
Handicapping the Race for the Last Mile?: A Critique of Open Access Rules for Broadband Platforms

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“The technology to supply almost limitless bandwidth is now at hand. Broadband networks already occupy the top tiers of the telephone network, operated by regional and national telephone companies, and the top tiers of the broadcast networks, operated by video carriers. Only the last mile remains to be conquered.”^{††} This Article evaluates the battle to conquer the last mile, by surveying the leading platforms and technologies for providing broadband telecommunications to individual customers. The Article also describes current regulation of those platforms, focusing on the extent to which the owners must provide open access to unaffiliated companies wishing to use the platforms. Addressing current arguments made by companies seeking mandatory open access rules for broadband platforms, this Article concludes that the nature of consumer demand for a broadband access platform, which will be strongly responsive to the variety of content services made available over the platform, makes open access rules unnecessary and potentially counterproductive.

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^{††} PETER W. HUBER, LAW AND DISORDER IN CYBERSPACE 17 (1997).

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Introduction

The often-predicted next generation of information services now seems genuinely at hand. The market has been found: consumers want faster Internet connections; they want more video channels; they want movies “on demand”; and they want new services, such as interactive gaming and virtual reality, that telecommunications and computer companies are only now beginning to offer. Businesses, too, want faster services. Some want to provide these new consumer services; others want to enhance on-line shopping, marketing, and customer service; and still others want better connections to remote offices and telecommuters.

Yet one historic technological barrier to these services remains: the phone lines. While computer operating speeds have greatly and rapidly

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increased, the capacity of the connections to individual computers in homes and small businesses has remained largely unchanged. Traditional copper telephone lines, the ends of the only true communications network that reaches every business and residence, simply do not have enough transmission capacity—enough “bandwidth”—to deliver these services to individual consumers. The potential unmet market is staggering—some estimate it in the hundreds of billions of dollars.

Four years ago, Congress demanded that the technological barrier be eliminated, but it provided no specific program for doing so. In the Telecommunications Act of 1996 (the “1996 Act”),¹ Congress provided that the Federal Communications Commission and each state public utility commission “*shall* encourage the deployment on a reasonable and timely basis of advanced telecommunications capability to all Americans.”² But although it made this command, Congress provided only a vague list of means by which the FCC and the states might accomplish this goal and mandated merely that the FCC should, after it had disposed of most of the Act’s other business, open a general inquiry into the matter.³ Congress’s tepid legislation on this point in an otherwise fairly aggressive law is easily understood: it had no idea how the limited capacity (or “narrowband”) local telephone lines could be upgraded to, or replaced with, systems that have greater capacity (“broadband” systems).

While the answers remain far from clear, the four years since the passage of the 1996 Act have provided a glimpse into the future of these new services. Old and new companies are now racing to deliver data to homes via new high-speed, broadband access platforms. Incumbent telephone companies and new startups are deploying digital subscriber line (DSL) technologies to boost the speeds over copper wires. Cable television companies are revamping their plant to make individual locations addressable and to support high-speed, two-way connections. A bevy of terrestrial wireless companies are deploying new platforms, and low-earth-orbit satellites are poised to join established satellite providers. All are promising interactive broadband connections soon.

The past year has also seen the first sustained regulatory controversy concerning the deployment of these new technologies. Spurred principally by AT&T’s acquisition of two of the largest cable television companies, Internet service providers (ISPs) and others have begun arguing for mandatory open access rules to broadband platforms. Most cable television companies, AT&T included, require their Internet subscribers to purchase service from their affiliated ISP. Unaffiliated ISPs claim that the cable

1 Pub. L. 104-104, 110 Stat. 56 (codified in scattered sections of 47 U.S.C.).

2 *Id.* § 706(a) (reproduced in the note to 47 U.S.C. § 157 (Supp. III 1997)).

3 *See id.* § 706(b).

companies are seeking to extend a monopoly over transmission into the market for content, and they seek regulatory rules requiring the cable companies to provide open access for all such unaffiliated ISPs.

In this paper, I examine the technologies that may provide these new advanced telecommunications services and the early controversy over open access to those platforms. In a recent staff report, the FCC's Cable Services Bureau concluded that "[b]roadband access is among the most compelling issues in the communications industry today. . . . [B]illions of dollars in revenues and investment are at stake."⁴ Part I describes the anticipated demand for advanced telecommunications services and the principal physical barrier to the widespread availability of these services. Long-distance transport networks are now, or soon will be, capable of more than sufficient transmission rates to support these new services. The bottleneck for advanced services involves getting them into individual homes and businesses—the "last mile" of transmission.⁵

Part II discusses the technologies that seem commercially viable for providing high-speed broadband services over the last mile in the near future. The principal battle is between DSL technologies, which promise greater speeds over the telephone companies' wires, and upgraded cable television systems. But there are also several forms of terrestrial wireless, as well as satellite services, that may provide advanced services to large numbers of consumers.

Part III surveys the regulatory scheme that currently governs each of these technologies, with special emphasis on open access rules. On one end of the spectrum, incumbent local telephone companies are currently subject not only to a significant remnant of traditional public utility regulation, but also the new interconnection, unbundling, and cooperation duties imposed by the 1996 Act. In the middle, new local telephone companies are subject to interconnection duties, although they need not provide any newly deployed elements to other carriers at a wholesale cost. At the other end, access providers that do not use any of the existing telephone plant (such as terrestrial wireless providers, cable television companies, and satellite systems) may not be required even to interconnect their facilities with those of other networks.

Finally, Part IV addresses which, if any, of these regulatory paradigms should govern the deployment of new high-speed access platforms and, in particular, the demands for open access to those platforms by unaffiliated content providers. The fear, of course, is that a monopoly owner of broadband access would restrict access to content or

4 DEBORAH A. LATHEN, FCC, BROADBAND TODAY 10 (1999) (Cable Services Bureau Report) <<http://www.fcc.gov/Bureaus/Cable/Reports/broadbandtoday.pdf>>.

5 See HUBER, *supra* note ††, at 17.

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extend its monopoly to information markets. I conclude that these concerns are largely misplaced—even if, as seems unlikely, only one broadband platform in fact is viable. Because demand for an access platform will depend on the availability of a wide variety of information services tailored to the platform, network externality theory suggests that mandatory interconnection and unbundling rules should not be necessary. Indeed, they may be harmful, by reducing incentives for companies to deploy platforms in the first place.

I. The Demand for Broadband and the Problem of the Last Mile

A. *The Anticipated Demand*

There can be little doubt that consumers desire services that require higher speed connections to their homes, even if the market has not had a full opportunity to demonstrate what prices consumers will pay. This is most clearly the case with high-speed Internet connections. Many urban Internet users have experienced these connections at work, where they have access to such connections through their business's high-speed telecommunications network.⁶ At home, the overwhelming majority of analog modems operate at a slow 33.6 kilobits per second (kbps) or less,⁷ and the fastest available modems, which operate at fifty-six kbps, have reached the maximum possible speeds.⁸ At these speeds, complicated web pages, pictures, and video download very slowly, and realtime video transfer is not possible.⁹ In addition to consumer demand, businesses believe that higher speed Internet connections will increase electronic commerce and permit new opportunities for marketing and consumer service.¹⁰ Some analysts see the market for high-speed Internet connections and other broadband services growing to forty million

⁶ See Wesley R. Iversen, *Financial Webcasting: To See or Not To See?*, FIN. SERV. ONLINE (Sept. 1998), available in LEXIS, News Library; *Broadband Bottleneck*, ECONOMIST, Nov. 7, 1998, at 65, 65.

⁷ See Iversen, *supra* note 6.

⁸ See Stuart Gavurin, *Real Options for Today's Nomads and Telecommuters*, BUS. COMM. REV., Oct. 1997, at 41, 43; *Circuit Concept Governs Telecom Net*, ELECTRONIC ENGINEERING TIMES, June 23, 1997, at 90, 90.

⁹ See In re Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, 14 F.C.C.R. 2398, ¶ 20, at 2430 (1999) [hereinafter FCC Section 706 Report]; Shira Levine, *At What Price Universal Service?*, TELEPHONY, June 2, 1997, at 80, 82.

¹⁰ See Howard A. Shelanski, *The Speed Gap: Broadband Infrastructure and Electronic Commerce*, 14 BERKELEY TECH. L.J. 721, 731-36 (1999). See generally Tapan K. Lala & Ozan Tonguz, *Economical Secure Broadband Access: Isn't It Time?*, IEEE COMM. MAG., Nov. 1998, at 97 ("Commerce through the Internet has entered the mainstream and significant revenue transactions between increasing number of businesses and clients are demanding broadband access today.").

consumers in the next several years.¹¹

Providing such high-speed Internet connections is one of the principal reasons behind AT&T's completed merger with TCI and its proposed merger with Media One and the consolidation of the cable television industry.¹² It is also the focus of the local telephone companies' attempts to upgrade their local telephone lines through DSL technology. Bell Atlantic, for example, has announced an agreement with America Online (AOL), under which Bell Atlantic will sell its digital subscriber lines, which promise Internet access speeds greater than the speed of analog modems, as an upgrade to current AOL subscribers.¹³ Every other major local telephone company has promised to deploy similar technology to boost Internet access speeds.¹⁴

Analysts also predict huge consumer demand for other services requiring high-speed connections directly to consumers. For example, video-on-demand, which permits consumers to access a stored database of movies or television shows for nearly instantaneous viewing, may become a one billion dollar a year market within the first three years, as more than seven million households access movies on demand three times each month—all assuming some way can be found to deploy the technology.¹⁵ Similarly, higher bandwidths can make true telecommuting—with remote workers having real-time access to company networks—a reality. Both consumers and businesses want this soon: workers because it increases their freedom and reduces commuting time, businesses because it can save costs.¹⁶

Computer companies similarly are clamoring for additional bandwidth, as microprocessor speeds far outstrip the speeds with which computers can share information over the public phone lines or the Internet. Bill Gates has said, "Bandwidth bottlenecks are the biggest

11 See Arik Hesseldahl, *ADSL vs. Cable Modems: The Coming Battle*, ELECTRONIC NEWS, Jan. 4, 1999, at 44, 44 (citing estimate by Sprint of forty million potential broadband consumers, although other analysts estimate consumer broadband access substantially lower).

12 See, e.g., Jim Davis, *TCI Deal May Speed PC-TV Marriage*, CNET NEWS.COM (June 24, 1998) <<http://www.news.com/News/Item/0,4,23528,00.html>>; John Greenwald, *AT&T's Power Shake*, TIME, July 6, 1998, at 76, 78; Ronald Rosenberg, *AT&T Leading Telecom Pack; Bidding War Boosts Firm in Convergence Race*, BOSTON GLOBE, May 6, 1999, at C1.

13 See Ronald Rosenberg, *Phone vs. Cable: A Bits Per Second Blitz Begins*, BOSTON GLOBE, Sept. 23, 1998, at D1.

14 See *id.*

15 See *Video on Demand Could Be Boon*, NEWSDAY, Aug. 27, 1998, at A53; see also Frank Ahrens, *Video Stores: Are They Headed to the Bottom?*, WASH. POST, Sept. 2, 1998, at D1 (quoting Andy Sernovitz of Interactive Media: "The idea of delivering movies electronically is proven and tested and ready to roll. The only thing we're waiting for is the capacity of the wires"); *Internet Video Growing, with Video on Demand Targeted*, COMM. DAILY, Aug. 26, 1999, at 1.

16 See, e.g., Michele Carleton, *No More DLC Nice Guy: Demands for Faster Internet Access, the Rise in Telecommuting and More Uses for VOD Are Turning Carriers' Attention to Next Generation DLC Gear*, TELEPHONY, Mar. 30, 1998, at 32, 32. See generally, Jo Ann Davy, *Executive-Level Telecommuting*, MANAGING OFF. TECH., June 1998, at 11.

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obstacle to where we'd like to take the PC."¹⁷ Andrew Grove, chairman of Intel, adds: "We're just a step away from the point when every computer is connected to every other computer. As exciting as that is, though, there's one big problem: telecommunications bandwidth."¹⁸ As a result, both Microsoft and Intel have invested heavily in companies attempting to deploy broadband access technologies.¹⁹

In sum, broadband services, once deployed, are expected to grow to a \$150 billion a year market²⁰ (with the market reaching \$8.8 billion within the next few years²¹) and, although some customers will emphasize video while others will look for Internet access, telecommuting, or shopping, the access regime will look the same for each.²² With such a market to meet, companies are racing to deploy technologies to meet the demand.

B. *The Hurdle: The Last Mile*

The physical barrier to companies' providing these services is the so-called last mile into the home. "In general terms, the last mile is the portion of a wide area network that runs from a user to the nearest aggregation point or hub. Most often that is the telephone company's local loop running from homes and businesses to a central switching office or exchange."²³ Switching offices and interoffice transmission facilities benefit from concentrated traffic, and investment in that capital plant can be spread over numerous users. Although telephone companies have substantially increased the transmission capacities between their switching offices, and Internet backbone providers use similar high-speed facilities, "the local loop largely remains as it has for at least the last three decades."²⁴ FCC Chairman Kennard predicts: "Demand for bandwidth doubles every month. But it could grow faster and consumers could see

17 Chip Brookshaw et al., *Last-Mile Alternatives*, INFOWORLD, Sept. 21, 1998, at 90, 90 (quoting Bill Gates).

18 *Id.* (quoting Andrew Grove); see also David D. Clark, *High-Speed Data Races Home*, SCI. AM., Oct. 1999, at 94, 96 ("Ultimately, the desire for broadband communications to the home derives from the increasing speeds of computers.").

19 See Corey Grice, *Intel Eyes Fatter Pipes*, CNET NEWS.COM (Nov. 12, 1998) <<http://www.news.cnet.com/News/Item/0,4,28691,00.html>>; Thomas E. Weber, *Inside the Race To Grab High-Speed Connections*, WALL ST. J., Oct. 22, 1998, at B1.

20 See Annie Lindstrom, *Broadband Notebook: Let the Broadband Boom Begin!*, AMERICA'S NETWORK, Sept. 1, 1998, at 68, 68.

21 See Laura Maggi, *Opt for Data*, MULTICHANNEL NEWS, May 31, 1999, at 18, 22.

22 See Charles Woloszynski, *Gearing Up for ADSL*, BELLCORE EXCHANGE, Summer 1998, at 2, 5 ("Internet access also appears about to subsume most of the other high-speed, high-volume applications for which ADSL was foreseen, such as pay-per-view TV and movies, remote access to local-area networks (LANs), video games, and catalogs for home shopping.").

23 Brookshaw, *supra* note 17, at 92.

24 Charles Eldering, *Prospects for Broadband Deployment in a Deregulated Environment*, IEEE COMM. MAG., July 1998, at 86.

even more benefits if the ‘last mile’ could carry even more.”²⁵

Why is the last mile the bottleneck? The only system that provides ubiquitous, two-way communications is the telephone network. But the telephone companies’ local loops were engineered to carry voice conversations and do not have sufficient bandwidth to carry broadband services. Human voices are intelligible in the 300 to 3400 hertz (Hz) range.²⁶ Local loops were therefore engineered to carry a total frequency of four kilohertz (kHz) between the customer’s premises and the telephone company’s switching office, and the telephone companies’ switches detect only frequencies within this narrow range.²⁷ A telephone network engineered to carry voice conversations has no need of other frequencies or additional bandwidth.

The bandwidth of voice communications thus determines the effective rate at which a traditional modem can push data over a telephone line. Transmission along the local loop is analog—an electrical carrier wave varies in response to the voice energy entering the telephone handset.²⁸ The typical computer modem translates the data sent by the computer into a series of tones, which are carried over the telephone wires in the same manner as a voice conversation—the tone is represented on the carrier wave. Early modems simply pulsed each bit (each 1 or 0) of a data stream by making one tone for a “1” and a different tone for a “0”; later modems have used varying sound levels to represent collections of bits.²⁹ The fastest current modems, which transmit data at a rate of approximately fifty-six kbps downstream, are also at the theoretical maximum for the

25 William Kennard, Remarks to NARUC (July 27, 1998) <<http://www.fcc.gov/Speeches/kennard/spwek822.html>>.

26 MARTIN P. CLARK, NETWORKS AND TELECOMMUNICATIONS 19 (1991). Hertz is a measure of cycles per second (1 Hz = 1 cycle per second).

27 The copper medium used in telephone local loops (pairs of copper wires twisted together, sometimes called “twisted pairs”) is capable of carrying higher bandwidths, but electrical signals lose strength as they travel over wires. As a result, the effective bandwidth along the length of the local loop, accounting for signal loss and any devices such as loading coils that boost the signal, is still generally 4 kHz. Those living closer to central offices may have somewhat greater capacity on their local loops, but the telephone system does not utilize this extra bandwidth. *See generally* CLARK, *supra* note 26, at 27-33; John M. Cioffi et al., *Very-High-Speed Digital Subscriber Lines*, IEEE COMM. MAG., May 1999, at 72. More importantly, filters installed in the telephone company’s switching offices eliminate from the local loop transmission frequencies other than those necessary for regular voice conversation. INTERNATIONAL ENGINEERING CONSORTIUM, ASYMMETRIC DIGITAL SUBSCRIBER LINE TUTORIAL (visited Jan. 16, 1999) <<http://www.webproforum.com/agcommsys/topic02.html>>.

28 *See* CLARK, *supra* note 26, at 19-21. This is something of an oversimplification, for telephone companies employ digital loop carriers (DLCs) in some cases. In this configuration, a local carrier runs fiber or other trunk lines into the field. The copper loops drop off the DLC to individual subscriber homes, and the DLC converts the analog signals on the copper subloop to digital and then multiplexes the individual calls over the trunk line back to the switch. The DLC does no switching itself, however. *See generally* BELLCORE, BOC NOTES ON THE LEC NETWORKS §§ 12.6 - 12.7 (1994).

29 *See, e.g.*, JERRY D. GIBSON, PRINCIPLES OF DIGITAL AND ANALOG COMMUNICATIONS 226-27 (2d ed. 1993); CLARK, *supra* note 26, at 156-64.

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compression of data into a four kHz electrical wave.³⁰ In other words, fifty-six kbps is the fastest one can transmit data over a typical telephone line, and even that top speed is available only to those with the cleanest local loops—approximately half of all telephone customers.³¹

Despite the relatively low speeds for data transmission over the local loop, the rest of the telephone network can carry data at much higher speeds. In the mid-1980s, the telephone companies began upgrading their switches and interoffice transmission facilities (their cable and interoffice switches) to digital transmission technology, and today almost all of these elements are digital.³² With the advent of fiber optics, interoffice transmission speeds have increased several times. Today, with new dense wave division multiplexing, the interoffice communications rates approach OC-192, or ten gigabits per second (ten billion bits per second) on a single fiber strand.³³ Each of the major long-distance telephone companies has installed substantial extra fiber capacity, and several new long-distance companies, such as Qwest Communications, are installing even more fiber.³⁴

Internet backbones transmit data at similar high rates of speed. The principal difference between telephone networks and Internet networks is that telephone communications are “circuit-switched,” while Internet networks are “packet-switched.” In a circuit-switched network, the network establishes a dedicated connection between parties to a communications session that is allocated to those users during the entire length of the call.³⁵ In a packet-switched network, data streams between users are divided into packets and routed over the network in real time:

30 See Zdzislaw Papir & Andrew Simmonds, *Competing for Throughput in the Local Loop*, IEEE COMM. MAG., May 1999, at 61, 63-64.

31 See Alan Liss, *Always On/Dynamic ISDN: It's Coming*, TELECOMMUNICATIONS, Apr. 1998, at 57, 57.

32 The conversion is accomplished as follows: As noted, a voice call requires four kHz of bandwidth. The telephone company's switch samples the frequency level on the caller's line 8000 times each second and records the frequency digitally. The telephone companies determined that 256 different voice levels adequately mimicked voice conversation, so at each of the 8000 times each second, one of 256 values is chosen. Binary numbers require eight digits to represent 256 levels, and, therefore, a telephone call transmitted digitally in this manner requires throughput of 64 kbps (8000 × 8). See CLARK, *supra* note 26, at 55.

33 See Doug Allen, *WDM Testing for Service Providers*, TELECOMMUNICATIONS, Dec. 1998, at 37, 37.

34 See JONATHAN M. KRAUSHAAR, FCC, FIBER DEPLOYMENT UPDATE: END OF YEAR 1997, at 9-12 (1998) <http://www.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/Fiber/fiber97.pdf>.

35 There is a dedicated path, although it may seem discontinuous because the intermediate digital links in a telecommunications network employ a form of time division multiplexing (TDM). The data stream carried on each frequency used in the high-speed link is simply divided into time slots, and individual calls, which require only a small percentage of the total throughput, are allocated to individual slots. There is dedicated bandwidth between the users, however, because the allocation of time slots is permanent throughout the length of the call, whether or not there is data (sound) to be carried in any particular frame.

that is, the packet is sent by the route most efficient at the time the packet is generated. More importantly, in a packet-switched network, when no data is being generated (for example, when the user is reading a downloaded web page before requesting the next one or when both parties to a voice conversation are silent) the network does not allocate transmission capacity to the session. In a circuit-switched network, silence is allocated as much of the network's capacity as constant conversation, and therefore circuit-switched networks generally do not use transmission capacity as efficiently as do packet-switched networks.³⁶ Nevertheless, this difference lies in the types of switches and protocols deployed in telephone versus Internet networks, and it does not alter raw interoffice transmission speeds. Both telephone and Internet switches are capable of these speeds, and, to some extent, the protocols are converging.³⁷ Thus, the cores of the telephone and Internet networks are capable of carrying huge amounts of data extraordinarily quickly and do not pose a barrier to the deployment of advanced telecommunications services.

Similarly, content providers are beginning to convert to digital formats that theoretically can be carried over any digital transmission platform. For example, almost all music is now digitally recorded, and new standards are making possible its rapid transmission.³⁸ Although almost all previously created content will need to be converted, most large content providers such as movie companies have begun that task.³⁹

In sum, the principal barriers, save one, to the deployment of very fast Internet services, video services such as video-on-demand, and computer applications such as interactive gaming have been conquered or soon will be. The remaining barrier is transmission over the last mile—getting these new services into consumers' homes and businesses.

II. The New Broadband Access Platforms

The four years since the passage of the 1996 Act have seen the development and, in some cases, initial deployments of several technologies designed to overcome the last-mile bottleneck and to provide high-speed transmission services to the home. Although these new technologies join some that have been available for a time from the telephone companies, the newer ones promise greater speeds and lower

³⁶ A packet-switched network will not always use bandwidth more efficiently than a circuit-switched network, however. In a packet-switched network, each packet of data has routing and application headers added to the underlying data. Thus, the relative efficiency of the architectures lies in balancing this "packet tax" against the amount of silence in a communications session.

³⁷ See Allen, *supra* note 33, at 37.

³⁸ See Margaret Quan, *New Voice in Internet Music Strikes Discord*, ELECTRONIC ENGINEERING TIMES, Dec. 21, 1998, at 1, 80.

³⁹ See Brian Dipert, *Compression Puts Images on a Diet*, EDN, June 18, 1998, at 71, 74.

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prices. In this Part, I review the current contenders to provide transmission for advanced telecommunications services and discuss both their technological prospects and the hurdles facing their implementation. Picking winners and losers is, at this point, tentative of course, but this Part provides the background necessary for identifying the various regulatory structures that govern the deployment of these services.⁴⁰

For readers wishing to skip the technology and marketing survey, the bottom line is that cable companies are leading in the race to provide broadband services. Telephone companies have developed a technology that permits high-speed transport over existing copper wires, although it does require new equipment at the subscriber's premises and at the telephone company's central office and it cannot work on all subscriber lines. Cable television providers can convert their systems to enable telephony as well as high-speed Internet access and other information services. Two kinds of new fixed wireless systems will provide a high-speed platform to some areas. Even satellite companies are getting into the game, providing some high-speed access services. Currently, the cable companies have the lead to market, with the telephone companies relatively close behind. The other access platforms, while feasible, are generally several years in the future. The survey also reveals, however, that none of the new access technologies will be able to provide multichannel video services similar to those currently offered by cable television and direct broadcast satellites.⁴¹

A. Wireline Telephone Plant

As previously discussed, current local loops cannot carry data at high speeds, and therefore cannot provide transmission for advanced telecommunications services. The maximum speed for an analog modem of fifty-six kbps is often itself unavailable. Telephone companies have sold faster access, but those services to date have required special provisioning at prices that make them impractical for the consumer market. The

40 In its recent report to Congress, the FCC stated that broadband access should be defined by technologies capable of operating at a minimum of 200 kbps. The FCC chose that threshold, it said, "because it is enough to provide the most popular forms of broadband—to change web pages as fast as one can flip through the pages of a book and to transmit full-motion video." FCC Section 706 Report, *supra* note 9, ¶ 20, at 2406. I believe the threshold should be higher, nearer to one megabits per second (Mbps), at least downstream, because that speed is necessary to view television-quality video. *See infra* notes 60, 71. Nevertheless, there is little practical difference between these thresholds, for current telephone plant is incapable of meeting even the lower 200 kbps speed and new platforms therefore must be developed.

41 The balance of the article, therefore, sets to one side the regulation governing multichannel video services, which for now includes broadcast (including new Advanced Television Services), telephone company video systems, cable television, and direct broadcast satellites. On these topics, see generally Glen O. Robinson, *The New Video Competition: Dances with Regulators*, 97 COLUM. L. REV. 1016 (1997).

emerging DSL technology promises inexpensive, high-speed service over existing copper plant.

1. Special Access

It has always been possible to buy a “fatter pipe” from the telephone companies. Generally known as T-1 service, the telephone companies will provide to any customer a facility capable of carrying the equivalent of twenty-four voice channels, or a total of 1.544 megabits per second. T-1 service, however, has been prohibitively expensive, because installation generally requires the telephone company to install new equipment between the switching office and the customer’s premises.⁴² Large businesses have long purchased T-1 lines (single or multiple for even higher speeds), but they represent almost the entire market due to installation costs of around \$1000 and monthly charges of \$600 to \$1000.⁴³ For this reason, the FCC has concluded that only large and medium-sized businesses in urban centers are currently able to receive advanced telecommunications services.⁴⁴

2. ISDN

In the early 1980s, the telephone companies developed ISDN—the integrated services digital network—and nearly two million customers are expected to subscribe by the end of 1998.⁴⁵ ISDN can be provisioned over the copper local loop, and the type of ISDN intended for provision over a local loop provides speeds of 128 kbps in each direction.⁴⁶ A customer buys special terminal equipment and can then use the line simultaneously for two voice calls, a voice call and a sixty-four kbps data session, or 128 kbps data transmission by combining two channels. This is a substantial improvement over analog modem speeds, but it is not fast enough for real-

42 See INTERNATIONAL ENGINEERING CONSORTIUM, ASYMMETRIC DIGITAL SUBSCRIBER LINE (ADSL) TUTORIAL (visited Nov. 26, 1999) <<http://www.webproforum.com/adsl/topic03.html>> (“Unfortunately, T-1/E-1 is not really suitable for connection to individual residences. The transmission protocol they used, alternate mark inversion (AMI), required transceivers 3,000 feet from the central office and every 6,000 feet thereafter. AMI demands so much bandwidth and corrupts the cable spectrum so much that telephone companies could use only one circuit in any 50-pair cable and none in any adjacent cables. Under these circumstances, providing high bandwidth service to homes would be equivalent to installing new wire.”).

43 See Josh McHugh, *Stretching Copper*, FORBES, Feb. 23, 1998, at 120, 120.

44 See FCC Section 706 Report, *supra* note 9, ¶ 26, at 2408.

45 See Robyn Aber, *Will Digital Copper Catch On?*, COMM. NEWS, May 1998, at 22, 27.

46 ISDN comes in two types: basic rate interface (BRI), and primary rate interface (PRI). BRI can be provisioned over a twisted pair, while PRI requires, at a minimum, a four-wire interface. PRI offers the equivalent of 24 voice channels and is equivalent to a digital T-1 line. See CLARK, *supra* note 26, at 454, 462-63; BELLCORE, *supra* note 28, at §§ 12.9.1 - 12.9.2.

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time video or for truly high-speed Internet access,⁴⁷ even when taking into account that digital compression software can often increase those speeds several fold.⁴⁸ ISDN's current advantage is its relatively mature technology, with established standards and nationwide availability.⁴⁹ And Always On/Dynamic ISDN, which minimizes the stress on telephone company switching equipment by not requiring full-time switched channels, may lead to some price reductions and provide acceptable speeds for remote commuting.⁵⁰ Nevertheless, ISDN's basic rate over copper wire simply cannot provide television-quality video or similar services.⁵¹

3. xDSL

xDSL refers to digital subscriber line technologies, where the "x" is a placeholder that refers to the particular DSL standard being employed. Currently competing flavors of DSL include: SDSL, which is a symmetric, high-speed service; ADSL, which is asymmetric in that downstream transmission rates toward the user are greater than upstream rates; IDSL, which is a new generation ISDN service, but offers no increase in speeds; and RADSL, which stands for rate-adaptive DSL and promises to optimize performance over loops whose condition may change based on weather or other variations. The fundamental part of each of these DSL technologies is that the local copper loop is disconnected from the telephone company's voice switch and reattached to a digital subscriber line access multiplexer (DSLAM).⁵² The DSLAM is typically housed in the telephone company's central office, and the DSLAM routes voice traffic back into the voice network and routes data to a data network.⁵³

Once the copper wire is split off from the voice switch, the consumer's DSL modem and the DSLAM send data streams on frequencies not transmitted over the voice network.⁵⁴ Using a wider total bandwidth, DSL transmits data over as many as 255 separate subchannels, while leaving the bottom four kHz available for voice conversations.⁵⁵ The most commonly touted type of DSL for deployment to residences and

47 See Brookshaw, et al., *supra* note 17, at 90-91.

48 See Annie Lindstrom, *Comfortable Bedfellows, After All? ISDN Is Getting New Life From—Surprise! It's [sic] New 'Partner,' xDSL*, AMERICA'S NETWORK, Nov. 1, 1998, at 13, 16.

49 See Aber, *supra* note 45, at 27.

50 See Annie Lindstrom, *Mind Your 2B1Qs: AO/DI Could Shine in 1999*, AMERICA'S NETWORK, Nov. 1, 1998, at 20, 20; Liss, *supra* note 31, at 58-59.

51 See FCC Section 706 Report, *supra* note 9, ¶ 20, at 2406, ¶ 61, at 2430.

52 See Walter Y. Chen, *The Development and Standardization of Asymmetrical Digital Subscriber Line*, IEEE COMM. MAG., May 1999, at 68, 70.

53 See Ken Cavanaugh, *Splitting Out the Issues of the ADSL G.lite Initiative*, TELECOMMUNICATIONS, Oct. 1998, at 45, 46-47.

54 See, e.g., ADSL FORUM, ADSL TUTORIAL (visited Nov. 26, 1999) <http://www.adsl.com/adsl_tutorial.html>; Cavanaugh, *supra* note 53, at 46.

55 See ADSL FORUM, *supra* note 54.

small business, and the one being pushed by both incumbent and new telephone companies, is ADSL. ADSL is a preferred solution for most consumers because transmission requirements downstream—for watching movies, receiving files, or receiving large web pages—far exceed the transmission requirements in the upstream direction, which can be as little as a few mouse clicks.⁵⁶ If a remote worker needs video conferencing or is sending large files back upstream, SDSL better mirrors data transmission needs. Unfortunately, overall data speed for SDSL cannot come close to ADSL's downstream push.⁵⁷

The maximum speeds for true ADSL approach ten Mbps downstream and one Mbps upstream, which is more than sufficient for video on demand and blazing Internet access.⁵⁸ The most likely versions for residential consumers will provide only about 1.5 Mbps downstream.⁵⁹ These speeds are not enough, however, to mimic cable television, for it is not sufficient bandwidth to drive multiple video signals at the same time.⁶⁰ Future versions of DSL may provide greater speeds, but they largely depend on the telephone companies or others deploying fiber optic cable much closer to individual homes and businesses.⁶¹

DSL has the advantage of being based upon the existing telephone network. As such, DSL is significantly cheaper to deploy than alternatives requiring new construction.⁶² Currently, more residences and small businesses are served by DSL-capable lines than are served by cable-modem ready cable systems.⁶³ It nevertheless trails cable systems by a ratio of ten to one or more in subscribers.⁶⁴

Now that a technical standard has been adopted for ADSL,⁶⁵ the principal impediments to its deployment are inappropriate local loops and

56 See, e.g., Woloszynski, *supra* note 22, at 4. Following section 706, the FCC limits its definition of advanced telecommunications services to technologies capable of "broadband" (i.e., for the FCC, 200 kbps or greater) in both directions. This is too limiting, for many consumers will not demand upstream bandwidth, and the FCC's definition therefore likely excludes some viable, competing services such as downstream delivery via direct broadcast satellite. See FCC Section 706 Report, *supra* note 9, ¶ 22 n.17, at 2407; *infra* notes 123-25 and accompanying text.

57 See Brookshaw et al., *supra* note 17, at 97.

58 See ADSL FORUM, *supra* note 54; Joanna Makris, *DSL: Don't Be Duped*, DATA COMM., Apr. 21, 1998, at 38; Woloszynski, *supra* note 22, at 4-5.

59 See Chen, *supra* note 52, at 68-69; Papir & Simmonds, *supra* note 30, at 64. Current mass-market versions are priced around \$50/month for half that speed (768 kbps). See David Schober, *Bringing DSL to Mainstreet*, TELEPHONY, Aug. 2, 1999, at 8, 8.

60 See Clark, *supra* note 26, at 98.

61 See Vince Vittore, *Video Re-emerges: Focus on VDSL Is Breathing New Life into Telcos' Ambitions*, TELEPHONY, July 6, 1998, at 58, 58.

62 See LATHEN, *supra* note 4, at 20.

63 See Patrick Flanagan, *Will the RBOCs Turn DSL into Another ISDN?*, TELECOMMUNICATIONS, May 1999, at 37, 37.

64 See *id.*; Brian L. Hinman, *ADSL Comes Home*, TELEPHONY, May 24, 1999, at 40, 40.

65 The principles for ADSL were developed in the late 1980s, but the international standards-setting body established technical standards in late 1997. See Lee Goldberg, *DSL Technologies Ready for Takeoff?*, ELECTRONIC DESIGN, June 28, 1999, at 53.

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sheer cost. Although ADSL works over twisted pairs, those pairs must meet some fairly aggressive characteristics. Principal among them are that the pairs can extend no further than approximately 15,000 feet from the central office; must not have long bridge taps (unterminated branches); must not have loading coils (originally installed by telephone companies to diminish interference from wavelengths that DSL uses); and must not branch from digital loop carriers.⁶⁶ Taking into account all of these restrictions, as few as 50% of telephone subscribers may be able to receive fast ADSL service in the near future.⁶⁷

Even in those instances in which the loop can bear ADSL, the telephone company must physically transfer it from the voice switch to the DSLAM and must install a splitter on the customer's premises. This splitter segregates the bandwidth for voice traffic from the bandwidth for data traffic, thereby ensuring that voice is available even if the DSL service fails and reducing interference between the two services.⁶⁸ This requires a "truck roll" to the customer's house, which increases the cost. Total costs for ADSL deployment are currently estimated at \$500 per house, plus approximately \$50-100 per month for service.⁶⁹

To reduce costs, several telephone and computer companies are backing an initiative known as "ADSL lite" or "G.Lite." This standard, which the International Telecommunications Union approved for final ratification in October 1998, provides ADSL without a splitter. Without the splitter, the telephone company need not visit a customer's premises, thereby reducing costs and enhancing ADSL as a "plug and play" technology for consumers.⁷⁰ The concession comes in maximum transmission speeds, which are significantly lower and make the service appropriate only for faster Internet surfing, not for full-motion video.⁷¹

Several computer companies have begun shipping computers with ADSL lite modems,⁷² and several telephone companies have begun

66 See Makris, *supra* note 58, at 40; Woloszynski, *supra* note 22, at 6. Where a DLC has been deployed, there is no copper loop at the telephone company's switching office. As a result, there is nothing to feed into the DSLAM at that point, and individual lines can not be broken off from the incumbent company's network. Of course, each of these problems, with the exception of the maximum length of the copper wire, can be solved: bridge taps and loading coils can be removed and the DSLAM can be collocated at the site of the digital loop carrier. But such remedies increase costs.

67 See Eric Krapf, *Slow Roll for DSL*, BUS. COMM. REV., Aug. 1998, at 47.

68 See Cavanaugh, *supra* note 53, at 46.

69 See *id.* at 40; Krapf, *supra* note 67, at 72 (quoting Covad Communications, a CLEC offering ADSL: "Our service is \$90 to \$195, so we're not in the consumer price range. . . . If you have to do a truck roll, it's very hard to hit the consumer price point. We charge a \$325 installation fee to businesses, and that's been acceptable").

70 See Timothy Kwok, *Residential Broadband Architecture over ADSL and G.Lite (G.992.2): PPP over ATM*, IEEE COMM. MAG., May 1999, at 84, 85; Hesseldahl, *supra* note 11, at 44.

71 See George T. Hawley, *DSL: Broadband by Phone*, SCI. AM., Oct. 1999, at 102, 103.

72 See Eric Auchard, *Compaq Organizes High-Speed Net Push*, REUTERS (Nov. 16, 1998) <<http://www.zdnet.com/zdnn/stories/news/0,4586,2164801,00.html>>.

deploying both full-scale ADSL and ADSL lite.⁷³ In mid-1999, a total of 160,000 DSL lines had been deployed.⁷⁴ Private analysts estimate that ADSL is likely to grow into a several-hundred million dollar per year industry within a decade,⁷⁵ and some predict that it will become the market leader in the near future.⁷⁶

4. New Outside Plant

Telephone companies, of course, could deploy new outside plant capable of higher transmission speeds. Some commentators predict that only the widespread deployment of fiber optics to the home, or to nearly each home, will support the full range of future telecommunications services.⁷⁷ But these solutions are very expensive, and no company is currently planning near-term fiber deployment to individual customers.⁷⁸

B. Cable Television Plant

Cable television is already a ubiquitous broadband technology. With the capacity for fifty or more simultaneous video channels, cable television has more than sufficient bandwidth to provide new telecommunications services. The impediment to providing such services over cable TV lines is that, as originally installed, almost all cable television plant is one-way: information goes out to users, but there is no return path. Subscribers cannot request information different from that which the system has chosen to provide at any given time. Cable television companies are now spending billions of dollars to upgrade their plant and, once converted, cable systems very likely will be able to provide simultaneous video, voice, and data transmission. As of August 1999, over one million customers subscribed to cable modem service.⁷⁹

Cable's first advantage is its ubiquity: cable television systems pass ninety-seven percent of all television households⁸⁰ and nearly two-thirds

⁷³ See Krapf, *supra* note 67, at 71; Susan O'Keefe, *While RBOCs Drag Their Heels, CLECs, ISPs Mean Business*, TELECOMMUNICATIONS, Dec. 1998, at 42; Juan Carlos Perez & Elinot Mills, *MCI Rolls Out DSL Service in U.S.*, INDUSTRY STANDARD (Nov. 19, 1998) <http://www.thestandard.net/articles/article_print/0,1454,2591,00.html>.

⁷⁴ See LATHEN, *supra* note 4, at 27.

⁷⁵ See *id.* at 27-28.

⁷⁶ See Hawley, *supra* note 71, at 103.

⁷⁷ See *e.g.*, Steve Smith & Mark Grimes, *The Access Piece*, COMM. NEWS, June 1998, at 86 (ADSL and other digital copper solutions can forestall the need for "fiber to the home" or "fiber to the curb" only until the year 2004).

⁷⁸ See KRAUSHAAR, *supra* note 34, at 22. *But see* Paul W. Shumate, Jr., *The Broadest Broadband*, SCI. AM., Oct. 1999, at 104, 105 (predicting increased use of fiber to the home).

⁷⁹ See LATHEN, *supra* note 4, at 25.

⁸⁰ See Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming, Fifth Annual Report, 13 F.C.C.R. 24,284, ¶ 16, at 24,293-94 (1998).

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of all television households are cable subscribers, with half of all subscribers purchasing some premium cable channels.⁸¹ Annual cable revenues are expected to exceed thirty-two billion dollars for 1998.⁸² The average cable system has fifty channels available, providing enough capacity for advanced telecommunications services.

The possibility that cable might compete with telephone companies has long been anticipated. As long ago as 1970, the FCC stated that “there is a substantial expectation that broadband cables, in addition to CATV services, will make economically and technically possible a wide variety of new and different services involving the distribution of data, information storage and retrieval, and visual, facsimile and telemetry transmissions of all kinds.”⁸³ While the FCC’s optimistic prediction did not come true in the 1970s or 1980s, in the 1990s cable operators began to upgrade their systems to provide two-way services. This upgrade requires installing new equipment to facilitate two-way communications and to permit each location on the cable system to be addressed independently.⁸⁴ Operators have been installing additional fiber and high-capacity coaxial cable, routing hubs capable of two-way communications, and cable modems capable of handling television, telephone, and Internet services.⁸⁵

As of August 1999, cable modem service was available to thirty-two million homes.⁸⁶ The best estimates place cable modem subscribership at 1.5 million by the end of 1999,⁸⁷ up from 350,000 at the end of 1998.⁸⁸ However, the pace of system conversion is increasing. The cable industry estimates that it spent six billion dollars on conversions in 1997 alone,⁸⁹ and AT&T’s mergers with TCI and Media One are premised on AT&T using its technical and monetary resources to push those systems to full conversion by the end of 2000.⁹⁰ Conversion of all systems is expected to cost thirty-one billion dollars.⁹¹ Numerous computer manufacturers have announced the availability of cable modems, and prices are expected to fall

81 See *id.* ¶ 16, at 24,293-94.

82 See *id.* ¶ 29, at 24,300.

83 Applications of Telephone Companies for Section 214 Certificates for Channel Facilities Furnished to Affiliated Community Antenna Television Systems, Final Report and Order, 21 F.C.C.2d 307, 324-25 (1970).

84 See generally Michael Finneran, *The Cable Modem Picture Comes into Focus*, BUS. COMM. REV., Mar. 1999, at 22. A cable system is typically converted to digital transmission at about the same time that upgrades to permit interactive services are made.

85 See James Careless, *A Path to Digital Cable*, COMM. NEWS, Oct. 1998, at 34, 34; Joseph S. Kraemer, *Tentative Steps Toward New Local Loop Technology*, BUS. COMM. REV., Feb. 1998, at 42, 43.

86 See LATHEN, *supra* note 4, at 25.

87 See *id.*

88 See FCC Section 706 Report, *supra* note 9, ¶ 54, at 2426-27.

89 See *id.* ¶ 37, at 2415-16.

90 See Davis, *supra* note 12; Ron Scherer, *AT&T, TCI Link Starts a New Info-Age Era*, CHRISTIAN SCI. MONITOR, June 26, 1998, at 3, 3.

91 See LATHEN, *supra* note 4, at 26.

to approximately \$200 in the near future.⁹²

When converted, cable systems can provide, in addition to video services, telephony, Internet access, and other information services. The prevailing standard—Data Over Cable Service Interface Specification (DOCSIS)—defines a usable downstream rate of twenty-seven Mbps and an upstream rate of 1.8 Mbps.⁹³ The effective rates for individual consumers are lower, however, because an upgraded cable system still is not a fully circuit-switched environment. Rather, reflecting its original design as a massive trunk-and-branch, one-way distribution system, consumers at the end of hubs share bandwidth, with routing protocols identifying which data streams are destined for which customers. As a result, cable modem users experience data speeds of approximately three Mbps downstream.⁹⁴

This use of shared bandwidth raises security concerns for businesses. Cable operators assert they are using encryption technologies, but the effectiveness of these systems has not yet been proved.⁹⁵ Moreover, shared use of the last mile also means that individual performance will vary; unlike DSL or ISDN, where no other user has a claim on the last mile, cable modem performance can vary depending on how many people in the same local hub are actively transporting data.⁹⁶ These variabilities may make cable less attractive to business users accustomed to the performance guarantees that accompany higher priced telephone services, such as T-1 access.

Nevertheless, cable seems uniquely positioned to provide the entire package of video, telephony, and high-speed, two-way data services. Although true video-on-demand may not be feasible in the near future,⁹⁷ this limitation is not unique to cable, and cable may be able to provide near video-on-demand by multicasting—showing the top twenty movies starting at twenty minute intervals—once system capacities increase with the conversion to digital protocols. For these reasons, analysts generally agree that cable operators are in the lead to provide high-speed access to the home.⁹⁸

92 See Brian Caufield, *Broadcom's Single Chip Gives Cable a Boost*, INTERNET WORLD, Sept. 28, 1998, available in LEXIS, News Library.

93 See Finneran, *supra* note 84, at 23. For more information on DOCSIS, see <<http://www.cablemodem.com>> (site provided by Cable Labs).

94 See Finneran, *supra* note 84, at 23; Morris Edwards, *High-Speed Access Kicks into High Gear*, COMM. NEWS, Aug. 1998, at 98, 98.

95 See Edwards, *supra* note 94, at 98.

96 See LATHEN, *supra* note 4, at 19.

97 See, e.g., Matthew Boersma, *High-Speed Access Roadblocks*, ZDNN (Dec. 1, 1998) <<http://www.zdnet.com/zdnn/stories/news/0,4586,2170781,00.html>> (cable Internet provider @Home is limiting customers to 10-minute downloads of broadcast-quality video due to bandwidth constraints).

98 See Hesseldahl, *supra* note 11, at 44 (summarizing analysts' reports); Eric Krapf, *Why Cable Modems Are Winning*, BUS. COMM. REV., Dec. 1998, at 16, 16. See generally Mark LaPedus,

C. *Terrestrial Wireless*

1. Cellular and PCS

Following FCC auctions of additional spectrum, personal communications service (PCS) and specialized mobile radio (SMR) providers have joined traditional cellular telephone companies in offering mobile telephone services.⁹⁹ As of June 1998, almost every part of the country was served by three companies offering mobile telephone service.¹⁰⁰ Each of these systems has a similar architecture: the deployment of small area transmitters (cells) permits the reuse of spectrum across the provider's service area; the smaller the cell size, the larger the system capacity.¹⁰¹ The system's connection to an individual mobile phone is "handed off" from cell site to cell site as callers move about the territory. Additionally, digital mobile telephone systems employ either time division multiplexing (TDMA) or code division multiplexing (CDMA) to reuse frequencies within a single cell.¹⁰² Current cellular systems support low-speed data services, generally at 14.4 kbps, although some CDMA systems can support speeds of up to 76.8 kbps by aggregating channels.¹⁰³ The process to set standards for converting these mobile systems to multimedia and high-speed data applications has just begun, and true multimedia services are not expected to be deployed in the near future.¹⁰⁴

It's ADSL vs. Cable Modems, ELECTRONIC BUYERS' NEWS, Nov. 9, 1998, at 16; Charles Mason, *Cable Modems v. DSL*, AMERICA'S NETWORK, Sept. 1, 1998, at 37.

⁹⁹ See FCC, REPORT TO CONGRESS ON SPECTRUM AUCTIONS, FCC 97-353, at 8-10 (1997) (discussing the history of FCC spectrum auctions).

¹⁰⁰ See FCC, THIRD ANNUAL CMRS COMPETITION REPORT 3 (1998).

¹⁰¹ See WILLIAM C.Y. LEE, MOBILE CELLULAR TELECOMMUNICATIONS 56-57, 67 (1995); Alex Hills, *Terrestrial Wireless Networks*, SCI. AM., Apr. 1998, at 86, 89-90.

¹⁰² TDMA is explained in note 35, *supra*; CDMA is a form of spread spectrum transmission, involving the use of the entire assigned spectrum by each transmitter in a cell, with a code being assigned to each individual conversation and the power output of the transmitter being continuously regulated to ensure that the cell is receiving transmissions at a similar power. CDMA permits greater system capacity than TDMA because each cell may use a greater portion of the available system spectrum. See LEE, *supra* note 101, at 503-33, 601-16; Douglas N. Knisely et al., *cdma2000: A Third-Generation Radio Transmission Technology*, BELL LABS TECH. J., July-Sept. 1998, at 63, 64-65; Hills, *supra* note 100, at 90; Arthur H.M. Ross, *The CDMA Revolution* (visited Jan. 17, 1999) <http://www.cdg.org/a_ross/CDMARevolution.html>. See generally Esmael H. Dinan & Bijan Jabbari, *Spreading Codes for Direct Sequence CDMA and Wideband CDMA Cellular Networks*, IEEE COMM. MAG., Sept. 1988, at 48.

¹⁰³ See Knisely et al., *supra* note 102, at 65; see also MUTHUTHAMBY STREETHARAN & RAJIV KUMAR, CELLULAR DIGITAL PACKET DATA 9-11 (1996) (stating that cellular digital packet data standard operates at 19.2 kbps, or approximately 12.8 kbps once packet overhead is accounted for).

¹⁰⁴ See Jin Wang et al., *Wireless Voice-over-IP and Implications for Third-Generation Network Design*, BELL LABS TECH. J., July-Sept. 1998, at 79, 95; Mahmoud Naghshineh & Marc Willebeek-LeMair, *End-to-End QoS Provisioning in Multimedia Wireless/Mobile Networks Using an Adaptive Framework*, IEEE COMM. MAG., Nov. 1997, at 72, 81.

2. Terrestrial Fixed Wireless

In the past several years, the FCC has opened spectrum for the provision of fixed wireless services. Initially, these services were known as “wireless cable,” because they were capable of only one-way transmission and were generally used to provide video services. Wireless has some advantages over wire systems: wireless providers need not acquire rights of way or string cable, and they therefore have some cost and speed-of-service advantages.¹⁰⁵ On the other hand, the FCC now charges for spectrum—auctioning new slices to the highest bidders¹⁰⁶—while wire creates its own spectrum. The two new terrestrial wireless services discussed below are expected to provide at least some broadband access.

a. MMDS

Multichannel multipoint distribution service (MMDS) is licensed in the 2500 MHz band. Although originally devised to provide video distribution to educational institutions, most educational institutions did not use their full allotment of channels and leased excess capacity to adjacent multipoint distribution service (MDS) providers.¹⁰⁷ On an analog basis, MDS distributors could provide only thirty-three channels, and they therefore could not compete with cable television systems.¹⁰⁸ MDS is strictly a line-of-sight service—there must be an unobstructed path between the provider’s and subscriber’s antennas.¹⁰⁹ While thirty-four million homes are within MDS territories, MDS had only 1.05 million subscribers at the end of 1997.¹¹⁰ In 1998, the FCC changed its rules, permitting MDS providers to offer interactive services. By converting to digital, MMDS providers can increase system capacity to 198 digital video channels.¹¹¹ That would be sufficient capacity for information services as well, and both MCI/Worldcom and Sprint have begun investing heavily in MMDS.¹¹² Until such conversions are made, however, MMDS will not

105 See Ihor Nakonecznyj, *Marketplace Demand for Bandwidth Here and Now Gives LMDS Edge*, AMERICA’S NETWORK, June 15, 1998, at S14, S14-15; Scott Seidel, *Broadband Wireless Services: In the Line of Sight*, BELLCORE EXCHANGE, Spring 1997, at 19, 20.

106 See *infra* note 114 and accompanying text.

107 See Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming, Fifth Annual Report, 13 F.C.C.R. 24,284, ¶ 81, at 24,336 (1998).

108 See *id.* ¶ 82, at 24,336; Seidel, *supra* note 105, at 20-21.

109 See Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming, Fifth Annual Report, 13 F.C.C.R. 24,284, ¶ 81, at 24,336 (1998).

110 See *id.* ¶ 83, at 24,336-37.

111 See Amendment of Parts 21 and 74 To Enable Multipoint Distribution Service and Instructional Television Fixed Services Licensees To Engage in Fixed Two-Way Transmission, Report and Order, 13 F.C.C.R. 19,112, ¶ 7 n.10, at 19,115-16 (1998).

112 See LATHEN, *supra* note 4, at 29; Kelly Carroll, *Alternative Access*, TELEPHONY, Sept. 6, 1999, at 12, 12; Nancy Gohring, *Sprint Readies MMDS Launch*, TELEPHONY, Aug. 16, 1999, at 16, 16.

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compete either in providing traditional cable TV services or in providing advanced telecommunications services.¹¹³

b. LMDS

In March 1998, the FCC concluded an auction of licenses for local multipoint distribution systems (LMDS), the largest of which provide one gigahertz (GHz) in the twenty-eight GHz band.¹¹⁴ LMDS will be deployed in a fixed cellular architecture, and individual subscribers can transmit and receive data at speeds of at least 155 Mbps.¹¹⁵ However, due to the recent licensing, the lack of technical standards, and a dearth of equipment suppliers, few LMDS providers are announcing near-term, large-scale deployment.¹¹⁶ Moreover, those few that are deploying LMDS say that it will not be used to provide video services in competition with broadcasters, cable television, and direct broadcast satellites.¹¹⁷

Because of the very high frequency at which LMDS operates, it too is strictly a line-of-sight technology. In the twenty-eight GHz band, even rain can degrade the transmission.¹¹⁸ Although careful engineering can overcome problems from rain, the need for direct line of sight (even tree leaves are too thick to penetrate) means that the principal near-term market for LMDS will be small and medium-sized businesses that cannot afford fiber-optic data services.¹¹⁹ This is precisely the market that the largest LMDS provider, Winstar Communications, is targeting.¹²⁰ AT&T also has taken a 41% interest in Teligent, another large LMDS provider, based principally on expected business applications.¹²¹ Even with this limited market, however, some analysts are predicting that LMDS will become a

113 See Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming, Fifth Annual Report, 13 F.C.C.R. 24,284, ¶ 84, at 24,337 (1998); Nancy Gohring, *The Miracle Cure*, TELEPHONY, July 5, 1999, at 28, 30.

114 See LMDS Auction Closes; Winning Bidders in the Auction of the 986 Local Multipoint Distribution Service (LMDS) Licenses, 13 F.C.C.R. 18,217, at 18,217 (1998); see also Charles Mason, *LMDS: Fixed Wireless Wave of the Future?*, AMERICA'S NETWORK, June 15, 1998, at S3.

115 See Doug Allen, *LMDS: A Wireless Bandwidth Bonanza Puts ILECs on Notice*, TELECOMMUNICATIONS, May 1998, at 51, 51; Jason Meyers, *On the Air*, TELEPHONY, Nov. 23, 1998, at 20, 24.

116 See Fred Dawson, *Concerns Rise for Wireless Providers*, MULTICHANNEL NEWS, Nov. 23, 1998, at 101, 101; Marc Liggio, *Wireless Internet—No Threat to Cable*, MULTICHANNEL NEWS, Oct. 26, 1998, at 81, 81; Daniel Sweeney, *LMDS: Finally Ready for Prime Time?*, AMERICA'S NETWORK, Aug. 1, 1998, at 22, 22.

117 See Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming, Fifth Annual Report, 13 F.C.C.R. 24,284, ¶ 87, at 24,339 (1998).

118 See Seidel, *supra* note 105, at 21-22.

119 See Allen, *supra* note 115, at 51-52; *LMDS Grows Past New Millennium*, TELEPHONY, Aug. 24, 1998, at 58, 58; Tom McCabe, *What Lies Ahead LMDS*, AMERICA'S NETWORK, June 15, 1998, at S8, S10.

120 See, e.g., Gene Heftman, *LMDS Set To Challenge for Last Mile Supremacy*, MICROWAVES & RF, Apr. 1999, at 30.

121 See Gohring, *supra* note 112, at 30.

\$8 billion industry, with about 15% of total broadband access revenues, within five years.¹²²

D. *Satellites*

Although space might seem a little far to go for advanced telecommunications services, service from direct broadcast satellites (DBS) is already the leading competitor to cable television video service, with more than 7.2 million subscribers as of June 1998 and fifteen million expected by 2002.¹²³ Four companies provide DBS service to the United States from several satellites in geosynchronous orbit; each satellite's coverage is at least one-half of the lower forty-eight states.¹²⁴ DBS providers also offer Internet access service, which provides 400 kbps downstream but uses ordinary phone lines for the upstream path.¹²⁵

The FCC has recently licensed several companies to launch low-earth orbit (LEO) or medium earth orbit (MEO)¹²⁶ satellites for data applications, including Internet access. One LEO system—Iridium—is already operating, but it currently handles only telephone calls and data at a mere 2.4 kbps.¹²⁷ LEO satellites orbit the earth faster than the earth's rotational speed, and users are therefore handed off from satellite to satellite. The theory is similar to cellular systems, except it is the antennas (the cells) that are moving as the user stands still.¹²⁸ With LEOs, lower power antennas can provide the return path, and delays, which can reach several seconds for satellites in geosynchronous orbit, are diminished. Data speeds are expected to reach sixty-four Mbps downstream and two Mbps upstream.¹²⁹ These systems are at least several years away.¹³⁰ Nevertheless, despite the massive investment required, several companies appear committed to their deployment.¹³¹

122 See Heftman, *supra* note 120, at 30; Charles Mason, *LMDs: Huge Niche Technology, AMERICA'S NETWORK*, Sept. 1, 1998, at 73, 73 (reporting projections by Pioneer Consulting).

123 See Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming, Fifth Annual Report, 13 F.C.C.R. 24,284, ¶ 62, at 24,323-24 (1998).

124 See *id.* ¶ 61, at 24,323.

125 See *id.* ¶ 75, at 24,332; Amelia Kassel, *Internet Access by Satellite*, ONLINE, July 17, 1998, at 30, 30.

126 LEO satellites operate at orbits of approximately 1500 kilometers, while MEO satellites orbit at about 10,000 kilometers; geosynchronous orbit is 36,000 kilometers. See John V. Evans, *New Satellites for Personal Communications*, SCI. AM., Apr. 1998, at 70, 73.

127 See *id.* at 74-75; Toni Mack, *The Skies Get Crowded*, FORBES, Nov. 30, 1998, at 152.

128 See Evans, *supra* note 126, at 73-74.

129 See Susan O'Keefe, *Watch Out DSL: Broadband Satellite Systems Are Coming*, TELECOMMUNICATIONS, Oct. 1998, at 35, 35; John Sweitzer, *The Future of Broadband Satellite Networks*, SATELLITE COMM., July 1999, at 30.

130 See Evans, *supra* note 126, at 77.

131 See LATHEN, *supra* note 4, at 22; Robert P. Norcross, *Satellites: The Strategic High Ground*, SCI. AM., Oct. 1999, at 106, 106-07.

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E. *Conclusion*

I have not endeavored to pick the winners or the losers. The current consensus is that cable television has the largest headstart in terms of subscribers, with DSL technology fairly close behind. It is also assumed that at least one wireless technology, most likely LMDS, will provide data services to a significant market. What the foregoing does reveal, however, is that a number of technologies will soon compete to provide video, telephone, and data, including Internet, services.

III. Current Regulation of Broadband Access

Different regulatory schemes govern these soon-to-be competing technologies, each largely a legacy of the statutes or rules passed in the technology's infancy. Although the FCC has been vigorously working to implement, and in some cases to rationalize, the 1996 Act, and to enable new technologies, it cannot fundamentally alter the statutory schemes. This Part reviews the principal statutes and regulations governing telephone companies, cable television systems, terrestrial wireless systems, and satellite providers as each seeks to provide some or all of the advanced telecommunications services Congress expects to be made available "to all Americans." I focus on the rules governing integrated offerings of access and information services, particularly rules requiring interconnection and mandatory unbundling of transport.

Providers face one of three different levels of unbundling rules. First, incumbent telephone companies deploying DSL technology are required to provide other carriers access, at cost-based rates, to the fundamental elements of their networks. Moreover, the largest incumbents must offer interconnection to all information service providers on a nondiscriminatory basis. Second, new telephone companies deploying DSL technologies must permit interconnection with their DSL facilities and must permit the resale of their transport, although they need not set discounted rates for those services. Finally, carriers deploying entirely new loop platforms, including wireless, cable, and satellite providers, may structure their information services to avoid any interconnection or unbundling regulations.

A. *Regulation as “Telecommunications Services”*

1. The Communications Act, as Amended

Providers of wireline telecommunications services are overwhelmingly regulated as common carriers. Congress modeled the original Communications Act of 1934 (the “1934 Act”)¹³² on the Interstate Commerce Act of 1887¹³³ and through it applied traditional common carrier and public utility regulation theories to telephone companies. The 1996 Act left that structure largely intact, while adding to it substantial new duties applicable to incumbent local telephone companies in an attempt to introduce new competition into telecommunications markets. All providers of telecommunications services must interconnect with other carriers, but the 1934 Act (as amended by the 1996 Act) and the FCC currently define “telecommunications” in such a way that many new entrants will not be required to provide high-speed infrastructures to others who wish to use it.

Consistent with its common carrier premise, the 1934 Act provided that “all common carriers” engaged in wire communications shall “furnish such communication service upon reasonable request therefor” and shall “establish physical connections with other carriers.”¹³⁴ The 1996 Act reiterates the fundamental interconnection obligation in slightly different terms: “Each telecommunications carrier has the duty to interconnect directly or indirectly with the facilities and equipment of other telecommunications carriers.”¹³⁵ This interconnection obligation recognizes the fundamental network externalities of telecommunications: a consumer purchases telecommunications service to connect to others, and the value to the consumer increases as the consumer is able to reach a greater number of persons. Although for several decades after the invention of the telephone many urban areas were served by more than one noninterconnected telephone company, regulation since the 1934 Act has recognized the benefit of requiring all networks to interconnect so that all subscribers to any network can reach all other subscribers.¹³⁶

The 1934 Act also imposed the other essential features of common carrier regulation: that the carrier’s rates be just and reasonable, that the

132 Pub L. No. 73-416, 46 Stat. 1064.

133 Ch. 104, 24 Stat. 379; see also Glen O. Robinson, *The Federal Communications Act: An Essay on Origins and Regulatory Purpose*, in *A LEGISLATIVE HISTORY OF THE COMMUNICATIONS ACT OF 1934*, at 3 (Max D. Paglin ed., 1989).

134 47 U.S.C. § 201(a) (1994).

135 47 U.S.C. § 251(a)(1) (Supp. II 1996).

136 See *infra* note 190 and accompanying text.

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carrier not discriminate among customers, and that the carrier provide service solely pursuant to tariffs filed with a federal agency having the power to investigate rates, classifications, and practices of the carrier.¹³⁷ In recent years, however, the FCC has eliminated rate regulation in significant parts of the telecommunications industry. For example, it has held that long-distance carriers are subject to effective competition and their rates are presumptively legal.¹³⁸ In the 1996 Act, Congress authorized the FCC to “forbear from applying” any portion of the Communications Act, so long as application of the statute was not necessary to ensure just and reasonable rates and practices, to protect against nondiscrimination, or to protect consumers, and was otherwise in the public interest.¹³⁹ The FCC has used that power to forbid long-distance carriers to file tariffs, finding that effective competition made the filing of tariffs unnecessary.¹⁴⁰

Congress’s principal goal in the 1996 Act was to open the local telephone market to effective competition.¹⁴¹ The House Report grandly, albeit without reference to any economic literature, states that “[t]echnological advances would be more rapid and services would be more widely available and at lower prices if telecommunications markets were competitive rather than regulated monopolies.”¹⁴² Thus, the 1996 Act intended widespread deregulation: “Indeed, the enormous benefits to American businesses and consumers from lifting the shackles of monopoly regulation will almost certainly earn the Communications Act of 1995 the distinction of being the most deregulatory bill in history.”¹⁴³

Congress attempted in the 1996 Act to remove all of the legal and some of the technological barriers to competition in local telephone markets. Congress first provided that “[n]o State or local statute or regulation, or other State or local legal requirement, may prohibit or have the effect of prohibiting the ability of any entity to provide any interstate

137 See 47 U.S.C. §§ 201-203 (1994). See generally Joseph D. Kearney & Thomas W. Merrill, *The Great Transformation of Regulated Industries Law*, 98 COLUM. L. REV. 1323, 1331-34 (1998) (describing the history of public utility regulation after the 1887 Interstate Commerce Act and other statutes modeled on that Act).

138 See, e.g., *Competition in the Interstate Interexchange Marketplace*, 6 F.C.C.R. 5880 (1991).

139 See 47 U.S.C. § 160(a) (Supp. II 1996).

140 See Policy and Rules Concerning the Interstate, Interexchange Marketplace, Implementation of Section 254(g) of the Communications Act of 1934 as Amended, 11 F.C.C.R. 20,730 (1996), *stayed pending appeal*.

141 For two comprehensive summaries of the 1996 Act, see Jonathan E. Canis & Enrico C. Soriano, *The Telecommunications Act of 1996: A Global Analysis*, 4 COMMLAW CONSPECTUS 147 (1996); Thomas G. Krattenmaker, *The Telecommunications Act of 1996*, 29 CONN. L. REV. 123 (1996).

142 H.R. REP. NO. 104-204, at 47-48 (1996), *reprinted in* 1996 U.S.C.C.A.N. 10, 11.

143 *Id.* at 48.

or intrastate telecommunications service.”¹⁴⁴ Congress gave the FCC power to preempt any state regulation found to violate this standard,¹⁴⁵ a great expansion of the FCC’s jurisdiction. Under the scheme of the 1934 Act, the Commission had been prohibited from regulating the intrastate activities of telecommunications carriers, and its ability to preempt state regulations was limited to instances in which a carrier’s interstate activities were inseparable from its intrastate activities.¹⁴⁶

To achieve this open competition, the 1996 Act also imposed new duties on local telephone companies designed to open their markets to competitors. Congress recognized that a new local telephone company would be unlikely to replicate an entire local network as an initial entry strategy, and, in some moments, seemed to acknowledge that the local loop might remain a natural monopoly. Congress therefore created, on top of duties required of all telecommunications carriers, two new classes of duties: duties applicable to all local telephone companies (local exchange carriers, or LECs in the Act’s parlance), and duties applicable to incumbent local exchange carriers (or ILECs).

Thus, all LECs, whether existing before the 1996 Act or born in the era of competition the 1996 Act was designed to develop, were given five new duties: (1) the duty not to prohibit or to limit unreasonably the resale of its services;¹⁴⁷ (2) the duty to provide number portability (so that consumers may switch telephone companies but retain their telephone numbers);¹⁴⁸ (3) the duty to accord dialing parity (so that customers may reach customers of other LECs by dialing no more digits than necessary to reach customers of that LEC);¹⁴⁹ (4) the duty to permit competing LECs access to the LEC’s rights of way;¹⁵⁰ and (5) the duty to establish reciprocal compensation with other LECs for the transport and termination of calls.¹⁵¹ The first three of these duties had some precedent in either the FCC’s rules or the consent decree that broke up the Bell System,¹⁵² while

144 47 U.S.C. § 253(a) (Supp. III 1997).

145 *See id.* § 253(d).

146 *See id.* § 152(b) (1994); Louisiana Pub. Serv. Comm’n v. FCC, 476 U.S. 355 (1986); National Ass’n of Regulatory Util. Comm’rs v. FCC, 746 F.2d 1492 (D.C. Cir. 1984).

147 *See* 47 U.S.C. § 251(b)(1) (Supp. III 1997).

148 *See id.* § 251(b)(2).

149 *See id.* § 251(b)(3).

150 *See id.* § 251(b)(4).

151 *See id.* § 251(b)(5).

152 *See* United States v. American Tel. & Tel. Co., 552 F. Supp. 131, 232-33 (D.D.C. 1982) (requiring, by consent decree, equal access dialing (1+ dialing) to competing long distance carriers), *aff’d*, Maryland v. U.S., 460 U.S. 1001 (1984); Provision of Access for 800 Service, 6 F.C.C.R. 5421, 5430 (1991) (requiring portability of 800 numbers); Regulatory Policies Concerning Resale and Shared Use of Common Carrier Domestic Public Switched Network Services, 83 F.C.C.2d 167, 173-74 (1980) (requiring carriers to permit resale of switched facilities), *aff’d*, Southern Pac. Communications Co. v. FCC, 682 F.2d 232 (D.C. Cir. 1982); Regulatory Policies Concerning Resale and Shared Use of Common Carrier Services and Facilities, 60 F.C.C.2d 261, 283-84 (1976) (same regarding private line facilities), *aff’d*, American Tel. & Tel. Co. v. FCC, 572 F.2d 17 (2d Cir. 1978).

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the last two were widely considered necessary to ensure that local telephone companies faced a level-playing field.¹⁵³

ILECs, defined as any local company providing exchange service as of the 1996 Act's passage,¹⁵⁴ were subject to further duties designed to open their networks and markets to entry by competitors. Initially, ILECs must negotiate interconnection agreements with any other telecommunications carrier to govern the implementation of the ILEC's other duties under the Act.¹⁵⁵ Substantively, ILECs must (1) permit nondiscriminatory interconnection with another carrier's facilities "at any technically feasible point in the [ILEC's] network;"¹⁵⁶ (2) provide to any other carrier unbundled access to many network elements in the ILEC's network at cost-based rates;¹⁵⁷ (3) establish wholesale rates for the resale of any telecommunications service provided by the ILEC;¹⁵⁸ (4) provide notice of any changes to the ILEC's network;¹⁵⁹ and (5) permit the collocation of other telecommunications carriers' equipment on the ILEC's premises.¹⁶⁰

Nearly four years after the 1996 Act, the scope of these new duties remains uncertain. It was not until 1999 that the Supreme Court decided that the Act conferred on the FCC, not state utility commissions, jurisdiction to make rules to implement the Act's interconnection and unbundling sections.¹⁶¹ Moreover, on the merits, the Supreme Court remanded the unbundling rules to the FCC for further consideration,¹⁶² and the FCC has just issued its revised rules.¹⁶³ The ILECs still have pending challenges to the FCC's interconnection pricing rules.¹⁶⁴ The FCC had issued regulations requiring incumbents to set their prices at total element long run incremental cost (TELRIC), a forward-looking cost methodology. Under TELRIC, prices are not based on the incumbent's historic cost of purchasing the plant used in the service, but rather on the current least-cost technology that could be used to offer the service. The

153 See WILLIAM J. BAUMOL & GREGORY J. SIDAK, TOWARD COMPETITION IN LOCAL TELEPHONY 117-37 (1994).

154 See 47 U.S.C. § 251(h)(1) (Supp. II 1996).

155 See *id.* §§ 251(c)(1), 252.

156 *Id.* § 251(c)(2)(B).

157 See *id.* § 251(c)(3).

158 See *id.* § 251(c)(4).

159 See *id.* § 251(c)(5).

160 See *id.* § 251(c)(6).

161 See *AT&T Corp. v. Iowa Utils. Bd.*, 119 S. Ct. 721 (1999). The Eighth Circuit had held that the state commissions had jurisdiction, and had stayed the FCC's rules. See *Iowa Utils. Bd. v. FCC*, 120 F.3d 753 (8th Cir. 1997), *rev'd*, 119 S. Ct. 721 (1999).

162 See *AT&T Corp.*, 119 S. Ct. at 734-36.

163 Implementation of the Local Competition Provisions of the Telecommunications Act of 1996, Third Report & Order & Fourth Further Notice of Proposed Rulemaking, FCC 99-238, available in 1999 FCC LEXIS 5663, ¶ 1, at *1 (1999).

164 See 119 S. Ct. at 728 n.3.

incumbents of course think that such pricing is too low, and the Eighth Circuit must now decide that issue.

The fundamental limitation on a LEC's section 251 duties is that they are all directed toward other "telecommunications carriers." A telecommunications carrier only has the obligation to interconnect with "other telecommunications carriers."¹⁶⁵ Similarly, LEC duties under section 251(b) are limited to "telecommunications services,"¹⁶⁶ and ILECs need only offer interconnection, unbundled network elements, and collocation to "requesting telecommunications carriers."¹⁶⁷

Thus, the 1996 Act's interconnection and unbundling rules do not directly benefit (or apply to) Internet service providers or other content providers. Those providers, as the FCC has held in a number of proceedings, are not "telecommunications carriers" and do not provide "telecommunications services." This distinction originated in the 1960s, in the FCC's *Computer Inquiry* proceedings. In those proceedings, the FCC attempted to determine whether and to what extent providers of computer services, such as early time-share data processing services, were subject to the 1934 Act. These services were provided over telephone lines, but the FCC attempted to find a manner in which they could be provided by non-telephone companies without regulation while simultaneously limiting the telephone companies' ability to leverage their monopoly power over telecommunications to gain an edge in data processing.¹⁶⁸ The rules that emerged from the *Computer Inquiry* proceedings drew a distinction between "basic" and "enhanced" telecommunications services. Basic services were those that involved only the transmission of sound or data unchanged from beginning to end.¹⁶⁹ Enhanced services were all other services that "acted on the format, content, code, protocol, or similar aspects of the subscriber's transmitted information; provided the subscriber with additional, different, or restructured information; or involved subscriber interaction with stored information."¹⁷⁰ Basic transmission services were subject to the 1934 Act's common carrier regulations; enhanced services were exempt from regulation under the 1934 Act.¹⁷¹ Common carriers that chose to offer enhanced services at first

165 47 U.S.C. § 251(a)(1) (Supp. II 1996).

166 *Id.* § 251(b)(1) (duty not to limit "resale of its telecommunications services"); *id.* § 251(b)(4) (access to rights of way for "competing providers of telecommunications services"); *see also id.* § 251(b)(5) (reciprocal compensation "for the transport and termination of telecommunications").

167 *Id.* §§ 251(c)(1), (2), (3), (6).

168 *See* Amendment of Section 64.702 of the Commission's Rules and Regulations (Second Computer Inquiry), 77 F.C.C.2d 384, 390 (1980).

169 *See id.* at 419 ("A basic transmission service is one that is limited to the common carrier offering of transmission capacity for the movement of information.")

170 *Id.* at 420-21.

171 *See id.*

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were required to do so through separate affiliates;¹⁷² later, they were permitted to offer enhanced services on an integrated basis so long as they unbundled and made generally available all of the telecommunications elements used in providing the service.¹⁷³

The 1996 Act perpetuates the distinction between basic and enhanced services in its mutually exclusive definitions of telecommunications on the one hand and information services on the other. Thus, the 1996 Act defined “telecommunications” as “the transmission, between or among points specified by the user, of information of the user’s choosing, without change in the form or content of the information as sent and received.”¹⁷⁴ Telecommunications carriers are “provider[s] of telecommunications.”¹⁷⁵ By contrast, the 1996 Act defines “information service” in accord with the FCC’s definition of enhanced services:

The term “information service” means 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.¹⁷⁶

The FCC has held under the 1996 Act that Internet service providers are not telecommunications carriers, because they offer services for “generating, acquiring, storing, transforming, processing, retrieving, utilizing, or making available information.”¹⁷⁷

2. Advanced Services Based on Existing Copper Loops

The foregoing rules combine to govern the terms on which LECs may deploy new broadband transmission elements based on the existing copper loop, such as DSL modems. First, any new LEC or other telecommunications carrier may request that an ILEC make available to it an unbundled local loop (a twisted pair of copper fibers) so that the new

¹⁷² See *id.* at 395.

¹⁷³ See Computer III Further Remand Proceedings: Bell Operating Company Provision of Enhanced Services, 13 F.C.C.R. 6040, ¶¶ 20-23, at 6054-55 (1998).

¹⁷⁴ 47 U.S.C. § 153(43) (Supp. III 1997).

¹⁷⁵ *Id.* § 153(44).

¹⁷⁶ *Id.* § 153(20).

¹⁷⁷ Deployment of Wireline Services Offering Advanced Telecommunications Capability, 13 F.C.C.R. 24,011, ¶ 36, at 24,030 (1998), *remand pending*, US WEST v. FCC, D.C. Cir. No. 98-1410 (Aug. 25, 1999); see also Petition for a Declaratory Ruling That AT&T’s InterSpan Frame Relay Service Is a Basic Service, 10 F.C.C.R. 13,717, ¶ 41, at 13,722-23 (1995).

carrier may deploy such service to new customers.¹⁷⁸ The FCC has even ruled that, upon request from another telecommunications carrier, the ILEC must upgrade the local loop by removing bridge taps and loading coils to make it capable of bearing DSL traffic.¹⁷⁹ The carrier may also place its DSLAM (the equipment that terminates DSL service¹⁸⁰) on the incumbent's premises, close to the termination of the local loop and near the other elements of the incumbent's voice network, although the incumbent may charge reasonable rent and may impose reasonable access rules.¹⁸¹

Second, a LEC selling a DSL service must permit other carriers or ISPs to purchase that service and resell it to individual customers.¹⁸² Thus, AOL could offer its customers a package of DSL and its proprietary Internet access by purchasing the DSL transport from a local carrier. But local carriers other than incumbents are not required to establish wholesale rates for the resale of their telecommunications services,¹⁸³ and AOL's purchase of DSL from a non-incumbent LEC would be at full retail rates. A non-incumbent offering DSL service also need not connect directly with ISPs, because ISPs are not telecommunications carriers under the 1996 Act.¹⁸⁴

An ILEC's deployment of DSL service is subject to greater regulation. Although the FCC, in its most recent order, does not require ILECs to provide cost-based access to the elements of its DSL service,¹⁸⁵ an ILEC still must permit interconnection with its DSLAMs and sale of the DSL service at wholesale rates. Of course, ISPs such as AOL are not themselves telecommunications carriers and could not demand interconnection or wholesale rates directly.¹⁸⁶ But AOL could establish an

178 See Implementation of the Local Competition Provisions of the Telecommunications Act of 1996, Third Report & Order, FCC 99-238, available in 1999 FCC LEXIS 5663, ¶ 165, at *187-88 (1999).

179 See *id.* ¶¶ 172-73, at *1-3, ¶¶ 190-95, at *21-26; Deployment of Wireline Services Offering Advanced Telecommunications Capability, 13 F.C.C.R. 24,011, ¶¶ 53-54, at 24,037-38 (1998).

180 See *supra* text accompanying notes 52-54.

181 The ILEC can impose these rates and rules under rights of collocation. See 47 U.S.C. § 251(c)(6) (Supp. II 1996). A new telecommunications carrier may choose to route the voice traffic back onto the incumbent's network and take only the data stream generated, providing only Internet access or other data services.

182 See Deployment of Wireline Services Offering Advanced Telecommunications Capability, Second Report & Order, FCC 99-330, available in 1999 FCC LEXIS 5719, ¶ 19, at *24 (1999).

183 Compare 47 U.S.C. § 251(b)(1) (Supp. II 1996), with 47 U.S.C. § 251(c)(4).

184 See *supra* text accompanying notes 165-66.

185 See Implementation of the Local Competition Provisions of the Telecommunications Act of 1996, Third Report & Order, FCC 99-238, available in 1999 FCC LEXIS 5663, ¶¶ 306-13, at *152-64 (1999).

186 See Implementation of the Local Competition Provisions in the Telecommunications Act of 1996, 11 F.C.C.R. 15,499, ¶¶ 994-95, at 15,990 (1996).

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affiliated telecommunications carrier to do so and then market a bundle of AOL service and DSL service purchased for resale from incumbents.

Similarly, certain of the FCC's pre-1996 Act rules permit information services providers, including ISPs, to request interconnection with facilities deployed by the largest ILECs.¹⁸⁷ Under these rules, an ISP may request interconnection with network elements deployed by the largest ILECs. Specifically, the *Expanded Interconnection* rules—which were a pre-1996 attempt by the FCC to unbundle the local networks¹⁸⁸—require the Bell operating companies and GTE to offer information services providers interconnection to transport elements.¹⁸⁹ Likewise, under the *Computer Inquiry* and *Open Network Architecture*¹⁹⁰ rules, the Bell companies and GTE must unbundle any transmission facilities used in providing information services and tariff those services for purchase by other information services providers.¹⁹¹ The FCC has held that all of these rules survive the 1996 Act, notwithstanding that the Act's very specific interconnection duties do not go as far.¹⁹²

In sum, under the rules currently applicable to telecommunications carriers, any advanced services provided over existing local loops must be provided generally to all carriers in one of the following two ways. First, if an ILEC deploys pure DSL technology, it must permit any requesting carrier to interconnect with the DSL loops or, at a minimum, must develop a wholesale rate for the resale of that service. Second, if an ILEC deploys DSL only in conjunction with its own Internet access or other information service and the incumbent is a Bell company or GTE, then it must unbundle the transmission capability from the information service and permit other information service providers to connect to customers through DSL loops. If a new telephone company or a separated affiliate of an ILEC deploys DSL technology, it, too, must interconnect with other carriers and must permit other carriers to resell its service but it need not interconnect directly nor develop a wholesale price.

187 The FCC's *IUB* remand order, *see supra* note 185, does not seem explicitly to address this issue.

188 *See generally* PETER W. HUBER ET AL., FEDERAL TELECOMMUNICATIONS LAW §§ 12.5.2 - .3 (2d ed. 1999).

189 *See* Expanded Interconnection with Local Telephone Company Facilities, 7 F.C.C.R. 7369 (1992).

190 The Open Network Architecture rules were another pre-1996 Act initiative by the FCC to ensure that information service providers had interconnection rights with the fundamental elements of the local networks. *See id.*

191 *See id.*

192 *See* Implementation of the Local Competition Provisions in the Telecommunications Act of 1996, 11 F.C.C.R. 15,499, ¶¶ 609-12, at 15,808-09 (1996) (*Expanded Interconnection* rules continue to apply); *see also* Deployment of Wireline Services Offering Advanced Telecommunications Capability, 13 F.C.C.R. 21,011, ¶ 37, at 24,030-31 (1998) (same).

3. Broadband Platforms (Other Than Cable and Satellites) Not Based on the Existing Cooper Loop

The rules applicable to carriers offering DSL over existing copper loops stand in sharp contrast to the minimal regulations applicable to any company that bases its customer access on a technology not built upon an ILEC's local loop. While such providers are subject to the Communications Act generally, which covers all "interstate and foreign communication by wire or radio,"¹⁹³ a carrier that provides only Internet access or other information services over its wires, and therefore does not sell mere transport, would not be regulated as a telecommunications carrier at all. Hence, such a provider would not be required to make its services generally available to or to connect with other carriers, and it could integrate any content services with its transmission services.

Of course, many of the new entrants plan to offer some transmission services. For example, LMDS providers are targeting large and mid-size businesses as one of their initial markets,¹⁹⁴ and they are planning to provide long-distance access services as well as Internet services. And, for such services, they would be telecommunications carriers and subject to basic interconnection obligations. However, these offerings will not permit AOL or other information service providers to utilize the platform to provide service to residential customers. Because of its greater capacity, a high-speed business access service would be inappropriate for providing service to a consumer.

Moreover, even if the LMDS provider were to offer a voice-functionality to smaller subscribers, interconnection and resale is not an option for information service providers because the 1996 Act would only require the LMDS provider to offer for resale the very slow data service necessary to support voice functionality. So long as the LMDS provider bundles its "intermediate" transport capacity—i.e., the amount of transmission necessary and effective for individual consumers desiring information services—together with the information services themselves, the LMDS provider need not interconnect or make that particular transmission functionality available to other information services providers. Thus, the FCC's rules, consistently applied, only require the LMDS provider to offer other carriers enough data speed to enable a voice functionality, and not the full, high-speed connection that the LMDS provider sells with a bundle of voice, Internet access, and other information services.¹⁹⁵

193 47 U.S.C. § 152(a) (1994).

194 See *supra* text accompanying notes 114-22.

195 It is important to note that it is not the fact that the carrier is providing "voice" that would

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B. Regulation as “Cable Services”

As discussed above, cable companies are quickly converting their systems to enable high-speed Internet access, video-on-demand, interactive gaming, and similar services requiring high transmission speeds to end users. Cable providers, however, are explicitly not “common carriers” for the purpose of providing cable services. In this regard, the basic model for cable television resembles broadcast: with the exception of specific must-carry and leased-access obligations,¹⁹⁶ cable providers have nearly complete discretion in determining what channels they will carry. Although the FCC has yet to rule on the issue directly, notwithstanding challenges raised in the context of the AT&T/TCI merger, Internet access and similar services provided over cable television facilities are cable services as well.¹⁹⁷ Hence, to the extent a cable provider offers these services, it may limit its subscribers’ access to certain ISPs, to certain video-on-demand databases, or to other affiliated services.

Cable television long occupied a regulatory gap in the 1934 Act. Although its communication was “by wire,” and therefore arguably within the 1934 Act’s common carrier regulation, it resembled broadcast, and broadcasters were explicitly not common carriers.¹⁹⁸ In the 1960s, the FCC took the position that cable systems were “neither common carriers nor broadcasters, and therefore are within neither of the principal regulatory categories created by the Communications Act.”¹⁹⁹ The Supreme Court agreed, holding that the FCC’s power to regulate cable arose from its general authority to regulate communications, but was limited to rules “reasonably ancillary to the effective performance of the Commission’s responsibilities for the regulation of television broadcasting.”²⁰⁰

Today, cable television is regulated under its own title of the

make the service telecommunications. Pure data transport is telecommunications as well. *See, e.g.*, Independent Data Communications Manufacturers Association, Inc., Petition for Declaratory Ruling That AT&T’s InterSpan Frame Relay Service Is a Basic Service, Mem. Op. & Order, 10 F.C.C.R. 13,717, ¶ 22, at 13,720 (1995); Application of AT&T: Authority Under Section 214 of the Communications Act of 1934, Mem. Op., Order & Authority, 94 F.C.C.2d 48, ¶¶ 11-12, at 54 (1983) (citing *Computer II Final Decision*, 77 F.C.C.2d 384, ¶ 39, at 423 (1980)). However, the FCC has ruled that e-mail and Internet access are information services. Thus, a data stream carrying a voice call is likely to be the only service that involves the seamless transmission of information necessary to be a telecommunications service. *See, e.g.*, Computer III Further Remand Proceeding: Bell Operating Company Provision of Enhanced Services; 1998 Biennial Regulatory Review—Review of Computer III and ONA Safeguards and Requirements, 13 F.C.C.R. 6040, ¶ 1, at 6042 (1998).

¹⁹⁶ *See* 47 U.S.C. §§ 532 (leased access), 534 (must carry), 535 (must carry for noncommercial stations) (1994).

¹⁹⁷ *See infra* notes 220-24 and accompanying text.

¹⁹⁸ *See id.* § 153(h).

¹⁹⁹ *United States v. Southwestern Cable Co.*, 392 U.S. 157, 164 (1968) (summarizing CATV and TV Repeater Services, 26 FCC 403, 427-28 (1959)).

²⁰⁰ *Id.* at 178.

Communications Act (Title VI), and cable services are exempt from the sort of common carrier, interconnection, and unbundling duties applied to telecommunications carriers. In the 1984 Cable Act, Congress directly, if inelegantly, provided that “[a]ny cable system shall not be subject to regulation as a common carrier or utility by reason of providing any cable service.”²⁰¹ “Cable service” was defined to include “the one-way transmission to subscribers of (i) video programming, or (ii) other programming service,” and “subscriber interaction, if any, which is required for the selection of such video programming or other programming service.”²⁰² In 1984, Congress recognized that cable television systems could, at least theoretically, be used to offer services in competition with the telephone companies. Its definition of cable services attempted to maintain separate, non-common carrier regulation for one-way video services, while permitting regulation of cable voice and data services. The prospect of unregulated competition was thought unacceptable because cable providers might not be subject to universal service and rate regulation and their “cream-skimming” of customers might reduce the telephone companies’ ability to provide universal service.²⁰³

Nevertheless, it is clear from the legislative history that Congress’s definition of “cable service” was not intended to exclude all interactive services. To the contrary, the definition of cable services included “other programming services,” and this meant that the cable provider could offer a wide variety of interactive services exempt from common carrier regulation. “Other programming service” was defined as “information that a cable operator makes available to all subscribers generally.”²⁰⁴ The House committee’s principal example was software downloading: to the extent that a cable provider made available to any requesting customer the option of requesting and then downloading software, such service would still remain cable service.²⁰⁵ That only some of the cable company’s subscribers might take advantage of the service, and that each subscriber might use the service in a slightly different manner, was irrelevant. By contrast, services resembling telephone companies’ services—transmitted information created for and destined to only a single, predetermined user—were not cable services. The committee’s examples of non-cable services were “shop at home and bank at home services, electronic mail, one-way and two-way transmission o[f] non-video data and information

201 47 U.S.C. § 541(e) (1994).

202 *Id.* § 522(6).

203 See H.R. REP. NO. 98-934, at 28-29 (1984), *reprinted in* 1984 U.S.C.C.A.N. 4655, 4665-66.

204 47 U.S.C. § 522(14) (1994).

205 See H.R. REP. NO. 98-934, at 42, *reprinted in* 1984 U.S.C.C.A.N. 4655, 4679.

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not offered to all subscribers, data processing, video-conferencing, and all voice communications.”²⁰⁶

In the 1996 Act, however, Congress added to the definition of cable services merely two words, but those words and the legislative history indicate that Congress intended to move Internet access and any other information service into the “cable services” definition and outside the reach of common carrier regulation. Specifically, Congress amended the definition of cable services to be: “the one-way transmission to subscribers of (i) video programming, or (ii) other programming service,” and “subscriber interaction, if any, which is required for the selection *or use* of such video programming or other programming service.”²⁰⁷ Although the House Report said merely that the addition of the words “or use” “reflect[ed] the evolution of video programming toward interactive services,”²⁰⁸ the Conference Report definitively sweeps Internet access into the definition:

The conferees intend the amendment 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. This amendment is not intended to affect Federal or State regulation of telecommunications service offered through cable system facilities, or to cause dial-up access to information services over telephone lines to be classified as a cable service.²⁰⁹

Arguably, the text does not support the result the conferees intended. The addition of the term “or use” does not alter the fact that a cable service must be either “video programming” or “other programming service,” and the word “use” merely clarifies that a subscriber not only may choose information made available but may use that information in whatever way the subscriber finds appropriate.

On balance, the text of the new definition of cable services is best read to include Internet access and similar information services. As noted, under the 1984 Cable Act, “other programming services” include “information that a cable operator makes available to all subscribers generally.”²¹⁰ Cable-operator-provided Internet access gives to all subscribers the same information contained on the Internet; a cable-operator gateway service (such as @Home) provides the same proprietary content to all subscribers; and a cable company video-on-demand service

206 *Id.* at 44, reprinted in 1984 U.S.C.C.A.N. 4655, 4681.

207 47 U.S.C. § 522(6)(B) (Supp. III 1997) (emphasis added).

208 H.R. REP. NO. 104-204, at 97 (1996), reprinted in 1996 U.S.C.C.A.N. 10, 64.

209 H.R. CONF. REP. NO. 104-458, at 169 (1996), reprinted in 1996 U.S.C.C.A.N. 124, 182.

210 47 U.S.C. § 522(13) (1994).

looks exactly like the software downloading service referred to as a cable service under the 1984 Cable Act. This general availability is the touchstone of “other programming service,” and Internet access and other information services seem obviously to fall on this side of the line.²¹¹ Coupled with the legislative history, Internet access and other information services are now clearly cable services and, to the extent provided by cable providers, are exempt from common carrier regulation.

Despite this analytical clarity, however, the issue is far from settled. In *AT&T Corp. v. City of Portland*, the District Court ruled that a municipality could require a cable system to open its lines to other ISPs.²¹² The case is on expedited appeal to the Ninth Circuit, the FCC has filed a brief supporting AT&T,²¹³ and Chairman Kennard has said that allowing municipalities to make differing decisions on open access would “stymie[]” investment in broadband.²¹⁴ Moreover, the FCC refused to condition the AT&T/TCI merger on such stipulations, and a 1998 report issued by the FCC’s Office of Plans and Policy describes as “possible” that the FCC could find that Internet access and Internet content services were cable services. The author of that report (Associate Bureau Chief of the Cable Services Bureau) concluded that a pure connection to the Internet would not be a cable service, but service that provided its own content would be a cable service.²¹⁵

I think that these services are “cable services,” but, even if they are not, they will be subject to only minimal regulation. Cable television services will not use elements of an ILEC’s local loop. To the extent they provide only information services, as seems likely, the Communications Act will not require interconnection or unbundling.²¹⁶

In sum, Internet access and other information services provided by cable television companies are “cable services” under the Communications

211 The service that provides problems for this interpretation is electronic mail. Although an electronic mail service might be made available to all subscribers, individual pieces of mail are not. The cable operator would then be offering information which is not available to all subscribers.

212 *AT&T Corp. v. City of Portland*, 43 F. Supp. 2d 1146, 1149 (D. Or. 1999). Broward County, Florida, has imposed a similar requirement, and other municipalities are considering them. See *AT&T Strikes Back at County*, FT. LAUDERDALE SUN SENTINEL, July 27, 1999, at 1D.

213 FCC, *Court Brief Underscores Consumer Benefits from the National Internet Policy of Unregulation*, (Aug. 16, 1999) <http://www.fcc.gov/Daily_Releases/Daily_Business/1999/db990817/nrmc9060.txt>.

214 FCC, *Chairman Kennard Calls on Cable Franchising Authorities To Promote National Broadband Policy* (June 15, 1999) <http://www.fcc.gov/Bureaus/Miscellaneous/News_Releases/nrmc9041.html>.

215 BARBARA ESBIN, INTERNET OVER CABLE: DEFINING THE FUTURE IN TERMS OF THE PAST 83, 88, (FCC OPP Working Paper No. 30, 1998), available in <<http://www.fcc.gov/Bureaus/OPP/workingpapers/oppwp30.pdf>>. The working paper, which contains a much more detailed analysis of the arguments on both sides, is published in essentially the same form. See Barbara Esbin, *Internet over Cable: Defining the Future in Terms of the Past*, 7 COMMLAW CONSPICUOUS 37 (1999).

216 See *supra* text accompanying notes 193-95.

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Act. They are therefore exempt from regulation as common carrier services, and cable companies cannot be required to interconnect these services to other providers, nor can they be required to permit other information services providers to access their systems.

C. *Services Provided by Satellite*

Providers of video services by satellite, such as DBS operators, are regulated neither as broadcasters nor as common carriers. Because their signals are scrambled and available only to subscribers, satellite video providers are not broadcasters.²¹⁷ Similarly, DBS providers are not common carriers; they do not even bear the quasi-common carriage must-carry and leased-channel obligations of cable television systems.²¹⁸ So long as DBS operators continue the current architecture, providing Internet and other information services downstream by satellite, with information upstream from the consumer by telephone line, no current legal structure requires the satellite provider to make its transmission facilities available to Internet service providers or other information providers. However, to the extent that low earth orbit or other satellite technologies permit two-way communication with subscribers, current regulation would govern that activity just as it does the new LMDS technologies.²¹⁹

D. *Conclusion*

The prospect that one or more new broadband access platforms might not be required to provide access to all requesting information services providers—such as all ISPs, all video-on-demand companies, and all electronic newspapers—has generated substantial controversy. AOL claims that unless AT&T/TCI is required to provide it equal access, the competitive Internet as we know it will cease to exist and AT&T/TCI will reconstitute the Bell System's monopoly over communications. Legislators and regulators are taking these arguments seriously; some resolution is necessary.

217 See Subscription Video, Report & Order, 2 F.C.C.R. 1001, ¶ 39, at 1006 (1987); see also Howard A. Shelanski, *The Bending Line Between Conventional "Broadcast" and Wireless "Carriage,"* 97 COLUM. L. REV. 1048, 1066-68 (1997).

218 See 47 U.S.C. § 549 (Supp. III 1997).

219 See *supra* notes 193-95 and accompanying text.

IV. Indirect Network Externalities Eliminate the Need for Mandatory Unbundling

The ultimate question, of course, is which, if any, of these different regulatory structures should govern the deployment of advanced telecommunications services platforms. I conclude that none of them should. First, legal rules are unnecessary to ensure that broadband platforms will be at least moderately open to competing providers. Second, open access rules may well reduce a broadband access platform owner's incentives to deploy the technology.

Briefly stated, my conclusions flow from an argument that demand for broadband access is characterized by indirect network externalities. Traditional telecommunications networks derive their principal value from connecting individual users and permitting those users to exchange content unique to both the users and the particular time-bounded connection.²²⁰ That is, consumers demand a connection. By contrast, a typical consumer who purchases broadband access derives value not from the connection alone, but rather from the combination of broadband access and the complementary information services made available.

As a result, a traditional telecommunications network, especially one that is an incumbent with a large existing subscriber base, has the incentive to frustrate interconnection with competing networks. But a broadband network, especially a newly developing network, does not have the same incentive to foreclose providers of complementary information services, even if the platform provider markets its own information services. It is against the platform owner's interest to attempt to monopolize content—even if the platform owner is a monopolist in transmission service. Indeed, the development of a consumer market for broadband access depends upon the widespread creation of such services. Applying these insights, a broadband access provider should be permitted to offer information services without unnecessary unbundling requirements. Moreover, because the platform is not demanded independently, platform owners need to provide incentives for customers to subscribe—such as keeping prices for platform services low. Thus, platform owners need to recover some of these foregone rents in the market for information services. An aggressive open access rule may diminish the platform owner's initial incentives to deploy the technology.

This Part begins with a description of the arguments being made in favor of open access rules to broadband platforms. Essentially, information

²²⁰ See, e.g., JOHN T. WENDERS, *THE ECONOMICS OF TELECOMMUNICATIONS THEORY AND POLICY* 29-30 (1987).

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service providers such as Internet access companies contend that owners of broadband access platforms will use their monopoly power over transport to impede competition in the complementary information services. Next, I turn to an overview of the particular economics of networks. I then apply this economics to telecommunications networks and demonstrate the different considerations raised by broadband access networks. I conclude that open access rules are both unnecessary and potentially counterproductive.

A. *Arguments for Open Access*

Immediately following the announcement of the AT&T/TCI merger, Internet service providers and others began an intense lobbying effort to secure open access rules to cable television and other new broadband access platforms. In objecting to the AT&T/TCI merger, AOL argued that “FCC approval of the proposed merger should include an open access condition on the provision of last-mile broadband cable data transport services.”²²¹ AOL claimed that open access conditions were necessary to ensure “robust competition in video-enabled Internet services,” and that, “[i]nvariably, absent an open access condition, consumers will be harmed by this merger.”²²² The recently formed OpenNET Coalition, which includes AOL, other ISPs, and long-distance carriers, argues that nothing less than “the Internet’s hallmarks of competition and consumer choice” are at risk unless open access rules are mandated for all providers of broadband last mile transport.²²³ These claims came notwithstanding AT&T and TCI’s commitment to permit its Internet access service purchasers to access all Internet content, including AOL. AOL and other ISPs demanded parity with the AT&T/TCI ISP (@Home), which currently is the required ISP for every customer purchasing high-speed Internet access from TCI. Any other rule, they claim, would force customers that prefer AOL or some other non-@Home ISP to “pay twice.”²²⁴ The FCC approved the merger without imposing open access conditions, but said that it would monitor the industry.²²⁵ More recently, several municipalities

221 Comments of America Online, Inc., Joint Applications of AT&T Corp. and Tele-Communications, Inc. for Transfer of Control to AT&T of Licenses and Authorizations Held by TCI and Its Affiliates or Subsidiaries, CS Docket No. 98-178, at 3 (filed Oct. 29, 1998) (copy on file with the author) [hereinafter AOL Comments].

222 *Id.* at 15.

223 OPENNET COALITION, *Coalition Formed To Protect Consumer Choice on the Internet* (Feb. 3, 1999) <<http://www.opennetcoalition.org/news/91867826.html>>.

224 AOL Comments, *supra* note 221, at 11.

225 See Applications for Consent to the Transfer of Control of Licenses and Section 214 Authorizations from Tele-Communications, Inc., Transferor, to AT&T Corp., Transferee, 14 F.C.C.R. 3160, ¶ 96, at 3207 (1999).

have imposed such open access rules.²²⁶

These arguments for open access not only touch the political hot-button of Internet competition, but also have a strong pedigree in the history of telecommunications regulation, which has long been concerned that dominant telephone companies will use their control over transport facilities to act anti-competitively against computer companies or other information service providers. In the 1970s, the FCC undertook the *First Computer Inquiry* based upon its fears that carriers providing computer services would “engage in anti-competitive and discriminatory practices.”²²⁷ As described above,²²⁸ the FCC’s later proceedings required either separate subsidiaries, fundamental unbundling, or both as conditions of dominant telephone companies entering the information services market. And, as part of the consent decree dissolving the Bell System, the Bell operating companies were forbidden to provide information services.²²⁹

B. *The Nature of Networks*

Those asserting that cable television systems and other providers of broadband access will use their ownership of wires or other platforms to impede competition in other markets fail to provide an economic model to support those claims. The most plausible model, in fact, suggests otherwise. This section provides background on the economics of networks necessary to support my claim.

Since the mid-1970s, a branch of economics has developed dealing with the peculiar demand effects associated with network goods.²³⁰ This literature, growing up alongside focused inquiry into the economics of regulation and of antitrust law, provides a useful approach to

226 See *supra* note 212 and accompanying text.

227 Amendment of Section 64.702 of the Commission’s Rules and Regulations (Second Computer Inquiry), 77 F.C.C.2d 384, ¶15, at 390 (1980); see also *id.* ¶ 18, at 391 (stating that the FCC undertook the *First Computer Inquiry* because “[we were] concerned with the possibility that common carriers might favor their own data processing activities through cross-subsidization, improper pricing of common carrier services, and related anti-competitive practices”).

228 See *supra* notes 187-92 and accompanying text.

229 See *United States v. American Tel. & Tel. Co.*, 552 F.Supp. 131, 143 (D.D.C. 1982). That restriction was eliminated in the early 1990s. See *United States v. Western Elec. Co.*, 993 F.2d 1572 (D.C. Cir. 1993).

230 Network economics has begun to penetrate the legal literature. See, e.g., David A. Balto, *Networks and Exclusivity: Antitrust Analysis To Promote Network Competition*, 7 GEO. MASON L. REV. 523 (1999); David S. Evans & Richard Schmalensee, *A Guide to the Antitrust Economics of Networks*, ANTITRUST, Spring 1996, at 36; William J. Kolasky, *Network Effects: A Contrarian View*, 7 GEO. MASON L. REV. 577 (1999); Mark A. Lemly & David McGowan, *Legal Implications of Network Economic Effects*, 86 CAL. L. REV. 479 (1998); John E. Lopatka & William H. Page, *Microsoft, Monopolization, and Network Externalities: Some Uses and Abuses of Economic Theory in Antitrust Decision Making*, 40 ANTITRUST BULL. 317 (1995); Carl Shapiro, *Exclusivity in Network Industries*, 7 GEO. MASON L. REV. 673 (1999).

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telecommunications, for telecommunications is the prototypical network good. As described by this literature, a “network” exists when an individual consumer’s demand for a good depends upon the number of other consumers that also demand the good. When it does, the market is said to exhibit “network externalities.” These demand effects are appropriately modeled as externalities because they are external to an individual’s sale and purchase transaction.²³¹

In the classic case of a network externality, a consumer’s demand for the good increases based on the number of other purchasers of the good because the good itself becomes more valuable to individual consumers as others also purchase it. Consider telephone service. If I am the only person purchasing telephone service, it is not worth anything to me. It may be worth something to me to be able to call my parents and something more if I can reach all of my relatives or friends. The value of telephone service continues to increase, although not necessarily at a constant rate, as additional individuals and businesses subscribe to telephone service. A similar example is facsimile machines. A facsimile machine is worthless to me if I am the only one that owns one; its value increases with the increased number of people that also buy facsimile machines. As the purchase decisions of other consumers feed back into my valuation of the good, the decisions of these other consumers cannot be internalized in my purchase. The economics literature refers to this particular kind of feedback as “direct network externalities.”²³²

231 See Kenneth D. Boyer, *Network Externalities*, in NETWORKS, INFRASTRUCTURE, AND THE NEW TASK FOR REGULATION 13 (Werner Sichel & Donald L. Alexander eds., 1996); Joseph Farrell & Garth Saloner, *Standardization, Compatibility, and Innovation*, 16 RAND J. ECON. 70, 70-71 (1985); Michael L. Katz & Carl Shapiro, *Network Externalities, Competition, and Compatibility*, 75 AM. ECON. REV. 424, 426-27 (1985); Anne Perrot, *Compatibility, Networks, and Competition: A Review of Recent Advances*, 27 TRANSP. SCI. 62, 64-66 (1993). In recent years, some authors have argued that the foregoing definition of network externalities is too broad, and that a distinction ought to be made between network effects and network externalities. These commentators would restrict network externalities to the direct network externalities situation, where private and social welfare do not balance due to positive gains to other consumers from additional purchases—i.e., where there are “unexploited gains from trade regarding network participation.” S.J. Leibowitz & Stephen E. Margolis, *Network Externality: An Uncommon Tragedy*, 8 J. ECON. PERSP. 133, 135 (1994). Indirect network externalities would be described as network “effects,” reflecting the fact that the demand feedbacks do not result in an equilibrium in which there are unexploited gains from trade. See *id.* at 138-39. Lemley and McGowan, *supra* note 230, at 488-500, provide a wider ranging summary of these category problems.

232 See Katz & Shapiro, *supra* note 231, at 424; Michael L. Katz & Carl Shapiro, *Systems Competition and Network Effects*, 8 J. ECON. PERSP. 93 (1994); Carmen Matutes & Pierre Regibeau, *A Selective Review of the Economics of Standardization*, 12 EUR. J. POL. ECON. 183, 186 (1996). On telephony specifically, see Lemley and McGowan, *supra* note 223, at 546-51. Nicholas Economides does not follow this direct/indirect taxonomy. He describes telephone service as the purchase of a series of complementary goods—the links between individual customers and the intermediate switching and interoffice transmission, as necessary. Viewed from this perspective, telecommunications networks still exhibit network externalities, but they seem more akin to the hardware/software paradigm. See, e.g., Nicholas Economides & Lawrence J. White, *Networks and Compatibility: Implications for Antitrust*, 38 EUR. ECON. REV. 651, 652 (1994). Nonetheless, the

A different, but related, form of network arises in markets in which there are so-called hardware and software goods. Hardware goods are those goods, usually durables, that provide the underlying technology for a given good or service. Software goods are those that provide the particular variety of the good or service that the consumer demands. A common example is video cassette players. Consumers want to watch movies. To do so, they need a video cassette player (a hardware good) and some prerecorded video tapes (the software goods). Other examples are computer operating systems and computer applications, turntables and records, and compact disc players and compact discs. These markets display network externalities if consumer demand for the hardware good is influenced by the variety of software goods that are compatible with the hardware. This will often be the case; consumers are more likely to buy the video cassette player that plays more of the available movies²³³ and are more likely to buy the operating system compatible with the widest variety of applications programs.²³⁴ But the supply and variety of software goods depends upon total consumer demand, and hence, an individual consumer's value for the hardware good depends upon, and increases with, the number of consumers purchasing the same hardware good. That is, a larger number of consumers purchasing the hardware good creates a greater market for, and hence a more diverse supply of, the complementary software goods. These sorts of network effects are referred to as "indirect network effects."²³⁵

Network externalities can create excess inertia, meaning that some networks may persist even after technologically superior alternatives have been developed simply because consumers value the incumbent network's ubiquity more than the superior features or lower cost of the new network.²³⁶ This will not always be the case and should never be the case where there is perfect, costless information. But where consumers do not expect all others—or a critical mass of others—to switch to a new network, the embedded base of the old network may enable it to persist. Most importantly, where the minimum size of a network is large, the possibility of its persisting is much greater. Even apart from inertia effects, networks characterized by strong direct network effects have incentives to

characteristic network effect of telecommunications and the unexploited social benefits from increased service still hold. See Nicholas Economides, *The Economics of Networks*, 14 INT'L J. INDUS. ORG. 673, 682 (1996).

233 Hence, VHS overwhelms Beta.

234 Hence, Windows dominates the Macintosh operating system.

235 See, e.g., Katz & Shapiro, *supra* note 231, at 424.

236 See Farrell & Saloner, *supra* note 231, at 71-72; Katz & Shapiro, *supra* note 232, at 108; Michael L. Katz & Carl Shapiro, *Technology Adoption in the Presence of Network Externalities*, 94 J. POL. ECON. 822, 825 (1986).

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exclude rivals, with each party seeking to become the sole provider.²³⁷

C. *Common Carrier Duties To Confront Direct Network Externalities*

Viewed from this perspective, a telecommunications network's common carrier obligations of interconnection and nondiscrimination make sense for two reasons. First, in the presence of direct network externalities, there are unexploited social gains due to the network owner's inability to capture all of the benefits of a subscriber's entrance into the network.²³⁸ In other words, consumer welfare can be improved by a mandatory service rule.

Second, in the absence of interconnection, a new telephone network seeking to unseat the incumbent not only must convince a sizeable section of the market of its superior price or quality, but it also must convince prospective customers of its ability to attract enough other subscribers that any given individual would be able to reach a significant number of the people the subscriber wishes to reach. Interconnection rights remove the need to do the latter and hence eliminate the potential inertial effects of direct network externalities. The entrant can represent that a subscriber switching from the incumbent will still be able to reach all of the incumbent's subscribers, and the entrant can compete with the incumbent based solely on price or quality of service.²³⁹

Although Congress did not refer to the idea of network externalities explicitly, this was the theory behind the interconnection obligations imposed in the 1934 and 1996 Acts.²⁴⁰ Local carriers and especially incumbent local carriers are subject to heightened interconnection obligations,²⁴¹ but Congress emphasized in passing section 251(a) that all telecommunications carriers must interconnect either directly or indirectly with all other telecommunications carriers.²⁴² This is to maximize the

237 See Besen & Farrell, *Choosing How To Compete: Strategies and Tactics in Standardization*, 8 J. ECON. PERSP. 117, 120 (1994).

238 See Leibowitz & Margolis, *supra* note 231, at 135-36.

239 See Besen & Farrell, *supra* note 237, at 119 ("The alternative is that firms standardize, thus explicitly or implicitly agreeing to make their products compatible. Agreeing on a standard may eliminate competition between technologies, but it does not eliminate competition altogether. Instead, it channels it into different and (to economists) more conventional dimensions, such as price, service, and product features.").

240 See 47 U.S.C. §§ 201(a), 251(a) (1994 & Supp. III 1997) (establishing interconnection obligations).

241 See *supra* notes 153-60 and accompanying text.

242 See H.R. REP. NO. 104-204, at 71 (1996), *reprinted in* 1996 U.S.C.C.A.N. 10, 36-37 ("Section 241 restates the obligation contained in section 201(a) of the Communications Act of 1934 on all common carriers to interconnect with the facilities and equipment of other providers of telecommunications services and information services. The interconnection requirement in section 201(a) is a cornerstone principle of common carriage, and it is restated here in light of its importance and relevance as the local telephone industry undergoes the transition to a competitive market.").

social value of a telephone network, as well as to assist the entry of new network providers.²⁴³

Some commentators have proposed that common carriage rules cannot survive in a system in which some competitors are not subject to the full burden of common carrier regulation. Eli Noam, for example, argues that a private carrier's ability to use differentiated pricing and to refuse to serve high-risk customers will give it an advantage, all other things being equal, over any carrier required to operate as a common carrier.²⁴⁴ Others find common carrier rules simply incompatible with the perceived new mandate for regulators: enhancing competition has replaced the control of monopoly as the goal of market intervention.²⁴⁵ Professors Joseph Kearney and Thomas Merrill describe the overall trend away from common carrier regulation as one of the principal aspects of "The Great Transformation of Regulated Industries Law."²⁴⁶

Nevertheless, whether or not full common carrier regulation is dead, direct externalities justify the imposition of interconnection and nondiscrimination obligations to eliminate potential inertia effects. Otherwise, new entrants will face significantly greater barriers to entry, and overall competition will suffer. Similarly, Eli Noam argues persuasively that interconnection rules, and regulation of interconnection prices, are necessary to prevent a price squeeze by an incumbent with market power. That is, in the absence of such regulation, an incumbent network with market power will simply charge an interconnection price that will make entry by new carriers uneconomic.²⁴⁷

D. *Common Carrier Regulation Applied to Broadband Access*

The network externalities model, however, does not support open access rules in the context of broadband access platforms. If broadband access platforms were considered traditional telecommunications networks, network externalities could be used to justify a right of equal interconnection for all users and all information service providers that provides the transport function to all comers. Such a right of interconnection would guarantee that each user could reach the maximum

243 See Besen & Farrell, *supra* note 237, at 119 ("Because the prize is so tempting, sponsors may compete fiercely to have their technologies become the standard, and this competition will generally dissipate part—perhaps a large part—of the potential gains.").

244 Eli M. Noam, *Beyond Liberalization II: The Impending Doom of Common Carriage*, 18 TELECOMMUNICATIONS POL'Y 435, 442-45 (1994); Eli M. Noam, *Will Universal Service and Common Carriage Survive the Telecommunications Act of 1996?*, 97 COLUM. L. REV. 955, 967 (1997) [hereinafter Noam, *Universal Service*].

245 See, e.g., Dean Burch, *Common Carrier Communications by Wire and Radio: A Retrospective*, 37 FED. COMM. L.J. 85, 86 (1985).

246 Kearney & Merrill, *supra* note 137, at 1363-69.

247 Noam, *Universal Service*, *supra* note 244, at 973-74.

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number of information providers, and each information provider could reach the maximum number of potential users. In circumstances in which a broadband access provider is the only such provider in the market, it also follows the spirit of the FCC's *Computer Inquiry* and *Open Network Architecture* rules.²⁴⁸

I believe, however, that broadband access networks are unlike traditional telephone networks because I believe that demand for broadband access will be characterized by indirect, rather than direct, network externalities. Most residential purchasers of broadband access are not, in all likelihood, simply purchasing a higher speed connection for the purposes of sending and receiving information at higher speeds. Rather, broadband access is merely a component of the overall package of goods consumers are purchasing: Internet access, video on demand, news services, interactive gaming, and other services. In this sense, broadband access and the related information goods are hardware and software goods. One of the leading telecommunications consulting and analysis firms, the Yankee Group, has written that "in the broadband service market, . . . content is king. Specifically, content that requires a fat pipe is king. Therefore, the proliferation of bandwidth-intensive applications is ultimately the key to the significant adoption of broadband service."²⁴⁹

If demand for broadband access is characterized by indirect network externalities, then vertical integration of access providers into content may be necessary. Especially in initial periods of deployment, broadband access providers must ensure a supply of complementary information services. If consumers view broadband access simply as a hardware good—necessary to the functioning of information services and not a good to be purchased on its own—then a broadband provider must either provide those goods itself or arrange for a source of supply.²⁵⁰ To the extent that there is risk involved in the deployment of the broadband technology, a provider will often find it more efficient to internalize the risk by developing the information services itself. Moreover, in early periods especially, the hardware provider must convince purchasers that there will be *some* complementary goods, and an efficient way to make that commitment is to guarantee supply oneself.²⁵¹

More importantly, while the producer of a hardware good has incentives to vertically integrate its own operations, it also has strong incentives to permit entry into the market for the supply of software goods,

248 See *supra* notes 189-91 and accompanying text.

249 THE YANKEE GROUP, INTERNET MARKET STRATEGIES (Dec. 1998) <<http://www.yankeegroup.com/imsv4n15/imsv4n15.htm>> (Executive Summary).

250 See Katz & Shapiro, *supra* note 232, at 103.

251 See *id.* at 104 ("A more direct approach [to convincing consumers to join the network] is for the network sponsor to make sunk investments that commit it to the supply of software, and to communicate this to consumers.").

because a consumer's demand for the hardware good increases with an increase in the variety of software goods. More precisely, demand for the hardware depends upon the consumer's expectations regarding the variety of software goods that will be available in equilibrium. However, a network owner that monopolizes the provision of complementary goods has a commitment problem. In equilibrium, a monopolist will always supply a smaller quantity of goods than would a competitive market, and consumers are aware of this. Even if a monopolist charges low prices initially, or makes large commitments to variety, consumers who must make a long-term commitment to a technology will expect a monopolist to seek to maximize its profits in later periods. In other words, if a consumer must make some investment to convert to the network, it may become concerned about being exploited in later periods after it is "locked-in." This dynamic applies to broadband access networks, because consumers must invest in equipment—cable modems or wireless equipment and compatible computer peripherals—in order to switch to the service.

Thus, a rational broadband access provider will not restrict its customers to accessing only information services it provides. In fact, the broadband access provider has the incentive not to restrict the market for information services and the availability of those services to its subscribers *even if* it has a monopoly in the provision of broadband access. Where network effects are strong, as I believe they are in the provision of residential broadband access, even a monopolist will have the incentive to encourage a wide variety of information services in order to increase subscribership.²⁵² The foregoing relates to one of the early and central insights of the economic analysis of antitrust law: A monopolist generally has no incentive to "extend" or "leverage" its monopoly into the market for complementary goods, because to do so would simply diminish consumer demand for the monopoly good, and therefore diminish total profits.²⁵³ For these reasons, a profit-maximizing broadband access

252 See Besen & Farrell, *supra* note 237, at 122-23; Katz & Shapiro, *supra* note 232, at 103. As Katz and Shapiro explain, this is related to the idea that a monopolist will license its technology to a competitor where consumer up-front investment in converting to the monopolist's technology is high. The licensing may be one means of convincing consumers that they will not be exploited in later periods. Katz and Shapiro, *supra*; see also Joseph Farrell & Nancy Gallini, *Second-Sourcing as a Commitment: Monopoly Incentives To Attract Competition*, 103 Q.J. ECON. 673, 675 & n.4 (1988); Matutes & Regibeau, *supra* note 232, at 190. In this regard, two telecommunications consultants have noted that consumers opting for a broadband access platform will likely be locked in to a degree to that platform. For example, a cable modem cannot be disconnected from the cable system and hooked up to an ADSL line; there are costs to switch. See Michael Weingarten & Bart Stuck, *The Upcoming Revolution in Consumer Demand*, BUS. COMM. REV., May 1, 1999, at 53. Nicholas Economides has demonstrated that a monopoly owner of a network may have similar incentives to open its network standard to competitors. Nicholas Economides, *Network Externalities, Complementaries, and Invitations To Enter*, 12 EUR. J. POL. ECON. 211, 213-14 (1996).

253 See, e.g., ROBERT H. BORK, *THE ANTITRUST PARADOX* 374-75 (1978); RICHARD A. POSNER, *ANTITRUST LAW: AN ECONOMIC PERSPECTIVE* 173 (1976). This result has been qualified in

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provider has no incentive to attempt to require its potential subscribers to pay for a service that they do not want.

In the final analysis, this argument suggests retaining the distinctive treatment for services provided as telecommunications services—i.e., raw voice or data transport. In these circumstances, direct network externalities dominate, and interconnection and nondiscrimination obligations are the appropriate regulatory response. However, to the extent that providers, responding to market demand, use their platforms principally to offer information services, legal rules requiring unbundling are unnecessary.

Moreover, legal rules requiring open access are likely to impose significant costs. First, an unbundling rule will reduce the platform provider's ability to ensure that the information services are technically appropriate for the platform. Although the platform provider can impose its own rules through private negotiation, it has no incentive to impose artificial rules limiting the availability of information services. Such rules would simply diminish total consumer demand for the platform. However, the platform provider does have an interest in ensuring that consumers only have access to information services that will perform well on the platform.²⁵⁴ A mandatory unbundling or interconnection rule would shift this decision to regulators less equipped to make the decision.

Second, an unbundling rule creates the opportunity for rent-seeking litigation and the inappropriate allocation of costs. Information services providers seeking access to a broadband transport platform can be expected to use any interconnection or unbundling right to seek such access at low costs. Such litigation creates the possibility that regulators will impose on the platform owners the costs of interconnection, in addition to whatever costs are incurred simply to make the platform technically capable of serving multiple providers.²⁵⁵ There is no reason to think that a regulator can determine the efficient sharing of those costs between the platform provider and information providers better than would private negotiations.

I readily acknowledge the limits of this analysis. For one, I have built an anecdotal, and not an econometric, case that the demand for broadband access services is characterized by strong indirect network externalities. I

important ways, principally through the demonstration that a monopolist will often increase its profits by engaging in tying or other leveraging behavior. *See, e.g.*, Patrick DeGraba, *Why Lever into a Zero-Profit Industry: Tying, Foreclosure, and Exclusion*, 3 J. ECON. & MGMT. STRATEGY 433 (1996); Michael D. Whinston, *Tying, Foreclosure, and Exclusion*, 80 AM. ECON. REV. 837 (1990). However, even where leveraging benefits the monopolist, it rarely harms consumers. More importantly, none of these qualifications challenges the conclusion that strong network effects create incentives for open access.

²⁵⁴ *See* THE YANKEE GROUP, *supra* note 249, § III.

²⁵⁵ For an account of how industries and economic groups exploit political processes to obtain beneficial regulatory effects, see generally George J. Stigler, *The Theory of Economic Regulation*, 2 BELL J. ECON. & MGMT. SCI. 3 (1971).

think the intuition and the evidence are sound, however, and, for services not yet available, this is the best case that can be made. Nevertheless, market experience with actual demand characteristics may justify reconsidering the appropriate legal rules.

Similarly, my analysis presumes strong network effects in the relevant range. Although the equilibrium level of variety to which a monopolist can credibly commit will always be lower than the equilibrium level in a perfectly competitive market, a monopolist can commit to some non-zero level of variety. A monopolist will open the supply of complementary goods to competitors where strong network effects exist in the range between the monopoly equilibrium level of variety and the competitive equilibrium level of variety. Again, consumer demand for information services seems strongly influenced by a demand for variety. The leading telecommunications market analysts think so,²⁵⁶ as do the FCC's chairman²⁵⁷ and its Cable Services Bureau.²⁵⁸ Furthermore, in addition to the survey I have supplied, the transformations of Prodigy, CompuServe, and AOL seem instructive. Each of those systems began as a closed-content system: users dialed into CompuServe, for example, and received only content created by or affiliated with CompuServe. But, because consumers demanded access to all of the information available on the Internet, those providers were forced to permit their subscribers open access to unaffiliated content on the Internet—while still providing their own proprietary content. As one analyst put it in 1995: “All online services are incorporating the World Wide Web into their strategy. If they don't, they could have a limited future because the Web is where the greatest amount of new content is being created.”²⁵⁹

Finally, the argument that strong indirect network effects give a monopolist an incentive to grant some access to its broadband access platform does not necessarily imply that the monopolist will grant complete open access. The equilibrium amount of open access—i.e., the amount of access that maximizes total returns to the platform provider, taking into account network externalities and other characteristics of market demand—may include fewer information service providers than

256 See THE YANKEE GROUP, *supra* note 249, § III.

257 See William E. Kennard, Remarks at the Federal Communications Bar, Northern California Chapter 4 (July 20, 1999) (transcript available at <<http://www.fcc.gov/Speeches/Kennard/spwek924.html>>) (“Consumers—the people who actually drive a market—deserve and will demand an open platform. They are used to openness in the dial-up world, and they will not want to be denied it in the broadband environment.”).

258 See LATHEN, *supra* note 4, at 42.

259 Jiri Weiss, *Online Services Take the Web for a Spin*, PC WORLD, Nov. 1995, at 54, 54 (quoting Karen Burka of SIMBA Information); see also Jack Egan, *Online Goes Big Time: The Commercial Services Are Beating the Web by Joining It*, US NEWS & WORLD REP., Nov. 20, 1995, at 104, 104; Ross Laver, *High-Tech Dinosaurs?*, MACLEAN'S, Nov. 11, 1996, at 50, 50; Mick O'Leary, *AOL Versus the Web for Consumer Research*, DATABASE, Apr.-May 1998, at 79, 79-80.

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had the broadband access platform been subject to perfect competition.

Notwithstanding these potential objections, I believe that open access rules should not be applied to broadband access platforms, especially at this stage in their development. First, technical standards are not yet established, and platform owners should be permitted to ensure that information services transmitted over their platform will perform well. Because consumer demand for a platform is based on the available information services, a consumer experiencing poor service from the information service provider may discontinue use of the platform. For example, if a person subscribes to a cable system in order to receive high-speed Internet access but experiences no perceptible increase in speeds because the Internet service provider has not upgraded its servers properly, the consumer will be dissatisfied with the entire service. Of course, the owner of the broadband access platform can advertise that its service is specially customized for use with the platform, but such costs can be avoided by initial enforcement of appropriate technical standards. And, because the monopolist has an incentive to permit access in order to increase demand for the platform, it will not impose unreasonable technical standards merely as an exclusionary device.

Second, open access rules that attempt to mimic perfectly competitive markets may decrease the broadband access provider's incentives to deploy the platforms in the first instance. A network owner's attempts to increase subscribership require it to sacrifice some of the potential returns from the platform, which raises the possibility that returns will be insufficient to ensure that the new network is deployed. This effect can be mitigated "if the network sponsor captures some of the benefits derived from a larger network. This can occur if the hardware supplier has a stake in the supply of software as well as hardware, either through vertical integration, a joint venture, or contract."²⁶⁰ Given congressional and FCC policy to encourage the near-term deployment of broadband access platforms, an open access rule that limits a platform provider's ability to benefit from the increasing popularity of its platform seems counterproductive.²⁶¹

Third, based on my survey of the technologies, I believe that any monopoly held by a broadband access provider would likely be

²⁶⁰ Katz & Shapiro, *supra* note 232, at 102.

²⁶¹ One rejoinder might be that a monopolist owner of a broadband access platform would always receive its full rents (and therefore not have any diminished incentive) so long as the monopolist were not price-regulated. However, in the presence of network effects, the monopolist frequently must give up potential rents in the hardware good in order to induce subscribership. See Katz & Shapiro, *supra* note 232, at 101-03. Two analysts have predicted that new broadband providers will repeat the strategy of early cellular phone companies and engage in deeply discounted penetration pricing to build early subscribership. See Weingarten & Stuck, *supra* note 252, at 53-54.

temporary.²⁶² Moreover, even in areas where only a single provider offers service, prices may be kept low by the prospect of quick entry by new competitors. Competitive local carriers and LMDS providers can move their assets relatively easily from market to market—they need not, for example, bury any wire in the ground to provide service²⁶³—meaning that their costs of entry and exit are relatively low. The prospect of entry by such parties alone provides a significant constraint on the incumbent’s ability to price discriminate or otherwise achieve supercompetitive profits.²⁶⁴

E. *Reconciling the 1996 Act*

Standing alone, the foregoing analysis based on network externalities may seem to call into question the 1996 Act’s requirements that ILECs interconnect with and fundamentally unbundle their networks for use by other carriers. Even apart from the direct network externalities which justify interconnection rules, however, these requirements can be justified based on Congress’s view that elements of the local network are natural monopolies and on its desire to continue universal telephone service. To the extent that elements of the public telephone network continue to be natural monopolies, interconnection rules alone will not permit competitors to replace incumbents in the provision of telecommunications services.

The classic definition of a natural monopoly was an enterprise with continuously increasing returns to scale.²⁶⁵ That definition has been replaced with the “more general idea of subadditivity,”²⁶⁶ natural monopoly obtains where, within a geographically bounded market,²⁶⁷ the “specified required rate of output can be supplied most economically by a single firm or single system.”²⁶⁸ Various aspects of telephone networks have long been considered natural monopolies, and their natural monopoly character was the basis for both initial common carrier regulation²⁶⁹ and later for the antitrust litigation breaking up the Bell System.²⁷⁰

262 FCC policy as well is based on this belief. See LATHEN, *supra* note 4, at 42 (the “[Cable Services] Bureau is not persuaded that consumers are at risk of cable establishing a bottleneck monopoly”); see also FCC Section 706 Report, *supra* note 9, ¶ 18, at 2405.

263 See FCC Section 706 Report, *supra* note 9, ¶ 49 & n.110, at 2424-25.

264 See WILLIAM J. BAUMOL, ET AL., *CONTESTABLE MARKETS AND THE THEORY OF INDUSTRY STRUCTURE* 290-93 (rev. ed. 1988).

265 See Thomas Hazlett, *The Curious Evolution of Natural Monopoly Theory*, in *UNNATURAL MONOPOLIES* 1, 10-11 (Robert W. Poole ed., 1985); WILLIAM W. SHARKEY, *THE THEORY OF NATURAL MONOPOLY* 21-24 (1982).

266 Hazlett, *supra* note 265, at 15.

267 See *id.* at 16.

268 *Id.* at 15.

269 See Robinson, *supra* note 133, at 6-7.

270 See, e.g., *MCI Communications Corp. v. American Tel. & Tel. Co.*, 708 F.2d 1081, 1133

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In the 1996 Act, Congress acted on its belief that legal regulation had long since replaced technological limitations as the reason most telephone services were provided by monopoly local carriers.²⁷¹ It recognized, however, that certain elements of the local network—and local loops especially—might remain natural monopolies, and it would therefore be unrealistic, as well as uneconomic, to expect other carriers to reproduce these elements.²⁷² Thus, in order to permit competition to the maximum extent possible, the 1996 Act ordered incumbents to make network elements available if they are “necessary” and if failure to do so would “impair the ability of the telecommunications carrier seeking access to provide the services that it seeks to offer.”²⁷³ The other principal duties the Act imposed on incumbents—to permit interconnection wherever technically feasible and to permit collocation of other carriers’ equipment—can be explained as necessary to permit new telephone companies to use the natural monopoly aspects of the incumbent’s network at no greater cost than the incumbent.²⁷⁴

At the current time, there is no reason to believe that any particular broadband platform, or any of a platform’s elements, is a natural monopoly. Moreover, the FCC has explicitly rejected the monopoly model: “We believe it is premature to conclude that there will not be competition in the consumer market for broadband. The preconditions for monopoly seem absent.”²⁷⁵ So, while the copper loop may remain a natural monopoly for the purposes of telephone service,²⁷⁶ it should not be treated as such for the deployment of advanced broadband services. More importantly, indirect network externality effects, which dominate for broadband services, suggest that even a monopolist will provide open access to competing content providers. Therefore, interconnection and unbundling rules are warranted for incumbent local telephone networks providing “telecommunications” that, for their principal purpose—

(7th Cir. 1983); *United States v. American Tel. & Tel. Co.*, 552 F. Supp. 131, 183 (D.D.C. 1982), *aff’d*, *Maryland v. U.S.*, 460 U.S. 1001 (1984).

²⁷¹ See, e.g., H.R. REP. NO. 104-204, at 49-51 (1996), *reprinted in* 1996 U.S.C.C.A.N. 10, 13-14.

²⁷² See, e.g., Implementation of the Local Competition Provisions in the Telecommunications Act of 1996, Notice of Proposed Rulemaking, 11 F.C.C.R. 14,171, ¶ 6, at 14,175 (1996) (discussing theory behind the 1996 Act).

²⁷³ 47 U.S.C. § 251(d)(2)(B) (Supp. III 1997); see also *AT&T Corp. v. Iowa Utils. Bd.*, 119 S. Ct. 721, 734-36 (1999).

²⁷⁴ This leaves unexplained the requirement that incumbents develop wholesale prices, at an avoided costs level, for resale of telecommunications services. This rule helps entrants avoid joint demand problems, where consumers demand certain goods or services together. The resale rule assists entry into a market by a competitor that can provide one of the joint goods at a lower price. It also puts pressure on incumbents to minimize marketing and other costs associated with the service.

²⁷⁵ FCC Section 706 Report, *supra* note 9, ¶ 48, at 2423-24.

²⁷⁶ See *id.* ¶ 48 n.102, at 2423 (“Incumbent LECs do, however, have market power in the related market for narrowband telecommunication.”).

telephone calls—are subject both to direct network externalities and elements of natural monopoly, but such rules are not warranted for the deployment of advanced services either by incumbents or new carriers.

So why are AOL and other Internet service providers pushing for open access? The best answer, at this time, is that they are unwilling to pay the full price that the cable providers want to charge. The open-access advocates are seeking to garner a regulatory imperative that they be provided access, which they will quickly follow with complaints that the cable systems are setting their prices too high. There may well be good arguments for price-regulation of the cable systems, but those arguments should be made explicitly, for they implicate the incentives that companies have to deploy the new technologies.

Conclusion

The approach I have suggested for broadband access platforms, which is based on their exhibiting indirect network externalities, suggests that the cable television model should be adopted and made applicable to all carriers deploying broadband information services. A carrier that deploys high-speed access services alone (i.e., without associated content) should still be subject to the interconnection duties specified in the Communications Act,²⁷⁷ for in that case direct network externalities dominate, and consumer welfare is enhanced by eliminating the competition between platforms. In other words, to the extent that a carrier is providing “telecommunications,” whether it be plain old telephone service or a new high-speed data pipe, interconnection and nondiscrimination should be imposed by rule. This rule, of course, extends only to interconnection with other telecommunications carriers, not to information services providers, although they certainly will be able to connect through affiliated or open-access telecommunications carriers.

However, to the extent that companies deploy broadband platforms coupled with information services, interconnection duties will be unnecessary and unwise. Thus, section 251(c)’s fundamental unbundling rules, and the FCC’s related *Computer Inquiry* and *Open Network Architecture* rules, should not apply even to incumbent local carriers that deploy new network elements, such as DSL, if those elements are deployed only for information services.

High-speed, digital transport systems are proliferating, and several competing companies promise to provide the “last mile” of access, permitting consumers to take advantage of new information services in their homes. These service providers currently are subject to differing

277 47 U.S.C. §§ 201(a), 251(a) (1994 & Supp. III 1997).

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regulatory burdens, and the degree to which they will be required to unbundle their transport from content services and interconnect with other information services providers remains unsettled. From the perspective of network externalities, and the fact that broadband access technologies are, unlike narrowband transport, likely demand-dependent on the development of those very information services, regulation should not be needed to ensure the competitive provision of such service. More importantly, such fundamental unbundling may diminish a provider's early ability to ensure demand and returns sufficient to justify the initial deployment of the platform.

Advanced telecommunications services "to all Americans" might not be here nearly so soon as commentators, and even the United States Congress, hope and believe. Yet they are coming, and there is every reason to believe, regardless of how many different platform providers there are, that consumers will have access to the widest variety of services.