

MULTIPLE BROADBAND WIRES TO THE HOME: FUTURE OR FOLLY?

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Communication technology is dynamic. It is constantly changing and improving in a myriad of ways. Advanced technology permits new and innovative uses of transmission media¹ and, today, allows a single medium to provide several services simultaneously.² Many revolutionary technical advancements have occurred recently. For instance, digital compression, at a reasonable cost, may be applied in several markets — telephone, video, and data.³ As applied to the communications market sector, economic efficiency means generally that facilities can be used during peak periods at reasonable costs and offered to consumers at fair prices.⁴ While communication technology may improve from a technical, economic, or public policy standpoint, advancement has not and will not, by itself, guarantee that the services will be

embraced by consumers and thus be commercially successful.

Narrowband and broadband communications enable end users to receive numerous and varied communication services.⁵ Broadband communication involves the simultaneous provision of multiple services, such as voice, video, and data, over a single transmission path that has sufficient bandwidth or capacity to provide the services at the same time.⁶ While coaxial cable is a broadband medium, narrowband communication, because of less bandwidth, provides only one service, typically telephone service.⁷

Today, economic, technical, industry, and regulatory drivers have spawned the concept of “convergence.” The notion is not new.⁸ Although there is no

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¹ For example, new technology is being developed that combines fiber optics with coaxial cable which expands the possible uses of transmission media. *In re Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming, Second Annual Report*, CS Dkt. No. 95-61, para. 9 (1995) [hereinafter *Second Annual Report*]; see also *In re Implementation of Section 19 of the Cable Television Consumer Protection and Competition Act of 1992, First Report*, 9 FCC Rcd. 7442, para. 197 (1994); *In re Advanced Television Systems and Their Impact Upon the Existing Television Broadcast Service, Second Report and Order/Further Notice of Proposed Rulemaking*, 7 FCC Rcd. 3340 (1992).

² For example, voice, video and data could be transmitted

over the same network. *Second Annual Report*, *supra* note 1, para. 173.

³ See, e.g., *In re Advanced Television Systems and Their Impact Upon the Existing Broadcast Service*, 10 FCC Rcd. 10540, para. 50 (1995).

⁴ See generally Jerry A. Hausman & Timothy J. Tardiff, *Efficient Local Exchange Competition*, ANTITRUST BULL., Sept. 22, 1995, at 529.

⁵ See *supra* notes 1, 3 and accompanying text.

⁶ *In re Amendment of Part 76 of the Commission's Rules and Regulations Relative to the Advisability of Federal Preemption of Cable Television Technical Standards or the Imposition of a Moratorium on Nonfederal Standards, Report and Order*, 49 F.C.C.2d 470, para. 13 (1974) (quoting Letter from Mr. Hubert Schlafly, Chairman of CTAC Steering Committee); *In re Amendment of Parts 2 and 21 of the Commission's Rules to Provide for the Creation of an Offshore Radio Telecommunications Service, Notice of Proposed Rulemaking/Notice of Inquiry*, 51 F.C.C.2d 1030, para. 3 (1975).

⁷ See, e.g., *FCC Cable Wiring and Equipment Rules Attacked by Cable, Backed by Telcos*, COMM. DAILY, Mar. 20, 1996; Robert M. Frieden, *Satellites in the Global Information Infrastructure: Opportunities and Handicaps*, TELECOMMUNICATIONS, Feb. 1, 1996, at 29; COMPUTER RESELLERS NEWS, Dec. 4, 1995, at 144 (excerpt of an address delivered by Microsoft Corporation Chairman and Chief Executive Officer, Bill Gates).

⁸ See, e.g., Mark Landler et al., *Bell-Ringer — How Bell Atlantic and TCI Hooked Up — and What It Means for the*

established definition, convergence refers to the ability of a single communication service provider, such as a cable television company, to provide voice telephony, video, and data (e.g., facsimile) services simultaneously over a single wire.⁹ For complex reasons, regulation of communication services generally has not kept pace with recent, profound technological advances.¹⁰ Congress, however, recently passed landmark communications reform legislation,¹¹ which now must be implemented by the FCC.¹² In addition, a number of states have enacted measures to foster competition by the elimination of monopolies and barriers to entry in the communications industry.¹³

Ironically, notwithstanding the influence of the financial markets, remarkable technological advances, and benefits that will be generated by multiple broadband wires to the home, it is conceivable that most geographic areas, specifically those located outside of highly populated, urban areas, will not be included in some communication service providers' construction plans.¹⁴ Under existing cost structures and any potential for market share, rural and lower population density areas cannot support the huge investments required for broadband deployment and, more specifically, more than one broadband "pipe" to every home.¹⁵ Furthermore, market research has not yet shown that consumers are necessarily embracing advanced communication services.¹⁶ Thus,

the goal of multiple broadband wires to every American household may remain for a period of time but, in the long term, the cost of providing such facilities and services can be overcome only through partnerships and alliances. This paper examines some of the reasons for this harsh and unfortunate reality.

BARRIERS TO A MULTIPLE BROADBAND WIRE HOUSEHOLD

Economic Barriers

Presently, the enormous cost and associated economic risk involved in extensive broadband construction is discouraging some major players in the communications industry from constructing, or upgrading existing systems to create, ubiquitous broadband networks.¹⁷ Not only are the basic construction costs substantial but, according to published reports, technology has not advanced to the point where all of the requisite components are either available or are available at a reasonable cost.¹⁸ Moreover, with respect to start-up and construction costs, local exchange telephone carriers ("LECs") may be at a competitive disadvantage *vis-a-vis* cable television operators.¹⁹ Many cable operators, in contrast to local telephone companies, already have a broadband infrastructure in place.²⁰ While cable operators boast extensive broadband facilities that pass

Information Age, Bus. Wk., Oct. 25, 1993, at 32; J. Huey & A. Kupfer, *What That Merger Means for You*, FORTUNE, Nov. 15, 1993, at 82.

⁹ See, e.g., James Coates, *Untangling the Web Woven into the Internet is a Colorful Tool that is Hastening the Day when Everyone is On-line*, CHIC. TRIB., Apr. 3, 1995, at C1.

¹⁰ For example, the FCC has endeavored to keep up with the ever-expanding wireless telecommunications sector and its technologies obviously unforeseen to the drafters of the Telecommunications Act of 1934. Mary Lu Carnevale, *FCC Acts to Keep Pace with Changes Reshaping the Communications Sector*, WALL ST. J., Feb. 4, 1994, at B2.

¹¹ The Telecommunications Act of 1996, Pub. L. No. 104-104, 110 Stat. 56 (1996) [hereinafter 1996 Act].

¹² The various sections of the 1996 Act mandate timetables for the FCC; the FCC subsequently released its own estimates for implementation. *Draft FCC Implementation Schedule for S.652, "Telecommunications Act of 1996"* [hereinafter *FCC Implementation Schedule*] (working document released by the FCC Feb. 12, 1996).

¹³ See, e.g., CAL. PUB. UTIL. § 709 (1994); FLA. STAT. § 364.01 (1995); TEX. REV. CIV. STAT. ANN. art. 1446c-0, § 3.001 (West 1995); WIS. STAT. § 196.195 (1994).

¹⁴ In discussing the possibility of two or more wires competing for customers, Amos "Bud" Hostetter, Chairman and Chief Executive Officer of Continental Cablevision, noted that

I believe there will be certain areas where this simply

won't work. Clearly, it will work in New York and Boston, Los Angeles and Chicago, but I think the jury is still out on how it will work in smaller and middle-size cities—Richmond, Va., or Findlay, Ohio—communities in which we're involved. And I'm confident it won't work in Keokuk and Upper Sandusky, Ohio.

Don West, *The Once and Future Cable*, BROADCASTING & CABLE, May 8, 1995, at 32, 34.

¹⁵ Kim McAvoy, *NCTA's Decker Anstrom: Working Around 'Profound Disagreements' with FCC*, BROADCASTING & CABLE, May 8, 1995, at 43.

¹⁶ See *infra* notes 34-38 and accompanying text; but see George Taninecz, *U.S. Wireless Gets Off Work*, INDUSTRY Wk., Oct. 2, 1995, at 47.

¹⁷ R. Brown & D. Cervenka, *Telcos Reshaping Video Battle Plans*, CED: COMM. ENGINEERING & DESIGN, Nov. 1995, at 34; A. Stewart, *Future Cable TV Network Configurations: Is HFC Adequate?*, CED: COMM. ENGINEERING & DESIGN, Dec. 1995, at 82; Mark Landler, *Dwindling Expectations: 2 Companies Adjust to Interactive TV's Costs*, N.Y. TIMES, Dec. 18, 1995, at D1, D10.

¹⁸ See generally Brown & Cervenka, *supra* note 17.

¹⁹ Joe Flint, *Programming Interest for Telcos Under Fire*, BROADCASTING & CABLE, Oct. 19, 1992, at 40 (discussing such arguments made by the LECs in the FCC's video dialtone proceedings).

²⁰ Although often overlooked, coaxial cable is a broadband

virtually every home in their franchise areas,²¹ they lack the essential switching facilities, the technical expertise, and the network reliability capabilities necessary to provide telephone service.²² Meanwhile, LECs have invested millions of dollars to build a state-of-the-art narrowband plant for voice service.²³ Generally speaking, these narrowband facilities are not optimal for, and in some cases cannot provide, advanced services, such as live television programming, switched video/video-on-demand, or on-line services.²⁴

Innovation in the form of technological advancement is not always driven by cost to the end user. It appears that most companies tend to initially focus upon perfecting technology and verification of performance. Cost considerations become a factor when company management ascertains the commercial viability of a product or service and begins to formulate a business plan.²⁵ With respect to integrated broadband networks, communication services providers are currently considering several different technologies

and architectures to provide numerous services.²⁶ While service providers consider delivery system options, one fact is ever present — the cost per home passed is prohibitively high for most network architectures.²⁷ Currently, these costs have been estimated to range from \$650 to \$17,000 per home passed.²⁸

Though the network construction costs are staggering, customer premises equipment (“CPE”) for integrated voice and video services is also expensive and thus may, in the near term, impose yet another obstacle to consumer demand. Depending upon technical capabilities and processing power, broadband CPE, such as set-top converter devices used for system security are prohibitively expensive.²⁹ In most cases, to receive the benefit of a panoply of services, these devices would have to be purchased or leased by the subscriber, adding significant expense for consumers.³⁰ Yet, it is generally agreed that, in the future, the cost of broadband CPE will decline upon achieving mass production efficiencies.³¹

medium that is capable of carrying more data than twisted copper pair, which is used to provide telephone service. West, *supra* note 14, at 34. Indeed, we are beginning to see cable operators offer Internet access using their cable networks because of the bandwidth advantage that cable systems have over telephone networks. Harry A. Jessell, *High Speed Modems a Top Priority*, BROADCASTING & CABLE, Dec. 4, 1995, at 82.

²¹ Most franchising authorities require the cable operator to construct facilities that could serve every residential dwelling in the franchise area. See 47 U.S.C. § 541(a)(4)(A) (1994). Approximately 95% of all homes are capable of receiving cable television service. Mark K. Miller, *Toward Competition in Cable Television*, BROADCASTING & CABLE, July 11, 1994, at 31.

²² When considering the state of construction of networks and, in particular, cable systems, one can refer to the number of homes “passed” or the number of homes that have the near immediate ability to receive service from the service provider. *In re Implementation of Sections of the Cable Television Consumer Protection and Competition Act of 1992: Rate Regulation, Second Report and Order, First Order on Reconsideration, and Further Notice of Proposed Rulemaking*, 8 FCC Rcd. 510, para. 8 n.13 (1992) (citing TELEVISION AND CABLE FACTBOOK: CABLE AND SERVICES, Vol. D-12 (1992)). Stating that a home is passed by a service provider may mean either that the home or apartment is already wired for service or that the nearest facilities pass the home on a utility pole and a service call is needed to string wire from the pole into the subscriber’s home. *In re Effective Competition Standard for the Regulation of Cable Television Basic Service Rates, Further Notice of Proposed Rulemaking*, 6 FCC Rcd. 208, 222 n.48 (1990).

²³ See, e.g., Mary J. Turner, *The Fate of Broad-based Electronic Commerce Lies in the Hands of the Common Carriers*, COMM. WK., Nov. 13, 1995, at 77.

²⁴ One technology, asymmetrical digital subscriber line (“ADSL”), is capable of transmitting compressed video over twisted copper pair (narrowband) facilities. Michael Krantz, *Trial by Wire: Bell Atlantic Prepares for Battle in Cyberspace*,

MEDIAWEEK, Mar. 20, 1995, at 25, 28. At this time, however, ADSL cannot transmit live or “real time” video programming. Bell Atlantic, a Regional Bell Operating Company (“RBOC”) that provides telecommunications services in New Jersey, Pennsylvania, Delaware, Washington, D.C., Maryland, Virginia, and West Virginia, has tested the ADSL technology in northern Virginia under the Stargazer brand name. *Id.* These limitations have caused some consumer dissatisfaction with the video services. Mike Mills, *Video On Demand: Still On Hold*, WASH. POST, Dec. 9, 1995, at A1.

²⁵ See, e.g., Kent Gibbons, *CAPs Are Switching, But Some Are Still Unsure*, MULTICHANNEL NEWS, June 12, 1995, at 6A.

²⁶ These technologies and architectures are discussed in section I.B, *infra*.

²⁷ Mills, *supra* note 24, at A14.

²⁸ M.J. Bax et. al, *Integrated Cable/Telephony Solutions*, CED: COMM. ENGINEERING & DESIGN, Dec. 1995, at 40 (after conversion from pounds to U.S. currency, depending upon the configuration, the cost per subscriber line for an HFC network can range from \$600 to \$925); Landler, *supra* note 17 (Bell Atlantic estimated the cost of a “full-dress video-and-telephone system” to be \$17,000); see also Peter Coy, *Please Hold for New Technology*, BUS. WK., Apr. 8, 1996, at 82. According to the National Cable Television Association and CableLabs, it now costs approximately \$750 per home passed to construct a state-of-the-art 750 megahertz cable system.

²⁹ Prices range from \$300 to \$2,000 per unit. Brown & Cervenka, *supra* note 17, at 38.

³⁰ Notably, in spite of an initial price of about \$700 for CPE, direct broadcast satellite (“DBS”) service achieved in excess of one million subscribers in its first year of operation. Randy Sharpe & Hamid Lalani, *Taking ATM Home*, TELEPHONY, Aug. 21, 1995, at 38.

³¹ See, e.g., Neil McManus & Margie Wulie, *Cable Plunges Into the Internet: Interactive Television has Given Way to Cable Modem*, DIGITAL MEDIA, Dec. 18, 1995, at 3 (discussing anticipated price drop for cable modems).

Market Demand for Advanced Communication Services

"If you build it, they will come." While we are not discussing the construction of baseball fields here as the characters did in the motion picture *Field of Dreams*,³² one must take account of the level of consumer demand for advanced communication services when considering the high level of investment needed to construct broadband networks. In a nutshell, if communication services providers build extensive broadband networks, will consumers subscribe? Is common carrier video service viable from an economic or commercial standpoint? While some consumers may favor "one-stop-shopping" convenience, one must wonder how long it will take for consumers to embrace the myriad of services providers plan to offer.³³

Market research is showing lukewarm consumer reaction to integrated, interactive broadband services.³⁴ While various segments of the population are interested in some interactive services such as video-on-demand, surveys suggest that many remain undecided or simply uninterested in other interactive services.³⁵ One recent survey indicates that nearly one-half (forty-nine percent) of those asked said they were "not at all interested" in buying their telephone and cable service from a single company.³⁶ According to this research, there are three reasons for consumer reluctance to accept integrated services: (1) dissatis-

faction with cable operators and fears that cable service could adversely affect telephone service; (2) concerns regarding increasing concentration of economic power; and (3) habit and general satisfaction with telephone service.³⁷ Other research demonstrates that demand for new services may be insufficient to provide a positive return on the substantial investments required to build two competing broadband networks in one market.³⁸

In addition to relative satisfaction with existing service providers, other concerns may be dampening consumer interest in these services. Americans have long been concerned with the potential loss of privacy.³⁹ Thus, privacy and security may make them reluctant to provide personal information, such as credit card information over a broadband network.⁴⁰ Communication service providers have touted new home shopping opportunities over these networks, and assert that technology will allow a subscriber to make purchases by "pointing and clicking" on an item with a remote control.⁴¹ Purchasing information, such as a subscriber's name, address, telephone number, credit card data, and buying habits represent market information that is becoming increasingly valuable as corporations seek to focus advertising and marketing efforts.⁴² Other "human" reasons also may be affecting market research results for interactive services. Many consumers enjoy social interaction: visits to shopping malls, the videotape rental store, the supermarket, and the like. Ad-

³² *FIELD OF DREAMS* (Universal City Studios, Inc. 1989).

³³ Some LECs have been charged with "electronic redlining," where advanced facilities are initially deployed only to middle and upper class neighborhoods, even though market research may indicate that lower income households subscribe in at least as strong proportionate numbers to entertainment services, such as cable television. The Cable Communications Policy Act of 1984, through section 621, has contributed to the availability of cable television by making it illegal for cable operators to redline low-income areas. The Cable Communications Policy Act of 1984, Pub. L. No. 98-549, § 621, 98 Stat. 2780, codified at 47 U.S.C. § 541 (1984); see also H.R. REP. No. 934, 98th Congress, 2d. Sess. 59 (1984), reprinted in 1984 U.S.C.A.N. 4655, 4696.

³⁴ *In re Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming*, 10 FCC Rcd. 7805, 7815 (1995) (citing Richard Karpinski, *No Demand for Video-on-Demand - Rochester Quits its Trial*, INTERACTIVE AGE, Jan. 30, 1995, at 5).

³⁵ See, e.g., Mills, *supra* note 24.

³⁶ D.J. Lynch, *Poll: Consumers Cool to Combo of Phone and Cable*, USA TODAY, Jan. 3, 1996, at 4B.

³⁷ *Id.*; see also *Washington's Wake-Up Call*, THE ECONOMIST, Jan. 20, 1996, at 61.

³⁸ Mercer Management Consulting, *Strong Consumer Demand Ahead For Broadband Services, But Still May Not Be*

Enough to Pay for the Enormous Investment in New Networks, BUS. WIRE, Sept. 18, 1995 (press release on file with the author).

³⁹ See generally Samuel D. Warren & Louis D. Brandeis, *The Right to Privacy*, 4 HARV. L. REV. 193 (1890); Robert F. Coppel, *Cable Television and the Allocation of Regulatory Power: A Study of Governmental Demarcation and Roles*, 44 FED. COMM. L.J. 1 (1991); Stephen Console, *Cable Television Privacy Act: Protecting Privacy Interests from Emerging Cable TV Technology*, 35 FED. COMM. L.J. 71 (1983).

⁴⁰ For example, advanced broadband networks may be capable of providing "tele-medicine" services which broadly refers to remote medical diagnosis. See B. Richards, *Doctors Can Diagnose Illnesses Long Distance, To the Dismay of Some*, WALL ST. J., Jan. 17, 1996, at A1; see also J. Markoff, *Plan to Guard Credit Safety on Internet*, N.Y. TIMES, Feb. 1, 1996, at D1 (business group led by Mastercard and Visa has developed an industry standard to protect electronic transactions over the Internet); M. Roberti, *Corporate Insecurity*, BUS. TRAVELER, Oct. 1995, at 16.

⁴¹ Stephen C. Miller, *Point, Click, Shop Till You Drop*, N.Y. TIMES, Apr. 20, 1995, at C5.

⁴² Erik Larson, *They're Making a List: Data Companies and the Pigeonholing of America*, WASH. POST, July 27, 1989, at C5.

vanced, interactive networks could be seen as potentially reducing or even eliminating this "social" contact.

Current market research for advanced telecommunications services reflects that the majority of the American consuming public is not yet comprised of the "computer generation," that is, the generation of children who grew up with computers and who are very computer-literate.⁴³ This population segment is more familiar, more adept, and less fearful of advanced technology than its parents. Until these users are prominently represented in market research, we may anticipate that demand will be relatively low.

Market research demonstrating moderate consumer interest will not provide enough incentive for communication services providers to construct competing, multi-million dollar broadband networks. It is unlikely that mid-sized and small markets can support more than two broadband networks, and most markets probably will not support more than one broadband facility.⁴⁴ Notably, while service providers have been able to obtain a competing cable franchise in any geographic market since 1984,⁴⁵ meaningful facilities-based cable competition has yet to emerge. This may be an indication that market share for broadband services can only be justified by one service provider. Moreover, industry figures indicate that, while cable facilities pass nearly every television household (about ninety-seven percent) in the United States, only sixty-four percent of all television households subscribe to basic cable service.⁴⁶

Interestingly, while current market conditions do not justify capital investment in advanced, broadband infrastructure and facilities, these conditions have not

discouraged service providers from entering new product and service markets with more cost effective alternative technologies. For example, several telephone companies are planning to use Multipoint Multichannel Distribution Service ("MMDS") or "wireless cable" to enter the video market,⁴⁷ and multiple cable system operators ("MSOs") will use wireless technologies, including newly-acquired personal communication service ("PCS") spectrum, in combination with their existing cable infrastructures, to enter the telephony market.⁴⁸ To date, three RBOCs have made substantial investments in wireless cable companies so that they will be able to enter the video market immediately with minimal capital outlay.⁴⁹ Telephone companies are also considering direct broadcast satellite service to compete with cable and over-the-air broadcast services.⁵⁰ For approximately \$135 million, AT&T recently purchased a 2.5 percent equity interest in DirectTV, a DBS operator owned by Hughes Communications, a subsidiary of General Motors.⁵¹ AT&T has an option to acquire up to thirty percent of DirectTV, which may indicate that AT&T will be in the DBS business for some time to come.⁵² MCI, with its partner News Corporation (owner of the FOX television network), paid nearly \$700 million for a DBS slot at a special FCC auction.⁵³

Cable MSOs, on the other hand, have been upgrading their networks to penetrate the closely-guarded local telephone business.⁵⁴ While many cable operators have broadband networks that serve nearly every home in a franchise area, these facilities, at least in the near term, are not capable of pro-

⁴³ See, e.g., Richard Cohen, *Kids Who Know How the World Works and Their Clueless Elders*, WASH. POST, Mar. 12, 1995, at C5.

⁴⁴ See West, *supra* note 14, at 34-36; Mercer Management Consulting, *supra* note 38. "Although many believe that the long-term interests of U.S. subscribers would be best served by fiber-to-the-curb, it is too expensive and time-consuming to deploy on a national basis any time soon." Stewart, *supra* note 17.

⁴⁵ See 47 U.S.C. § 541(a) (1994).

⁴⁶ NATIONAL CABLE TELEVISION ASSOCIATION, *CABLE TELEVISION DEVELOPMENTS 1* (Fall 1995).

⁴⁷ See, e.g., Mark Berniker, *Bell Atlantic, NYNEX Purchase CAI Wireless Systems*, BROADCASTING & CABLE, Apr. 3, 1995, at 40; Berniker, *Philips Enters Digital Wireless Cable*, BROADCASTING & CABLE, Nov. 13, 1995, at 95; Christopher Stern, *Telcos Hedge Bets with Wireless Wagers*, BROADCASTING & CABLE, May 1, 1995, at 22.

⁴⁸ See, e.g., Mark Berniker, *Broadcasters May Get Boost from Telco, Cable Networks*, BROADCASTING & CABLE, Apr. 10, 1995, at 62.

⁴⁹ Brown & Cervenka, *supra* note 17, at 42, 44, 50. Appar-

ently, these actions, in their best light, indicate that some LECs are "hedging their bets" for the near term with respect to the need to upgrade facilities in order to provide video programming services.

⁵⁰ *Five Bell RHCs Seek Waiver To Offer Direct Broadcast Satellite Services*, THE CABLE-TELCO REP., Oct. 6, 1995, at 1.

⁵¹ Rich Brown, *DBS Auctions Yield \$735 Million; AT&T Skips Auction for DirectTV*, BROADCASTING & CABLE, Jan. 29, 1996, at 6.

⁵² *Id.* Additionally, Microsoft Corporation and DirectTV have formed an alliance to allow DirectTV subscribers to receive new interactive digital services over their computers. Doug Abrahms, *Internet Providers Ease Access with Pacts*, WASH. TIMES, Mar. 12, 1996, at B6.

⁵³ Mike Mills, *MCI Becomes a Broadcaster: \$683 Million Bid Wins Satellite TV License*, WASH. POST, Jan. 26, 1996, at A1.

⁵⁴ Mark Beriker, *Sprint, Cable Partners Plan Phone Service*, BROADCASTING & CABLE, Apr. 3, 1995, at 39; see also Bill Frezza, *Cable TV: Giving Us the Broadband Business*, NETWORK COMPUTING, May 15, 1996, at 31.

viding technically reliable telephone service.⁵⁵ Most cable systems are one-way, multi-cast (every subscriber receives the same programming simultaneously) distribution networks and need at a minimum a series of interconnected, multi-million dollar telephone switches to provide telephone service.⁵⁶ Because most operators have never been in the telephone business, they may have to acquire the technical expertise, that is, network design engineers, software engineers, and technicians, to construct integrated services networks. Cable MSOs are considering strategies that incorporate a combination of wireless and wireline solutions to provide voice service.⁵⁷ Several MSOs, including Tele-Communications, Inc. ("TCI"), Comcast, and Cox Enterprises, have allied with Sprint Communications Corporation to purchase nationwide PCS licenses and will eventually integrate PCS facilities with their cable facilities to provide complete "end-to-end" voice, data, and cable services.⁵⁸

Technical Barriers

In addition to daunting economic barriers, technical issues remain in a state of flux, making service providers uncertain about making substantial investments in broadband facilities. Outside of laboratory testing or trial conditions, no service provider is offering integrated voice and video on a commercial basis over a broadband network by using a single wire to the home. Indeed, some critics maintain that the provision of integrated voice, video, and data services is a "pipe dream," and that there is a high probability that most Americans will never reap the benefits of an advanced broadband infrastructure.⁵⁹

Industry standards have yet to emerge because of several different, developing network solutions and delivery options.

As mentioned above, there are several technologies and wireline network architectures under consideration by service providers. The wireline networks are: hybrid optical fiber-coaxial cable ("HFC"), fiber-to-the-curb ("FTTC"), fiber-to-the-home ("FTTH"), and ADSL (which is not a network architecture but a solution that permits a traditional copper wire telephone network to transmit stored, compressed video).⁶⁰

The HFC network is similar to a state-of-the-art cable television system as it consists of an optical fiber backbone that feeds a "neighborhood node" and extends to the customer's premises using coaxial cable (the same cable that cable operators currently use for their distribution plant).⁶¹ Like any cable system, the HFC network has broadband capabilities and, with the addition of optical fiber cable and switching equipment, it can simultaneously deliver voice and video signals.⁶² This network was initially popular with LECs that contemplated early entry into the video market by providing "video dialtone" service.⁶³

Both the FTTC and FTTH network designs utilize optical fiber cable for feeder and distribution facilities.⁶⁴ As fiber facilities extend deeper into the network, that is, the farther fiber cable runs from the LEC central office or cable head-end to the node or pedestal, there is less need for signal amplification than for coaxial cable. Over distances, coaxial cable requires amplification and, when signals are amplified, greater degradation of signal occurs.⁶⁵ At the first terminating point in the network, optical sig-

⁵⁵ Andrew Kupfer, *Can Cable Win Its Phone Bet?*, *FORTUNE*, Sept. 18, 1995, at 175.

⁵⁶ *Id.*

⁵⁷ Beriker, *supra* note 54, at 39.

⁵⁸ *Washington's Wake-Up Call*, *supra* note 37.

⁵⁹ See discussion *supra* section I.A.

⁶⁰ As mentioned above, some telephone companies have recently acquired wireless cable systems. See, e.g., David Tobenkin, *The Wireless System That Could*, *BROADCASTING & CABLE*, May 1, 1995, at 20. These systems, because of the relative short construction time, give the telcos the ability to quickly penetrate the video market. *Id.*

⁶¹ See, e.g., *42,000 Mile Optical Fiber Backbone*, *N.H. BUS. REV.*, Sept. 15, 1995, at A8.

⁶² See Michael Burgi, *No U Turn, The Electronic Superhighway is Under Construction*, *MEDIAWEEK*, Apr. 19, 1993, at 26.

⁶³ Prior to passage of the 1996 Act, video dialtone was envisioned as a common carrier video service to be regulated under Title II of the Communications Act of 1934, as amended. Tele-

phone Company-Cable Television Cross-Ownership Rules, Sections 63.54-63.58, *Second Report and Order, Recommendation to Congress, and Second Further Notice of Proposed Rulemaking*, 7 FCC Rcd. 5781 (1992) [hereinafter *Second Report and Order*]. The Commission intended video dialtone service to compete with cable service. *Id.* at 5787, para. 9. Section 651 eliminates all rules and regulations regarding video dialtone. Pursuant to the section, common carriers are not required to receive authorization pursuant to section 214 of the Act to provide cable service directly to subscribers. Because of legal uncertainty and regulatory obstacles, however, video dialtone did not fulfill its intended purpose. The 1996 Act refers instead to "open video systems." 1996 Act, *supra* note 11, § 653.

⁶⁴ *In re Implementation of Section 19 of the Cable Television Consumer Protection and Competition Act of 1992*, *First Report*, 9 FCC Rcd. 7442, App. B (1994).

⁶⁵ Robert Bixby, *Totally Wired: Data Communications Technology in the Past and Future*, *COMPUTE!*, Aug. 1994, at 80; Jon Van, *Antec on Same Wavelength as Cable TV*, *CHIC. TRIB.*, Apr. 27, 1992, at C1.

nals, which are carried over the optical fiber facilities, are converted back to electrical signals, so that they may be delivered over coaxial cable facilities to the subscriber's premises.⁶⁶ One disadvantage to predominantly fiber architectures like FTTC, FTTH, and even HFC, is that optical fiber cable cannot carry power.⁶⁷ Therefore, these networks require an independent cable path or a combined optical fiber-coaxial cable to power neighborhood nodes and optical network units.⁶⁸ In addition, to ensure reliability, fiber networks used to provide telephony should not depend entirely upon commercial power. Either diesel generators or battery back-up systems must be integrated into system designs.⁶⁹ Yet another disadvantage for certain network designs involves maintenance of network interface and termination equipment.⁷⁰ "For some service calls, the service provider may need access inside the home to repair the remote terminal; this creates scheduling problems for the service provider and the subscriber alike."⁷¹

ADSL is not a network architecture, but rather a technology that enables telephone networks, constructed mainly of twisted copper pair, to carry stored, compressed video over existing infrastructure.⁷² Hardware is installed between the originating point in the network (usually the LEC central office) and the subscriber's premises.⁷³ In contrast to a "multi-cast" HFC network, ADSL is a switched delivery system. Each subscriber establishes an individual connection with the central office and receives a signal sent from the central office that is intended only for the use of that particular subscriber.⁷⁴ The disadvantage to this technology is that it is not yet

capable of providing live, real time video signals.⁷⁵ In addition, because ADSL does not support integrated services or simultaneous use of the same path for both voice and video services, each ADSL subscriber needs an additional telephone line for telephone service.⁷⁶

Notwithstanding their disadvantages, LECs have been testing ADSL networks for some time with Commission authorization.⁷⁷ The earliest technical trials using ADSL were conducted in 1993 by Bell Atlantic in northern Virginia,⁷⁸ and by NYNEX, which successfully tested a hybrid optical fiber and coaxial cable network (HFC network) in New York City.⁷⁹ Technical and marketing trials have also been conducted by SNET, US WEST Communications, and the Rochester Telephone Corporation.⁸⁰ The Commission authorized other trials under the video dialtone model, yet due to technical, economic, and regulatory reasons, these trials were not begun.⁸¹

While carriers have conducted video trials, conflicting information exists concerning the commercial availability of necessary electronic components and systems integration software for advanced broadband networks.⁸² Critics claim that equipment needed to separate voice and video signals from a common delivery path at the customer's premises has not been perfected.⁸³ Others assert that elements of FTTC networks have not yet passed "bench tests."⁸⁴ Systems integrators, like Lockheed Media Systems and Microsoft, continue to work the "bugs" out of the mammoth software packages that will run LEC networks.⁸⁵ It is possible, therefore, that LECs may be hedging their bets by investing in and acquiring

⁶⁶ See, e.g., Craig Hubbard, *Laser Improves Fibre Efficiency*, CANADIAN ELECTRONICS, July 1991, at 2.

⁶⁷ A. Loni, *Optical Modulation Goes External*, MICRO-WAVE J., Feb. 1995, at 110.

⁶⁸ See generally Bax et al., *supra* note 28, at 30. Southern New England Telephone Company ("SNET") is testing a combination optical fiber and copper cable that uses the copper for power transport and the fiber for carrying video signals. Brown & Cervenka, *supra* note 17, at 46.

⁶⁹ Tim Stevens, *Bellcore*, INDUSTRY WK., Dec. 19, 1994, at 38.

⁷⁰ Bax et al., *supra* note 28, at 30.

⁷¹ *Id.*

⁷² See generally Landler et al., *supra* note 17.

⁷³ *In re Expanded Interconnection with Local Telephone Company Facilities, Memorandum, Opinion and Order*, 9 FCC Rcd. 5154, para. 7 (1994).

⁷⁴ *In re Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming, Second Annual Report*, CS Dkt. No. 95-61, FCC 95-491, para. 191 (Dec. 11, 1995).

⁷⁵ *Id.* paras. 127, 192.

⁷⁶ *In re Telephone Company - Cable Television Cross-*

Ownership Rules, Memorandum Opinion and Order, 10 FCC Rcd. 244, para. 138 (1994).

⁷⁷ See generally *Second Report and Order*, *supra* note 63; Mills, *supra* note 24.

⁷⁸ *In re Chesapeake and Potomac Telephone Co. of Va., Order and Authorization*, 8 FCC Rcd. 2313 (1993).

⁷⁹ *In re New York Telephone Co., Order and Authorization*, 8 FCC Rcd. 4325 (1993); see also Brown & Cervenka, *supra* note 17, at 36-38, 42-44.

⁸⁰ See *In re the Southern New England Telephone Co., Order and Authorization*, 9 FCC Rcd. 1019 (1993); *In re US West Communications, Inc., Order and Authorization*, 9 FCC Rcd. 184 (1993); *In re Rochester Telephone Corp., Order and Authorization*, 9 FCC Rcd. 2285 (1994).

⁸¹ See, e.g., Carolina Tel. & Tel. Co., FCC File No. WPC-6999 (1994); Puerto Rico Tel. Co., FCC File No. WPC-6949 (1994).

⁸² Brown & Cervenka, *supra* note 17, at 42, 50.

⁸³ See, e.g., Fred Dawson, *Bellcore Delves into HFC Amid Support for FITL*, CED: COMM. ENGINEERING & DESIGN, Oct. 1995.

⁸⁴ *Id.*

⁸⁵ Brown & Cervenka, *supra* note 17, at 50.

wireless cable systems.

Legal and Regulatory Barriers

While the FCC has approved several LEC applications to provide video service, many carriers and other service providers have suspended their broadband deployment plans due to continuing regulatory uncertainty.⁸⁶ This reluctance to construct facilities has, in part, been caused by an outdated federal statute — the Communications Act of 1934.⁸⁷ While the Communications Act has assisted in the development of a semi-competitive communications market,⁸⁸ the Act was written and subsequently revised in times where the integrated provision of communications services could not be envisioned. At the time of its adoption, the public switched telephone network consisted entirely of twisted copper pair wiring (a narrowband medium). Coaxial cable did not emerge until the mid-1960s with the advent of cable television.⁸⁹

Indeed, the Communications Act was organized according to the type of service provided and the identity of the service provider. For example, Title II of the Communications Act set forth the general requirements for the provision of interstate telephone service by communications common carriers.⁹⁰ The Communications Act, though flexible, in truth, has, until very recently, not been flexible enough. In response to the explosive growth of cable television in the 1970s, Congress amended the Communications Act by enacting the Cable Communications Policy Act of 1984.⁹¹ The 1984 Cable Act established the framework for the provision of cable service. Signifi-

cantly, the 1984 Cable Act delegated authority and specific responsibilities to state and local franchising authorities, who were believed to be in a better position to evaluate the best interests of a community than the federal government.⁹² The 1984 Cable Act's provisions were further modified to impose cable rate regulation and other requirements in 1992.⁹³

Notwithstanding major amendments in 1984 and 1992, the Communications Act has been in need of major reform for some time. Its provisions have not kept pace with recent, remarkable technological advances. Nor has it satisfied the needs of strong market forces that are demanding that service providers increase earnings and create new revenue streams.⁹⁴ While Congress has attempted to re-write parts of the Communications Act several times, bills to revise its provisions have failed in at least five Congresses.⁹⁵ Recently, however, Congress passed landmark communications reform legislation, "The Telecommunications Act of 1996."⁹⁶ The 1996 Act now must be implemented, in a short timeframe, by the FCC.⁹⁷ If the 1996 Act is not implemented in a timely, complete and effective manner, meaningful competition in important sectors of the economy will be delayed, ultimately denying consumers the benefits of full and fair marketplace competition.

In connection with broadband facilities and services, the 1996 Act seeks to resolve several flaws and anomalies in the Communications Act. It generally updates communications law by attempting to foster market competition and permitting companies to enter new businesses and pursue new sources of revenues.⁹⁸ From most of the LECs' perspective,⁹⁹ one of the most significant changes is the elimination of

⁸⁶ See, e.g., Christopher Stern, *Bell Atlantic Pulls Back VDT Applications*, BROADCASTING & CABLE, May 1, 1995, at 34.

⁸⁷ Communications Act of 1934, 47 U.S.C. §§ 151-609 (1994) [hereinafter Communications Act].

⁸⁸ The "communications market" consists of many sub-markets and market segments. Jim McConville, *Customer Service Key to Success*, BROADCASTING & CABLE, Oct. 16, 1995, at 46. Several of these sub-markets, e.g., toll-free service, have become competitive and, accordingly, regulation has been reduced or "streamlined" to permit market forces to influence or "check" market behavior. See generally *In re Decreased Regulation of Certain Basic Telecommunications Services, Notice of Proposed Rulemaking*, 2 FCC Rcd. 645 (1987).

⁸⁹ Matt Stump & Harry Jessel, *Cable: The First Forty Years*, BROADCASTING, Nov. 21, 1988, at 35.

⁹⁰ See 47 U.S.C. § 201 et seq. (1994).

⁹¹ Pub. L. No. 98-549, 98 Stat. 2779 (1984) (codified at 47 U.S.C. §§ 521-559 (1994)) [hereinafter 1984 Cable Act].

⁹² See, e.g., 47 U.S.C. § 521(2) (1994).

⁹³ Cable Television Consumer Protection and Competition

Act of 1992, Pub. L. No. 102-385, 106 Stat. 1460 (1992).

⁹⁴ Interestingly, communications law reform has been more successful at the state level. In the last several years, many states have enacted laws to foster the elimination of telecommunications monopolies and stimulate communications competition. See, e.g., *PUCs at 2000; 1995 Regulators' Forum*, PUB. UTIL. FORT., Nov. 15, 1995, at 29; see also Donald C. Eberle and Lyle Williamson, *Deregulation of Telecommunications at the State Level: Managing a Transition*, PUB. UTIL. FORT., Sept. 1, 1988, at 20. States such as Illinois, Michigan, Ohio, and New York have spearheaded the creation of a new era of communications competition. Eberle and Williamson, *supra*, at 21; see also Steven M. Fetter, *Four Steps to a New Regulatory Model*, PUB. UTIL. FORT., Nov. 1, 1992, at 44; Lori Burkhardt, *Local Telephone Monopoly - The Beginning of the End*, PUB. UTIL. FORT., Feb. 1, 1992, at 32; *supra* note 13 and accompanying text.

⁹⁵ *Washington's Wake-Up Call*, *supra* note 37.

⁹⁶ 1996 Act, Pub. L. No. 104-104, 110 Stat. 56 (1996).

⁹⁷ See *FCC Implementation Schedule*, *supra* note 12.

⁹⁸ See 1996 Act, *supra* note 11, at Preamble.

the telephone-cable television cross-ownership restrictions previously found in Section 613 of the Communications Act of 1934.¹⁰⁰ These cable regulations were read by some to apply to the video programming operations of common carriers, even when the carrier constructed and offered *common carrier* video capacity to unaffiliated programmers on other portions of a video platform.¹⁰¹

As a result of this revision, telephone companies may now provide video services without concern for uncertain judicial, statutory, and regulatory impediments. Implementation of the landmark 1996 Act means that the FCC will undertake to complete as many as eighty proceedings in timeframes ranging from six to twenty-four months.¹⁰² For example, the FCC has initiated the proceeding necessary for promulgation of the rules to govern "open video systems," the regulatory model which "replaces" video dialtone.¹⁰³ Among other things, these regulations must: ensure that rates for carriage are just and reasonable and not unreasonably discriminatory;¹⁰⁴ ensure that the service provider not select the video programming that occupies more than one-third of the activated channel capacity when demand exceeds available capacity;¹⁰⁵ satisfy FCC "sports exclusivity" policies, "must-carry" rules, and retransmission consent rules;¹⁰⁶ ensure that service providers do not discriminate in favor of affiliates with regard to advertising or marketing;¹⁰⁷ ensure compliance with programming copyright and signal identification requests;¹⁰⁸ and ensure that unaffiliated programming services are included on electronic menus or navigational devices.¹⁰⁹ Furthermore, the FCC must promulgate regulations concerning significant issues such as universal service,¹¹⁰ network interconnection,¹¹¹ toll-free billing practices,¹¹² BOC provision

of pay telephone service,¹¹³ and network infrastructure sharing.¹¹⁴

Budget constraints have also been hoisted on the Commission. The FCC is an independent federal agency that currently employs over 1,900 people.¹¹⁵ Its budget for fiscal year 1995 was approximately \$185 million.¹¹⁶ Unfortunately, the FCC is currently operating without a budget appropriation for its operations in fiscal year 1996 and operates under a continuing resolution that funds the agency at approximately \$177 million.¹¹⁷ This critical budget situation also has the potential to impede the Commission's effort to implement the Telecommunications Act of 1996 under the time constraints contained in the legislation. While the FCC has implemented legislation before, it has not had to undertake an implementation of this magnitude, affecting so many industry players, under such short deadlines.

CONCLUSION

While advanced broadband facilities are likely to provide consumers with new integrated services and service providers with new revenue streams, several challenging obstacles remain that at least will delay and could scuttle deployment plans. At this time, network construction and broadband CPE costs are prohibitively expensive for many markets. As demonstrated by some studies, consumer demand for advanced communication services is uncertain. In addition, technical obstacles — glitches and "bugs" — remain unresolved. Finally, the FCC must implement the provisions of the new Telecommunications Act of 1996 under severe deadlines and budget constraints.

While many hope that the historic telecommunica-

⁹⁹ Due in part to perceived excessive regulatory hurdles, several LECs have decided, for the time being, to forego construction of "pure" common carrier video dialtone facilities for the provision of integrated telephony and common carrier video services. Instead, these companies, such as Ameritech, SBC Communications Inc. and SNET, have decided to construct state-of-the-art cable television systems. Mills, *supra* note 24, at A14; Brown & Cervenka, *supra* note 17, at 35-36.

¹⁰⁰ The 1934 provision, 47 U.S.C. § 533(b) (1994), is repealed by § 653 of the 1996 Act.

¹⁰¹ See, e.g., AT&T Comments in CC Dkt. No. 87-266 at 4-9; Cox Enter. Inc. Comments at 4-5; NATOA & NLC Comments at 5-6; NBC Comments at 15-17; NCTA Comments at 12-13 (these comments were in response to the *Fourth Further Notice of Proposed Rulemaking*, 10 FCC Rcd. 4617 (1995)).

¹⁰² This includes the period for reconsideration of the decisions rendered by the Commission. See *FCC Implementation Schedule*, *supra* note 12.

¹⁰³ See 1996 Act, *supra* note 11, § 653(b); Michael Grebb,

FCC Rulemaking on Open Video Systems Seeks to Clarify Broad Statutory Language, TELECOMMUNICATIONS REPORTS, Mar. 18, 1996, at 4.

¹⁰⁴ 1996 Act, *supra* note 11, § 653(b)(1)(A).

¹⁰⁵ *Id.* § 653(b)(1)(B).

¹⁰⁶ *Id.* § 653(b)(1)(D).

¹⁰⁷ *Id.* § 274(c)(1).

¹⁰⁸ *Id.* § 302(b)(1)(E)(ii), (iii).

¹⁰⁹ *Id.* § 653(b)(1)(E)(iv).

¹¹⁰ *Id.* § 254.

¹¹¹ *Id.* § 251.

¹¹² *Id.* § 701.

¹¹³ *Id.* § 276.

¹¹⁴ *Id.* § 259.

¹¹⁵ FCC REPORT, Jan. 17, 1996.

¹¹⁶ 141 CONG. REC. H1817 (daily ed. Mar. 7, 1996).

¹¹⁷ *Id.* As of March 19, 1996, the budget resolution H.R. 3019 had not passed.

tions reform legislation will fulfill its intended purposes — eliminate impediments to marketplace competition and create new and numerous business opportunities for service providers — the task is only partially complete. The tremendous implementation of the provisions of the 1996 Act now falls to the FCC, which must accomplish this task in an uncertain budget environment. As the communication in-

dustry by 1998 will represent one-sixth of our gross domestic product,¹¹⁸ it is imperative that the FCC have the resources and facilities to fully implement the 1996 Act. Taken as a whole, all of these factors — technological, market demand, and cost — mean the often-discussed benefits to American consumers may become significantly delayed, or some would argue, never realized.

¹¹⁸ *Reauthorization of the FCC: Hearings Before the Subcomm. on Telecommunications and Finance of the House Comm. on Commerce*, 104th Cong., 1st Sess. (1995) (prepared

statement of Reed E. Hundt, Chairman, FCC) (on file with COMMLAW CONSPECTUS).

With high hope for the future, no prediction is ventured.
Abraham Lincoln