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TELECOMMUNICATIONS

Technological and Regulatory Factors Affecting Consumer Choice of Internet Providers

GAO

Accountability * Integrity * Reliability

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Abbreviations

AOL	America Online
BOC	Bell Operating Company
CMTS	cable modem termination system
CRTC	Canadian Radio-Television and Telecommunications Commission
DSL	digital subscriber line
DSLAM	digital subscriber line access multiplexer
FCC	Federal Communications Commission
ISP	Internet service provider
kbps	kilobits per second
LATA	local access and transport area
LMDS	local multipoint distribution service
MMDS	multichannel multipoint distribution service
NTIA	National Telecommunications and Information Administration
PC	personal computer
RUS	Rural Utilities Service
TCP/IP	Transmission Control Protocol/Internet Protocol
TELRIC	total element long-run incremental cost
UNE	unbundled network element

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Accountability * Integrity * Reliability

United States General Accounting Office
Washington, D.C. 20548

October 12, 2000

The Honorable Mike DeWine
Chairman
The Honorable Herb Kohl
Ranking Minority Member
Subcommittee on Antitrust, Business Rights
and Competition
Committee on the Judiciary
United States Senate

Often described as a "network of networks" that forms a worldwide information infrastructure, the Internet is expected to become a primary medium for communications, commerce, education, and entertainment in the 21st century. As the Internet becomes a growing force in daily life, the degree of consumer choice among Internet providers has emerged as a key public policy issue. For an American consumer today, gaining access to the Internet usually involves obtaining service from two types of companies. The first is a provider of physical transport—a telephone, cable television, or wireless communications company—that supplies a physical connection over which data are transmitted from the consumer's home computer to the provider's facilities. Users typically already have such a connection for phone or cable TV services. The second type of company is an Internet service provider (e.g., America Online, Earthlink, Excite@Home) that provides a pathway or "on-ramp" from a transport provider's facilities to the Internet. Although the majority of Americans currently access the Internet over a telephone line and subscribe separately to an Internet service provider, integrated Internet services offered by cable companies are becoming increasingly prevalent, and various wireless methods of Internet transport are also expected to become popular in the next few years.

Because of your interest in the degree of choice consumers have among communications companies providing physical transport to the Internet and among Internet service providers, you asked us to report on (1) the current distribution of transport modes among consumers and the key technological differences among communications networks used for transport to the Internet; (2) the legal and regulatory differences in how these providers are governed; (3) whether these technological, legal, and regulatory differences are affecting the development of consumer choice of communications companies providing physical transport to the Internet and Internet service providers, and if so, how; and (4) the extent to which users have full access to and choice of portals (e.g., Yahoo, Lycos), applications (e.g., e-mail), and content (i.e., information sources) and whether this access or choice is affected by users' selection of physical transport provider, Internet service provider, or other factors. You also asked us to examine whether narrowband and broadband Internet access are in separate economic markets and, if so, whether the cable industry dominates the broadband market.[1] A discussion of this latter issue is in appendix II. A discussion of wireless Internet access modes is provided in appendix III.

[1]FCC defines services with a transmission speed of 200 kilobits per second (kbps) in one direction as "high speed." It defines services capable of delivering a speed of 200 kbps or more in both directions as "advanced services" or as having "advanced telecommunications capability." We use the term "broadband" to refer to services of both types.

To respond to your request, we interviewed a variety of experts, including representatives of telephone companies, cable companies, wireless companies, Internet service providers, portal providers, content providers, communications equipment and software manufacturers, and industry trade associations. We also interviewed experts from financial investment firms and consulting firms, as well as academicians specializing in communications. In addition, we interviewed officials of 10 municipal franchising authorities, the Federal Communications Commission (FCC), the National Telecommunications and Information Administration (NTIA), and the Canadian Radio-Television and Telecommunications Commission. We also contracted with a market research firm to survey a randomly selected group of Internet users and ask questions about their Internet usage and their selection of providers.[2] Finally, we reviewed relevant laws, FCC proceedings, court decisions, and industry studies. See appendix I for more detailed information on our research methodology, including a detailed discussion of our survey of Internet users. A glossary of terms is included at the end of this report.

Results in Brief

Because the telephone networks and cable systems that provide consumers with physical transport to the Internet were originally designed to provide different services—voice or video communications—they differ technologically in several respects. Although U.S. households most often use conventional telephone lines for Internet transport, these lines offer relatively slow data transmission speeds. While the use of a new technology over telephone networks can provide transport to the Internet at higher speeds, at this time this technology generally can only serve consumers living within a few miles of their telephone company's facilities. Cable television systems also can offer customers physical transport to the Internet at high speeds, but the speed can degrade when many customers simultaneously use the cable system for transport to the Internet. The adoption of these high-speed transport technologies by Internet users has grown rapidly over the past few years, as evidenced by our finding (based

[2]The survey results in this report represent the responses from a panel of Internet users intended to be representative of Internet users in the United States who are at least 18 years old. However, because the panel consisted of users who volunteered to be surveyed about their Internet use, it may represent a set of users that is somewhat more sophisticated than the general Internet user population. We will be publishing a more detailed report on the results of our survey of Internet users in early 2001.

on our survey) that, as of May 2000, 12 percent of Internet users had a broadband connection.

Laws and regulations devised to govern these different networks were generally tailored to the specific services each network originally supported. Hence, at this time, different types of communications providers are held to different rules when providing physical transport to the Internet. The public telephone networks are governed by a complex web of regulations requiring them to provide nondiscriminatory access to their networks at just and reasonable rates for telephone service and Internet access. Cable companies are not covered by such obligations when providing cable services, but considerable controversy exists over whether physical transport to the Internet over the cable network should be defined as a cable service or whether it should fall under a different regulatory framework, such as that applied to the telephone network.

As a consequence of both technology and regulation, consumers who use the telephone network as a means of physical transport to the Internet may have a choice of transport provider and generally have significant choice of Internet service provider (ISP). Conversely, consumers who use the cable network (or perhaps wireless networks) for transport to the Internet generally find themselves automatically connected to an ISP affiliated with or chosen by the transport provider. In the next few years, consumers are likely to have wider choice of communications companies providing physical transport to the Internet, but the same may not be true for their choice of ISP. As a growing number of Americans move to technologies that use nontelephone networks to gain fast transport to the Internet, they may automatically obtain ISP service from the particular ISP or ISPs chosen by their transport provider.

Consumers generally have broad access to Internet portals, applications, and content, either from their ISP or directly from the Internet itself, regardless of the transport provider or ISP they have chosen. However, we did find that ISPs can influence consumers' selection of content because consumers can quickly and easily access content that ISPs prominently display on their home pages. Our survey indicated that infrequent users of the Internet were most likely to rely on ISP-provided features and functions and, therefore, these users are most likely to be influenced by their ISP's selection and display of content.

As anticipated for some time, "convergence" is occurring in the telecommunications industry. Varied communications providers are

redesigning or upgrading their networks to provide Internet access—a relatively new service—and ultimately many traditional communications services will flow over the Internet. However, even with passage of the Telecommunications Act of 1996, communications law retains a "stovepiped"—or compartmentalized—structure under which each traditional communications service is governed by particular laws. Significant debate exists over what laws and regulations apply to certain providers of Internet transport and whether, when providing this service, all providers should be held to the same rules despite fundamental differences in network technologies. These issues highlight how the once sharp demarcations that defined types of communications providers and the services they offered are fading. As these distinctions continue to blur, additional complex issues surrounding the governance of the communications industry are likely to arise.

We provided a draft of this report to FCC, NTIA, and the Department of Justice for their review and comment. FCC and NTIA officials stated that they were in general agreement with the facts presented in the report and provided technical comments that were incorporated as appropriate. The Department of Justice did not comment on the report.

Background

The development of the Internet began in the late 1960s through government-funded projects to demonstrate and perform "remote access data processing," which enabled researchers to use off-site computers and computer networks as if they were accessible locally.[3] Although these networks were initially intended to support government and academic research, when their public and commercial value was realized, they were transformed into the medium known today as the Internet.[4] In addition to the privatization of these networks and the construction of new networks, advances in computing technology fostered the Internet's growth. For example, a "hypertext" programming system, which automatically links digitized text to other information sources, made possible the information retrieval method known as the World Wide Web. Advancements in the processing capability of personal computers and the development of "browser" software also greatly facilitated public use of the Internet. By the mid-1990s, a major surge occurred in Internet use that continues unabated today. According to one research firm, the number of Internet users (both at home and work) in the United States grew from 27 million in 1996 to over 86 million today.[5]

The means by which American consumers gain access to the Internet from their homes[6] is relatively simple, beginning first with the purchase of a desktop computer, laptop, wireless device, or Internet appliance.[7] A consumer then needs service from two types of providers: (1) a

[3]The two most prominent of these projects were ARPANET, funded by the Department of Defense's Advanced Research Projects Agency, and NSFNET, supported by the National Science Foundation. For further discussion of the development of the Internet see our recent report, *Department of Commerce: Relationship With the Internet Corporation for Assigned Names and Numbers* (GAO/OGC-00-33R, July 7, 2000).

[4]The Internet employs a form of transmission known as "packet switching," in which streams of digital data signals are split into separate pieces or "packets," routed over the most efficient available pathway, and reassembled at their destination point. Because there is an open protocol known as TCP/IP—or the Transmission Control Protocol/Internet Protocol—which was introduced in 1973 as the ARPANET was developing, all types of computers can interconnect at many different points along the Internet.

[5]MRI, *CyberStats*, Spring 2000.

[6]This report focuses on residential consumers' Internet use. As one expert we spoke with noted, the majority of Internet traffic consists of business use.

[7]An example of an Internet appliance is a set-top device enabling a television set to be used to access the Internet (such as WebTV) instead of a personal computer (PC). In the future, many such non-PC devices for Internet access are expected to come to market.

communications company providing a means of physical transport to the Internet and (2) an ISP.

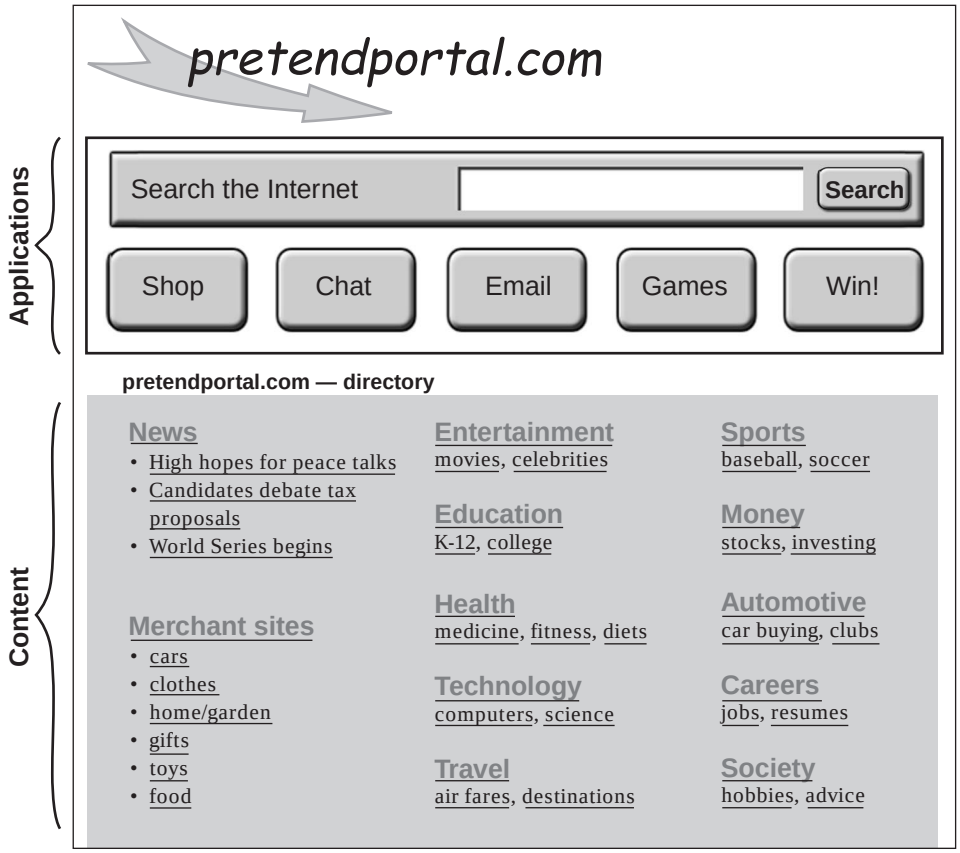
- A communications company providing physical transport to the Internet—for example, a telephone or cable television company—provides a physical connection from a computer at the consumer's home to the provider's network (and, ultimately, to an ISP). The "bandwidth," or transmission capacity of connections, varies: A "narrowband" connection, such as that provided by a conventional telephone line, offers limited transmission capacity, resulting in relatively slow speed; a "broadband" connection, such as that provided by cable modem service or by a telephone technology known as digital subscriber line (DSL),[8] has greater transmission capacity, giving the user higher speeds and the ability to easily access more sophisticated forms of Internet content, such as video and audio.
- An ISP is the consumer's link or "on-ramp" to the Internet. As the initial destination of the physical transport provided to consumers by their communication companies, ISPs have servers, routers, switches, and other equipment necessary to transmit traffic to and from the long-haul networks—known as the Internet "backbone"—which connect the computer and communications networks that are part of the Internet. ISPs differ in the features and functions they offer to subscribers. While some only provide a link to the Internet and an e-mail application, others have additional applications and direct links to content on the ISP's home page—the first Web page that users see when they access the ISP.

In most cases today, consumers already subscribe to conventional voice telephone service or cable television service, so the consumer does not need to establish service with a separate company to gain physical transport to the Internet. Most consumers then subscribe separately to an ISP. However, transport and an ISP are sometimes sold as an integrated package by cable television companies. Wireless providers are also expected to sell integrated transport and ISP service in the near future.

[8]Although there are many forms of DSL technology, all fall into two general categories—symmetric (designed to provide the same maximum upstream and downstream transmission speeds) and asymmetric (providing faster downstream than upstream transmission speeds). Asymmetric DSL is the most common form of DSL for the residential market.

Once a consumer establishes a physical connection and subscribes to an ISP, he or she may use a variety of features and functions—portals, applications, and content—provided either on the ISP's home page or available on the Internet. Figure 1 depicts a typical portal Web page that includes links to various applications and content.

Figure 1: Representation of a Typical Portal Featuring Applications and Links to Content



- A "portal" is a Web page that provides a search engine or subject directory to enable users to search the Internet for desired Web pages and content. Some portals also provide direct links to specific content and applications, such as e-mail, or may be targeted for specialized uses.
- "Applications," as used in this report, means tools designed to let Internet users perform various online tasks. These applications include e-mail, chat rooms (electronic communications among numerous

users), instant messaging (messages sent and received instantaneously between two users), file transfer capabilities, and Web page hosting (enabling a user to build and maintain a personal Web page). Applications are provided by most ISPs and are also available on many Web pages that users can access over the Internet.

- "Content," as used in this report, refers to the information contained in the over 1 billion Web pages posted on computer servers around the world and to other resources users access when connected to the Internet. Some ISPs' home pages and many other Web pages have direct links to popular content such as news, weather, and sports information; research sources; and online merchants.

Consumers' Use of Broadband Transport Is Increasing; Different Networks Have Various Strengths and Weaknesses

Our survey of Internet users found that about 12 percent[9] of people who access the Internet do so over a broadband connection. Given previous estimates of Internet use, it appears that broadband access has grown rapidly in the past couple of years. The traditional designs of the telephone and cable networks are fundamentally very different: The telephone network provides a dedicated line to each user's home, while the cable network provides a shared network to a set of users. Because of the technological differences of these networks, they have particular strengths and weaknesses for providing transport to the Internet. (This report focuses most closely on telephone and cable provision of Internet transport because these methods are the most used today. App. III discusses wireless methods—which are likely to become very important in the coming years.)

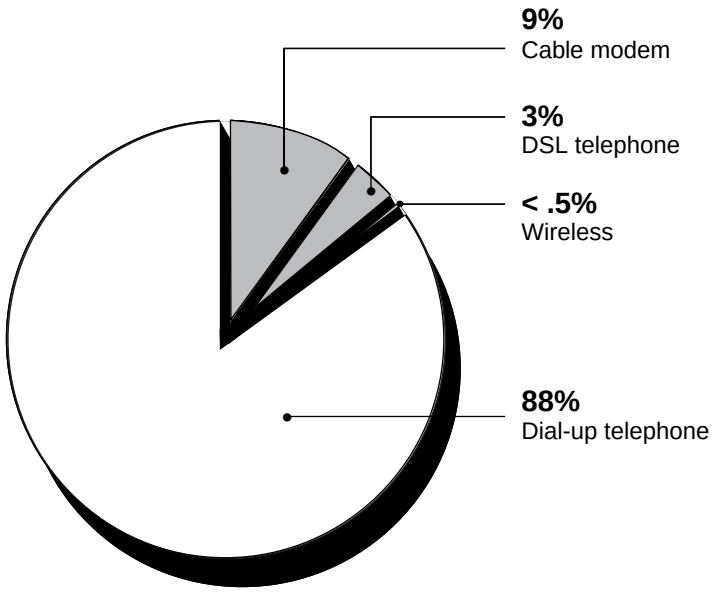
[9]Unless otherwise indicated in the text, the sampling error for percentages presented in this report is plus or minus no more than 5 percentage points.

Approximately 12 Percent of Internet Users Have Broadband Transport to the Internet

According to our random survey of Internet users, the conventional telephone line is the most common method of transport to the Internet, with about 88 percent of respondents using conventional narrowband telephone transport. Twelve percent of the respondents have a broadband method of transport to the Internet—9 percent using cable modem service, and 3 percent using DSL telephone service. However, broadband transport provided by both telephone and cable companies is becoming an increasingly popular form of transport to the Internet. Two analysts' reports note that as recently as 1998, only about 2 percent of users subscribed to a broadband service.[10] This considerable difference suggests a recent substantial increase in broadband subscribership. Figure 2 presents a distribution of the current means of physical transport to the Internet based on our survey results.

[10]Merrill Lynch and Company, *Internet/e-Commerce: The Quarterly Handbook: Q1 2000* (New York, N.Y.: 1999), p. 67, and Morgan Stanley Dean Witter and Company, *The Internet Data Services Report* (New York, N.Y.: 1999), p. 20. Variations in the results between these studies and our own may be attributable to methodological differences. Our study examined only the means of physical transport to the Internet from residences.

Figure 2: Distribution of Physical Transport Modes Used by Consumers From Their Homes



Source: GAO's Random Survey of Internet Users as of April-May 2000.

Notes: The percentages total more than 100 percent because of rounding. The survey results in this report represent the responses from a panel of Internet users intended to be representative of Internet users in the United States who are at least 18 years old. However, because the panel consisted of users who volunteered to be surveyed about their Internet use, it may represent a set of users that is somewhat more sophisticated—and thus possibly geared more toward broadband—than the general Internet user population. The following 95-percent confidence intervals apply to the percentages in the figure: dial-up telephone (84.6-90.4), cable modem (6.4-11.4), DSL telephone (1.7-4.8), and wireless (0-1.0).

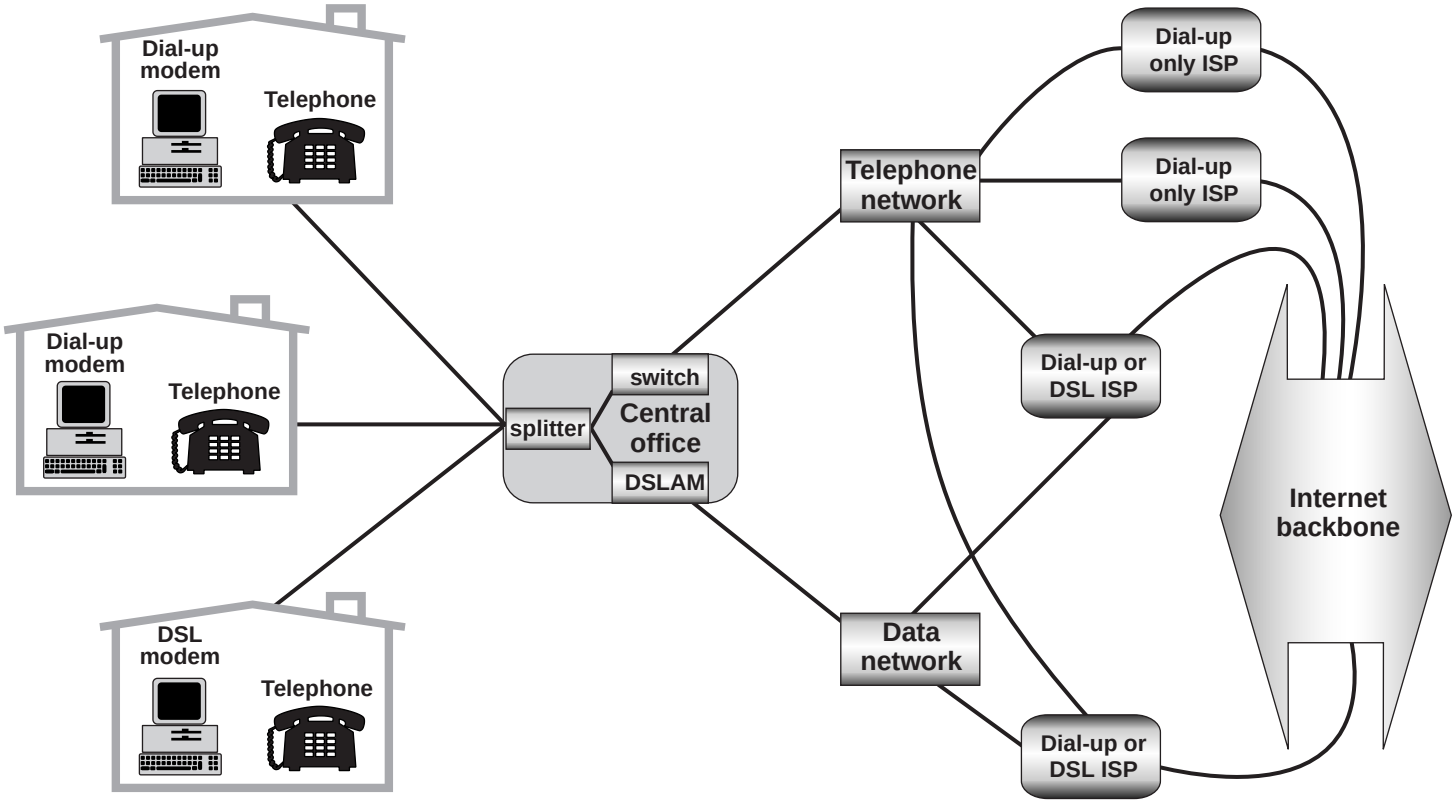
Telephone and Cable Networks Have Fundamentally Different Designs

The telephone network was originally designed in a star configuration with each customer connected by a dedicated line—a twisted pair of copper wires—to a central office facility (see fig. 3).[11] This design was considered an efficient and secure means to enable all customers connected to the telephone network to make voice calls to any other customer on the network. The ubiquity of the telephone network throughout the United

[11]As the telephone network is updated, some aspects of the network are becoming "shared." In particular, telephone companies are deploying more optical fiber from central offices to "nodes" from which copper wires run to individual customers. In this case, the optical fiber portion is a shared medium.

States is illustrated by FCC's estimation that 94 percent of U.S. households had basic dialtone telephone service in 1999.

Figure 3: Star Configuration of the Telephone Network



Note: A switch is a piece of equipment in a telephone company's central office facility that routes telephone signals between users.

Using a conventional telephone line to obtain narrowband transport to the Internet, a consumer connects the modem[12] in (or attached to) his or her computer to the household telephone line and dials the number of an ISP from the computer. The signals generated by the call travel over the customer's line to a telephone company's central office facility, where they are routed through the telephone network to a line serving the customer's

[12]A modem is an electronic device that allows computers to send and receive data.

ISP. Once connected to the ISP, the customer will be able to use the ISP's services, including a link to the Internet. As with voice calls, the lines and network resources that route the data from the customer's computer to the ISP remain dedicated for the duration of the call and cannot be used for other calls.

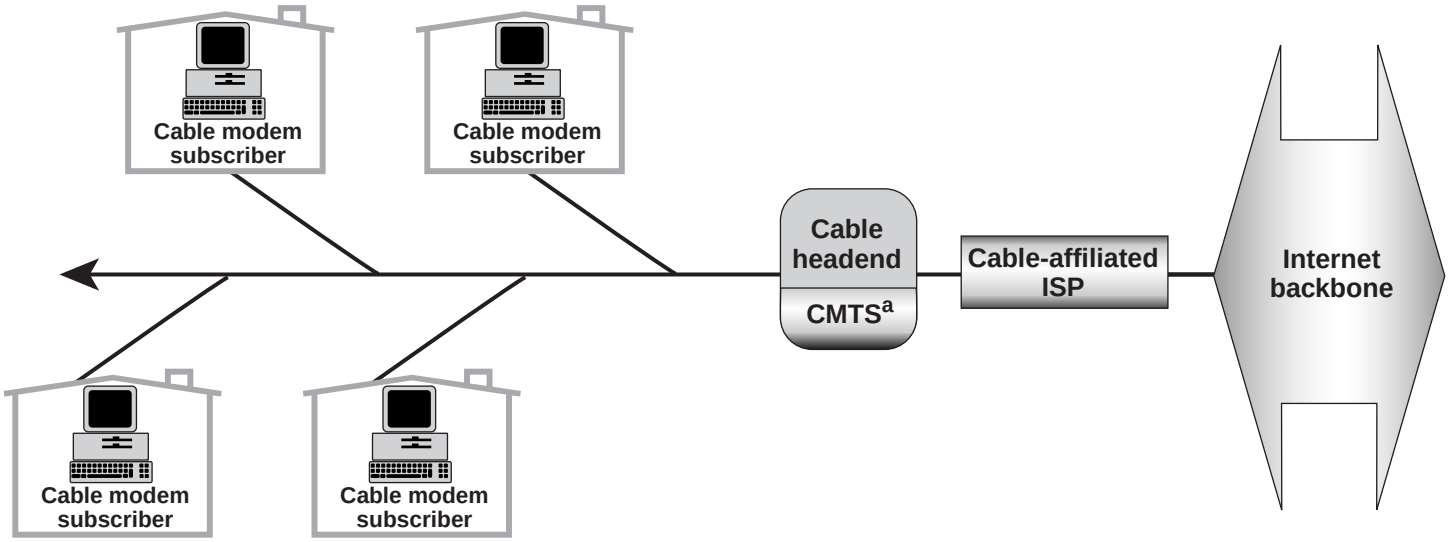
To respond to users' demands for higher speed and an Internet connection that is "always on"—meaning there is no need to dial the ISP to establish an Internet connection—telephone companies adapted an existing technology known as DSL[13] to offer broadband services over existing telephone lines. With DSL, data signals are transmitted over the high-frequency portion of the copper telephone line—a portion of the line that is not needed for transmitting voice signals. DSL technology thus allows telephone companies to exploit this otherwise dormant capacity and provide both voice and data signals simultaneously over the same telephone line. Because DSL requires that telephone lines be in good condition, telephone companies must evaluate each line to determine if imperfections could degrade DSL service and, if so, make the necessary line upgrades. In addition, equipment must be installed at both ends of the DSL line to support broadband transmissions. At the customer's premises, a splitter must be installed to separate the voice and data signals, and a DSL modem must also be installed (or already integrated within the user's personal computer). At a telephone company facility, a splitter and digital subscriber line access multiplexer (DSLAM) must be installed to identify voice and data signals, route voice traffic to the public telephone network,[14] and transmit data signals to the data network from which the customer's ISP takes traffic.

[13]For a more detailed discussion on the development of DSL, see our recent report, *Telecommunications: Issues Related to Local Telephone Service* (GAO/RCED-00-237, Aug. 31, 2000).

[14]Going downstream (toward the user), the splitter combines the voice signal from the traditional telephone company switch with the data signal from the DSLAM and sends the combined signal over the copper wire to the customer.

The design of the cable network differs from that of the telephone network largely because of its original purpose—the one-way transport of video signals. As such, cable networks were designed in a "tree and branch" configuration with a single source transmitting video programming signals to a dispersion of customers (see fig. 4). On a cable system, video signals transmitted by satellites and broadcast television towers are received at a cable company facility known as a headend.[15] These video signals are then packaged together and sent simultaneously from the headend over coaxial cables to subscribers' premises. Unlike the telephone network, the cable network does not provide a dedicated line from the headend to each customer's premises. Rather, the tree and branch structure provides a shared medium among subscribers in which a given amount of capacity is available to a group of subscribers. In the context of Internet use, if certain subscribers use very large amounts of bandwidth during an Internet session, less bandwidth will be available to other subscribers at that time. This shared usage requires the cable operator to expend resources managing the capacity of its network.

Figure 4: Tree and Branch Configuration of the Cable Television Network



[15]A headend is a facility that originates and distributes cable service in a geographic area. Depending on the size of the geographic area the cable company serves, the company could have several headend facilities within a cable system.

[a]A CMTS, or "cable modem termination system," is a data-switching system designed to route data between cable modem users and the Internet.

Many cable companies are upgrading their networks in a variety of ways to offer subscribers a greater number of video channels as well as to provide two-way services such as broadband Internet service. To provide Internet service, cable companies must dedicate transmission capacity that would have been used for one or more video channels.[16] At the customer's premises, a device known as a cable modem is attached to the cable wire and then to the customer's computer. Cable companies have also invested in certain ISPs—such as Excite@Home and Road Runner—and have integrated physical transport with the ISP functions. Thus, cable modem subscribers purchase a "bundled" transport and ISP service. This contrasts with the telephone network, where users generally purchase ISP service separately from their transport service.

Different Networks Providing Transport to the Internet Have Various Strengths and Weaknesses

According to the experts and industry officials we interviewed, telephone and cable networks have various strengths and weaknesses when providing transport to the Internet because of the differences in their technological designs (see table 1). For example, the strengths of narrowband telephone service for transport to the Internet include the ubiquity of the public telephone network and the low incremental cost to consumers for the service.[17] However, narrowband telephone service provides limited capacity, so transport speeds are slow, and users must "dial up" their ISP each time they want to initiate an Internet session. By contrast, both DSL and cable modem services offer higher speeds and provide an "always on" Internet connection (no dial-up is needed). However, DSL can at present only serve users living within about 3 miles of a telephone company's central office facility, and cable modem service does not provide a dedicated line, which results in degraded speeds when many customers are simultaneously using the shared capacity.

[16]Typically, one or two channels are assigned for downstream traffic from the headend to the customer, and one channel is reserved for upstream traffic from the customer to the headend. If a cable network providing Internet access has not upgraded its facilities to allow two-way services, a telephone line is used for upstream traffic.

[17]Consumers using dial-up telephone service for transport to the Internet can establish Internet service at no additional cost if they do not purchase a second telephone line and if they select a free ISP. In our survey of Internet users, 10 percent of dial-up users reported that they incurred no incremental monthly cost to gain Internet transport and service. Almost half of dial-up users reported spending $20 or less per month on these services.

Table 1: Strengths and Weaknesses of Dial-Up Telephone, DSL Telephone, and Cable Modem Services for Transport to the Internet

	Strengths	Weaknesses
Dial-up telephone service	Ubiquity of telephone network Low price Dedicated line Ease of connecting the computer Reliability of the telephone network	Slow speed Dial-up required for each session; connection may not be possible at times Unavailability of telephone line for voice calls if only one phone line is purchased
DSL telephone service	High speed Dedicated line “Always-on” connection Line can be used for simultaneous access to Internet and voice calls	Requires close customer proximity to telephone facilities Higher price than dial-up telephone service, and additional installation fees
Cable modem service	High speed “Always-on” connection Cable lines can be used for simultaneous access to Internet and cable television programming	Degraded speed as more users go online Security concerns about shared network Higher price than dial-up telephone service

Laws and Regulations Were Written When Specific Communication Services Aligned With Specific Networks

The legal and regulatory differences in the treatment of telephone and cable providers stem from the different communications services—voice and video, respectively—that these networks were originally designed to provide. Voice and video services are treated separately under the Communications Act of 1934; no separate title of the law addresses Internet services.[18] Telephone carriers have long been treated as “common carriers” and required to provide nondiscriminatory access to their networks. When data services began to flow over the telephone network, this common carrier approach was also applied to the transport of data. Cable operators are not treated as common carriers when providing a cable service. Considerable debate and confusion exists about whether cable modem service is appropriately considered a cable service or should be considered some other type of a service to which specific laws might be applicable. (See apps. IV and V for more detailed discussions of the laws and regulations governing the telephone and cable networks.)

[18]However, section 706 of theTelecommunications Act of 1996 directs FCC and relevant state commissions to encourage the deployment of “advanced telecommunications capability” to all Americans through several means, including regulatory forbearance or “regulating methods that remove barriers to infrastructure investment.”

The Stovepiped Structure of the Communications Act of 1934

The Communications Act of 1934 was originally crafted by combining separate statutes regulating distinct services—telephone voice service and radio broadcasting—and as such, the law was originally structured in a "stovepiped"—or compartmentalized—fashion in which each traditional communications service was governed under particular provisions of the law. The Telecommunications Act of 1996 amended the 1934 act with the primary aim of promoting competition in all communications sectors. Many analysts envisioned that convergence in the industry would occur as different types of carriers entered each others' traditional service markets. However, the stovepiped regulatory structure, with separate titles governing telephone (common carrier), cable, and radio (wireless) services, was largely left intact. While telephone and cable companies have entered each others' traditional service markets to some extent, a primary focus of competition has turned out to be in the provision of Internet services—a relatively new service market that is not governed by a separate title of the Communications Act.

Telephone Laws and Regulations

Even preceding the enactment of the Communications Act of 1934, the nation's telephone companies were treated as "common carriers" under the law, being required to provide voice telephone service to customers on request within their service areas on a nondiscriminatory basis at just and reasonable rates. Nearly 40 years ago, as data signals began to flow over the public telephone network, FCC began contemplating the regulatory treatment of these data transmissions. The Commission determined that while the physical transport of data over the telephone network should be regulated under the same common carrier approach used for voice traffic, the data-processing or computer-enhanced functions themselves should be left unregulated. This distinction between "telecommunications services" and "information services"[19] was carried forward in various FCC rules and in court proceedings and, according to FCC, was codified in the Telecommunications Act of 1996. ISPs are generally only providers of "information services" and thus not regulated by FCC.

As the first comprehensive amendment to the Communications Act of 1934, the 1996 act made further statutory changes that have become important to the provision of Internet services. Specifically, in an effort to promote

[19]FCC originally referred to telecommunications services as "basic" services and to information services as "enhanced" services.

competition for local telephone service, the 1996 act and the implementing rules issued by FCC require incumbent local telephone companies to resell their service to competitors at wholesale rates and to sell unbundled network elements (UNE)—designated piece parts of the telephone network—to competitors. The new law and FCC rules have resulted in the emergence of numerous competitive companies that have begun to offer consumers new choices for providers of local telephone service—and, thus, choices also for providers of physical transport to the Internet. Moreover, these rules do not apply only to narrowband telephone services. FCC has ruled that the high-frequency portion of the telephone line—the portion used to provide DSL service—is a UNE and must be made available to competing telephone companies.

Cable Laws and Regulations

The federal laws and associated FCC regulations governing cable systems differ substantially from those governing the telephone industry. For example, the history of cable laws and regulations is shorter, and primary authority is generally exercised in local jurisdictions. The first federal law governing the provision of cable services was enacted in 1984, explicitly bringing the cable industry under the regulatory control of both FCC and local municipal franchising authorities.[20] The law states that cable companies providing "cable services" are not to be treated as common carriers, and few limitations are placed on cable companies' control over the video programming carried on their systems.[21] However, under certain circumstances, FCC could promulgate additional rules necessary to provide diversity of information sources.[22]

[20]Local franchising authorities grant cable franchises and allow cable operators the rights to lay cable under city streets and use other public rights-of-way.

[21]Cable operators' control over content does have some regulatory limitations. For example, the "must carry" rules can require cable systems to carry local broadcast stations, and the franchising authority may demand a certain number of cable channels be set aside for public access, educational, and government uses.

[22]47 U.S.C. 532(g). In a recent notice of inquiry, the Commission is asking whether these circumstances exist (*In the Matter of Annual Assessment of the Status of Competition in Market for the Delivery of Video Programming*, CS Docket No. 00-132, Notice of Inquiry, FCC 00-270 (released Aug. 1, 2000) at paragraph 8).

The question of whether data services provided over a cable system—such as cable modem service—are governed by any existing laws and regulations hinges on whether an existing legal service definition is applied. Much debate exists over whether the definition of a "cable service"—first included in the 1984 Cable Act and later modified in the Telecommunications Act of 1996—includes cable modem service.[23] The differing views over the correct definition of cable modem service have been expressed primarily within the context of the debate over "open access." An open access policy would require that nondiscriminatory access to the cable network be provided to ISPs that are not affiliated with the cable company, so that they can offer their own Internet services to cable modem subscribers. Cable operators have consistently argued against open access mandates. The debate is highly contentious, with some parties claiming that the very nature of the Internet lies at the heart of the dispute.

There has been disagreement both between and among proponents and opponents of open access policies about what service definition should be applied to cable modem service—that is, whether it is a "cable service," a "telecommunications service," or an "information service." Each definition would apply a different regulatory framework to cable modem service. (See app. V for a more detailed discussion of these definitions.) In addition to disagreements over the proper service definition of cable modem service, proponents and opponents of open access disagree over whether open access mandates amount to "regulating the Internet" and whether requiring open access would stifle investment in cable system upgrades. Opponents of open access mandates also point out that cable modem subscribers can already access nonaffiliated ISPs through the affiliated ISP and over the Internet. Proponents counter that this access is not equivalent in quality to that given to affiliated ISPs and that this method forces consumers to pay twice for an ISP.

FCC has noted that the appropriate service definition for cable modem service is an unsettled issue and has stated that the 1996 act did not provide a definitive answer to this question. However, a few municipal franchise

[23]"Cable service" is defined by law as "the one-way transmission to subscribers of video programming or other programming service together with subscriber interaction, if any, which is required for selection *or use* of such programming" (emphasis added). The words "or use" in the definition were added by the 1996 act. Interpretations of the meaning and implications of this change in the definition of a cable service vary. See app. V for a further discussion of this issue.

authorities have mandated open access under the presumption that cable modem service is a "cable service" and is, therefore, subject to the control of the franchise authority. Legal challenges to some of these decisions have led to inconsistent rulings by various courts on the ability of franchise authorities to regulate cable modem service and on whether cable modem service is a cable service, a telecommunications service, or an information service. The most definitive of these rulings to date came in June 2000, when the U.S. Court of Appeals for the Ninth Circuit held that cable modem service is not a cable service and further stated that it is a telecommunications service. (See app. V for a more detailed discussion of various court decisions.)

On September 28, 2000, FCC released a Notice of Inquiry to examine the issues surrounding the regulatory treatment of cable modem services.[24] In the notice, FCC seeks comment on the appropriate service classification of cable modem service, on whether open access is a desirable policy goal, and if so, what the most appropriate means are of achieving that goal. FCC also asks whether uniform requirements should be adopted to govern all providers of broadband Internet transport, such as wireless providers.

Consumers' Choices of Internet Providers Are Affected by the Technological and Regulatory Differences of the Transport Networks

Consumers' choice of companies providing transport to the Internet over the telephone network has been facilitated by the design of the telephone infrastructure as well as by the common carrier regulation of these companies. For the same reasons, consumers using the telephone network for transport to the Internet have many ISPs from which to choose. On the cable network, consumers generally purchase both the transport and ISP functions from the cable provider and must subscribe to a second ISP if they want to obtain particular content or applications from an ISP not affiliated with their cable company. Consumers' choice of communications companies providing transport to the Internet is expected to increase in the coming years as telephone, cable, and wireless providers roll out competing broadband services across many areas of the United States. However, because only telephone providers are required to offer nondiscriminatory access to their network, consumers who choose another transport mode may find their choice of ISPs limited.

[24] *In the Matter of Inquiry Concerning High-Speed Access to the Internet Over Cable and Other Facilities,* GN Docket No. 00-185, *Notice of Inquiry*, FCC 00-355 (released Sept. 28, 2000).

Telephone Network Technology and Regulations Facilitate Consumers' Choice of Transport and Internet Service Providers

The technology and regulations of the telephone industry facilitate consumers' choice of physical transport providers over the telephone infrastructure. As discussed earlier, the telephone network resembles a star configuration in which dedicated lines are routed from a central point to each customer. Recognizing that, from a technological standpoint, this configuration could enable more than one carrier to provide local telephone service, FCC rules implementing the 1996 act—in an attempt to enhance consumer choice—required incumbent telephone companies to allow competitors to resell services, lease UNEs, or offer DSL service through line sharing.[25] Although modest progress overall has been made by competitive local telephone companies in gaining market share for local voice telephone service,[26] FCC has reported that these companies were providing 20 percent of the total DSL lines in service as of February 2000.

The design features and ubiquity of the telephone network also have provided consumers broad choice of ISPs. Because both individual customers and ISPs are end-users of telephone service, data signals can be transported between a multitude of ISPs and their customers through interconnected telephone facilities. Just as a telephone customer can place a voice call to any other telephone on the network, no matter how far the distance, the customer can also place a data call from his or her computer to any ISP that is connected to the telephone network.[27] In addition, many of the industry participants and experts with whom we spoke told us that telephone laws and regulations were fundamental in promoting the development and growth of the ISP industry. The regulatory distinction between transport and data processing functions, combined with FCC's close regulation of telephone companies' participation in the data processing layer, led to the creation of new independent companies to

[25]However, some of those we interviewed told us that laws and regulations, such as line sharing and the restriction on the Bell Operating Companies' provision of long-distance data services are actually impeding deployment of DSL services.

[26]We reported in January 2000 that competitive local telephone companies serve 3 percent of local telephone lines. See *Telecommunications: Development of Competition in Local Telephone Markets* (GAO/RCED-00-38, Jan. 25, 2000). Similarly, the Association for Local Telecommunications Services reported in February 2000 that competitive local telephone companies service about 5 percent of local lines. In fact, many residential consumers today do not have a choice of local carriers. However, trends show local telephone competition is growing.

[27]To avoid per-minute long-distance charges while online, however, a consumer is likely to use an ISP that has a presence within the local calling area.

provide Internet services and also kept these ISPs largely free of regulation. Moreover, the common carrier status of telephone companies, which requires that they provide nondiscriminatory service at just and reasonable rates, worked to give ISPs easy access to consumers through the telephone network.

The Cable Network Facilitates Limited Consumer Choice of Transport and Internet Service Providers

The nation's cable systems, designed and built to provide television programming to residential consumers, generally do not offer consumers a choice of providers for transport to the Internet. Unlike the telephone network, where dedicated lines emanate from a central facility to each customer, cable customers share capacity from a principal distribution "trunk" in a cable system. Thus, potential competitors' ability to access customer-specific parts of the infrastructure, such as the equivalent of UNEs in the telephone network, is problematic. Moreover, there have been no requirements placed on cable companies to open their networks to competitors, as is the case in the telephone industry under the 1996 act. Thus, unless a second franchise has been granted in an area to an alternative cable company that offers cable modem Internet access service,[28] consumers will only have one choice of transport provider over a cable system.

[28]FCC reported in January 2000 that 210 communities across 28 states had awarded franchises to competitive cable systems—a second cable firm within a jurisdiction—from 1995 to 1999. One expert told us that, eventually, 25 to 35 percent of households might be passed by more than one cable system. Several of these companies are currently providing or soon plan to offer cable modem Internet services.

Cable systems also offer customers a limited choice of ISPs. Because cable systems have generally been built in a manner that integrates affiliated ISPs with cable access, nonaffiliated ISPs are not able to offer their service directly to cable modem subscribers. Regardless, the shared nature of the system would complicate the integration of multiple ISPs. That is, just as the cable provider must monitor consumers' "consumption" of the shared capacity, so it would have to monitor how a set of ISPs use the shared medium.[29] No federal requirements have thus far been placed on cable companies to provide ISPs with nondiscriminatory access to the cable platform. As such, a cable modem subscriber wishing to gain access to a nonaffiliated ISP's content and applications[30] must subscribe to a second ISP service and "click through" the cable system's affiliated ISP to get to the second ISP's site.[31] We were told, however, that accessing an ISP in this fashion may reduce functionality—in particular, speeds may be reduced when accessing content through the second ISP—compared with accessing content available from the affiliated ISP directly.

[29]Since many of the wireless networks will provide Internet transport over a shared network, the technical problems in providing access to multiple ISPs may apply to these companies as well.

[30]A consumer would not use a secondary ISP for the primary function that ISPs perform—access to the Internet—since such a service would be redundant. Hence, users would only subscribe to a second ISP to gain access to value-added features such as content and applications provided by the ISP.

[31]Consumers may be able to click directly to an alternative ISP by placing the ISP's icon on their desktops. However, functionally, they are still using the cable ISP to gain access to the Internet and are still accessing the secondary ISP through the Internet.

Considerable controversy has arisen over the inability of nonaffiliated ISPs to offer service to cable modem subscribers. In the past, FCC has stated that requiring cable companies to allow nonaffiliated ISPs access to the cable system to offer service is not necessary in this nascent stage of broadband deployment. Rather, Commission staff have stated that market forces should ultimately lead to a greater choice of ISPs for cable modem subscribers. Cable companies have, in fact, moved toward opening cable systems to multiple ISPs. The two largest cable operators, AT&T and Time Warner Cable,[32] have both announced technical trials over selected cable systems[33] to test the operation of multiple ISPs and to study such issues as billing and bandwidth allotment. Both companies are currently tied to their affiliated ISPs through exclusive contracts but have indicated that they plan to start offering cable modem subscribers a choice of ISPs when those exclusive contracts end.[34] However, such commitments have not averted controversy over the current lack of access by nonaffiliated ISPs to cable systems.[35] Moreover, litigation has ensued over various municipal franchise authorities' decisions to mandate open access for their particular cable systems. Decisions reached by various federal courts have so far generally held that municipal franchise authorities do not have the authority to place open access requirements on cable modem service,[36] but the courts have differed on whether the legal definition of "cable services" encompasses

[32]America Online (AOL) has proposed purchasing Time Warner in an all-stock transaction. The new company would be named AOL Time Warner, Inc.

[33]AT&T will test multiple ISPs in Boulder, Colorado, in late 2002; Time Warner Cable's technical trial is in Columbus, Ohio. Additionally, Time Warner has agreed to allow Juno—an unaffiliated ISP participating in the Columbus trial—to offer service throughout its cable systems beginning in late 2000.

[34]AT&T's exclusive contracts with Excite@Home expire on June 30, 2002. In a December 1999 letter to FCC Chairman William Kennard, AT&T expressed its intention to allow multiple ISPs to negotiate access to their cable systems, thus giving its customers some choice of ISPs. Time Warner's exclusive contracts with Road Runner expire on Dec. 31, 2001, although Time Warner has stated that it will restructure its Road Runner venture and might end the exclusive carriage arrangement prior to that date. A Memorandum of Understanding was issued in February 2000 setting forth commitments of AOL Time Warner to make multiple ISPs available to consumers on its cable systems.

[35]Nor have these promises averted controversy over whether the cable operators' version of open access—allowing subscribers to select among a few ISPs that have contracted with the cable operator—is true open access. Some argue that open access must mean access to any ISP that wants on the network, such as occurs in the telephone industry.

[36]The district court in *AT&T Corp. v. City of Portland* found the municipal franchising authority could mandate open access, but the court's decision was reversed on appeal.

cable modem Internet service. In September 2000, FCC opened a proceeding to examine these unsettled issues. (See app. V for a more detailed discussion of issues related to the open access debate.)

The complicated and as yet unsettled issue of open access largely stems from the structure of communications law wherein applying a particular service definition determines what laws and regulations apply to a communications service. But the appropriate application of these definitions has become fuzzy in the face of a converging industry. Other manifestations of this problem within the communications marketplace are likely to arise in the coming years. For example, FCC has noted that it is not yet ready to comment on the legal status of IP telephony—the emerging provision of voice services over the Internet. Still other potential issues will arise as communications providers use their networks in new ways. Experts with whom we spoke also noted that broadcasters may use part of the spectrum provided to them for digital television to provide data services, and electric companies may provide telecommunications services over their networks.

Consumers' Choice of Communications Companies Providing Transport to the Internet Will Likely Increase in the Coming Years, but the Choice of ISPs Could Decrease

The degree of consumers' choice of communications companies providing transport to the Internet will likely increase over the next few years, particularly as broadband Internet transport modes become increasingly available. Our analysis suggests that consumers are likely to adopt broadband technologies relatively quickly. According to our survey of U.S. Internet users, demand for broadband transport appears to exceed its availability at this time. In particular, we found that 19 percent of narrowband Internet users had made some attempt to obtain a broadband technology but were unable to do so. Common reasons cited for the inability to obtain broadband were the technical limitations of various broadband technologies and the absence of certain broadband services in some areas. Similarly, many experts and industry participants told us that consumers will migrate quickly to broadband transport modes as their availability increases.

In our survey, 55 percent of Internet users reported that they have at least one broadband transport option available to them now. For many consumers, the availability of competing forms of broadband Internet transport could become a reality relatively soon. Both DSL and cable modem service are being rolled out rapidly, according to current market data; numerous satellite providers are planning to launch Internet transport services in the near future;[37] and new wireless transport services are expected to begin operation soon. Yet, it also appears that as transport choices become increasingly available across the country, the choices available to any given user will depend on the area in which he or she lives and the economics of deploying those technologies in that area. For example, even though several experts told us that DSL service could eventually be available to 60 to 80 percent of American homes, that percentage will likely be lower in rural areas where, on average, customers live farther from telephone companies' central office facilities.[38] Despite the likely uneven dispersion of broadband availability, most experts and industry representatives that we spoke with told us that multiple forms of Internet transport will be available to consumers in many areas and that no one transport method will become so dominant that others will fail.

[37]A one-way satellite Internet service is currently available (customers must use a telephone connection for their return path), although our Internet user survey suggests that a majority of consumers (71 percent) are not familiar with this type of wireless service.

[38]In the report *Advanced Telecommunications in Rural America* issued in April 2000, NTIA and the Rural Utilities Service (RUS) concluded that broadband deployment in rural areas is occurring at a slower rate than in urban areas and that deployment of broadband services is less likely to occur in remote areas outside of rural towns than in such towns. NTIA and RUS attributed these trends to the economics of serving rural areas, but they indicated that DSL service, cable modem service, and emerging wireless Internet services hold the promise of serving rural areas at higher rates in the future.

Although consumers' choice of companies providing transport to the Internet is expected to increase, consumers' choice of ISPs could simultaneously diminish in the next few years. At present, there are approximately 7,000 ISPs in the United States.[39] One study issued in 1998 found that 92 percent of American consumers had seven or more ISPs to chose from in their local areas.[40] In large degree, the considerable consumer choice in the ISP market is related to the fact that most consumers obtain physical transport to the Internet over the telephone network. In the coming years, as consumers make the transition to alternative transport modes—those that are not readily designed to support multiple ISPs (such as cable and wireless networks) and that are not required by law or regulation to do so—consumers may find they have diminishing ISP choices. In particular, their choice may be limited to an ISP affiliated with their transport provider or to the set of ISPs that successfully negotiated a contract with the transport provider. In fact, our survey found that one of the reasons broadband users commonly cited for choosing an ISP was that, in effect, they had had no choice—the ISP came bundled with the physical transport service.

[39]Many of these serve only specific local or regional areas, so each consumer's choice of ISPs is actually much more limited, assuming the consumer wants to obtain service from an ISP that maintains facilities in the local area. One national ISP—America Online—has by far the largest market share in the ISP market.

[40]Tom Downes and Shane Greenstein, "Do Commercial ISPs Provide Universal Access?" in *Competition, Regulation, and Convergence: Current Trends in Telecommunications Policy Research*, eds. Sharon Gillett and Ingo Vogelsang (Mahwah, N.J.: Lawrence Erlbaum Associates, 1999), pp. 195-212.

The experts and industry officials we interviewed differed over whether a reduction in ISP choice—if it occurs—constitutes a public policy concern. Some experts felt that a highly competitive ISP market was not very important. In particular, several of these experts noted that the ISP market itself was an artifact of telephone regulations—that is, no specific policy was undertaken to promote the ISP market per se, but the market developed because of the particular manner in which the telephone network was structured and regulated.[41] Many of these experts stated that a reduction of consumer choice at the ISP layer is not a concern as long as there is adequate competition among companies providing physical transport to the Internet.[42] Others, however, expressed concern about potential concentration in the ISP market and suggested that consumers will be better served by having choices among both Internet transport providers and multiple ISPs. Several experts we spoke with also stated that ISP choice is important, in part, because of the changing nature of that industry. In particular, these experts noted that many ISPs are making a transition from providing only a simple "on-ramp" to the Internet to providing content and applications. A potential ramification of this transition is greater control by ISPs over what content is prominently displayed to consumers. Therefore, greater consumer choice among these "content aggregators" is seen by some as important because it can enhance consumers' access to varied content. Thus, these experts contend, if consumers dislike the content choices of particular ISPs, it is important that they have the option of "voting with their feet" by switching to any of several other ISPs that may provide alternative content choices.

[41]Specifically, telephone companies have been required to provide nondiscriminatory access to their network. Additionally, the Bell Operating Companies (BOC) were initially prohibited from providing information services under the 1982 AT&T consent decree. Although the BOCs are now allowed to offer information services, they still may not transport data (or voice) traffic across local access and transport area (LATA) boundaries originating in their service regions without FCC approval.

[42]FCC has stated in the past that no action was needed to promote open access since multiple means of gaining access to the Internet will be available to consumers.

Consumers Generally Have Substantial Choice of Portals, Applications, and Content; but Internet Service Providers Can Influence Those Choices

Despite the prospect for a decrease in consumers' choice of ISPs in the future, many market participants and industry experts we spoke with told us that consumers currently have, with few exceptions, full access to and broad choice of portals, applications, and content, both on the Internet and, in many cases, as part of their ISP subscriptions. There was wide consensus that ISPs generally have a strong competitive incentive to provide extensive access to features, functions, and content. Generally no limitations on access to portals were described to us. In terms of applications, some consumers may find they cannot use an application unless they register or pay a required fee and specific applications may only be available to subscribers of a particular ISP. For example, some chat rooms require users to register before participating in online conversations. As for content, with over a billion Web pages available on the Internet, consumers have access to enormous amounts of content.[43] However, consumers may not realistically be able to access certain "bandwidth-intensive" content, such as video materials, if they are using a form of narrowband transport that would make downloading such content prohibitively slow. Also, some consumers may actively choose to employ filtering technology to block access to particular types of content (such as pornographic material) or may be unable to access some content without first paying a fee or registering with a Web site.

[43]Industry data showed that, as of January 2000, approximately 72 million host computers were connected to the Internet. A host is any computer that has a unique Internet address and can provide information to visitors versus solely receiving information from other computers.

Although portals, applications, and content are widely available, some industry participants and experts told us that ISPs can influence consumers' choices of these items. For example, we were told that an ISP may place a particular portal, certain applications, and links to specific content on its home page—the first page a subscriber encounters when beginning an Internet session with the ISP—and that this placement may influence consumer choice. Such placement makes the features easy to find and quick to access because an ISP can employ a common technology known as a "caching." An ISP "caches" certain popular content by storing those files on its local server. When users click to access cached content—which will typically include items on the home page but also could include other content as well—it is accessible directly and quickly from the ISP's servers, and the user need not download the pages over the Internet.[44]

Some experts expressed concern about the ISPs' influence over consumers' choices. They noted that such influence may be subtle—consumers may not realize that they have come to prefer certain content as a result of its faster accessibility. Our survey findings indicate that users who access the Internet infrequently[45] may be the most influenced by the ISP's content placement. In particular, we found that these users spend a greater percentage of their Internet time—43 (plus or minus 7) percent on average versus 26 (plus or minus 6) percent on average for frequent users—on their ISP's home page.[46] Some experts also noted that consumers' loyalty to their ISPs might strengthen the ISPs' influence. In particular, we were told that there are nonfinancial "costs" to consumers when they switch ISPs. For example, consumers' e-mail addresses change whenever they switch ISPs, and they lose the familiar applications or specific content made available by their former ISP.[47]

[44]Because consumers may come to prefer cached content, caching can also have an effect on the content provider market. In particular, content providers have an incentive to negotiate contracts to place their content on ISPs' home pages.

[45]We are defining an "infrequent user" to be one whose household's online usage is less than 10 hours per week, while a frequent user is one whose household's online usage is 40 hours or more per week.

[46]The Precursor Group recently reported that some industry sources have stated that nearly three quarters of the content that users view had appeared on their ISPs' home pages.

[47]These problems may be mitigated for consumers who do not use their ISP-provided e-mail service.

Other experts expressed little concern about the ISPs' influence on consumers. We were told that users could easily customize a home page, opting to not even use the ISP's home page.[48] Similarly, as users move to always-on connections, they will be less likely to begin a session on the home page itself and more likely to begin with whatever page they ended their previous session on. Moreover, a few experts noted that the ISPs' influence is mitigated by the consumers' ability to switch their ISP service. There is evidence to suggest that some consumers readily change ISPs. For example, a recent study noted that each month, about 5 to 6 percent of all Internet users switch to a different ISP.[49] Generally, most experts stated that notwithstanding the possible influence the ISPs may have, subscribers are able to access the Internet through any ISP and thereby reach the portals, applications, and content they desire.

Observations

The Internet is governed by a common set of open computer protocols—not by a body of laws and regulations. However, consumers obtain physical transport to the Internet over regulated communications networks. While consumers use Internet features and functions in a similar manner regardless of which communications network they use to access the Internet, the relevant laws and regulations hold different communications networks to different rules. The capability of several networks to provide consumers with an identical service—physical transport to the Internet—has resulted in a regulatory conundrum. Should the various communications providers be held to the same rules when providing the same service?

[48]However, the Precursor Group recently reported that some evidence suggests that about two thirds of users never change the browser "default" from the home page.

[49]Morgan Stanley Dean Witter and Company, *The Internet Data Services Report* (New York, N.Y.: 1999), p. 24.

Because of the different rules that are currently applied to the different communications networks, the prospect exists that, as consumers make the transition to broadband transport methods over nontelephone networks, they could lose the extensive choice of ISPs that they generally now enjoy. That possibility has brought the open access issue to the forefront and has elicited calls for regulatory intervention. But federal policymakers may determine that there is no public policy need to promote competition in the ISP market. Or policymakers could find that market forces would adequately satisfy such a policy objective. If it is determined that a competitive ISP market needs to be promoted and that the expected benefits of this policy outweigh the cost of imposing it,[50] a general policy of "openness" for Internet/data services could be extended to all communications providers of Internet transport. However, in developing such a policy, the inherent differences of the varied network designs need to be recognized. That is, it may not be as easy to facilitate consumer choice of ISPs over all modes of Internet transport as it has been over the telephone network.

Many industry observers believed that after the passage of the 1996 Telecommunications Act, the telecommunications industry would "converge," with telephone companies using their networks to provide video services and cable companies using their infrastructure to compete in the local telephone market. Today, it appears that convergence is occurring, but mostly in the context of different communications networks being redesigned to provide Internet access—and ultimately, many traditional communications services are expected to flow over the Internet. Yet the Communications Act remains a stovepiped law that addresses each service—telephone (common carrier), cable, and radio (wireless)—separately. As the lines between providers and services continue to blur, policymakers may increasingly face challenges—similar to that embodied in the open access debate—in how functionally similar services are governed over different networks. For example, the provision of voice service using Internet technology, or "IP telephony," is on the horizon. What rules will apply to such a service? Similarly, Internet services may roll out over the broadcast spectrum or the electric utility network, and video services similar to traditional television may be provided over the Internet. Thus, the fundamental issues underlying the open access debate may

[50]Administrative costs could be significant. See the discussion in app. V of the Canadian experience in implementing an open access policy and the discussion of the difficulties in determining appropriate UNE prices in the United States.

portend a host of complex issues and disputes yet to arise in the converging communications marketplace.

Matter for Congressional Consideration

In light of the convergence occurring in the communications market and the disparate regulatory treatment of functionally equivalent services provided over different networks, the Congress may wish to consider whether statutory or regulatory action is needed at this time. For example, the Congress may wish to consider

1. amending the Communications Act of 1934 to ensure that both existing and emerging services provided over different networks are regulated in a comparable manner, while also recognizing the historical, commercial, and regulatory structure of the respective communications network sectors, and each network's technological capabilities; or

2. directing FCC to convene a public-private advisory committee or working group to develop recommendations on the appropriate regulation of existing and emerging services that are functionally similar but provided over different networks.

Agency Comments

We provided a draft of this report to the Federal Communications Commission, the National Telecommunications and Information Administration of the Department of Commerce, and the Department of Justice for their review and comment. FCC and NTIA officials stated that they were in general agreement with the facts presented in the report, and provided technical comments that were incorporated as appropriate. The Department of Justice did not comment on the report.

We conducted our review from October 1999 through September 2000 in accordance with generally accepted government auditing standards.

As agreed with your offices, unless you publicly release its contents earlier, we plan no further distribution of this report until 14 days after the date of this letter. At that time we will provide copies to interested congressional committees; the Honorable William E. Kennard, Chairman, Federal Communications Commission; the Honorable Gregory Rohde, Assistant Secretary of Commerce for Communications and Information, Department

of Commerce; A. Douglas Melamed, Acting Assistant Attorney General, Antitrust, Department of Justice; and other interested parties. We will also make copies available to others on request.

If you or your staffs have any questions about this report, please contact me at (202) 512-7631. Key contributors to this report are listed in appendix VI.

Stanley J. Czerwinski
Director, Physical Infrastructure

Scope and Methodology

To respond to the objectives of this report, we gathered information from a variety of sources, including government officials, industry participants, financial analysts, and academics familiar with Internet policy issues. Much of our contact with these sources was in the form of semi-structured interviews designed to elicit responses that would directly address the objectives of the report, although we often obtained relevant documents from these sources as well. We also designed and conducted an online survey of Internet users to better incorporate the views of consumers into our report.

We interviewed officials and obtained documents from the Federal Communications Commission, the Department of Justice, and the National Telecommunications and Information Administration of the Department of Commerce. We also interviewed officials from the following industry trade associations: the National Cable Television Association; the Satellite Industry Association; the United States Telecom Association; the National Association of Telecommunications Officers and Advisors; the National Association of Broadcasters; and the Edison Electric Institute. We interviewed officials from two industry coalitions: the OpenNET Coalition and Hands Off the Internet. Also, an interview was conducted with a representative of the Media Access Project, a representative body for consumer interests in media policy issues.

We completed 25 semi-structured interviews with market participants. Of these, six were with Internet service providers (ISP), most of which also provide a portal and two of which were affiliated with cable companies. Twelve interviews were with Internet transport providers—six telephone companies, three cable companies, two wireless companies, and one satellite company. We had two interviews with Internet content providers, one interview with a portal provider, and three interviews with Internet software or hardware providers. We also met with one company planning to broadcast content to subscribers using a system described as an "Internet overlay." Responses from all the market participants, as well as the responses from the financial analysts and academics, were compared and contrasted. General themes were extracted from all respondents or from various subsets of respondents and are presented throughout the report.

To obtain more detailed information on the cable "open access" issue, we conducted separate semi-structured interviews with 10 municipal franchising authorities. We selected franchising authorities that had already addressed or were currently addressing the open access debate,

usually in the context of a license transfer proceeding accompanying the sale of the franchised cable system. To balance our inquiry, we interviewed both franchising authorities that had reached a final decision to impose an open access condition and those that had reached a final decision not to impose such a condition. We also interviewed a few franchising authorities that were debating the issue and had not reached a final decision. The semi-structured interviews collected information on what considerations, such as pricing structures or technical requirements, have been part of the open access discussions and decisions, as well as on the franchise authorities' findings on the market definition of broadband Internet access. Because open access has been mandated and is being implemented in Canada, we also interviewed officials of the Canadian Radio-Television and Telecommunications Commission and the Canadian cable and ISP trade associations.

In addition to the information collected through interviews, we conducted technical, legal, and regulatory research on the provision of Internet access, ISPs, portals, applications, and content available on the Internet.

We developed, and contracted for, a survey of Internet users to supplement documentary and testimonial evidence. In the survey, we asked questions about the method of Internet access that consumers use, why consumers selected their method of Internet access, why they selected their ISPs, what applications consumers believe are important, consumers' patterns of use of the Internet, the cost consumers incur for Internet services, and the availability and ease consumers encounter when attempting to purchase broadband Internet access. This survey was conducted over the Internet. Participants were notified about the survey and responded to the survey over the Internet. We selected this approach, rather than a traditional mail or telephone survey, because we sought information from current users of Internet services.

To provide the sample frame,[1] draw the sample, and manage the survey operations, we contracted with NPD Group, Inc., a survey research firm. NPD maintains a panel of approximately 400,000 Internet users that is intended to be representative of the Internet population. The panel consists of Internet users who have volunteered to respond to surveys NPD conducts for its clients over the Internet. Factors influencing the degree to which the panel is deemed representative include demographic

[1]A sample frame is a list from which a sample can be drawn.

information and usage patterns. We did not evaluate whether NPD's panel is representative of the Internet population.

We used information from existing documentary evidence and preliminary interviews to develop the survey instrument. The survey instrument was pretested by 34 randomly selected members of NPD's panel. The pretest allowed us to identify the existence of unclear portions of the survey instrument and potential biased questions. Additionally, the pretest was conducted on NPD's Internet-based application, thus allowing us to assess whether the survey instrument performed in an acceptable manner on NPD's online application.

The survey was available to participants over an 18-day period (Apr. 21, 2000, through May 8, 2000) on NPD's secure Web site. Participants were notified by e-mail that a survey was available to be completed and could complete it any time during the period. A total of 1,225 people were notified. A total of 604 people responded to the survey (a 49.3-percent response rate). Of the respondents, 97 were excluded because they were not the households' primary decisionmakers regarding Internet access. This left 507 valid responses (41.4 percent of the sample).

The sample frame determines the population to which we can generalize the survey results. For our survey of Internet users, the sample frame is intended to be representative of the U.S. Internet user population. While demographic and usage patterns for survey participants are intended to be representative a specific U.S. Internet user population, some biases might be present because participants are volunteers.

Because we used a sample to develop the estimates of Internet characteristics presented throughout this report, each estimate has a measurable precision, or sampling error, that may be expressed as a plus/minus figure. A sampling error indicates how closely we can reproduce from a sample the results that we would obtain if we were to take a complete count of the population we are analyzing using the same measurement methods. By adding the sampling error to and subtracting it from the estimate, we can develop upper and lower bounds for each estimate. This range is called a confidence interval. Sampling errors and confidence intervals are stated at a certain confidence level—in this case, 95 percent. For example, a confidence interval at the 95-percent confidence level means that in 95 out of 100 instances, the sampling procedure used would produce a confidence interval containing the universe value we are estimating.

We will publish a more detailed report on the findings of the Internet user survey in early 2001.

Definition of Internet Access Market Unclear

This appendix provides information on (1) whether narrowband and broadband Internet access are in the same or different economic markets and (2) whether the cable industry is dominating the broadband Internet market, if it is a distinct economic market.

Views Differ on Whether Broadband and Narrowband Internet Access Are Part of the Same Market or Are Different Markets

The issue of whether narrowband and broadband Internet technologies are part of the same market or are in separate economic markets has arisen recently in two different contexts. The issue arose in the AT&T–MediaOne merger because of the combined company's interests in both Excite@Home and Road Runner, the two largest cable modem ISPs. The Department of Justice argued that narrowband and broadband are different markets from a content provider's perspective. For a broadband content provider, narrowband is not a good substitute for broadband because much of the broadband content will not be readily accessible or attractive to narrowband customers. Broadband content providers therefore need access to ISPs that provide service to customers with broadband connections. Since narrowband and broadband access are not good substitutes from the content provider's perspective, the Department of Justice found these to be separate economic markets for purposes of its analysis of the AT&T–MediaOne merger.

The market definition issue has also arisen in the open access controversy discussed earlier in this report. In the open access controversy, however, there is a consumer perspective to the market definition issue. The question here is whether consumers consider narrowband and broadband technologies good substitutes for one another. Some industry participants and experts have suggested that cable firms should be required to make it possible for multiple ISPs to serve cable modem customers because cable currently dominates what may be a unique economic market—the broadband Internet market. The concern is that, ultimately, this dominance could harm consumers if competition is reduced in the vertically related ISP industry. This view hinges on an assumption that the broadband market is a unique, or "relevant," economic market from a consumer's perspective.

Determining whether broadband Internet technologies constitute a unique economic market requires an evaluation of the relevant product market and geographic market boundaries. In particular, this analysis would examine whether a narrowband Internet connection would be considered a close enough substitute for a broadband connection that some broadband consumers, if faced with a measurable rise in the price of broadband, would choose to switch to a narrowband connection. Factors that would

influence the outcome of the analysis include the attributes of the services and the geographic area where the services are available. When an alternative product is similar to a given product from the consumers' perspectives and is available in reasonable proximity, the price of the given product is likely to be constrained by the availability of the substitute product. But when an alternative product is perceived as fairly different or is not readily available in the same geographic area, prices are less likely to be constrained by the available substitute.

Some market participants and experts with whom we spoke believe that narrowband and broadband technologies constitute a single market. The general perception among these individuals is that both broadband and narrowband consumers are purchasing the same basic product—physical transport to the Internet—and that these different types of connections simply provide different speeds, or quality levels, of that transport. Proponents of this view told us that the price of a narrowband connection constrains the price of a broadband connection—that is, the availability of narrowband service at a relatively low price prevents broadband providers, such as cable companies, from charging prices considerably higher than the cost of providing the service. This interrelatedness in pricing would imply that consumers consider narrowband and broadband to be substitutable services.

Other market participants and experts, as well as several municipal officials, told us that narrowband and broadband technologies constitute different markets. Some argued that once consumers have purchased a broadband connection, most will be unwilling to return to narrowband—even if the price of their broadband were to rise. According to some standard techniques for determining the boundaries of a "relevant" market, consumers' unwillingness to return to narrowband after, for example, a 5-percent or more increase in the price of a broadband connection implies that broadband and narrowband technologies are distinct services. In support of this view, several of these experts stated that narrowband and broadband technologies provide different types of services to consumers. For example, some argued that services and applications available through broadband are not practical through narrowband (e.g., video streaming). Thus, substitutability between these two types of connections is reduced by the fundamental differences between these services.

While views currently differ on whether narrowband and broadband access are different markets, some of the experts we spoke with indicated that these technologies could become more clearly different in the future.

Because of the limited broadband content and applications currently available, consumers purchasing broadband are generally only getting additional speed and the always-on capability that broadband offers. However, several companies are developing content and applications specifically for the broadband market. An example is the streaming video that combines television-like features with data and interactive features common to the Internet. Thus, the functionality of narrowband and broadband will become increasingly different when new content and applications become more widely available to broadband consumers.

Cable Is the Leading Provider in the Broadband Market but May Not Dominate This Market in the Future

Whether the cable industry currently dominates the Internet transport market depends on the definition of the relevant market. If narrowband and broadband constitute a single market, cable firms are not dominant. In our survey of Internet users, we found that about 9 percent of the respondents subscribe to cable modem Internet service, while the vast majority—88 percent—obtain a narrowband telephone connection to the Internet. However, if broadband is a distinct market, cable firms do currently hold a leading position in that market. In the same survey, approximately 71 percent (plus or minus 12 percent) of consumers choosing a broadband technology use cable modem service.

Even under the assumption that broadband is a unique market, cable will not necessarily maintain a market lead in the future. Many experts noted that the broadband market is nascent. While the cable industry has a considerable lead at this early stage, digital subscriber line (DSL) service and various forms of wireless transport modes are being deployed at a rapid pace. Therefore, cable may not maintain its lead. In fact, most experts with whom we spoke stated that no particular broadband technology would dominate the market in the future. Similarly, several forecasts of future broadband deployment predict that neither DSL nor cable modem service will dominate the broadband market in the future.

Analyses examining broadband deployment often look at aggregate data across the entire United States. In individual markets—for example, within a particular city—markets can be more concentrated than is the case at the national level. It is possible that even as DSL and wireless providers deploy their services, cable modem service will maintain a leading position in some local Internet transport markets. However, it is also possible that cable may have no presence in some local market areas and DSL could be the leading broadband provider in those areas. Thus, even though DSL and wireless broadband technologies may become more prevalent over the

next few years, geographic areas may remain where a particular broadband option dominates.

Wireless Internet Access Technologies and Regulations

This appendix provides information about certain wireless technologies that will provide physical transport to the Internet. Specifically, this appendix discusses (1) the technologies of various wireless networks and (2) the regulatory framework governing wireless technologies.

Wireless Internet Access Technologies

A variety of wireless communications networks are expected to provide Internet transport, although most of these technologies are just beginning to be deployed. In wireless networks, information is transmitted over radio frequencies, which can engender certain economic advantages over wireline connections. Three basic types of wireless technologies are expected to be used to provide Internet transport to consumers: satellite systems, fixed wireless networks, and mobile wireless networks. A fourth type of wireless network—the broadcast spectrum—may also be used in the future to provide physical transport to the Internet.

- **Satellite.** Satellite systems can provide services to users by transmitting information over radio frequencies between an orbital satellite and an earth station reception dish. A wired connection transmits the signal from the satellite reception dish to the home computer. Today, transport to the Internet over a satellite system is available throughout the United States over the DirecPC system, which provides one-way transmissions from the satellite to the user, and a telephone line connection is used for the return path. Several two-way satellite systems are being developed, some of which will provide Internet transport directly to end users. We were told that because satellites have a broad “footprint”—in many cases, covering the entire continental United States—these systems can be particularly beneficial in bringing services to remote or rural areas that are unlikely to obtain services from wireline providers.
- **Fixed wireless technologies.** Fixed wireless systems provide services to users through the transmission of information between base station towers and antennas that are affixed at particular locations (e.g., businesses and residences). The limitations of this type of system are largely due to the need for antennas to “see” the transmitting tower—hills, foliage, buildings, or other obstructions can block this necessary line of sight. Various types of fixed wireless systems exist, but two systems using different frequency bands are being designed and deployed to provide last-mile Internet transport.
  - One fixed wireless system—multichannel multipoint distribution service (MMDS)—uses spectrum that was previously used for wireless cable services. In 1998, FCC authorized these systems to

provide two-way services. MMDS spectrum can be used to transmit information over fairly long distances—up to 35 miles.[1] MMDS for Internet access is being rolled out mostly in large towns and small cities.
  - Another fixed wireless system uses higher-frequency bands that have shorter transmission ranges. One of these, local multipoint distribution service (LMDS), has a transmission range of about 3 to 5 miles and is expected to be deployed mostly in urban areas.
- **Mobile wireless technologies.** Mobile wireless technologies—such as cellular telephones—enable subscribers to use communications services as they move from one location to another. As with other wireless technologies, information is carried over radio frequencies, in this case, between a mobile handset and transmitting towers located throughout an area. In mobile wireless systems, the connection from the handset will be "handed off" to the tower that is closest at any given time. Mobile telephone service—which is at present narrowband—is being adapted to provide some limited Internet capabilities. Future mobile wireless Internet transport methods are being developed that may provide broadband functionality, and FCC is expected to allocate and auction the necessary spectrum for these services. Many industry representatives and experts suggest that accessing the Internet over mobile wireless systems is likely to become extremely popular.
- **Broadcast.** With the conversion of over-the-air broadcast television services from analog to digital, broadcasters will have expanded bandwidth capabilities for transmission of data over the broadcast spectrum. Currently, according to FCC, broadcasters are concentrating on high-end one-way transmissions to some residential customers. Two-way services over the broadcast spectrum are also possible in the future.

Regulation of Wireless Networks

FCC governs wireless providers in two principal ways: control over the allocation of spectrum to service providers and control over what types of services may be transmitted over certain spectrum bands. In recent years, FCC has allowed more flexibility in how allotted spectrum is used. This general flexibility is apparent in the regulatory environment governing data transmission by several types of wireless providers:

[1]One technology expert we spoke with, however, noted that interactive MMDS may only have a transmission range of 8 to 10 miles and that LMDS spectrum used interactively may only have a transmission range of about 1 to 3 miles.

- Mobile wireless providers, such as those providing cellular telephone service, can use their spectrum to provide data services without restrictions.
- MMDS and LMDS operators have obtained changes in FCC rules enabling them to provide two-way data services and enjoy general flexible-use rules on their transport of data.
- Although satellite operators today generally offer consumers subscription video programming services, they do not fit the definition of "cable" and are therefore not subject to title VI regulation. While these providers are subject to some public interest programming obligations,[2] they are otherwise free to use their spectrum to provide a mix of services, including data.

Broadcasters, as they make the transition to digital broadcasts, were given the right by the Congress in the 1996 act to offer "ancillary or supplementary services" over their digital spectrum. FCC has stated that such services could include, but are not limited to, computer software distribution, data transmissions, teletext, and interactive services. FCC has not imposed a requirement that the ancillary and supplementary services be broadcast-related and has left the door open for broadcasters to offer Internet-based applications.

[2]Additionally, direct broadcast satellite providers offering local broadcast stations will become subject to must-carry rules on Jan. 1, 2002. Recently, these rules have been challenged in court.

Telephone Laws and Regulations Promote Consumer Choice of Internet Service Providers

This appendix provides more detailed information on the key laws and regulations governing the use of the telephone network for the provision of Internet access. In particular, this appendix discusses (1) the long history and traditions of the laws and regulations governing the telephone industry and (2) the effect of the telephone laws and regulations on the development and rapid growth of the ISP industry.

Telephone Laws and Regulations Have a Lengthy History

Although the first federal law governing the nation's telephone industry was not enacted until more than 30 years after Alexander Graham Bell's 1876 landmark invention of the telephone, state and local governments began to adopt regulations governing various aspects of local telephone service soon after the device was introduced to the market. But the industry's rapid growth prompted the Congress to enact the Mann-Elkins Act of 1910, a law empowering the Interstate Commerce Commission to regulate interstate telephone service. From that time forward, telephone companies have been treated as "common carriers," which requires them to provide service on request at just and reasonable rates without discrimination or undue preference. Inherent in these principles was the need for interconnection among telephone companies to provide a seamless and ubiquitous infrastructure for voice services. These principles were codified in the Communications Act of 1934 and preserved by the Telecommunications Act of 1996—the two major telecommunications laws subsequently enacted in the 20th century.

Because a single company—AT&T—dominated the local, long-distance, and telephone equipment manufacturing markets for several decades, regulation took the form of ensuring that services over AT&T's network were available at the lowest cost to a maximum number of consumers. Starting in the 1950s, competitors began to challenge AT&T's market dominance in several submarkets of the telecommunications industry. The government's regulatory approach then began to evolve from one focused on oversight of a monopoly to one that attempted to foster increased competition through broader enforcement of common carrier requirements. For example, FCC ruled in 1968 that independently manufactured telephone equipment could be attached to a telephone line at the customer's premises as long as it did not impair the network.[1] This regulatory approach was generally extended to the treatment of data transmissions over the telephone network.

The Telecommunications Act of 1996 and its implementing rules imposed a variety of conditions—many exclusively on incumbent telephone carriers—aimed at promoting competition in the local telephone market. Some of the key market-opening provisions include (1) interconnection—the requirement that all telecommunications carriers interconnect their networks with those of other telecommunications carriers; (2) resale—the requirement that all local telephone companies offer their service for resale to competitors at wholesale prices; and (3) unbundled network elements (UNE)—the requirement that incumbent local telephone companies sell designated specific parts (that is, "elements") of their networks to competitors at cost-based rates.[2] In addition, FCC determined that the high-frequency portion of incumbents' lines are UNEs and thus must be shared with competitors who want to use that portion to provide digital subscriber line (DSL) service.

[1]FCC's *Carterfone* decision is viewed as key to the emergence of the Internet because of the precedent it set. Specifically, because that decision allowed end users to attach equipment not manufactured by the telephone company to their telephones, it also allowed residential and business customers to connect computer modems to their telephone lines.

[2]Both the local telephone line connecting each customer to a central office facility (known as the "local loop") and the high-frequency portion of the line (used for high-speed DSL service) have been designated as UNEs. In *AT&T v. Iowa Utilities Board*, 525 U.S. 366 (1999), the U.S. Supreme Court found that FCC, in determining which network elements must be unbundled, had not fully considered the 1996 act's "necessary and impair" standard. FCC reissued rules consistent with the Court decision in September 1999 and specified the UNEs that incumbents must offer for sale to competitors.

An increasing number of consumers can now choose among carriers for voice service. Since a consumer's telephone service provider can also be the consumer's provider of transport to the Internet, these market-opening requirements may also create competition among Internet transport providers. At this time, competition in the provision of Internet transport over the telephone network is mostly occurring in the broadband segment of the market. In particular, FCC reports that nearly 20 percent of DSL subscribers purchase their DSL from a transport provider other than the incumbent local telephone company.

Telephone Laws and Regulations Are Credited With the Development of the ISP Industry

Many of the industry participants and experts we spoke with told us that the laws and regulations governing telephone networks for nearly three quarters of a century are key to understanding the regulatory treatment of Internet services over this medium. In particular, we were told that telephone laws and regulations were important to the development and rapid growth of the ISP industry. Several key regulatory, judicial, and legislative actions taken over the past 30 years fostered the development of a competitive market that today totals nearly 7,000 national, regional, and local ISPs, offering a variety of applications and content. Key policy actions that fostered the ISP industry's growth include the following:

- **Computer Inquiries.** During the 1960s, policymakers began contemplating how data transported over the telephone network should be regulated. In a series of *Computer Inquiry* proceedings, FCC split the online world in two: a *physical transport layer* that is regulated under title II of the Communications Act and a *data processing layer* that is unregulated.[3] To help ensure that the telephone companies could not discriminate against competitors or cross-subsidize their own affiliate enterprises—which would reduce competition in the data processing layer—FCC closely regulated the ability of telephone companies to provide data processing services.[4] Today, "data processing" services are generally referred to as "information services," a category that includes the services of ISPs. As one expert explained it, without these early limitations on telephone companies' provision of information services,

[3]FCC originally referred to the transport layer as "basic services" and to the data processing layer as "enhanced services."

[4]Limitations on telephone companies' provision of data processing (or information) services were first established in a 1956 consent decree.

consumers today would likely call their local telephone provider to order ISP service in the same way they now order Call Waiting or Caller ID. Instead, new independent companies entered the market to provide information services, leading to a highly competitive ISP market with many types and sizes of ISPs available to consumers.

- **Treatment of the Bell Operating Companies.** The 1982 consent decree that resulted in AT&T's divestiture of the Bell Operating Companies (BOCs) imposed prohibitions on the lines of business in which the newly formed BOCs could engage. The BOCs were prohibited from providing long-distance telephone service, manufacturing telephone equipment, and providing information services.[5] The prohibition on information services was deemed necessary because of the BOCs' incentive and ability to discriminate against other information service providers. The information services ban was lifted in 1991; however, the Telecommunications Act of 1996 required the BOCs to form separate affiliates for the provision of information services—such as ISP services—in certain cases. The requirement for separate affiliates expired in 2000, but BOCs still must get permission to provide data services across local access and transport area (LATA) boundaries within their service regions.

[5]The term "information service" was defined by the court in *U.S. v. American Telephone and Telegraph Co.*, 552 F. Supp. 131, 179 (D.D.C. 1982) but was later defined by the Congress in the Telecommunications Act of 1996 to mean "the offering of a capability for generating, acquiring, storing, transforming, processing, retrieving, utilizing, or making available information via telecommunications, and includes electronic publishing, but does not include any use of any such capability for the management, control, or operation of a telecommunications system or the management of a telecommunications service."

- **Treatment of ISPs under the access charge regime and the Universal Service Program**. Access charges are fees paid to local telephone companies for calls that originate or terminate on their facilities. In a 1983 proceeding and again in 1997, FCC chose not to impose access charges on ISPs, stating that these per minute charges would have a deleterious effect on the Internet and on e-commerce. Similarly, FCC has found that ISPs do not need to pay directly into the "universal service fund"—a fund that was established to ensure the delivery of affordable telecommunications services to all Americans.[6] The fact that ISPs pay no per minute access charges or direct universal service fees has helped them keep their costs down and has been an important factor underlying ISPs' flat-rate pricing plans.

[6]Federal and state regulators have had a long tradition of subsidizing basic residential telephone service with revenues gained by charging rates that exceed cost for some users or some other telecommunications services. The ubiquity and average low cost of basic telephone service—a result of the long-standing policies to promote universal service—have made narrowband dial-up telephone Internet access an option for nearly all Americans. This concept of "universal service" was maintained and expanded by the Congress when it passed the 1996 act, and in several respects, the policies underlying universal service have helped to promote the use of the Internet. Although ISPs do not directly pay universal service fees, they do so indirectly when they purchase underlying telecommunications services.

Lack of Clarity on Internet Services in Cable Laws and Regulation Has Resulted in "Open Access" Debate and Litigation

This appendix provides more detailed information on the key laws and regulations governing cable networks. In particular, this appendix discusses (1) the relatively short history of the laws and regulations governing the cable industry, (2) how the absence of a determination of the legal treatment of Internet services over cable systems has led to protracted debate and litigation over "open access," and (3) the experience with "open access" in Canada.

Laws and Regulations Governing the Cable Industry Have a Short History

The federal laws and the associated FCC regulations governing the cable industry are very different from those governing the telephone industry. The first explicit statutory grant of FCC authority over the cable industry was in the 1984 Cable Act,[1] which added title VI to the Communications Act. This act, and the subsequent 1992 Cable Act, brought the cable industry under the regulatory control of both FCC and local municipal franchising authorities. These acts generally recognize that cable operators should have significant control over the content carried on their systems—unlike telephone carriers, which generally provide a simple transport function. Title VI explicitly states that cable companies are not to be treated as common carriers in their provision of cable services.[2] As long as the service provided is defined to be a "cable service," cable companies are free from the requirements that apply to telecommunications carriers under title II of the act, such as the requirements for interconnection and the sale of unbundled network elements to competitors.

Confusion Over the Legal Treatment of Cable Modem Service Has Produced Disputes Over "Open Access" Policies

Whether the provision of cable modem service is governed by any particular laws and regulations hinges on what service definition, if any, is applicable. Considerable debate exists over whether the definition of a "cable service"—first included in the 1984 Cable Act and later modified in the Telecommunications Act of 1996—is broad enough to include Internet access over a cable system. A "cable service" is defined as "the one-way transmission to subscribers of video programming or other programming service together with subscriber interaction, if any, which is required for selection *or use* of such programming" (emphasis added). The words "or

[1]Prior to the 1984 act, FCC regulated cable under its ancillary jurisdiction.

[2]Under 47 U.S.C. 532(g), in certain circumstances, FCC might exercise more control over cable companies. In a recent notice of inquiry, the Commission is asking whether these circumstances exist.

use" in the definition were added by the 1996 act. Interpretations of the meaning and implications of this change in the cable service definition vary. These differing views have been expressed primarily within the context of a policy debate known as "open access"—the issue of whether cable operators offering cable modem service should be required to allow multiple nonaffiliated ISPs nondiscriminatory access to the cable system so they may offer their own cable modem service to subscribers.

Proponents of open access—those who favor a requirement that cable operators open their systems to multiple nonaffiliated ISPs—have split over what service definition they believe should apply to cable modem service. Some open access proponents, particularly some municipal franchise authorities, argue that it is a "cable service" and thus subject to any local or federal open access mandates. Other open access proponents believe the service to be more correctly defined as either an "information service" or a "telecommunications service" because it is effectively the same as the broadband transport and service provided over the telephone network. According to those who believe cable modem service should be defined as a telecommunications service, regulatory parity should be achieved by placing nondiscriminatory interconnection requirements and obligations on cable operators. In addition to their definitional arguments for open access, proponents also contend that the Internet is based on open, nondiscriminatory protocols and that the cable industry model of selling a bundled ISP violates the inherent openness and competitiveness of the Internet.

Opponents of open access—those who believe that market forces should determine how the cable industry structures cable modem services—are also split in their views on the applicable definition for cable modem service. Many cable operators view cable modem service as a "cable service" in which they exercise considerable control over choice of content, as with video programming. AT&T has stated that cable operators purchase rights to programming (or produce it themselves) and then sell that programming to subscribers, whether the programming "is CNN, HBO, or an interactive online cable service that includes Internet access."[3] Also, some cable operators and other open access opponents argue that the two words—"or use"—added to the legal definition of "cable service" in the

[3]Reply Comments of AT&T Corp. and MediaOne Group, Inc., *In the Matter of Applications for Consent to the Transfer of Control of Licenses, MediaOne Group, Inc., Transferor, to AT&T Corp., Transferee*, CS Docket No. 99-251, filed Sept. 17, 1999, at 122.

1996 act were meant to expand that definition to include interactive offerings such as cable modem service. In support of this argument, they point to the 1996 act's Conference Report, which states, "The conferees intend the amendment [of the definition of cable service] to reflect the evolution of cable to include interactive services such as game channels and information services made available to subscribers by the cable operator, as well as enhanced services." Open access opponents contend that cable modem service is just such an "interactive" and "enhanced" service. However, should cable modem service be defined as an "information" or "telecommunications" service, opponents of open access argue that local franchise authorities clearly have no authority to mandate open access.

Besides the definitional issue, open access opponents argue against a mandate for several other reasons. First, they argue that the federal government should avoid any such requirement or risk stifling investment in cable system upgrades and slowing the deployment of cable modem service. Second, they note that there would be many costly administrative problems in applying an open access regime.[4] Finally, they note that, as a practical matter, cable modem subscribers are not denied access to alternative service providers because they may simply "click through" the affiliated ISP to reach the content of a nonaffiliated ISP over the Internet.

Recently, several courts have addressed the issue of the service definition of cable modem service and have reached different conclusions. Part of the difficulty of defining the service is the fact that cable modem service is not exactly analogous to Internet services provided over the telephone network because cable combines two levels of services—transport and ISP—that are provided separately on the telephone side. The reason this definitional issue is so fervently debated is that application of a specific definition may have significant ramifications as the following illustrates:

[4]The most difficult administrative issue would probably be pricing. Many experts we spoke with noted that the government would likely have to be involved in developing and enforcing a pricing schedule for wholesale cable modem service. This could be difficult, however. For example, the pricing of UNEs for telephone services under the 1996 act has led to protracted legal disputes. Most recently, the United States Court of Appeals for the Eighth Circuit stated that FCC's total element long-run incremental cost (TELRIC) pricing model violates the 1996 act. Thus, nearly 5 years after the passage of the act the appropriate pricing for UNEs is still unclear. Similarly, the determination of wholesale rates for cable modem service in Canada was highly contentious and took considerable time.

- Defining Internet access over a cable system to be a "cable service" subjects it to the regulatory treatment of existing cable services, such as video programming or some interactive services offered over cable. Two different federal district courts have said that cable modem service was a "cable service," yet these courts reached different conclusions about whether a municipal franchising authority could mandate open access for nonaffiliated ISPs.[5] One of these courts, in *AT&T Corp. v. City of Portland*, was then overruled by the appeals court, which found cable modem service not to be a "cable service" at all.[6]
- Defining Internet access over a cable system to be a "telecommunications service" subjects it to the regulatory treatment of the transport function in the telephone industry. This would mean that title II and common carriage obligations would apply, unless FCC decided to forbear application of these rules under title I, section 10 of the Communications Act. The appeals court in the *Portland* case, in overruling the lower court, held that cable modem service is not a "cable service." The court went on to say that cable modem service is a "telecommunications service" because the provider controlled all the transmission facilities between its subscribers and the Internet. The decision currently leaves open the door for unaffiliated ISPs to attempt to demand carriage on AT&T's cable system under common carrier rules.
- Defining Internet access over a cable system as an "information service" aligns it with the treatment of ISPs under telephone laws and regulations—where ISPs and other information services have remained unregulated by FCC. However, if a cable company was found to be a telecommunications carrier for some other reason (for example, if it was also offering local phone service) then it might have to offer transport on a nondiscriminatory basis to other unaffiliated information service providers because it is providing its own affiliated information service. The *Portland* appeals court said the ISP part of cable modem service was an information service and indicated that this portion of the service alone would not be subject to regulation. In another court case that actually dealt with pole attachment regulations rather than open access mandates, the U.S. Court of Appeals for the Eleventh Circuit stated that cable modem service was not a "cable service or a

[5] *AT&T Corp. v. City of Portland*, 43 F. Supp. 2d 1146 (D. Or. 1999); *MediaOne Group v. County of Henrico*, 97 F. Supp. 2d 712 (E.D. Va. 2000).

[6] *AT&T Corp. v. City of Portland*, 216 F.3d 871 (9th Cir. 2000).

telecommunications service" and implied it might be considered an information service.[7]

Until recently, FCC had chosen only to monitor the competitive environment involving Internet transport services and the deployment of broadband, preferring to let market forces determine how the nascent industry evolved. FCC's previous decision to not comment on the service definition may have been motivated, in part, by its desire not to impose a regulatory regime on this burgeoning broadband technology for the purpose of promoting competition in the ISP market. Among its public pronouncements on the matter, FCC has stated that it found evidence showing early competition among Internet transport providers—telephone, cable, and wireless carriers—and concluded that developing competition at the transport level indicated that no action was needed to address competition at the ISP level.[8] In deciding against open access in the license-transfer proceeding of TCI and AT&T, FCC relied on the assurances of the two companies that cable modem subscribers could "click through" their affiliated ISP to reach the services of a competing ISP. In addition, FCC's Cable Services Bureau has stated that consumer choice of ISP on cable systems will likely come about without an open access mandate because "customer demand for choice ultimately will compel cable operators to open their systems to unaffiliated ISPs."

FCC released a notice of inquiry on September 28, 2000, seeking "to create a legal and policy framework for cable modem service and the cable modem platform that will foster competitive deployment of new technologies and services by all entities, including cable operators and Internet service providers (ISPs) alike."[9] In the notice, FCC seeks comment on the appropriate service classification of cable modem service, on whether open access is a desirable policy goal, and if so, what are the most appropriate means of achieving that goal. FCC also stated that it may find regulatory intervention to be unnecessary if market incentives continue to

[7] *Gulf Power Company v. FCC*, 208 F.3d 1263 (11th Cir. 2000).

[8] *In the Matter of 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*, CC Docket No. 98-146, *Report*, FCC 99-5 (released Feb. 2, 1999) at paragraph 101.

[9] *In the Matter of Inquiry Concerning High-Speed Access to the Internet Over Cable and Other Facilities*, GN Docket No. 00-185, *Notice of Inquiry*, FCC 00-355 (released Sept. 28, 2000) at paragraph 2 (*High-Speed Access Inquiry*).

work to foster a competitive environment. Alternatively, the Commission stated, it may choose to initiate a rulemaking proceeding or forbear from enforcing statutory and regulatory requirements.[10]

Canadian Authorities Have Imposed "Open Access" Requirement

As with cable modem service in the United States, Canadian cable firms' affiliated ISPs are integrated with the local transport function. Concerned about consumers' choice of ISPs on the cable network, the Canadian Radio-Television and Telecommunications Commission (CRTC) issued a key decision in 1996 determining that broadcast carriers' (i.e., cable companies) nonprogramming services—such as cable modem service—constitute "telecommunications services" under Canadian law. Over the course of the next 2 years, CRTC developed and ultimately issued a further decision prescribing a regulatory approach to govern cable modem Internet access and to require cable providers to facilitate access by multiple ISPs. At the direction of CRTC in this decision, the Canadian Cable Television Association initiated a technical trial to facilitate third-party Internet access to cable systems. Although CRTC refrained from imposing some requirements on rates and terms of service, the Commission determined that it would be appropriate to set tariffs—or the price—of high-speed Internet services—cable modem and DSL services—once a carrier has the ability to provide competitive ISPs with access to facilities.[11] In 1999, CRTC called on the large cable companies to develop cost studies and file proposed tariffs for the use of cable facilities by nonaffiliated ISPs.

At the time of our first meetings with Canadian stakeholders in April 2000, the Canadian Cable Television Association technical trial was still in progress. As to the number of ISPs that can technically gain access to cable systems, we were given conflicting information. On one hand, we were told that the objective of the CRTC decision was for an unlimited number of ISPs to be able to offer service over the cable platform; on the other hand, we were told that a cable system can facilitate at most six to seven nonaffiliated ISPs. Another disputed issue involved the tariffs cable companies would likely propose for third-party ISP access to the cable

[10] *High-Speed Access Inquiry* at paragraph 50.

[11] Because CRTC found that the Internet services at the retail level were competitive, it forbore from exercising much of its authority on the rates and terms on cable companies' provision of retail Internet services despite the technical infeasibility of immediate access of nonaffiliated ISPs to cable systems. CRTC set interim rates and, in a separate decision, permitted the resale of cable modem Internet access services.

platform. In particular, the Canadian cable companies and the Canadian ISP industry appeared to have very different views on the appropriate wholesale price of access to the cable system. These differences stemmed, in part, from varying views on the appropriate costs that cable companies should be allowed to recoup through their rates. As evidence of the difficulty of rate-setting, we were told that the interim rates for the resale of cable modem service were set too high to enable ISPs to make a profit when serving cable modem customers. As a result, no ISPs have chosen to resell cable modem service.

In subsequent contacts we made with the same Canadian stakeholders in September 2000, we were told that no technical impediments had been found in the technical trial to allow third-party ISP interconnection to the cable modem platform. The next technical phase, which has already commenced, is a live field trial of third-party ISP service over the cable modem platform that involves the participation of one large cable company, one third-party ISP, and 10 customers. We were also told that CRTC had finalized its decision on tariffs for the wholesale rates charged by the large cable companies and for associated terms and conditions. The wholesale rates set by CRTC were approximately 50 percent less than the rates proposed by each affected cable company. However, decisions on additional charges for third-party ISPs' access to the cable modem platform, such as installation and interconnection charges, are still to be decided along with various operational matters. A representative of the Canadian ISP industry told us that third-party ISP service over the cable platform could be delayed further if the CRTC tariff decision is challenged or if access rates are set too high. Thus, 4 years after the Canadian government's initial open access decision, Canadian consumers still have no choice of ISP when subscribing to cable modem service.

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Glossary of Communications Terms

The definitions in this glossary are drawn from several sources, including <www.netlingo.com>; <www.whatis.com>; the Glossary of PC and Internet Terminology at <homepages.enterprise.net/jenko/Glossary/G.htm>; and the Glossary of Telecommunication Terms at <www.its.bldrdoc.gov/fs-1037/>.

Always On	A connection feature of two-way broadband Internet access technologies. "Always on" means that a user need only turn on his or her computer to be connected to the Internet. This is unlike narrowband telephone Internet access, which requires the user to "dial up" and establish a connection with their ISP for each online session.
Application	With regard to the Internet, a program or service that users can access online, such as a chat room, e-mail, shopping, or interactive gaming.
Backbone	Very high-speed, long-haul networks that connect to ISPs and to other backbone providers.
Bandwidth	A measure of the capacity of a communications system. Greater bandwidth indicates faster data transfer capabilities.
Bell Operating Company (BOC)	The local telephone service companies created by the court-ordered divestiture of AT&T.
Broadband	A high-speed, high-capacity transmission channel. Broadband connections can be used to send different types of signals simultaneously, such as video, voice, and data.
Browser	A computer program used to access and display pages on the World Wide Web. Netscape Navigator and Microsoft Internet Explorer are two examples of Web browsers.
Bundling	Combining goods or services into a single package, often for a discounted price.

Cable Modem	A communication device connected to a coaxial cable television system to offer customers access to the Internet at speeds 50 to 100 times faster than a traditional telephone connection.
Cache	Storing the content or part of the content of a frequently viewed Web site on an ISP's server, thus enabling quicker access to the information than when retrieving it from the source Web site.
Central Office	A telecommunications facility where local loops are terminated and calls are switched.
Chat Room	An application, often hosted on a Web site, that allows users to take part in an online discussion on a particular subject or with a particular group. Users type their messages and then have them instantly posted for others to read and reply to.
Circuit-Switched	A method of opening communications lines, as through the telephone system, creating a physical link between the initiating and receiving parties. In circuit switching, the connection is made at a switching center, which physically connects the two parties and maintains an open line between them for as long as needed.
Coaxial Cable	A transmission line with an inner wire to conduct signals and an outer aluminum coating to act as a ground. The two metal layers are separated by insulation and may be wrapped in a protective plastic sheathing. This is the type of wire typically used by cable companies.
Common Carrier	A communications provider, such as a telephone company, that offers its services to all members of the public for a set fee or tariff. Common carriers are regulated by federal and state agencies and exercise no control over the content of the messages they carry.
Content	Information contained in a Web site, including the structure in which it is presented.

Dial-Up Connection	A temporary connection between two computers, or to the Internet, using a standard telephone line and a modem. The user establishes a connection by dialing the telephone number of his or her ISP. This is currently the most popular form of Internet connection for a home user.
Digital	The use of binary digits (zeros and ones) to represent data such as text, audio, and video.
Digital Subscriber Line (DSL)	A high-speed method of accessing the Internet using a traditional telephone line that has been “conditioned” to handle DSL technology. DSL allows the same telephone line to be used simultaneously for voice calls and data transmissions.
Download	To transfer a file or Web page from another computer.
Downstream	A flow of signals from a communications provider to a customer.
E-commerce	Conducting business or shopping online. E-commerce entails both business-to-consumer and business-to-business transactions.
E-mail	Electronically transmitted messages that Internet users can send to one another using a common addressing system. E-mail is the most popular use of the Internet today.
Facilities-Based Provider	A company offering a communications service through its own network and equipment, rather than through the resale of services over the network of another provider.
Franchising Authority	A governmental body (city, county, or state) responsible for awarding and overseeing local cable franchises.

Headend	A facility that originates and distributes cable service in a given geographic area.
Home Page	The first or “front” page on a Web site that serves as the starting point for navigation through that particular site.
Hypertext	A system of displaying text that allows it to contain links to related documents or Web pages. When users “click” on the link, they are automatically taken to another Web page or document, or to a different section of the current Web page.
Instant Messaging	An application that allows two Internet users to have a written conversation through messages sent back and forth instantly.
Interconnection	The linking of two or more communications networks or communications providers.
Internet	A global system of linked computer networks supporting research, education, information, and commercial services.
Internet Service Provider (ISP)	A company that provides Internet Protocol access (a computer connection) to the Internet. An ISP has the servers, routers, switches and other equipment necessary to either provide the subscriber with the ISP’s own content or, if the subscriber is seeking a specific Web site, to transfer the call onto the Internet backbone and route it to the requested Web page.
Internet Transport Provider	A company providing the physical transport of data signals from the customer’s computer to the customer’s ISP.
Last Mile	Refers to the last segment of the connection between a communication provider and the customer’s premises.

Local Access and Transport Area (LATA)	A geographical area within which a Bell Operating Company is permitted to offer local exchange telecommunications services.
Local Loop	The physical connection between the telephone company's central office and a subscriber's premises.
Local Multipoint Distribution Service (LMDS)	A broadband digital microwave (wireless) technology used to deliver multiple service offerings (voice, video, and data) in a localized area. LMDS operates in the higher frequencies, limiting the distance the signal can travel.
Modem	An electronic device that allows users to connect computers and other equipment to a network for the purpose of sending or receiving data. The word is derived from the term *mo*dulator-*dem*odulator.
Multichannel Multipoint Distribution Service (MMDS)	A broadband microwave (wireless) technology. Originally built as "wireless cable" systems for video delivery, MMDS technology can be upgraded to digital, making high-speed Internet access possible. MMDS requires clear line of sight between transmitters and receiving antennas.
Narrowband	A low-speed, low-capacity transmission channel. Narrowband Internet access works best when the user accesses content that is not "bandwidth intensive," such as simple text pages.
Nodes	A connection point in a cable system, often where optical fiber enters the neighborhood and connects to coaxial cables.
Online	The state of being connected to the Internet.
Open Access	A term used to refer to mandates that cable companies allow unaffiliated ISPs access to their cable system so they may offer competing cable modem service.

Optical Fiber	A method of transmitting a light beam along optical fibers, usually made of glass or other transparent material, in which the beam is modulated to carry information. A single fiber optic channel can carry significantly more information than most other means of information transmission.
Packet-Switched	The method used to move data around efficiently on the Internet. Data are broken into pieces, or "packets," with each piece including the address of where it is going. Each piece travels the best route currently available between the source and the destination. The pieces are then reassembled at the destination.
Portal	Web sites that serve as starting points to other destinations or activities on the Web—a door to the Internet. Portals commonly provide an array of services, such as e-mail, search engines, and news stories, as well as links to popular content.
Router	A device that forwards data packets from one network to another network based on routing tables and routing protocols.
Search Engine	Used to locate desired information on the Internet by searching a database of Internet content for key words that the user has specified. Search engines usually work by maintaining indices of Web resources.
Server	A host computer on a network that holds information (e.g., a Web site) and responds to requests for information.
Streaming Media (or Streaming Video)	When audio or video is sent in a continuous stream and played as it arrives. Streaming avoids waiting for a large file to download before playing it, but it does require the users to have "player" software installed on their computers.
Surf	To browse through and look at information on the World Wide Web.

Transmission Control Protocol/Internet Protocol (TCP/IP)	A standard set of protocols that governs the basic workings of the Internet. TCP ensures that data are transmitted correctly, while IP controls how the data packets move from one point to another.
Unbundled Network Element (UNE)	Pieces of an incumbent telephone company's network that must be leased to competitors on request to facilitate local phone service competition.
Unbundling	When services that are packaged together are split apart and offered separately, often by government mandate. Unbundling often addresses antitrust concerns when a company with market power in one service packages it together with another service in which it does not have market power.
Universal Service	The concept of making basic local telephone service (and, in some cases, certain other telecommunication and information services) available at an affordable price throughout the United States.
Upstream	A flow of signals from the customer to the communications provider.
Web Page	A single "file" on the World Wide Web, usually containing text, audio, or video content.
Web Site	A location on the Web usually made up of multiple Web pages.
World Wide Web (WWW or the Web)	The global collection of Web sites that are connected by the Internet. The Web is a popular part of the Internet because it is easy to navigate and use.

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