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The Speed Gap: Broadband Infrastructure and Electronic Commerce

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THE SPEED GAP: BROADBAND INFRASTRUCTURE AND ELECTRONIC COMMERCE

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ABSTRACT

Although high-speed, broadband telecommunications services are not yet widespread outside of urban and commercial areas, they are starting to reach an increasing range of residential customers. Greater availability of high-speed communications links is likely to increase the growth of electronic commerce and other Internet applications, to the benefit of consumers and online businesses alike. Regulation of advanced services may, however, affect the speed of residential broadband deployment and the prices for such services in the short run. This essay discusses some important legal constraints underlying current regulatory proceedings and the impact those constraints may have on the spread of affordable broadband services.

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Telecommunications infrastructure is critical to the growth of electronic commerce. Telephone networks, cable systems, and other providers of facilities are essential intermediaries that can shape the volume and nature of transactions between online buyers and sellers. The faster and less expensive the links are between users and the Internet, the more quickly electronic commerce is likely to grow. Competition, innovation and regulatory changes have all contributed to the development of a more efficient, higher capacity telecommunications network that is increasingly well suited to moving large amounts of data quickly. There is, however, a point at which broadband transmission stops: the local, residential network. The extension of broadband capability beyond its current scope to a majority of small businesses and households is an important challenge for the communications industry.

Part I of this essay will discuss the current state of broadband capability in U.S. telecommunications networks. Part II will then discuss the importance for electronic commerce of increasing residential access to advanced, high-speed telecommunications services. Finally, Part III will examine how statutory constraints and tradeoffs underlying current regulatory proposals might affect the availability and affordability of residential broadband services. It suggests that the 1996 Act may constrain the Federal Communications Commission ("FCC") to favor rules that maximize the number of competitors in the broadband market at the expense of rules that maximize the spread of low-priced, advanced service offerings to residential customers.

I. AN OVERVIEW OF BROADBAND AVAILABILITY TO CONSUMERS

This section will begin by discussing changes in the telecommunications system's ability to provide high-capacity lines to customers and to process information in digital format, both of which are essential for broadband services. It will then discuss how, because of the high costs of deploying fiber lines to most individual customers, several technologies have been developed to increase capacity of the communications plant that telephone and cable carriers have already constructed. It will argue that deployment of those technologies—namely integrated services digital network ("ISDN"), digital subscriber line ("DSL"), and cable modem

service—has helped to make broadband service cheaper and more widely available, but not yet on a ubiquitous scale to residential consumers.

A. Current Deployment of Advanced Network Capability

Substantial progress has been made in upgrading telecommunications infrastructure to meet the needs of the information sector of the economy. When AT&T was broken up in 1984, not one "central office"—the offices where the switches that route telephone calls are located—contained advanced, digital signaling technology. By 1997, over 97 percent of central offices deployed such technology,[1] and over 99 percent of customer lines were routed through such switches.[2] Similarly, in 1984 only a very small number of links used to transport telephone traffic between central offices were made of fiber optic cable; the vast bulk were low-capacity copper lines.[3] By 1990, 60 percent of interoffice transmission links were fiber, and by 1997 the proportion of fiber transport plant had reached nearly 96 percent.[4]

FCC figures show that from 1993 through 1997, overall deployment of high-capacity, fiber optic cable in the U.S. telephone system increased from 2.3 million to 3.4 million miles in long-distance networks,[5] from 6.6 million to 12.2 million miles in incumbent local telephone networks,[6] and from 0.2 million to 1.8 million miles in competitive local exchange networks.[7] Total fiber mileage increased an estimated 16 percent in 1997 alone, and actual fiber capacity by the end of 1998 was almost certainly much higher.

While the paving of the "Infobahn" has reached the freeways and main roads, it has not yet reached the neighborhood streets. For the most part, the high-capacity fiber infrastructure stops well short of individual customer lines—often called "loops," or the "last mile"—that connect individual customers to the network. Of the 150 million customer lines oper-

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1. See INDUSTRY ANALYSIS DIV., FEDERAL COMMUNICATIONS COMM'N, TRENDS IN TELEPHONE SERVICE 90 tbl.17.2 (July 1998).

2. *See id.*

3. Indeed, in 1986, total fiber deployment by AT&T was less than 30 percent of its total network, including long distance lines where the bulk of fiber was used. *See* John Haring & Ewan Kwerel, *Competition Policy in the Post-Equal Access Market*, 62 Rad. Reg. 2d (P & F) 587, n.18 (OPP Working Paper, Feb. 1987).

4. *See* INDUSTRY ANALYSIS DIV., *supra* note 1, at 91 tbl.17.3.

5. *See* JONATHAN M. KRAUSHAAR, FEDERAL COMMUNICATIONS COMM'N, FIBER DEPLOYMENT UPDATE END OF YEAR 1997 10 tbl.2 (1998).

6. *See id.* at 24 tbl.6.

7. *See id.* at 36 tbl.14.

ated by the Bell operating companies (the major incumbent carriers), 86 percent were copper and only 14 percent were fiber at the end of 1997.[8] Because some competitive local exchange carriers have been building all-fiber networks, the percentage of fiber loops for the overall market may be slightly higher than the percentage for the incumbents' networks alone. But the competitive carriers have only about 3 percent of the local market by lines,[9] so the total percentage of customer lines served by fiber loops is still almost certainly under 20 percent.

Not only is the proportion of fiber loops small, but the distribution of those links is heavily skewed toward businesses and urban customers. Once fiber "backbones" are put in place in dense areas, as they have been in many cities, it can be economical to build a fiber link from the backbone to an office or apartment building. The distances are short—often a matter of yards—and a single building will either have multiple customers or a very high-revenue customer. The economics of building fiber links to customers in less dense areas are much less promising. Loops are much longer—a matter of miles rather than yards—and at the end of that loop generally lies one, relatively low-revenue customer. As a result, no carriers are currently building fiber lines to individual customers outside of the densest urban areas.[10]

B. Broadband Options in the "Last Mile"

The absence of fiber deployment to individual customers means that the speed of data transport drops precipitously at the point where information is handed off from the network's transport lines to the customer's loop. Given the time and cost required to build out fiber networks, the solution for bringing broadband service to residential customers must, in the foreseeable future at least, work over existing residential infrastructure: either the copper phone loops or the coaxial links of the cable television network. In addition to solutions based on landline telephone and cable systems, wireless technologies may also become important in the residential broadband market. Today, three technologies that meet the constraints of existing facilities are beginning to enter the market for residential

8. INDUSTRY ANALYSIS DIV., *supra* note 2, at 91 tbl.17.3.

9. *See* COUNCIL OF ECONOMIC ADVISORS, PROGRESS REPORT: GROWTH AND COMPETITION IN U.S. TELECOMMUNICATIONS 1993-1998, 24 (Feb. 8, 1999) (White Paper).

10. *See* KRAUSHAAR, *supra* note 5, at 21 n.18.

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