University of Florida Journal of Law & Public Policy

Volume 8 | Issue 2 Article 3

1997

Public Policy for a Networked Nation

Gerald R. Faulhaber

PUBLIC POLICY FOR A NETWORKED NATION

Gerald R. Faulhaber[*]

I. INTRODUCTION

The extremely rapid emergence of the Internet as a mass communications service and its concomitant commercialization have stirred great interest in creating a broadband[1] infrastructure, both in the United States and worldwide. The concept of a national, even global, network linking citizens and governments, friends and neighbors, customers and firms, and schools and students appears new and exciting, almost unprecedented to many.

---

* Professor, Public Policy and Management Department, Wharton School, University of Pennsylvania, Philadelphia, PA 19104. I wish to thank the Annenberg School's Public Policy Center for their financial support for this project. I have also benefited from comments by Christiaan Hogendorn, Wharton School, on an earlier draft. Internet: faulhaber@wharton.upenn.edu; WWW: rider.wharton.upenn.edu/~faulhabe.

1. I use the term "broadband" to refer to an electronic signal (or to the facilities designed to transmit that signal) that carries information substantially greater than a voice signal, for example, video or high-speed data. For the more engineering oriented, I consider Integrated Services Digital Network (ISDN) to be more than voice, but less than broadband. Generally, a useful if not wholly accurate benchmark would be signals of 10 Mhz or above. Note that modern compression technologies may eventually permit the practical carriage of such signals across telephone lines that were originally designed for voice.

Whether this will occur, and how it will play out, is a great uncertainty.

In fact, networks are nothing new. "Hard" networks, such as road and rail systems, power grids, and water and gas distribution networks have been with us for a century. These networks connect customers to suppliers, or other customers, with physical facilities. "Soft" networks, such as computer hardware and software, and automobile service and parts systems, depend upon shared standards and protocols to link products and their uses and are a barely noticed part of our lives. Telecommunications networks have also been with us for a century, from early telephone networks, local in scope, to the emergence of the current globally connected telephone system. In the 1920s, radio networks emerged, followed by television networks in the 1940s and 1950s. Somewhat later, cable television networks grew, slowly at first, but now passing over 90% of U.S. homes.[2] In other countries, satellite television distribution networks perform much the same role. More recently, cellular telephone networks have also grown, illustrating the point that telecommunications networks, though "hard" in the sense used above, can be wireless links, without a continuous physical connection.

In this broader network context, why the sudden interest in broadband networks, and what is unique about them? For those familiar with this technology, the surprise is that it took so long. Engineers and communications specialists have been predicting the coming of broadband systems with both confidence and regularity over the last thirty years. There have been numerous "false dawns," such as teletext and videotext, and more successfully, Minitel[3] in France. However, despite the enthusiasm of engineers and telephone companies, consumers did not have a question to which broadband data networks were the answer.

But given the rich context of existing telecommunications networks, what is so special and unique about broadband data networks? The fact that they are broadband is nothing special; coaxial cable and broadcast television are broadband. However, both these media are inherently one-way; they are designed to carry video content from a producer of that content to customers. Recent attempts to refit cable systems for two-way traffic, though successful, reinforce the point that this system was designed to deliver a specific product, and attempts to modify it are quite costly. These are specialized systems. The fact that broadband networks are interactive is also nothing

---

2. 1995 FCC SECOND ANN. REP. ON CABLE COMPETITION 2 app. B, tbl.1.

3. Minitel is a network of service providers and home/office "boxes" for accessing these providers that France Telecom started to deploy in 1982. Although still essentially limited to France, it has expanded substantially, now encompassing 7 million users and 26,000 services. *See generally* Jack Kessler, *The French Minitel: Is There Digital Life Outside of the "US ASCII" Internet? A Challenge or Convergence?*, D-LIB MAG. § 2.0 (Dec. 1995) <http://www.dlib.org/dlib/december95/12kessler.html>.

special; the telephone network has been two-way for a hundred years. But again, this is a network designed to deliver a specific product, and that is two-way simultaneous voice call; and it will not be easily modified to do much else. This, too, is a specialized system. What is special is that broadband data networks are *both* broadband *and* interactive. And, it is this conjunction of attributes that creates the power broadband networks: just about *any* electronic signal can be sent *from* anybody *to* anybody else. Rather than the design of the network tying it to a specific purpose, it is a *general* system, with the potential for its use to be shaped and tailored by the needs and desires of its users.

However, all this power is of little interest unless there are people capable of using it who find it of value to them. Prior to, say, 1992, this defined a small community of scientists, who were computer-literate and widely dispersed among the world's universities and research institutions, who placed a high value on communicating with each other, and who had access to large data sets for experimental purposes. For this group, the Internet became integral to their research efforts. For everyone else, the Internet was virtually unknown.

Nevertheless, the Internet has grown at an extremely rapid rate since the late 1980s[4] and as of this writing, shows no sign of diminishing. This extremely rapid and sustained growth has generated for the Internet enormous press and attention by many corporations.

What was the cause of this sudden growth spurt? There is no definitive answer, of course. However, by 1993, a number of *necessary* conditions were in place:

(1) the World Wide Web (WWW), invented at Conseil Européen pour la Rechérche Nucleaire (CERN) in 1989[5] and in general use by this time;
(2) over 30% of U.S. households owned personal computers,[6] generally with an easy-to-use graphic interface (Windows or Macintosh);
(3) the ready availability of an easy-to-use graphics "browser" for the WWW: first Mosaic, followed shortly by Netscape;
(4) sufficient information available on the WWW (data, graphics, programs, etc.) to make it worthwhile for people to browse.

This list is certainly not exhaustive; it merely enumerates the more obvious necessary conditions that must have been present to support the observed growth spurt.

During 1993, there was a growing corporate involvement in the potential

---

4. *See* Mark K. Lottor, *Internet Domain Survey, 10/84 - 7/95,* Network Wizards, Inc. (visited Apr. 15, 1997) <http://www.nw.com/zone/hosts-graph-linear.gif>.

5. *A Little History of the World Wide Web* (last modified Oct. 3, 1995) <http://www.w3.org/pub/WWW/History.html>.

6. Andrew Freeman, *Technology in Finance Survey*, ECONOMIST, Oct. 26, 1996, at 19.

for "multimedia," a catchphrase that included video-on-demand and other entertainment options.[7] Several very large mergers were proposed, the most publicized being the Bell Atlantic-TCI deal;[8] only some of these were consummated.[9] These mergers were predicated, at least in part, on the future market potential of broadband network entertainment delivery systems.[10] But during this year, the Internet and WWW were not even considered worth mentioning in the same context as the true "Information Superhighway."[11]

By 1994, the sustained growth of the Internet attracted more and more users and corporations. The number of ".com" sites (indicating a commercial user) exceeded the number of ".edu" sites (indicating an educational user) for the first time in Internet history.[12] Both total traffic and total number of hosts on the Internet exploded during 1994.[13]

Nevertheless, the Internet continued to be viewed by most large corporations throughout 1994 and 1995 as something of a fad, the "oat bran muffin of the 1990s." Nor was their skepticism unwarranted; having seen several "false dawns," the unruly hackers' paradise of the Internet hardly looked like the engine of commerce and entertainment that large corporations envisioned as the Information Superhighway.

The highly publicized launch of Windows 95 by Microsoft in August 1995, also introduced the Microsoft Network (MSN), the world's largest software firm's much anticipated entrée into on-line services. Microsoft's early experience with MSN, coupled with its assessment of the traditional on-line services market, apparently was not entirely satisfactory; in December, Microsoft announced a major shift in strategy which would focus its considerable resources on the Internet. This acknowledgment by the most influential software firm in the world, that it was more profitable to cooperate on the Internet than compete with it, marked a turning point in both public and corporate perceptions of the future of the Internet: this was no longer seen as another "false dawn"; the Net appeared to be here to stay. By 1996, Microsoft had announced plans "to eliminate proprietary interfaces altogether

---

7. *Make Way for Multimedia*, ECONOMIST, Oct. 16, 1993, at 15-16.

8. *See* John Huey & Andrew Kupfer, *What That Merger Means for You; The Wiring Together of Cable and Telephone by Bell Atlantic and TCI Will Be Good News for Consumers and U.S. Competitiveness*, FORTUNE, Nov. 15, 1993, at 82-89.

9. *See* Andrew Kupfer, *The Baby Bells Butt Heads*, FORTUNE, Mar. 21, 1994, at 76.

10. *See* Andrew C. Barrett, *Shifting Foundations: The Regulation of Telecommunications in an Era of Change*, 46 FED. COMM. L.J. 42-43 (1993).

11. For example, in 1993, a review article of multimedia and the "Information Superhighway" in a well-known newsmagazine made no mention of the Internet or the WWW. *See The Tangled Webs They Weave*, ECONOMIST, Oct. 16, 1993, at 21-24.

12. *See* Mark K. Lottor, *Internet Domain Survey* (July & Oct. 1994) <http://nw.com/zone/www-9410/distribution.html>.

13. *See id.*

and move entirely to Web-based content."[14]

In sum, it now appears that the long-anticipated mass deployment of broadband data networks is at hand, with the Internet and WWW forming the basis of this growth. How fast this will occur; what fraction of households, businesses, schools, and governments will eventually become active users; what technologies will be used; and what they will be used for, are all subjects of great uncertainty. There is a very wide range of possibilities, from "small-impact-on-a-few-enthusiasts," to "a-fundamental-change-in-the-way-we-all-live-and-work."

However, which route is taken, and how fast it develops, will almost surely be deeply affected by public policy decisions being made now regarding government involvement in infrastructure development, either via direct encouragement and even investment, or via regulation, possibly with universal service mandates.

II. CONVERGENCE OF THE TELECOMMUNICATIONS, COMPUTERS, AND ENTERTAINMENT INDUSTRIES

For three decades, engineers and communications specialists have spoken of the convergence of the telecommunications, computers, and entertainment industries around the technologies of broadband networks to produce a new, integrated industry, serving a new set of customer demands.[15] Convergence does seem to be what is happening: telecommunications firms are seeking partners in the entertainment business; computer firms, both hardware and software, are seeking content providers; and cable television companies are looking both for telephone companies and for entertainment distribution channels. Whether such pairings will be consummated, and if consummated, will be successful, is highly uncertain. Mergers or alliances among established firms indeed may be how convergence is realized; but there are other routes as well.

Complicating matters is the Internet "industry" itself: noncommercial, based on cooperative arrangements among (largely) academics, and supported (until quite recently) by the federal government research establishment. For good or ill, the Internet Society[16] and the Internet Engineering Task

---

14. Todd Spangler, *The Net Grows Wider: Internet Services*, PC MAG., Nov. 19, 1996, at 148.

15. *See* Stavros Christodoulakis & Peter Triantafillou, *Research and Development Issues for Large-Scale Multimedia Information Systems*, 27 ACM COMPUTING SURVEYS 576, 576-79 (1995).

16. The Internet Society is a U.S. nonprofit organization founded in January 1992 "to maintain and extend the development and availability of the Internet and its associated technologies and applications." *What Is the Internet Society?* (last modified Apr. 8, 1997) <http://www.isoc.org/what is/what-is-isoc.html> (providing information on this influential organization).

Force[17] currently control the destiny of the only existing broadband data network in the United States, indeed the world.

Each of these industries approaches this convergence with very different expectations of what convergence actually means, and with very different skills and attitudes towards markets and technology. From the perspective of this article, however, the most important difference among these industries is the degree and kind of government intervention into their markets. There are two fundamental hypotheses which this article addresses:

(1) The convergence of these industries into a single new industry leads ineluctably to the convergence of the public policy models for these industries into a single new public policy model overarching this emerging market.
(2) The speed and direction of the market convergence will be closely coupled with the speed and direction of the public policy convergence.

Each of these industries is briefly, and somewhat arbitrarily, characterized below, with particular but not exclusive attention to their history of government intervention.

A. *Computer Hardware and Software*

Since the early 1980s, the computer business has undergone extraordinary changes, driven largely by extraordinary improvements in the price and performance of microelectronic devices and the conversion to open architectures. From a highly specialized corporate market for proprietary systems dominated by a few firms, the industry has moved toward a mass commodity market for open systems with many competitors in nearly every market segment. The industry is *technology- and market-driven*, highly competitive and rivalrous. There has been very little government intervention into this market: even though IBM dominated the industry in the 1960s and 1970s, and Microsoft has approached that dominance in the late 1980s and 1990s, no government antitrust suit was prosecuted to completion against either firm.[18] The industry is and always has been completely unregulated. Even its standard-setting has been negotiated without government intervention. The worldview is that this industry is highly competitive, where the firm that best manages technology and its markets wins. Government

---

17. The Internet Engineering Task Force is a voluntary organization that provides a forum for working groups to develop and select standards within the Internet protocol suite. See *IETF Overview* <http://www.ietf.org> for more information on this standard-setting organization.

18. *See, e.g.*, Cal. Computer Prods, Inc. v. International Bus. Machs. Corp., 613 F.2d 727 (9th Cir. 1979); Telex Corp. v. International Bus. Machs. Corp., 510 F.2d 894 (10th Cir. 1975). The Department of Justice entered into a consent decree with Microsoft. United States v. Microsoft Corp., CIV.A.94-1564, 1995 WL 505998 (D.D.C. Aug. 21, 1995).

intervention, although occasionally requested by smaller players fearful of dominant firms, is virtually nonexistent.

B. *Entertainment*

Entertainment is a high-risk business in which vertical relationships among content providers, for example, Disney and Paramount, and distributors, for example, NBC and HBO, are shifting and generally contentious. The industry is *deal-driven*, highly competitive, and individualistic. Government intervention has often been sought by some players to gain a competitive advantage within their value chain. For example, intervention was sought by entertainers at the height of the power of network broadcasters to ensure that their rights to syndication royalties could not be bargained away.[19] Generally, government power has been viewed as a mechanism to advance one's own commercial interests, not as a constraint on behavior.

C. *Telephone*

Historically, the telephone industry is highly stable, with an enormous capital base and very large cash flows. Dependability and quality of service characterize this industry, which has historically been *operations-driven*. This is the most tightly regulated of all the converging industries, with both state and federal regulators controlling price, quality, investment, and entry into many aspects of this industry. The process of deregulation, begun so tentatively with the breakup of the Bell System in 1984,[20] has only modestly freed this industry to behave competitively in certain sectors.

D. *Cable Television*

An industry which spent its early years in battle against the Federal Communications Commission (FCC) and the broadcast networks, cable television has had a somewhat "rough and tumble" history. The late 1970s were a period of substantial growth based on municipal franchising, an often questionable process, followed by full deregulation by Congress in 1984.[21] Rapidly increasing rates and decreasing quality of service led to voter demand for relief, which was delivered by Congress in 1992 in the form of

---

19. Financial interest and syndication rules have recently changed. *See* Joe Flint, *Facing the Facts of Life in a Post Fin-Syn World*, BROADCASTING & CABLE, Jan. 17, 1994, at 82 (describing its effect on networks and producers).

20. *See, e.g.*, GERALD FAULHABER, TELECOMMUNICATIONS IN TURMOIL: TECHNOLOGY AND PUBLIC POLICY 94-96, 146-47 (1987).

21. *See* Cable Communications Policy Act, 47 U.S.C. §§ 521-573 (1996).

re-regulation of the industry.[22] Cable is *short-term-financials-driven*, often dominated by the need for short-term cash flow to meet substantial debt payments with less attention paid to longer term issues.

E. *Internet*

Few would actually characterize the Internet as an "industry" at all; until quite recently, the backbone network of the U.S. Internet was owned by the National Science Foundation. The "mid-level" networks, which served universities, schools, governments, not-for-profits, and some technology-based firms in local geographic areas (often multistate), were owned and managed by consortia of universities and technology firms operating in a cooperative mode. The objective of the network managers was to support research and education, and until quite recently, commercial traffic was not permitted on the network for fear of compromising the cooperative, not-for-profit spirit of the Internet. Nor was there much attempt to make the Internet easy to use; the target market was scientists and computer experts well-versed in high-end computing, with little interest in (indeed, antagonistic to) graphic interfaces or "easy to use" tools. The Internet was *research and education-driven*. Government intervention was generally in the form of financial support with only those regulations that the Internet community generally supported, such as the ban on commercial use, which was implemented by the National Science Foundation. Indeed, the privatization of the Internet in 1994 (but announced earlier) occasioned great concern that the Internet community was being abandoned by the National Science Foundation, perhaps being left to the not-so-tender mercies of the FCC.[23]

As should be evident, each of these industries about to converge have quite different histories, different expectations, and different perspectives on government intervention. As of this writing, there is ample evidence that none of these industries has much understanding of the others. The Internet community and the telephone industry, to name just one example, are in conflict over the appropriate technology to use for very high-speed connections, a capability both industries want and need.[24] Other examples abound. Although not germane to this article, it is worth noting that convergence is apt to be characterized by contention and misunderstanding

---

22. *See* Cable Television Consumer Protection & Competition Act of 1992, Pub. L. No. 102-385, 106 Stat. 1460 (codified in scattered sections of 47 U.S.C. (1996)).

23. *See, e.g.*, Richard Mandelbaum & Paulette Mandelbaum, *The Strategic Future of the Mid-Level Networks, in* BUILDING INFORMATION INFRASTRUCTURE 74-76, 113-16 (B. Kahin ed., 1992) (discussing concerns about the (at the time) coming privatization of the NSFNet backbone network).

24. Steven Steinberg, *Net-Heads vs. Bell-Heads*, 4 WIRED MAG. (Oct. 1996) <http://www.hotwired.com/wired/4.10/features/atm.htm>.

among the principal players. There are other industries, of course, such as cellular telephone, direct broadcast television, and other wireless technologies that will no doubt affect, and be affected by, this convergence. But the five listed above are most likely to be the major participants.

What are the public policy issues associated with electronic network infrastructure? Generally, the economic issues[25] that draw governmental attention are as follows: (1) Is the service available and affordable to all citizens? This is generally referred to as "universal service." (2) Is the service efficiently provided at a reasonable quality? This is generally referred to as "quality of service." (3) Is the provider earning excess profits from abuse of a monopoly market position? (4) Is the distribution system available to all content providers? I will consider each in turn.

III. THE PROBLEM OF UNIVERSAL SERVICE

Each of the five industries mentioned above is network-based. Each has achieved a substantial degree of penetration of the mass market.[26] For example, over 93% of households have telephones, over 98% of households have television, over 90% of households are passed by cable, about two-thirds of which subscribe to the service,[27] and about 40% of households have personal computers.[28] Most every desk and workstation in U.S. industry has a computer on it, and almost all the growth is now coming from sales to homes, where growth rates are still high.[29]

Each industry has arguably achieved, or is about to achieve, "universal service"; those customers who want the service are generally able to afford it. And yet the routes they followed to achieve universal service are quite different. In the cases of television, cellular phones, and personal computers,

---

25. There are a host of noneconomic issues that legislators and regulators consider in infrastructure services, such as limiting distribution of material seen as socially pernicious (*e.g.*, pornographic material, instructions for making bombs, and foreign content) and encouraging the distribution of material seen as socially beneficial (*e.g.*, access to the Library of Congress, educational television, and local and neighborhood content). While I recognize the importance of these issues, I do not consider them in this article, which focuses on economic issues only.

26. The Internet is the exception, of course. However, its phenomenal growth rate suggests that it may eventually stabilize at relatively high penetration rates.

27. *See* INDUSTRY ANALYSIS DIVISION, FCC, TRENDS IN TELEPHONE SERVICE tbl.1 (1996); *see also* 1995 FCC SECOND ANN. REP. ON CABLE COMPETITION, *supra* note 2 for cable data.

28. *See* Freeman, *supra* note 6, at 19.

29. Even cellular telephones, once thought to be a product targeted to wealthy stockbrokers so they could phone in buy orders and sell orders from their BMWs, have achieved a market penetration substantially beyond what was originally predicted. In 1995, the cellular market grew by 36% to 32 million subscribers. *See* INDUSTRY ANALYSIS DIVISION, *supra* note 27 tbl.39. Today, it is just as likely that the person using a cellular phone next to you in a traffic jam is driving a pickup truck, as a BMW.

competitive markets drove prices down and market penetration up. In the case of cable television, the laying of cable in all neighborhoods was generally a condition of the franchise that granted each company a geographic monopoly on wireline video delivery. In the case of telephone, universal service was an objective of both the old Bell System and its regulators since the early years of this century, but not to be realized until about 1960. In cable and telephone, universal service is an explicit public policy objective,[30] but they use different instruments to achieve it. In telephone, active regulation was the chosen instrument; in cable, the franchise contract was the chosen instrument.

IV. THE PRICE OF MANDATED UNIVERSAL SERVICE

In both cable and telephone, however, the price of publicly mandated universal service was monopoly. In order to make it feasible (so it was claimed) for a firm to serve everyone, profitable and unprofitable, the government had to forbid entry by competitors into the firm's market area. Why should this be? The universal service mandate of regulators has traditionally gone beyond ensuring that service is available to all. The mandate is rather that service should be affordable by all.[31]

In order to achieve this objective, regulators have traditionally insisted on pricing practices that involve subsidies. For example, the FCC has insisted that prices for service should be the same for all (or based on simple criteria such as distance), regardless of cost. Telephone service in rural areas, where it is more costly to provide, is priced no higher than service in suburban areas, where it is less costly to provide. Long-distance telephone service rates depend only upon the distance between the two parties having the conversation, whether the call uses very expensive, sparse routes across rugged terrain or relatively cheap dense routes across a plain.[32]

Prices for *basic* services, such as telephone access or basic-tier cable television, are often subsidized by "premium" services, such as long-distance and international telephone or premium cable channels, in order that they be "affordable," especially for the poor.[33] It should be noted that these pricing practices are not unique to the United States, but occur in publicly regulated or publicly owned networks throughout the world.[34]

However, such practices cannot be sustained in the presence of

30. Telecommunications Act of 1996, 47 U.S.C. § 254(a)(1) (1996).

31. *Id.* § 254(b)(1).

32. *See* FCC No. 96-331, IMPLEMENTATION OF SECTION 254(G) OF THE COMMUNICATIONS ACT OF 1934, AS AMENDED 3-4 (1996).

33. *See* JACK WENDERS, THE ECONOMICS OF TELECOMMUNICATIONS: THEORY AND POLICY 161-63, 173-77 (1987).

34. *See* ELI NOAM, TELECOMMUNICATIONS IN EUROPE 55-56 (1992).

competitive entry. New firms could enter only those markets in which prices are held above cost in order to subsidize other customers, forcing incumbents to respond competitively with price decreases or lose the business altogether. In either case, the source of internal subsidy would eventually disappear, and the incumbent could no longer afford to serve unprofitable (though allegedly deserving) customers. Therefore, in order to maintain the subsidies that most regulators use to achieve universal service, regulators restrict competitive entry, either by regulatory fiat or by the granting of franchise monopoly.

As a matter of logic, a public policy of universal service need not necessarily lead to franchise monopoly. For example, the market could be open to competition, but some form of direct subsidy from the government, either to customers (such as "telephone stamps" to poor or rural subscribers) or to firms (such as the small-city subsidies that the Civil Aeronautics Board (CAB) gave to serving airlines), would also achieve universal service. However, a direct subsidy has two political drawbacks: (1) it is an explicit on-budget government expenditure, rather than an implicit industry-implemented internal subsidy; and (2) it would make the subsidy more explicit, and thus subject to potential criticism. Few regulators have used this mechanism (save the CAB in a previous era), favoring the less visible industry cross-subsidy approach.

The costs of regulated monopoly have been well-documented elsewhere,[35] including reduced incentives for efficient operation, reduced incentives for innovation, excessive resources devoted to "rent-seeking" through the regulatory process, and so forth. There is no question that paying the price of monopoly is quite high; but is it really necessary in order to achieve universal service?

Several scholars have disputed the assertion that the granting of monopoly franchises was necessary in order to induce cable operators to enter the market and provide ubiquitous coverage.[36] They argue that granting monopolies is simply bad public policy.[37] Of course, any firm would like a monopoly and will demand that one be given to it as a condition of investment, but is it necessary in order to get cable deployment? These scholars marshal evidence that there are cities in which cable operators compete, and it seems to work. Others argue that the risks of extensive infrastructure investment are just too great to be left to the competitive

35. *See generally* RONALD BRAUETIGAM & BRUCE OWEN, THE REGULATION GAME: STRATEGIC USE OF THE ADMINISTRATIVE PROCESS (1978) (an early reference).

36. *See, e.g.*, Tom Hazlett, *Duopolistic Competition in Cable Television*, 7 YALE J. REG. 65 (1990); Stanford Levin & John Meisel, *Cable Television and Competition*, TELECOMMUNICATIONS POL'Y, Dec. 1991, at 521-22.

37. *See* Stanford Levin & John Meisel, *Cable Television and Competition*, TELECOMMUNICATIONS POL'Y, Dec. 1991, at 521-22; Tom Hazlett, *Duopolistic Competition in Cable Television*, 7 YALE J. REG. 65 (1990).

market, and that no firm will take that risk unless assured of a reasonable return.[38]

The core of the universal service problem for "hard" network infrastructure, however, is simply the magnitude of the investment required. This investment is best conceived as having a network component (switching, transmission, computers, head-end, long-haul satellite, etc.) and an access component (local loop, inside wire, etc.). The network component is typically a shared resource; many users make use of switches and transmission systems. The access component is typically not shared, but dedicated to a single household.[39] Moreover, the access component, sometimes referred to as "the last mile," may account for as much as half the total investment in the network. Capital cost of a traditional telephone access line is typically estimated at around $1,000.[40] Every customer, therefore, represents a substantial financial commitment by the serving firm.

V. THE PROBLEM OF QUALITY OF SERVICE

In a market with some form of competition, the expectation is that quality of service will take care of itself. Firms will provide the level of quality that customers demand and are willing to pay for, and competition will ensure their responsiveness to customers. In the case of monopoly, however, the incentives for the firm to provide appropriate quality levels may be diminished, so that quality of service may suffer. The most salient examples of quality-of-service problems in these network industries have occurred in the more monopolistic industries: cable television and the Internet.

The recent congestion on the Internet is less a problem of monopoly than it is of growth outstripping the Internet's governance structure. WWW users have been experiencing agonizingly slow download times from graphics-intensive web servers, and the delays from U.S. sites to European or Asian sites are extremely long. Since the network uses shared resources, increased demands cause those shared resources to become congested. Management of this situation is at once everyone's problem and no one's problem; both

---

38. Virginia M. Kahn, *How Safe Is Cable's Natural Monopoly?*, CABLEVISION, Oct. 13, 1986, at 61.

39. This is much less of a problem with connections to medium to large businesses, in which the businesses provide substantial "cooperating" investment in telephone equipment on their own premises, so that a dedicated access circuit group to a business is a less risky investment for the local telephone company. For households, however, the access investment is often made prior to the household making consumption choices or cooperative investments.

40. ROBERT W. CRANDALL & LEONARD WAVERMAN, THE BROOKINGS INSTITUTION, TALK IS CHEAP: THE PROMISE OF REGULATORY REFORM IN NORTH AMERICAN TELECOMMUNICATIONS 82-85 (1995). Crandall and Waverman estimate the annualized capital cost of the access line to be around $100. *Id.*

demand and supply of all network components, not just a few, must be managed to solve this quality-of-service problem.

The decline of service quality of another kind was observed by many customers of the cable television industry during the late 1980s and gave rise to demands on Congress for a solution. That solution was the Cable Television Consumer Protection & Competition Act of 1992.[41] However, the political demand grew out of what many customers perceived as shoddy treatment in handling requests and complaints and failure to provide reliable, outage-free services.

In principle, regulators generally have the legal power to coerce firms to provide the "right" service level. In practice, this is more difficult, as is borne out in Williamson's well-known analysis of cable television franchise bidding.[42] Additionally, it is not clear that regulators are good at assessing the quality level that customers would demand in a more competitive market. For example, in the precompetitive airline market, most scholars agree that airlines over-provided schedule quality, at the cost of higher fares, as a result of the CAB's regulatory practices.[43] After deregulation, many more routes involved hub-and-spoke connections and fewer nonstop connections, reducing schedule quality to that for which customers were willing to pay.[44] Another example occurred in the telephone industry. Prior to the deregulation of terminal equipment, the Bell System, with regulatory approval, provided rather simple telephones that were virtually indestructible.[45] After deregulation, it became clear that most customers preferred telephones with many more features and a shorter life; the telephone soon became another consumer electronics product.[46] In both cases, regulation led to an inappropriate quality level, as measured against the competitive standard.[47]

VI. THE PROBLEM OF MONOPOLY

Many consider network infrastructure to be a "natural monopoly," an industry in which competitive markets would naturally lead to a single supplier as the most efficient alternative. In such cases, antitrust actions to break up a monopoly would be ineffective, as market forces would eventually

41. Pub. L. No. 102-385, 106 Stat. 1460 (codified in scattered sections of 47 U.S.C. (1996)).

42. Oliver Williamson, *Franchise Bidding for Natural Monopolies – In General and with Respect to CATV*, 7 BELL J. ECON. 82, 99 (1976).

43. Steven Morrison & Clifford Winston, *The Economic Effects of Airline Deregulation, in* STUDIES IN THE REGULATION OF ECONOMIC ACTIVITY 4 (1986).

44. *Id.* at 5-6.

45. Gerald R. Faulhaber, *Public Policy in Telecommunications: The Third Revolution*, 7 INF. ECON. & POL'Y 251, 261 (1995).

46. *See id.*

47. *See id.*

lead to the remonopolization of the industry. Some form of regulation may be justified as a means to control the abuse of monopoly power in such industries, and this is the rationale given by many for the creation of regulated monopolies in network industries.[48] Others argue that these monopolies may not be so natural, but are in fact products of the regulation that seeks to control them.[49] This latter view is somewhat more compelling, in that virtually all regulators protect regulated monopolies with entry prohibitions. In the words of Alfred Kahn, "If competitors want to enter, how natural can monopoly be?"[50] In fact, the protection is necessary to maintain subsidizing price structures, which are indeed a product of regulation. In any case, regulators find that control of monopoly power is added to their list of responsibilities, be that monopoly natural or created. Generally, much regulatory attention is devoted to determining if a firm is abusing its market power. In the classic regulated monopoly, this concern takes the form of ensuring that the firm's earnings are not "excessive," that is, do not exceed the cost of capital. In regulated monopolies operating in some markets subject to competition, this concern takes the form of ensuring that power in monopoly markets is not being used to subsidize operations in competitive markets. Both tasks are extremely difficult, but concern for cross subsidy is virtually impossible. For example, as telecommunications competition slowly increased during the 1970s and early 1980s, the FCC devoted very substantial efforts to develop an accounting standard by which to judge whether or not the Bell System rates involved cross subsidy,[51] although without notable success.

VII. THE PROBLEM OF VERTICAL INTEGRATION (CONTENT VS. CONDUIT)

The "network" of a network industry is a distribution system, a conduit over which something else, *content*, is sent. In telecommunications, this something is telephone calls; in cable, it is video programming; in electric utilities, it is power. In computing, it is possible to think of hardware as conduit and software (which actually delivers what customers want) as content. In both regulated and competitive markets, an important economic issue is the vertical integration of content and conduit.

In some markets such as telephone, content and conduit are separated as

48. ALFRED E. KAHN, 1 THE ECONOMICS OF REGULATION: PRINCIPLES AND INSTITUTIONS 11 (1970).

49. Sam Peltzman, *The Economic Theory of Regulation After a Decade of Deregulation, in* BROOKINGS PAPERS ON MICROECONOMIC ACTIVITY 4-5 (1989).

50. ALFRED E. KAHN, 2 THE ECONOMICS OF REGULATION: PRINCIPLES AND INSTITUTIONS 146 (1971).

51. FAULHABER, *supra* note 20, at 64-65.

a matter of law, generally on First Amendment grounds.[52] In other related markets such as cable and broadcast television, content and conduit can be, and generally are, integrated within each firm.[53] For example, a subscriber to a particular cable firm can only buy material that the cable firm chooses to make available. In contrast, anyone can use the telephone network to distribute any information, such as 800 or 900 services; and the telephone company has nothing to say about it.[54]

The computer industry provides a prime example of how competitive markets evolve. Prior to the early 1980s, virtually all computer companies bundled hardware and software together. An IBM customer had to buy IBM proprietary software, because no other commercially available software ran on IBM machines. This was the era of "closed" computer architecture. In contrast, the PC ushered in the era of "open" architecture, in which hardware vendors encouraged provision of software by as many firms as possible. The result was a flowering of both hardware and software, with thousands of companies, many no more than a single person, pumping out tens of thousands of software titles. Many have credited this open architecture with the extraordinary growth and richness of the computer industry of the 1980s and 1990s,[55] compared to the relatively stately pace of innovation in the closed architecture era. However, many software firms have complained that Microsoft, the firm that controls the dominant PC operating system (the conduit), has used its operating system control as an unfair competitive advantage in the applications (content) market, such as word processors, spreadsheets, and presentation graphics.[56] After considering such complaints, the Department of Justice did not prosecute, reaching a relatively mild agreement with Microsoft that it cease certain practices.[57] No one seriously suggests that Microsoft should not be permitted to compete in the applications software market. However, the example brings home the fact

---

52. For example, when granting applications for international common carrier certification, the FCC inserts the following clause: "[Common carrier] will act as an objective conduit of its customers' communications without influence or control in determining the content or the destination of the calls." Overseas Common Carrier Section 214 Application Actions Taken, 11 F.C.C.R. 10,080 (1996).

53. This is not to say that cable or broadcast firms actually produce their own content (although broadcasters do produce their own news shows), but rather that they control the content, which they generally purchase from outside, entertainment suppliers.

54. *See supra* note 52 and accompanying text for an example of the FCC's stance.

55. M. Kapor, Electronic Frontier Foundation, *Building the Open Road: The NREN as Test-Bed for the National Public Network* (last modified September 1991) <http://www.uio.no/~elund/rfc/1259.txt>.

56. James Gleick, *Making Microsoft Safe for Capitalism*, N.Y. TIMES, Nov. 5, 1995, § 6 (Magazine), at 50.

57. *See* United States v. Microsoft Corp., CIV.A.94-1564, 1995 WL 505998 (D.D.C. Aug. 21, 1995).

that vertical integration of content and conduit is certain to give rise to the contention of market abuses, if not actual abuses, and constitutes a public policy problem, either regulatory or antitrust.

In sum, universal service with appropriate service quality, control of monopoly pricing, and open architectures can be achieved with competitive markets, at least in some cases. However, regulation/franchise control have traditionally been the chosen instruments in virtually all electronic network infrastructure industries. In the case of broadband networks the question is, which is the more appropriate means of achieving the public policy objectives? It is this question to which I now turn.

The four issues raised in the previous section present an interrelated set of problems for which various interest groups expect a public policy response. Fortunately, Congress, in the Telecommunications Act of 1996,[58] established a procompetitive context in which state regulators and legislators, as well as federal regulators, can respond. However, control of telecommunications in the United States is fragmented among fifty-two local jurisdictions, plus the federal level, suggesting that progress within this framework and the policies adopted may be quite varied, even contradictory. The process by which the individual states and the nation as a whole come to understand what needs to be done is likely to be drawn out over the better part of a decade, after which there will no doubt continue to be some variation among jurisdictions. The focus of this article is on the economic issues, not the jurisdictional issues.

VIII. UNIVERSAL SERVICE

The universal service issue for broadband two-way networks is currently relatively quiescent. Recent action by the FCC, in conjunction with state regulators, has been to implement a mechanism to ensure advanced broadband access for the nation's schools.[59] Generally, however, few have supported a universal service concept of a broadband link into every home in the United States, an enormously capital-intensive venture. Restricting the universal service concept to below-cost provision of broadband to schools, and possibly libraries, ensures that this will be a non issue.

However, this may change if there is a substantial increase in the demand for broadband in rural areas or from disadvantaged groups. This demand would translate into political action that could redefine universal service to include broadband, possibly fiber, to the home or curb. Should this occur

58. Pub. L. No. 104-104, 110 Stat. 56 (codified in scattered sections of 47 U.S.C. (1996)).

59. Pamela Mendels, *FCC Moves to Ensure Net Access for Schools*, N.Y. TIMES, CYBERTIMES (Nov. 13, 1996) <http://search.nytimes.com/web/docsroot/library/cyber/week/1113fcc.htm>.

relatively soon, before the industry has a chance to form, there could well be public intervention to ensure that all suppliers are required to provide fiber service to all households and businesses. In fact, if municipalities are permitted to limit broadband fiber providers by monopoly franchising, as has been done in cable television, this outcome is highly likely. Even more likely is that those firms who believe they have a good chance of winning such monopoly franchises may press legislators toward universal service as a means of justifying monopoly. It could be argued, as above, that only monopoly can ensure that everyone will be served.

Should this occur, it will almost surely be a substantial loss to the nation, for the following reasons:

(1) The track record of regulated/franchised monopoly in fostering product innovation has been particularly poor. In the emerging broadband network industry, this form of innovation will be particularly important. Since no one now knows what services will emerge that will capture the interests of consumers, it is essential that firms be permitted to explore the possibilities, that consumers have the maximum choices, and that the market be permitted to evolve in as free and open a fashion as possible. Imposing regulation/franchised monopoly on this market will surely throttle this needed innovative process, substituting (whether intended or not) the visible hand of government for the invisible one of the market.

(2) There is an existing infrastructure for delivering Internet-type services to everyone. Most schools and libraries have some form of access, and most households have telephones, which permit 28.8 Kbps access, which is satisfactory if not perfect for Internet access, at least at present.

(3) There is little evidence that broadband access from the home, as opposed to broadband access from the *school* or *28.8 Kbps* access from the home, constitutes an essential tool for all Americans to achieve equal opportunities, either in the political or the economic marketplace. It could, of course, become a valued entertainment distribution channel, but this is hardly a public policy reason to subsidize universal service.

If regulated monopoly is a poor policy choice, is it at least better than competition? A unique feature of the emerging broadband technologies is that there are so many of them. While much attention has been focused on fiber, both satellite delivery as well as various "add-on" technologies for telephone and cable are also competitors to fiber for broadband.[60] This potential for *intermodal* competition changes the nature of the market alternative to franchised/regulated wireline monopoly.[61] Preliminary

60. *See* David Strom, *Breaking the Internet Speed Barrier*, WINDOWS SOURCES 1-3 (June 17, 1996) <http://www.zdnet.com/wsources/content/960617/feature.html>.

61. It also is worth noting that developing countries in Latin America and Southeast Asia, poised to expand their telephone networks, do not plan on using wireline technology to

research on competition for broadband access has shown the following tentative results:[62]

(1) For "reasonable" estimates of cost and demand for broadband distribution, it appears likely that major metropolitan areas may support more than one fiber distributor.
(2) However, competitive deployment of fiber may occur in "rings," in which the areas of most dense population are served by *n* fiber distributors, and the less dense areas are served by *n*-1 distributors, until the final ring, which is served by only one provider. Prices within each ring would reflect competitive conditions. The least dense areas may not be served by fiber at all.
(3) Most likely, satellite services would also serve metropolitan areas in competition with fiber,[63] albeit with a service that is somewhat inferior.[64] These services would cover the whole population, thus achieving universal service via competition.

However, at least some legislators and regulators find it difficult to refrain from intervention, if only to "help" competition to achieve public policy objectives. Some have suggested an intermediate approach that would permit public policymakers to show a commitment to universal service while encouraging competition. Municipalities could offer nonexclusive franchises, on the condition that franchise holders would be required to provide universal service. Entry would require a franchise, but anyone could obtain a franchise for the asking. This could encourage competition among broadband fiber firms, all of which would be forced to serve all customers. In this way, not only would everyone enjoy the benefits of broadband, but they would also

---

provide universal service, but intend to rely on (indeed, are relying on) cellular and other wireless services to provide services to rural areas. The presence of both wired and wireless modes has changed the nature of the universal service problem in these countries. *See* Peter Haynes, *The End of the Line: A Survey of Telecommunications*, ECONOMIST, Oct. 23, 1993, at 1, 7.

62. Gerald R. Faulhaber & Christiaan Hogendorn, Competition for Broadband Electronic Distribution: Feasibility of Open Markets and Universal Service, Annenberg Public Policy Center, Annenberg School of Communications, University of Pennsylvania (work in progress, available June 1997).

63. Recently, Direct Broadcast Satellite (DBS) distribution of video entertainment, a direct competitor to cable television, has had some success in penetrating markets already served by cable. *See* Mark Robichaux, *Once a Laughingstock, Direct-Broadcast TV Gives Cable a Scare*, WALL ST. J., Nov. 7, 1996, at A1, A10.

64. Satellite can be used for broadband distribution to the customer. However, without expensive transmitting equipment and much more bandwidth than is currently available, customers would be required to transmit signals from the home via telephone lines. This service would be broadband in and narrowband out, as compared with fiber, which can handle two-way broadband. On the other hand, fiber to the curb is not yet a reality, while satellite systems delivering a 400Kbps downlink can be purchased today. *See* Jeffrey G. Witt, *Hughes Networks on The Final Frontier*, PC MAG., June 25, 1996, at NE23-24.

enjoy the benefits of competition as well.

Unfortunately, this happy outcome may never occur. The requirement for universal service imposes a fixed cost on entrants which would constrain the number of fiber providers who would be willing to enter with a universal service constraint. Simulations based on the aforementioned preliminary research suggest that even if a competitive market could support multiple fiber providers, an open market with a universal service obligation may be able to support only one supplier. The reason is that the cost of supplying fiber infrastructure to unprofitable customers may be greater than even duopoly profits from the profitable markets. Thus, imposing the universal service obligation may actually lead to monopoly, even if unconstrained competition could support multiple fiber vendors. Of course, the price charged under this scenario would be a monopoly price, substantially higher than most customers would pay under unconstrained competition. The only constraint on monopoly pricing in this scenario would be the presence of satellite services, should satellite vendors choose to, and be permitted to, compete.

On balance, then, it would appear that competitive provision of broadband access is far superior to any form of regulation or franchising. Further, unless there is significant pressure from rural or disadvantaged groups for below-cost provision of broadband access to the home, it should be relatively easy for legislators, regulators, and municipalities to resist vendor demands for monopoly franchises. The policy direction established by the Telecommunications Act of 1996 should provide a rationale for policymakers to take the competitive option.

IX. QUALITY OF SERVICE

The evolution of the Internet into the two-way broadband network of the future has been both exciting and painful. The network itself, its administrative support, and its governance structure were all designed for a much different environment. Institutions and infrastructure designed to meet the needs of university researchers around the world are quite unsuitable for the high-growth, high-volume, commercialized mass-market service the Internet has become in the last year. What is amazing is not that the Internet is congested, which it clearly is,[65] but that it has not collapsed under the crushing weight of unprecedented traffic volumes. The problem is clear: investment in Internet capacity has not kept pace with the growth of demand, leading to a slow-down of the Internet. In some places, such as transoceanic traffic, and for some uses, such as telnet and real-time video, this increase in

65. *See Why the Net Should Grow Up*, ECONOMIST, Oct. 19, 1996, at 17-18.

congestion has made the Internet almost unusable.[66]

Does this call for a public policy intervention? The Clinton administration has established an Information Infrastructure Task Force,[67] with committees, working groups, events, speeches, and testimony.[68] The current Internet Engineering Task Force is comfortable working with government agencies, so this may help. However, any long-term solution will clearly involve three factors:

(1) *An overhaul of the Internet's governance structure.* While research and education should continue to have strong representation in governance, commercial users and vendors will eventually take on more governance responsibility.

(2) *Pricing and revenue sharing.* This is probably the most immediate need of the Internet, in order to ensure that those who own facilities, such as transmission pipes, servers, and routers, have sufficient incentive to invest in new capacity to handle increased traffic volumes.[69] Such arrangements exist in virtually every commercial network industry in which multiple entities are responsible for different parts of a single network: railroads and telecommunications are two obvious examples. Such arrangements need to be adopted by the Internet, and relatively quickly.

(3) *Development and integration of new networks.* It is likely that several Internets may develop and coexist, interconnected with gateways that limit the impact of congestion between networks. In October 1996, a group of American universities announced their intention to set up "Internet II" as a means of avoiding increased congestion and ensuring that this network would enable them to meet their education and research objectives. It is likely that other groups may wish to do the same in order to meet their objectives. Certainly the recent trend toward corporate "intranets" is best viewed in this light; they are networks that share the protocols of the Internet without sharing its congestion and lack of security.

Clearly, government can play a role in helping this happen. It is most likely that existing institutions can evolve toward the above solutions, albeit with some pain and contention. Government can play a supporting role here. However, should government attempt to play a directive role, it is more likely to be the problem, not the solution. In the early 1990s, the National Science Foundation correctly perceived that its role in providing the NSFNet

---

66. *See Too Cheap to Meter?*, ECONOMIST, Oct. 19, 1996, at 23-27.

67. Exec. Order No. 12,864, 58 Fed. Reg. 48,773 (1993).

68. As befits such an organization, its primary point of contact is its website: <http://iitf.doc.gov>.

69. *See Too Cheap to Meter?*, *supra* note 66, at 23.

backbone was over, and that this role should be taken over by the private sector. Despite many protestations from the Internet community, the National Science Foundation implemented this privatization.[70] It would be inappropriate if the government were to step back into a directive role, having had the good sense to withdraw from such a role some years ago.

X. MONOPOLY AND VERTICAL INTEGRATION

There is a reasonable chance that limited competition in broadband may emerge. Not only might there be more than one fiber provider, there is likely to be satellite coverage as well. Further, existing infrastructure providers are currently developing technologies that increase the effective bandwidth of their infrastructure. Cable firms are experimenting with cable modems, which promise in-bound speeds of 10 Mbps, although there is some concern over how much bandwidth cable systems have for heavy Internet usage. Telephone companies are experimenting with Asynchronous Digital Subscriber Line, a technology that will permit 10 Mbps in-bound over existing telephone lines. All these technologies will compete with each other, provided they are deployed.

And therein lies the concern. It is possible, some would say likely, that after all the grand announcements, alliances, initial public offerings, and other fanfare, only the telephone companies will actually lay fiber to the curb, and thereby control the one broadband two-way distribution channel into the home. In that case, two problems confront public policymakers. The first is the classic problem of monopoly: a firm takes advantage of its market position to charge prices higher than costs. The second is the problem of access control: the monopoly firm chooses the content its users can access, which limits both its customers as well as potential suppliers. Monopolies tend to be closed architecture systems, with a limited choice controlled by the "bottleneck" supplier.

On balance, it is likely that the second problem would be more serious than the first. If it is the case that the market can only support a single supplier, then it is likely that monopoly prices are not very much higher than total costs; if they were, then the market could support more than one supplier. Of course, it could be that the monopoly may be a temporary one, until other firms can deploy resources to compete. In this case, it is particularly important that antitrust authorities be alert to attempts by the incumbent to raise potential rivals' entry costs and other anticompetitive behavior. In any case, this would appear to be a problem for the antitrust authorities.

The second problem is somewhat more difficult. Should a single firm

70. Mandelbaum & Mandelbaum, *supra* note 23, at 74-76.

be the monopoly supplier of broadband distribution, it is likely to control content, increasing its profits through price discrimination among content providers. By analogy with the IBM-dominated computer market of the 1970s, we would expect proprietary content provision in a closed architecture, without the profusion of content and access that a more competitive market would provide. If such a monopoly emerges, or emerges even temporarily, how should policymakers respond?[71]

The problem is closely related to two issues in telecommunications today: (1) encouraging local telephone competition, a market now dominated by the Regional Bell Operating Companies (RBOCs); and (2) ensuring that RBOC provision of video services is open to nonRBOC content providers. Both issues are before regulatory commissions as of this writing, and broadly similar approaches are being taken. In the case of local competition, RBOCs are being required by the Telecommunications Act of 1996 to open their networks to potential competitors who wish to lease facilities to provide local service.[72] Originally, the FCC mandated wholesale rates at which the RBOC would be required to provide local facilities;[73] however, this requirement was struck down on a challenge by state regulators on jurisdictional grounds. Nonetheless, state regulators are arbitrating agreements between RBOCs and potential competitors for wholesale rates close to the FCC guidelines.[74] The concept of the Act was to mandate resale of bottleneck facilities to encourage competitive supply of local telephone service.[75]

Similarly, in the case of video services, several interested parties were concerned that the provision of these services could become a distribution monopoly, with the fiber becoming a bottleneck facility.[76] To address this problem, the FCC has adopted the Open Video Systems (OVS) approach, in which telephone companies, indeed, any OVS supplier providing video distribution to the home is required to provide access to any content provider that wishes to use the supplier's capacity under the same terms and

---

71. The following analysis draws on James Kaplan, Integration, Competition, and Industry Structure in Broadband Communications (1996) (unpublished manuscript, on file with the Wharton School Advanced Study Project, Wharton School, Public Policy & Management Department).

72. 47 U.S.C. § 259 (1996).

73. Interconnection Between Local Exchange Carriers and Commercial Mobile Radio Service Providers, FCC No. 96-325, CC Docket No. 95-185 (1996) (first report and order).

74. Roger Fillion, *Phone Market Competition Proceeds – Not as Planned*, REUTERS BUS. REP. (Nov. 13, 1996) <http://www2.elibrary.com/getdoc.cgi?id=5...pubname=Reuters_Business_Report&puburl=0>.

75. Implementation of Infrastructure Sharing Provisions in the Telecommunications Act of 1996, CC Docket No. 96-456, FCC 96-456, at 1-2 (proposed Nov. 22, 1996).

76. Open Video Systems, 61 Fed. Reg. 28,698 § 117, at 64 (June 5, 1996) (second report and order).

conditions that it supplies its own content provider.[77] In this model, the facilities supplier is not enjoined from providing content; but it is required to make its facilities available to other content providers under the same terms and conditions it offers its own content provider.[78] While this approach is not without problems, it does represent a regulatory approach to convert an otherwise bottleneck facility into an open architecture system.

In fact, the OVS is a good example of a regulatory intervention that opens up markets to a far richer supply structure than would otherwise be obtainable, and certainly far richer than would be obtainable under traditional rate-base and rate-of-return monopoly regulation. Should temporary monopoly of two-way broadband facilities become a problem, then this relatively light touch of regulation designed to open access to any content provider is an effective solution to that problem.

The history of network infrastructure supply in the United States, and indeed the world, is one of unrelenting regulated monopoly. I have argued in this article that adopting such a model for two-way broadband networks is likely to throttle innovation and deliver only a very small fraction of the content that would be interchanged in a more open market. Ensuring that this historical public policy solution is not imposed on this exciting and uncertain enterprise is perhaps the most important public policy issue for the electronic age of the next century.

Fortunately, the Telecommunications Act of 1996 set a highly procompetitive strategic direction for public policymakers[79] that federal and state regulators, as well as state legislators, appear to be following. Calls for broadband universal service appear to be limited to schools, health care providers, and libraries, an enterprise well within the capabilities of the emerging industry to handle. The FCC's OVS approach to handling bottleneck broadband facilities shows promise of providing more open architectures, even under conditions of facilities monopoly. The willingness of state regulators to permit competition with "their" local telephone companies is a welcomed break from the past. Competition among broadband access providers appears possible; whether municipalities are willing to give up franchise control of video distribution has yet to be tested.

Indeed, this trend toward open competition, which appears so robust as of this writing, is likely to be rather fragile, cutting against the historical grain of American regulation of network infrastructure. Past attempts at deregulation in this industry have not fared well. Cable television, deregulated in 1984, is the best example of how an industry made re-

77. *Id.* § 7, at 7-8.
78. First Report & Order, *supra* note 73 §§ 682-703, at 342-51.
79. 47 U.S.C. § 254(b)(6) (1996).

regulation an attractive option to a country steeped in the tradition of competition. A major setback, a public relations fiasco, or overly aggressive monopolists could reverse this current trend toward reliance upon competitive markets, leading the nation back to regulated monopoly, which may well smother this exciting and promising, but yet infant, industry in its crib.