The fixed wireless industry provides television programming (in the Multi-channel Multi-Point Distribution Service (MMDS) and Local Multi-Point Distribution Service (LMDS)), Internet access, data transfer services, interactive services and advanced telecommunications services over a terrestrial microwave platform. Despite the setbacks that the fixed wireless industry has faced during the past year, including financial problems and halting of deployment plans by major operators, analysts believe that the industry still has the potential to grow and become a successful vehicle for offering high-speed services.¹⁷⁶ One analyst estimates that the number of fixed-wireless high-speed subscribers in the United States will grow from 100,000 today to 4.7 million by 2005, and that fixed-wireless technology will account for 15 to 20 percent of the U.S. high-speed market at that time.¹⁷⁷ Another analyst estimates there are currently about 300,000 fixed wireless subscribers, including businesses, in the United States, and that that figure will grow to two million by 2005.¹⁷⁸ In addition, one analyst reports that MMDS systems currently reach 55 percent of the U.S. population, but will be available to 90 percent of the population by 2004.¹⁷⁹ At the end of 2000, there were approximately 20,000

¹⁷¹ Covad Communications, Form 10-Q Consolidated Balance Sheet (Nov. 2001) (visited Feb. 5, 2002) <<http://www.covad.com/companyinfo/investorrelations/documents/COVD-10-Q-11-14-2001.pdf>>.

¹⁷² *Morgan Stanley – Broadband Part Due*x at 46.

¹⁷³ *TeleChoice Sees Slower but Still Substantial Growth in DSL Market* (visited Feb. 5, 2002) <<http://xDSL.com/content/tcarcicles/wp081101.asp>>.

¹⁷⁴ *Id.*

¹⁷⁵ *Morgan/McKinsey Broadband Report* at 44; *Morgan Stanley Broadband Cable Report* at 31.

¹⁷⁶ *Fixed Wireless No Wipeout, Despite Recent Troubles*, Network World, Jun. 4, 2001, at 38 (citing Insight Research: “Despite the high-profile failures we’ve seen, we think this is a temporary setback. … Providers are definitely going to implement more broadband wireless.”); *Wireless Expected To Challenge Cable, DSL For SOHO Customers*, Business Communications Review, Jun. 1, 2001, at 8 (citing Allied Business Intelligence: “Broadband wireless technology is a potential challenger to cable modems and DSL for small office/home office (SOHO) customers.”).

¹⁷⁷ Alex Salkever, *Broadband’s Next Wave: Wireless?*, Business Week Online, May 17, 2001 (citing Peter Jarich of Strategis Group).

¹⁷⁸ Eve Tahmincioglu, *For High-Speed Access to the Web, a Dish-to-Dish Route*, New York Times, Oct. 11, 2001, at G9 (citing Cahners In-Stat Group).

¹⁷⁹ Michael Bartlett, *Fixed Wireless System To Join Broadband Access Race – Study*, Newsbytes, Aug. 29, 2001 (citing Lindsay Schroth, an analyst with Yankee Group).

subscribers in the United States in the MMDS sector.¹⁸⁰ Another analyst expects that there will be 87,000 subscribers by the end of 2001,¹⁸¹ and that this number will grow to about 890,000 MMDS fixed wireless subscribers by 2006.¹⁸²

73. Many analysts believe that fixed wireless carriers are awaiting the availability of next-generation technologies that will not require a direct line-of-sight between subscribers' antennas and their receivers before making further deployments because these new technologies will lower their costs and increase their service options significantly.¹⁸³ One analyst stated, "MMDS is not readily available because service providers are waiting for next-generation equipment to come to market."¹⁸⁴ Another analyst claims, "Combining cellularization with non-line-of-sight technologies could lower the cost of providing MMDS service significantly."¹⁸⁵ Analysts conclude, however, these technologies will not be ready for full-scale deployment until at least 2003.¹⁸⁶

74. Given the severe financial reversals of three major fixed wireless carriers (Teligent, Inc., WinStar Communications, Advanced Radio Telecommunications), the phasing out of fixed wireless service by AT&T, and the halting of new deployments while waiting for newer equipment by Sprint Broadband, capital expenditures within the fixed wireless sector have declined during 2001. One analyst predicts, however, that subscriber growth should create a fixed wireless equipment market in the U.S. worth \$10.4 billion and a revenue stream of \$825

¹⁸⁰ Michael Bartlett, *Fixed Wireless System To Join Broadband Access Race – Study*, Newsbytes, Aug. 29, 2001 (citing Yankee Group).

¹⁸¹ Denise Pappalardo, *Worldcom Adds Wireless MMDS Area*, Network World, Aug. 20, 2001, at 23 (citing Lindsay Schroth, an analyst at The Yankee Group).

¹⁸² *Id.*

¹⁸³ *Wireless Expected To Challenge Cable, DSL For SOHO Customers*, Business Communications Review, Jun. 1, 2001, at 8 (citing Allied Business Intelligence: "Technology breakthroughs that allow for non-line-of sight applications are being introduced, boosting the prospects for multichannel multipoint distribution service (MMDS) and broadband wireless access (BWA) systems."); *The Yankee Group Projects That Worldwide Market for High Frequency Fixed Wireless Solutions Will Grow to \$1.9 Billion in 2006*, Business Wire, Nov. 8, 2001 ("[D]espite the disillusionment caused by slow growth in 2001, there is a market for high-frequency (HF) point-to-multipoint products. However, the market for HF PMP solutions is still emerging, and there are issues yet to be resolved by both vendors and carriers that use this technology"); Michael Bartlett, *Fixed Wireless System To Join Broadband Access Race – Study*, Newsbytes, Aug. 29, 2001 (citing Lindsay Schroth, an analyst with Yankee Group: "[L]ine-of-sight restrictions are hampering deployment of MMDS fixed wireless systems." One technology that might help overcome next-generation products overcome these restrictions is orthogonal frequency division multiplexing (OFDM). Schrath believes that OFDM has "spectral efficiency" and that "several vendors are working on next-generation technologies that address the limitations of MMDS fixed wireless systems.").

¹⁸⁴ Denise Pappalardo, *Worldcom Adds Wireless MMDS Area*, Network World, Aug. 20, 2001, at 23 (citing Lindsay Schroth, an analyst at The Yankee Group).

¹⁸⁵ Michael Grebb, *Can Broadband Save MMDS?*, Cablevision, May 28, 2001, at 32 (citing Andy Fuentes, senior vice president of communications technology at Allied Business Intelligence. He also states that with non-line-of-sight technology, "there's the potential for more self-install.... That takes the massive cost of the truck roll out of there." Fuentes predicts that self-installs will be commonplace in MMDS operations within two years.)

¹⁸⁶ Sinead Carew, *Could Fixed Wireless Still Have Its Day?*, ComputerWire, Oct. 30, 2001 (citing Lindsay Schroth, an analyst at Yankee Group); Denise Pappalardo, *Fixed Wireless Takes Some Lumps*, Network World, Nov. 5, 2001, at 33 (citing Maribel Dolinov, senior analyst at Forrester Research); Denise Pappalardo, *Worldcom Adds Wireless MMDS Area*, Network World, Aug. 20, 2001, at 23 (citing Lindsay Schroth, an analyst at The Yankee Group).

million within five years.¹⁸⁷ Another forecasts that high-speed wireless revenue in North America will increase from \$963 million during 2000 to over \$14 billion by 2006.¹⁸⁸

75. Some analysts believe that, while fixed wireless has the potential to compete with DSL and cable modem service, the technology is best-suited for rural and underserved markets where these services are not available.¹⁸⁹ Other analysts claim that the technology will be deployed mainly to residential, not business, customers.¹⁹⁰

76. During 2001, the Commission authorized the use of MMDS and Instructional Television Fixed Service¹⁹¹ (ITFS) spectrum for mobile, in addition to, fixed use by licensees. Analysts and industry players generally believe the decision gives fixed wireless carriers and equipment vendors additional flexibility and may help to revive the industry.¹⁹²

77. Satellite: High-speed service is available today by satellite in most areas of the U.S.¹⁹³ Hughes provides high speed service under its DIRECWAY and DirecPC brands, and StarBand, which has strategic partnerships with Gilat Satellite Networks, Microsoft Corporation and EchoStar Communications, began operation in 2000 and launched its service in late 2000.¹⁹⁴

¹⁸⁷ Alex Salkever, *Broadband's Next Wave: Wireless?*, Business Week Online, May 17, 2001 (citing Peter Jarich of Strategis Group).

¹⁸⁸ *Fixed Wireless No Wipeout, Despite Recent Troubles*, Network World, Jun. 4, 2001, at 38 (citing Insight Research).

¹⁸⁹ Sinead Carew, *Could Fixed Wireless Still Have Its Day?*, ComputerWire, Oct. 30, 2001 (citing Lindsay Schroth, an analyst at Yankee Group: "Fixed wireless is not going to be the market that people thought, but there will still be a place for it," she said. Rather than pitching their wares against DSL or cable, operators should go after niche markets like rural areas outside of the reach of DSL.").

¹⁹⁰ *Fixed Wireless No Wipeout, Despite Recent Troubles*, Network World, Jun. 4, 2001, at 38 (citing Peter Jarich, an analyst with The Strategis Group: "We see the technology as being primarily residential.... We're not seeing business as the right way to go. ... Business users have a range of connectivity options to choose from, and they're more concerned about quality of service and reliability than are residential users."); and citing Chris Whitley of Insight Research: "When businesses decide to go with a fixed wireless link, it's often as a back-up connection, or for less critical traffic only.").

¹⁹¹ ITFS are wireless services supplied by holders of spectrum created for educational and related community purposes.

¹⁹² Jim Barthold, *Fixed Wireless Eyes Mobile Future*, Telephony, Oct. 1, 2001. (John Schwartz, president of the Instructional Telecommunications Foundation and a representative of The National ITFS Association, stated, "We do have an evolution to make now."); Leo Cyr, president and chief operating officer of Clearwire Technologies, which serves ITFS licensees, said, "It gives you some new service possibilities, especially with portability."; Charles Riddle, vice president of marketing and business development at NextNet Wireless: "This ruling really plays into our hands ... We're uniquely positioned to take advantage."; Peter Jarich, director of Global Broadband Research for The Strategis Group: "It doesn't look like [Sprint PCS and WorldCom] are committed to fixed. ... In fact, everyone wonders if they're [both] going to stick with their MMDS fixed wireless plans or move to deploy 3G.").

¹⁹³ We note that high-speed satellite services are widely available in the United States. *See, e.g.*, Q&A StarBand Facts (visited Feb. 5, 2002) <<http://www.starband.com/faq/starbandfacts.htm#available2>> ("The StarBand service is currently available only in the 48 contiguous U.S., Alaska and Hawaii.").

¹⁹⁴ *See* DIRECWAY, Frequently Asked Questions, (visited Feb. 5, 2002) <http://www.hns.com/direcway/for_home/learn_more/faq.htm>, and the DirecPC System For Your Home (visited Feb. 5, 2002) <<http://www.direcpc.com/athome/serviceplanstxt.html>>. *See also* Q&A StarBand Facts (visited Feb. 5, 2002) <<http://www.starband.com/faq/starbandfacts.htm>>; What is StarBand? (visited Feb. 5, 2002) <<http://www.starband.com/whatis/index.htm>>; (visited Feb. 5, 2002)

(continued....)

Several satellite providers project deployment of additional systems using the Ka-band that will be capable of providing residential and business advanced services over the next several years.¹⁹⁵

78. Subscriber projections for satellite high-speed systems vary significantly. Several recent projections estimate subscription rates of from 4 to 5 million by 2005.¹⁹⁶ Several analysts suggest that there are 20 to 30 million U.S. homes that are unlikely to ever have DSL or cable modem access and consequently that satellite-based consumer services should make significant headway in the market for high-speed connectivity.¹⁹⁷ Some analysts predict that satellite high-speed systems will become the dominant means of delivering high-speed data and Internet to users outside urban areas and in areas of low subscriber density, and, within ten years, may capture between 5 and 10 percent of high-speed access subscribers.¹⁹⁸ Salomon Smith Barney projects revenue from high-speed satellite Services to reach \$3.6 billion in 2005.¹⁹⁹ Bank of America Securities estimates that high-speed satellite service revenues will grow from \$694 million in 2001 to \$4.486 billion in 2005 and \$7.489 billion in 2008.²⁰⁰ In 2000, ING Barings estimated total investment in U.S.-based satellite high-speed projects over the next ten years to be \$28.55 billion.²⁰¹ Aggregate revenue estimates for the next eight to ten years range from \$15 to over \$30 billion.²⁰²

D. Overview of Trends in Developing Technologies

79. Since the *Second Report*, there have been a number of developments in the technologies capable of supporting advanced services. Many of these technologies appear to have significant potential for expanding the availability of advanced telecommunications to more Americans. In addition, some of these developments may improve the speed and the range of

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<<http://www.starband.com/whowear/index.htm>>. See also *StarBand Communications Launches Nation's First Consumer Two-Way High Speed Internet Service Via Satellite*, StarBand Press Release, Nov. 6, 2000.

¹⁹⁵ For example, two Ka-band services plan introduction of service in 2003: WildBlue, an independent company with ties to EchoStar and News Corp., and Spaceway, to be provided by Hughes. Armand Musey, *The Satellite Model Book*, Salomon Smith Barney, Jun. 4, 2001, at 24 (*Satellite Model Book*).

¹⁹⁶ Salomon Smith Barney projects broadband satellite service subscribers to grow to 4 million by year-end 2005. *Id.* at 23. Bank of America Securities projects 5 million broadband satellite services subscribers by 2005. Armand Musey, *Satellite Communications Industry Overview*, Bank of America Securities (First Quarter 2001) at 21 (*Satellite Industry Overview*). In 2000, ING Barings predicted that the number of residential subscribers would increase from close to 100,000 estimated in 1999 to over 39 million by the end of 2008. David B. Kesternbaum, Michael K. French, and Eric Lentini, *The Satellite Communications Industry: Efficient Infrastructure 2000*, ING Barings, Mar. 2000, at 13 (ING Barings).

¹⁹⁷ *Satellite Model Book* at 23.; Marc E. Nabi, *Eye in the Sky, 2Q01 Preview*, Merrill Lynch, Jul. 3, 2001, at 47.

¹⁹⁸ Thomas W. Watts and William W. Pitkin, *Global Satellite Marketplace 99: Clearing the Hurdles: The Satcom Industry Focuses on Execution*, Merrill Lynch, Apr. 14, 1999, at 99-101 (*Global Satellite Marketplace*).

¹⁹⁹ *Satellite Model Book* at 23.

²⁰⁰ *Satellite Industry Overview* at 22.

²⁰¹ ING Barings at 24.

²⁰² In addition, ING Barings Broadband Growth Forecast predicts \$20 billion in service revenue by 2009. ING Barings, *ING Barings* at 13. *Satellite Industry Overview* at 60; *Global Satellite Marketplace* at 101.

services offered to consumers through various technological platforms. In the following, we take notice of several of these trends and consider technologies that may emerge in the near future.²⁰³

80. 3G Wireless. Providers are beginning to deploy third generation wireless (3G) systems. Third generation wireless generally refers to high-speed advanced mobile services and the next generation of technologies – beyond the current first generation (analog cellular and paging systems) and second generation (digital systems, such as digital cellular and PCS). These 3G systems are expected to provide support of multimedia services and capabilities, including fixed and variable bit rate traffic; bandwidth on demand; asymmetric data rates in the forward and reverse links; multimedia mail store and forward; and access to advanced services.²⁰⁴ The International Telecommunication Union (ITU) has developed worldwide standards for 3G wireless devices that specify that these systems must be capable of supporting circuit and packet data at rates of 2 Mbps or higher for indoor traffic, 384 kbps for pedestrian traffic, and 144 kbps or higher in high mobility (vehicular) traffic.²⁰⁵ In addition, many commercial mobile radio service licensees are beginning to deploy, or have developed plans to deploy, 3G services within their existing spectrum. The successful deployment of 3G wireless services may significantly expand availability of advanced services, especially to consumers that are currently unserved by wireline connections.

81. Cable Modem Standard. The current cable modem specification, DOCSIS 1.0, accounts for almost all cable modem services.²⁰⁶ Recently, the cable industry began adopting a new standard, DOCSIS 1.1. DOCSIS 1.1 delivers some capabilities to support tiered services, multimedia, telephony and PacketCable; enhanced security; increased upstream performance; and additional features that make data-over-cable platforms easier to manage. The cable industry also recently announced the development of DOCSIS 2.0.²⁰⁷ DOCSIS 2.0 will add an advanced physical layer for DOCSIS cable modems and headend Cable Modem Termination System (CMTS) products. DOCSIS 2.0 will allow cable operators to provide improved voice over Internet protocol and videoconferencing offerings for homes and businesses. In addition, DOCSIS 2.0 may provide increased transmission reliability and protect against reverse path noise impairments. DOCSIS 2.0 is backward compatible with the DOCSIS 1.0 and 1.1 specifications meaning that cable modems conforming to any of the three specifications will be able to interoperate with cable modem termination systems supporting DOCSIS 2.0. As a result, the implementation of the new cable modem standards may improve reliability on the cable network and expand the types of available applications for consumers who subscribe to cable services.

²⁰³ We emphasize that this overview is not intended to endorse or advocate any particular platform or system.

²⁰⁴ See *Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems*, ET Docket No. 00-258, Notice of Proposed Rulemaking and Order, 16 FCC Rcd 596, 604 (2001). This proceeding is exploring the possible use of frequency bands below 3 GHz to support the introduction of new advanced wireless services, including third generation (3G) as well as future generations of wireless systems.

²⁰⁵ *Id.*

²⁰⁶ One exception is proprietary modem services.

²⁰⁷ KC Neel, *Terayon Gets DOCSIS 2.0 Boost New Cable-Modem Standard Should Increase Bandwidth*, Cable World, Sep. 10, 2001 ("With DOCSIS 2.0, cable operators should be able to gain additional revenues through upstream-intensive applications including voice over Internet protocol, peer-to-peer networking, video conferencing, Web hosting, video-on-demand, online gaming and application services.").

82. Broadband Passive Optical Networking. SBC recently announced that it plans to use broadband passive optical networking (BPON) to provide direct fiber service to smaller businesses and residences.²⁰⁸ BPON uses splitters to replicate a wavelength division multiplexed signal, which is then distributed over multiple fibers to customers' locations. The BPON system planned for use by SBC can serve up to 38 residences or small businesses. SBC is targeting consumers that currently have multiple T1 lines that are deployed using repeaters. Because T1 signals can interfere with DSL, the company believes that shifting T1 repeater customers to BPON would improve the range and service quality of other DSL customers. By moving fiber closer to the home, consumers will have significantly greater amounts of available bandwidth, capable of supporting emerging applications such as video-on-demand.

83. DSL Extension. DSL extension products have been developed to serve subscribers who are located beyond the range of the central office or who are blocked by a digital loop carrier that cannot be modified with a remote access multiplexer or remote DSLAM.²⁰⁹ For example, GoDigital Networks recently introduced the Xcel-4a ADSL extender which provides ADSL up to 25 miles from the DSLAM with an estimated downstream transmission speed of 1.5 Mbps and a guaranteed upstream speed of 384 kbps.²¹⁰ Because the extender is able to support four DSL customers over a single copper pair, the company estimates that carriers can provide DSL for outlying areas for \$600 to \$900 a port.²¹¹ In addition, 2Wire recently demonstrated a loop extender technology that uses loop-extender line cards to replace load-coil cards every 6000 feet in a network.²¹² According to reports, the technique supports 5.8 Mbps downstream for over 24,000 feet. The installation of loop-extender devices may bring consumers, especially those in low-density areas, within range for DSL services.

84. G.SHDSL. The ITU Telecommunications Standards Sector recently announced a new DSL standard, G.SHDSL.²¹³ It is a symmetric, multi-rate DSL that may be used to provide symmetrical voice, data, and Internet DSL services. According to reports, the new standard reaches up to 2.3 Mbps in both directions, and can be deployed nearly twice as far from the central office than SDSL, which is limited to 18,000 feet. Because of the high rate of symmetric transfer, vendors providing G.SHDSL anticipate that business customers will be interested in adopting the new standard. As a result, this new standard would not only increase the available bandwidth for consumers, but would also extend DSL capability to consumers that are currently beyond the reach of the central office.

85. Two-way Satellite Platform. Satellite service providers recently started offering residential service on a two-way platform, with both the downstream and upstream paths

²⁰⁸ See SBC Comments at 4; Stephen Lee, *SBC Sees Bright Future for Home Broadband*, InfoWorld Daily News, Oct. 5, 2001; Eric Krapf, *Fiber Access: The Slog Continues*, Business Communications Review, Aug. 1, 2001.

²⁰⁹ Donny Jackson, *Shifting Gears*, Telephony, Jul. 2, 2001, at 60.

²¹⁰ *Id.*

²¹¹ *Id.*

²¹² *Id.*

²¹³ See Jim Thompson, *G.SHDSL: New and Improved DSL*, ISP-Planet (Jun. 19, 2001) (visited Feb. 5, 2002) <<http://www.isp-planet.com/technology/dsl/ghdsl.htm>>.

provided by satellite.²¹⁴ Previously, only a one-way platform was available for satellite Internet access. A one-way platform provided the downstream path by satellite and the upstream path was often provided by a standard dial-up telephone connection. Two-way platform satellite service provides high-speed service in the downstream direction at speeds ranging up to 400 kbps. Service providers claim that upstream transmissions range between 40 and 60 kbps during off-peak hours.²¹⁵ In addition, satellite service providers have also announced plans to deploy a new generation of satellite services that will provide advanced telecommunications services at significantly greater speeds.²¹⁶ Some service providers claim that the new generation of satellite service will be capable of downstream speeds of up to 30 Mbps and upstream speeds starting at 512 kbps, up to tens of Mbps.²¹⁷ Because satellite services are widely available in most, if not all, of the United States, the successful deployment of the new generation of satellite service has the potential to extend the availability of advanced services to almost all Americans.

86. Helios. Researchers recently tested Helios, an unmanned, solar-powered aircraft that can provide the transmission of advanced services.²¹⁸ The plane is designed to fly in the stratosphere for six-month periods of time, and can supply consumers with advanced services at speeds between 1.5 Mbps and 125 Mbps.²¹⁹ Helios is promoted to be a possible alternative to wireless towers and satellites. Specifically, developers claim that the Helios transmission services can run more efficiently than wireless towers and the aircraft will cost less than satellites. Conventional communications satellites are estimated to cost about \$200 million each, whereas the Helios aircraft are anticipated to cost \$10 million each.²²⁰ Researchers believe that Helios could be used to provide advanced services in regions that are currently unserved by wireline technologies, or could stimulate competition in more dense regions as an alternative platform.

87. Free Space Optics. Free Space Optics (FSO) uses laser-guided beams of light to transmit advanced services.²²¹ Specifically, FSO transmits light pulses through the air to receivers that are less than a kilometer away and within the line-of-sight of a base terminal, which is connected to fiber-optic cable.²²² Developers claim that the system can support point-

²¹⁴ See Hughes Comments; StarBand Comments. See also, e.g., Larry Barrett, *New High-Speed Net Service from Space*, CNET News.com (Jun. 22, 2001) (visited Feb. 5, 2002) <http://news.cnet.com/news/0-1004-200-6354160.html?tag=cd_mh>.

²¹⁵ See StarBand Comments at 11.

²¹⁶ See Hughes Comments at 5.

²¹⁷ *Id.*

²¹⁸ Patrick Houston, *A Bird? No, a Plane. And It's Broadband...Plus More News*, AnchorDesk from ZDWire, Aug. 13, 2001.

²¹⁹ Max Smetannikov, *NASA Flies to Broadband Rescue*, Interactive Week from ZDWire, Aug. 14, 2001.

²²⁰ *Id.*

²²¹ Tony Waltham, *Of Free Space Optics and the Laws of Telecom*, Bangkok Post, Nov. 7, 2001 ("His technology fills a gap, as it were, where a fiber optic or broadband link is desired for point-to-point or point-to-multipoint, even multipoint-to-multipoint communications, but is impractical for geographical or for right-of-way reasons.")

²²² Robert Vosper, *The Magic Potion*, America's Network, Dec. 1, 2001 ("All a company needs to do is plug a 4 foot receiver into its LAN, place it near a window and wait for the receiver to capture a laser beam carrying up to one gigabit of data a section through the air.").

to-point connections at rates up to 1.55 Gbps and costs around \$9000.²²³ As a result, because FSO does not require spectrum or the installation of wire or cable, the system may be a cost-effective alternative for the provision of advanced services to businesses.

88. I-Burst Wireless Internet. The I-Burst wireless system uses 5-10 MHz of spectrum to provide advanced telecommunications capability within a network coverage area. Consumers can use portable or stationary devices to connect to the network, which is designed to allow users to move between coverage areas, similar to mobile telephone networks.²²⁴ I-Burst is capable of providing connections of about 1 Mbps per user. In 2001, the Commission issued an experimental license to test-market the wireless Internet system.²²⁵

V. IS DEPLOYMENT REASONABLE AND TIMELY?

89. We now consider the third question presented in our Third Notice of Inquiry: is deployment reasonable and timely?²²⁶ In determining whether deployment is reasonable and timely, we have examined various aspects of the deployment of, and market for, advanced services. Based upon our analysis, we conclude that the deployment of advanced telecommunications capability to all Americans is reasonable and timely. We find that there is continued and rapid growth in subscription to high-speed and advanced services on a nationwide basis, which is indicative of the increased availability of advanced services. We are encouraged by the expansion of advanced services to many regions of the nation, and growing number of subscribers. Nevertheless, we will continue to monitor deployment to certain categories of consumers so that if deployment to such customers ceases to be reasonable and timely in the future, we will recognize that development early. We also conclude that investment in infrastructure for most advanced services markets remains strong, even though the pace of investment trends has generally slowed. It is important to mention, however, that some of the decline in investment may be simply be the result of the general economic slowdown in the nation. In addition, we find that emerging technologies continue to stimulate competition and create new alternatives and choices for consumers. Based on these findings, we believe that advanced services are being made available in a reasonable and timely manner.

90. We will continue to use this assessment as the basis for the development of public policies that promote and support the ubiquitous deployment of advanced services. In our prior report, we stressed that the high-speed market is still early in development, and it is even earlier in the development of the services and infrastructure with speeds of over 200 kbps in both directions.²²⁷ Although investment trends have gone through a period of transition over the past

²²³ Cliff Grassmick, *Louisville, Colo., Firm Offers Solution to Broadband's Last Mile*, Knight-Ridder Tribune Business News, Nov. 30, 2001.

²²⁴ *ArrayComm Keeps I-Burst Trials Under Wraps*, Wireless Today, Sep. 17, 2001; Dee McVicker, *Bandwidth Boom: Wireless Bandwidth for the Net is Way Too Narrow and Real Improvements are Still Years Away*, Internet Week, Sep. 11, 2000 ("I-Burst is like traditional cellular in setup: Mobile users can move freely within a cell coverage area, usually two to six miles in radius. But unlike traditional cellular networks, I-Burst is an open architecture system like the Internet. It could operate as a wireless feature on a handset or it could be added to a laptop or desktop, similar to adding a modem card.")

²²⁵ See Experimental License No. 0067-EX-ML-2000 (granted Jan. 29, 2001).

²²⁶ *Third NOI* at para. 19.

²²⁷ *Second Report*, 15 FCC Rcd at 20992.

18 months, deployment has continued to grow at an impressive rate for both high-speed and advanced services. In the near future, we expect that the market will continue to expand and availability will increase. As the advanced services market matures, however, we anticipate that the rate of growth will eventually begin to slow, due to widespread availability among consumers.

91. In the following section, we consider patterns of deployment, so that if deployment to such customers ceases to be reasonable and timely in the future, we will recognize that development early. We pay particular attention to businesses, residential consumers, rural communities, elementary and secondary schools, and persons with disabilities in our determination. Following our review of the availability of advanced services, we also discuss subscription rates, and how they may impact the growth of advanced technology. In addition, we review and compare various international deployment trends, in order to further explore patterns of deployment that may be useful to our own nation's efforts to provide ubiquitous advanced telecommunications capability.

A. Patterns of Deployment

92. There are three primary components to our assessment. First, we examine availability, as indicated by the Commission's data collection on subscribership and industry assessments of availability. We focus both on how it has changed over the last year and how it is projected to change in the future. By examining our data collection, we seek a verifiable count of exactly how much high-speed service is being delivered and purchased in the marketplace. Our subscribership data necessarily reflects a combination of factors including availability of infrastructure, service offerings tailored to customers' needs, and affordable pricing. Consequently, we believe that this is a potentially useful indicator of the state of high-speed deployment. Second, we consider investment in the infrastructure necessary to support advanced services. Third, we review trends in the alternatives available to consumers of advanced services. This includes both assessing the number of providers offering service through a particular technology and the different technological options that consumers have for obtaining advanced services. Through our analysis, we hope to identify any groups that may not obtain access to advanced services in a timely manner.

a. Businesses

93. After reviewing trends in the availability of advanced services for businesses, we conclude that advanced telecommunications capability is being made available to business customers in a reasonable and timely manner. Subscription rates for large business and institutional customers have increased considerably since the *Second Report* and groups, especially local communities, continue to invest in infrastructure for advanced telecommunications. In addition, technology trends indicate that new generations of equipment and technology are being developed that may be beneficial to the business community.

94. Our data indicate that 18.8 percent of high-speed lines are serving business customers, which represents over 1.8 million lines in service.²²⁸ This is over 0.8 million more

²²⁸ We note, however, that the actual number of lines serving business customers may be substantially higher, since our survey does not take into account private lines or internal networks serving business customers.

lines than reported in the *Second Report*, an increase of over 80 percent.²²⁹ We note that the overall percentage of high-speed lines serving business customers has dropped from 35 percent to 18.8 percent of the reported high-speed lines. This is due to the significant growth of high-speed services for residences and small businesses and the fact that high-speed services were widely available for most businesses in 1999.²³⁰ Independent sources support our conclusion as well. For example, in one recent survey that asked business customers to prioritize barriers to adopting high-speed services, business customers selected "no barriers exist" (27 percent) more than any other alternative.²³¹

95. In accord with the growth in high-speed lines serving businesses, advanced telecommunications are becoming increasingly incorporated into the conduct of business and our economy. Businesses use advanced telecommunications to quickly send and receive large documents, such as blueprints and customer databases, keep in contact with customers, by marketing and receiving orders for products on-line, and track inventory and receipts in a real-time fashion. Thus, some communities fear that a lack of infrastructure to support advanced services could prevent communities from attracting businesses and pursuing economic development opportunities.²³²

96. In response, some communities have taken specific steps intended to stimulate economic development in their areas such as building high-speed networks, or aggregating demand.²³³ For example, Butler County, Ohio, recently announced the development of a fiber optic network connecting businesses, schools, and government offices that is designed to promote economic development in the region.²³⁴ Another example is the state of North Dakota,²³⁵ which constructed a statewide telecommunications network, connecting 194 cities in the state. This is a trend that we noted in our *Second Report*, that appears to be continuing on an increasingly frequent basis.²³⁶

97. We note, however, that we are not aware of any specific data on the impact that the availability of advanced services has on a particular location's ability to attract or retain businesses. Indeed, most existing businesses appear to have some options for the provision of

²²⁹ *Second Report*, 15 FCC Rcd at 20943.

²³⁰ *Id.* at 20994-20995.

²³¹ Cahners Report at 35-38. Other alternatives included: monthly cost (25 percent); low service reliability (14 percent); availability (12 percent); and security concerns (5 percent).

²³² Jim Hopkins, *In Rural Areas, Fast Net Service Vital but Elusive; Speed Needed to Attract Businesses*, USA Today, Nov. 12, 2001, at E4 ("Economic development leaders...view broadband as important as sewer, gas and other utilities when attracting firms. That's because lack of high-speed service makes it tougher for rural areas to create, recruit and keep firms that benefit from fast Internet access.").

²³³ See *Second Report*, 15 FCC Rcd at 20980-20981.

²³⁴ *Quantum Bridge to Supply Networking Equipment to Ohio's Government*, Fiber Optics Weekly Update, Nov. 23, 2001.

²³⁵ Alexia Bowie, *Success Stories from the States*, Rural Telecommunications, Jan. 1, 2001 (At a press conference announcing the network, North Dakota's chief information officer was quoted, "All business will need broadband access to be competitive...The simple reality is, businesses will go where higher speed access is available, period.").

²³⁶ See *Second Report*, 15 FCC Rcd at 20926 ("Additional examples of middle mile networks include statewide networks such as the fiber optic network in South Dakota..."); *Id.* at 20994.

advanced services, regardless of location. As a result, other factors may limit a business' ability to subscribe to advanced services. For instance, the high cost associated with obtaining advanced services in some locations may be a primary factor. For example, business customers in rural or remote areas may be able to obtain advanced telecommunications capability as a technical matter, but the cost of such services may be prohibitively high. Our data reflects that most areas outside of major cities do not have multiple advanced service providers.²³⁷ Therefore, these communities may not see the benefits of price competition.

98. We also note that technology is continuing to emerge that will be particularly useful for the business market. For example, service providers anticipate the new DSL standard, G.SHDSL, will be attractive to business customers because of the high rate of symmetric transfer. In addition, the successful deployment of the new generation of 3G Wireless and satellite services may also be attractive to business customers, given the high speeds that these services appear to be capable of providing. As a result, the successful development of these new platforms may result in increased competition in the advanced services market and new options for businesses.

b. Residential Customers and Small Businesses

99. Overall, we conclude that advanced telecommunications capability is being made available to residential and small business customers in a reasonable and timely manner. We are pleased that our data demonstrate strong growth in the availability of advanced services for residential and small business customers.²³⁸ In addition, service providers continue to invest in facilities capable of supporting advanced telecommunications for residential and small business customers. We are also encouraged by recent developments in technology that has significantly expanded the reach of high-speed services.

100. Our data indicate that there are almost 4.3 million residential and small business subscribers to advanced services in the nation, up from 1.0 million in the *Second Report*.²³⁹ Over the past year alone, this number has increased by 149 percent. Additionally, a variety of technological options appear to be available for most residential and small business consumers, with cable modem and ADSL services providers reporting the highest number of high-speed lines in service. As of June 2001, there were almost 5.0 million residential and small business high-speed cable modem lines in service, and almost 2.5 million residential and small business high-speed ADSL lines in service. In the *Second Report*, those numbers were 1.4 million and 0.4 million, respectively.²⁴⁰ As of June 2001, we also report 0.2 million satellite and fixed wireless high-speed lines in service, up from 0.05 million at the time of the *Second Report*.

101. As we discuss in further detail below, our data illustrates that advanced services are becoming more available for almost all segments of residential customers, including many of

²³⁷ We note that high-speed satellite services are widely available in the United States. *See supra*, note 57.

²³⁸ As we previously noted, the Commission's data collection program reflects this grouping and combines both residential and small business customers. The Commission has a pending inquiry relating to our data collection program and how we could improve the data we collect on high-speed and advanced services. *See Data Gathering Second NPRM*, 16 FCC Rcd 2072.

²³⁹ *Second Report*, 15 FCC Rcd at 20995.

²⁴⁰ *Id.* at 20943.

the groups that we previously identified as being vulnerable to not receiving timely access to advanced services.²⁴¹ We believe that it is important to continue to closely monitor these groups, in order to ensure that advanced services are being made available in a timely fashion. Specifically, we consider rural customers (who we discuss in further detail in the following section), low-income customers, and persons with disabilities.

102. Among residential consumers, advanced services appear to be more widely available to households in low-income zip codes since the *Second Report*. In the *Second Report*, 42 percent of zip codes with the lowest median household income reported a high-speed subscriber.²⁴² As of June 2001, 59 percent of the zip codes with the lowest household income reported a high-speed subscriber. Our data also indicate that there is a high-speed service provider in 96 percent of zip codes with the highest median household income, up from 91 percent. Although our data reveals that there has been growth in subscribership for low-income zip codes and that the gap between low- and high- income zip codes appears to be closing, there continues to be a strong correlation between household income and subscription to advanced services.²⁴³ The correlation between income and subscription to advanced services is consistent with other sources of data, indicating that penetration is associated with income.²⁴⁴ While customers in these zip codes may have infrastructure available, there is evidence that other barriers to subscription persist. For example, as of September 2001, about 16.6 percent of online households with income under \$15,000 had high-speed services,²⁴⁵ whereas 25.1 percent of online households with income over \$75,000 had high-speed services.²⁴⁶

103. As emphasized by the Commission in the *Second Report*, advanced services have the potential to provide significant opportunities for persons with disabilities.²⁴⁷ Widespread deployment of high-speed services to persons without disabilities may ultimately promote the corresponding deployment to persons with disabilities. Advanced telecommunications may enable individuals that have difficulty leaving their home to shop for clothing or groceries online, or telecommute for a job. In addition, advanced services may enable the hearing impaired to communicate freely with friends and relatives or allow persons with disabilities to research medical questions or receive medical care at telemedicine facilities. Although the Commission's data collection program does not specifically address the availability of advanced services for persons with disabilities, we note that persons with disability could face significant impediments to their ability to access to advanced services.²⁴⁸ Some of the relevant facts include: low rates of computer ownership among people with disabilities; prohibitive costs for computers and Internet

²⁴¹ *Id.* at 20991-21003.

²⁴² *Id.*

²⁴³ *Id.* at 21001-21002.

²⁴⁴ Based on calculations from National Telecommunications and Information Administration staff (relying on unpublished census data). We note that some of the services did not possess speeds in excess of 200 kbps.

²⁴⁵ *Id.*

²⁴⁶ *Id.* A study released in April 2001 estimates that 25 - 35% of online users subscribe to high-speed services in some areas. *Morgan/McKinsey Broadband Report* at 4.

²⁴⁷ See *Second Report*, 15 FCC Rcd at 21000.

²⁴⁸ See, e.g., AFB Comments at 1 ("people who are blind or visually impaired are being left out of the advanced telecommunications revolution."); APT, AAPD, and ACB Comments; APT and WID Comments at 6.

access services;²⁴⁹ the lack of adaptive hardware, software, and Internet content; and lack of training. Almost 60 percent of persons with disabilities have never used a computer, compared to 25 percent of persons without disabilities,²⁵⁰ and people with disabilities are significantly less likely to have Internet access as those without disabilities.²⁵¹ Reported low-income and employment rates among persons with disabilities may further limit their ability to acquire computers or Internet access.²⁵² Thus, we will continue to monitor deployment to persons with disabilities closely, so that we can quickly assess whether additional government or non-government action is necessary.

104. Adaptive technologies may offer persons with disabilities innovative ways to access the Internet, and increase the availability of advanced services. Indeed, in addition to ensuring that investment in network infrastructure capable of providing advanced services is done consistent with section 255 of the Act and other statutes directed towards ensuring access to people with disabilities,²⁵³ it may be necessary to encourage the development of accessible user platforms and applications in order to make advanced services available to persons with disabilities.²⁵⁴ For example, some companies have begun to adapt their web-sites by magnifying content and installing sensitive hyperlinks, in order to be more accessible to individuals with disabilities.²⁵⁵ In addition, AT&T recently announced the release of a commercial product that has a text-to-speech engine that turns written words into natural-sounding speech.²⁵⁶ We note, however, that the development of adaptive technologies appears to be on a limited basis and that it is frequently associated with additional purposes, which make the application more cost-effective for the developer. For instance, AT&T states that its text-to-speech application could be used by businesses that operate call centers, or by service providers that create voice portals.²⁵⁷

105. Investment trends indicate that service providers continue to focus investments on the residential market, and that service providers are deploying new facilities capable of supporting advanced services for residential and small business consumers. Since the *Second Report*, our data demonstrate that new facilities have expanded the reach of advanced

²⁴⁹ See NAD Comments at 1.

²⁵⁰ US Department of Commerce, Economics and Statistics Administration, National Telecommunications and Information Administration, *Falling Through the Net: Toward Digital Inclusion* (Oct. 2000) at 61. See also TDI Comments at 2 ("...individuals with disabilities are far less likely than the general population to have access to computers and the Internet.")

²⁵¹ See H. Stephen Kaye, *Computer and Internet Use Among People with Disabilities*, United States Department of Education, National Institute on Disability and Rehabilitation Research (Mar. 2000) at 5, Tbl. A.

²⁵² See TDI Comments at 2.

²⁵³ See 47 U.S.C. § 255.

²⁵⁴ See AFB Comments at 2.

²⁵⁵ Anna Marie Kukuc, *A Gurnee Firm Offers Next-Generation Accelerators to Enhance Some PC Games*, Chi. Daily Herald, Oct. 8, 2001 ("Chicago-based Infinitec Inc. has revamped its site to provide easier access for people with disabilities. Content can be magnified and accommodate all browser types for those with vision impairments. Ultra-sensitive hyperlinks, called hovers, allow those with limited mobility who use alternative mouse equipment to activate the link just by coming within range.")

²⁵⁶ AT&T Comments at 12; *AT&T Labs Launches Natural Voices*, PR Newswire, Jul. 31, 2001.

²⁵⁷ *Id.*

telecommunications and the percentage of zip codes with high-speed lines in service has jumped from 60 percent to 78 percent.²⁵⁸ Our data also indicate that there is increased choice among service providers. In particular, we note that more than two service providers were reported in about 41 percent of zip codes, whereas only 18 percent of zip codes had more than two service providers in December 1999.²⁵⁹ Additionally, there are approximately 160 providers of high-speed lines in the nation, compared to 105 in the *Second Report*.²⁶⁰

106. We acknowledge, however, that capital expenditures in infrastructure have slowed in recent months, especially within the competitive LEC market. Analysts report that this slow-down is a result of excess capacity of infrastructure in the market, and anticipate that rising demand will increase the utilization of existing assets. As a result, the provision of advanced services may become more cost-effective for service providers as revenues increase and overall subscription rates rise. Therefore, the reduction in the growth rate of investment does not necessarily imply a reduction in the growth of subscription to high-speed services. As we discuss in further detail below, however, service providers have indicated that low subscription rates may have an impact upon whether they can afford to expand services to new consumers. We note that service providers recently raised prices in an effort to increase net revenues, which may have also affected penetration for residential customers. For example, SBC and Verizon raised their basic residential rates for DSL from \$40 per month to \$50 earlier this year.²⁶¹ In addition, some cable modem service providers announced a price-hike in May 2001. AT&T Broadband raised monthly rates by \$6 and Cox Communications raised monthly rates by \$5.²⁶²

107. Advances in technology continue to make advanced services more accessible to residential customers. In particular, the development of two-way satellite services has extended the availability of high-speed services to almost all residential customers in the United States. Other new technological developments, such as 3G Wireless, Helios, and DSL extenders, may extend the footprint of available advanced services to new residential consumers.²⁶³ In addition, the successful deployment of new generations of technology, such as DOCSIS 2.0, may provide residential consumers with a new range of applications that some technologies are capable of supporting.²⁶⁴

c. Rural Communities, Insular Areas, and Tribal Lands

108. Since the *Second Report*, the Commission has continued to monitor the deployment trends in rural areas, so that we will be able to promptly recognize if deployment

²⁵⁸ *Second Report*, 15 FCC Rcd at 20946. See also revised data reported in Appendix C, Tbl. 9.

²⁵⁹ See revised data reported in Appendix C, Tbl. 9.

²⁶⁰ *Second Report*, 15 FCC Rcd at 21017.

²⁶¹ See *Morgan/McKinsey Broadband Report* at 21.

²⁶² *Cable Notes*, Warren's Cable Regulation Monitor, May 7, 2001 ("AT&T...said it would increase rate for data service plus modem rental 15 percent to \$45.95 per month."); Carolyn Shapiro, *Area Cable Company Increases Internet Rates*, Knight-Ridder Trib. Bus. News, May 24, 2001 ("Cox@Home plans to raise its rates for high-speed Internet access by \$5 a month, narrowing the price gap between the dominant cable provider and competing telecommunications companies.")

²⁶³ See *supra* paras. 78-88.

²⁶⁴ *Id.*

ceases to be reasonable and timely to such consumers. We are encouraged that our data indicate that advanced and high-speed services are becoming more widely available in rural areas. In addition, although investment trends for services providers in low-density regions appear to be in a period of transition, it appears that new facilities for advanced services continue to be deployed. In particular, developments in technology, such as satellite services and DSL extenders, have expanded the reach of high-speed services to previously unserved areas.

109. In the *Second Report*, our data demonstrated that there was at least one subscriber to high-speed services in 65 percent in our sample of small town zip codes, and 20 percent²⁶⁵ of the most sparsely-populated outlying areas.²⁶⁶ Availability appears to have increased considerably, and high-speed services are now being reported in 86 percent of our sample of small town zip codes, and 37 percent of sparsely-populated outlying areas.²⁶⁷ Despite the upward trend in subscription rates for rural communities, we note that a positive correlation persists between population density and the presence of high-speed subscribers. In addition, there continues to be a significant disparity in access to advanced services between those living in rural population centers and those living in sparsely-populated outlying areas. As a result, we believe that it is important to closely monitor the availability of advanced services for rural Americans, especially those living outside of the rural population centers, in order to ensure that they receive timely access to advanced services.

110. Our data indicate that advanced services are being made more widely available on tribal lands.²⁶⁸ At the end of 1999, at least one subscriber to high-speed services was reported in 49 percent of the zip codes that contain tribal territories.²⁶⁹ As of June 2001, the number had risen to 71.3 percent. Despite this promising growth, unique and challenging issues relating to the provision of advanced services on tribal lands remain. As the Commission noted previously, many territories lack phone service and basic telecommunications infrastructure.²⁷⁰ Consequently, tribal communities have begun to consider wireless and satellite advanced services in order to improve the availability of advanced services in tribal territories. For

²⁶⁵ In the *Second Report*, the Commission estimated that approximately 57 percent of zip codes that include small towns and 19 percent of the most sparsely-populated decile of zip codes reported a high-speed line in service. *Second Report*, 15 FCC Rcd at 20996. Based on revised data filed since the *Second Report*, we now calculate that 65 percent of the zip codes that included small towns and 20 percent of the most sparsely-populated decile of zip codes reported high-speed lines in service at the end of 1999.

²⁶⁶ We consider “sparsely-populated outlying areas” to be the least densely-populated decile of zip codes in our data collection. *See Appendix C, Tbl. 11.*

²⁶⁷ We note that the availability of advanced services in rural areas may, in fact, be higher than the Commission’s data reflect, because small providers (with fewer than 250 full or one-way broadband lines) are not subject to the Commission’s Form 477 reporting requirements. *See, e.g.*, OPASTCO Comments at 3 (“...there is not doubt that the true level of deployment in these areas is higher than portrayed [by the Commission’s Form 477 data].”); Texas PUC Comments at 2 (“...the threshold of 250 broadband customers before reporting is required may have prevented collection of sufficient information on broadband service in rural and sparsely populated areas, given that many such areas are served by relatively small incumbent local telephone and cable television companies.”)

²⁶⁸ *See supra* note 90.

²⁶⁹ In the *Second Report*, the Commission estimated that approximately 44 percent of zip codes that include tribal territories reported a high-speed line in service. *Second Report*, 15 FCC Rcd at 20997. Based on revised zip code lists filed since the *Second Report*, we now calculate that 49 percent of the zip codes that contained tribal lands reported high-speed lines in service at the end of 1999.

²⁷⁰ *Id.*

example, the Broadband Wireless International Corporation recently announced that the company successfully installed and tested a high-speed, broadband wireless network service offering across the Hopland Band of Pomo Indians reservation in three days.²⁷¹ In addition, StarBand Communications and Northern Arizona University are working to provide satellite-based Internet access to 120 locations within the Navajo, Hopi, and Havasupai reservations.²⁷²

111. We are particularly concerned that no service providers reported high-speed lines in service in the Pacific Insular Islands. In response to our Inquiry, the Commonwealth of the Northern Mariana Islands reports that advanced telecommunications capability is not being deployed to either business or residential consumers in the Commonwealth.²⁷³ Although our own data does not conclusively reveal the availability of advanced services in the Pacific Insular Islands, we are aware that economic forces make the deployment of advanced services difficult. As a result, the deployment of advanced telecommunications capability in the Pacific Insular Islands may be limited until demand increases among consumers that have available advanced services.

112. We also note that resources continue to be made available to help support the deployment of advanced telecommunications for medically underserved rural communities. Additionally, the Rural Health Care Program, administered by the Universal Service Administrative Company (USAC), has committed over \$21 million to help provide assistance for remote communities, so that rural areas may have the necessary advanced telecommunications capability to connect to health care facilities.²⁷⁴ According to estimates from the Rural Health Care Division (RHCD) of USAC, the program has provided funding for about 585 health care providers to receive advanced telecommunications services during the first three years of the program.²⁷⁵ In addition, about 450 health care providers requested and received support for lower speed services (56 kbps to 128 kbps), such as ISDN. Interest in the program appears to be escalating, the RHCD also reports a 50 percent increase in the number of applicants for the fourth program year (2001).

113. Investment trends in the rural market are continuing to unfold, as service providers attempt to establish viable business plans. Indeed, many rural service providers appear to be in the process of evaluating deployment alternatives in order to consider what segments of the rural market may be cost-effective for the services that they offer. Some carriers suggest that investment in rural areas appears to be slowing. For example, a recent survey identified several major barriers to expanding advanced services in rural areas, including: the length of the loop; the high cost of deployment; low demand by consumers; and the lack of cost-effective equipment

²⁷¹ *Broadband Wireless Network Installation Completed in Northern California; Tribal Network Rollout Completed in Three Days*, PR Newswire, Aug. 13, 2001.

²⁷² Ruth Suarez Zane, *Unwired Tribal Lands Poised For Wireless Innovation*, Wireless Insider, Jun. 18, 2001.

²⁷³ See Northern Mariana Islands Comments.

²⁷⁴ The estimates are based on completed applications as of December 3, 2001. As of December 3, 2000, RHCD had received 95 percent of the expected program year 3 applications (2000) and 4 percent of the expected program year 4 (2001) applications.

²⁷⁵ The RHCD considered networks that were capable of supporting bandwidth of 256 kbps or greater, well above the bandwidth that the Commission considers to be advanced services.

scaled for smaller companies.²⁷⁶ Based on current subscription rates, it concluded that the deployment in additional regions is not likely, and that about 25 percent to 30 percent of rural telephone subscribers are not likely to have access to high-speed services in the near future.²⁷⁷

114. One analyst predicts that the rural local exchange carrier industry will undergo a dynamic change over the next few years, through consolidation and the introduction of new financial plans that focus on generating higher revenues and returns for investors.²⁷⁸ A study, considering the cost of transporting Internet traffic from an Internet Service Provider to an Internet Backbone Provider, concluded that the provision of high-speed DSL Internet service may not be economically viable in many rural areas for rural telephone carriers.²⁷⁹ In particular, the study indicates that estimated revenue shortfalls may actually increase with higher market penetration, rising from \$9.7 million per year at 0.5 percent penetration to \$33.6 million per year at 5 percent penetration.²⁸⁰ The decision of Regional Bell Operating Companies (RBOCs) to sell numerous rural local exchanges may be consistent with this trend. Other carriers, however, appear prepared to serve rural or less-dense communities and, analysts believe, these carriers are more likely to make the necessary capital investments to upgrade networks so that they can support advanced services.²⁸¹ We note that one local exchange carrier, VALOR, determined that it was only cost-effective to provide DSL services at exchanges with 5000 lines, or at least 75 customers requesting DSL.²⁸²

115. Despite certain economic and distance-related challenges for wireline service providers in the rural market, it appears that advances in technology, such as the successful deployment of a two-way platform for satellite high-speed services in all 50 states, will continue to drive up availability in rural areas.²⁸³ Other technology developments, such as DSL extenders,

²⁷⁶ National Telephone Cooperative Association, *NTCA 2001 Internet/Broadband Availability Survey Report* (Dec. 2001) (*NTCA Survey*). The survey inquired 542 of the National Telephone Cooperative Association (NTCA) members on broadband and Internet services. 248 members (48 percent) responded.

²⁷⁷ *Id.* at 4. The NTCA estimates that its members serve almost 2.9 million lines. As a result, between 720,000 and 865,000 lines are not likely to have high-speed services in the near future.

²⁷⁸ *McKinsey/Goldman Infrastructure Report* at 37-40.

²⁷⁹ National Exchange Carrier Association, *Middle Mile Broadband Study* (2001) (*NECA Middle Mile Study*).

²⁸⁰ *Id.* at 36-37.

²⁸¹ *Reshaping Rural Telephone Markets*, Legg Mason Research (2001) (*Legg Mason Report*) at 33. In fact, we have considered numerous "study area" waiver requests from rural carriers purchasing local exchanges from RBOCs that contend that they will make investment in advanced telecommunications. See, e.g., *Citizens Telecommunications Company of Wyoming and Qwest Corporation Joint Petition for Waiver of the Definition of "Study Area" Contained in the Part 36 Appendix-Glossary of the Commission's Rules*, CC Docket No. 96-45, Joint Petition for Waiver, 16 FCC Rcd 3563 (2001) ("In its petition, Citizens states its intent to invest approximately \$4.5 million in the five exchanges it is purchasing during the first three years of ownership, using some of the capital investment to upgrade the network to provide enhanced services. According to Citizens, it also will provide broadband/digital subscriber line services when there is sufficient demand to make it possible to provide these services at an affordable rate."); *Citizens Telecommunications Company of Colorado, Inc. and Qwest Corporation Joint Petition for Waiver of the Definition of "Study Area" Contained in the Part 36 Appendix-Glossary of the Commission's Rules*, CC Docket No. 96-45, Joint Petition for Waiver, 15 FCC Rcd 31 (2000).

²⁸² *Legg Mason Report* at 64-65.

²⁸³ See *supra* para. 85; *StarBand Brings High-Tech, High-Speed "Surfing" to Hawaii*, Press Release, Oct. 23, 2001 (visited Feb. 5, 2002) <www.starband.com/whoweare/pr/102301.htm>.

may allow local exchange carriers to improve the range at which they are able to offer advanced services.²⁸⁴ As a result, carriers may be able to serve additional customers, making the provision of advanced services more cost-effective. We also note that service providers are continuing to develop innovative means to serve the rural advanced services market, such as public utilities that provide services over power lines in their rights of way. For example, in Washington, the Grant County Public Utility District (a local power company) has installed over 7,000 miles of fiber optics in order to provide high-speed services to rural utility customers.²⁸⁵ There is evidence that emerging technologies and providers will develop into viable alternatives for segments of the rural community that remain unserved.²⁸⁶

d. Elementary and Secondary Schools

116. While we do not have specific statistics from our data collection relating to the speed of connections being used in schools, we are encouraged by the fact that almost all schools have access to the Internet. As of late 2000, about 98 percent of public schools had connections to the Internet. About 77 percent of public schools with Internet access connected to the Internet with dedicated lines,²⁸⁷ and 24 percent of schools used other continuous connections.²⁸⁸ Only 11 percent of schools used dial-up connections to access the Internet, down from 15 percent in 1999.²⁸⁹ Because dedicated lines tend to support higher-speed services, we believe that high-speed and advanced telecommunications services are becoming more widely available in our nation's schools.

117. The Commission's Schools and Libraries Program helps to finance the deployment of infrastructure that supports advanced services in our nation's schools. As of July 2001, SLD has committed approximately \$6 billion in funds for telecommunications and information services for the first three funding years.²⁹⁰ In particular, the Schools and Libraries Program contributed significantly to providing schools with assistance for information services. During the first three funding years, about \$3.4 billion was committed for internal connections--the majority of which supports high-speed access. In fact, program funding for internal

²⁸⁴ See *supra* para. 83.

²⁸⁵ See AT&T Comments at 8.

²⁸⁶ See, e.g., SIA Comments at 2 ("SAI believes that satellite systems present the only practical near-term alternative to provide broadband services in rural and other underserved areas."); Grange Comments at 6 ("...new terrestrial based fixed wireless technologies (such as microwave, wireless fidelity and MMDS systems) offer promising opportunities to reach some rural communities, especially when they are combined with existing cable, DSL or fiber optic networks.")

²⁸⁷ Percentages add to more than 100 percent because schools may use more than one type of connection. Office of Educational & Research Improvement, U.S. Department of Education, Pub. No. 2001-071, *Internet Access in U.S. Public Schools and Classrooms: 1994 - 2000* (May 2001) at 6 (NCES Study). NCES defined dedicated lines to be 56K, T1/DS1, fractionalized T1, T3/DS3, and fractionalized T3 lines. We note that 56 kbps lines do not meet our definition of advanced or high-speed service.

²⁸⁸ *Id.* "Other connection types" are considered to be ISDN, wireless connections, and cable modems (ISDN). Again, we note that some of these connections may not satisfy the Commission's definition of advanced or high-speed capability.

²⁸⁹ *Id.*

²⁹⁰ See Federal Universal Support Mechanisms Fund Size Projections for the Fourth Quarter, available at <<http://www.universalservice.org/overview/filings/default.asp>> (filed by USAC Aug. 2, 2001).

connections helped bring Internet access to 77 percent of public school instructional rooms, compared to only 14 percent in 1996.²⁹¹ By comparison, as of September 2001, 50.5 percent of households in the United States had Internet access.²⁹² In addition, as of the beginning of 2000, SLD estimates that funds were used to install high-speed services in about 170,000 school and library buildings.²⁹³ SLD further estimates that as of September 2002, that number will increase more than 17 percent, to 200,000.

B. Subscription Rates

118. While we focus on the availability of advanced services in this Report, we acknowledge that subscription rates may influence business and investment decisions regarding advanced telecommunications. Therefore, it is useful for this analysis to identify factors that affect consumers' decisions to purchase advanced services. For example, a survey from rural local exchange carriers recently concluded that the current take rates among customers may limit their expansion plans for advanced services.²⁹⁴ More specifically, in this section we consider a variety of factors which may be relevant to the overall subscription rate for advanced services, including: computer ownership, cost, the lack of applications which require advanced telecommunications capability, and marketing techniques. Each of these factors may have varying degrees of consequence for subscription rates.

119. Our data indicates that 7.0 percent of American households subscribe to high-speed services.²⁹⁵ This is a substantial increase from the 1.6 percent residential penetration rate cited in the *Second Report*.²⁹⁶ By comparison, analysts estimate that high-speed Internet access is available in about 75 percent to 80 percent of US households via DSL and cable modem service.²⁹⁷ These estimates are consistent with the Commission's data collection, which indicates that as of June 2001, high-speed service subscribers were reported in 78 percent of the zip codes in the United States.²⁹⁸

120. We believe that computer ownership is a significant factor to subscription for consumers with available advanced services. Although advanced services may be used by technologies other than computers, most use of these services today centers on the use of computers to access the Internet. The Department of Commerce reports that about 56.5 percent of households in America have computers.²⁹⁹ Because consumers without computers currently

²⁹¹ *NCES Study* at 4.

²⁹² *A Nation Online* at 5.

²⁹³ This information is based on estimates from staff of the Schools and Libraries Division of the Universal Service Administrative Company.

²⁹⁴ See *NTCA Survey*.

²⁹⁵ The Department of Commerce indicates that 10.8 percent of the population subscribes to high-speed services. See *A Nation Online* at 39-40.

²⁹⁶ *Second Report*, 15 FCC Rcd at 20942.

²⁹⁷ See *Broadband Will be Available to 75 percent of US Homes by Year-Says New Yankee Group Report*, Yankee Group News Releases, Nov. 1, 2001; *Morgan/McKinsey Broadband Report* at 43 ("...approximately 80% of the U.S. is reached today by upgraded Cable or xDSL.").

²⁹⁸ See *supra* para. 27.

²⁹⁹ *A Nation Online* at 5.

have little or no reason to subscribe to advanced services, we can easily conclude that computer ownership has a direct relationship with penetration rates for advanced services. We also note that computer ownership trends appear to vary significantly based on certain factors, such as income and race.³⁰⁰ Accordingly, high-speed penetration rates also appear to vary with income and race.³⁰¹ Of consumers with computers who are already on-line, the percentage of subscribers is significantly greater than the overall subscription rate. A recent study indicates that 25-35 percent of online users subscribe to high-speed services in some areas.³⁰²

121. The cost of such services may also be a factor in consumers decisions to purchase advanced service lines. According to a survey from the Strategis Group, more than 30 percent of online customers were willing to purchase advanced services at \$25 per month, whereas only 12 percent were willing to pay \$40 per month.³⁰³ Consequently, cost appears to be closely associated with the number of consumers willing to subscribe to advanced services. Another survey reports a similar conclusion, stating that 36 percent of dial-up users were interested in advanced services, but not at current prices.³⁰⁴

122. In addition, some consumers and industry participants believe that it is important to focus on the development of a “killer” application, which would require higher bandwidths and generate wide-spread interest in advanced services for new subscribers.³⁰⁵ They suggest that a “killer” application will make advanced telecommunications capability not just desirable, but essential for most consumers. For example, video-on-demand, Internet gaming,³⁰⁶ and voice over Internet Protocol have received a significant amount of attention. Content-related applications, however, such as video-on-demand, appear to have some legal barriers to full deployment due to copyright infringement concerns and current related restrictions on content

³⁰⁰ For example, 23.4 percent of households with income less than \$15,000 per year own computers and 89.0 percent of households with income over \$75,000 per year own computers. In addition, households of different ethnic and racial backgrounds report varying rates of computer ownership controlling for income. For instance, households with income under \$15,000, 52.5 percent of Asian American and Pacific Islander households report owning a computer, along with 26.9 percent of White households, 18.1 percent of Hispanic households, and 13.3 percent of Black households. Data are based on calculations from National Telecommunications and Information Administration staff (relying on unpublished census data).

³⁰¹ See *supra* para. 102; As of September 2001, 22.9 percent of Asian American and Pacific Islander households with Internet access report high-speed Internet access, along with 19.3 percent of White households, 17.0 percent of Hispanic households, and 16.0 percent of Black households. Race data controlling for income is not available. Again, data are based on calculations from National Telecommunications and Information Administration staff (relying on unpublished census data).

³⁰² *Morgan/McKinsey Broadband Report* at 4.

³⁰³ Information Technology Association of America, *Building a Positive, Competitive Broadband Agenda* (Oct. 2001) (ITTA Study) (citing survey from the Strategis Group).

³⁰⁴ *Broadband Too Pricey for Dial-up Users, Survey Says*, Communications Daily, Nov. 30, 2001 (citing survey from Hart Research and The Winston Group).

³⁰⁵ See, e.g., John Sullivan, *What Can We Learn From Watching TV?*, Broadband Networking News, Dec. 4, 2001 (“It’s been argued that a major reason for broadband’s malaise is the absence of a compelling killer app.”); Steve Gold, *3G’s Success Hinges on Girls*, Newsbytes, Dec. 14, 2001 (“...third-generation (3G) wireless services won’t take off until the networks start coming up with killer applications for users.”)

³⁰⁶ Grahame Lynch, *Discovered: A Profitable Killer App for Broadband*, America’s Network, Nov. 15, 2001 (noting that on-line gaming has helped drive the broadband market in Korea).

availability by content owners.³⁰⁷ As the market continues to develop and these issues are resolved, we anticipate that innovative applications may drive consumer demand and subscription rates.

123. Another factor for subscription may be the fact that consumers are unaware of available alternatives in advanced services and have not yet become familiar with the benefits of high-speed access to the Internet.³⁰⁸ Accordingly, service providers have begun experimenting with marketing techniques in order to increase subscribership. For example, satellite providers and cable modem providers have recently begun offering subscriptions to high-speed services at retail outlets and report that consumers have responded favorably.³⁰⁹

124. Overall, we note that the penetration of advanced services is generally comparable, or higher, than the historical rates of penetration for other technologies, such as the telephone or television. For example, the telephone took 36 years and the television took 17 years to reach 30 percent of Americans.³¹⁰

C. International Deployment

125. We believe that it is instructive to monitor the deployment of advanced services in the international community to determine if there are lessons to be learned from their experience. For instance, experiences in other countries suggest that the United States is most likely to rapidly deploy high-speed or advanced services when we encourage competition among services providers in the advanced telecommunications market. Nevertheless, we acknowledge that some of the results may be of limited value due to unique circumstances in a particular nation. Factors such as geography, population concentration, industry structure, and government subsidies may all influence the effectiveness of deployment techniques employed by various countries. As a result, while we believe that it is a useful exercise to consider the deployment techniques of other nations, we believe that any international comparisons should be made with caution. In the following, we provide a short overview of reports relating to international deployment, and briefly take note of a variety of factors that may have influenced penetration rates for high-speed services in several nations.

³⁰⁷ See Dan Mitchell, *Can Technology Save Copy Protection?*, Cable World, Apr. 9, 2001 ("The movie studios often blame a lack of copyright protection for their reluctance to make content available for video-on-demand and other advanced television services."); Christopher Boyd, *Video on Demand Ready to Hit Home*, Orlando Sentinel at A1 ("Analysts say copyright and fee issues need to be resolved before video-on-demand libraries contain great numbers of new releases."); Dick Kelsey, *Movies Will Cause Broadband Explosion – Valenti*, Newsbytes News Network, Aug. 21, 2001 ("The extraordinary potential of on-demand entertainment on the Internet was illustrated by music download site Napster, which was ordered to block copyrighted songs made available through its peer-to-peer technology.")

³⁰⁸ Covad Comments at 3 ("Consumers are slowly realizing the benefits of broadband, but haven't yet been convinced in large number to adopt the technology. That is an issue for sales and marketing arms of broadband providers, not for regulators.")

³⁰⁹ AT&T states that its high-speed data service can be purchased at 115 Best Buy stores, 75 Gateway stores, and 120 Circuit City stores and that year-to-date sales through these retail outlets have already exceeded sales for all of 2000. See AT&T Comments at 10 (AT&T Comments were dated September 24, 2001). In addition, StarBand announced that it plans to have an in-store demo in up to 5,000 MSN/RadioShack stores by the end of 2001. See StarBand Comments at 15.

³¹⁰ See ITA Study at 14.

126. A recent report to the Office of Economic Cooperation and Development (OECD) discusses broadband developments and penetration rates in 30 OECD countries, including the United States.³¹¹ This report provides a comprehensive review of the deployment of high-speed services, and may reflect a variety of regulatory structures in each of the countries it considers. According to this report, in June 2001 the United States had a broadband penetration rate of 3.24 per 100 inhabitants. Three countries had higher broadband penetration rates than the United States: Korea at 13.91, Canada at 6.22, and Sweden at 4.52. Additional OECD countries with June 2001 broadband penetration rates above 2.0 included the Netherlands at 2.74, Austria at 2.36, Denmark at 2.33 and Belgium at 2.27. Several other countries that one might have expected to have high broadband penetration, but that were lower than 2.0, included Germany 1.03, Japan at 0.94, France at 0.59, Australia at 0.59 and United Kingdom at 0.09.³¹²

127. An important question to consider is why Korea, Canada, and Sweden report a broadband penetration level significantly higher than the United States. According to the OECD report, the rapid roll-out of high-speed Internet access in Korea is a result of competition between companies using different technologies and different infrastructures. By the end of 2000, Korea Telecom was able to offer DSL service to 92 percent of the Korean population, which was due in part to the fact that a high percentage of Koreans live in apartment buildings. Cable modem service was introduced into Korea in July 1998, before DSL service was available. IP telephony may have also been an important source of broadband growth. IP telephony was introduced by Serome Technology in January 2000, and by December 2000 apparently 4.3 million users had signed up for the service. Serome Technology offers a "DialPad" service that allows users to signal that they are online.³¹³ In conjunction with advanced telecommunications capability, it removes one of the barriers to computer-to-computer use of IP telephony. In addition, broadband growth may also be driven by the fact that a wide range of content is available to Korean consumers.³¹⁴ The Korean Government has set a target to wire 84 percent of Korea's households with services at 20 Mbps by 2005.³¹⁵

128. Canada ranked second in broadband penetration in June 2001.³¹⁶ Competition between different companies using different networks has been important in Canada as well.

³¹¹ Office of Economic Cooperation and Development. Directorate for Science, Technology and Industry, Committee for Information, Computer and Communications Policy, Working Party on Telecommunications and Information Service Policies, *The Development of Broadband Access in OECD Countries* (Oct. 29, 2001) (OECD Report). The OECD Report defines broadband as downstream access at 256 kbps and higher speeds, and upstream access at significantly lower speeds, apparently as slow as 64 kbps, in order to include ADSL within the broadband definition.

³¹² *Id.* at 14.

³¹³ *Id.* at 33.

³¹⁴ *Speedcast Partners with World's Largest Broadband Provider*, Asia Pulse, Nov. 1, 2001 ("...Korea Telecom subscribers will now be able to access SpeedCast Multimedia live streaming video and audio content directly from their PC... This multimedia content ranges in subject matter from business and finance, to news and entertainment, lifestyle, as well as a variety of ethnic programs in many languages."); Kim Gilmour, *Survival of the Quickest: Broadband Will Change Your Life, They Say*, Internet Magazine, Dec. 1, 2001 ("Abundant broadband availability and, just as importantly, appealing content and rock-bottom access prices...have given South Koreans an insatiable appetite for broadband recreation.")

³¹⁵ *Korean Trailblazers*, CommunicationsWeek International, Sep. 10, 2001.

³¹⁶ OECD Report at 24-25.

Some cable networks began introducing commercial cable modem services as early as November 1996. Telephone carriers responded to the availability of cable modem service by offering DSL service.

129. As of June 2001, Sweden had a broadband penetration rate of 4.52. The Swedish government has a goal of ensuring that broadband reaches 98 percent of towns and villages by 2004 or 2005.³¹⁷ We also note that a majority of the Swedish population rents apartments in multi-tenant buildings, and cable operators generally have agreements with the building owners that give them exclusive access to tenants for 25 years or longer.³¹⁸

130. As mentioned above, several other OECD countries had broadband penetration levels above 2.0 in June 2001, even though they were below the estimated United States level of 3.24. The Netherlands has one of the highest penetration rates for cable modems among OECD countries. At the end of 2000, cable modem penetration in the Netherlands was only second to Canada and Korea. The OECD Report indicates that the divestiture of the cable network incumbent may have assisted investment in upgrading cable networks in the Netherlands.³¹⁹ In Austria, consumers are beginning to purchase cable modems, and Telekom Austria is in the process of upgrading its network to provide DSL.³²⁰ In Denmark, rollout of high-speed Internet has been relatively slow. This may be explained in part by the fact that the incumbent telecom carrier owns the largest cable system and in 1999 had a 61 percent share of total Denmark cable subscribers.³²¹

131. In most of the brief examples listed above, a particularly important factor that encouraged the relatively rapid build out of broadband access was the level of competition between cable TV systems and local telephone companies. Where such competition was diminished because the local telephone provider was also a significant owner of cable networks, the level of competition and the growth of high-speed access on both cable and using DSL on the telephone network, appears to be significantly slower. As a result, we believe that this may support our conclusion in the *Second Report* that competition among service providers increases the quality of services made available to consumers.³²²

132. As we noted above, the successful deployment of advanced telecommunications capability in other nations may be instructive to our efforts to provide access to advanced telecommunications services to all Americans. We emphasize, however, that this exercise may be useful only to the extent that we recognize that there are numerous differences among nations, and that certain comparisons may be of limited value.

³¹⁷ *Id.* at 39-40.

³¹⁸ BDRC Ltd., *The Development of Broadband Access Platforms in Europe: Technologies, Services, Markets, Full Report* (Aug. 2001) (BDRC Report) at 114-118.

³¹⁹ *OECD Report* at 35.

³²⁰ *BDRC Report* at 23.

³²¹ *Id.* at 25.

³²² See *Second Report*, 15 FCC Rcd at 21004.

VI. ACTIONS TO ACCELERATE DEPLOYMENT OF ADVANCED TELECOMMUNICATIONS CAPABILITY

A. Overview

133. In the *Second Report*, we identified the three main factors linked to the deployment of advanced telecommunications capability as sufficient demand in a particular locality, the presence of competition among advanced services providers, and the strength of local community efforts to increase the level of deployment.³²³ Given the Commission's role in the telecommunications marketplace, we focused our recommendations on steps that will increase competition in the market for advanced services. We stated that "competition, not regulation, holds the key to stimulating further deployment."³²⁴ This continues to be our view. We believe that a minimal regulatory framework will promote competition and thus encourage investment in advanced telecommunications capability. This framework should be as comprehensive as possible, while recognizing that there may be important legal, policy, technological, or other differences among classes of providers that require disparate regulatory treatment for such providers. Our recent and recommended actions are designed to promote competition and investment through limiting regulatory cost and regulatory uncertainty by establishing a regulatory framework for the evolving broadband market.

134. In the following sections, we discuss the steps that we have taken to encourage investment and further the deployment of advanced telecommunications capability. We also discuss actions the Commission is considering, along with pending proceedings, that may improve the availability of advanced telecommunications capability. Finally, we take note of several suggestions that are designed to promote access to advanced telecommunications capability and may be relevant to entities other than the Commission.

B. Recent Commission Actions

135. Section 706 states, among other things, that "the Commission...shall encourage the deployment on a reasonable and timely basis of advanced telecommunications capability to all Americans...by utilizing...price cap regulation, regulatory forbearance, measures that promote competition in the local telecommunications market, or other regulating methods that remove barriers to infrastructure investment."³²⁵ In order to meet this requirement, the Commission has implemented a wide range of actions aimed at encouraging the growth and development of the advanced services market. More recently, we have turned our focus to establishing the appropriate comprehensive regulatory framework that will promote investment in infrastructure and increase access to advanced telecommunications capability for all Americans. In keeping with our belief that robust competition, minimal regulation, and regulatory certainty create the best environment for increased availability for advanced telecommunications capability, we have taken actions to advance these goals. Highlights of our significant actions are detailed below.

³²³ *Id.* at 21003 – 21004.

³²⁴ *Id.* at 21004.

³²⁵ § 706(a) of the 1996 Act, reproduced in the notes under 47 U.S.C. §157.

1. Promoting Investment Through Competition

136. *Revised Collocation Rules.* In August 2001, we adopted revised collocation rules.³²⁶ Collocation is a crucial means by which some competitors provide advanced services to customers. The revised rules are designed to advance the statutory goals of promoting investment, competition, and technological innovation in all telecommunications markets, including advanced services, while protecting incumbent LEC property interests against unnecessary takings.³²⁷ These rules make clear that a competitive LEC may collocate equipment if an inability to deploy that equipment would, as a practical, economic, or operational matter, preclude the requesting carrier from obtaining interconnection or access to unbundled network elements as contemplated in sections 251(c)(2) and 251(c)(3) of the Act.³²⁸ With regard to multifunctional equipment, we found that the primary function of such equipment must satisfy this test in order to be eligible for collocation. In addition, we required that an incumbent LEC must provide cross-connections between collocated carriers upon reasonable request.³²⁹ We also established principles to ensure that an incumbent LEC assigns and configures physical collocation space in accord with its statutory duty to provide for physical collocation on rates, terms, and conditions that are just, reasonable, and nondiscriminatory.³³⁰

137. *Encouraged Competitive Delivery of DSL Services Through Line Sharing.* “Line sharing” permits competitive LECs to provide DSL-based services over lines that are already served by an incumbent LEC for local voice service.³³¹ In January 2001, we rejected requests to reconsider the requirement that incumbent LECs provide unbundled access to the high frequency portion of the local loop through “line sharing.”³³² We also clarified the Commission’s policy requiring incumbent LECs to facilitate “line splitting,” where two competitive LECs share a single local loop to provide an end-user both local voice and broadband services.

138. *Encouraged Further Competition in the International Submarine Cable Market.* In November 2001, the Commission adopted a Report and Order that will promote competition in the Internet-driven submarine cable market and further streamline our licensing process.

³²⁶ The rules were revised in response to a D.C. Circuit decision remanding for further consideration certain aspects of the Commission’s prior collocation rules. *Deployment of Wireline Services Offering Advanced Telecommunications Capability*, CC Docket No. 98-147, Fourth Report and Order, 16 FCC Rcd 15435 (2001) (*Collocation Remand Order*), petitions for review filed sub nom. *Verizon California, Inc., et al. v. FCC and USA*, No. 01-1371 (D.C. Cir. filed Aug. 23, 2001); see also *GTE Service Corp. v. FCC*, 205 F.3d 406 (D.C. Cir. 2000).

³²⁷ See *Collocation Remand Order* at 15443.

³²⁸ *Id.* at 15443-15464.

³²⁹ *Id.* at 15464-15479.

³³⁰ *Id.* at 15478-15486.

³³¹ *Deployment of Wireline Services Offering Advanced Telecommunications Capability*, CC Docket Nos. 98-147 and 96-98, Third Report and Order in CC Docket No. 98-147 and Fourth Report and Order in CC Docket No. 96-98, 14 FCC Rcd 20912, 20913, para. 4 (1999).

³³² *Deployment of Wireline Services Offering Advanced Telecommunications Capability and Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, CC Docket Nos. 98-147, 96-98, 98-147, and 96-98, Third Report and Order on Reconsideration in CC Docket No. 98-147, Fourth Report and Order on Reconsideration in CC Docket No. 96-98, Third Further Notice of Proposed Rulemaking in CC Docket No. 98-147, Sixth Further Notice of Proposed Rulemaking in CC Docket No. 96-98, 16 FCC Rcd 2101 (2001).

These changes reflect our response to recent growth in the number and capacity of new submarine cables and our recognition of the need to move with the swift pace of the market. In addition, we seek to tailor the Commission's licensing processes to encourage rapid, facilities-based entry by multiple firms that can bring increased capacity to the market.³³³

2. Universal Service

139. *Encouraged Investment in Infrastructure in High-Cost Areas.* The Commission recently modified its rules for providing intrastate high-cost loop support to rural carriers, based on proposals made by the Rural Task Force and recommended by the Federal-State Joint Board on Universal Service.³³⁴ This five-year plan will encourage investment in rural America by providing rural carriers with certainty and stability. Among other things, the Rural Task Force plan increases the total amount of high-cost loop support available to rural carriers and, in certain circumstances, provides support for additional investment that they make in their infrastructure. The Commission also explained that use of universal support to invest in infrastructure capable of providing access to advanced services does not violate section 254(e), which mandates that support be used "only for the provision, maintenance, and upgrading of facilities and services for which the support is intended."³³⁵ Thus, although the high-cost loop support mechanism does not support the provision of advanced services, the modified support mechanism will not impede the deployment of modern plant capable of providing access to advanced services.

140. *Reformed Access Charges for Rate-of-Return Telephone Companies.* In October 2001, the Commission modified its rules to help provide certainty and stability for rate-of-return carriers, thereby encouraging investment in infrastructure -- including infrastructure that may be used to provide advanced services -- in rural America. Rate-of-return carriers are typically small, rural telephone companies.³³⁶ In particular, the Commission modified its interstate access charge rules and universal service support system for rate-of-return incumbent local exchange carriers.³³⁷ Specifically, the Commission created a universal service support mechanism to replace implicit support in the interstate access charges collected by rate-of-return carriers, with explicit support that is portable to all eligible telecommunications carriers. The new, uncapped support mechanism will provide stability by ensuring that rate structure modifications do not affect overall recovery of interstate access costs.³³⁸ In addition, the Commission permitted small

³³³ *Review of Commission Consideration of Applications Under the Cable Landing License Act.* IB Docket No. 00-106, Report and Order, FCC 01-332 (rel. Dec. 14. 2001).

³³⁴ *Federal-State Joint Board on Universal Service.* CC Docket No. 96-45, Fourteenth Report and Order and Twenty-Second Order on Reconsideration. *Multi-Association Group (MAG) Plan for Regulation of Interstate Services of Non-Price Cap Incumbent Local Exchange Carriers and Interexchange Carriers.* CC Docket No. 00-265, Report and Order, 16 FCC Rcd 11244 (2001) (Rural Task Force Order).

³³⁵ *Rural Task Force Order*, 16 FCC Rcd at 11320-11323.

³³⁶ *Multi-Association Group (MAG) Plan for Regulation of Interstate Services of Non-Price Cap Incumbent Local Exchange Carriers and Interexchange Carriers, Federal-State Joint Board on Universal Service. Access Charge Reform for Incumbent Local Exchange Carriers Subject to Rate-of-Return Regulation. Prescribing the Authorized Rate-of-Return for Interstate Services of Local Exchange Carriers.* CC Docket Nos. 00-256, 96-45, 98-77, and 98-166. Second Report and Order and Further Notice of Proposed Rulemaking in CC Docket No. 00-256, Fifteenth Report and Order in CC Docket No. 96-45, and Report and Order in CC Docket Nos. 98-77 and 98-166. FCC 01-304, para. 4 (rel. Nov. 8, 2001), reconsideration pending.

³³⁷ *Id.*

³³⁸ *Id.* at para. 12.

and mid-sized local telephone companies that serve rural and high-cost areas to continue to set rates based on a rate-of-return of 11.25 percent.³³⁹ Furthermore, the Commission agreed that universal service policies should not inadvertently create barriers to the provision of access to advanced services.³⁴⁰

3. Efficient Use of Spectrum

141. *Authorized Voluntary Clearing of Upper 700 MHz Bands.* In a series of decisions regarding the 747-762 and 777-792 MHz bands (Upper 700 MHz),³⁴¹ the Commission made portions of this band available for next generation mobile and high-speed broadband services, among other possible uses. In particular, the Commission authorized voluntary band-clearing agreements between incumbent broadcasters and new commercial wireless interests. The Upper 700 MHz auction (Auction No. 31) is scheduled to begin June 19, 2002.³⁴²

142. *Adopted Service Rules for Lower 700 MHz.* As part of the digital television transition, the Commission adopted service rules for the 698-746 MHz band (Lower 700 MHz) to enable the introduction of wireless services.³⁴³ Like the Upper 700 MHz band, wireless licenses to use the spectrum will be awarded via competitive bidding. Potential uses of the spectrum include next generation mobile and high-speed broadband services.

143. *Took Actions to Identify Appropriate 3G Spectrum.* In an effort to implement the International Telecommunications Union's (ITU) International Mobile Telecommunications 2000 initiative (IMT-2000), the FCC, in conjunction with the National Telecommunications and Information Administration (NTIA) and the White House, has taken a series of actions to identify appropriate spectrum for potential reallocation to third generation (3G) wireless services.³⁴⁴

144. *Authorized Ka-band Satellites.* In August 2001, the Commission authorized the deployment of 11 new Ka-band systems that have the potential to provide a variety of services, including broadband, interactive, direct-to-home and digital services to all parts of the country.

³³⁹ *Id.* at paras. 206-210.

³⁴⁰ *Id.* at para. 12.

³⁴¹ See *Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules*, WT Docket No. 99-168, Third Report and Order, 16 FCC Rcd 2703 (2001); Order on Reconsideration of Third Report and Order, FCC 01-258 (rel. Sep. 17, 2001).

³⁴² *Auction of Licenses for 747-762 and 777-792 MHz Bands (Auction No. 31) Scheduled For June 19, 2002*, Public Notice, DA 01-2394 (rel. Oct. 15, 2001).

³⁴³ *Reallocation and Service Rules for the 698-746 MHz Spectrum Band (Television Channels 52-59)*, GN Docket No. 01-74, Report and Order, FCC 01-364 (rel. Jan. 18, 2002).

³⁴⁴ *Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems*, ET Docket No. 00-258, Notice of Proposed Rulemaking and Order, 16 FCC Rcd 596 (2001); Memorandum Opinion and Order and Further Notice of Proposed Rulemaking, 66 Fed. Reg. 47618-01 (2001); First Report & Order and Memorandum Opinion and Order, FCC 01-256 (rel. Sep. 24, 2001). By ITU standards, 3G services for pedestrian and indoor traffic are high-speed services, capable of supporting circuit and packet data at 384 kbps for pedestrian traffic and 2 Mbps of higher for indoor traffic. For high mobility (vehicular) traffic, the 3G standard includes services capable of speeds of 144 kbps or higher. Accordingly, some services satisfying the ITU's standard are not high-speed.

Specifically, the Commission authorized 11 “second round” Ka-band applicants to provide fixed-satellite service from geostationary satellite systems located in a total of 34 orbit locations.³⁴⁵

145. *Expanded Over-the-Air Reception Devices Rule.* The Commission took steps to minimize interference with the installation, maintenance, or use of antennas used for high-speed services. As directed by Congress, the Commission in 1996 adopted the Over-the-Air Reception Devices Rule (OTARD) prohibiting governmental and non-governmental restrictions that impair installation, maintenance or use of certain antennas.³⁴⁶ The rule applies to antennas, including TV antennas, and fixed wireless and satellite antennas that are less than one meter in diameter, or any size in Alaska. The rule was expanded, effective in May 2001, to apply to fixed wireless antennas used to transmit or receive data, voice and other non-video services. Thus, in addition to its application to video antennas, the rule now applies also to providers that offer high-speed access.³⁴⁷ The rule applies if the antenna user has a direct or indirect property interest and exclusive use or control of the location where the antenna is installed.

146. *Commenced Rolling One-Day Filing Window for MDS and ITFS Licensees.* In 1998, the Commission adopted technical rule changes to provide MDS and ITFS licensees flexibility to fully employ digital technology in delivering two-way communication services, including high-speed and high-capacity data transmission and Internet service.³⁴⁸ An initial filing window for two-way service was held from August 14-18, 2000. Following this initial filing window, on April 16, 2001, the Bureau commenced a rolling one-day filing window process, which permits current licensees to apply for upstream and downstream authorizations. This process provides protection to previously proposed applications.³⁴⁹ To date, approximately 1,600 of those applications have been granted.

147. *Added Mobile Allocation to the 2500-2690 MHz Band.* On September 24, 2001, the Commission adopted a *First Report and Order and Memorandum Opinion and Order (First R&O)* in the New Advanced Wireless Services proceeding.³⁵⁰ The *First R&O* adds a mobile

³⁴⁵ *Second Round Assignment of Geostationary Satellite Orbit Locations to Fixed Satellite Service Space Stations in the Ka-Band*, Order. DA 01-1693 (rel. Aug. 3, 2001).

³⁴⁶ 47 C.F.R. § 1.4000.

³⁴⁷ *Promotion of Competitive Networks in Local Telecommunications Markets, Wireless Communications Association International, Inc. Petition for Rulemaking to Amend Section 1.4000 of the Commission's Rules to Preempt Restrictions on Subscriber Premises Reception or Transmission Antennas Designed to Provide Fixed Wireless Services*, WT Docket No. 99-217, First Report and Order, 15 FCC Rcd 22983 (2000).

³⁴⁸ *Amendment of Parts 21 and 74 to Enable Multipoint Distribution Service and Instructional Television Fixed Service Licensees to Engage in Fixed Two-Way Transmissions*, MM Docket No. 97-217, 13 FCC Rcd 19112 (1998), recon., 14 FCC Rcd 12764 (1999), further recon., 15 FCC Rcd 14566 (2000).

³⁴⁹ *Mass Media Bureau Provides Further Information regarding Grants of ITFS and MDS Two-Way Applications, Certain ITFS Major Modification Applications, and the Rolling One-Day Filing Window Procedure*, Public Notice, DA 01-751 (rel. Mar. 26, 2001).

³⁵⁰ *Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems and Amendment of the US Table of Frequency Allocations to Designate the 2500-2520/2670-2690 MHz Frequency Bands for the Mobile-Satellite Service*, ET Docket No. 00-258 and RM-9911, First Report & Order and Memorandum Opinion and Order, FCC 01-256 (rel. Sep. 24, 2001).

allocation to the 2500-2690 MHz band³⁵¹ to provide additional near-term and long-term flexibility for use of this spectrum, thereby making this band potentially available for advanced mobile and fixed terrestrial wireless services, including 3G and future generations of wireless systems. The Commission decided not to relocate the existing licensees or otherwise modify their licenses.

C. Commission Actions Under Consideration

148. We recently initiated several major initiatives relating to promotion of advanced services, which will limit regulatory costs and regulatory uncertainty by creating a broad framework for the developing advanced services market. These proceedings will enable the Commission to explore how regulatory policy should evolve in a manner that is complementary to the advanced services marketplace. In addition, these initiatives are designed to remove barriers to deployment of advanced telecommunications capability by promoting competition in the telecommunications market.

149. As we discuss in more detail below, the Commission has initiated four proceedings that focus on a comprehensive regulatory treatment of broadband services. First, the Commission launched the *Cable Modem Notice of Inquiry* that considers the definitional question of the regulatory classification under the Act of cable modem service, which is used as a broadband platform.³⁵² Second, we plan to initiate a *Broadband NPRM*, where we examine the legal and policy issues associated with broadband offerings by wireline carriers and universal service issues associated more broadly with all broadband offerings. Third, in the *Incumbent LEC Broadband Telecommunications Services NPRM*, we examine the appropriate regulatory requirements for the incumbent LECs' provision of domestic broadband telecommunications services, including what regulatory safeguards and carrier obligations, if any, should apply when a carrier that is dominant in the provision of traditional local exchange and exchange access services provides broadband service.³⁵³ Fourth, in the *Triennial Review NPRM*, we address, among other things, the incumbent LECs' wholesale obligations under section 251 to make their facilities available as unbundled network elements to competitive LECs for the provision of broadband services.³⁵⁴

³⁵¹ There are currently thirty-three 6 MHz channels, or 198 MHz of spectrum, allocated to MDS and ITFS. In the top fifty markets in the country, MDS utilizes two 6 MHz channels in the 2150 to 2162 MHz band. In the rest of the country, the 6 MHz MDS 2 channel is replaced by a 4 MHz MDS 2-A channel (2150 to 2160 MHz). In addition, both MDS and ITFS share spectrum in the 2500 to 2686 MHz band. In this band, ITFS licensees are allotted twenty 6 MHz channels (120 MHz of spectrum), and MDS licensees are allotted eleven 6 MHz channels (66 MHz of spectrum).

³⁵² *Inquiry Concerning High-Speed Access to the Internet Over Cable and Other Facilities*, GN Docket No. 00-185, Notice of Inquiry, 15 FCC Rcd 19287 (2000) (*Cable Modem NOI*).

³⁵³ *Review of Regulatory Requirements for Incumbent LEC Broadband Telecommunications Services*, CC Docket No. 01-337, Notice of Proposed Rulemaking, FCC No. 01-360 (rel. Dec. 20, 2001) (*Incumbent LEC Broadband Telecommunications Services NPRM*).

³⁵⁴ *Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers*, CC Docket No. 01-338, *Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, CC Docket No. 96-98, *Deployment of Wireline Services Offering Advanced Telecommunications Capability: Notice of Proposed Rulemaking*, CC Docket No. 98-147, FCC 01-361 (rel. Dec. 20, 2001) (*Triennial Review*).

150. At the same time, the Commission is currently considering other actions that are intended to promote the build-out of advanced telecommunications capability. In particular, we take note of actions that the Commission is currently considering that are designed to promote competition. As noted in our *Second Report*, the existence of competition among providers benefits consumers by increasing the range and quality of service offerings, while reducing the price of services.³⁵⁵ We also take note of several Commission actions relating to universal service. In addition, we consider the efficient and fair use of limited public resources, such as spectrum and the public rights of way. Furthermore, we emphasize that we will continue to use the enforcement authority available to us to ensure that any advanced services or components of advanced services are provided in a manner that is consistent with the Act and relevant Commission rules and orders. We will continue to coordinate our efforts with the Joint Conference on Advanced Services and other groups interested in promoting deployment.

1. Establishing a Regulatory Framework

151. *Cable Modem Notice of Inquiry*. On September 18, 2000, we initiated a proceeding through a Notice of Inquiry to consider the policy and legal issues surrounding high-speed Internet services offered over cable and other facilities.³⁵⁶ The *Cable Modem NOI* seeks comment on the proper regulatory classification for cable modem service and/or the cable modem platform, including whether the service should be classified as a cable service, a telecommunications service, an information service, or some other category of service.³⁵⁷ Consistent with the Commission's directive in the *Second Report*, the *Cable Modem NOI* seeks comment on whether there should be a national policy for multiple ISPs' access to cable operators' infrastructure for delivery of advanced services.³⁵⁸ The *Cable Modem NOI* asks whether current market forces are working to achieve multiple-ISP access, or whether government intervention is desirable and/or necessary to achieve that goal.³⁵⁹

152. *Broadband NPRM*. We plan to initiate an inquiry relating to the statutory classification of wireline broadband Internet access services. We will explore what regulations, if any, are appropriate if wireline broadband Internet access services are found to be information services or other services subject to Title I of the Act. Specifically, we plan to examine implications for universal service, access and interconnection, and other core communications policy objectives. Finally, we will examine whether providers of broadband Internet access services provided over wireline and other platforms should be required to contribute to universal service.

153. *Incumbent LEC Broadband Telecommunications Services NPRM*. In light of the market changes that are occurring in telecommunications, we are considering whether the various regulatory frameworks to measure and respond to the development of competition in markets previously served by a monopoly provider, established by the Commission in prior

³⁵⁵ See *Second Report*, 15 FCC Rcd at 21004.

³⁵⁶ *Cable Modem NOI*.

³⁵⁷ *Id.* at 19293-19298.

³⁵⁸ *Id.* at 19298-19306; *Second Report*, 15 FCC Rcd at 21010.

³⁵⁹ *Cable Modem NOI*, 15 FCC Rcd at 19306-19308.

proceedings, continue to have relevance today.³⁶⁰ We initiated a review of the current regulatory requirements for incumbent LECs' broadband telecommunications services. We seek comment on what changes, if any, the Commission should make to its traditional regulatory requirements on incumbent LEC broadband service.

154. *Triennial Review of Unbundled Network Elements.* We initiated our first Triennial Review of the Commission's policies on unbundled network elements.³⁶¹ Our re-evaluation of the unbundling rules is designed to bring benefits to consumers through innovation and meaningful competition, and consider how to balance incumbent LECs' unbundling obligations with incentives for carriers to invest in facilities. Among other inquiries, we are examining whether and how to incorporate our mandate under section 706 of the Act as an explicit factor in our unbundling analysis.

2. Promoting Investment Through Competition

155. *Collocation in Remote Facilities.* We are considering modifications to our collocation rules to ensure competitive access to incumbent LEC remote premises.³⁶² As fiber is pushed further into the local loop and customers are increasingly served through remote terminals, we recognize the need to ensure that investment is not stifled by the ability of incumbents to control access to remote devices where DSL technology may be installed.

156. *Carrier Compliance.* Recognizing that the unbundled network element continues to be an important model for competitors to provide service, we note that the underlying carrier's service quality can greatly influence a competitor's ability to meet customer's needs and the carrier's ability to provide quality service. As a result, we have initiated an inquiry about whether to establish national performance measurements and standards that would assist in evaluating a carrier's compliance with its local competition obligations.³⁶³ The dozen or so measures we will consider may have the effect of streamlining the number of existing performance measurements, making clearer a carrier's performance in critical areas, and facilitating federal and state enforcement of that carrier's responsibilities.

157. *Cable Inside Wire Second Further Notice of Proposed Rulemaking.* We continue to adopt pro-competitive policies governing the use of cable wiring inside multiple dwelling units. To facilitate competition from alternative providers, we have established rules that govern the disposition of the incumbent cable operator's wiring once it no longer has a right to serve multiple dwelling units.³⁶⁴ We are currently considering whether additional measures are

³⁶⁰ *Incumbent LEC Broadband Telecommunications Services NPRM.*

³⁶¹ See *Implementation of the Telecommunications Act of 1996*, Third Report and Order and Fourth Further Notice of Proposed Rulemaking, 15 FCC Rcd 3696, 3766 n.269 (announcing the review may begin after approximately only two years of experience with these rules); *Triennial Review*.

³⁶² *Deployment of Wireline Services Offering Advanced Telecommunications Capability*, CC Docket No. 98-147, Order on Reconsideration and Further Notice of Proposed Rulemaking, 15 FCC Rcd. 17044 (2000).

³⁶³ *Performance Measurements and Standards for Unbundled Network Elements and Interconnection*, et al., CC Docket No. 01-318, Notice of Proposed Rulemaking, FCC 01-331 (rel. Nov. 19, 2001).

³⁶⁴ See 47 C.F.R. §§ 76.804-76.805; see also 47 C.F.R. §§ 76.801-76.802 (disposition of wiring within a residence).

necessary to enhance the ability of service providers to use existing cable wiring to offer traditional and advanced services to residents of multiple dwelling units.³⁶⁵

3. Universal Service

158. *Definition of Core Services.* In December 2000, the Commission asked the Joint Board on Universal Service (Joint Board) to consider whether changes should be made to the definition of core services that are eligible for universal service support and to make recommendations to the Commission.³⁶⁶ On August 21, 2001, the Joint Board invited comment on, among other things, whether any advanced or high-speed services should be included within the list of core services.³⁶⁷

159. *Schools and Libraries Program.* We are currently seeking comment on whether the Commission should modify its rules in order to improve program operation and ensure that support is distributed in a fair and equitable manner.³⁶⁸ By taking steps to streamline the program, we hope to improve schools and libraries' access to modern telecommunications and information services for educational purposes.³⁶⁹

160. *Rural Health Care.* Telemedicine and access to communications infrastructure for rural health care providers is a critical component of the Nation's emergency preparedness. We will consider reviewing our rules for the Rural Health Care program to ensure that the discounts available to rural health care providers promote a national network for health care and emergency medical communications. We will take a lead role in fostering awareness of the program and the role it can play in the advancement of telemedicine.

4. Efficient Use of Spectrum

161. *Secondary Markets.* The Commission is considering the removal of unnecessary regulatory barriers to the development of a more robust secondary market in radio spectrum usage rights.³⁷⁰ The proposed action would enable the more efficient use of spectrum through leasing and other commercial arrangements. One objective of such additional flexibility is to increase the availability of spectrum for innovative service offerings, including advanced and high-speed services.

162. *Auctions.* Spectrum allocations that may be suitable for high-speed wireless services and that may be available in the future for auction include: 24 GHz, 3650-3700 MHz, 698-746 MHz (Lower 700 MHz), 1710-1755 MHz and 2110-2150 MHz.

³⁶⁵ See *Telecommunications Services Inside Wiring*, CS Docket No. 95-184 and MM Docket No. 92-260, Report and Order and Second Further Notice of Proposed Rulemaking, 13 FCC Rcd 3659 (1997).

³⁶⁶ *Federal-State Joint Board on Universal Service*, CC Docket No. 96-45, Order, 15 FCC Rcd 25257 (2000).

³⁶⁷ *Federal-State Joint Board on Universal Service Seeks Comment on Review of the Definition of Universal Service*, CC Docket No. 96-45, Public Notice, FCC 01J-1 (rel. Aug. 21, 2001).

³⁶⁸ *Schools and Libraries Universal Service Support Mechanism*, CC Docket No. 02-6, Notice of Proposed Rulemaking and Order, FCC 02-8 (rel. Jan. 25, 2002).

³⁶⁹ *Id.* at para. 2.

³⁷⁰ *Promoting Efficient Use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets*, WT Docket No. 00-230, Notice of Proposed Rulemaking, FCC 00-402 (rel. Nov. 27, 2000).

163. *3G Spectrum Options.* On January 5, 2000, the Commission issued a *Notice of Proposed Rulemaking* that examined spectrum options for 3G and other advanced wireless services.³⁷¹ In a subsequent Order, the Commission recognized that it plans to explore the service rules that would apply to permit mobile operations, including 3G and future generations of wireless systems, in the 2500-2690 MHz band.³⁷²

164. *Service Rules for MVDDS.* The Commission plans to adopt service rules to enable the introduction of a new terrestrial wireless service -- Multichannel Video Distribution and Data Service (MVDDS) -- in the 12.2-12.7 MHz band currently used for domestic satellite service.³⁷³ Service rules may include the flexibility to introduce high-speed data services to the residential market.

165. *DBS Ancillary Services.* In December 2000, the Commission sought comment on whether it should eliminate, relax or maintain remaining restrictions on ancillary uses of DBS spectrum.³⁷⁴

5. Efficient Use of the Rights-of-Way

166. *Rights-of-Way.* The Commission currently has some proceedings pending that consider various aspects of the roles and practices of federal, state, and local governments with respect to rights-of-way management.³⁷⁵ We share commenters' concern about the difficulty

³⁷¹ See *Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems*, ET Docket No. 00-258, Notice of Proposed Rulemaking and Order, 16 FCC Rcd 596 (2001).

³⁷² See *Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems*, ET Docket No. 00-258, First Report and Order and Memorandum Opinion and Order, FCC 01-256 (rel. Sep. 24, 2001).

³⁷³ See also *Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range*, ET Docket No. 98-206, Notice of Proposed Rulemaking, 14 FCC Rcd 1131 (1998); First Report and Order and Further Notice of Proposed Rulemaking, 16 FCC Rcd 4096 (2001).

³⁷⁴ See *Commission Requests Further Comment in Part 100 Rulemaking Proceeding on Non-Conforming Uses of Direct Broadcast Satellite Service Spectrum*, 1B Docket No. 98-21, Public Notice, FCC 00-426 (rel. Dec. 8, 2000). The FCC currently permits Direct Broadcast Satellite (DBS) providers to utilize up to 50 percent of their capacity for ancillary services. See *Revision of Rules and Policies for the Direct Broadcast Satellite Service*, Report and Order, 11 FCC Rcd 9712, para. 17 (1995). See also *Petition of U.S. Satellite Broadcasting Company, Inc. for Declaratory Ruling Regarding Permissible Uses of the Direct Broadcast Satellite Service*, 1B Docket No. 95-168 and PP Docket No. 93-253, Petition for Declaratory Ruling, 1 FCC Rcd 977, 977 (1986). Such ancillary services could include high-speed digital services.

³⁷⁵ See *Implementation of the Local Competition Provisions in the Telecommunications Act of 1996*, WT Docket No. 99-217 and CC Docket No. 96-98, Notice of Proposed Rulemaking and Notice of Inquiry in WT Docket No. 99-217 and Third Further Notice of Proposed Rulemaking in CC Docket No. 96-98, FCC 99-141 (rel. Jul. 7, 1999) at paras. 70-80; *Comments Sought on City Signal Communications, Inc. Petition for Declaratory Ruling Concerning Use of Public Rights of Way for Access to Poles in Cleveland Heights, Ohio Pursuant to Section 253*, Public Notice, 2000 FCC LEXIS 6802 (Dec. 22, 2000); *Comments Sought on City Signal Communications, Inc. Petition for Declaratory Ruling Concerning Use of Public Rights of Way for Access to Poles in Wickliff, Ohio Pursuant to Section 253*, Public Notice, 2000 FCC LEXIS 6803 (Dec. 22, 2000); *Comments Sought on City Signal Communications, Inc. Petition for Declaratory Ruling Concerning Use of Public Rights of Way for Access to Poles in Pepper Pike, Ohio Pursuant to Section 253*, Public Notice, 2000 FCC LEXIS 6804 (Dec. 22, 2000). City Signal withdrew its petition

(continued....)

some companies have faced in securing access to the rights-of-way necessary to deploy advanced telecommunications infrastructure in a timely manner.³⁷⁶ Based on our commitment to ensuring the right-of-way issues are resolved in a fair and expeditious manner, we have asked the Common Carrier Bureau to further examine this matter to consider the legal and policy issues it presents including the question of federal jurisdiction. This effort may best be served through a forum for all interests to meet and work together in creating a guiding set of "best practices" for the appropriate management of the public's rights-of-way.

167. In particular, some service providers provided the Commission with specific examples of rights-of-way disputes and argued that costs and other requirements imposed on carriers for use of the public rights-of-way are burdensome to the point where they are a barrier to deployment. For example, Global Crossing claims that during recent negotiations for a right-of-way permit, a city requested that Global Crossing provide the city with a percent of revenue fee and waive its right to challenge the legality of the permit's provisions.³⁷⁷ In addition, Global Photon notes that it was requested to "voluntarily" contribute \$350,000 to a property's improvement fund in order to obtain a permit.³⁷⁸ Furthermore, others describe prolonged and uncertain application procedures. For instance, ABS gives examples of permit requests not being considered until fifteen to nineteen months after the municipality was originally contacted.³⁷⁹ Additionally, some commenters note that the need to seek permits from multiple jurisdictions can cause significant delay in deploying new facilities.³⁸⁰ Local government parties counter that there is no evidence to suggest their current practices should be restricted.³⁸¹

168. We are concerned about the impact that some of these practices may have on the deployment of advanced services. As a result, we intend to examine these claims and explore solutions through a dialogue with industry and our state and local colleagues, in order to remove barriers that may hinder investment in infrastructure for advanced or high-speed services.³⁸² We

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with regard to the City of Wickliff after the city granted City Signal access to the public rights-of-way. See City Signal Communications, Inc. v. City of Wickliff, DA 01-1499, 2001 FCC LEXIS 3401 (Jun. 26, 2001).

³⁷⁶ See, e.g., MFN Comments at 1 ("...obtaining access to public rights of way poses a significant barrier to the deployment of broadband infrastructure."); Qwest Comments at 12 ("Excessive municipal regulation threatens to delay or prevent distribution of advanced telecommunications services, particularly landline services, which typically require new facilities to be placed within the rights-of-way."); Velocita Comments at 1 ("...Velocita hereby adds its voice to the chorus urging prompt and decisive action by the Commission to address the pervasive and crippling barriers to competitive market entry posed by unreasonable and unlawful rights-of-way management practices and policies."); Verizon Comments at 14 ("...a substantial record has been compiled...showing how existing restrictions are interfering with provision of all types of telecommunications services, including broadband, in violation of section 253 of the Act.")

³⁷⁷ Global Crossing Comments at 6.

³⁷⁸ Global Photon Comments at 14.

³⁷⁹ ABS Comments at 19-21.

³⁸⁰ See, e.g., Velocita Comments at 8; Global Crossing Comments at 6-7.

³⁸¹ We note that several commenters expressed concern that local right-of-way authority should not be preempted. See, e.g., NATA and NLC Comments at 2 ("There is no evidence to suggest that local governments' current right-of-way management or compensation policies have impeded the entry of competitive providers into the market."); TCCFUI Comments at 8 ("there is no evidence that restrictions on local government right-of-way franchise authority facilitate deployment of advanced services to all Americans.").

³⁸² See 47 U.S.C. § 253.

are hopeful that building a consensus regarding best practices will help create reliable and reasonable expectations regarding management of the public's right-of-way.

D. Additional Actions

169. During the course of this proceeding, we received a wide range of suggestions on how to promote the deployment of advanced services to all Americans. Some of these ideas may be relevant to groups outside of the Commission, including various legislative, regional, local, private and regulatory entities. The appropriate authorities may wish to take these suggestions into consideration.

170. *Coordination Between Federal, State, and Local Entities.* Federal, State, and local entities would likely benefit from working together to remove barriers and create incentives for the development of infrastructure to support advanced services. In addition, State and local entities may find it useful to coordinate enforcement efforts with the Commission, in order to ensure compliance and limit regulatory uncertainty.³⁸³

171. *Tax Credits.* Investment credits may provide incentives for service providers to deploy additional infrastructure capable of supporting advanced services.³⁸⁴ We note that legislation is currently pending before Congress that would create a tax credit for organizations that build-out advanced services in rural areas.³⁸⁵

172. *Loan Guarantees.* Loan guarantees may be used to provide low- or no- interest financing for infrastructure that supports advanced services. Loan guarantees could also be designed to spur development for certain underserved communities. For example, the Rural Utilities Service (RUS) of the Department of Agriculture currently administers a pilot program that provides loan guarantees for rural areas.

173. *Grants.* Grant programs may be an additional source of financing for advanced services. For example, the National Telecommunications and Information Administration's Technology Opportunities Program (TOP) gives grants to public and non-profit private sector entities for model projects demonstrating innovative uses of network technology.

174. *Support Public/Private Partnerships.* Communities may benefit from working with private entities in order to establish community-based technology centers in order to provide computer resources and training for residents. Partnerships may be tailored to address particular local needs, or could target the availability of services for certain members of the community, such as the disabled.³⁸⁶

175. *Demand Aggregation and Anchor Tenancy.* Communities may wish to join together with local government, schools, and private businesses in order to warrant private

³⁸³ See, e.g., CompTel Comments at 2.

³⁸⁴ See, e.g., Qwest Comments at 7.

³⁸⁵ See, e.g., S. 88, 107th Congress, 1st Session (2001) (Provides tax credits for five years to companies investing in advanced telecommunications equipment to serve low-income and rural areas.)

³⁸⁶ See TDI Comments at 6.

investment in advanced services. Additionally, fostering an understanding of advanced services among community leaders may help promote community-driven demand aggregation.³⁸⁷

176. *Compile Additional Data.* States, municipalities, and other entities may find it useful to collect additional information regarding providers and the availability of services in their region. This information may provide insight relating to deployment and allow groups to assess specific concerns relating to the availability of advanced services.

177. *Deployment Timelines.* States or local communities may find it useful to set goals with respect to the deployment of advanced services in their region.³⁸⁸

VII. ORDERING CLAUSE

178. Accordingly, IT IS ORDERED that, pursuant to section 706 of the Telecommunications Act of 1996, this Report is ADOPTED.

FEDERAL COMMUNICATIONS COMMISSION

William F. Caton
Acting Secretary

³⁸⁷ See APT, AAPD, and ACB Comments at 4.

³⁸⁸ See, e.g., APT and WID Comments at 10.

APPENDIX A

Section 706 of the Telecommunications Act of 1996 provides:

SEC. 706. ADVANCED TELECOMMUNICATIONS INCENTIVES.

(a) In General. -- The Commission and each State commission with regulatory jurisdiction over telecommunications services shall encourage the deployment on a reasonable and timely basis of advanced telecommunications capability to all Americans (including, in particular, elementary and secondary schools and classrooms) by utilizing, in a manner consistent with the public interest, convenience, and necessity, price cap regulation, regulatory forbearance, measures that promote competition in the local telecommunications market, or other regulating methods that remove barriers to infrastructure investment.

(b) Inquiry. -- The Commission shall, within 30 months after the date of enactment of this Act, and regularly thereafter, initiate a notice of inquiry concerning the availability of advanced telecommunications capability to all Americans (including, in particular, elementary and secondary schools and classrooms) and shall complete the inquiry within 180 days after its initiation. In the inquiry, the Commission shall determine whether advanced telecommunications capability is being deployed to all Americans in a reasonable and timely fashion. If the Commission's determination is negative, it shall take immediate action to accelerate deployment of such capability by removing barriers to infrastructure investment and by promoting competition in the telecommunications market.

(c) Definitions. -- For purposes of this subsection:

- (1) Advanced Telecommunications Capability. -- The term "advanced telecommunications capability" is defined, without regard to any transmission media or technology, as high-speed, switched, broadband telecommunications capability that enable users to originate and receive high-quality voice, data, graphics, and video telecommunications using any technology.
- (2) Elementary and Secondary Schools. -- The term "elementary and secondary schools" means elementary and secondary schools, as defined in paragraphs (14) and (25), respectively, of section 14101 of the Elementary and Secondary Education Act of 1965 (20 U.S.C. 8801).

Telecommunications Act of 1996, Pub. L. 104-104, § 706, 110 Stat. 153, reproduced in the notes under 47 U.S.C. § 157.

APPENDIX B

NETWORK OVERVIEW

1. In this Appendix, we examine each of the components of the network, both in terms of the technology used and the types of entities providing these components.³⁸⁹ We indicated in our inquiry that we were unaware of significant changes in the technology and networks for high-speed services for the purposes of our Report.³⁹⁰ For the most part, we conclude that our prior descriptions continue to be applicable, and we have revised our summary where appropriate. We focus particularly on the last mile because it is a critical link between existing long haul transport and middle mile infrastructure and the last 100 feet to the end-user's terminal, and it appears to be where there is the greatest need for further investment. In examining each component of the network, we also attempt to identify any major technological barriers to deployment of advanced telecommunications capability.

A. Long Haul Communications Transport Facilities

2. At the core of the physical infrastructure supporting advanced telecommunications capabilities are long haul communications transport facilities.³⁹¹ Much of the terrestrial fiber optic infrastructure in this country has been constructed along public rights of way created for railroad, telephone, and electric-utility owned companies. Providers have created additional transport capacity in the form of undersea cables and satellite systems.

3. Long haul communications transport providers in the United States include large long haul providers such as AT&T, WorldCom, Sprint, Qwest, Level 3 and a number of smaller facilities-based transport providers. There are additional wireline, terrestrial wireless, and satellite-based long haul transport providers, with varying amounts of physical facilities. In addition to traffic over the Internet backbone, we note that the long haul transport networks carry a wide range of applications, such as voice, data, and traffic for various financial networks. The major transport providers support speeds ranging from approximately 2.5 Gbps to over 10 Gbps (OC-48 to OC-192 equivalent speeds).³⁹²

³⁸⁹ See *Second Report*, 15 FCC Rcd 20922-20939.

³⁹⁰ *Third Notice of Inquiry* at para. 6.

³⁹¹ In our prior Report, we used the term "backbone" to refer to "long haul communications transport facilities." This led to some confusion as to whether we were referring to high-speed physical transport specific to the Internet backbone. The Internet backbone uses high-speed fiber infrastructure, but so do other applications, including conventional voice. See *Second Report*, 15 FCC Rcd at 20923-20924. In this Report, we use the term long haul communications transport facilities to refer to high-speed physical transport, that includes, but is not limited to, facilities used to support the Internet backbone.

³⁹² See, e.g., Sprint web-site, Internet Backbone Operations, (visited Feb. 5, 2002) <<http://www.sprintlink.net>> (describing its backbone as operating at OC-48 backbone speed); AT&T Technical Brief, Attributes of a World Class IP Provider (visited Feb. 5, 2002) <<http://www.ipservices.att.com/techviews/whitepapers/IPProvider.pdf>> (AT&T announced that it would be at OC-192 at the end of 2000).

4. Although the cost of building and maintaining transport facilities is high, there do not appear to be significant technological or regulatory barriers to deployment of these facilities.³⁹³ To date, advances in fiber optic and microwave technologies have allowed capacity to keep pace with demand for national communications transport facilities. While long haul transport capacity does not appear to present a barrier to deployment of advanced telecommunications capability at this time, the ability to access that capacity presents other questions.

B. Middle Mile Facilities

5. Middle mile facilities provide transport or routing from last mile aggregation points in order to interconnect and exchange traffic with long haul providers or directly with other middle mile networks. It appears that most fiber optic, middle-mile facilities, like long haul communications transport facilities, exist along public rights of way.³⁹⁴ Other middle miles include fixed wireless and satellite links.

6. Many middle mile facilities were originally built by incumbent telephone and cable companies for ordinary telecommunications or cable television services. For example, the fiber optic connections that transport telephone traffic between telephone company central offices can be considered middle mile facilities. Additional examples of middle mile networks include statewide networks and regional commercial enterprises.³⁹⁵

7. Many providers of middle mile transport lease capacity on their networks to non-facilities based Internet service providers (ISPs) and high-speed providers. For example, many local exchange carriers (LECs) currently lease the fiber or high-speed lines connecting their central offices. Most cable systems also have fiber or satellite transport facilities to regional and national backbone, which they may lease to other providers. In addition, there are entities known as Global Service Providers providing interLATA Internet transport service.³⁹⁶ As demand for middle mile facilities has increased, existing providers and new providers have deployed additional facilities. Interexchange carriers, incumbent and competitive local exchange carriers, cable television companies and others, including fixed wireless service providers, have invested enormous amounts of money into construction of fiber facilities.

³⁹³ One analyst notes that national communications transport facility fibers are currently under-utilized, waiting for the last mile access bottleneck to be relieved. *See Michael Ching, Tal Liani, Merrill Lynch, Broadband Access – Speed is of the Essence*, May 15, 2001, at 13 (2001).

³⁹⁴ NECA suggests construction of additional transport facilities across private property, including farm land, significantly increases the cost of construction. NECA Rural Broadband Cost Study, 2000 (visited Feb. 5, 2002) <<http://www.neca.org/broadban.asp>>.

³⁹⁵ For example, South Dakota has deployed a state-wide fiber optic network. *See Second Report*, 15 FCC Rcd at 20926.

³⁹⁶ For example, Verizon sets forth its policy with respect to Global Service Providers on its web-site. *See Verizon* web-site (visited Feb. 5, 2002) <<http://www.gte.net/links/policies/gspfaq.asp>> (“In certain states, Verizon does not have authorization to provide interLATA (long distance) services. A Global Service Provider (GSP) provides the interLATA portion of the Internet service and the connection with the Internet.”)

8. We noted previously that high capacity fiber connects to almost every local exchange carrier central office.³⁹⁷ Indeed, significant amounts of unused high capacity fiber, typically referred to as dark fiber, exist within the fiber conduit connecting local exchange carrier central offices.³⁹⁸ In part because of the lack of ubiquitous alternative middle mile transport, we determined that interoffice dark fiber transport qualified as an unbundled network element.³⁹⁹ This determination allows competitive carriers access to interoffice dark fiber.⁴⁰⁰

C. Last Mile Facilities

9. Last mile facilities provide the connection between middle mile facilities and the last 100 feet. While all components of the network play important roles in the delivery of advanced services, we focus particular attention on the deployment of last mile facilities because they are often the missing link in communities that do not have access to advanced telecommunications capability. The last mile connection to the end-user can take the form of cable modem service, digital subscriber line service (DSL) or some other LEC-provided service, terrestrial wireless service, or satellite service. Some operators of last mile facilities, like cable providers, transport data entirely over facilities that they own. Others, including many terrestrial wireless providers, lease transport to regional and/or national connection points from local exchange carriers. Last mile facilities called Very Small Aperture Terminals (VSATs) may also use satellite links to transport traffic to middle mile facilities or directly to the national backbone networks.⁴⁰¹ In the sections that follow, we examine each of the four major technologies used to provide last mile facilities: cable modem service, DSL and other LEC-provided services, terrestrial wireless, and satellite service. We discuss the types of entities that provide these last mile facilities, including the technology used to deliver advanced services and the significant technological barriers to deployment of each technology.

1. Overview of Cable Modem Architecture

10. Over the last several years, cable operators have begun to offer digital video, interactive television services, high-speed cable modem services, and, in some cases, facilities-

³⁹⁷ *First Report*, 14 FCC Rcd at 2417 (“High-capacity fiber goes into almost every telephone central office in this country, and new Dense Wave Division Multiplexing technology will increase its capacity hugely.”); *Second Report* 15 FCC Rcd at 20926.

³⁹⁸ The local exchange carriers that serve about 90 percent of local customers had, at the end of 2000, a total of 12.4 million fiber miles of dark fiber. The vast majority of this was between central offices. See *Statistics of Communications Common Carriers, 2000/2001 Edition* (visited Feb. 5, 2002) <http://www.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/SOCC/00socc.pdf>.

³⁹⁹ *Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, Third Report & Order & Fourth Further Notice of Proposed Rulemaking, 15 FCC Rcd 3696, 3853 (1999) (*Dark Fiber Order*) (“a competitive wholesale market for alternative network elements has not developed for dedicated transport, in part because of the lack of ubiquitous transport alternatives.”).

⁴⁰⁰ *Dark Fiber Order*, 15 FCC Rcd at 3772, 3376, 3785-86 (“interoffice transport”), 3843-45 (“we modify the definition of dedicated interoffice transport to include dark fiber”), 3852-55.

⁴⁰¹ Very small aperture terminals or “VSATs” are small earth stations or antennas usually designed to operate in the Ku satellite band that are installed at a user location to allow two way communications via satellite. In addition to providing point to multipoint data network services to merchants to transmit credit card, inventory management and other business related data, VSATs are used for distance training and high speed intranet and Internet access.

based telephone services.⁴⁰² As we reported last year, cable modem technologies rely on the same basic network architecture used for many years to provide multichannel video service, but with upgrades and enhancements to support a variety of advanced services.⁴⁰³ As of June 2001, many major cable multiple system operators (MSOs) had nearly completed these upgrades on their systems, with approximately 70 percent of cable systems nationwide at capacities of 750 MHz or higher.⁴⁰⁴ In the last Report, we noted that many cable systems were providing asymmetric high-speed cable modem services (broadband downstream with telephone return path connections).⁴⁰⁵ This year, substantial progress in network upgrades has allowed cable operators to provide two-way service to the vast majority of cable modem ready homes.⁴⁰⁶

11. Cable systems were originally built to provide video programming in one direction, from the network to the subscriber.⁴⁰⁷ These systems were designed to send the same content, a package of video channels, in an analog signal format to all subscribers uniformly.⁴⁰⁸ Before offering high-speed Internet and other two-way high-speed services, most cable providers upgrade their networks. This process often includes extending optical fiber closer to the end-user and improving system quality to reduce signal leakage.⁴⁰⁹ Through this upgrade process,

⁴⁰² Over the past year, the cable operators have proven that they can successfully deploy such multiple services. See *Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming*, CS Docket No. 01-129, Eighth Annual Report, FCC 01-389 (2001 MVPD Competition Report).

⁴⁰³ See *Second Report*, 15 FCC Rcd at 20928-20930. As noted in the *First Report*, our inclusion of cable modem technology in our assessment of advanced telecommunications capability does not implicate any determination by this Commission as to the appropriate regulatory classification of cable modem services under the Communications Act. See *First Report*, 14 FCC Rcd at 2407. The Commission is currently considering the appropriate classification of cable modem service and the applicable regulatory framework in its *Inquiry Concerning High-Speed Access to the Internet Over Cable and Other Facilities (High-Speed Access Inquiry)*, GN Docket No. 00-185, Notice of Inquiry, 15 FCC Rcd 19287 (2000).

⁴⁰⁴ See NCTA Comments in the *2001 MVPD Competition Report* at 32-33. Comcast expects that by year-end 2001, 85 percent of its customers will be served by systems with bandwidth of 750 MHz or higher. Comcast Comments in the *2001 MVPD Competition Report* at 13. Cox expects that by year-end 2001, 80 percent of its' cable plant in 15 of its' largest markets will be at a bandwidth of 750 MHz, and expects that by the end of 2002, 80 percent of its plant nationwide will be at a bandwidth of 750 MHz. Cox Comments in the *High-Speed Access Inquiry* at 2-3.

⁴⁰⁵ See *Second Report*, 15 FCC Rcd at 20929.

⁴⁰⁶ See NCTA Comments in the *2001 MVPD Competition Report* at 26; see also Comcast Comments in the *2001 MVPD Competition Report* at 7; CableLabs, *DOCSIS Primer* (visited Feb. 5, 2002) <<http://www.cablemodem.com/docsisprimer.html>>.

⁴⁰⁷ Many cable systems had some "upstream" capability, i.e. ability for the subscriber to transmit information back to the cable operator through the cable system, even before systems were upgraded to provide cable modem service, but this tended to be for simple, user-to-system messages, such as ordering pay-per- view programs. CableLabs, *DOCSIS Primer* (visited Feb. 5, 2002) <<http://www.cablemodem.com/docsisprimer.html>>.

⁴⁰⁸ Newer cable systems, such as those constructed by overbuilders, generally are designed to provide an array of services, including advanced services such as cable modem service. These systems typically are constructed to modern specifications and can provide advanced services without additional upgrades. See Letter from Charles A. Rohe and D. Anthony Mastando, Counsel, Carolina BroadBand, Inc. to Magalie Roman Salas, Secretary, Federal Communications Commission, WT Docket No. 99-217, CC Docket Nos. 96-98, 88-57, CS Docket No. 95-184, MM Docket No. 92-260 (filed May 3, 2001).

⁴⁰⁹ Signal leakage can result in either lost data or the transmission of unusable data. Digital signals are composed of discrete packets of information and carry error-correcting codes that can regenerate any lost data. If these error-correcting codes are lost due to system leaks, the packets may not be transmitted accurately or may be re-assembled incorrectly at the receiving end. Also, repairing or replacing cable plant to prevent signal leakage has the added

(continued....)

cable operators typically increase the system's transmission capacity to 550 MHz or 750 MHz, which allows the operator greater flexibility in allocating bandwidth for two-way high-speed services without reducing the capacity available for existing video services.

12. Upgrading a system for high-speed Internet service typically requires installation of equipment that enables the transmission of digital data packets: routers, switches, and a cable modem termination system (CMTS) to allow the high-speed transmission of data over the cable infrastructure in both the upstream and downstream directions. Without such equipment, providers typically can provide high-speed service only in the downstream direction and must rely on a telephone line return path.

13. Cable operators have invested in major improvements or system upgrades to provide cable modem service. The typical upgrade employs a hybrid fiber-coaxial (HFC) architecture. Most HFC systems utilize fiber between the cable operators' offices (the headend) and the neighborhood "nodes."⁴¹⁰ Between the nodes and the individual end-user homes, signals travel over traditional coaxial cable infrastructure. Part of the cable system, typically a 6 MHz channel, is dedicated to cable modem service.⁴¹¹ At each subscriber's home or office, a splitter and a high-speed cable modem are installed. The splitter separates signals and sends them to different cables going to the subscriber's television and computer. The cable that goes to the computer connects with a high-speed cable modem and an Ethernet card that are attached to the computer. This modem and card enable the cable system to communicate with the subscriber's computer, and vice versa.⁴¹²

14. The HFC architecture generally increases the reliability and the overall bandwidth available for cable modem service, video programming, and other services. Once a portion of the cable plant is upgraded to an HFC network, new services are available to all homes passed by the upgraded infrastructure. This contrasts with DSL technologies, where variations in legacy outside plant conditions can limit access to certain end-users even in upgraded areas, and with wireless technologies where line-of-sight requirements may be a factor.

15. As noted above, cable modem service requires special equipment at the headend and in other parts of the cable system. The CMTS, usually located primarily at the cable headend, manages the flow of data between cable subscribers and the Internet and other equipment. The

(...continued from previous page)

benefit of reducing signal ingress into the cable system which translates to less error correction required in the system.

⁴¹⁰ A "headend" is "the origination point for signals in the cable system. Each local service area is typically served by one or more headends. The headend has parabolic or other appropriately shaped antennas for receiving satellite-delivered program signals, high-gain directional antennas for receiving distant TV broadcast signals, directional antennas for receiving local signals, machines for playback of taped programming and commercial insertion, and studios for local origination and community access programming." Walter Ciciora et al., *Modern Cable Television Technology* 12 (1999). The headend may also house equipment to connect the cable system to the Internet. *Id.*

⁴¹¹ See Kinetic Strategies, Inc., *Overview of Cable Modem Technology and Services* (visited Feb. 5, 2002) <<http://www.cabledatocomnews.com/cmic/cmic1.html>>; Dan Costa, *Cable: This Technology is the Simplest and Most Popular Option*, ZDNet, Dec. 14, 2001 (visited Feb. 5, 2002) <<http://msn.zdnet.com/msn/zdnet/story/0,12461,2671130-hud00025inmn1,00.html>>.

⁴¹² See Transport Diagram (visited Feb. 5, 2002) <<http://www.cabledatocomnews.com/cmic/home.html>>.

CMTS enables the enhanced two-way capabilities essential for cable modem service.⁴¹³ File servers for data storage within the cable system and other types of Internet-related servers, switches, and high-speed routers that manage data flow on the Internet are often located at regional data centers.⁴¹⁴

16. The current cable modem specification is DOCSIS 1.0, which accounts for practically all cable modem services, with the exception of cable operator-specific, proprietary modem services.⁴¹⁵ The near term upgrade is DOCSIS 1.1, which is DOCSIS 1.0 compatible. There are presently nine different DOCSIS 1.1 cable modem models that are certified by CableLabs.⁴¹⁶ This new specification will require additional investments by cable operators for headend equipment and software enhancements. DOCSIS 1.1 delivers some Quality of Service (QoS) capabilities to support bandwidth management, tiered service offerings (i.e. different transmission speeds), multimedia, and telephony; enhanced security; increased upstream performance; and additional features that make data-over-cable platforms easier to manage.⁴¹⁷

17. Recently, CableLabs announced the next version of the specification, to be called DOCSIS 2.0, which will provide further enhancements for cable modem services and significantly increase cable bandwidth for data transmissions without requiring any physical rebuilding of cable networks.⁴¹⁸ For example, DOCSIS 2.0 will enable greater transmission capacity, increased transmission reliability, reduced noise impairments, and compatibility with DOCSIS 1.0 and 1.1 specifications to allow simultaneous operation within the same cable network.⁴¹⁹ When completed, the DOCSIS 2.0 specifications will allow cable operators to provide improved IP telephony and videoconferencing offerings for homes and businesses. DOCSIS 2.0 is likely to become the future standard, with full specifications to be announced soon by CableLabs. PacketCable, another CableLabs project, is intended to develop interoperable interface specifications for delivering advanced, real-time multimedia services over two-way cable plant. PacketCable will use IP technology to enable a wide range of services,

⁴¹³ See, e.g., Letter from Betsy J. Brady, Esq., Vice President, Federal Government Affairs, to Magalie Roman Salas, Secretary, Federal Communications Commission, GEN Docket No. 00-185 (filed December 18, 2001) (See AT&T Dec. 18, 2001 *Ex Parte*).

⁴¹⁴ "Regional Data Centers," sometimes referred to in whole or in part as "master headends," are facilities that process, store, and manage data transmitted through cable modem service. Regional data centers are located upstream of headends, in general, and may serve many headends. See, e.g., AT&T Dec. 18, 2001 *Ex Parte*.

⁴¹⁵ See generally Kinetic Strategies, Inc., *DOCSIS Cable Modem Vendors*, Cable Datacom News (last updated Jan. 25, 2002) (visited Feb. 5, 2002) <<http://www.cabledatocomnews.com/cmic/doocsicm.html>>.

⁴¹⁶ See CableLabs, *CableLabs Certifies Seven More DOCSIS 1.1 Modems, Continuing Cable Data Advances*, Press Release, Dec. 20, 2001 (visited Feb. 5, 2002) <http://www.cablelabs.com/news_room/PR/01_pr_cw20_122001.html>.

⁴¹⁷ See generally CableLabs, *DOCSIS Project Primer* (visited Feb. 5, 2002) <<http://www.cablemodem.com/docsisprimer.html>>; CableLabs, *Project CableModem FAQs* (visited Feb. 5, 2002) <<http://www.cablemodem.com/FAQs.html#FAQ17>>.

⁴¹⁸ CableLabs, *CableLabs Certifies Two DOCSIS 1.1 Modems and Qualifies Two CMTS, Achieving Breakthrough on Advanced Devices*, Press Release, Sep. 27, 2001.

⁴¹⁹ See CableLabs, *CableLabs Creating Advanced Modem Spec to Enable 30 Mbps in Upstream*, Press Release, Aug. 31, 2001 (visited Feb. 5, 2002) <www.cablelabs.com/news_room/PR/01_pr_adv_phy_083101.html>.

including IP telephony, multimedia conferencing, interactive gaming and general multimedia applications.⁴²⁰

18. Cable networks transport data signals over infrastructure that serves numerous users simultaneously, i.e., a “shared network”, rather than providing a dedicated link or “local loop” between the provider and each home, as does DSL technology. As discussed below, the shared architecture of cable networks poses certain challenges for providers that seek to offer high-speed Internet access or other advanced services over cable infrastructure.

19. In addition to the network improvements just described, a cable operator must establish a connection to the Internet in order to provide cable modem service. Depending on network topologies and business arrangements between the cable operator and other entities, Internet connectivity to the cable plant can be accomplished by various methods, as discussed below in relation to business models. In one scenario, the cable operator provides the Internet connectivity, either by itself or in conjunction with a single affiliated or unaffiliated ISP. In a second scenario, the cable operator may offer more than one brand of cable modem service, in effect giving subscribers a choice of various ISPs. In this model, an unaffiliated ISP delivers its content and services over the cable system to subscribers through one of two different methods: 1) via the cable operator's (or affiliated ISP's) own Internet transport arrangements; or 2) via a direct interconnection agreement between the cable operator (or affiliated ISP) and the unaffiliated ISP.⁴²¹

20. Currently, many cable systems providing high-speed data services offer asymmetric service, as the great majority of available bandwidth is allocated for downstream transmissions. The limited remaining bandwidth available for the return path results in lower upstream speeds. Most systems' upstream capacity appears to be sufficient to support current consumer demand for established services such as web surfing. In some instances, however, this asymmetric service may not offer sufficient upstream speed to qualify under our definition of advanced telecommunications capability. As consumers use applications with higher upstream requirements such as video conferencing, cable operators may need to allocate greater network capacity for upstream transmission. Technological advances under development, such as DOCSIS 1.1 and 2.0 and PacketCable, should address many of these constraints.

21. Under optimal conditions, an upgraded cable system can provide maximum downstream speeds of 27 Mbps and maximum upstream speeds of 10 Mbps, more than sufficient to qualify as advanced telecommunications capability.⁴²² In practice, however, cable transmission speeds typically range from 500 kbps to 1.5 Mbps. The lower speed is attributable to several factors. First, because of the shared architecture of cable networks, the bandwidth --

⁴²⁰ See CableLabs (visited Feb. 5, 2002) <<http://www.packetcable.com>>. See also 2001 Video Competition Report at para. 195.

⁴²¹ See generally Letter from Betsy J. Brady, Esq., Vice President, Federal Government Affairs, to Magalie Roman Salas, Secretary, Federal Communications Commission, GEN Docket No. 00-185 (filed Dec. 15, 2000) (AT&T Dec. 15, 2000 *Ex Parte*).

⁴²² See Kinetic Strategies, Inc., Overview of Cable Modem Technology and Services (visited Feb. 5, 2002) <<http://www.cabledatocomnews.com/cmic/cmic1.html>>; *Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming*, CS Docket No. 99-230, Sixth Annual Report, 15 FCC Rcd 978, 1004, para. 56 (2000) (1999 Video Competition Report). In most cases, however, cable operators offer a maximum theoretical downstream capacity of 10 Mbps.

and consequently the speed -- available to any single user drops as the number of simultaneously active users increases.⁴²³ Second, a system's transmission speed may be affected by the proportion of capacity devoted to advanced services. Third, congestion on the Internet itself often limits the speed of access to well below 10 to 27 Mbps. Given these current limitations on system throughput, cable operators have typically offered a "maximum speed available" rather than a guaranteed stable speed of service.

22. Subscribers to cable modem service typically receive the same functions they could obtain through narrowband Internet service, including personal web pages, e-mail accounts, access to news groups, and unrestricted ability to retrieve information from the World Wide Web, though cable modems allow users to access the Internet at speeds that range from fifty to several hundred times faster than telephone dial-up.⁴²⁴ Subscribers can send and view content with little or no transmission delay, utilize sophisticated "real-time applications," and view streamed video content at a higher resolution and on a larger portion of their screens than is available via narrowband.

23. As we noted in our last *Report*, high-speed cable modem service is primarily available to the residential market, rather than the business market.⁴²⁵ Cable networks were originally deployed to provide video programming and other programming services to residences throughout the United States. While some residences are located in areas where there are large and small businesses alike, most businesses were originally, and still are, not wired for cable service. This leaves cable operators less capable of providing cable modem services to many business districts without additional system build-outs. In addition, cable's shared network characteristics make it difficult for providers using currently deployed cable modem technology to guarantee the consistently high speeds and other advanced features that some business customers require. Moreover, the relatively narrow bandwidth typically allocated to upstream transmission renders cable unable, again using currently deployed cable modem technology, to provide upstream speeds and symmetric transmission capabilities sufficient to support the requirements of some business customers. These technical constraints may be alleviated or eliminated as DOCSIS 1.1 and 2.0 cable modems are deployed, and advances made through the PacketCable process are placed in commercial use.

2. DSL and other LEC-Provided Services

24. Since 1996, local telephone carriers have offered consumers high-speed data service through their digital subscriber line (DSL) service offerings. With the addition of certain electronics to the telephone line, carriers can transform the copper loop that already provides voice service into a conduit for high-speed data traffic. While there are multiple variations of DSL, some of which we discuss below, most DSL offerings share certain characteristics. With most DSL technologies today, a high-speed signal is sent from the end-user's terminal through the last 100 feet and the last mile (sometimes a few miles) consisting of the copper loop until it reaches a Digital Subscriber Line Access Multiplexer (DSLAM), usually located in the carrier's

⁴²³ See 1999 *Video Competition Report*, 15 FCC Rcd at 1004, para. 56.

⁴²⁴ See Comcast Reply in the 2001 *MVPD Competition Report* at 7; see also Cox Comments in the *High-Speed Access Inquiry* at 10; Cablevision Systems Corp., *Optimum Online* (visited Feb. 5, 2002) <<http://www.optimumonline.com>>.

⁴²⁵ See *Second Report*, 15 FCC Rcd at 20930.

central office. At the DSLAM, the end-user's signal is combined with the signals of many other customers and forwarded through a switch to middle mile facilities.

25. The most common form of DSL used by residential customers is asymmetric DSL, or ADSL.⁴²⁶ As its name suggests, ADSL provides speeds in one direction (usually downstream) that are greater than the speeds in the other direction.⁴²⁷ ADSL permits the customer to have both conventional voice and high-speed data carried on the same line simultaneously because it segregates the high frequency data traffic from the voice traffic. This segregation allows customers to have an "always on" connection for the data traffic and an open path for telephone calls over a single line. Thus a single line can be used for both a telephone conversation and for Internet access at the same time. A survey of various web sites indicates that prices for low-end ADSL service typically range from \$45 to \$59 per month.⁴²⁸ Faster ADSL services ranged from \$49 to \$99 per month.⁴²⁹ Installation fees ranged from free, typically where customers are offered "DSL in a box,"⁴³⁰ to \$250, where a technician visit is necessary to install premises equipment.

26. In contrast to ADSL, symmetric DSL (SDSL) provides users with equal speeds in the downstream and upstream path, usually in excess of 200 kbps. Because of the symmetrical nature of SDSL, it is well-suited to applications that require high-speed capacity in the upstream path, such as videoconferencing. Because of its higher capacity needs, SDSL service typically requires a dedicated copper pair for its high-speed data transmissions. The price of SDSL service currently ranges from \$79 to \$149 per month, with installation costs ranging from free to \$875, depending on the transmission speed desired.⁴³¹

27. DSL service is subject to certain limitations that currently prevent it from being deployed as a last mile facility to all potential end-users. First, it is distance sensitive. Currently, an ADSL customer must be within approximately 15,000 feet of the Digital Subscriber Line Access Multiplexer (DSLAM), usually located in the carrier's central office; SDSL customers must be between 10,000 and 12,000 feet of the central office depending on the speed of the service in question.⁴³² Eighty percent of the subscriber loop plant falls within these distance limitations, and thus is capable of supporting DSL service, but this factor remains an impediment to DSL deployment in more sparsely populated and remote locations. New technologies may allow DSL deployment at substantially greater distances.⁴³³ For example, GoDigital Networks recently introduced the Xcel-4A ADSL extender, which may provide ADSL up to 25 miles from

⁴²⁶ In using the acronym "ADSL," we are referring generally to DSL service that is asymmetric, not the specific protocol ADSL.

⁴²⁷ We note that some residential ADSL offerings provide speeds in excess of 200 kbps in only the downstream path with a slower upstream path and thus do not meet the standard for advanced telecommunications capability.

⁴²⁸ Based on a survey by Commission staff of ADSL service offerings posted on the Internet.

⁴²⁹ *Id.*

⁴³⁰ "DSL in a box" is a form of ADSL in which the provider sends the customer filters and a modem that the customer installs. By having the customer install these filters, the provider avoids sending a technician to the customer's premises, thus reducing the time and cost associated with establishing ADSL service.

⁴³¹ Based on a survey by Commission staff of SDSL service offering posted on the Internet.

⁴³² As distance from the telephone company's central office decreases, the potential data rate increases.

⁴³³ See Donny Jackson, *Shifting Gears*, Telephony, Jul. 2, 2001 at 60.

the DSLAM.⁴³⁴ As a result, extender technologies may permit rural carriers to provide DSL services to additional customers that are not within the current reach of the central office.

28. The second factor limiting the deployment of DSL to some potential customers is the presence on their loops of load coils and bridged taps, devices that were used to enhance the quality of voice traffic over the copper. While they improve the quality of voice transmission, these devices prevent the deployment of DSL service over a line on which they are installed. Thus, in contrast to an upgraded cable network, which can offer upgraded service to all homes it passes, LECs must "condition" each end-user's line by removing the load coils and bridged taps while increasing the strength of the signal to maintain the quality of the line's voice traffic. Moreover, older loops or loops in need of maintenance, which may occur in poor or inner-city areas, pose additional problems for the deployment of DSL service. Frayed insulation or poorly spliced loops can cause signal leakage, which can result in poor quality transmission.

29. A third factor that impedes DSL deployment is the choice by some incumbent local exchange carriers to abandon copper wire and instead deploy Digital Loop Carrier (DLC) in their networks. DSL service is incompatible with most currently deployed DLC systems. However, it appears that new DLC products will allow DSL providers to circumvent this limitation. For example, an ADSL Digital Line Unit Card (ADLU Card) integrates ADSL and Asynchronous Transfer Mode (ATM) capabilities into the DLC system and can be plugged into a DLC system to provide advanced services.⁴³⁵ The ADLU card provides functionality similar to a DSLAM, although it also contains voice capabilities and a spectrum splitter functionality.

3. Overview of Other LEC-Provided Wireline Services

30. In addition to DSL offerings, many local exchange carriers offer more traditional high-speed, circuit switched services like T1 lines, which have been available for some time. The monthly charge for T1 service can range from \$450 to \$2000, with installation cost ranging from \$750 to \$5500, depending on the transmission speed desired and equipment purchased.⁴³⁶ Additionally, local exchange carriers have used fiber technology for many years for their interoffice plant. It is also used to deliver signals at speeds in excess of 45 Mbps directly to certain large business customers. Most residential and smaller business customers currently do not need the transmission speed of fiber, and the cost of fiber service generally makes it prohibitive for all but the largest users. Several fiber-based residential architectures have been devised;⁴³⁷ however, at this time, the high cost associated with deploying this technology makes it economically viable only in new or densely populated residential settings.⁴³⁸ In addition, some T1 lines are currently being replaced by HDSL and HDSL2 services.⁴³⁹

⁴³⁴ We note that this may require a dedicated line.

⁴³⁵ See *For Consent to Transfer Control of Corporations Holding Commission Licenses and Lines Pursuant to Sections 214 and 310(d) of the Communications Act and Parts, 5, 22, 24, 25, 63, 90, 95, and 101 of the Commission's Rules*, CC Docket No. 98-141, Second Memorandum Opinion and Order, 15 FCC Rcd 17521 (2000).

⁴³⁶ Based on a survey by Commission staff of T1 service offerings posted on the Internet.

⁴³⁷ See, e.g., Vince Vittore, *Fiber Hits Home*, Telephony, Mar. 12, 2001, at 66 (As part of a pilot program, Huxley Cooperative Telephone Cooperative installed fiber into six new homes in Huxley, Iowa).

⁴³⁸ See, e.g., Jeff Hecht, *Fiber Links Speed Data on Local Telephone Networks*, Laser Focus World, Aug. 1, 2001 ("Fiber to the home...also requires a costly rebuild of the entire local transmission network."); Evan Bass, *FTTH* (continued....)

4. Terrestrial Fixed Wireless

31. Wireless services and technologies have the potential to deliver high-speed services to residential, rural, and otherwise underserved areas and to increase competition in the last mile. As discussed below, terrestrial fixed wireless technologies may offer unique advantages and quick-to-market solutions for the delivery of high-speed services in a number of circumstances.⁴⁴⁰ At present, however, technical limitations have constrained the level and breadth of their overall deployment and their effectiveness in certain settings. Moreover, capital market conditions over the past year have slowed deployment. Many of the larger carriers have exited the market or significantly scaled back their operations. At this point, terrestrial fixed wireless services have been deployed to a lesser extent than the traditional “wired” services, cable-modem and DSL.

32. In a terrestrial fixed wireless system that provides high-speed services to consumers, a provider generally attaches to a customer’s premises a radio transmitter/receiver (transceiver) that communicates with the provider’s central antenna site. The central antenna site then acts as the gateway into the public switched telephone network or the Internet for these transceivers. The radio signals that travel over this network architecture serve as a substitute for the copper wire or cable strand that connects customers to the network in traditional, wired technologies.

33. Providers of terrestrial fixed wireless (wireless) services typically have the ability to deploy their networks much more quickly and with substantially less expense than is required to build a network capable of supporting either cable-modem or DSL service. First, wireless networks are free of the substantial costs associated with installing and maintaining wires that run to a customer’s premises making it potentially well suited as an economic alternative to wireline technologies.⁴⁴¹ Second, the relative ease of installation of this technology allows wireless providers to deploy their networks much more quickly than is possible for providers that

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Not Ready for Prime Time – Yet, Fiber Optics News, Oct. 15, 2001 (“...the technology and the products really have not existed to offer competitive services at a cost-effective price.”).

⁴³⁹ See, e.g., DSL Knowledge Center, HDSL2: Advanced HDSL for Flexible Deployment (visited Feb. 5, 2002) <http://www.orckit.com/hdsl2.html>; HDSL Basics (visited Feb. 5, 2002) <http://www.arcelect.com/High-bit-rate_Digital_Subscriber_Line-HDSL.htm> (“High-bit-rate Digital Subscriber Line (HDSL) technology is a transparent replacement for a T-1 repeatered line in the distribution plant.”); HDSL Basics (visited Feb. 5, 2002) <http://www.acterna.com/downloads/white_papers/hds1_tn.pdf> (Providing T1 service is a competitive race, and High-bit-rate Digital Subscriber Line (HDSL) is quickly emerging as the ideal solution to remain a step ahead. Currently touted as “repeaterless T1”, HDSL enables T1 service to travel up to 12,000 ft. on copper cable with-out regeneration.”).

⁴⁴⁰ While the future of wireless high-speed services likely will include mobile service, it does not appear from our recent data collection that any providers currently are offering mobile data service at a speed that comports with our definition of high-speed. No provider that met our 250 high-speed line (or wireless channel) threshold reported delivering high-speed service over mobile wireless technology. Nor do industry analysts report that any provider is offering such service. Accordingly, we discuss only terrestrial fixed wireless offerings in this report.

⁴⁴¹ These savings have the potential to make wireless technology especially well suited to deployment in many rural areas, where substantial distances between customers may be cost-prohibitive for wireline technologies. Wireless technologies may also serve as an economic alternative in urban areas where consumers are not otherwise served by certain forms of wireline technologies. For example, only a small percentage of multi-tenant office buildings are currently served by fiber networks. Thus, terrestrial fixed wireless services may make high-speed access more affordable for those small and medium-sized businesses for which direct fiber connections remain too expensive.

must actually install wires leading to each customer's premises. This permits wireless providers to respond rapidly and dynamically to developing demand for advanced telecommunications capability. Third, the architecture of a wireless network allows providers to roll out their facilities in an incremental manner more closely related to the product demand they encounter than cable or DSL.⁴⁴² This incremental build-out process has the potential to allow wireless providers to avoid much of the up-front investment that traditional wired advanced telecommunications capability providers must make.

34. Although wireless services can generally be deployed more rapidly and at lower cost than comparable wireline services, they remain subject to certain technical limitations that may reduce their effectiveness in certain areas and for certain purposes. For example, in addition to requiring access to telecommunications equipment closets and any necessary in-building wiring, wireless providers often must obtain access to rooftops for the placement of antennas. This can become particularly problematic in the case of multi-tenant buildings, in which a building owner may resist permitting access. Also, many, though not all, terrestrial fixed wireless technologies are subject to line-of-sight restrictions. Thus, there must be an unobstructed path from a wireless provider's antenna to the customer's antenna on the rooftop of a building. While certain advances in wireless technology may help to overcome this limitation in the future, buildings, topographical features, certain adverse weather conditions, and even vegetation can interfere with the provision of service.

35. While physical infrastructure costs of wireless networks may be significantly less than wireline networks, wireless networks require access to spectrum. Of the terrestrial fixed wireless operators providing high-speed services today, some use unlicensed spectrum, some obtained free spectrum licenses, and others obtained spectrum through auctions.⁴⁴³ New wireless and satellite services are increasingly constrained by spectrum scarcity and encumbrances,⁴⁴⁴ which may result in substantial additional acquisition costs in the future.

36. There are several different bands of spectrum over which wireless providers have offered their services. The characteristics of the services, their means of deployment, and their potential technical limitations all vary somewhat over the different spectrum bands. Accordingly, we briefly discuss each separately below.

37. The Upperbands (above 24 GHz). The technologies that have been deployed in the "upperband" spectrum generally have the ability to provide data rates of up to 155 Mbps, a speed

⁴⁴² A traditional wired provider often will install the network infrastructure in an entire area before it begins to market its service in that area. Thus, a cable provider will upgrade its cable plant throughout a neighborhood when it begins to offer advanced telecommunications service to the neighborhood's residents even if initial subscription rates are low. Similarly, a DSL provider likely will make certain network investments in an area where it intends to offer service before it signs up its first customer. By contrast, once a wireless provider has installed its antenna in an area, it completes the last-mile connection by installing an on-premises transceiver only for those customers who have actually subscribed to its service.

⁴⁴³ Spectrum licenses have garnered nearly \$34 billion in winning bids since the Commission received authority to auction spectrum, with spectrum capable of providing high-speed terrestrial services receiving bids over \$1.2 billion. FCC Wireless Telecommunications Bureau Auction Summary, Completed Auctions Summary Table (visited Feb. 5, 2002) <<http://wireless.fcc.gov/auctions/summary.html#completed>>.

⁴⁴⁴ See *Principles for Reallocation of Spectrum to Encourage the Development of Telecommunications Technologies for the New Millennium*, Policy Statement, 14 FCC Rcd 19868 (1999) (*Spectrum Reallocation Policy Statement*).

adequate to support a host of multimedia applications.⁴⁴⁵ As a general matter, wireless services in the upperbands may suffer signal loss in adverse weather conditions. However, by adjusting factors such as cell size and transmission power, these systems can be engineered to the standard reliability level for telecommunications networks. Fixed wireless technologies operating in these bands have relatively small cell sizes, with an average cell radius of between three and five miles. Also, since upperband signals behave more like visible light than cellular or PCS signals, wireless networks deployed in these spectrum bands require a clear line of sight between transmitters and receivers. Terrain, buildings, and even vegetation may interfere with the provision of service.

38. The Lowerbands (below 3 GHz). *MDS.* Multipoint Distribution Service (MDS) operators provide commercial terrestrial fixed wireless services in the 2 GHz range.⁴⁴⁶ The MDS spectrum was originally used for one-way video programming services, requiring a telephone return path for data services, until the Commission modified its technical rules to afford licensees flexibility in designing systems to offer two-way communication services, including high-speed Internet access.⁴⁴⁷ MDS spectrum is heavily licensed throughout the country, with several licensees already providing high-speed Internet services to customers; other MDS licensees are projecting two-way operations in the near term.⁴⁴⁸ In a rule making proceeding to examine and propose frequency bands to be used for advanced wireless services, including third generation wireless, the Commission recently removed the 2.5-2.7 GHz from consideration for relocation,⁴⁴⁹ and added a mobile allocation to provide additional flexibility for use of that spectrum.

⁴⁴⁵ The upperbands of spectrum that have been used for the commercial deployment of wireless high-speed systems generally consist of three different spectrum bands: 24 GHz (formerly known as Digital Electronic Messaging Service or DEMS), 28 GHz (Local Multipoint Distribution Services or LMDS), and 39 GHz bands.

⁴⁴⁶ This spectrum, made up of 33 different 6 MHz channels in the 2.1-2.2 GHz and 2.5-2.7 GHz spectrum bands, includes MDS, Multichannel MDS (MMDS) and Instructional Television Fixed Service (ITFS) channels. *See* 47 C.F.R. § 21.900 *et seq.*; 47 C.F.R. § 74.901 *et seq.* In a two-way communication system, an MDS operator generally uses the MMDS channels and leased excess capacity on the ITFS channels in the 2.5-2.7 GHz range for downstream communications and it uses the 2.1-2.2 GHz band for upstream communications to hub receiving facilities. The band is also used for educational, instructional and cultural video programming and other services.

⁴⁴⁷ *See Amendment of Parts 21 and 74 to Enable Multipoint Distribution Service and Instructional Television Fixed Service Licensees to Engage in Fixed Two-Way Transmissions*, Report and Order, 13 FCC Rcd 19112 (1998), recon., 14 FCC Rcd 12764 (1999), further recon., 15 FCC Rcd 14566 (2000). These modified rules afford licensees flexibility to superchannelize or subchannelize 6 MHz-wide channels to form wider or narrower bandwidth channels.

⁴⁴⁸ The Commission recently undertook a study of the 2500-2690 MHz band, issuing reports which provide detailed information regarding the roll-out of two-way services by MDS providers. FCC Staff Report issued by the Office of Engineering and Technology, Mass Media Bureau, Wireless Telecommunications Bureau, and International Bureau: "Spectrum Study of the 2500-2690 MHz Band: The Potential for Accommodating Third Generation Mobile Systems," *Interim Report*, ET Docket No. 00-232, DA 00-2583, rel. Nov. 15, 2000; *Final Report*, DA 01-786, rel. March 30, 2001. *See also Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services*, Sixth Report, 16 FCC Rcd 13350, App. A-20 (2001) (*Sixth Competition Report*), listing 29 MDS operators offering Internet access at speeds ranging from 256 kbps to 11 Mbps.

⁴⁴⁹ *Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems*, ET Docket No. 00-258, FCC 01-256 (rel. Sep. 24, 2001) (*New Advanced Wireless Services Report and Order*).

39. MDS transmissions have a substantially greater radius than upperband fixed wireless services, generally 25 to 35 miles versus three to five miles for upperband services. This is partly because MDS signals do not degrade in adverse weather conditions. MDS's larger radius makes the service well suited for not only urban and suburban residential customers, but also customers in rural, underserved, and unserved areas, where the larger cell-size substantially reduces the cost of providing service.⁴⁵⁰ MDS typically has functioned best with a direct line of sight between the transmitter and the receiver. However, recent technological developments may help to overcome this restriction.⁴⁵¹

40. *Wireless Communications Service (2.3 GHz).* WorldCom offers MDS-based fixed wireless broadband services to businesses in nine markets,⁴⁵² however, in four of those markets it is reportedly using a combination of MDS and WCS⁴⁵³ spectrum to offer these services.⁴⁵⁴ AT&T Wireless had also been using WCS licenses for its Digital Broadband (formerly called "Project Angel") terrestrial fixed wireless service.⁴⁵⁵ However, in October 2001, AT&T

⁴⁵⁰ Generally, customers of Sprint can subscribe to its high-speed MDS service for \$49.95 per month, or \$39.95 if bundled with a home long-distance plan. *Sprint to Expand Fixed Wireless Service Area in Houston*, Jun. 26, 2001, (visited Feb. 5, 2002) <http://www3.sprint.com/PR/CDA/PR_CDA_Press_Releases_Detail/1,1579,2909,00.html>. Sprint recently announced the suspension of its deployment of first generation two-way fixed wireless services, but stated it would continue to provide service to existing first generation customers and video service customers. *Sprint to Terminate ION Efforts; Announces Additional Actions to Improve Competitive Positioning and Reduce Operating Costs in FON Group*, Oct. 17, 2001 (visited Feb. 5, 2002) <http://www3.sprint.com/PR/CDA/PR_CDA_Press_Releases_Detail/1,1579,3921,00.html>.

⁴⁵¹ Several equipment manufacturers are continuing to advance wireless technology in this area. On September 26, 2001, the Mass Media Bureau granted a request filed by Cisco Systems, Inc. for a declaratory ruling on the use of Orthogonal Frequency Division Multiplexing (OFDM) Modulation, a technology which allows the capture of signals as they bounce off buildings and other objects and redirects the signals to end-user transceivers. NextNet Wireless, Inc. has developed an end-to-end MDS system with a desktop customer-premises unit that requires no rooftop antenna and no inside wiring connections. See NextNet Wireless, Inc., Products & Technology (visited Feb. 5, 2002) <<http://www.nextnetworks.com/products.html>>. IPWireless, Inc. has developed a technology that will allow its customers to utilize modems inside buildings under non-line-of-sight conditions. See *New Advanced Wireless Services Report and Order*, *supra* at ¶ 16. See also IPWireless, Inc., Technology (visited Feb. 5, 2002) <www.ipwireless.com/tech_over.html>. Sprint is continuing to test second generation fixed wireless technology which promises to reduce or eliminate line-of-sight restrictions, provide lower installation costs, and provide voice capability. See *As it Cuts back on fixed-wireless service, Sprint considers using spectrum for mobile offerings*, TR Daily, Oct. 8, 2001.

⁴⁵² Suzanne King, *WorldCom Brings to KC its Fixed Wireless Service*, The Kansas City Star, Nov. 13, 2001, at D15.

⁴⁵³ WCS service operates on the 2305-2320 MHz and 2345-2360 MHz bands.

⁴⁵⁴ See *Sixth Competition Report*, at A-12.

⁴⁵⁵ AT&T Wireless had also used its broadband PCS licensees to offer this service initially. However, prior to halting the service, AT&T Wireless had converted nearly all of its Digital Broadband customers to WCS spectrum in order to free up its broadband PCS spectrum for mobile service. *AT&T Wireless Exits Fixed Wireless, Takes \$1.3 Billion Charge*, Communications Daily, Oct. 24, 2001. AT&T Wireless reportedly offered Digital Broadband in five markets. *Blackwell Project Angel Article*; Marcia Martinek, *Angel in the Outfield*, Wireless Review, Sep. 30, 2000, available in 2000 WL 7119396; Elizabeth Douglas, *Putting Broadband on the Air Wireless Technology is Speeding the Spread of Residential Service*, Los Angeles, Oct. 19, 2000, available in 2000 WL 25909045. The service gave users up to four voice lines, unlimited local calling, long distance calling at five cents per minute for in-state calls and seven cents per minute for out-of-state calls, three advanced calling features, and unlimited, "always-on" Internet access for up to five computers with downstream speeds of up to 512 kbps and upstream speeds of 128 kbps. *Blackwell Project Angel Article*; AT&T, *Digital Broadband Services California* (visited Apr. 4, 2001) <http://www.iatt.com/local/ca/local/local_services.html>. Digital Broadband cost AT&T Wireless \$700-\$750 per customer to deploy, and about two-thirds of that expense is for end-user equipment. Jeff May, *Out of Thin Air –* (continued....)

Wireless announced it was exiting the terrestrial fixed wireless business and phasing out service to its 47,000 existing customers.⁴⁵⁶

41. *Unlicensed Spectrum.* The unlicensed spectrum that is currently used for commercial terrestrial fixed wireless services consists of 26 megahertz in the 900 MHz band, 83.5 megahertz in the 2.4 GHz band, and 300 megahertz in the 5 GHz band.⁴⁵⁷ Operators can use these bands without an FCC license for a variety of radio transmissions, but are not protected from interference and may not cause interference to licensed users in the spectrum. Unlicensed fixed applications primarily use spread spectrum technology for long range transmissions in order to minimize the risk of interference with other operators.

42. Most of the companies that use unlicensed spectrum to offer Internet access are local and regional ISPs that offer the service in a small number of markets each, and many of these companies offer traditional wireline dial-up Internet access as well. Estimates of the number of companies using unlicensed spectrum to provide Internet access vary. Based on obtainable, publicly-available information, the Commission estimates there are at least 241 different companies using unlicensed spectrum to provide high-speed terrestrial fixed wireless Internet access in approximately 503 different counties.⁴⁵⁸

43. Most unlicensed operators offer Internet access speeds ranging from 384 kbps to 15 Mbps, with some advertising speeds as high as 100 Mbps. Many of the carriers are targeting business customers, while others serve both businesses and residences. Furthermore, many operators offer unlicensed Internet access in rural and underserved areas.⁴⁵⁹

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AT&T's Home-Grown 'Fixed Wireless' Technology Has Yet to Bear Fruit, The Star Ledger, Sep. 10, 2000, available in 2000 WL 26254641.

⁴⁵⁶ *AT&T Wireless Exits Fixed Wireless, Takes \$1.3 Billion Charge*, Communications Daily, Oct. 24, 2001. AT&T has stated that it will retain the WCS licenses, and that it may re-purpose tower capacity originally designated to support fixed wireless services to expansion of the company's mobile capacity. *Id.* (citing CFO Joseph McCabe.)

⁴⁵⁷ See generally 47 C.F.R. Part 15.

⁴⁵⁸ Approximately 143 million people (or 50 percent of the U.S. population) live in counties with at least unlicensed fixed wireless Internet provider. This analysis is based on publicly-available information, such as news articles and operators' press releases, SEC filings, and web sites. Several caveats apply to this data. First, in order to be considered as "covering" a county, an operator need only be offering service in a portion of that county. Second, because some carriers serve small and remote locations and because unlicensed operators provide service without a license from the Commission, it is difficult to assess precisely who is operating where. Therefore, the analysis may not include certain companies that do not make the information on their fixed wireless offerings easily obtainable or publicly available. See *Sixth Competition Report* at A-12.

⁴⁵⁹ For example, Canyon Country Communications offers Internet access in Page, Arizona; Planet Connect offers fixed wireless service in Bristol, Seymour, Newport, and Greeneville, Tennessee; and DATACentric sells the service in Lufkin, Conroe, and Bryan-College Station, Texas. Canyon Country Communications, *Page Arizona's...First High-Speed Internet Access* (visited Feb. 5, 2002) <<http://www.canyoncountry.net/>>; Planet Connect, *Planet Connect Internet* (visited Feb. 5, 2002) <<http://www.planetc.com/Wireless/Locations/Locations.html>>; DATACentric Broadband to Provide Wireless Broadband Connectivity to the City of Lufkin, News Release, DATACentric, Oct. 17, 2001.

44. Unlicensed spectrum is also used for short-range data transmissions and wireless LAN/WAN connections.⁴⁶⁰ Bluetooth and 802.11b are two short-range data transmission technology standards that operate using unlicensed spectrum. Bluetooth is currently being integrated into numerous electronic devices, such as mobile phones, handheld devices, and personal computers, in order to allow users to transfer data among the devices without using wires or cables. 802.11b is being used to connect multiple computers to servers in wireless LANs.⁴⁶¹

5. Satellite Service

45. Satellite service provides another option for last mile facilities with its own set of unique characteristics. Two companies, StarBand and Hughes Network Systems, which provides a high-speed service with the brand name DIRECWAY, now provides residential satellite-based last mile facilities in the United States. Both can provide a service in which both the downstream and upstream signal is provided by satellite. DIRECWAY also offers a service in which the downstream path is provided by satellite and the upstream path is provided by a standard dial-up telephone connection. Even when both downstream and upstream signals are provided by satellite, the downstream signals for current residential satellite offerings are capable of providing speeds in excess of 200 kbps, but the upstream signals are generally much slower and therefore do not meet the definition of advanced telecommunications capability.⁴⁶² Nonetheless, satellite-based last mile facilities can provide consumers and small businesses in geographically remote and sparsely populated areas with access to high-speed services that would not otherwise be available.

46. High-speed satellite service is currently provided to both residential and business customers. Much of the current business use is for high-speed service and data communications such as credit card verification or inventory control. Most of this traffic is handled under private contractual arrangements similar to private line service. A growing number of business customers are also using satellite service for Internet connections.⁴⁶³

⁴⁶⁰ For example, MobileStar Networking Corp. (MobileStar) uses unlicensed spectrum to provide WLAN service in over 370 locations across the United States, including airports, hotels, restaurants, and multi-tenant office buildings. MobileStar, *Locations* (visited Feb. 5, 2002) <<http://www.mobilestar.net/locations/page5.asp>>. Mobile professionals who subscribe to MobileStar's service can bring their handheld devices and laptop computers to these locations and obtain high-speed Internet access without attaching a cord or cable. The buildings may then connect to the Internet using wireline technology.

⁴⁶¹ See *Sixth Competition Report* at 77.

⁴⁶² In many large business satellite-based offerings, the end-user's terminal (i.e., satellite dish) is capable of both receiving and sending data. This allows for downstream and upstream speeds that exceed 200 kbps.

⁴⁶³ For example, Hughes Network Systems announced that it had entered into an agreement to provide DIRECWAY broadband services to 1,200 Wendy's restaurants. Its press release also states that "Hughes Network Systems, a unit of Hughes Electronics Corporation, is the world's largest provider of broadband satellite network solutions for businesses and consumers, with approximately 500,000 systems installed in more than 85 countries." See *Wendy's International Signs With Hughes Network Systems for Nationwide Broadband Connectivity Via DIRECWAY*, Press Release, Dec. 17, 2001, (visited Feb. 5, 2002) <<http://www.hns.com/corporate/news/pr/pr9999487460000.htm>>. Hughes Network Systems also announced that it had entered into agreement with AgriStar to provide two-way high-speed satellite communications services for the agricultural industry. See *Hughes and AgriStar Join Forces to Provide High-Speed Connectivity for Agriculture Industry*, Press Release, Dec. 18, 2001 (visited Feb. 5, 2002) <<http://www.hns.com/corporate/news/pr/pr9999487460001.htm>>.

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47. Hughes' originally developed a service called DirecPC, which provided high-speed service in the downstream direction but the upstream transmissions used a conventional telephone dial-up connection.⁴⁶⁴ Hughes now provides a broadband service named DIRECWAY. DIRECWAY offers two types of options: satellite downstream provision of data and the return upstream path by telephone line, or a two way system in which both the downstream and upstream data are carried over satellite.⁴⁶⁵ DIRECWAY two-way satellite systems are offered through Earthlink, Pegasus, and local rural electric or telephone cooperatives and independent telephone companies. The "one-way" satellite service with the telephone line return path is offered through AOL and a variety of other companies such as American Satellite, InfoDish, Value Electronics and Best Buy.⁴⁶⁶

48. StarBand Communications Inc., which began operation in April 2000, has strategic partnerships with Gilat Satellite Networks, Microsoft Corporation and EchoStar Communications.⁴⁶⁷ StarBand provides a two-way always on high-speed satellite Internet connection. According to StarBand, downlink speeds may be up to 500 Kbps per second with a targeted minimum speed in excess of 150 kbps.⁴⁶⁸ Currently, StarBand's web site does not specify upload speeds, but previously it indicated that upload speeds range from 40 to 60 Kbps.⁴⁶⁹ Service is available virtually everywhere in the continental United States, as well as Alaska and Hawaii, as long as the satellite antenna or dish has a clear unobstructed view of the southern sky.⁴⁷⁰ StarBand is testing plans and options for expanding its service to the U.S. Virgin islands, Puerto Rico, and Canada.⁴⁷¹ StarBand is offered through an authorized distribution partner and professional installation by a certified StarBand installer is required. The suggested retail price for the equipment package is \$499 plus a suggested basic standard installation charge starting at \$199. Monthly unlimited service fees start at a suggested price of \$69.99 per month.⁴⁷²

49. Satellite-based last mile facilities have some limitations. Consumers must have a clear line of sight to the south in order to access satellite-based services. Areas subject to extreme rain or snow may have difficulty receiving satellite signals in those conditions.

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⁴⁶⁴ DirecPC service is apparently still available. Prices range from \$19.99/month without using their ISP and 25 hours per month of usage (with extra hours costing \$0.99/hour) to \$49.99/month for unlimited service and using their ISP. See the DirecPC System for your home (visited Feb. 5, 2002) <<http://www.direcpc.com/athome/serviceplanstxt.html>>.

⁴⁶⁵ See DIRECWAY, Frequently Asked Questions (visited Feb. 5, 2002) <http://www.hns.com/direcway/for_home/learn_more/faq.htm>.

⁴⁶⁶ See DIRECWAY, Getting DIRECWAY (visited Feb. 5, 2002) <http://www.hns.com/direcway/for_home/how_to_get_it/getting_direcway.htm>.

⁴⁶⁷ See Q&A StarBand Facts (visited Feb. 5, 2002) <<http://www.starband.com/faq/starbandfacts.htm>>.

⁴⁶⁸ See What is StarBand? (visited Feb. 5, 2002) <<http://www.starband.com/whatis/index.htm>>.

⁴⁶⁹ *Id.*

⁴⁷⁰ See Q&A StarBand Facts (visited Feb. 5, 2002) <<http://www.starband.com/faq/starbandfacts.htm>>.

⁴⁷¹ *Id.*

⁴⁷² *Id.*

D. Last 100 Feet Facilities

50. The last 100 feet typically refers to the final infrastructure segment from the demarcation point to the end-user's terminal. This includes in-building wiring, local area networks and wireless local area networks and there appears to be a variety of wireline and wireless options for constructing these facilities. The cost of some of these facilities, however, may be a significant factor in the deployment of advanced telecommunication capability, especially in the small business or school and library context. Unlike a residential setting with a handful of users, small businesses or schools and libraries may have multiple users accessing advanced services simultaneously. This need for simultaneous access may require upgrades to the existing in-building wiring and other last 100 feet facilities, which may have been originally installed only with enough capacity for standard voice telephony services. In addition, access to last 100 feet facilities may be controlled by someone other than the end-user, such as the landlord of a multiple tenant dwelling.⁴⁷³ This also may create access barriers for these facilities, especially for competitors of the incumbent service provider.

E. Connection Points

51. In the preceding discussion, we have examined the various components of the network. In order for advanced services to be delivered to end-users, however, these components must interconnect with each other at the places we loosely describe as connection points -- those places at which traffic passes between the various components of networks. High-speed networks exchange traffic at a variety of different places and in a variety of different mechanisms. For example, public telephone networks, including local, long distance and international networks, interconnect at Points of Presence (POPs) or through other interconnection arrangements. Satellite networks exchange traffic with terrestrial networks. National Internet service providers exchange traffic at network access points (NAPs), Metropolitan Area Exchanges (MAEs),⁴⁷⁴ and through other public and private peering and

⁴⁷³ The Commission is currently considering whether additional measures are necessary to enhance the ability of service providers to use existing cable wiring to offer traditional and advanced services to residents of multiple dwelling units. *See Telecommunications Services Inside Wiring*, CS Docket No. 95-184 and MM Docket No. 92-260, Report and Order and Second Further Notice of Proposed Rulemaking, 13 FCC Rcd 3659 (1997).

⁴⁷⁴ *See, e.g., Exchange Point Information* (visited Feb. 5, 2002) <www.ep.net> (listing 55 Internet exchange points in North America).

transit arrangements.⁴⁷⁵ National Internet transport providers report operating commercial exchange points in over 200 cities in the United States and having over 900 POPs where they interconnect with regional networks, private networks and other providers. As usage and demand increase, network operators establish additional arrangements for the exchange of traffic.⁴⁷⁶

⁴⁷⁵ See, e.g., *Architecture: The Internet: What is it?* (visited Feb. 5, 2002) <<http://www.ispworld.com/isp/Architecture.htm>>.

⁴⁷⁶ In response to Internet congestion and delay, content creators, service providers and users employ different strategies, including caching and web hosting server site selection. Caching is the practice of placing copies of the popular content nearer to the users on web servers off of the major Internet exchanges or in major cities. Web hosting site selection permits a content creator to locate its content off of a major access point in order to maximize accessibility to their content while minimizing latency and intermediary network routing. Both these strategies minimize the impact of the location of content creator on the accessibility of the content created.

APPENDIX C

COMMISSION'S SUBSCRIPTIONS DATA AS OF JUNE 30, 2001

High-Speed Services for Internet Access: Subscribership as of June 30, 2001

Industry Analysis Division
Common Carrier Bureau
February 2002



This report is available for reference in the FCC's Information Center at 445 12th Street, S.W., Courtyard Level. Copies may be purchased by calling Qualex International, Portals II, 445 12th Street S.W., Room CY-B402, Washington, D.C. 20554, telephone 202-863-2893, facsimile 202-863-2898, or via e-mail qualexint@aol.com. The report can also be downloaded from the **FCC-State Link** Internet site at www.fcc.gov/ccb/stats.

High-Speed Services for Internet Access: Subscribership as of June 30, 2001

Congress directed the Commission and the states, in section 706 of the Telecommunications Act of 1996, to encourage deployment of advanced telecommunications capability in the United States on a reasonable and timely basis.¹ To assist in its evaluation of such deployment, the Commission instituted a formal data collection program to gather standardized information about subscribership to high-speed services, including advanced services, from wireline telephone companies, cable providers, terrestrial wireless providers, satellite providers, and any other facilities-based providers of advanced telecommunications capability.²

We summarize here information from the fourth data collection, thereby presenting a snapshot of subscribership as of June 30, 2001.³ Subscribership to high-speed services for Internet access increased by 36% during the first half of the year 2001, to a total of 9.6 million lines in service. The presence of high-speed service subscribers was reported in fifty states, the District of Columbia, Puerto Rico, and the Virgin Islands, and in 78% of the zip codes in the United States.

Before presenting the most recent information in some detail, a brief description of the Commission's data collection program is in order to enable the reader to better understand how the nationwide information presented here may compare to similar information derived from other sources. First, a facilities-based provider of high-speed service lines (or wireless channels) in a given state reports to the Commission basic information about its service offerings and customers if the provider has at least 250

¹ See §706, Pub.L. 104-104, Title VII, Feb. 8, 1996, 110 Stat. 153, reproduced in the notes under 47 U.S.C. §157. We define services as "high-speed" that provide the subscriber with transmissions at a speed in excess of 200 kilobits per second (kbps) in at least one direction. "Advanced services," which provide the subscriber with transmission speeds in excess of 200 kbps in each direction, are a subset of high-speed services.

² *Local Competition and Broadband Reporting*, CC Docket No. 99-301, Report and Order, 15 FCC Rcd 7717 (2000) (*Data Gathering Order*). During this data gathering program, qualifying providers file FCC Form 477 each year on March 1 (reporting data for the preceding December 31) and September 1 (reporting data for June 30 of the same year). An updated FCC Form 477, and Instructions for that particular form, for each specific round of the data collection may be downloaded from the FCC Forms website at <www.fcc.gov/formpage.html>. The formal program followed several attempts by the Common Carrier Bureau to collect information on a voluntary basis. See *Local Competition and Broadband Reporting*, CC Docket No. 99-301, Notice of Proposed Rulemaking, 14 FCC Rcd 18106 (1999).

³ Results from the first data collection, in which providers reported numbers of subscribers to high-speed services at the end of 1999, were presented in the Commission's second report to Congress on advanced telecommunications capability. See *Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion*, CC Docket No. 98-146, Second Report (rel. Aug. 21, 2000), available at <www.fcc.gov/broadband>. (In the report, the Commission's data collection program is referred to as the "Broadband Survey.") Results from the second and third data collections appear in reports titled *High-Speed Services for Internet Access*, available at <www.fcc.gov/ccb/stats>.

such lines in service in that state. While providers not meeting the reporting threshold may provide information on a voluntary basis, as some have done, it is likely that not all such providers have reported data.⁴ In particular, we do not know how comprehensively small providers, many of which serve rural areas with relatively small populations, are represented in the data summarized here. Second, lines (or wireless channels) that do not meet the Commission's definition of "high-speed" (i.e., delivering transmissions to the subscriber at a speed in excess of 200 kbps in at least one direction) are not reported. Some asymmetric digital subscriber line (ADSL) services and Integrated Services Digital Network (ISDN) services provided by telephone companies and some services that connect subscribers to the Internet over cable systems do not meet this criterion, but may nevertheless meet the needs of the subscribers who select them.

We expect providers to report data more accurately as they gain experience with the program. We also expect that there may be some need for further clarification and adjustment of the reporting system.⁵ Nevertheless, based on the information now available, the following broad conclusions emerge:

- Subscribership to high-speed services increased by 36% during the first half of the year 2001, to a total of 9.6 million lines (or wireless channels) in service. The rate of growth during the last half of the year 2000 was 62%.⁶ See Table 1.
- Considering services according to the technology deployed in the "last few feet" to the subscriber's premises, high-speed lines in service over coaxial cable systems (cable modem service) remained the most numerous, increasing 45% during the first half of the year 2001, to 5.2 million lines. High-speed ADSL lines in service increased 36%, to 2.7 million lines.⁷

⁴ We received 76 state-specific voluntary submissions (made by 38 holding companies) in the first FCC Form 477 filing, 81 voluntary submissions (made by 35 holding companies) in the second filing, 64 voluntary submissions (made by 41 holding companies) in the third filing, and 64 voluntary submissions (made by 41 holding companies) in the fourth filing. High-speed lines reported in voluntary submissions in the fourth filing represent less than 0.1% of total high-speed lines reported.

⁵ The Commission has requested comments on whether various modifications should be made to this data collection. *See Local Competition and Broadband Reporting*, CC Docket No. 99-301, Second Notice of Proposed Rulemaking, 16 FCC Rcd 2072 (rel. Jan. 19, 2001).

⁶ The National Bureau of Economic Research dates the current U.S. recession from March, 2001. Starting about a year earlier, facilities-based providers of high-speed services -- particularly non-incumbent providers -- found it increasingly difficult to raise capital.

⁷ Providers are instructed to report a high-speed subscriber in the (mutually exclusive) technology category that characterizes the last few feet of distribution plant to the subscriber's premises, e.g., coaxial cable in the case of the hybrid fiber-coax (HFC) architecture of upgraded cable systems. As noted above, ADSL services that do not deliver over 200 kbps in at least one direction are not included in the data reported here. Symmetric DSL services at speeds exceeding 200 kbps are included in the "other wireline" category because they are typically used to provide data services that are functionally equivalent to a T1 and other data services that wireline telephone companies have offered to business customers for some time.

- Reported high-speed connections to end-user customers by means of satellite or fixed wireless technologies increased at the fastest rate, 73%, during the first half of the year 2001, to 0.2 million.⁸ Reported fiber optic connections to end-user customer premises increased by 21%, to 0.5 million.⁸
- Subscribership to the subset of high-speed services that the Commission defines as advanced services (i.e., delivering to subscribers transmission speeds in excess of 200 kbps in each direction) increased by 38% during the first half of the year 2001, to a total of 5.9 million lines (or wireless channels) in service. Advanced services lines provided by means of ADSL technology increased by 48%, and advanced services lines provided over coaxial cable systems increased by 52%. See Table 2.
- As of June 30, 2001, there were 7.8 million residential and small business subscribers to high-speed services. By contrast, there were approximately 5.2 million such subscribers six months earlier, and about 3.2 million a year earlier. See Table 3.
- Of the 7.8 million high-speed lines in service to residential and small business subscribers at the end of June 2001, we estimate that 4.3 million lines also met the Commission's definition of advanced services. See Table 4.
- Among entities that reported facilities-based ADSL high-speed lines in service as of June 30, 2001, about 93% of such lines were reported by incumbent local exchange carriers (ILECs). See Table 5.
- Providers of high-speed services over coaxial cable systems report serving subscribers in 49 states and the District of Columbia. Providers of high-speed ADSL services report serving subscribers in 50 states, the District of Columbia, Puerto Rico, and the Virgin Islands, as do providers who use wireline technologies other than ADSL, or who use optical carrier (i.e., fiber), satellite, or fixed wireless technologies in the last few feet to the subscriber's premises.⁹ See Table 6.
- The Commission's data collection program uniquely gathers from providers information about the number of high-speed lines in service in individual states, in total and by technology deployed in the last few feet to the subscriber's premises. Relatively large numbers of total high-speed lines in service are associated with the more populous states. The most populous state, California, has the largest reported number of high-speed lines. The second, third, and fourth largest numbers of high-speed lines are reported for New York, Florida, and Texas, which are the third, fourth, and second most populous states, respectively. See Table 7.

⁸ Inconsistencies in reporting data in these technology categories over the course of the first three data collections make comparison of growth rates problematic.

⁹ Information about providers of high-speed services other than ADSL and cable modem is reported in a single category, for the individual states, to honor requests for nondisclosure of information that reporting entities assert is competitively sensitive. In the *Data Gathering Order*, the Commission stated it would publish high-speed data only once it has been aggregated in a manner that does not reveal individual company data. *See Data Gathering Order*, 15 FCC Rcd 7760.

- Reporting entities estimate the percentage of their high-speed lines in service that connect to residential and small business end-user customers (as opposed to connecting to medium and large business, institutional, or government end-user customers).¹⁰ These percentages allow us to derive approximate numbers of residential and small-business high-speed lines in service by state. See Table 8.
- The Commission's data collection program also requires service providers to identify each zip code in which the provider has at least one high-speed subscriber. As of June 30, 2001, subscribers to high-speed services were reported in 78% of the nation's zip codes. Multiple providers reported having subscribers in 58% of the nation's zip codes.¹¹ See Table 9.
- Our analysis indicates that 97% of the country's population lives in the 78% of zip codes where a provider reports having at least one high-speed service subscriber.¹² Moreover, numerous competing providers report serving high-speed subscribers in the major population centers of the country. See the map that follows Table 9.
- States vary widely with respect to the percentage of zip codes in the state in which no high-speed lines are reported to be in service. See Table 10.
- High population density has a positive correlation with reports that high-speed subscribers are present, and low population density has a negative correlation. For example, as of June 30, 2001, high-speed subscribers are reported to be present in 97% of the most densely populated zip codes and in 49% of zip codes with the lowest population densities.¹³ However, the comparable figure for the least dense zip codes was 39% six months earlier. See Table 11.

¹⁰ End-user customers use the high-speed services for their own purposes and do not resell them to other entities. For purposes of the FCC Form 477 data collection, Internet Service Providers (ISPs) are not end-user customers. Reporting entities are directed to consider a line as being provided to an end-user customer in the "residential and small business" category if that customer orders high-speed service of a type (e.g., speeds in the downstream (from the Internet to the end user) and upstream (from the end user to the Internet) directions) that is normally associated with residential customers.

¹¹ Lists of zip codes with number of service providers as reported in the FCC Form 477 filings are made available at <www.fcc.gov/ccb/stats> in a format that honors requests for nondisclosure of information the reporting entities assert is competitively sensitive.

¹² Historical zip code data have been revised following staff review of reporting methodologies with a number of reporting entities. Some inconsistencies of reporting methodology among reporting periods and among reporting entities remain.

¹³ For this comparison, we consider the most densely populated zip codes to be those with more than 268 persons per square mile (the top three deciles), and the least densely populated zip codes to be those with fewer than 25 persons per square mile (the bottom three deciles).

- High median family income also has a positive correlation with reports that high-speed subscribers are present. In the top one-tenth of zip codes ranked by median family income, high-speed subscribers are reported in 96% of zip codes. By contrast, high-speed subscribers are reported in 59% of zip codes with the lowest median family income, compared to 55% six months earlier. See Table 12.

As other information from the Commission's data collection program (FCC Form 477) becomes available, it will be included in future reports on the deployment of advanced telecommunications capability and in publications such as this one.

We invite users of this information to provide suggestions for improved data collection and analysis by:

- Using the attached customer response form,
- E-mailing comments to eburton@fcc.gov,
- Calling the Industry Analysis Division at (202) 418-0940, or
- Participating in any formal proceedings undertaken by the Commission to solicit comments for improvement of FCC Form 477.

Table 1
High-Speed Lines 1/
(Over 200 kbps in at Least One Direction)

Types of Technology 2/					Percent Change	
	December 1999	June 2000	December 2000	June 2001	Jun 2000 - Dec 2000	Dec 2000 - Jun 2001
ADSL	369,792	951,583	1,977,101	2,693,834	108 %	36 %
Other Wireline	609,909	758,594	1,021,291	1,088,066	35	7
Coaxial Cable	1,411,977	2,284,491	3,582,874	5,184,141	57	45
Fiber	312,204	307,151	376,203	455,593	22	21
Satellite or Fixed Wireless	50,404	65,615	112,405	194,707	71	73
Total Lines	2,754,286	4,367,434	7,069,874	9,616,341	62 %	36 %

Table 2
Advanced Services Lines 1/
(Over 200 kbps in Both Directions)

Types of Technology 2/					Percent Change	
	December 1999	June 2000	December 2000	June 2001	Jun 2000 - Dec 2000	Dec 2000 - Jun 2001
ADSL	185,950	326,816	675,366	998,883	107 %	48 %
Other Wireline	609,909	758,594	1,021,291	1,088,066	35	7
Coaxial Cable	877,465	1,469,130	2,193,609	3,329,976	49	52
Fiber	307,315	301,143	376,197	455,549	25	21
Satellite or Fixed Wireless	7,816	3,649	26,906	73,476	NM	173
Total Lines	1,988,455	2,859,332	4,293,369	5,945,950	50 %	38 %

NM - Not meaningful due to inconsistencies in reported data.

1/ Some previously published data have been revised.

2/ The mutually exclusive types of technology are, respectively: Asymmetric digital subscriber line (ADSL) technologies, which provide speeds in one direction greater than speeds in the other direction; wireline technologies "other" than ADSL, including traditional telephone company high-speed services and symmetric DSL services that provide equivalent functionality; coaxial cable, including the typical hybrid fiber-coax (HFC) architecture of upgraded cable TV systems; optical fiber to the subscriber's premises (e.g., Fiber-to-the-Home, or FTTH); and satellite and (terrestrial) fixed wireless systems, which use radio spectrum to communicate with a radio transmitter at the subscriber's premises.

Table 3
Residential and Small Business High-Speed Lines 1/
(Over 200 kbps in at Least One Direction)

Types of Technology 2/					Percent Change	
	December 1999	June 2000	December 2000	June 2001	Jun 2000 - Dec 2000	Dec 2000 - Jun 2001
ADSL	291,757	772,272	1,594,879	2,490,740	107 %	56 %
Other Wireline	46,856	111,490	176,520	138,307	NM	NM
Coaxial Cable	1,402,394	2,215,259	3,294,546	4,998,540	49	52
Fiber	1,023	325	1,994	2,623	NM	NM
Satellite or Fixed Wireless	50,189	64,320	102,432	182,165	59	78
Total Lines	1,792,219	3,163,666	5,170,371	7,812,375	63 %	51 %

Table 4
Residential and Small Business Advanced Services Lines
(Over 200 kbps in Both Directions)

Types of Technology 2/					Percent Change	
	December 1999	June 2000	December 2000	June 2001	Jun 2000 - Dec 2000	Dec 2000 - Jun 2001
ADSL	116,994	195,324	393,246	916,364	101 %	133 %
Other Wireline	46,856	111,490	176,520	138,307	NM	NM
Coaxial Cable	872,024	1,401,434	2,177,328	3,146,953	55	45
Fiber	138	325	1,992	2,617	NM	NM
Satellite or Fixed Wireless	7,682	2,916	17,043	60,988	NM	NM
Total Lines	1,043,694	1,711,488	2,766,130	4,265,229	62 %	54 %

Note: Residential and small business advanced services lines are estimated based on data from FCC Form 477.

NM - Not meaningful due to inconsistencies in reported data.

1/ Some previously published have been revised.

2/ The mutually exclusive types of technology are, respectively: Asymmetric digital subscriber line (ADSL) technologies, which provide speeds in one direction greater than speeds in the other direction; wireline technologies "other" than ADSL, including traditional telephone company high-speed services and symmetric DSL services that provide equivalent functionality; coaxial cable, including the typical hybrid fiber-coax (HFC) architecture of upgraded cable TV systems; optical fiber to the subscriber's premises (e.g., Fiber-to-the-Home, or FTTH); and satellite and (terrestrial) fixed wireless systems, which use radio spectrum to communicate with a radio transmitter at the subscriber's premises.

Table 5
High-Speed Lines by Type of Provider
as of June 30, 2001
(Over 200 kbps in at Least One Direction)

Types of Technology 1/	Lines				Percent of Lines		
	RBOC 2/	Other ILEC	Non-ILEC 3/	Total	RBOC	Other ILEC	Non-ILEC
ADSL	2,328,147	175,876	189,811	2,693,834	86.4 %	6.5 %	7.0 %
Other Wireline	706,944	108,738	272,384	1,088,066	65.0	10.0	25.0
Coaxial Cable	*	*	5,105,547	5,184,141	*	*	98.5
Other	*	*	597,983	650,300	*	*	92.0
Total Lines	3,095,699	354,917	6,165,725	9,616,341	32.2 %	3.7 %	64.1 %

* Data withheld to maintain firm confidentiality.

1/ The mutually exclusive types of technology are, respectively: Asymmetric digital subscriber line (ADSL) technologies, which provide speeds in one direction greater than speeds in the other direction; wireline technologies "other" than ADSL, including traditional telephone company high-speed services and symmetric DSL services that provide equivalent functionality; coaxial cable, including the typical hybrid fiber-coax (HFC) architecture of upgraded cable TV systems; optical fiber to the subscriber's premises (e.g., Fiber-to-the-Home, or FTTH); and satellite and (terrestrial) fixed wireless systems, which use radio spectrum to communicate with a radio transmitter at the subscriber's premises.

2/ RBOC lines include all high-speed lines reported by BellSouth, Qwest, SBC, and Verizon.

3/ Non-ILEC lines include lines provided by carriers affiliated with non-RBOC ILECs.

Table 6
Providers of High-Speed Lines by Technology
as of June 30, 2001 1/
(Over 200 kbps in at Least One Direction)

	ADSL	Coaxial Cable	Other 2/	Total (Unduplicated)
Alabama	*	8	10	16
Alaska	*	0	6	7
Arizona	5	*	9	11
Arkansas	*	*	4	7
California	12	8	22	28
Colorado	8	*	11	14
Connecticut	5	5	10	13
Delaware	*	*	*	5
District of Columbia	5	*	11	11
Florida	9	10	19	27
Georgia	11	7	18	24
Hawaii	*	*	*	*
Idaho	*	*	4	7
Illinois	10	5	17	23
Indiana	6	6	10	17
Iowa	6	6	9	15
Kansas	*	6	10	14
Kentucky	7	*	7	14
Louisiana	4	4	8	12
Maine	4	*	6	8
Maryland	4	5	13	17
Massachusetts	5	5	13	16
Michigan	8	5	13	20
Minnesota	8	8	15	22
Mississippi	*	*	4	8
Missouri	6	5	12	17
Montana	5	*	*	7
Nebraska	4	5	7	11
Nevada	*	*	10	11
New Hampshire	4	*	8	9
New Jersey	6	*	14	16
New Mexico	4	*	8	10
New York	12	5	20	26
North Carolina	9	7	13	21
North Dakota	*	*	*	5
Ohio	11	8	15	23
Oklahoma	4	*	10	14
Oregon	6	*	9	11
Pennsylvania	11	5	22	25
Puerto Rico	*	0	*	*
Rhode Island	*	*	4	4
South Carolina	6	7	10	15
South Dakota	4	*	*	7
Tennessee	7	5	9	16
Texas	19	7	22	33
Utah	5	*	10	11
Vermont	*	*	*	6
Virgin Islands	*	0	*	*
Virginia	8	5	19	23
Washington	9	*	12	17
West Virginia	*	*	5	6
Wisconsin	9	*	11	16
Wyoming	*	*	*	*
Nationwide (Unduplicated) Jun 2001	86	47	98	160
Nationwide (Unduplicated) Dec 2000	68	39	87	136
Nationwide (Unduplicated) Jun 2000	47	36	75	116
Nationwide (Unduplicated) Dec 1999	28	43	65	105

* Data withheld to maintain firm confidentiality. In this table, an asterisk also indicates 1-3 providers reporting.

1/ Some previously published data have been revised.

2/ Other includes wireline technologies other than asymmetric digital subscriber line (ADSL), optical fiber to the subscriber's premises, satellite, and (terrestrial) fixed wireless systems.

Table 7
High-Speed Lines by Technology 1/
(Over 200 kbps in at Least One Direction)

	Dec 1999	Jun 2000	Dec 2000	Jun 2001				Percentage Change	
				ADSL	Coaxial Cable	Other 2/	Total	Jun 2000 - Dec 2000	Dec 2000 - Jun 2001
Alabama	19,796	32,756	63,334	*	47,325	*	86,234	93 %	36 %
Alaska	*	*	934	*	0	*	20,906	NA	2138
Arizona	58,825	111,678	153,500	39,828	*	*	158,122	37	3
Arkansas	8,155	15,539	28,968	*	*	5,154	40,803	86	41
California	547,179	910,066	1,386,625	735,677	609,174	360,963	1,705,814	52	23
Colorado	36,726	64,033	104,534	52,617	*	*	147,220	63	41
Connecticut	36,488	63,772	111,792	30,142	106,019	12,896	149,057	75	33
Delaware	1,558	3,660	7,492	*	*	*	12,771	105	70
District of Columbia	13,288	16,926	27,757	16,313	*	*	39,101	64	41
Florida	190,700	244,678	460,795	170,702	372,190	108,275	651,167	88	41
Georgia	75,870	130,292	203,855	106,649	109,922	86,027	302,598	56	48
Hawaii	*	*	*	*	*	*	*	NA	NA
Idaho	*	8,070	15,908	*	*	2,441	20,233	97	27
Illinois	77,672	166,933	242,239	89,080	144,872	116,289	350,241	45	45
Indiana	20,059	49,702	60,494	2,375	56,441	21,548	80,364	22	33
Iowa	19,258	49,159	58,199	9,532	59,253	3,798	72,583	18	25
Kansas	26,179	42,679	68,743	*	74,337	*	101,734	61	48
Kentucky	23,570	24,237	32,731	20,256	*	*	39,297	35	20
Louisiana	28,133	43,294	74,950	37,444	64,219	20,022	121,685	73	62
Maine	19,878	17,864	26,266	6,877	*	*	38,149	47	45
Maryland	52,749	71,005	124,465	51,051	97,466	32,504	181,021	75	45
Massachusetts	114,116	185,365	289,447	82,699	243,670	30,887	357,256	56	23
Michigan	81,223	135,318	198,230	41,428	301,842	52,313	395,583	46	100
Minnesota	38,268	65,272	117,283	51,640	80,259	16,113	148,012	80	26
Mississippi	*	6,514	12,305	*	*	7,551	21,517	89	75
Missouri	23,347	46,903	100,403	53,250	51,733	18,932	123,915	114	23
Montana	*	*	7,378	2,842	*	*	10,446	NA	42
Nebraska	36,748	44,188	54,085	9,293	37,168	8,727	55,188	22	2
Nevada	23,514	40,582	59,879	*	*	16,691	78,535	48	31
New Hampshire	22,807	33,045	42,364	5,651	*	*	55,658	28	31
New Jersey	101,832	144,203	285,311	102,430	*	*	428,514	98	50
New Mexico	*	2,929	28,497	7,578	*	*	20,482	873	-28
New York	186,504	342,743	603,487	197,135	564,423	131,474	893,032	76	48
North Carolina	57,881	81,998	136,703	41,332	115,949	48,335	205,616	67	50
North Dakota	*	2,437	4,227	*	*	*	6,277	73	48
Ohio	160,792	156,980	230,525	87,567	213,606	57,792	358,965	47	56
Oklahoma	96,730	163,703	95,138	31,321	*	*	92,947	NM	NM
Oregon	27,062	44,186	76,839	25,877	*	*	93,242	74	21
Pennsylvania	71,926	79,892	176,670	89,595	131,119	42,522	263,236	121	49
Puerto Rico	*	*	*	*	0	*	*	NA	NA
Rhode Island	*	20,628	30,919	*	*	1,908	49,215	50	59
South Carolina	25,229	32,824	63,914	9,704	68,487	18,648	96,839	95	52
South Dakota	*	3,516	2,839	1,652	*	*	5,448	-19	92
Tennessee	66,307	87,317	122,391	22,902	96,119	33,489	152,510	40	25
Texas	152,518	276,087	522,538	197,668	328,900	120,271	646,839	89	24
Utah	11,635	19,612	35,970	23,476	*	*	55,103	83	53
Vermont	*	1,551	7,773	*	*	*	16,230	401	109
Virgin Islands	0	*	*	*	0	*	*	NA	NA
Virginia	51,305	72,436	139,915	39,114	131,553	42,141	212,808	93	52
Washington	71,930	118,723	195,628	64,812	*	*	227,066	65	16
West Virginia	*	1,835	6,498	*	*	2,062	16,697	254	157
Wisconsin	18,599	34,262	76,257	17,800	*	*	127,755	123	68
Wyoming	*	*	*	*	*	*	*	NA	NA
Nationwide Reported Total	2,754,286	4,367,434	7,069,874	2,693,834	5,184,141	1,738,366	9,616,341	62 %	36 %

NA - Not Available.

NM - Not meaningful due to inconsistencies in reported data.

* Data withheld to maintain firm confidentiality.

1/ Some previously published data have been revised.

2/ Other includes wireline technologies other than asymmetric digital subscriber line (ADSL), optical fiber to the subscriber's premises, satellite, and (terrestrial) fixed wireless systems.

Table 8
High-Speed Lines by Type of User
as of June 30, 2001
(Over 200 kbps in at Least One Direction)

	Residential and Small Business	Other 1/	Total
Alabama	70,308	15,926	86,234
Alaska	15,288	5,618	20,906
Arizona	141,450	16,672	158,122
Arkansas	37,616	3,187	40,803
California	1,332,462	373,352	1,705,814
Colorado	128,198	19,022	147,220
Connecticut	138,552	10,505	149,057
Delaware	10,736	2,035	12,771
District of Columbia	22,243	16,858	39,101
Florida	547,207	103,960	651,167
Georgia	221,220	81,378	302,598
Hawaii	*	*	*
Idaho	17,616	2,617	20,233
Illinois	256,197	94,044	350,241
Indiana	62,335	18,029	80,364
Iowa	69,232	3,351	72,583
Kansas	96,393	5,341	101,734
Kentucky	23,557	15,740	39,297
Louisiana	102,516	19,169	121,685
Maine	32,898	5,251	38,149
Maryland	149,593	31,429	181,021
Massachusetts	312,711	44,545	357,256
Michigan	350,073	45,510	395,583
Minnesota	132,244	15,768	148,012
Mississippi	15,008	6,509	21,517
Missouri	108,458	15,457	123,915
Montana	9,528	918	10,446
Nebraska	49,912	5,276	55,188
Nevada	62,451	16,084	78,535
New Hampshire	49,992	5,666	55,658
New Jersey	369,508	59,006	428,514
New Mexico	17,513	2,969	20,482
New York	738,924	154,108	893,032
North Carolina	163,507	42,109	205,616
North Dakota	5,645	632	6,277
Ohio	299,240	59,725	358,965
Oklahoma	81,584	11,363	92,947
Oregon	82,919	10,323	93,242
Pennsylvania	216,551	46,685	263,236
Puerto Rico	*	*	*
Rhode Island	46,622	2,593	49,215
South Carolina	78,183	18,656	96,839
South Dakota	4,479	969	5,448
Tennessee	119,464	33,046	152,510
Texas	387,910	258,929	646,839
Utah	47,256	7,847	55,103
Vermont	15,021	1,209	16,230
Virgin Islands	*	*	*
Virginia	178,648	34,160	212,808
Washington	204,137	22,929	227,066
West Virginia	15,223	1,474	16,697
Wisconsin	105,574	22,181	127,755
Wyoming	*	*	*
Nationwide Reported Total	7,812,375	1,803,966	9,616,341

* Data withheld to maintain firm confidentiality.

1/ Other includes medium and large business, institutional, and government customers.

Table 9
Percentage of Zip Codes with High-Speed Lines in Service 1/

Number of Providers	December 1999	June 2000	December 2000	June 2001
Zero	40.3 %	33.0 %	26.8 %	22.2 %
One	26.0	25.9	22.7	20.3
Two	15.5	17.8	18.4	16.7
Three	8.2	9.2	10.9	13.2
Four	4.3	4.9	6.1	8.2
Five	2.7	3.4	4.0	4.9
Six	1.7	2.5	3.0	3.6
Seven	0.8	1.7	2.3	2.8
Eight	0.3	0.8	2.0	2.2
Nine	0.2	0.4	1.6	1.9
Ten or More	0.0	0.4	2.4	3.9

1/ Some previously published data have been revised.

High-Speed Providers by Zip Code

(As of June 30, 2001)

2944

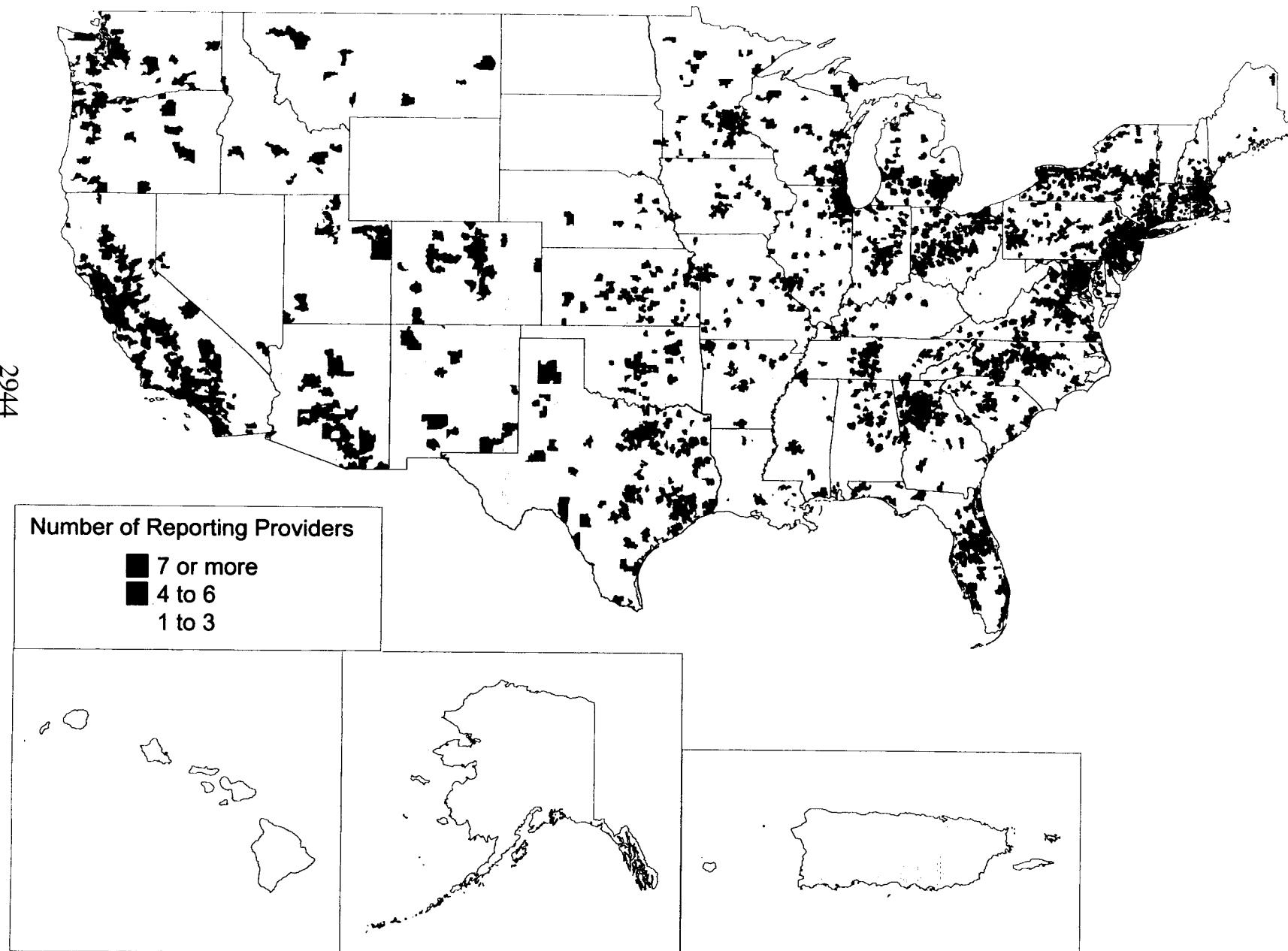


Table 10
Percentage of Zip Codes with High-Speed Lines in Service
as of June 30, 2001
(Over 200 kbps in at Least One Direction)

	Number of Providers					
	Zero	One - Three	Four	Five	Six	Seven or More
Alabama	20 %	66 %	11 %	3 %	1 %	0 %
Alaska	79	18	3	0	0	0
Arizona	8	37	14	10	12	20
Arkansas	39	54	7	0	0	0
California	7	29	9	7	7	41
Colorado	15	48	10	6	3	18
Connecticut	3	48	11	10	12	16
Delaware	0	72	28	0	0	0
District of Columbia	7	15	4	7	4	63
Florida	2	35	17	13	9	24
Georgia	16	51	10	5	4	13
Hawaii	20	80	0	0	0	0
Idaho	34	56	5	5	0	0
Illinois	18	56	5	3	2	16
Indiana	19	61	8	5	1	6
Iowa	49	45	4	1	0	0
Kansas	35	52	8	4	1	0
Kentucky	40	57	3	0	0	0
Louisiana	21	75	4	0	0	0
Maine	35	61	3	1	0	0
Maryland	12	37	10	4	8	28
Massachusetts	1	31	18	10	11	29
Michigan	10	57	8	5	4	16
Minnesota	35	46	7	4	5	3
Mississippi	28	66	6	1	0	0
Missouri	35	50	4	4	3	4
Montana	48	48	3	0	0	0
Nebraska	44	49	5	2	0	0
Nevada	22	47	17	11	2	2
New Hampshire	8	64	14	8	4	2
New Jersey	1	25	13	10	10	40
New Mexico	34	56	5	3	2	1
New York	8	45	11	8	6	20
North Carolina	11	64	14	5	3	2
North Dakota	72	28	0	0	0	0
Ohio	8	59	15	7	4	6
Oklahoma	29	53	5	5	5	3
Oregon	9	64	11	7	6	3
Pennsylvania	22	50	7	6	3	12
Puerto Rico	0	100	0	0	0	0
Rhode Island	6	43	26	25	0	0
South Carolina	16	67	13	3	1	0
South Dakota	63	37	1	0	0	0
Tennessee	18	62	12	5	2	2
Texas	17	48	8	5	3	19
Utah	25	42	8	6	6	13
Vermont	25	74	1	0	0	0
Virginia	18	51	6	7	3	15
Washington	11	50	11	11	8	9
West Virginia	58	41	0	0	0	0
Wisconsin	16	62	8	5	5	4
Wyoming	47	53	0	0	0	0
Nationwide	22 %	50 %	8 %	5 %	4 %	11 %

Table 11
High-Speed Subscribership
Ranked by Population Density 1/
(Over 200 kbps in at Least One Direction)

Deciles (Blocks of Zip Codes Grouped by Density)	Persons per Square Mile (In Each Decile of Zip Codes)	Percent of Zip Codes in Decile with at Least One High-Speed Subscriber			Percent of Population in Decile that Resides in Zip Codes with High-Speed Service		
		Dec 1999	Dec 2000	Jun 2001	Dec 1999	Dec 2000	Jun 2001
90-100	More Than 3,147	96.1 %	98.2 %	98.1 %	98.9 %	99.9 %	99.9 %
80-90	947-3,147	93.2	97.1	97.1	98.5	99.8	99.8
70-80	268-947	87.5	95.7	95.6	96.2	99.3	99.5
60-70	118-268	77.1	91.5	92.3	91.4	98.1	98.8
50-60	67-118	66.9	85.9	87.5	83.3	95.0	96.8
40-50	41-67	53.7	76.1	80.9	72.3	87.9	93.0
30-40	25-41	40.9	65.0	72.8	60.0	80.0	87.3
20-30	15-25	29.8	50.1	58.9	50.9	69.4	78.4
10-20	6-15	26.7	38.5	51.1	50.2	61.9	74.6
0-10	Fewer Than 6	19.9	27.5	36.8	38.5	49.9	60.7

1/ Some previously published data have been revised.

Table 12
High-Speed Subscribership
Ranked by Household Income 1/
(Over 200 kbps in at Least One Direction)

Deciles (Blocks of Zip Codes Grouped by Median Household Income)	Median Household Income (In Each Decile of Zip Codes)	Percent of Zip Codes in Decile with at Least One High-Speed Subscriber			Percent of Population in Decile that Resides in Zip Codes with High-Speed Service		
		Dec 1999	Dec 2000	Jun 2001	Dec 1999	Dec 2000	Jun 2001
90-100	\$53,494 to \$291,938	90.8 %	96.1 %	96.4 %	98.4 %	99.8 %	99.8 %
80-90	\$43,617 to \$53,478	77.1	88.9	90.7	95.8	99.0	99.3
70-80	\$38,396 to \$43,614	67.0	79.5	83.8	94.3	97.8	98.5
60-70	\$34,744 to \$38,395	59.9	74.5	80.0	91.5	96.6	97.9
50-60	\$32,122 to \$34,743	55.3	71.2	77.3	90.0	95.9	97.4
40-50	\$29,893 to \$32,121	53.7	67.4	73.4	88.9	94.5	96.3
30-40	\$27,542 to \$29,892	50.4	66.9	73.5	86.1	93.8	95.9
20-30	\$24,855 to \$27,541	50.1	65.1	69.6	85.7	93.1	95.2
10-20	\$21,645 to \$24,855	46.3	61.2	67.4	83.0	91.1	93.9
0-10	\$0 to \$21,644	41.7	54.9	59.1	83.8	91.5	94.1

1/ Some previously published data have been revised.

APPENDIX D

COMMENTERS:

Adelphia Business Solutions, Inc.
 Alcatel USA, Inc.
 Alliance for Public Technology &
 World Institute on Disability
 Association of America's Public Television
 Stations
 AT&T Corp.
 BellSouth Corporation
 Burnstein, Dave
 Commonwealth of the Northern Mariana Islands
 Global Crossing Ltd.
 Global Photon Systems, Inc.
 Hughes Network Systems,
 Hughes Communications Galaxy, Inc.,
 Hughes Communications, Inc.
 Intel Corporation
 Intertainer, Inc
 Metromedia Fiber Network Services, Inc.
 National Association of the Deaf
 National Cable & Telecommunications Association, The
 National Exchange Carrier Association
 National Grange of the Order of Patrons Husbandry
 National Rural Telecommunications Cooperative
 New Networks Institute
 Organization for the Promotion and Advancement
 of Small Telecommunications Companies
 City of Plano, Texas
 Progress & Freedom Foundation
 Qwest Communications International, Inc.
 Ruby Ranch Internet Cooperative Association
 SBC Communications, Inc.
 Sprint Corporation
 StarBand Communications Corporation
 State of Alaska
 Telecommunications for the Death, Inc.
 Texas Coalition of Cities for Utility Issues
 Texas Public Utility Commission
 United States Telecom Association
 Verizon Telephone Companies
 WorldCom, Inc.

ABBREVIATION:

ABS
 Alcatel
 APT & WID
 APTS
 AT&T
 BellSouth
 Global Crossing
 Global Photon
 Hughes
 MFN
 NAD
 NCTA
 NECA
 Grange
 NRTC
 NNI
 OPASTCO
 PFF
 Qwest
 Ruby Ranch
 SBC
 Sprint
 TDI
 TCCFUI
 Texas PUC
 USTA
 Verizon
 WorldCom

COMMENTERS:

Alcatel USA, Inc.
Alliance for Public Technology
American Foundation for the Blind
American ISP Association
AT&T Corp.
BellSouth Corporation
City of Boulder, Colorado
City of Carrollton, Texas
City of Colorado Springs, Colorado
Competitive Telecommunications Association
Corning Incorporated
Covad Communications Company
EarthLink, Inc.
Hughes Network Systems,
 Hughes Communications Galaxy, Inc.,
 Hughes Communications, Inc.
National Association of Community Action Agencies
National Association of Telecommunications Officers
 and Advisors and the National League of Cities
National Rural Telecommunications Cooperative
National Telephone Cooperative Association
Progress & Freedom Foundation
Qwest Communications International, Inc.
SBC Communications, Inc.
Telecommunications for the Deaf, Inc.
Telecommunications Industry Association
Telecommunications Right-of-Way Coalition
Texas Coalition of Cities for Utility Issues
United States Telecom Association
Velocita Corporation
Verizon Telephone Companies
WorldCom, Inc.

ABBREVIATION:

Alcatel
APT
AFB
AISPA
AT&T
BellSouth

CompTel
Corning
Covad
EarthLink

Hughes
NACAA

NATOA and NLC
NRTC
NTCA
PFF
Qwest
SBC
TDI
TIA
TelROW
TCCFUI
USTA
Velocita
Verizon
WorldCom

SEPARATE STATEMENT OF CHAIRMAN MICHAEL K. POWELL

Re: *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable And Timely Fashion, and Possible Steps To Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996*

This *Report* culminates the latest in a growing list of broadband proceedings that the Commission has conducted recently to help fulfill section 706's mandate that we encourage the deployment of high-speed communications services to all Americans.

Over the last several months, the Commission has begun an examination of regulatory requirements for incumbent LEC broadband telecommunications services and expanded our consideration of broadband deployment as a goal in the context of triennial review of section 251 unbundling requirements. In the coming weeks, we will consider the statutory classification of high-speed Internet access provided via cable modems, as well as initiate an inquiry regarding the appropriate regulatory treatment of broadband Internet access provided by telephone companies. As the *Report* details, there are several additional proceedings that directly address broadband deployment, including those that seek to promote intramodal competition among incumbent LECs and their competitors and those that seek to facilitate spectrum-based broadband offerings. And these examples do not include the myriad other formal and informal activities undertaken by me, my colleagues, our fellow federal and state policymakers and our able staffs that will address some aspect of broadband deployment.

In sum, our demonstrated commitment to spurring broadband deployment is as varied as it is pervasive. It is one of our highest priorities and is never far from our thoughts as we decide communications policy.

It is in the context of these many efforts that I write separately to underscore my support for this *Report*. I agree with the *Report*'s finding that broadband is being deployed in a reasonable and timely manner, notwithstanding my firm belief that the Commission's central policymaking focus is and should remain the promotion of efficient broadband deployment. Although one can easily point to specific communities or categories of customers in which broadband is not yet fully available, the record amply illustrates that the broadband market continues to grow, and that overall availability and subscribership have increased significantly, despite some slowing investment trends. Likewise, the *Report* shows that availability and subscribership have enjoyed strong growth even in the categories of residential and small business customers, low-income consumers and people within sparsely populated regions. The *Report* bases these conclusions not only on the extensive data the Commission collects as part of its ongoing data gathering efforts, but also based on various governmental, industry and analyst assessments. In this regard, I would note that the conclusions in this *Report* are consistent with the Commerce Department's recent finding that one of the key drivers of broadband deployment,

computer usage, is increasing for Americans regardless of income, education, age, race, ethnicity or gender.⁴⁷⁷

Certainly, we should strive for more granular or direct data upon which to make the findings required under section 706, though obtaining it is easier said than done, as many analysts have learned. But it is misleading to suggest that the zip code data used in our evaluation provide little useful guidance on broadband deployment. Because the leading forms of broadband technology (DSL and cable modem) involve upgrading significant portions of existing networks, we know that the presence of at least one subscriber in a zip code means that there are probably many other subscribers who also have broadband available in that zip code, particularly where a service provider is mass marketing the service. And although the *Report* does correctly indicate that 97% of the country's population lives in zip codes that have some broadband deployment, it is careful not to conclude that all of those people currently have broadband available. We also must recognize that collecting additional broadband data at the Commission may burden service providers or subject them to competitive injury, thereby inhibiting their ability to contribute to the very deployment we seek to promote. In any event, the judgments we make here are reasonable and more than adequately supported by the many internal and independent sources cited or discussed here, and so I support these judgments fully.

In closing, I would reiterate that our finding that broadband deployment is reasonable and timely in no way suggests that we should flag in our efforts to foster deployment. Section 706 mandates that we promote the availability of broadband whether or not we conclude that deployment is reasonable and timely. And promoting such deployment is clearly imperative if we are to enjoy the full promise of our economy and our democratic society. Thus, the Commission will continue to carry out and expand upon the prodigious array of proceedings and other activities that I reference above. I eagerly anticipate, in particular, continued partnership with our state utility commission colleagues. It is through their individual efforts, and those of the Federal-State Joint Conference on Advanced Services that we have made enormous progress in highlighting the urgency of promoting broadband, in sharing potential solutions, and in continuing a dialogue that will yield further benefits to our regulatory efforts and to the public generally. I look forward to working with the states, and with my federal counterparts, on this worthy and critical endeavor.

⁴⁷⁷ U.S. Department of Commerce, National Telecommunications and Information Administration and Economics and Statistics Administration, *A Nation Online: How Americans Are Expanding Their Use of the Internet* 3 (Feb. 5, 2002).

SEPARATE STATEMENT OF COMMISSIONER KATHLEEN Q. ABERNATHY

Re: Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable And Timely Fashion, and Possible Steps To Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996

I support the Commission's determination that advanced telecommunications capability is being deployed on a "reasonable and timely basis."⁴⁷⁸ I write separately to emphasize that, while broadband deployment is occurring reasonably, that is no reason to rest on our laurels. To the contrary, I am committed to remaining vigilant in our monitoring efforts and I am encouraged that, notwithstanding our generally positive assessment of broadband deployment, the Commission has recently launched a number of rulemaking proceedings to explore how to eliminate barriers to infrastructure investment and to accelerate broadband deployment.

The Commission has appropriately been concerned about the deployment of broadband facilities in rural areas and other underserved areas. But our most recent data suggest that the digital divide is *narrowing*. The deployment gaps between urban and rural areas and between high-income and low-income households have narrowed significantly since the issuance of our last Report.⁴⁷⁹ To be sure, deployment still needs to improve in rural areas and among low-income households. But given our conclusion in the *Second Report* that the deployment of advanced telecommunications capability was occurring on a reasonable and timely basis, the significant improvement since that Report demonstrates that such deployment — while not perfect — remains "reasonable and timely."

As the foregoing Report recognizes, our information concerning broadband deployment is imperfect. To avoid imposing undue burdens on providers, the Commission permitted providers to report subscribership (which in turn reflects their deployment of facilities) at a highly aggregated level. While the Commission's data-collection requirements prevent us from assessing the full extent of subscribership or facilities deployment within particular zip codes, third-party data confirm the conclusion that providers are continuing to deploy facilities throughout the country.⁴⁸⁰ Moreover, the Commission already has launched a proceeding seeking comment on the efficacy of our data-collection requirements, so if there improvements we can make without imposing undue burdens on providers, we are well-positioned to do so.⁴⁸¹

In addition, there are strong indications that the gap between broadband "haves" and "have-nots" will continue to shrink as a result of technological developments. Perhaps most

⁴⁷⁸ See Telecommunications Act of 1996, § 706, Pub. L. 104-104, Title VII, 110 Stat. 153 (Feb. 8, 1996) (reproduced in the notes under 47 U.S.C. § 157).

⁴⁷⁹ See Report, *supra*, at ¶¶ 35-39.

⁴⁸⁰ See generally *id.* at ¶¶ 89-124.

⁴⁸¹ See *Local Competition and Broadband Reporting*, CC Docket No. 99-301, Second Notice of Proposed Rulemaking, 16 FCC Rcd 2072 (2000).

promisingly, high-speed satellite services are now available in all 50 states.⁴⁸² Local exchange carriers also appear to be making progress in extending the reach of their DSL services through new technologies.⁴⁸³ And other service providers, such as electric utilities, are developing innovative means of reaching rural consumers.⁴⁸⁴

Despite this evidence of reasonable and timely deployment — particularly in comparison to the rollout of other new technologies and services⁴⁸⁵ — the Commission is considering an impressive array of actions to encourage further broadband deployment. Indeed, having made broadband deployment a top priority, the Commission is leaving no stone unturned in its consideration of measures that will encourage the deployment of advanced telecommunications capability to all Americans as soon as possible. Thus, the Commission is proceeding as if the existing pace of deployment *weren't* reasonable, making the Report's assessment of reasonableness academic. As the Report details, the Commission has launched or soon will launch rulemakings that explore (a) the impact of our section 251(c) unbundling obligations on telephone companies' incentives to deploy new facilities; (b) the appropriate regulatory treatment of incumbent LECs' broadband transmission services and Internet access services; and (c) the appropriate regulatory treatment of cable operators' broadband Internet access services.⁴⁸⁶ I enthusiastically support the Commission's further decision to consider, in consultation with industry and our state and local colleagues, possible means of removing barriers to deployment associated with local right-of-way regulation.⁴⁸⁷ And the Commission has identified a range of other actions that have the potential to promote broadband deployment.⁴⁸⁸

Finally, I recognize that subscription rates lag far behind our estimates of infrastructure investment and facilities deployment. Many commenters are discouraged that the "take rate" for broadband remains less than 10 percent, even as estimates of availability approach 80 percent. But we must keep in mind the Commission's role under the 1996 Act. Section 706 directs us to encourage the deployment of advanced telecommunications *capability* — not to ensure that

⁴⁸² See Report, *supra* at ¶ 115.

⁴⁸³ *Id.*

⁴⁸⁴ *Id.*

⁴⁸⁵ See *id.* at ¶ 124 (comparing rollout of the telephone and television).

⁴⁸⁶ *Id.* at ¶¶ 151-54.

⁴⁸⁷ *Id.* at ¶¶ 166-68.

⁴⁸⁸ *Id.* at ¶¶ 169-77.

consumers purchase particular services. As one competitor put it, convincing large numbers of consumers to purchase broadband services "is an issue for sales and marketing arms of broadband providers, not for regulators."⁴⁸⁹ I am confident that, as providers continue to introduce new applications and better educate consumers about the many benefits of broadband, subscribership figures will increase. But my job as a regulator is to ensure only that the necessary facilities are being deployed. As the Report demonstrates, such deployment is occurring on a reasonable and timely basis.

⁴⁸⁹ Covad Comments at 3.

DISSENTING STATEMENT OF COMMISSIONER MICHAEL COPPS

Re: Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable And Timely Fashion, and Possible Steps To Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996

On the basis of the record before us, I am unable to determine whether the deployment of advanced telecommunications capability to all Americans is or is not reasonable and timely. This is because we have not gathered data of adequate quality or granularity to fulfill our statutory responsibility under Section 706. I cannot therefore endorse the conclusions of the majority and must respectfully dissent from this Report. I impugn no colleague's commitment to broadband deployment and no bureau's enthusiasm and hard work for bringing the wonders of broadband technologies to the American people. I just happen to have a different perspective.

The Importance of Broadband

Congress recognized the importance of broadband access in the Telecommunications Act of 1996. It gave us the statutory mandate to advance the cause of bringing access to advanced telecommunications to each and every citizen of this great country – whether they live in rural areas, on tribal lands or in the inner city; whether they are affluent or of limited income; with or without disabilities. Congressional interest in broadband has only increased in the intervening years, with broadband occupying an increasingly prominent position on the Congressional agenda. Indeed, the nation generally seems to have embarked on a significantly more intensive dialogue about broadband, putting issues on the table that were simply not there just a few months ago. This is a welcome and salutary development.

Broadband is rapidly becoming a key component of our nation's systems of education, commerce, employment, health, government and entertainment. The transformative potential of broadband technologies is, I believe, akin to the major infrastructure developments that built America to greatness. I believe that when the history of our times is written, the broadband transformation will be discussed in the same vein as the building of the roads and ports and harbors that made commerce possible in pre-Civil War America; as the Transcontinental railroads that made us a continental power in the late Nineteenth century; as the national highway system that opened the way for rapid transportation and demographic migration in the last century; and as the first great telecommunications revolution that brought telephone service to the far corners of America, a job mostly, but not yet totally, completed.

Some may argue that broadband infrastructure does not rise to the level of developmental importance I ascribe to it. But the issue does seem to be coming front-and-center in our national dialogue, and I believe there is sufficient plausibility attached to it to merit, indeed to compel, a significantly broader and deeper analysis of broadband deployment than we have thus far undertaken. We can argue whether the parameters of previous Section 706 reports were sufficiently broad. I think they were not. But circumstances have changed; new questions now need to be asked; and old questions may merit new and very different answers. This is precisely why Congress instructed the Commission to reexamine this issue regularly. New data, new analysis and new perspectives can only nourish the national dialogue we are beginning to have.

Congress gave the Commission the charge to determine whether advanced telecommunications capability -- broadband -- is being deployed to *all* Americans in a reasonable and timely fashion for two reasons. First, Congress required us, as the government's expert agency, to engage in fact finding that would inform the national debate. Second, as the agency that implements Congressional policy, we have been instructed by Congress that, if we find deployment not to be reasonable and timely, we must take immediate action to accelerate it.

Thus, in adopting this section, Congress envisioned that the FCC would actively pursue information each year on broadband deployment. Here, we have not delved as deeply as Congress expects. The data we have and the analysis derived from it are, for me, insufficient for making the critical determination mandated by Congress.

I am further troubled that today's Report neither lays out a plan to obtain these data nor initiates an action for the Commission that would foster a national dialogue and promote broadband deployment. The Commission needs to be more proactive in this pursuit. We need to investigate the availability of broadband to all Americans, including those communities that are at risk of being left behind. We must be willing to ask the hard questions and act according to full and accurate data, rather than conjecture about the state of deployment. This is too important an issue for our nation merely to conduct an incomplete analysis and conclude that everything is proceeding apace.

Inadequacy of the Data

I do not believe the Commission has gathered data of adequate quality or granularity to fulfill its statutory responsibility to determine if deployment of advanced telecommunications capability is reasonable and timely to all Americans. We simply did not have access to the information necessary to carry out our section 706 mandate. It is our statutory duty to obtain this data.

The competition-enhancing portions of the 1996 Act have led to undoubted progress in deploying broadband. We are now seeing competition not only within delivery platforms, but also among delivery platforms. Indeed, we are seeing convergence of industries, convergence of services, and convergence of markets. It is clear that companies are actively deploying advanced technologies in response to competition from other broadband providers. The competition resulting from the 1996 Act unleashed an unprecedented investment in communications infrastructure in many areas of the country.

A detailed analysis of broadband deployment might well have shown that broadband deployment is proceeding as Congress expected. Certainly the number of broadband subscribers and users of the Internet in many communities continues to increase substantially, as every report seems to confirm. And certainly we should not expect broadband to be available to everyone at the exact same instant. But the Commission is obligated to seek specific and concrete data to undergird its conclusions and to ensure that all Americans are obtaining broadband access in a reasonable and timely manner.

To carry out this 706 inquiry, the Commission asks providers to report zip codes in which there is at least one subscriber. Our data leaves the impression that everyone in a zip code has access to broadband merely because one person has it. The Report concedes that "we cannot

determine from our data the full extent to which the presence of high-speed service in a given zip code indicates that high-speed services are widely available, or whether they are restricted to a few customers." In fact, with our data, that zip code might include only large business customers buying facilities that would not be available or affordable to small business or residential customers. It might also include zip codes where only a limited number of customers have access. The majority recognizes these shortcomings, but nevertheless concludes on the basis of the data that deployment is reasonable and timely. By the logic of our current use of these data, rather than counting each zip code with one subscriber as fully connected, perhaps we ought to count each zip code that has one customer without access as *not* connected. I suspect accurate numbers would demonstrate a much smaller percentage of the population with access than the 97 percent contained in our data.

Moreover, the Commission must ensure that communities are not being left behind. Importantly, the Report states that certain citizens – those living in rural or insular areas or on tribal lands, those with low incomes, and those with disabilities – are at significantly greater risk of not having access to broadband. Is deployment reasonable and timely to these Americans? I do not believe that the Commission has adequately explored this question. Without doing so, we have not fulfilled our statutorily mandated responsibilities.

A Broadband Action Plan

Given the importance of broadband deployment for our nation, and without an adequate record to make a determination under section 706, I believe that the Commission should initiate a broadband action plan to obtain concrete, nationwide data, to elicit wider stakeholder input and analysis, and to promote the deployment of broadband to all Americans.

First, the Commission should adopt a specific plan to gather information that would allow a rigorous analysis of broadband deployment. The majority recognizes the limited usefulness of our data, but does not undertake steps to rectify the problem. The Commission issued a Notice of Proposed Rulemaking on this issue over a year ago but has yet to issue an order. The data we collect should focus on the availability of broadband and should not assume that everyone in a zip code has access to broadband merely because one entity does. Although certainly not an exhaustive list, more granular information, separation of data based on services to residential and small business customers, and statistical sampling can provide a fuller and more accurate picture of deployment patterns. This data is admittedly neither easy nor cheap to come by. It is, however, necessary for the fulfillment of our charge from Congress, and it must have a resource priority here at the Commission commensurate with the developmental priority that broadband has for the nation. The Commission should devote the additional resources necessary to carry out our section 706 mandate as Congress expected.

The states can play a critical role in supplying information, expertise and new perspectives. Indeed, the states are charged with an active role by Section 706. Their more active participation during the Commission's annual Section 706 work would significantly enhance the quantity of our data and the quality of our analysis. Soliciting their more active input should be one of the Commission's first action plan steps.

Second, the Commission has a responsibility to help foster a national dialogue on broadband. The nation's sense of urgency about this issue is heightening as people are asking

hard questions about how the infrastructure is to be built. We need to develop answers to these questions. A serious national dialogue about this issue will help frame the policy options. For openers, we should conduct hearings and roundtables around the country – meetings that include other government entities and significant input from both traditional and non-traditional stakeholders. We are of course an independent agency and we implement, rather than make, policy. Nevertheless, it is clear that Congress envisioned a major role for the FCC when it charged us with encouraging reasonable and timely deployment of advanced telecommunications capability to all Americans. Congress did not urge a hands-off policy upon the Commission when it comes to broadband deployment.

As part of the effort, we should devote more adequate resources to looking at what other countries are doing. We don't pay nearly enough attention to this. Interesting broadband initiatives are taking place in numerous countries. They need to be looked at, studied, evaluated. As far as I can tell, all of the industrialized countries, except the United States and Italy, have national plans for broadband deployment. And Italy is in the process of developing one. It's not that we need to emulate what others with different traditions and cultures and economies may be doing, but let's be serious enough to at least look at what they're doing and see if there may not be a lesson or two there for us.

Let's look in more detail at what some communities right here at home are doing. We need to realize that communities across America are already taking steps to supply broadband themselves when industry fails to get it to them. Certainly we need to examine the demand for broadband services; I would be among the last to suggest that we ignore the realities of the marketplace. Indeed, we must examine consumer demand, and whether and when it is appropriate to define advanced telecommunications as a higher transmission speed to take account of evolving technologies and consumer expectations. But I have been to too many conferences where the definition of broadband and demand are the only questions that are discussed. Shouldn't we also discuss why it is that some communities in America are already floating bond issues and taxing themselves to get broadband deployed to satisfy unmet demand?

Let's look at the many communities that do not have access to broadband. We should undertake a specific accounting of where these places are and what they have in common. We should examine how population density, income level, race, and other factors come into play, and determine if there are market failures that are limiting broadband deployment in these communities. We should focus in particular on rural areas, tribal lands, inner city communities, and on those of our fellow citizens who have disabilities.

Let's look more closely at potential impediments to broadband deployment. As the Report demonstrates, we have initiated a number of proceedings to promote broadband deployment. But we have not committed the resources to evaluate more broadly the impediments to deployment and to consider steps to eliminate those barriers.

And, finally, let's examine the role of government in the deployment effort. The private sector can, should, and will be the lead locomotive in rolling out broadband. But I've asked just about every businessperson I've had the chance to meet if he or she was convinced the market could get the job of deployment done. The vast majority of these business leaders tell me that for that last 10, 15, 20 percent or more of Americans, probably not. One of America's foremost CEO's told us a few months ago that 30 percent could be beyond deployment. Leaving 10

percent behind amounts to about 29 million people, and leaving 20 percent behind abandons 58 million fellow citizens. So the issue has a human face. If we get to 2020 and we have 29 or 58 or 87 million people without broadband, we will have a *Broadband Chasm* that not only denies many citizens of a precious right but also denies our country of critically needed economic growth.

Historically, business and government worked closely together in all of the great economic infrastructure transformations that I described earlier in these comments. All of these were built with the public and private sectors working together to provide America with the infrastructure we needed to prosper. History doesn't necessarily repeat itself, but there are enough resemblances to merit our close attention. Some may say that broaching such questions stretches the FCC mandate. I answer that examining what works -- in our communities and municipalities, in other countries, in our own historical experience -- is integral to setting out the options for our nation's policy-makers in Congress and the Administration. Our policy makers expect no less of us.

I don't pretend to have all of the answers. I don't even have all of the questions that need to be asked. Nor am I saying these are the only steps we should take. I merely say that we need to take action to get a fuller and more accurate picture of broadband deployment and try to get a handle on meeting one of the most important challenges -- and opportunities -- confronting our country today. America's broadband business is not, I think, business as usual.

SEPARATE STATEMENT OF COMMISSIONER KEVIN J. MARTIN

Re: Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable And Timely Fashion, and Possible Steps To Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996

Encouraging the deployment of broadband services to all Americans should be a national priority. Such services are essential to the economy of the 21st century, dramatically reducing the costs of exchanging information and allowing previously local businesses to serve the world. Broadband services are especially important to rural America, providing business, educational, and healthcare opportunities to remote parts of the country. I am hopeful that, just as rapid developments in telecommunications and technology have driven much of this nation's economic growth in recent years, broadband deployment will lead to a new period of growth. I thus believe that all levels of government should work to eliminate barriers to infrastructure investment and to accelerate broadband deployment.

Under the Chairman's direction, the Commission has sought to promote broadband deployment through a variety of efforts, including (i) proceedings on performance measures for unbundled network elements and special access, (ii) examination of the impact of unbundling obligations on telephone carriers' incentives to invest in new facilities, and (iii and iv) consideration of the appropriate regulatory treatment of broadband transmission services and Internet access services provided over cable and telephone infrastructure. These proceedings are positive steps, and I am pleased to support them.

I write separately to emphasize my belief that there is some urgency to the need for continued efforts. I agree with the Commission's conclusion that "advanced telecommunications capability" is currently being deployed on a "reasonable and timely basis." The availability of that capability is increasing, and I am pleased that subscribers to services the Commission characterizes as "high-speed" were reported in 78 percent of all zip codes in the United States.

I am concerned, however, that deployment of such services still lags in rural and other underserved areas. Our data show that fewer than 40 percent of the most sparsely populated zip codes have at least one subscriber to "high-speed" services while more than 90 percent of the most densely populated zip codes have at least one such subscriber. While that gap is narrowing, there is no question that the continued lag is far from ideal. Moreover, the fact that a particular zip code contains one subscriber to a service does not necessarily indicate that the service is widely available.

More fundamentally, however, I am concerned about the transmission speed of the services that are available to most subscribers. In making our determinations of the availability of "advanced telecommunications capability," we measure the deployment of services that offer transmission speeds of at least 200 kbps. Many argue that Internet access services at such speeds are merely transitional and that true broadband services should be defined at a much higher speed. As we acknowledge, many of the most exciting applications, such as video-on-demand, require transmission speeds significantly in excess of 200 kbps. There are strong arguments that such applications, or others that require higher speeds, offer the kind of content that consumers

truly demand, and will ultimately drive much higher adoption rates. I thus am pleased with this report's recognition that the speed at which we define "advanced telecommunications capability" is an evolving measure and particularly support the report's commitment to reevaluate the appropriate transmission speed in the future. I expect that in the next 706 inquiry, we will ask more in depth questions on the appropriate transmission speed that should mark "advanced telecommunications capability" and will seek specific information on the deployment of and subscription to higher speed services.

In the mean time, I believe that government, at all levels, should continue to play an important role in promoting broadband. While I am cautious of avoiding industrial policy, I think the government can, and should, focus on removing barriers to infrastructure investment and eliminating disincentives to deployment, both financial and regulatory.

For example, I believe the government should commit to exercising self-restraint in placing financial burdens on broadband. Currently, at every level, government too often sees broadband deployment as a potential revenue stream. Telecommunications services are subject to federal and state excise taxes – the kind of taxes traditionally reserved for *decreasing demand* for products such as alcohol and tobacco. New entrants to the broadband market face federal, state, and local rights-of-way management fees and franchise fees, which are sometimes intended to generate revenue rather than recover legitimate costs. All of these financial burdens discourage deployment and should be minimized.

Government should also endeavor to remove regulatory underbrush – burdensome regulations that may no longer serve compelling purposes. Some state and local governments – and the federal government with respect to federal lands – maintain onerous permitting processes for rights of way, zoning, and tower siting, which may be significant impediments to new entrants' ability to provide broadband. I am pleased to say that some states have begun to address these problems. For example, the Michigan Public Service Commission evaluates how open Michigan local communities are to broadband deployment, including the time it takes them to provide rights-of-way permits and the amounts they charge in franchise fees. I hope that this kind of effort to spotlight local communities that may be impeding deployment and those that are facilitating it will spur all officials to take a more critical look at their existing regulations.

Moreover, we need to focus not only on changing our regulations, but also on changing the regulatory environment. Regulatory uncertainty and delay function as entry barriers, limiting investment and impeding deployment of new services. We should work to be faster and more reliable in our decisionmaking and in our enforcement efforts. Prolonged proceedings, with shifting rules, ultimately serve no one's interest, regardless of the substantive outcome.

Finally, at the Commission, we need to place a high priority on facilities-based competition. In the past, the Commission adopted a framework that may have discouraged facilities-based competition, allowing competitors to use every piece of the incumbents' network at super-efficient prices. This regime creates significant disincentives for the deployment of new facilities that could be used to provide broadband. Under such a regime, new entrants have little incentive to build their own facilities, since they can use the incumbents' cheaper and more quickly. And incumbents have little incentive to build new facilities, since they must share them with all their competitors. Under the current Chairman, we have begun several important proceedings that may change this regime. In particular, we will examine how our unbundling

and/or pricing rules should apply to incumbent deployment of new facilities. Nevertheless, there is still significant work to be done. I look forward to working on these issues and hope to ensure that advanced telecommunications capability continues to be deployed on a reasonable and timely basis.