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IP-Enabled Services	)	WC Docket No. 04-36

COMPETITION IN THE PROVISION OF VOICE OVER IP AND OTHER IP-ENABLED SERVICES

Prepared for and Submitted by
BellSouth, Qwest, SBC, and Verizon

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This report describes the state of competition in the provision of Voice over Internet Protocol ("VoIP") and other IP-enabled services, and the extent to which these services compete with traditional telecommunications services and networks.[1]

The main prerequisite for providing VoIP service is a broadband connection, which between 85 and 90 percent of U.S. households can now obtain from a provider *other than* their incumbent local telephone company. Riding on this competitive infrastructure, a wide range of competitive providers are deploying and marketing VoIP services nationwide. All six major cable operators, which collectively reach 85 percent of U.S. households, have begun commercial deployment of IP telephony, or have announced plans to do so imminently. VoIP services are now being offered in markets throughout the country by AT&T, other traditional CLECs and interexchange carriers, and a new breed of VoIP-only competitors.

VoIP services match the functionality of conventional circuit-switched voice in virtually all respects, including voice quality, backup power, total home wiring, and number portability, and are typically priced 30-40 percent or more below comparable circuit-switched offerings. VoIP providers also offer many features that are unavailable on conventional circuit-switched networks.

VoIP providers now market their service as a primary-line replacement, and the majority of consumers are purchasing the service as such. Significant numbers of consumers have already abandoned circuit-switched service in favor of VoIP, and their ranks are rising very rapidly. Analysts predict that, within the next three years, local telephone companies will lose up to 10 percent of their lines to cable-operator providers of VoIP services, and millions of additional lines to other VoIP competitors. Consumer surveys corroborate these estimates. The percent of *traffic* migrating from circuit-switched to IP-based networks is substantially higher. These trends establish that consumers view VoIP service as a substitute for conventional voice.

Recent advances also make possible new video-over-IP services that could provide much-needed competition to cable companies. And IP-based services are also being offered competitively to enterprise customers, as both complements to and substitutes for older packet-switched services, such as Frame Relay and ATM.

[1] *See IP-Enabled Services*, Notice of Proposed Rulemaking, WC Docket No. 04-36, ¶ 1 (FCC rel. Mar. 10, 2004) ("Customers are beginning to substitute IP-enabled services for traditional telecommunications services and networks, and we seek comment on the rate and extent of that substitution.") ("*VoIP NPRM*").

I. Voice-over-IP Services

A. Competitive Availability, Usage, and Growth

Cable operators, traditional CLECs and interexchange carriers, and a new breed of IP-only providers are now offering VoIP services to mass-market customers throughout the country. *See* Table 1. Any customer who has access to a broadband connection – which at least 90 percent of all U.S. households now do – can obtain VoIP service from multiple providers. *See* Appendix A (describing availability of and competition for broadband services).[2] A large and rapidly growing number of consumers are already purchasing VoIP services, and most of these consumers are buying the service as a replacement for their primary phone line. While VoIP services are still at an early stage of development, growth rates now rival those witnessed in the boom years of Internet in the mid-1990s; no static market-share analysis can capture the true competitive impact of this new technology or the speed at which it is taking hold.[3] Industry analysts unanimously agree that a very large number of primary access lines – and an even greater amount of traffic – will migrate to VoIP in the relatively near future.

Most importantly, VoIP is promoting adoption of broadband service itself. Indeed, VoIP is now widely viewed as the "killer app" for broadband service.[4] Because VoIP will give consumers an increased incentive to subscribe to broadband service, it will expand the base of broadband customers, and thereby lower the average cost of providing broadband service. As

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[2] The cable industry has publicly committed to a policy of "network neutrality" that will enable customers to connect to unaffiliated VoIP providers as easily as they may browse the Internet. *See* D. Jackson, *NCTA: Cable Won't Get in Vonage's Way*, TelephonyOnline (Dec. 19, 2003) ("Vonage will not be stopped by the cable industry from providing its phone service, even though it competes directly with many cable operators in this emerging market, according to Robert Sachs, president and CEO of the National Cable & Telecommunications Association. This policy is a reflection of the 'network neutrality' philosophy adopted by the cable industry that allows broadband users to access any Web site and use any DOCSIS-approved equipment, Sachs said. . . . For a cable company to strip out voice bits of a Vonage transmission would represent a departure from this philosophy, and the industry has 'no intention' to do that, he said.").

[3] *See, e.g.*, *Amendment of Parts 2 and 25 of the Commission's Rules To Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range*, First Report and Order and Further Notice of Proposed Rule Making, 16 FCC Rcd 4096, ¶ 298 (2000) (noting that market share of DBS firms in multichannel video programming distribution market "may understate their competitive importance" given the "fast growth of DBS"); *Price Cap Performance Review for Local Exchange Carriers*, Second Further Notice of Proposed Rulemaking in CC Docket No. 94-1, Further Notice of Proposed Rulemaking in CC Docket No. 93-124, and Second Further Notice of Proposed Rulemaking in CC Docket No. 93-197, 11 FCC Rcd 858, ¶ 143 (1995) ("[A]n analysis of the level of competition for LEC services based solely on a LEC's market share at a given point in time would be too static and one-dimensional."); *Petition of the People of the State of California and the Public Utilities Commission of the State of California To Retain Regulatory Authority over Intrastate Cellular Service Rates*, Report and Order, 10 FCC Rcd 7486, ¶ 103 (1995) (rejecting CPUC's static analysis of wireless market because it did "not fairly reflect the speed at which CMRS market structure conditions affecting cellular services are evolving"); *Revisions to Price Cap Rules for AT&T Corp.*, Report and Order, 10 FCC Rcd 3009, ¶ 19 (1995) ("Market share is only one factor to be considered in determining the level of competition in a given market. Relying solely on AT&T's market share at a given point in time to make this determination would be too static and one dimensional.").

[4] *See, e.g.*, D. Jackson, *VoIP Recognition*, TelephonyOnline (Jan. 26, 2004) (Chairman Powell: "VoIP is going to be a tipping point for people to buy broadband."); *Creation of Online Regulatory Distinctions in VoIP said to Concern AT&T*, Comm. Daily (Feb. 12, 2004) (David Dorman, CEO, AT&T: VoIP is "a killer application for broadband . . .and will be the biggest driver of broadband adoption in the next couple of years.").

analysts note, consumers will likely switch to VoIP at an even faster rate when regulators stop diverting competition to UNE-based alternatives defined by artificially depressed TELRIC prices.[5]

[5] *See, e.g.*, G. Miller, *et al.*, Fulcrum Global Partners, *Wireline Communications: Revising BLS and SBC Estimates Due to AWE Dilution* at 2, 7 (Mar. 10, 2004) ("In densely populated UNE-P areas," "it simply may not make sense for a cable company to aggressively rollout a telephony-like offering," given the "fear that 50 or more local resellers, with little capital requirements, would flood the market." Conversely, "the potential elimination of UNE-P resale" would accelerate the adoption of broadband, "as companies would not be as concerned with the loss of telephony subscribers to such companies that do not have to invest in ANY infrastructure." "Eliminating UNE-P resale all together . . . would offer incentives to cable companies to pursue such a customer base," and would "further the FCC's primary objective of near ubiquitous nationwide broadband deployment."); M. Rollins, *et al.*, Citigroup Smith Barney, *AT&T Corp.* at 3 (Feb. 25, 2004) (while VoIP "makes sense, and can be a long-term source of incremental revenue" for AT&T, it does not "offer[] the same return opportunities as UNE-P given a higher hurdle to clear and sell and service the product."); F. Governali, *et al.*, Goldman Sachs, *VoIP, It's 'Hear' Now; VON Conference Takeaways* at 2 (Apr. 1, 2004) ("For the next couple of years at least, it is very unlikely that VoIP can be as attractive financially to [AT&T] as the present UNE-P arrangements.").

Table 1. Deployment and Availability of VoIP Services		
	Mass-Market Service Area	**Deployment Status**
Cable Operators		
Cablevision	4.4 million homes passed	Commercial VoIP service available throughout service area 71,000 VoIP subscribers; adding 3,200 customers per week
Time Warner	18.8 million homes passed	Commercial VoIP service available in 16 markets (Portland, ME; Raleigh, NC; Charlotte, NC; Kansas City, MO; Rochester, NY; Columbus, OH; Western OH, plus 9 markets "quietly added" in May 2004); 30% VoIP penetration among cable modem subscribers in Portland Will deploy "in most, if not all, of our markets" by end of 2004
Cox	10.5 million homes passed	Commercial VoIP service available in Roanoke, VA "Keen interest in rolling out VoIP to all our homes passed;" "plan[s] to move forward with additional [VoIP] deployments later this year"
Charter	11.9 million homes passed	Commercial service in WI and MO; plans to launch in MA in 4Q04 Plans to expand from 120,000 homes passed at the end of 1Q04 to over 1 million by YE
Comcast	39.4 million homes passed	Expanding trial launches in four markets in 2004 (suburban Philadelphia; Indianapolis; Springfield, MA; and Hartford, CT) Will make half of all homes "VoIP-ready" by 2004; 95% by 2005
Adelphia	9.7 million homes passed	Trials planned for 2004; commercial launch planned for 2005
Bright House	3.6 million homes passed	Trials in FL; commercial launch possible in 2004
Mediacom	2.8 million homes passed	Trials planned for 2004; commercial launch beginning in 2H04
Insight	2.3 million homes passed	Commercial launch planned for 2004
Traditional CLECs and IXCs		
AT&T	46 states (UNE-P)	Commercial service with local numbers available in 34 markets in AZ, CA, CO, MA, NJ, NY, OR, TX & WA as of May 2004 Plans to be in all "Top 100 MSAs by the end of 2004"
Covad	44 states	"[M]arket trials by mid-year with rollout of VoIP services by the fourth quarter of 2004." Acquiring GoBeam with commercial service in CA and Chicago
McLeodUSA	25 states	Market trial in Chicago, Denver, Dallas, and Detroit planned for 2Q04
MCI	48 states & DC (UNE-P)	Commercial launch planned for 2004
Z-Tel	49 states (UNE-P)	Scheduled launch in Tampa and Atlanta in June 2004; expansion to peripheral markets such as Birmingham, Knoxville, and Orlando expected by August 2004
Cavalier (Phonom)	5 states	Commercial service since Jan. 2004; local numbers available in VA, MD, DE, eastern PA, and southern NJ
Cbeyond	GA, TX, CO	Commercial service in Atlanta, Dallas-Ft. Worth, Denver, Houston
FDN Comm. (Broadline)	FL, GA	Commercial service since Nov. 2003

Table 1. Deployment and Availability of VoIP Services		
	Mass-Market Service Area	**Deployment Status**
New VoIP-Based Providers		
Vonage	Nationwide	Commercial service since Mar. 2002; local numbers available in more than 1,900 active rate centers in 120 U.S. markets
voiceglo	Nationwide	Commercial service since Aug. 2003; local numbers available in more than 85 area codes in 22 states
VoicePulse	Nationwide	Commercial service since Apr. 2003; local numbers available in more than 55 area codes in 15 states & DC
Packet8	Nationwide	Commercial service since Nov. 2002; local numbers available in more than 1,900 rate centers in 44 states & DC
Nuvio	Nationwide	Commercial service since Jan. 2004; local numbers available in 24 states with availability in all states planned for 2004
Net2Phone	Nationwide	Commercial service since June 2001; local numbers available in 11 area codes in 6 states
Addaline	Nationwide	Commercial service with local numbers available in 27 area codes in 9 states
BroadVoice	Nationwide	Commercial service since Apr. 2004; local numbers available in more than 1,300 active rate centers in 26 states & DC
FuturaVoice	Nationwide	Commercial service with local numbers available in 132 area codes in 24 states & DC; availability in all states planned for 2004
iConnectHere	Nationwide	Commercial service since Aug. 2002; local numbers available in more than 45 area codes in 19 states & DC
ZipGlobal	Nationwide	Commercial service since Mar. 2004; local numbers available in more than 100 area codes in 23 states & DC
Sources: *See* Appendix D.		

Cable Operators. Since the beginning of 2004, each of the six major cable operators – whose networks reach 85 percent of U.S. households and serve 90 percent of all cable modem subscribers – has either begun commercial deployment of IP telephony service, or has announced plans to do so imminently. *See* Table 1.[6] Many smaller cable operators have done so as well. *See* Table 1.

Analysts now predict that all major cable operators will offer cable telephony "to nearly 100% of their in-franchise homes over the next two to three years."[7] The smaller cable operators are expected to offer cable telephony to about two-thirds of their subscribers within that same

[6] *See also* J. Halpern, *et al*., Bernstein Research Call, *US Telecom & Cable: Faster Roll-Out of Cable Telephony Means More Risk to RBOCs; Faster Growth for Cable* at 2 (Dec. 17, 2003) ("*Bernstein Cable Telephony Report*") ("Nearly every major cable MSO has indicated over the past month that it will offer cable telephony service to every or nearly every household in its footprint by 2005, with Time Warner Cable and Cablevision targeting year-end 2004"); J. Hodulik, *et al*., UBS, *High-Speed Data Update for 3Q03: Competition Heats Up in Broadband* at 12 (Dec. 1, 2003) ("By the end of 2005/2006" four major "cable operators will have rolled out a cable telephony service across substantially all of their respective footprints, representing total homes of approximately 70 million.").

[7] *Bernstein Cable Telephony Report* at 1.

time frame.[8] Analysts estimate that, within two years, 80 percent or more of U.S. households will be able to obtain IP telephony services from their cable operator.[9]

Cablevision was the first cable operator to deploy IP-based telephone service throughout its cable service territory. The company now offers VoIP to all 4.4 million cable homes that it passes in metropolitan New York, southern Connecticut, and New Jersey.[10] Time Warner has deployed IP telephony in 16 markets, and is on track to deploy service to "essentially all" of its cable systems – which pass a total of almost 19 million homes – "by the end of 2004."[11] Comcast offers circuit-switched voice service to more than 9 million homes and has told analysts it will have half of the 39 million homes it passes "VoIP ready" by year-end 2004 and 95-percent VoIP ready by year-end 2005.[12] Cox already offers circuit-switched voice service to more than half of the 10 million homes it passes, and has begun offering VoIP service in one of its other markets – Roanoke, Va – with plans to offer VoIP service in additional markets later this year.[13] Charter plans to offer VoIP services in 2004 to at least one million of the 12 million homes it passes.[14]

Analysts project that cable operators will capture 10 percent of current residential lines by 2007,[15] and over 15 percent by 2008.[16] *See* Table 2. These projections may well prove to be conservative. Consumer surveys report very high interest in voice over broadband. In a recent

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[8] *See Bernstein Cable Telephony Report* at 4-5.

[9] *See, e.g., Bernstein Cable Telephony Report* at 4 (estimating that cable operators will deploy VoIP to "roughly 82% of US households" by 2006); Kagan, *Cable VoIP Outlook: Q1 '04 Sector Update* at 17 (Jan. 2004) (estimating that cable VoIP will pass 80 percent of occupied households in 2006) ("*Kagan 1Q04 Cable VoIP Outlook*").

[10] *See* Cablevision News Release, *Cablevision Completes Network Rebuild* (Dec. 3, 2003).

[11] Time Warner News Release, *Time Warner Reports First Quarter 2004 Results* (Apr. 28, 2004); A. Breznick, *Cable MSOs Pick Up VoIP Pace, Shrug off Vonage*, Comm. Daily at 3 (May 24, 2004).

[12] John R. Alchin, Executive Vice President and Co-CFO, Comcast, Presentation to Bear Stearns Media, Entertainment and Information Conference at 16, 18 (Mar. 9, 2004), http://media.corporate-ir.net/media_files/irol/11/118591/presentations/cmcsa_030904/sld001.htm.

[13] Cox News Release, *Cox Communications Brings Digital Telephone Service to Northern Virginia; Northern Virginia Marks Cox's 13th Telephone Market* (Apr. 30, 2004); Cox News Release, *Cox Communications Delivers Cox Digital Telephone to 12th Market; Roanoke, Va. Marks Cox's First Market Launch of VoIP Technology* (Dec. 15, 2003).

[14] Mark Barber, VP of Corporate Telephony, Charter Communications, *Charter Voice-Over-IP Current Status and Future Plans*, presentation at the Banc of America Securities Voice over IP Conference at 4 (Apr. 14, 2004), http://media.corporate-ir.net/media_files/NSD/CHTR/presentations/chtr_041404.pdf; G. Campbell, *et al.*, Merrill Lynch, *Everything over IP: VoIP and Beyond* at 17, 52 (Mar. 12, 2004) ("*Merrill Lynch, Everything over IP*").

[15] *See, e.g.*, F. Governali, *et al.*, Goldman Sachs, *Cable Telephony/VoIP Threat Evolves, But Shouldn't Be Catastrophic* at 1 (Apr. 16, 2004) ("*Goldman Sachs Cable Telephony/VoIP Analysis*").

[16] *See, e.g., Bernstein Cable Telephony Report* at 1 ("[W]e are raising our estimate of cable telephony subscribers from 10.4M by 2008 (off a 2003 base of 2.3 M) to 17.4 M. Our new outlook suggests that the cable MSOs will control 15.5% of the consumer primary access lines in the US by 2008, up from our previous estimate of 9.3%); *see also* F. Governali, *et al.*, Goldman Sachs, *Telecom Services: Qualifying the VoIP Threat, an Eye-Opening Exercise* at 1 (Dec. 23, 2003) ("[W]e've been expecting the Bells to lose 20% to 30% consumer market voice share, as a result of the aggressive introduction of voice services by the cable industry over the next 5 to 7 years.").

Gallup Poll, "[r]oughly 34% of respondents that do not have VoIP [said they] would switch from their existing landline service to VoIP for cost savings."[17] Some 30 percent of Time Warner's cable modem customers in Portland – 10 percent of all homes in the city passed by cable – are now purchasing Time Warner's VoIP service.[18] In Roanoke, Cox Cable's first VoIP market, Cox reports penetration ramping up as quickly as in markets where Cox offers circuit-switched service – markets in which Cox's penetration now averages 20 percent and rises as high as 55 percent.[19] Cablevision has been adding VoIP subscribers at a rate of 3,200 per week in the New York metropolitan area.[20]

[17] J. Hodulik, *et al*., UBS, *Gallup Survey Highlights VoIP Potential* at 1 (Apr. 8, 2004); *see also, e.g*., Michael K. Powell, Chairman, FCC, remarks at the National Association of Regulatory Commissioners General Assembly, Washington, DC (Mar. 10, 2004) (50 percent of Internet households are interested in switching to VoIP service); AT&T Customer Insights Group, *VoIP PR Research: Public Opinion on VoIP* at 12 (Jan. 2004) ("three out of four adults have heard of [VoIP] technology," and "[a]mong current 'non users' aware of VoIP services, 76 percent would consider actually implementing the service in the next year, depending on the price and package offering." Of that 76 percent of respondents, 63 percent would consider VoIP to replace a primary line); J. Barrett, *et al*., Parks Associates, *Residential Voice-over-IP: Analysis & Forecasts* at Figure 5-20 (Jan. 2004) (53 percent of broadband households interested in VoIP were willing to switch service providers if a single company offered a telephone, TV, and Internet bundle; 77 percent were willing to switch for a monthly savings of $10, and 85 percent were willing to switch for a monthly savings of $20) ("*Parks Associates Residential VoIP Analysis*"); C. Moffett, *et al*., Bernstein Research Call, *Cable and Telecom: Bernstein Study Finds Consumers Ready and Willing to Switch to Cable Telephony* (Dec. 9, 2003) ("26% of households . . . report a *preference* for their cable operator over their RBOC for voice telephony service even at no discount to their current rate. 51% of respondents report a preference for a cable telephony service over an equivalent RBOC offering if a 30% discount is offered by the cable operator.").

[18] *See* J. Shim, Tradition Asiel Securities Inc., *1Q04 Stat Pack: DBS and DSL Step on the Gas, While MSOs Point to FCF* at 5 (May 14, 2004).

[19] *See* Chris Bowick, SVP Engineering & CTO, Cox Communications, *Cox Communications: Distribution at Its Best*, presentation at the Bear Stearns 17th Annual Media, Entertainment & Information Conference at 19 (Mar. 8, 2004); *Q1 2004 Cox Communications Inc. Earnings Conference Call – Final*, FD (Fair Disclosure) Wire, Transcript 042904as.714 (Apr. 29, 2004) (Pat Esser, Cox executive vice president & COO); M. Richtel, *Time Warner To Use Cable Lines To Add Phone to Internet Service*, N.Y. Times (Dec. 9, 2003) ("In Omaha, 45 percent of Cox's cable customers now subscribe to its telephone service, and in Orange County, Calif., that figure is 55 percent."); C. Moffett, *et al*., Bernstein Research Call, *Cable and Telecom: Bernstein Study Finds Consumers Ready and Willing To Switch to Cable Telephony* (Dec. 9, 2003) (in Cox's most mature circuit switched markets share is now approaching 35% of homes passed).

[20] *See* Cablevision News Release, *Cablevision Systems Corporation Reports First Quarter 2004 Results* (May 10, 2004).

Table 2. Cable Telephony Subscriber Forecasts					
		2003	**2004**	**2005**	**2006**
Circuit-Switched + VoIP	**JP Morgan (Nov. 2003)**	2.4 million	3.8 million	6.3 million	8.9 million
	Bernstein (Dec. 2003)	2.3 million	3.7 million	7.0 million	11.7 million
	Morgan Stanley (Jan. 2004)	2.3 million	3.1 million	4.6 million	6.4 million
	Frost & Sullivan (Jan. 2004)	3.3 million	4.2 million	6.1 million	7.7 million
	UBS (Mar. 2004)	2.4 million	3.1 million	4.4 million	5.8 million
	Merrill Lynch (Mar. 2004)	2.7 million	3.7 million	7.0 million	10.5 million
VoIP Only	**JP Morgan (Nov. 2003)**	0.0 million	1.0 million	3.0 million	5.3 million
	Kagan (Jan. 2004)	0.0 million	0.4 million	1.9 million	5.6 million
Sources: See Appendix D.					

Traditional CLECs and Interexchange Carriers. Many traditional CLECs and IXCs have also begun deploying VoIP services, or have announced plans to do so. AT&T's new consumer strategy is to "migrate to [VoIP] and alternate access" so that it can "provide Local & Long Distance & Advanced Applications & Mobility – all on our own platform."[21] AT&T has made a "commitment" to deploy mass-market VoIP service in the top 100 MSAs by the end of 2004[22] and has already begun providing service in at least 34 of those markets.[23] AT&T projects it will have one million VoIP subscribers by the end of 2005.[24]

MCI likewise plans to launch a consumer VoIP initiative in 2004.[25] Z-Tel has told investors it is "moving to VoIP from UNE-P,"[26] and is preparing for a VoIP launch in Tampa

[21] John Polumbo, *President and CEO AT&T Consumer, AT&T Consumer Overview: Bending the Trends* at 11 (Feb. 25, 2004); Cathy Martine, SVP Internet Telephony & Consumer Product Management, AT&T, *Voice over IP* at 10 (Feb. 25, 2004).

[22] Cathy Martine, SVP Internet Telephony & Consumer Product Management, AT&T, *Voice over IP* at 27 (Feb. 25, 2004).

[23] *See* AT&T News Release, *AT&T's CallVantage Service Expands To Serve the Western United States* (May 17, 2004).

[24] *See id.*

[25] *See* MCI Press Release, *MCI Provides 2004 Financial Guidance* (Jan. 22, 2004).

[26] Z-Tel Presentation for the Needham & Co. Sixth Annual Growth Conference (Jan. 2004), http://media.corporate-ir.net/media_files/NSD/ZTEL/presentations/0104.pdf; *see also* Z-Tel News Release, *Z-Tel to Launch Voice Over IP Services Delivering Enhanced Voice and Data Bundles to Small and Medium Businesses and Multiple Housing Units* (Feb. 9, 2004) (Z-Tel will "initially focus on the small-to-medium business market and multiple dwelling units (MDUs) such as condominiums, apartment buildings and hotels in Georgia and Florida.").

and Atlanta by June 2004.[27] Level 3 recently launched a wholesale service that provides carriers with all the building blocks needed to provide residential VoIP service; service is currently available in 50 U.S. markets, and will reach over 300 markets by the end of 2004.[28] Net2Phone has announced that it will use Level 3's wholesale service to expand the availability of its VoIP service over cable networks.[29] Many other CLECs are enthusiastically adopting VoIP technology as well. *See* Table 1.

New VoIP-Based Providers. New companies that do not offer traditional circuit-switched voice service at all were the first to grasp the competitive possibilities of VoIP. *See* Table 1. These new VoIP providers all offer service nationwide, and the larger providers now offer local telephone numbers in virtually all the markets they serve. *See* Table 1. Because they can allow customers to choose their own area code, the new VoIP providers can compete against both long-distance and terminating-end carriers as well; a VoIP phone physically located in New York can be set up with a San Francisco area code, thus displacing Verizon on the terminating end of calls originating out of region.[30]

Vonage, the largest of the new providers, currently offers local numbers in more than 1,900 rate centers in approximately 120 U.S. markets.[31] Vonage already serves at least 155,000 subscribers, and is adding "more than 20,000 lines per month to its network."[32]

VoIP Software and Applications Providers. Additional competition comes from a number of VoIP providers that rely entirely on the public Internet and do not own or operate network facilities of their own. *See* Appendix C (containing a list of these providers and their service offerings).[33] Skype provides software that enables any user with a PC, sound card, microphone, and speakers to place free calls over the public Internet.[34] According to Chairman

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[27] *See* Z-Tel Press Release, *Z-Tel Announces First Quarter 2004 Financial Results* (May 13, 2004) (quoting Z-Tel president and CEO Gregg Smith).

[28] *See* Level 3 Press Release, *Level 3 Launches Residential VoIP Service in More than 50 U.S. Markets* (May 3, 2004) ("Key features of (3)VoIP Enhanced local service include: Local and long distance calling including access to the PSTN; Local phone numbers; Operator assistance; Directory listings and assistance; E911 emergency services; Local number portability.").

[29] *See* Net2Phone Press Release, *Net2Phone Teams with Level 3 To Expand Cable VoIP Offerings* (May 3, 2004). Net2Phone has signed agreements to provide VoIP service for Bresnan Communications, with over 500,000 homes passed in Colorado, Montana, Wyoming, and Utah. *See* Net2Phone Press Release, *Bresnan Communications Selects Net2Phone as Provider for Cable Telephony Deployment* (May 13, 2004).

[30] *See, e.g.*, Vonage, *Available Area Codes*, http://www.vonage.com/area_codes.php (customers are not "tied to [a] 'local area code.'"); G. Campbell, *et al.*, Merrill Lynch, Investext Rpt. No. 7453992, Voice over Broadband – The Challenge from VoIP in the Resident – Industry Report at *7 (June 24, 2003) ("*Merrill Lynch Voice over Broadband Report*").

[31] *See* Vonage, *About Vonage: Fast Facts*, http://www.vonage.com/corporate/aboutus_fastfacts.php. Vonage plans to spend $5 million in 2004 to expand to 50 states from 37. J. Hodulik, *et al.*, UBS Investment Research, *The Vonage Story: The Who, What, Where, and How* at 9 (Nov. 24, 2003) ("*UBS Vonage Story*").

[32] Vonage Press Release, *Vonage Drops Residential Premium Unlimited Plan by $5 to $29.99* (May 17, 2004).

[33] *See, e.g., Parks Associates Residential VoIP Analysis* at 3-3, 3-4.

[34] Skype, *Home*, http://www.skype.com/home.html.

Powell, "the quality [of Skype's service] is fantastic – and it's free – it's over. The world will change now inevitably."[35] Skype reports that millions of customers have already downloaded its software.[36] Pulver.com allows "members" who register for its Free World Dialup service to place unlimited free calls to other registered members.[37] Pulver provides hardware that members may connect to their regular phones, as well as software that converts a PC into a "soft phone," both of which also may be obtained from multiple suppliers.[38] As of December 2003, Free World Dialup members had placed an estimated 2 million VoIP calls representing over 1 billion minutes of use, and monthly volume continues to grow.[39] Other companies – like Net2Phone and InPhonex – offer similar, unlimited-free-calling soft-phone software, and also offer call termination on the PSTN at rates well below those offered for circuit-switched service and VoIP services over private IP backbones.[40] Net2Phone claims to "route[] millions of minutes daily over data networks."[41] As one analyst has noted, the competition provided by these services simply does not show up at all in the conventional metrics of competition: these Internet-enabled voice services can "substitute[] for calling occasions, even as they leave measured market share untouched."[42]

Bell Companies. The Bell companies are new entrants in the provision of VoIP service. To date, only two of the four Bell companies – Verizon and Qwest – have announced plans to deploy consumer VoIP services. In December 2003, Qwest began providing consumer services on a limited basis in Minnesota;[43] the company plans additional deployments in 2004.[44] Verizon will begin rolling out VoIP services in the second quarter 2004, targeting DSL users and the consumer market.[45] Verizon and Qwest – as well as BellSouth and SBC – will also provide IP-based services – including IP VPN services, IP Centrex services, and Hosted IP services – to

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[35] D. Roth, *Catch Us If You Can*, Fortune (Feb. 9, 2004).

[36] *See* Skype News Release, *Skype Hits 10 Million Downloads* (Apr. 8, 2004) (As of April 2004, Skype's software had been downloaded more than 10 million times).

[37] *See* Pulver, *About Free World Dialup*, http://www.freeworlddialup.com/content/view/full/895/; *Parks Associates Residential VoIP Analysis* at 4-12.

[38] *See* Pulver, *Free World Dialup*, http://www.pulver.com/fwd/.

[39] *See* Nextone Communications Press Release, *Free World Dialup Powered by Nextone Session Controllers* (Dec. 17, 2003).

[40] *See Parks Associates Residential VoIP Analysis* at 4-9; InPhonex, *Products and Services*, http://www.inphonex.com/products/products.php.

[41] Net2Phone, *About Net2Phone: Company Overview*, http://web.net2phone.com/about/company/.

[42] J. Halpern, *et al*., Bernstein Research, *U.S. Telecom and Cable: Flat-Rate Pricing Signals Telephony Voice ARPU Compression* at 4 (Apr. 8, 2004) ("*Bernstein Flat-Rate Pricing Note*").

[43] *See* Qwest Press Release, *Qwest Communications is First Major Telecom Company to Provide Voice Over Internet Protocol Services to Customers* (Dec. 10, 2003); *Qwest Reports Profit, Says It Will Offer VoIP in Dec. in Minn*., Comm. Daily (Nov. 20, 2003).

[44] *See Qwest Holder Proposals on Board Independence Lose Steam*, Dow Jones Newswires (May 25, 2004) (At a recent Qwest annual shareholders meeting, CEO Richard Notebaert "highlighted Qwest's efforts in voice-over-Internet protocol, or VOIP, service. The company plans to reach 12 markets out of its 14-state service region by the end of this year, he said, without naming the markets.").

[45] *See* Verizon Communications, Form 8-K (SEC filed Nov. 19, 2003).

enterprise customers.[46] The switches and software used to provide VoIP services are quite different from those used in legacy circuit-switched networks, and Bell companies thus start out with no competitive edge in the provision of new VoIP services.

B. Price, Service Quality, and Functionality

Voice-over-IP services are now competitive with those available over traditional circuit-switched networks, and in most cases are cheaper and provide more features and functionality.

1. Economics of Providing VoIP Service

Although VoIP services are in their infancy, they may already be economically provided to the vast majority of mass-market customers, and costs are dropping rapidly. As the following analysis demonstrates, VoIP services can be economically provided not only to customers who already have a broadband connection, but also to those who do not.

VoIP for Existing Broadband Subscribers. About 24 million customers – 22 percent of U.S. households – currently subscribe to broadband service; 30 percent will by the end of 2004, and almost 40 percent by the end of 2005.[47] For these households, the *incremental* capital cost of adding VoIP service is low according the cable companies and VoIP-only service providers who offer VoIP services to these customers.

The principal incremental equipment-related capital cost of adding VoIP service for a customer who already has a broadband connection is for relatively inexpensive CPE and call-management network equipment.[48] The CPE consists of an analog-to-digital phone adapter and

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[46] *See* Verizon News Release, *Verizon Puts New National Backbone to Work with Launch of IP-Based Virtual Private Network Service* (May 10, 2004) ("Verizon has launched long-haul Internet protocol virtual private network (IP-VPN) service to support its largest business, education and government customers."); Qwest Press Release, *Baan Chooses KPNQwest for New Global IP-VPN Network* (Nov. 23, 1999) (announcing provision of IP-VPN service); BellSouth News Release, *BellSouth Launches Network VPN Services, Providing Innovative IP Networking Capabilities for Businesses* (Mar. 24, 2003) ("BellSouth announced today that it is launching BellSouth Managed Network VPN Service to provide state-of-the-art data networking capabilities to business customers."); BellSouth News Release, *BellSouth Expands Voice over IP Portfolio to Include Centrex IP with Advanced New Features for Businesses* (May 13, 2004) ("BellSouth announced today the availability of BellSouth Centrex IP Service throughout the Southeastern markets served by the company."); SBC News Release, *SBC Communications Introduces IP Product Portfolio to Serve Enterprise Customers Nationwide* (Nov. 20, 2003) (announcing introduction of new hosted VoIP product, SBC PremierSERV(SM) Hosted IP Communication Service (HIPCS)(1), that provides advanced features such as unified messaging for voice mail and e-mail, ability to forward calls to a mobile phone, remote office, or another extension, one-click calling from a phone set or PC Web browser, and conference call set-up from an Internet browser. "SBC PremierSERV HIPCS is available in select markets today, and will be available in cities nationwide by the end of 2004."); SBC News Release, *SBC Communications Delivers New Options for Businesses To Incorporate Secure IP Features into Traditional Phone Systems* (Feb. 17, 2004) ("SBC Communications Inc. today announced new business service options that allow companies to add secure IP features and services to their existing voice infrastructure.").

[47] *See* Appendix A at A-7.

[48] *See, e.g.*, F. Governali, *et al*., Goldman Sachs, *VoIP – The Enabler of Real Telecom Competition* at 27 (July 7, 2003) ("No network build is required other than placing gateways and securing PSTN interconnection in the particular location.") ("*July 2003 Goldman Sachs VoIP Report*"); Tom Rutledge, President, Cable & Communications, Cablevision, Cablevision Presentation at the Bear Stearns Media & Entertainment Conference at 46 (Mar. 9, 2004) ("*Rutledge/Cablevision Presentation*").

(optionally) a battery for backup power. The adapter encodes the analog signal from an ordinary telephone as Internet-Protocol (IP) digital packets, and dispatches them to the router and modem.[49] Cablevision puts the current incremental cost of the adapter at $23;[50] analysts see costs "dropping rapidly,"[51] and "expect a steep and continued decline . . . as the segment picks up considerable momentum."[52] A backup battery is not needed in any household that can rely on a wireless phone during a power outage, but in any event, a battery can readily be bundled with the adapter, and at least some cable operators plan to do just that.[53] According to Time Warner, battery backup currently costs about $50 per subscriber;[54] that price is projected to drop to $10-$20 within 18-24 months.[55]

Most of the customers currently signing up for VoIP service install the CPE themselves, at no cost to the provider; no major provider sees self-installation as likely to deter customer acceptance of the service.[56] Cablevision, the cable operator with the largest VoIP deployment to date, estimates that a one-time service call for the (few) customers who do not install CPE themselves costs $66.[57]

VoIP service also requires a "softswitch" or "call management server" in the network to establish, route, and terminate calls, manage call quality, provide vertical services such as caller ID and voice mail, and handle billing. Softswitches are much smaller and less expensive than ILEC circuit switches[58] – Cablevision puts the cost at $44 per customer, while Time Warner

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[49] These devices also are known as an Analog Telephone Adapter (ATA), Multimedia Terminal Adapter (MTA), or Digital Phone Adapter. The adapter can either be a stand-alone device, or its functionality can be incorporated directly in the modem. When built into the modem, it is known as an embedded MTA (E-MTA).

[50] *See Rutledge/Cablevision Presentation* at 46.

[51] *Merrill Lynch Voice over Broadband Report* at *30.

[52] *Kagan 1Q04 Cable VoIP Outlook* at 5.

[53] *See, e.g.*, Cox Communications, *Whitepaper: Voice over Internet Protocol: Ready for Prime Time* at 13 (May 2004) (Cox provides back-up battery power in Roanoke).

[54] *See* Glenn Britt, Chairman & CEO, Time Warner Cable, Presentation to UBS Media Week Conference at slide 26 (Dec. 11, 2003) ("*Britt/Time Warner Cable Presentation*").

[55] N. Gupta, *et al.*, Citigroup Smith Barney, *Cablevision Systems (CVC)* at 4 (Dec. 12, 2003).

[56] *See, e.g., UBS Vonage Story* at 3 (Vonage "does not require a truck roll to initiate service"); Transcript of AT&T Analyst Day (Feb. 25, 2004) (quoting Cathy Martine) ("[t]here is no truck roll"); D. Iler, *AT&T Paves Last Mile with VoIP*, Multichannel News at 39 (Mar. 1, 2004) (quoting Cathy Martine, SVP of Product Management, AT&T Consumer: installation takes only "about 10 minutes.").

[57] *See Rutledge/Cablevision Presentation* at 46 ("Truck Roll: $66"); *see also* V. Vittore, *Cablevision Gets Cocky*, TelephonyOnline.com (Dec. 12, 2003) ("85% of Cablevision's data customers do self-installation, and the company is planning on moving to that model for voice soon").

[58] *See, e.g., Britt/Time Warner Cable Presentation* at slide 26 ("VoIP is over 50% cheaper than traditional circuit switched architecture."); Chris Bowick, SVP, Engineering and CTO, *Distribution at Its Best: Cox Digital Telephone: The Voice of Experience*, Cox presentation at the Bear Stearns 17th Annual Media, Entertainment & Information Conference at 21 (Mar. 8, 2004) ("Expected CapEx per customer" of $590/sub for circuit switched vs. $330/sub for VoIP); C. Carr, *et al.*, CIBC World Markets, *Comcast Is Best Defense If RBOCs Take the Offensive* at 6, Exhibit 2 (Dec. 5, 2003) (estimating costs per subscriber at $568 for circuit-switched telephony, but $152-$375 for premises-powered VoIP).

estimates $50.[59] Vonage, which uses much cheaper servers,[60] puts its switch costs at just $1 to $2 per customer.[61] The cost of both options is falling steadily.[62] A VoIP provider also pays a one-time fee of about $15 to port a customer's existing telephone number to its switch, or about $1 to obtain a new telephone number.[63]

In sum, the total one-time, equipment-related capital cost for a cable operator to add VoIP service to its existing broadband network is under $200 per customer, and under $150 for customers who don't need a service call or battery backup. The costs for VoIP-only providers like Vonage, which use less expensive equipment, are below $75 per subscriber.[64] If just these equipment-related capital costs are amortized over 36 months,[65] at the current discount rate, these numbers translate into $6 and $4 per month for cable-supplied VoIP, or as little as $2 per month for Vonage-type service.

Subscriber acquisition costs are ordinarily booked as capital expenditures as well. These one-time costs are currently estimated at an average of about $125[66] – or about $3.50 per month

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[59] *See Rutledge/Cablevision Presentation* at 46 (price per port on soft switch: $44); *Britt/Time Warner Cable Presentation* at slide 26 (softswitch & gateway cost per sub: $50). *See also November 2003 In-Stat/MDR Cable Triple-Play Report* at 21, Figure 7 (estimating $45 per line for the softswitch).

[60] *See, e.g., Merrill Lynch Voice over Broadband Report* at *47 (Due to Vonage's use of the SIP protocol, "[c]all connections made are effectively on a peer to peer basis (rather than via a softswitch or conventional switch)."); D. Iler, *AT&T Paves Last Mile with VoIP*, Multichannel News at 39 (Mar. 1, 2004) ("the Vonage SIP network does not use a soft switch, like the PacketCable VoIP standard, but relies on servers placed along the network or within customer-premises equipment to perform soft-switch functions.").

[61] *See, e.g., UBS Vonage Story* at 9 ("[Vonage] has 25 regional data centers where its voice gateways, routers, and blade servers reside. The company estimated that its equipment costs per data center run about $100-200K for 100-200K customers.").

[62] *See, e.g.*, M. Paxton, InStat/MDR, *Cable Telephony Service: The Third Leg of Cable's 'Triple Play' Bundle*, Report No. IN030711MB at 35 (Nov. 2003) ("As the bigger telecommunications carriers started to deploy softswitches, they also started to demand that the products function more like Class 5 switches in terms of scalability and functionality, but be less expensive and more capable . . . . To a certain extent, the industry's leading softswitch vendors are meeting these demands.").

[63] *See* Q. Hasan, Utendahl, *Vonage-Telecom Services: VoIP* at 7 (Nov. 4, 2003).

[64] *Cf. Merrill Lynch, Everything over IP* at 16 ("[Vonage] Founder Jeffrey Citron confirmed that our cost estimate of US $50 per new subscriber (excluding marketing expenses) was 'close.'").

[65] *See Merrill Lynch Voice over Broadband Report* at *28, Table 5 (assuming 2.5% churn for VoIP); *see also, e.g.*, D. Barden, *et al.*, Banc of America Securities, *Straight Talk on VoIP* at 2 (Apr. 15, 2004) (Vonage's "churn is about 2.4%"); *UBS Vonage Story* at 7 ("customers that have been with Vonage for six months have a churn rate of 2.1%. This drops to 1.8% for customers that are over one-year old. Over a 2-3 year cycle Vonage expects to see blended churn come down to about 1.5%."); Frost & Sullivan, *North America IP Cable Telephony Market; Is Cable Able?*, Market Insight Report #6917-61 at 7 (Jan. 2004) ("Bundling of services works – offering two services reduces churn from a single service, and offering three reduces churn even further.").

[66] *Merrill Lynch Voice over Broadband Report* at *28, Table 5 (estimating "marketing and installation expenses of between $75 and $125" for cable IP telephony); D. Barden, *et al.*, Banc of America Securities, *Straight Talk on VoIP* at 2 (Apr. 15, 2004) (reporting that Vonage's subscriber acquisition cost is "only $170, and declining"); S. Donohue, *Ops Call on Vonage*, Multichannel News at 42 (Mar. 8, 2004) (Vonage vice president of MSO and cable sales Phil Giordano estimates subscriber acquisition costs total about $130 per subscriber); J. Enck, Daiwa Institute of Research, *Eurotelcorama* at 4, 7 (Nov. 3, 2003) ("the estimated cost to build one center (routers, voice gateway and servers, along with associated admin expenses) is under $200,000 per site." Vonage's "average cost of customer acquisition (CAC) has diminished substantially since the service launched in April 2002, and

when amortized using the same methodology. Factoring in these costs brings the total incremental capital costs up to between $7-$9 per month for cable-supplied VoIP, or as little as $5 per month for Vonage-type service. In other words, based on these providers' own cost estimates, the incremental cost to add VoIP for a customer that already has a broadband connection is on the order of $5-$9 per month.[67]

Current prices and profit margins reflect the low costs of providing VoIP services. VoIP providers are now offering service at considerable discounts from circuit-switched service. As Table 3 demonstrates, VoIP service is typically priced 30-40 percent or more below comparable circuit-switched offerings.[68] In New York, for example, AT&T offers VoIP service for $40 per month, compared to $55 per month for its comparable UNE-P-based offering. *See* Table 3; *see also* Appendix B (describing VoIP offerings in major markets). Moreover, AT&T and other VoIP providers also are now offering significant promotional discounts to attract new subscribers.[69] Vonage just lowered the price of its most popular package from $35 to $30.[70]

Even at these low rates, VoIP providers are reporting large profit margins. Cablevision estimates its margins at 40-45 percent, with a capital payback of 10 months.[71] Vonage reports margins of 70 percent, headed to 80 percent.[72] Kagan estimates that cable operators will have

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management see the CAC moving down further to a sustainable level of approximately $100 over the next two years."); Q4 2003 Earthlink Conference Call, FD (Fair Disclosure) Wire (Jan. 27, 2004) (Earthlink, which offers VoIP through a partnership with Vonage, announced "blended subscriber acquisition cost in the current quarter was $126 per gross organic subscriber addition.").

[67] *Cf. Cable and Telecom Pinning Their Hopes on VoIP*, Comm. Daily at 5 (Feb. 11, 2004) ("Precursor's Scott Cleland said his analysts calculated that VoIP cost 1/50th the capital expenditures outlays of traditional service."); A. Wahlman, *et al*., Needham & Company, *The Dumb Pipe Is the Only Money Pipe* at 3 (Dec. 15, 2003) (Costs of voice over broadband "are 1/1000th or less of what it costs the Bells to build their circuit-switched local access infrastructure in the United States."); J. Hodulik, *et al*., UBS, *First Quarter 2004 Preview: The Calm Before the Storm* at 5 (Apr. 13, 2004) ("IP-based voice infrastructure (servers, routers, softswitches, back-up) costs a fraction of the cost of traditional TDM infrastructure.").

[68] *See generally Bernstein Flat-Rate Pricing Note* at 3 ("By entering with pricing that is 30%+ below prevailing RBOC rates, cable operators are setting benchmarks that will be difficult for incumbent telcos to match.").

[69] *See, e.g*., AT&T, *CallVantage*, http://www.usa.att.com/callvantage/home.jsp? (AT&T offers consumers that sign up before June 30 a $20 discount each month for the first six months); VoicePulse, *Plans*, http://www.voicepulse.com/plans/default.aspx (VoicePulse offers a savings of $120 for the first year with a one-year contract); *This Just In*; *Circuit City Dials Vonage for VoIP Phone Service*, Multichannel News (Mar. 8, 2004) (Circuit City offers customers two months of free service and activation when they purchase starter kits and sign up for Vonage service).

[70] Vonage Press Release, *Vonage Drops Residential Premium Unlimited Plan by $5 to $29.99* (May 17, 2004).

[71] *See, e.g*., *Rutledge/Cablevision Presentation* at 47.

[72] *See* D. Barden, *et al*., Banc of America Securities, *Straight Talk on VoIP* at 2, 5 (Apr. 15, 2004).

cash flow margins of 40 percent for their VoIP services.[73] Wall Street analysts are making similar projections.[74]

Table 3. VoIP vs. Circuit-Switched Telephony: Comparison of Bundled Local/Long-Distance Service Offerings

	Circuit-Switched			VoIP				
	BOC	**Cable**	**UNE-P**	**AT&T**	**Vonage**	**Other***	**Cable**	**Wireless****
New York, NY	$60 Verizon		$55 AT&T	$40	$30	$20	$35 Cablevision	$40
Los Angeles, CA	$49 SBC	$49 Comcast	$40 MCI	$40	$30	$20		$40
Dallas, TX	$49 SBC	$50 Comcast	$49 AT&T	$40	$30	$20		$40
Houston, TX	$49 SBC		$49 AT&T	$40	$30	$20		$40
Boston, MA	$55 Verizon	$49 Comcast	$50 AT&T	$40	$30	$20		$40
San Francisco, CA	$49 SBC	$50 Comcast	$40 MCI	$40	$30	$20		$40
Phoenix, AZ	$46 Qwest	$45 Cox	$44 AT&T	$40	$30	$20		$40
Seattle, WA	$46 Qwest	$50 Comcast	$44 AT&T	$40	$30	$20		$40
San Diego, CA	$49 SBC	$49 Cox	$40 MCI	$40	$30	$20		$40
Denver, CO	$46 Qwest	$50 Comcast	$50 MCI	$40	$30	$20		$40
Kansas City, MO	$50 SBC		$49 AT&T		$30	$20	$40 Time Warner	$40
San Jose, CA	$49 SBC		$40 MCI	$40	$30	$20		$40
Charlotte, NC	$55 BellSouth		$55 AT&T		$30	$20	$40 Time Warner	$45 ALLTEL
Bridgeport, CT	$55 SBC		$56 MCI		$30	$20	$35 Cablevision	$40
Raleigh, NC	$55 BellSouth		$55 AT&T		$30	$20	$40 Time Warner	$45 ALLTEL
Portland, ME	$55 Verizon		$55 AT&T			$30 voiceglo	$40 Time Warner	$40
Roanoke, VA	$50 Verizon		$50 AT&T		$30	$20	$50 Cox	$40

*Packet8, unless otherwise noted. **T-Mobile, unless otherwise noted.

Qwest pricing assumes a maximum expenditure of $20 for long-distance calls. Time Warner pricing assumes subscription to high-speed Internet and digital cable services.

Sources: *See* Appendix D.

[73] *See Kagan 1Q04 Cable VoIP Outlook* at 9.

[74] *See, e.g., Merrill Lynch, Everything Over IP* at 17 ("We believe that margins on VoIP service could be very high (depending on where pricing and regulation end up) . . . . For cable operators, we believe that incremental service margins on VoIP can be comparable to HSD service margins (i.e., 60%-plus at scale, assuming current pricing) and significantly better than cable TV margins.").

VoIP for Most Mass-Market Customers. For customers who do not already subscribe to broadband service, it is necessary to factor the cost of that service into the analysis. It is also necessary to take into account the fact that the typical U.S. household already purchases, in addition to basic local voice service, some mix of vertical services, long-distance service, second lines, and dial-up Internet access, all of which can be displaced with a VoIP-equipped broadband connection. As demonstrated below, the price for a broadband connection and VoIP service already is comparable to the market price for circuit switched bundled service offerings.

The average retail price of stand-alone broadband service (*i.e.*, not bundled with another service, but including full Internet access) is approximately $46 per month.[75] For the 67 percent of U.S. households that subscribe to cable video service,[76] the average price is $43.[77] The average price is further lowered by the promotional offerings that broadband providers now routinely offer (*see* Appendix A at Table 4). Credit Suisse First Boston reports that the average user of cable modem service generates only $39 per month of additional revenue for the cable operator.[78]

According to the most recent data available from the FCC, by contrast, the average household spends $48 per month for local and long distance services – $36 per month for local, and $12 per month for long distance.[79] This total appears to include contributions for the SLC and Federal Universal Service Fee; the average amount spent on vertical services, second lines, access charges, and intraLATA toll services; and taxes. Consistent with the FCC's reported average, most wireline providers now offer bundles of service for approximately $55-60 (including the $6 SLC), which include unlimited local and long distance service plus a number of vertical features. *See* Table 3.

[75] *See* J. Atkin, RBC Capital Markets, *Cable/RBOC/DBS: Telephony, Data, and Video Pricing Comparisons*, at Exhibit 2 (Feb. 3, 2004) (estimating $50 for cable broadband and $42 for DSL).

[76] *See* NCTA, *Industry Overview: Statistics & Resources*, http://www.ncta.com/Docs/PageContent.cfm?pageID=86; J. Halpern, *et al.*, Bernstein Research Call, *Broadband Update: DSL Share Reaches 40% of Net Adds in 4Q . . .Overall Growth Remains Robust* at Exhibit 1 (Mar. 10, 2004)

[77] *Merrill Lynch, Everything over IP* at Table 2.

[78] *See* L. Warner, *et al.*, Credit Suisse First Boston, *The Broadband Battle: DSL Prepares To Overtake Cable Net Add Share* at Exhibit 11 (Apr. 20, 2004) ("*Credit Suisse, The Broadband Battle*").

[79] Ind. Anal. & Tech. Div., Wireline Competition Bureau, FCC, *Trends in Telephone Service* at Table 3.2 (May 2004); *see also* A. Quinton, *et al.*, Merrill Lynch, *The Telecommunicator: Telecom Act Seven Years On – The UNE Shock Wave Belatedly Reverberates Around the RBOCs – and How!* at 17 & Table 2 (Sept. 23, 2002) (estimating average expenditures of $12 for InterLATA toll, $2 for intraLATA toll, $2 for access charges, $8.50 for vertical services).

These totals do not, however, include the $22 per month that some 36 million U.S. households[80] (32 percent) pay for dial-up Internet access services.[81] Some part of that is for proprietary content, but the lowest-cost, barebones ISP service still runs about $10 per month.[82]

An analysis based on these current prices establishes that the existing prices for a VoIP equipped broadband connection are comparable to a circuit switched bundled service offering. *See* Table 4. A broadband connection equipped with VoIP service now sells for between $72 and $90 per month – $42-$50 for the broadband service, plus $30-$40 for VoIP service that includes unlimited local and long distance services plus vertical features. *See* Table 3.[83] Comparable narrowband voice bundles are priced at between $60 and $82 per month – $50-$60 for the voice component (including the $6 SLC), *see* Table 3, plus $10-$22 per month for dial-up Internet access.[84] But taxes are considerably higher for narrowband service than for VoIP – a difference of at least $5.45 per month, according to Goldman Sachs.[85] Taking into account these additional charges, the price of VoIP-equipped broadband is comparable to and often lower than the price of conventional service, and in no case more than a few dollars higher, even before taking into account the promotional discounts that are widely offered for both broadband and VoIP service. One recent study concluded that the average narrowband household could capture a net savings of $8 per month by subscribing to broadband and migrating to VoIP service.[86]

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[80] *See* R. Bilotti, *et al*., Morgan Stanley, *Broadband Update – Tiering Strategies* at Exhibit 10 (Apr. 12, 2004) (excluding dial-up subscribers that also use broadband).

[81] *See, e.g*., MSN, EarthLink, and SBC Yahoo! charge $21.95 per month for dial-up service. MSN, *MSN 9 Dial-Up*, http://join.msn.com/?page=dept/dialup&pgmarket=en-us&ST=1&xAPID=1983&DI=1402; Earthlink, *Earthlink Dial-Up Internet Access*, http://www.earthlink.net/home/dial/; SBC Yahoo! Dial, *SBC Yahoo! Dial: Getting Started*, http://promo.sbcglobal.net/sbcyahoo_myhome/. AOL charges $23.90 for dial-up service. AOL, *Price Plans*, http://www.aol.com/price_plans/index.adp. United Online (which includes NetZero, Juno, and BlueLight) charges $9.95, with $14.95 for high-speed dial-up service. United Online, *United Online Home*, http://www.unitedonline.net/.

[82] Netscape, *Netscape FAQ*, http://www.getnetscape.com/more_info.adp?promo=NS_2_11_8_2003_12_1; PeoplePC, *PeoplePC Online Details*, http://www.peoplepc.com/connect/ppc_online.asp; *March 2004 Bernstein Broadband Update* at Exhibit 5.

[83] *See, e.g*., AT&T, *CallVantage*, http://www.usa.att.com/callvantage/home.jsp? (AT&T offers consumers that sign up before June 30 a $20 discount each month for the first six months); VoicePulse, *Plans & Pricing: No Hidden Fees*, http://www.voicepulse.com/plans/fees.aspx (VoicePulse offers a savings of $120 for the first year with a one-year contract).

[84] *Cf.* J. Barrett, *et al*., Parks Associates, *VoIP: At Last a Killer App?* at Figure 2-2 (Jan. 2004) (estimating that average telecommunications expenditure by U.S. household that subscribes to narrowband Internet access is $94 per month).

[85] *See Goldman Sachs Cable Telephony/VoIP Analysis* at 24 (estimating "avoided connection fees for VoIP providers" at $5.45, which includes federal USF contribution, LNP, E911, state telecommunications relay, federal excise tax, and utility user tax); *see UBS Vonage Story* at 3 (voice over broadband providers benefit from having "much lower taxes," whereas "regulatory fees and other taxes [] typically increase the price for the Bells by $10-$15."); Vonage, *Top Questions*, http://www.vonage.com/learn_center.php (Vonage subscribers incur no more than $2.55 to cover the Federal excise tax and regulatory recovery fee; customers in New Jersey are also charged a state sales tax); Optimum Voice, http://www.optimumvoice.com/index.jhtml (Cablevision's VoIP service is priced at "$34.95, all inclusive").

[86] *Parks Associates: VoIP Key to Boosting Broadband Adoption*, Business Wire (Feb. 10, 2004).

Table 4. Price Comparison of Circuit-Switched and VoIP-Based Service					
Service	**Circuit-Switched**		**VoIP**		
	BOC	**Cable**	**Cable**	**Vonage**	**Other**
Voice*	$50 - $60	$50	$35 - $40	$30	$30 - $40
Internet Access	$10 - $22		$42	$42 - $50	
Taxes/Fees/Surcharges*	$5.50 - $13+		$0 - $5	$2 - $4	$0 - $5
Total	**$62 - $95**	**$65 - $85**	**$76 - $87**	**$74 - $84**	**$62 - $95**
*Assumes unlimited local, local toll, and long-distance calling. *See* Table 3 & Appendix B. *Sources: See* Appendix D.					

The foregoing comparison is conservative because it uses the average retail *price* of both VoIP service and the underlying broadband service. As demonstrated above, however, the average incremental costs of providing VoIP service for a cable operator or a VoIP-only provider are significantly below these current retail prices. An analysis based on these costs, rather than current prices, proves even more conclusively that it is economical to provide VoIP service to most households today. The average household currently spends from $58 to $70 per month on voice and dial-up Internet service together. For most households, this is more than enough to cover the $46 average price of broadband service and recover the cost of providing VoIP service. Moreover, as demonstrated above and in Appendix A, the cost of providing VoIP service is dropping quickly.[87] And VoIP providers already are testing alternative, lower pricing plans. For example, in Roanoke, Va., Cox now offers "Basic Line" – barebones, local, VoIP service – for $13.59 per month to non-broadband subscribers; or $12.20 for customers that subscribe to certain video service packages.[88]

2. Quality/Functionality

Given that VoIP service costs considerably less, many consumers would likely substitute VoIP for circuit-switched service even if there was some difference in quality or functionality.[89] But as industry analysts, competitive carriers, and equipment vendors now uniformly agree, VoIP provides comparable or superior quality and functionality to conventional circuit-switched service. *See* Table 5.[90]

[87] *See, e.g.*, A. Shah et al., Morgan Stanley, *Voice-over-IP Conference Highlights* at 3 (May 20, 2004) ("Given the very high margins on VoIP, aggressive promotions can be supported without increasing deficits.").

[88] Cox, *Digital Telephone, Roanoke, Pricing*, http://www.cox.com/roanoke/telephone/pricing.asp.

[89] *See, e.g.*, J. Hodulik, *et al.*, UBS, *Gallup Survey Highlights VoIP Potential* at 1 (Apr. 8, 2004) ("Roughly 34% of respondents that do not have VoIP would switch from their existing landline service to VoIP for cost savings. Respondents appear more willing to sacrifice quality than reliability."); J. Halpern, *et al.*, Bernstein Research Call, *SBC & BLS: Cutting Estimates on Cingular-AWE Deal Dilution* at 6 (Feb. 25, 2004) ("Our previous research has shown that consumers exhibit a high willingness to switch telephony providers, even with a sacrifice in quality, provided they are offered a significant discount.").

[90] *See also VoIP NPRM* ¶ 11 ("According to many industry watchers, [VoIP] technology has now overcome prior quality and reliability concerns.").

Table 5. Universal Agreement That VoIP Quality Is Comparable to or Better Than PSTN	
VoIP Providers	
AT&T	"Works just like your home phone – only better."
Cablevision	"[C]risp, clear digital voice service all the time."
Cox	"[E]xcellent voice quality that meets today's telecommunication standards. … crystal-clear connections."
Time Warner	"[Q]uality will be certainly equal to the RBOC quality. " "Feels just like conventional telephone service."
Vonage	"98% of our customers experience quality of the call that's equivalent to the quality they get on their POTS service."
Investment Analysts	
Bernstein	"[T]he sound quality for VoIP via cable is likely to be indistinguishable from that of a traditional circuit switched RBOC voice call."
Goldman Sachs	"VoIP on a managed network can reach or even exceed the quality level of the PSTN."
Merrill Lynch	"It now appears possible to deliver high-quality phone service at very low cost via existing broadband connections."
Equipment Suppliers	
Cisco	"[R]eliability, and voice quality of the global switched telephone network."
Nortel	"PSTN-equivalent voice quality and service richness"
Motorola	"[M]eet[s] the reliability and availability demands of primary-line voice applications."
Sources: *See* Appendix D.	

The first generation of VoIP services depended on first-come, first-served switching and routing of packets.[91] When network traffic was heavy, voice packets waited in line along with data; short delays that were of little consequence for e-mail or Web browsing could seriously degrade the quality of a two-way voice conversation. Most of these early services also required customers to make their voice-over-Internet phone calls through microphones and speakers connected to their computers, or to deploy cumbersome CPE.[92]

Today, however, vendors are manufacturing equipment that incorporates quality-of-service ("QoS") standards and protocols, and other functionality to place VoIP on par with traditional telephone service.[93] Analog-to-digital adapters built to the PacketCable standard that most cable operators now implement were certified in December 2002;[94] PacketCable call

[91] *See*, *e.g.*, K. Werbach, Office of Plans and Policy, FCC, *Digital Tornado: the Internet and Telecommunications* Policy, OPP Working Paper No. 29 at 36 (Mar. 1997) ("These services work by converting voices into data which can be compressed an split into packets, which are sent over the Internet like any other packets and reassembled as audio output on the . . . receiving end.").

[92] *See*, *e.g.*, *Federal-State Joint Board on Universal Service*, Report to Congress, 13 FCC Rcd 11501, ¶¶ 86-90 (1998); *July 2003 Goldman Sachs VoIP Report* at 4.

[93] *See*, *e.g.*, Cable Datacom News, *Cable IP Telephony Primer* (Jan. 15, 2003); Motorola, *Using PacketCable QoS To Deliver Carrier-Class Telephony Services* at 4 (Nov. 11, 2003) ("Platforms that are graded as PacketCable 1.0 qualified by CableLabs technical staff have passed rigid interoperability and certification testing, and they allow operators to build telephony infrastructure that enables end-to-end QoS control.").

[94] *See* CableLabs Press Release, *PacketCable Marks Cable Milestone with Certification of First VoIP Devices* (Dec. 20, 2002); *see also* CableLabs, *PacketCable Certified E-MTA Products* (current as of Nov. 14, 2003), http://www.packetcable.com/ downloads/Certified_Products.pdf; CableLabs, *PacketCable Qualified Products* (since

management servers were certified in April 2003; and IP-to-PSTN gateways were certified in July 2003.[95] Analog-to-digital adapters that rely on the Session Initiation Protocol ("SIP") and other industry standards[96] as alternatives to PacketCable – were introduced in March 2002.[97] More sophisticated models that further improved service quality were introduced in December 2003.[98]

Analysts now agree that VoIP routed over private networks fully matches the sound quality of conventional circuit-switched voice[99] – and most broadband service providers have in fact either partnered with backbone providers,[100] or have deployed their own private IP backbones.[101] Even when voice over broadband is routed over the public Internet, moreover, service quality is comparable to, or better, than typical wireless service – fully adequate for price-sensitive customers, or for those who ascribe more value to the superior features that end-to-end digital service can offer.[102]

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the first PacketCable qualified CMTSs were approved in December 2002, 23 devices have been approved through the PacketCable certification/qualification process).

[95] *See* Cable Labs Press Release, *Two CMS and Additional PacketCable Devices Get Certified/Qualified in Wave 25* (Apr. 11, 2003); CableLabs Press Release, *PacketCable Media Gateway Among Three New Certified/Qualified Devices* (July 25, 2003).

[96] *See, e.g.*, *Merrill Lynch Voice over Broadband Report* at *2 ("We are now seeing 'virtual' phone-to-phone services that use the public Internet, thanks to recent innovations, including SIP ("Session Internet Protocol") and low cost phone adapters."); *July 2003 Goldman Sachs VoIP Report* at 20 ("SIP is the emerging protocol of choice for the VoIP service providers.").

[97] *See* Vonage Press Release, *Cisco Introduces New SIP-Enabled Voice over IP Solutions* (Mar. 11, 2002) (introducing, among other VoIP products, the Cisco ATA 186, an analog telephony adapter.)

[98] *See, e.g.*, Motorola Press Release, *Motorola Broadband and Vonage Team to Simplify Broadband Telephony for Consumers and Small Businesses* (Dec. 8, 2003) ("Unique product features of the VT1000v series voice terminal that improve the consumer experience for broadband telephone service are its embedded routing functionality and voice traffic prioritization.").

[99] *See, e.g.*, *Merrill Lynch Voice over Broadband Report* at *17 ("We have been testing the Vonage service for some time. In our experience, voice quality is good. Consumer Reports reached the same conclusion in testing reported in the July 2003 issue."); *July 2003 Goldman Sachs VoIP Report* at 15 ("A study conducted by Columbia University Computer Science Associate Professor Henning Schulzrinne concluded that when the Internet is used as the transport network, net VoIP service availability is approximately 98%. . . . initial call failure probability is 0.47% on average, and call abortion (caller hangs up after an interruption) probability is about 1.53% on average").

[100] *See, e.g.*, M. Stump, *MSOs, AT&T Set Table for VoIP Rollouts*, Multichannel News (Dec. 15, 2003) (Time Warner Cable calls will travel from the Time Warner media gateway to either the MCI or Sprint network).

[101] *See, e.g.*, Cox Communications, *White Paper: Voice over Internet Protocol: Ready for Prime Time* at 3 (May 2004) ("The Cox advantage, in terms of architecture, rests in the fact that it owns and operates its own end-to-end network infrastructure, including a nationwide OC-48 IP backbone network"); F. Governali, *et al.*, Goldman Sachs, *T (IL/C): Analyst Mtg Provides No Arguments for Getting More Positive on Stock* at 2 (Feb. 26, 2004) (AT&T CallVantage service "looks much like what Vonage offers in the market today, except that it will be a managed service, riding on the AT&T network").

[102] *See, e.g.*, *Merrill Lynch Voice over Broadband Report* at *2 ("We believe that a paradigm shift is under way in customer and operator attitudes toward phone service. We suspect that traditional 'telco reliability" . . . matters less than it did – while price, convenience and service matter more"); *id.* at *12 (noting "changing customer preferences with respect to phone service, which in our view lessen the value of 'five nines' telco reliability and increase the value of new services and functionality."); J. Hodulik, *et al.*, UBS, *AT&T Corp.: Unveiling Consumer*

VoIP services now readily match conventional circuit-switched service in overall functionality as well – backup power,[103] total home wiring,[104] and number portability.[105] *See* Table 6. The addition of such "primary line" functions, AT&T states, is operationally straightforward and requires "less than 10% additional upgrade and rebuild capital."[106] The one primary-line feature that not all VoIP providers have implemented is Enhanced 911 capability. A number of VoIP providers have accordingly adopted alternative 911 capabilities[107] that analysts believe many consumers will find adequate.[108] As discussed further below, VoIP already supports a number of other calling features far superior to those offered to mass-market users of conventional service. *See* Table 6.[109]

VoIP at 2 (Dec. 11, 2003) ("We do not see voice quality as an issue, however, as consumers have increasingly become conditioned to accept lower quality through increased use of wireless calling.").

[103] As described above, battery back-up power can now be provided as relatively inexpensive CPE. In any case, as Goldman Sachs notes, "Powering . . . appears to be an issue declining in importance as customers rely more and more on their wireless phones as an 'emergency backup line.' . . . In essence, it is arguable that powering is a 'legacy requirement,' and the customers will drive migration away from the limitations that powering imposes." *July 2003 Goldman Sachs VoIP Report* at 5-6.

[104] *See, e.g.*, J. Halpern, *et al.*, Bernstein Research, *U.S. Telecom and Cable: Faster Rollout of Cable Telephony Means More Risk for RBOCs, Faster Growth for Cable* at 4 (Jan. 9, 2004) ("Time Warner's offering is already more robust, with . . . total home wiring (i.e., all existing phone jacks)"); Cox, *Digital Telephone: Frequently Asked Questions*, http://www.cox.com/roanoke/telephone/faqs.asp (Cox's service will "deliver dialtone to each of you[r] phone jacks."); James Dolan, President & CEO, Cablevision, Presentation to UBS Media Week Conference at 38 (Dec. 11, 2003) ("Whole House Wiring Available . . . in 2004.").

[105] *See, e.g.*, *Bernstein Cable Telephony Report* at 5 (Time Warner's initial cable IP telephony offering included LNP); Vonage, *Features: Keep Your Phone Number*, http://www.vonage.com/features_lnp.php?refer_id=27400178 (A customer can keep their "existing phone number."); James Dolan, President & CEO, Cablevision, Presentation to UBS Media Week Conference at 38 (Dec. 11, 2003) (LNP will "[c]ome in 2004").

[106] Greg Braden, CTO and EVP, Broadband Services, AT&T Broadband, Investor Presentation at 35 (July 25, 2001).

[107] *See, e.g.*, A. Quinton, *et al.*, Merrill Lynch, *VoIP Update: Notes from the FCC Forum on VoIP* at 3 (Dec. 1, 2003) (Vonage "offer[s] a form of 911 service"); Net2Phone Presentation at 13, *FCC VoIP Forum* (Dec. 1, 2003) (Net2Phone "has a 911 solution in place today"); Covad Press Release, *Covad Announces Voice Over Internet Protocol (VoIP) Deployment Plans* (Feb. 9, 2004) (Covad plans to offer VoIP "[with] emergency 911 . . . [as a] standard feature[]."); AT&T Presentation at 20, *FCC VoIP Forum* (Dec. 2003) ("The National Emergency Number Association (NENA) and VoIP leaders, including AT&T Consumer, reached an agreement on key principles for providing 911 services to VoIP users."); Letter from G. Carberry, Level 3 Communications to L. Rickard, CT DPUC, File # 2729.79443 (Jan. 21, 2004) (Level 3 "intends to provide 911 emergency service access to its Connecticut customers in the short term and in the long term").

[108] *See, e.g.*, A. Quinton, *et al.*, Merrill Lynch, *US VoIP Update: Competitive, Regulatory and Other Issues* at 8 (Nov. 25, 2003) ("Vonage's simple 911 solution, where the user specifies his location such that a call from his "number" reaches the right PSAP (Public Service Answering Point) might well be adequate.").

[109] *See generally* A. Quinton, *et al.*, Merrill Lynch, *US VoIP Update: Competitive, Regulatory, and Other Issues* at 4 (Nov. 25, 2003) ("Against traditional telecom, VoIP represents a classic disruptive force – cheaper, lower quality perhaps but able to offer services the existing provider can not match."); J. Halpern, *et al.*, Bernstein Research, *Telecom and Cable: VoIP Will Force Regulatory Lines to be Redrawn* at 3 (Nov. 13, 2003) ("[T]he inherent flexibility associated with a software-defined service suggests that feature/functionality of VoIP is likely to eventually significantly outstrip that of the traditional circuit-switched phone network."); *Merrill Lynch Voice over Broadband Report* at *18 ("VoIP enables certain features that are not easily replicated by conventional carriers.").

Consistent with the fact that VoIP now matches the quality and functionality of traditional service, VoIP providers now market their service as a primary-line replacement,[110] and the majority of consumers are now purchasing the service as such. Some 86 percent of Time Warner's Digital Phone subscribers reportedly bring their old phone number with them when they sign up,[111] as do 50 percent of Vonage customers.[112] Cablevision still markets its service as a second-line replacement, but reports that more than a third of its customers use the existing service as primary line service anyway.[113]

[110] *See, e.g.*, AT&T, *AT&T CallVantage Features*, http://www.usa.att.com/callvantage/what/features.jsp ("With AT&T CallVantage, we're taking your home phone to an entirely new level. One that completely outperforms what traditional telephones can do and revolutionizes how you stay connected."); Vonage, *About Us*, http://www.vonage.com/corporate/aboutus_index.php ("Vonage offers an innovative, feature-rich and cost effective alternative to traditional telephony services."); J. Atkin, *et al.*, RBC Capital Markets, *Cable Update: Telephony and Video/Data/Voice Pricing Developments* at 1 (Mar. 16, 2004) ("[W]e have increasing confidence that cable VoIP deployments will offer stiff competition to RBOC telephony as most MSOs plan to market a primary-line telephony product with the intention of displacing the local telephone company (and having customers port their existing numbers).").

[111] *See Britt/Time Warner Cable Presentation*; *see also* C. Moffett, *et al.*, Bernstein Research Call, *Cable and Telecom: Bernstein Study Finds Consumers Ready and Willing To Switch to Cable Telephony* at 4 (Dec. 9, 2003) ("80-90% of Time Warner's customers in Portland are opting to keep their existing number.").

[112] *See UBS Vonage Story* at 5; A. Quinton, *et al.*, Merrill Lynch, *US VoIP Update: Competitive, Regulatory, and Other Issues* at 9 (Nov. 25, 2003).

[113] *See* C. Moffett, *et al.*, Bernstein Research Call, *Cable and Telecom: Bernstein Study Finds Consumers Ready and Willing To Switch to Cable Telephony* at 4 (Dec. 9, 2003) (Cablevision is currently marketing its service as a second line for regulatory reasons); G. Campbell, *et al.*, Merrill Lynch, *3Q03 Broadband Update: The Latest on Broadband Data and VoIP Services in the U.S. and Canada* at 15 (Nov. 3, 2003) (at least 37 percent of Cablevision's subscribers have disconnected all other landline service) ("*Merrill Lynch 3Q03 Broadband Update*") .

Table 6. Feature Comparison – VoIP vs. PSTN						
Features	**RBOC PSTN**	**Cable-vision**	**Time Warner**	**Cox VoIP**	**AT&T VoIP**	**Vonage**
Primary Line Features						
911	✓	✓	✓	✓	✓	✓
E911	✓	✓	✓	✓		
Powering	✓	✓*		✓		
LNP	✓	✓*	✓	✓	✓	✓
Home Wiring	✓	✓	✓	✓		
Traditional Vertical Services on PSTN						
Caller ID	✓	✓	✓	✓	✓	✓
Call Forwarding	✓	✓		✓	✓	✓
Call Waiting	✓	✓	✓	✓	✓	✓
Call Waiting ID	✓		✓	✓	✓	✓
3-way Calling	✓	✓		✓	✓	✓
Voicemail	✓	✓	✓*	✓	✓	✓
Call Return	✓	✓		✓		✓
Repeat Dialing	✓			✓		✓
Caller ID Block	✓			✓		✓
Priority Ring				✓		
Choice of Long-Distance Providers	✓			✓		
Second Line	✓					✓
Advanced Features						
Tel. Number Portability					✓	✓
Area Code Selection						✓
Toll-Free Numbers ($4.99/month)						✓
Advanced 411						✓
Online Real-Time Billing						✓
Virtual Phone Numbers						✓
Personal Conferencing					✓	
Call Logs					✓	
Online Call Management		✓*			✓	
Locate Me Service					✓	
Advanced Voicemail		✓			✓	
*Scheduled to be implemented in 2004. *Sources*: *See* Appendix D.						

Finally, VoIP already offers features and functionality that are superior to those available on circuit-switched networks, and VoIP is expected to be able to offer an even greater array of new features and functionality in the future.[114] The IP platform is widely viewed as much more

[114] *See generally Merrill Lynch, Everything Over IP* at 19 ("VoIP features evolution [is] likely to outstrip conventional phone service."); D. Barden, *et al*., Banc of America Securities, *Straight Talk on VoIP* at 3 (Apr. 15, 2004) ("The vast majority of the presentations from all the operators [at the VoIP seminar] focused on the enhanced

flexible than the circuit-switched platform, because it enables new features to be developed and deployed much more quickly and efficiently.[115] Vonage has apparently "been deploying a new service feature every six weeks, on average (which it can achieve with a software push to the adapter). This compares to as much as a year or more in the traditional incumbent environment."[116]

VoIP providers are already promoting the advanced features of their service. AT&T's CallVantage offers "multiple advanced features such as call logs, unified messaging, settable do-not-disturb periods, 'locate me' functionality, and virtual conference call functionality."[117] AT&T recently added new capabilities – "the first in a long services of innovations the company plans to add" – which include an online, searchable phone book with storage for up to 250 names and phone numbers, and the ability to send alerts and to forward voicemail messages to multiple e-mail recipients.[118] Vonage enables customers to "alter their phone line's settings (call forwarding, call waiting, etc.), track real-time usage, or check voice mail all through the Internet."[119] Packet8 "offer[s] a videophone service and hardware."[120] VoicePulse offers an "'Open Access' plan, which allows subscribers to use the service via any appropriately configured device such as a PDA, laptop, or IP phone."[121]

Analysts expect an even wider array of features to be introduced in the future, as VoIP services become more integrated with data and video.[122] Some of the anticipated features and functionality include: Web-based customization that enables the user to set special ring tones for different callers, instant line provisioning, or customized call-blocking; more advanced unified messaging and message management capabilities; and video-conferencing.[123] Service

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capabilities of VoIP, the rate at which it enables innovation and the power it gives consumers to control their experience."); J. Hodulik, *et al*., UBS, *AT&T Corp.: Unveiling Consumer VoIP* at 3 (Dec. 11, 2003) ("IP provides a platform that, over time, should deliver a richer set of calling features than the traditional PSTN.").

[115] *See, e.g*., J. Halpern, Bernstein Research, *U.S. Telecom and Cable: Faster Rollout of Cable Telephony Means More Risk for RBOCs, Faster Growth for Cable* at 4 (Jan. 9, 2004) (noting the "flexibility of IP-based telephony platforms"); *Merrill Lynch Voice over Broadband Report* at *7, *37 ("VoIP has inherent advantages in its greenfield all-IP architecture and voice/data/ multimedia integration." "It is not difficult to imagine that before long, VoIP will have a clear advantage over conventional telephony in terms of features, vendor support and R&D spending.").

[116] D. Barden, *et al*., Banc of America Securities, *Straight Talk on VoIP* at 3 (Apr. 15, 2004).

[117] L. Warner, *et al*., Credit Suisse First Boston, *AT&T Launches VoIP in New Jersey: Competition for Voice Customers Accelerating* at 1 (Mar. 29, 2004).

[118] AT&T News Release, *AT&T Adds New Features and Enhances AT&T CallVantage Service* (May 27, 2004).

[119] *Parks Associates Residential VoIP Analysis* at 4-3.

[120] *Id.* at 4-4.

[121] *Id*. at 4-6.

[122] *See, e.g*., *Merrill Lynch, Everything Over IP* at 23 ("[W]e believe that service integration will occur, and that it will be more powerful than simple bundling. By service integration, we mean services that work together in a way that creates value for the customer, rather than simply being assembled as a package for marketing purposes.").

[123] J. Halpern, Bernstein Research, *U.S. Telecom and Cable: Faster Rollout of Cable Telephony Means More Risk for RBOCs, Faster Growth for Cable* at 4 (Jan. 9, 2004); *Merrill Lynch Voice over Broadband Report* at *7.

integration will also allow "message manager" services that identify incoming phone calls on the customer's TV screen.[124]

II. Other IP-Enabled Services

A number of other IP-enabled services promise to exert competitive pressure on traditional networks and services. New video-over-IP services could provide much-needed competition to cable companies. IP-based services are also being successfully marketed to enterprise customers as substitutes for earlier generations of packet-switched services.

A. Video over IP

Video-over-IP is emerging right behind voice[125] and with cable operators now offering voice, many analysts believe that telephone companies will need to offer video to remain competitive.[126] IP can be used to deliver video over the fiber networks that some local telephone companies are now deploying, or in some cases over existing networks using DSL technology.[127] As Merrill Lynch notes, "the business case for telco TV has improved substantially," and "can work economically."[128]

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[124] *See Merrill Lynch, Everything over IP* at 23. *See also Hearing of the Senate Committee on Commerce, Science and Transportation*, Federal News Service (May 12, 2004) (Comcast President & CEO Brian Roberts: "[T]he IP platform lets us offer a differentiated product with services like integrated messaging so you can check your email and voice mail together on any number of different devices – as we saw some truly incredible IP videophones at the cable industry's national show in New Orleans just last week – it gets me even more excited. Voice Over IP will make cable a ubiquitous facilities-based telephone competitor.").

[125] *See, e.g., Merrill Lynch, Everything over IP* at 33 ("For cable, 'video over IP' has important implications: It represents a potential challenge to cable's gatekeeper role for video content. . . . The demand for (and the value of) the broadband connection looks set to increase still further.").

[126] *See, e.g.*, A. Kishore, Yankee Group, *Will Video Drive New Revenue Growth for Telcos?* at 11 (May 2004) (Telcos "should not underestimate the threat of the cable bundle or the negative impact on their revenue of broadband and wireless migration and competitive carriers. They must commit to a video strategy today for it to drive revenue in the future."); M. Davis, Yankee Group, *Telcos Take on Cable with Video Delivery* at 6 (Feb. 2004) ("Video would not command the attention of the telcos if the cable operators were not quickly moving into VoIP over cable. . . . Now that the MSOs are moving strongly into voice, the telcos fear their voice and DSL bundles will not be able to compete with a voice, cable broadband and cable TV bundle.").

[127] New video compression technologies, based on the MPEG-4 standard, reduce by about half the amount of bandwidth needed to transport digital video, and new ADSL chips (such as ADSL2 and ADSL2+) increase bandwidth and improve quality of service. *See, e.g.*, R. Talbot, *et al.*, RBC Capital Markets, *Canadian Telecom Services: Battle for the Broadband Home* at 38 (Jan. 27, 2004) ("[I]ncremental improvements to MPEG2 will deliver acceptable quality real-time TV below 2.5 to 3.0 Mbps, while the launch of MPEG4 in 2005 is expected to reduce video streams to approximately 1.5Mbps."); ATM Forum White Paper, *Delivering Video over Packet Networks* (Apr. 2003) ("The use of new video compression techniques based on MPEG-4 decreases the bandwidth requirement by 50%, effectively doubling the number of channels that can be carried concurrently."); A. Bray, *IP Technologies I*, Light Reading (Oct. 1, 2003), http://www.lightreading.com/document.asp?site=lightreading&doc_id=40811&page_number=3 ("[T]he true enabler for video delivery is the advance in bandwidth and the latest generation of ADSL chips. With the new standards, such as S=1/2 and ADSL 2+, telcos can now deliver the bandwidth to meet commercial video requirements.").

[128] *Merrill Lynch, Everything over IP* at 33 ("Our analysis suggests that DSL video can work economically: telcos can 'afford' to spend up to $200 per home passed on network upgrades (likely enough for ADSL-based video)

A number of local telephone companies in the U.S. – 60 according to one source[129] – have already begun offering cable-like video service over DSL. Most are small independent telcos.[130] Larger local phone companies are actively considering the provision of such services as well, and are also now deploying fiber networks over which they plan to provide video services.[131]

Content owners – particularly movie studios in search of new distribution channels – are offering a number of other video-over-IP services to all DSL and cable modem subscribers.[132] Five leading Hollywood studios have joined with Intel to form Movielink, which "allows users to download films 'on demand' in either Windows Media or Real format."[133] Disney, Microsoft, and AOL have each launched a video-on-demand service as well.[134]

The rise of video-over-IP has important competitive implications. As the Commission has found, wireline overbuilders provide the most effective competition to incumbent cable operators. "In areas where a wireline overbuild is present, cable subscribers receive more channels at lower prices."[135] A recent study by the General Accounting Office reaches the same conclusion: "cable rates were approximately 15 percent lower in areas where a wire-based competitor was present. . . . Our interviews with cable operators also revealed that these

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if no retention benefits are considered – and up to $600 per home passed (likely enough for VDSL) if every second video customer represents a 'saved' phone customer.").

[129] ATM Forum White Paper, *Delivering Video over Packet Networks* at 9 (Apr. 2003) ("There are already 60 phone companies in the US providing digital video over DSL, and they are getting good take-up rates.").

[130] *Merrill Lynch Voice over Broadband Report* at *3 ("Smaller telcos in both the U.S. and Canada have already gone ahead with major access network rebuilds needed to support video and higher-speed DSL services."); D. Briere, *et al*., *What's New with DSL TV?*, Network World Fusion (Apr. 27, 2004), http://www.nwfusion.com/edge/columnists/2004/0426bleed.html ("Within in the U.S., a number of independent (mainly rural) telcos have deployed video over ADSL solutions, combining local content, 'cable' channels and digital audio programming with high-speed Internet and voice services."); *but see Merrill Lynch 3Q03 Broadband Update* at 12 ("Qwest currently provides DSL-based video services to approximately 64,000 customers using a combination of VDSL, satellite and hybrid fiber-coaxial cable. We believe that about 40,000 of these are on the VDSL platform.").

[131] *See, e.g.*, M. Davis, Yankee Group, *Telcos Take on Cable with Video Delivery* at 3 (Feb. 2004) ("[M]ajor operators such as Qwest, BellSouth, Verizon, SBC, Sprint and CenturyTel either have implemented or are experimenting with copper and fiber deployments" to provide video services.); *More Consumers to Get High-Speed Broadband Connection*, Appliance (Jan. 1, 2004) (ABI Research "believes that video-over-DSL will be the new kid on the block in coming years, with U.S. incumbent local exchange carriers and competitive local exchange carriers charging ahead with aggressive deployments to fend off cable's triple-play offering."); B. Bath, Lehman Brothers, *SBC Communications: Mgmt. Mtgs. Confirm Positive Outlook* at 3 (May 6, 2004) (SBC "is currently exploring the potential for switching video at the head-end/central office, instead of on the set-top box; in this way, the company can provide video service over copper to the house, as it would only have to provide 2 - 4 simultaneous video streams, instead of the current multiple hundreds being transmitted over the cable plant.").

[132] *Merrill Lynch, Everything over IP* at 31.

[133] *Id.* at 32.

[134] *Id.* ("In October 2003, Disney launched a wireless VOD service with TiVo-like features ('MovieBeam') in Jacksonville, Fla., Spokane, Wash., and Salt Lake City, Utah."); *id.* ("The big ISPs are pushing hard to add video content to their services." (citing Microsoft's launch of "MSN Video" in January 2004 and AOL's launch of "TV's Top 5" in October 2003)).

[135] *Implementation of Section 3 of the Cable Television Consumer Protection and Competition Act of 1992*, Report on Cable Industry Prices, 17 FCC Rcd 6301, ¶ 47 (2002).

companies generally lower rates and/or improve customer service where a wire-based competitor is present."[136] Numerous analysts now expect Video-over-IP to have a similar pro-competitive impact.[137]

B. Enterprise IP

Competitive supplied IP-based services are already widely used by enterprise customers, as both complements to and as substitutes for older packet-switched services (Frame Relay and ATM) and traditional private line services.[138] IP-PBXs now represent approximately 30 percent of new PBX line shipments, and are expected to grow by at least 35 percent in 2004.[139] According to one recent survey, 45 percent of large businesses and 23 percent of medium-sized businesses are now using VoIP, with the totals expected to rise considerably (to 65 percent and 39 percent, respectively) by the end of 2004.[140] Another analyst estimates that, by 2005, "50% of Frame Relay customers will migrate to IP VPNs,"[141] which provide virtual dedicated channels over any distance via IP backbones. Yet another analyst forecasts that, "[b]y 2006, nearly all large U.S. enterprises will use IP VPN services in some part of their network."[142]

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[136] General Accounting Office, *Telecommunications: Issues Related to Competition and Subscriber Rates in the Cable Television Industry*, GAO-04-8, at 10 (Oct. 2003).

[137] *See, e.g.*, F. Governali, Goldman Sachs, *Telecom Svcs: DSL Broadband Share Just Over 50% This Qtr; Ideal Situation* at 1 (Apr. 29, 2004) ("[I]f the telcos stick with these advances, and continue to improve speed, reliability, and the size of the addressable market they can stay even with the cable companies. . . . cable companies will lose some video market share."); J. Hodulik, *et al.*, UBS, *Gallup Survey Highlights VoIP Potential* at 2 (Apr. 8, 2004) ("The Bells are starting to roll-out video offerings . . . while the cable operators continue to deploy IP based telephony service. . . . Both groups are encroaching on the cash cow businesses of the other, which likely means further consumer benefits are on the horizon."); *Merrill Lynch Voice over Broadband Report* at *2 ("Cable operators are now beginning to face real competition in HSD (high-speed data) services as well as in their core video services.").

[138] *See, e.g.*, C. Munroe, IDC, *U.S. Private Line Forecast and Analysis, 2002-2007* at 1-2 (Dec. 2003) (Convergence is driven by "[t]he migration by enterprises to IP VPN from private lines and frame relay," and "[a]s prices have declined, many CLECs and incumbents have experienced great success marketing integrated T1 lines. With the growth of IP telephony, IDC expects this phenomenon to continue."); L. Starr, Probe Group LLC, *The Enterprise Market* at 10 (Dec. 2003) ("IP VPNs should be seen as a means to extend the reach of Frame and ATM networks, not as substitutions.").

[139] Telecommunications Industry Association, *2004 Telecommunications Market Review and Forecast* at Tables III-2.1, III-2.2 (2004) (citing TEQConsult Group). *See also* TIA Press Release, *Spending in U.S. Telecom Industry to Rise 6.8% to $769.5 Billion in 2004, Turnaround in Sight for U.S. Telecom Equipment Spending* (Jan. 14, 2004) ("The enterprise equipment market expanded 3.9 percent to $94 billion in 2003. In the enterprise, the shift to IP is boosting most segments of equipment spending. For instance, after declining in the previous three years, the PBX market bounced back in 2003 with a 12.0 percent increase, reaching $4.2 billion on the strength of growing IP-PBX sales.").

[140] S. Flannery, *et al.*, Morgan Stanley, *Part 1 – Annual Telecom Survey: Spending Outlook* at 14-15 & Exhibit 28 (Mar. 25, 2004); *see also* J. Hodulik, *et al.*, UBS, *UBS 2004 Telecommunications Services CIO Survey* (Mar. 1, 2004) (44% of Fortune 1000 Chief Information Officers surveyed "have already deployed VoIP, while another 18% plan to deploy over next 2 years.").

[141] L. Starr, Probe Group LLC, *U.S. Competitive Service Markets: The Enterprise Market* at 7 (Dec. 2003).

[142] M. Schoener, *et al.*, Gartner, *Fixed Public Network Services, United States, 2001-2007* at 13 (June 17, 2003).

Competing carriers lead in the provision of IP-based services to enterprise customers, just as they do in the provision of older packet-switched services like ATM and Frame Relay. *See* Appendix A at A-19 – A-21. AT&T and MCI were the first carriers to deploy Multi-Protocol Label Switching (MPLS) services that enable IP-based services to be provided over the same backbone networks as other packet-switched services.[143] AT&T now claims to be the leading the IP-VPN provider in the United States, and has declared that it will be the industry leader in VoIP.[144] MCI still operates one of the largest IP backbones in the world, and reports that private IP is the company's fastest growing service.[145] Numerous other competing carriers have also deployed IP services for enterprise customers.[146] According to In-Stat/MDR, the five largest providers of IP-VPN service are AT&T, MCI, SAVVIS, Level 3, and Sprint; the only two BOCs in the Top 10 are Qwest and SBC, with a combined market share of only 3.4 percent.[147]

Because they offer significant cost savings and efficiencies,[148] IP-based services are now putting significant price-pressure on enterprise-market services. As one analyst notes, "Voice over IP has emerged as a major reason for declining spending across local, data, and long distance spending."[149] "Intense competition among VoIP vendors has driven prices down sharply since Q2 '03," according to Forrester Research, which predicts "a 20% to 30% yearly decline in VoIP [equipment] prices through 2006."[150]

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[143] J. Marcus, Probe Group LLC, *Frame Relay versus IP VPN Markets in North America* at 3 (June 2003).

[144] Bill Hannigan, President, AT&T, *AT&T Business Overview: The Networked Enterprise* at 14 (Feb. 25, 2004).

[145] C. Marsan, *MCI Rolls Out Convergence Services*, NetworkWorldFusion (Apr. 5, 2004), http://www.nwfusion.com/newsletters/isp/2004/0405isp1.html (quoting Jim DeMerlis, VP, Data and IP Services, MCI).

[146] *See, e.g.*, V. Grover, Needham & Company, *VoIP in the Spotlight – Ways to Play the Trend* at 2 (Nov. 28, 2003) ("[Level 3] offers VoIP solutions through indirect channels geared for enterprises and carriers"); Global Crossing, *Company*, http://www.globalcrossing.com/xml/global/gl_company.xml ("Leverage Global Crossing's global, fully meshed MPLS-te IP network. . . . [w]hether you're a carrier in need of capacity, or an enterprise looking for network transport or value-added services."); ICG Communications, *VoicePipe – Set Your Whole Enterprise Free*, http://www.icgcomm.com/products/corporate/voicepipe/voicepipe.asp (offering "VoicePipe" IP telephony for enterprise customers).

[147] *See* H. Goldberg, In-Stat/MDR, *VPNs Take a New Look: Trends in the US IP VPN Services Market*, Report No. IN0401350BD at Table 5 (Jan. 2004).

[148] AT&T, *AT&T Managed Router Service with Voice Over IP*, http://www.business.att.com/content/productbrochures/mrsvoip.pdf ("Voice over IP can move your circuit-switched voice and faxtraffic off the Public Switched Telephone Network (PSTN), compressing and multiplexing it onto your data network. You can save as much as 30% to 40% on your domestic calls, and as much as 80% to 90% on international calls."); L. Starr, Probe Group LLC, *U.S. Competitive Service Markets: The Enterprise Market* at 6 (Dec. 2003) ("Enterprises' decision to roll out MPLS and IP-based services may be driven by lower operational expense and improved quality of service (QoS). The first new service area is likely to be IP VPNs, this due to the cost savings afforded by IP VPN when compared to legacy services.").

[149] S. Flannery, *et al.*, Morgan Stanley, *Part 1 – Annual Telecom Survey: Spending Outlook* at 1 (Mar. 25, 2004).

[150] V. Bhagavath, *et al.*, Forrester, *Second-Generation VoIP* at 2 (Sept. 2003).

APPENDIX A
BROADBAND COMPETITION: MAY 2004

This appendix provides an overview of competition in the provision of broadband services. It demonstrates that cable companies continue to dominate the provision of mass-market broadband service, while at the same time competition is also increasing from a number of other technologies. As a recent study finds, this is true not only for residential customers, but also for small-business customers for whom cable has become the most used broadband technology and who also rely heavily on alternative technologies such as fixed wireless and satellite. Moreover, competing carriers also dominate the provision of broadband services to large business customers, which likewise enjoy increasing access to alternative technologies.

A. Cable Operators Dominate the Broadband Mass Market

Recent data show that cable continues to dominate the broadband mass market. According to the Commission's latest *High-Speed Services Report*, as of June 2003, cable controlled more than *two-thirds* of all high-speed lines provided to residential and small-business customers,[1] which is the segment of the broadband market that cable operators target.[2] As of that same date, cable also controlled more than *83 percent* of the most rapidly growing segment of mass-market broadband lines – those capable of over 200 kbps in both directions.[3] In both cases, cable has increased its lead in the most recent six-month period for which the Commission reports data.[4]

Although the Commission's data are current only as of June 2003, more recent data show that cable has continued to maintain its lead over DSL through the first quarter of 2004, despite significant price decreases by DSL providers.[5] *See* Table 1. In the past nine months, cable added just over 3.3 million new subscribers, compared to only 2.9 million added by DSL. *See* Table 1.

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[1] Ind. Anal. & Tech. Div., Wireline Competition Bureau, FCC, *High-Speed Services for Internet Access: Status as of June 30, 2003* at Tables 3 & 4 (Dec. 2003) ("*High-Speed Services Report*").

[2] *Compare High-Speed Services Report* at Table 3 (Cable provides 13,660,541 high-speed lines to residential and small-business customers) *with High-Speed Services Report* at Table 1 (Cable provides a total of 13,684,225 high-speed lines).

[3] *See High-Speed Services Report* at Table 4. Residential and small-business high-speed lines capable of over 200 kbps in both directions represented 85 percent of all residential and small-business high-speed lines added between June 2002 and June 2003, and 78 percent of all high-speed lines added during that same period. *See id.* at Tables 1, 3 & 4. Verizon introduced a symmetrical xDSL service capable of over 200 kbps in both directions in July 2003. *See* Letter from Richard Ellis, Verizon, to Marlene Dortch, FCC, Transmittal No. 343 (July 22, 2003).

[4] *See High-Speed Services Report* at Table 3 (Cable share of all residential and small-business high-speed lines grew from 65 to 66 percent from December 2002 to June 2003); *High-Speed Services Report* at Table 4 (Cable share of residential and small-business high-speed lines with over 200 kbps in both directions grew from 79 to 83 percent from December 2002 to June 2003).

[5] *See, e.g.*, J. Hodulik, *et al.*, UBS, *High-Speed Data Update for 1Q04: DSL Net Adds Greater Than Cable for First Time Ever* at 1 (May 21, 2004) ("Cable continues to control the market for broadband with 60% share."); G. Campbell, *et al.*, Merrill Lynch, *Everything over IP* at 2 (Mar. 12, 2004) ("Thanks to price-cutting, DSL made modest inroads into cable's dominant position in the U.S. market.") ("*Merrill Lynch, Everything over IP*").

Table 1. Cable Modem and DSL Subscriber Growth: 3Q 2003-1Q 2004					
DSL			**Cable**		
	Net Adds 3Q 2003-1Q 2004	**Total Subs. 1Q 2004**		**Net Adds 3Q 2003-1Q 2004**	**Total Subs. 1Q 2004**
SBC	1.2 million	4.0 million	Comcast	1.3 million	5.7 million
Verizon	733,000	2.7 million	Time Warner	600,000	3.6 million
BellSouth	393,000	1.6 million	Cox	475,000	2.2 million
Qwest	208,000	744,000	Charter	304,000	1.7 million
Sprint	126,000	349,000	Cablevision	208,000	1.1 million
Other*	236,000	1.1 million	Other*	449,000	1.7 million
Total	**2.9 million**	**10.4 million**	**Total**	**3.3 million**	**15.9 million**
*Other DSL providers are ALLTEL, Citizens Communications, Cincinnati Bell, CenturyTel, Commonwealth Telephone, and Covad. Other cable modem providers are Adelphia, Mediacom, and Insight Communications. *Source: See* Appendix D.					

Cable also continues to lead DSL in terms of availability and penetration. Cable modem service is now available to more than 85 percent of all U.S. households,[6] and by the end of 2004 will be available to 90 percent of U.S. households.[7] Four of the largest cable companies (Comcast, Time Warner, Cox, and Cablevision) now make cable modem service available to between 95 and 100 percent of their homes passed,[8] and between 25 and 36 percent of these companies' video subscribers now take cable modem service.[9] The Bell companies, by contrast, currently make DSL available to about 75-80 percent of their homes passed,[10] and only between 7 and 15 percent of their residential voice subscribers take DSL.

Cable modem service is available in virtually all of the same markets where DSL is provided. JP Morgan has estimated that no more than 5 percent of U.S. households would be able to receive DSL but not cable modem by the end of 2003.[11] The actual number may well be even lower today, given that JP Morgan assumed that cable modem service would be available to

[6] *See* NCTA, *Broadband Services*, http://www.ncta.com/Docs/PageContent.cfm?pageID=37; *see also* J. Halpern, *et al*., Bernstein Research Call, *Broadband Update: DSL Share Reaches 40% of Net Adds in 4Q . . . Overall Growth Remains Robust* at Exhibits 1 & 6 (Mar. 10, 2004) ("*Mar. 2004 Bernstein Broadband Update*") (cable broadband available to 92.3 percent of total cable homes passed).

[7] *See id.* at 7.

[8] *See, e.g., id.* at 7 & Exhibit 6 (reporting cable modem availability at 98.5% for Time Warner, 97.7% for Cox, 100% for Cablevision, and 87% for Comcast, which is adding almost 3.5 million homes passed in 2004).

[9] A. Bourkoff & J. Hodulik, UBS, *High-Speed Data Update for 4Q03: Getting Ready for Cable Telephony* at 8, Chart 6 (Mar. 11, 2004) ("*UBS 4Q03 High-Speed Data Update*").

[10] *See Mar. 2004 Bernstein Broadband Update* at 7, Exhibit 7 (reporting DSL availability at 75% for SBC, 80% for Verizon, 74% for BellSouth, and 45% for Qwest).

[11] *See* J. Bazinet, *et al*., JP Morgan, *Broadband 2003* at Figure 9 (Dec. 5, 2002).

only 76 percent of all U.S. households as of year-end 2003, whereas the actual total today is somewhere between 85 and 90 percent.[12]

Broadband competition is thriving for small-business customers just as it is for residential customers.[13] Cable companies have moved rapidly to provide cable modem services to small-business customers. Five of the six largest cable system operators (which, collectively, represent over 90 percent of consumer cable modem subscribers) already offer broadband services specifically tailored to small businesses.[14] These cable operators have acknowledged that they can readily reach most small-business customers with their existing infrastructure, and that it makes sense to serve them.[15] Indeed, these cable operators already have been very successful in attracting small-business subscribers.[16]

Several recent studies confirm that small businesses are increasingly turning to cable modem service for their broadband needs.[17] A March 2004 study commissioned by the Small Business Administration, which the CLECs' own trade association has praised as a "well-researched report,"[18] separately analyzed small businesses according to three different segments (those with 0-4 employees, those with 5-9 employees, and those with revenues less than $200,000), and found that "for all three segments penetration was higher for cable modem service than for DSL."[19] A December 2003 study by In-Stat/MDR analyzes small businesses with 5 to 99 employees and finds that, as of year-end 2003, there were 2.1 million such

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[12] *See id*.

[13] *See* Letter from Dee May, Verizon, to Marlene H. Dortch, FCC, WC Docket Nos. 01-337, 02-33, 98-10, 98-20 at 10-17 (Nov. 13, 2003) ("*Verizon November 13, 2003 Ex Parte*"); *see also* Letter from Edward Shakin, Verizon, to Marlene H. Dortch, FCC, WC Docket Nos. 01-338, 96-98, 98-147, 02-33, 01-337 (Jan. 15, 2003).

[14] *See* J. Shim, Credit Lyonnais Securities, *The U.S. Cable Industry – Act I* at 196-202 (Nov. 20, 2002); Time Warner, *Time Warner Cable*, http://www.aoltimewarner.com/companies/time_warner_cable_index.adp.

[15] *See, e.g.*, A. Figler, *Turning Businesses into Customers*, Cable World (Dec. 9, 2002) (Ken Fitzpatrick, senior vice president of commercial services for Time Warner Cable: "We've got an infrastructure there that is just ripe for commercial services. . . . We pass 1.2 million businesses."); Jason Livingood, Director of Comcast Commercial Internet Services, *Overview of Cable Modem Offerings for Businesses in Maryland* (Aug. 15, 2002) (Comcast targets "SMBs with 1-100 employees," "Non-profit orgs, schools, government," and "SMBs and Enterprises with telecommuters.").

[16] *See, e.g., A Snapshot of the Cox Business Strategy*, Interview with Coby Sillers, Vice President and General Manager for Cox Business Services, Xchange Mag. (June 1, 2003) ("Cox Business Services now serves more than 65,000 business customers, and the company's business efforts have grown in the past three years from less than 1 percent of Cox's overall revenue to just more than 5 percent of Cox's consolidated revenue."); J. Barthold, *Small Business, Big Money, No Guarantees*, TelephonyOnline (Aug. 12, 2002) (Kevin Curran, senior vice president of marketing and sales for Cablevision Lightpath: Cablevision "can't keep up with demand" for Cablevision's Business Class Optimum Online service for small businesses).

[17] S. Pociask, Telenomic Research, LLC, *A Survey of Small Businesses' Telecommunications Use and* Spending (Mar. 2004) ("*Small Business Administration Study*"); K. Burney, In-Stat/MDR, *The Data Nation: Wireline Data Services Spending and Broadband Usage in the US Business Market; Part Three: Small Businesses (5 to 99 Employees)* (Dec. 2003) ("*In-Stat/MDR Small Business Study*").

[18] ALTS Press Release, *ALTS Applauds SBA's Survey of Competition for Small Business Customers* (Mar. 11, 2004) (statement of ALTS president John D. Windhausen, Jr.).

[19] *See Small Business Administration Study* at 44, 47 (Fig. 32), 48 (Fig. 33), 50 (Fig. 35).

businesses using cable modems compared to 1.4 million using DSL.[20] A November 2003 study by In-Stat/MDR finds that small offices and home offices (businesses with fewer than 5 employees) subscribe to cable modem service more than twice as often as they subscribe to DSL.[21]

These studies also demonstrate that small businesses use cable modem service far more often than the T-1 services the local telephone companies provide. The Small Business Administration study finds that the penetration of T-1 services among small businesses is only 4 percent, compared to 26 percent for cable modem services.[22] In-Stat/MDR likewise reports low penetration rates of T-1 service among the small-business customers it studied.[23]

The most recent competitive offerings and promotions from DSL and cable operators also demonstrate that there is extensive head-to-head competition across all geographic markets and for all segments of the mass market. In recent months, each of the Bell companies has cut their national DSL prices considerably. *See* Tables 2 & 4. Cable operators have responded with promotional and targeted price reductions, and, more broadly, by increasing data speeds that effectively offer consumers more bandwidth at a lower price than those operators' previous offerings. *See* Table 4.[24] And because these price wars began *after* the *Triennial Review Order*, they also vindicate the Commission's recent decision to phase out line sharing.[25]

Tables 2 and 3 show current broadband offerings over DSL and cable to residential and small-business customers, respectively. The tables reflect the standard prices for high-speed Internet access service – that is, Internet access bundled together with broadband transport. In Table 2, the bottom of the price range reflects prices when the lowest-speed broadband service is purchased together with at least one other service – voice service (local and long-distance) in the case of DSL, and video or voice service in the case of cable.[26] The higher prices in the range are

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[20] K. Burney, In-Stat/MDR, *The Data Nation: Wireline Data Services Spending and Broadband Usage in the US Business Market; Part Three: Small Businesses (5 to 99 Employees)* (Dec. 2003).

[21] *See* K. Burney & C. Nelson, In-Stat/MDR, *The Business Hot Wire!: Data Access in the Commercial and Residential Environments of US Businesses; Part One: Cable Modem Services* at 26, Table 11 (Nov. 2003) (48.5% of SOHO businesses subscribe to cable modem; 17.8 percent subscribe to DSL).

[22] *See Small Business Administration Study* at 44 (Fig. 30); *see also id.* at 47 (Fig. 32), 48 (Fig. 33), 50 (Fig. 35).

[23] *See* K. Burney & C. Nelson, In-Stat/MDR, *The Business Hot Wire!: Data Access in the Commercial and Residential Environments of US Businesses; Part One: Cable Modem Services* at 20, Table 11 (Nov. 2003) (8.5% of SOHO businesses and 25.6% of small businesses use Full T-1 in their main office; 5.9% and 17.3%, respectively, use Fractional T-1; and 48.5% and 43.7%, respectively, use cable modem).

[24] *See also* G. Campbell, *et al.*, Merrill Lynch, *3Q03 Broadband Update: The Latest on Broadband Data and VoIP Services in the U.S. and Canada* at 2 (Nov. 3, 2003) (cable operators "are increasingly moving 'off the rate card,' with market-specific pricing and increased use of promotional and bundled-price discounts specific to certain markets") ("*Merrill Lynch 3Q03 Broadband Update*").

[25] *See Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers*, Report and Order and Order on Remand and Further Notice of Proposed Rulemaking, 18 FCC Rcd 16978, ¶ 263 (2003) ("*Triennial Review Order*"). Of course, competitive providers of DSL service have traditionally accounted for a only a small fraction of the broadband market, particularly for mass-market customers. *See, e.g., High-Speed Services Report* at Table 5.

[26] *Merrill Lynch, Everything over* IP at Table 2.

for broadband service purchased without one of those other services, or for higher-speed service. In Table 3, the bottom of the price range reflects prices under a one-year contract for the lowest-speed broadband service (with dynamic IP addresses, where available); the higher prices in the range are for higher speeds under a one-year contract.[27] The prices do not factor in the promotional discounts that, as demonstrated in Table 4, both DSL and cable modem providers are now routinely offering their customers.

Table 2. Current Residential Offerings by DSL and Cable Modem Providers

Technology	**DSL**				**Cable Modem**			
Provider	**Verizon**	**SBC**	**BellSouth**	**Qwest**	**Comcast**	**Cablevision**	**Cox**	**Time Warner**
Downstream Bandwidth	1.5 Mbps	384 kbps-3 Mbps	256 kbps-3 Mbps	256 kbps-1.5 Mbps	3 Mbps	3.5 Mbps	3 Mbps	2 Mbps
Upstream Bandwidth	384 kbps	128-384 kbps	128-384 kbps	256-896 kbps	256 kbps	1 Mbps	256 kbps	384 kbps
Monthly Price	$29.95-$34.95	$26.95-$59.99	$26.95-$54.95	$15.00-$44.99	$42.95-$57.95	$44.95-$49.95	$39.95-$49.95	$44.95-$59.95

Sources: See Appendix D.

Table 3. Current Small Business Offerings by DSL and Cable Modem Providers

Technology	**DSL**				**Cable**		
Provider	**Verizon Business DSL**	**SBC Symmetric DSL**	**Covad TeleSpeed Business DSL**	**AT&T Business Class DSL**	**Time Warner Road Runner Business Class**	**Comcast Business Comm. Comcast Workplace**	**Cablevision Business Class Optimum Online**
Downstream Bandwidth	384 kbps-7.1 Mbps	144 kbps-1.5 Mbps	144 kbps-1.5 Mbps	144 kbps-1.5 Mbps	1-4 Mbps	4-5 Mbps	10 Mbps
Upstream Bandwidth	384-768 kbps	144 kbps-1.5 Mbps	144 kbps-1.5 Mbps	144 kbps-1.5 Mbps	256 kbps-2 Mbps	384-512 kbps	1 Mbps
Monthly Price	$39.95-$204.95	$89.99-$289.95	$125.95-$289.95	$149.95-$399.95	$79.95-$399.95	$145-$200	$109.95

Sources: See Appendix D.

[27] The one exception to this is for Covad. The low-end for Covad reflects pricing under a two-year contract; the high-end reflects pricing under a one-year contract; and both exclude a one-time rebate of $150-$584. AT&T also offers a one-time rebate which is not reflected here.

Table 4. Recent Changes in Cable/DSL Competitive Offerings and Promotions

DSL		
Verizon	May 2003	Lowered monthly rate by 30% to $34.95 ($29.95 when bundled with phone service); increased maximum download speeds to 1.5 Mbps from 768 kbps
	May 2004	Raised maximum upstream speeds for the 1.5 Mbps service from 128 kbps to 384 kbps. Announced plans to offer a 3.0 Mbps/768 kbps service in the summer
SBC	Feb. 2003	Lowered monthly rate to $34.95 with a one-year contract
	1H 2003	Lowered monthly rate with bundled service to $24.95 in San Diego and Orange County, Cal.; Kansas City, Mo., and Wichita, Kan., with one-year commitment
	June 2003	Lowered $34.95 monthly rate to $29.95 for new customers
	Sept. 2003	Lowered prices by 10% to $26.95 across its region to customers who sign-up online or purchase DSL within a bundle with a one-year commitment
	Feb. 2004	Replaced a $99.95 high-end offering with 3.0 Mbps/384 kbps service for $44.99
	Apr. 2004	Reduced price for 3.0 Mbps/384 kbps service to $36.99 when purchased with local, long-distance, and wireless service. Reinstated promotion of $26.95 per month for download speeds of up to 1.5 Mbps.
BellSouth	2Q 2003	Offered introductory rate of $19.95 for first three months
	July 2003	Implemented tiering and selective discounts, including $5/month reduction in its more competitive DSL markets
	3Q 2003	Began offering free first and third months of service
	3Q 2003	Reduced monthly rates to $29.95 and $39.95, when DSL is purchased with unlimited local and long-distance calling
Qwest	2003	Reduced monthly rate by 30 percent to $34.99 when purchased as part of a bundle
	3Q 2003	Reduced monthly modem rental fees from $5 to $2; monthly rate with bundled service is now $29.95
CABLE		
Comcast	Sept. 2003	Launched aggressive promotional trial, offering $19.95 for one year to a select group of DSL customers in California, Illinois, and Maryland
	3Q 2003	Offered $19.99 per month (effective for 3 or 6 months) for video customers, or $33.99 per month for non-video customers, in most markets.
	Oct. 2003	Announced increased download speed to 3 Mbps from 1.5 Mbps
Time Warner	Oct. 2003	Increase download speed to 3 Mbps from 2 Mbps
	Dec. 2003	Lowered monthly rate in Kansas City, Mo. from $44.95 to $26.95 for one year
	4Q 2003	Currently testing faster upload speeds (512 kbps)
Charter	Sept. 2003	Increased download speeds to 2.0 Mbps at no extra charge
Cablevision	Aug. 2003	Began limited promotion of $29.95 for the first six months
Cox	3Q 2003	Reduced monthly modem rental rate from $15 to $10
	4Q 2003	Rolling out a reduced-priced data product in 7 markets – Northern Va., Kan., New Orleans, Humboldt and Santa Barbara, Cal., Phoenix, and Ga.
	4Q 2003	Plans to add a higher-speed service as part of its tiering strategy
Adelphia	Oct. 2003	Increased download speed to 3 Mbps; doubled upload speed to 256 kbps
RCN	Oct. 2003	Increased top download speed to 5 Mbps; doubled download speed of lower-priced tier to 3 Mbps
Mediacom	Jan. 2004	Announced it will double download and upload speeds to 3 Mbps and 256 kbps, respectively, at no extra charge

Sources: See Appendix D.

Finally, the fact that cable and DSL providers are engaging in aggressive comparative advertising provides additional confirmation that they are competing head-to-head for the same customers in the same markets. For example, Time Warner boasts that its "High Speed Online . . . leaves DSL in the dust."[28] Comcast claims "download speeds up to 2x faster than 1.5 Mbps DSL."[29] Cablevision claims its service "is more than twice as fast as the lowest-priced DSL."[30] BellSouth points out that DSL "provides a dedicated connection to your home to the [] DSL network. Cable modem service shares a connection with other cable modem subscribers."[31] A recent SBC print ad encourages customers to "stop throwing money away on cable and sign up for SBC Yahoo DSL." A recent Verizon television ad boasts service "that's 13 bucks less than Comcast," and, unlike Comcast includes a pop-up blocker, antivirus software, and modem. Within several weeks of airing this spot, Comcast aired a copycat advertisement – using the same set, format, and body double.[32] According to MINTEL's Comperemedia, telephone companies have also boosted their direct-mail marketing efforts "primarily due to cable companies' more aggressive marketing of packages with cable modem and cable TV services and most recently, phone service."[33]

Analysts expect all of these trends to continue, and for the broadband market to become increasingly competitive, for the foreseeable future. Prices are expected to continue to drop even further.[34] Deutsche Bank, for example, expects the cable industry "to lower basic pricing very close to the $30 level in reasonably short order."[35] Broadband penetration is expected to increase apace, from 22 percent of U.S. households today, to 30 percent by the end of 2004, and almost 40 percent by the end of 2005. *See* Figure 1.[36]

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[28] Time Warner Cable, *Products & Services: High Speed Online from Time Warner Cable*, http://www.timewarnercable.com/dispatcher/products;jsessionid=0000LZJGUTC4AGS3LJ0T3J34NUY:-1?category=10056&expand=Y&rootCategory=10050&src=0homeHS0.

[29] Comcast, *Features*, http://www.comcast.com/Benefits/CHSIDetails/Slot3PageOne.asp.

[30] Optimum Online, *What Is It?*, http://www.optimumonline.com.

[31] BellSouth, *Common Questions*, http://www.fastaccess.com/content/consumer/common_questions.jsp.

[32] Transcript of Verizon Online DSL advertisement aired on Feb. 4, 2004 at 5:58 AM on WNBC in New York, NY. The Comcast ad was subsequently pulled off in the air, in response to copyright and other challenges made by Verizon.

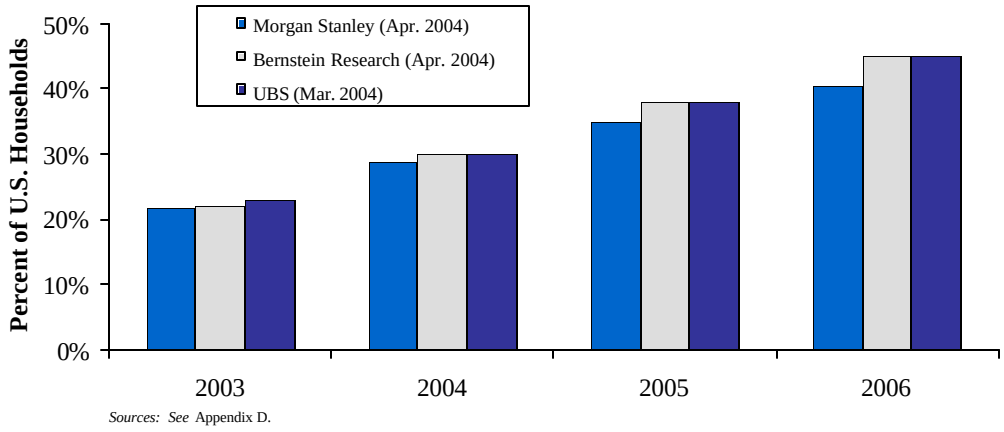
[33] *MINTEL's Comperemedia: Telecom Companies Push Bundled Services Packages*, Business Wire (Mar. 9, 2004).

[34] *See, e.g.*, R. Bilotti, *et al.*, Morgan Stanley, *Broadband Update – Tiering Strategies* at 4 (Apr. 12, 2004) ("[O]ur forecasts assume that cable modem pricing declines from an average of $40 in 2003 to approximately $34-36 longer term.").

[35] V. Shvets, *et al.*, Deutsche Bank Securities Inc., *Wireline Services; DSL – A Reversal of Fortune* at 4 (May 4, 2004).

[36] As of year-end 2003, there were approximately 24 million households subscribing to broadband service. *See Mar. 2004 Bernstein Broadband Update* at Exhibit 1. *See also* Cathy Martine, SVP Internet Telephony & Consumer Product Management, AT&T, *Voice over IP* at 5 (Feb. 25, 2004) (justifying AT&T's VoIP strategy to investors based on estimates of Residential Broadband Subscribers increasing to more than 45 million by 2007).

Figure 1. Residential Broadband Subscribers



Sources: See Appendix D.

B. There Is Significant Mass-Market Broadband Competition from Other Sources

The Commission has already recognized that, in addition to cable and DSL, there are numerous additional platforms and technologies already competing in or poised to enter the broadband mass market, including power lines, fixed wireless, 3G mobile wireless, and satellite.[37] Indeed, many of these technologies are already being used to provide service offerings that are competitive with DSL and cable modem services, both for residential and small-business customers. *See* Tables 5 & 6. Under well-settled precedent, all of these alternatives must be taken into account in the analysis of broadband competition,[38] particularly given that that the broadband market is still "in the earliest stages" and is evolving rapidly.[39]

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[37] *See, e.g., Inquiry Concerning the Deployment of Advanced Telecommunications Capability*, Third Report, 17 FCC Rcd 2844, ¶¶ 79-88 (2002); *Triennial Review Order* ¶ 263 ("[T]he Commission also has acknowledged the important broadband potential of other platforms and technologies, such as third generation wireless, satellite, and power lines.") (citing *Third Section 706 Report 2002*, 17 FCC Rcd 2844, ¶¶ 79-88 (2002)); R. Mark, *Broadband over Power Lines: FCC Plugs In*, Internetnews.com (Apr. 23, 2003), http://dc.internet.com/news/article.php/2195621 (Chairman Powell: "[t]he development of multiple broadband-capable platforms – be it power lines, Wi-Fi, satellite, laser or licensed wireless – will transform the competitive broadband landscape.").

[38] The Commission has held that a proper market analysis must "examine not just the markets as they exist today," but must also take account of "future market conditions," including "technological and market changes, and the nature, complexity, and speed of change of, as well as trends within, the communications industry." *Applications of NYNEX Corp., Transferor, and Bell Atlantic Corp., Transferee, for Consent To Transfer Control of NYNEX Corp. and Its Subsidiaries*, Memorandum Opinion and Order, 12 FCC Rcd 19985, ¶¶ 3, 7, 41 (1997) ("*Bell Atlantic/NYNEX Merger Order*"); *Applications of Teleport Communications Group Inc., Transferor, and AT&T Corp., Transferee, For Consent To Transfer of Control of Corporations Holding Point-to-Point Microwave Licenses and Authorizations To Provide International Facilities-Based and Resold Communications Services*, Memorandum Opinion and Order, 13 FCC Rcd 15236, ¶ 19 n.65 (1998); *Applications for Consent to the Transfer of Control of Licenses from Comcast Corp., Transferor, and AT&T Corp. to AT&T Comcast Corp., Transferee*, Memorandum Opinion and Order, 17 FCC Rcd 23246, ¶ 27 (2002); *see also Triennial Review Order* ¶ 263 ("The fact that broadband service is actually available through another network platform and may potentially be available through additional platforms helps alleviate any concern that competition in the broadband market may be heavily dependent

Table 5. Typical Residential Offerings by Alternative Broadband Providers				
Technology	**BPL**	**Satellite**		**Fixed Wireless**
Provider	**Prospect Street Broadband**	**DIRECWAY**	**StarBand**	**NTELOS Portable Broadband**
Downstream Bandwidth	200-300 kbps	500 kbps	200-500 kbps	1.5 Mbps
Upstream Bandwidth	200-300 kbps	50 kbps	40-60 kbps	550 kbps
Monthly Price	$26.95	$59.99-$99.99	$49.99-$99.99	$49.95-$69.95
Availability	Manassas, VA	Continental U.S.	Nationwide	VA Cities
Sources: See Appendix D.				

Table 6. Typical Small-Business Offerings by Alternative Broadband Providers			
Technology	**Satellite**		**Fixed Wireless**
Provider	**DIRECWAY**	**StarBand Small Office**	**NTELOS Portable Broadband**
Downstream Bandwidth	200 kbps-1.5 Mbps	150 kbps-1 Mbps	1.5 Mbps
Upstream Bandwidth	n/a	40-100 kbps	550 kbps
Monthly Price	$75.99-$189.99	$119.99-$149.99	$49.95-$69.95
Sources: See Appendix D.			

1. Fixed Wireless

Recent evidence confirms that fixed wireless continues to be a viable broadband alternative for many customers, and is likely to grow significantly in the future. The Commission has estimated that residential fixed wireless Internet access is available in counties that contain approximately 62 million people, or 22 percent of the U.S. population.[40] The national trade association for fixed wireless providers has stated that "approximately 1,500-1,800 [Wireless Internet Service Providers] already are providing service to approximately 600,000 subscribers in the U.S., with subscribership expected to double by the end of 2003 and reach nearly 2,000,000 by the end of 2004."[41] As the Chairman of that association has noted,

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upon unbundled access."); *FCC v. RCA Communications, Inc.*, 346 U.S. 86, 96-97 (1953); *FCC v. WNCN Listeners Guild*, 450 U.S. 582, 594-95 (1981).

[39] *Bell Atlantic/NYNEX Merger Order* ¶¶ 40-41; *see also Inquiry Concerning the Deployment of Advanced Telecommunications Capability*, Third Report, 17 FCC Rcd 2844, ¶¶ 79-88 (2002) ("preconditions for monopoly appear absent" in the broadband market).

[40] *Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993*, Eighth Report, 18 FCC Rcd 14783, A-4 at n.709 (2003).

[41] Comments of the License-Exempt Alliance at 3, *Revision of Parts 2 and 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band*, ET Docket No. 03-122

"[w]ireless ISPs have rolled out broadband service in virtually every state of the union – and in hundreds of rural and metropolitan markets. . . . Wireless has boldly become the nation's third pipe for last-mile access."[42]

In just the past few months, there have been a number of new deployments of fixed wireless broadband service. In May 2004, NextNet announced the launch of non-line-of-sight broadband wireless service in conjunction with three regional ISP partners: W.A.T.C.H. TV in Ohio, SpeedNet in Michigan, and Gryphon Wireless in Nebraska.[43] Earlier this year, NextNet reported a successful trial with America Connect in Granville County, N.C.[44] In January 2004, NTELOS "announced initial commercial deployment of 'Portable Broadband, high speed-Internet access to go" in Charlottesville, Stuarts Draft, and Waynesboro, Va. "for business and residential users."[45] In December 2003, SR Telecom announced that its fixed wireless access product was selected by Southwest Texas Telephone Company "to deliver voice and broadband data services to previously difficult to serve areas in the state."[46] WindChannel Communications announced in December 2003 its roll-out of fixed wireless broadband in downtown Durham, N.C.[47] In November 2003, Adams NetWorks deployed fixed-wireless non-line-of-sight

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(FCC filed Sept. 3, 2003) (citing Alvairon, Inc., *The License-Exempt Wireless Broadband Market* at 8 (Apr. 2003)) ("*LEA Comments*"). The Commission's own *High-Speed Services Report* counts only 309,006 high-speed lines provided through "satellite or fixed wireless" as of June 2003, but this is likely due to the fact that the many fixed wireless lines are provided in rural areas by small providers. As the Commission notes, "we do not know how comprehensively small providers, many of which serve rural areas with relatively small populations, are represented in the data summarized here." *High-Speed Services Report* at 2.

[42] *WISPs Buck Investment Trends*, ISP-Planet (Nov. 12, 2002), http://www.isp-planet.com/research/2002/vc_trends_021112.html.

[43] NextNet Wireless News Release, *NextNet and Regional Service Providers Launch NLOS Broadband Wireless Services in Ohio, Michigan and Nebraska* (May 17, 2004). W.A.T.C.H. TV is an MMDS provider with over 10,000 customers in Ohio. SpeedNet holds MMDS licenses covering 500,000 households in northeast and mid-Michigan. Gryphon Wireless is an ITFS carrier "targeting 87,000 residential and SOHO subscribers in underserved markets" in Kearney, Neb. and the surrounding area. *Id.*

[44] NextNet Wireless News Release, *America Connect and NextNet Announce Successful Launch of Non-Line-of-Sight Broadband Wireless Trial at 2.3 GHz* (Jan. 21, 2004). The NextNet system has also been deployed by ISPs in Arizona, Iowa, Minnesota, and New Mexico. NextNet Wireless News Release, *NextNet and Regional Service Providers Launch NLOS Broadband Wireless Services in Ohio, Michigan and Nebraska* (May 17, 2004). NextNet was recently acquired by an organization backed by Craig McCaw. *See NextNet Bought by Cell-Phone Tycoon*, Minneapolis St. Paul Bus. J. at 1 (Apr. 23, 2004).

[45] NTELOS Press Release (Jan. 6, 2004), http://www.wcai.com/pdf/2004/mds_ntelosJan6.pdf. Portable Broadband will be available to approximately 50,000 households in these three cities. *Id.* NTELOS plans to expand the system later this year "to Lynchburg, VA, as well as fill out coverage in Charlottesville, and Waynesboro." *Id.* The service offers "download speeds up to 1.5 Mbps, and upload speeds up to 550 Kbps" with prices starting at $49.95 per month. Consumers can use the service to receive high-speed connection both from their homes, but also from "anywhere within the coverage area" using the "added flexibility of un-tethered non-line-of-sight access" that is "truly plug-and-play, requiring no external antenna." *Id.*

[46] SR Telecom News Release, *SR Telecom's Stride2400 Selected for Voice and Internet Project in U.S.* (Dec. 11, 2003) (Its last-mile access technology is used both for voice services as well as broadband and "provides excellent performance over long spans (11 miles) . . . resulting in reduced infrastructure deployment costs.").

[47] *WindChannel Expands; Brings Fixed Wireless Broadband Access to the EPA and Others in Durham and the Research Triangle Park*, Business Wire (Dec. 22, 2003).

broadband services to four communities in Illinois and Missouri, and has plans to expand its networks into an additional twelve communities in 2004.[48]

A number of recent fixed wireless roll-outs and trials – including by NTELOS, W.A.T.C.H. TV, Gryphon Wireless, and America Connect – have been targeted at business customers as well as residential ones.[49] According to In-Stat/MDR, more small businesses are now using fixed wireless (22 percent of SOHO businesses and 23 percent of small businesses) than ADSL (18 percent and 23 percent, respectively).[50] In-Stat/MDR also expects 35 percent of small businesses and 39 percent of SOHO businesses to begin using fixed wireless within the next 12 months.[51]

As these deployments make clear, there has been a recent surge of investment in fixed wireless. Fixed wireless providers are now "attracting significant amounts of financing from venture capital private capital investments."[52] There has likewise been significant investment by equipment suppliers.[53] For example, Intel and Nokia have begun aggressively promoting the technology.[54] Established telecom firms like Nextel also have recently invested in fixed

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[48] WaveRider Communications, Inc. News Release, *Adams NetWorks, Inc. Expands Its NetVelocity Service With WaveRider's Last Mile Solution* (Nov. 24, 2003). The WaveRider system boast speeds of up to 2.0 Mbps in a two-mile range in non-line-of-sight conditions with indoor antennas. With outdoor antennas, WaveRider's products delivers speeds of 2.0 Mbps at a range of up to five miles in non-line-of-sight conditions, and up to 25 miles with a line-of-sight connection. *See id*.

[49] *See, e.g.*, NTELOS Press Release (Jan. 6, 2004) (announcing "initial commercial deployment of 'Portable Broadband,' high speed-Internet access to go" "for business and residential users."); NextNet Wireless News Release, *NextNet and Regional Service Providers Launch NLOS Broadband Wireless Services in Ohio, Michigan and Nebraska* (May 17, 2004) (W.A.T.C.H. TV launched broadband wireless services "for business and residential subscribers in Lima, Ohio on May 1;" Gryphon Wireless offers "a broadband alternative to SOHO and residential subscribers."); NextNet Wireless News Release, *America Connect and NextNet Announce Successful Launch of Non-Line-of-Sight Broadband Wireless Trial at 2.3 GHz* (Jan. 21, 2004) (reporting the success of a fixed wireless trial in Granville County, N.C. NextNet and America Connect are working "toward the goal of creating new opportunities for business and residential populations in the Southeast.") (quoting NextNet president and CEO Guy Kelnhofer).

[50] *In-Stat/MDR December 2003 Study* at 19, Table 10.

[51] *Id*.

[52] *WISPs Buck Investment Trends*, ISP-Planet (Nov. 12, 2003), http://www.isp-planet.com/research/2002/vc_trends_021112.html; K. Beckman, *WorldCom MMDS Assets Go to BellSouth*, RCR Wireless News (May 19, 2003) ("Several fixed-wireless vendors have received investments during the past several months."); C. Nolter, *BellSouth Bids for WorldCom Unit*, Daily Deal (May 13, 2003) ("Since December, IPWireless, Aperto Networks and Soma Networks have received infusions from venture capital firms, [Yankee Group's Linda] Schroth wrote."); C.D. Marsan, *AirBand Attracts Venture Capital Largesse*, Network World ISP News Report Newsletter (Sept. 24, 2003) (AirBand, a WISP using fixed wireless technology to deliver broadband services in the Southwest, raised $10.5 million from a group of venture capital firms in the first half of 2003).

[53] *See, e.g.*, *Motorola Canopy(TM) Wireless Broadband Portfolio Expands with New 2.4GHz Product*, PR Newswire (Dec. 15, 2003); *Athena Semiconductors Closes Series B $10 Million Funding Round Led by Samsung*, Business Wire (Dec. 17, 2003); *Trango Broadband M900S 900MHz System Gains FCC Approval; Low Cost, Non-Line-of Sight Wireless Broadband Solution is Ready for Market*, Business Wire (Jan. 7, 2004); *Airspan Announces New Range of 802.16 OFDM Products*, Business Wire (Oct. 31, 2003).

[54] *See, e.g.*, M. Angell, *Techs Again Tout Fixed Wireless*, Investor's Business Daily at A06 (May 7, 2003) ("Now a group of tech companies, including Intel Corp. and Nokia Corp., wants to revive fixed wireless technology."); *Intel, Nokia, Proxim, Others Launch WiMax*, TMCnet.com News (Apr. 11, 2003) ("Intel, Nokia,

wireless.[55] According to one recent estimate, the U.S. market for broadband wireless access services is expected to grow to $3.7 billion within five years.[56] Not surprisingly, the stocks of both fixed wireless providers and equipment suppliers have risen steadily over the past year.[57]

This renaissance in fixed wireless is due to the fact that its underlying technology and economics have improved considerably. One major development is the adoption of an industry-wide standard for fixed wireless broadband – IEEE 802.16a (commonly known as WiMax)– that is designed to provide "a wireless alternative to cable, DSL and T1/E1 for last mile broadband access," and that can "also be used as complimentary technology to connect 802.11 [*i.e.*, Wi-Fi] hot spots to the Internet."[58] The new standard enables fixed wireless to be used for high-speed data transmission over much greater distances than previous standards – "up to 30 miles, with a typical cell radius of 4-6 miles."[59] It also "allows users to get broadband connectivity without needing direct line of sight with the base station," a major limitation of previous generations of

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Proxim, and a host of other companies yesterday launched WiMax, a non-profit group formed to certify and promote the developing wireless broadband standard 802.16."); M. Hachman, *Intel To Ship WiMAX Products in 2004*, EWeek (Sept. 18, 2003) ("Intel Corp. will produce integrated products that meet the 802.16 WiMAX specification by mid-2004."); R. Kay, *WiMax*, Computerworld (Dec. 1, 2003) ("Intel has now promised WiMax versions of its Centrino chip set for 2004, whereas Nokia says it will have battery and other technical issues solved in time to launch a WiMax cell phone in 2005.").

[55] Nextel recently purchased MMDS spectrum from WorldCom and Nucentrix, and has already moved well into trials of WiMAX technology. Nextel cited two potential applications for WiMAX: as an enterprise solution for offering integrated Wi-Fi, cellular and WiMAX systems; and as a parallel data network, which would allow Nextel to reach remote areas. *See* C. Nolter, *Nextel Wins Nucentrix Spectrum*, Daily Deal (Nov. 7, 2003); G. Williams, *Nextel Communications Acquires Wireless Assets*, World Markets Analysis (Nov. 10, 2003); *Nextel May Be First Major WiMAX Operator*, Blueprint Wi-Fi (Nov. 26, 2003), http://www.rethinkresearch.biz/free_page_view.asp?crypt=%B3%9C%C2%97%8C%84%86%AF%BC%C2%88%97kvn%91; *see also* V. Lipset, *Operators Wary of WiMax, Study Says*, Wi-Fi Planet (Nov. 19, 2003), http://www.wi-fiplanet.com/news/article.php/3111361. Nextel is testing a wireless broadband service using the 802.20, "Mobile Fi" standard, across a coverage area of approximately 1,300 square miles in North Carolina's Research Triangle. Nextel News Release, *Nextel Expands Successful Broadband Trial To Include Paying Customers and Larger Coverage Area* (Apr. 14, 2004).

[56] Senza-Fili Consulting Press Release, *WiMAX Poised To Dominate US$3.7bn Market for Broadband Wireless Access* (Apr. 21, 2004) (citing a new study by BWCS and Senza-Fili Consulting). *See also* R. Kay, *WiMax*, Computerworld at 34 (Dec. 1, 2003) ("Visant Strategies Inc., a market research firm in Kings Park, N.Y., predicts that WiMax product sales will reach $1 billion by 2008. According to Oyster Bay, N.Y.-based ABI Research, the market for long-range wireless products based on 802.16 and the forthcoming 802.20 standard will reach $1.5 billion by 2008.").

[57] For example, the stocks of fixed wireless equipment providers Alvarion (ALVR), California Amplifier (CAMP), Proxim (PROX), Endwave (ENWV), and Stratex Networks (STXN) rose 492 percent, 163 percent, 104 percent, 718 percent, and 65 percent, respectively, between January 2, 2003 and December 31, 2003. *See* Yahoo! Finance, *Historical Prices* and *Company Profile*, http://finance.yahoo.com (closing prices).

[58] *See* WIMAX Forum, *WIMAX Overview* at 1, *available at* http://www.wimaxforum.org (" *WIMAX Overview*"). The standard was approved by the IEEE and released January 29, 2003. WIMAX Forum, *WIMAX FAQs* at 1, *available at* http://www.wimaxforum.org (" *WIMAX FAQs*"). Initial vendor tests are scheduled for the third quarter of 2004, *WIMAX Overview* at 2, and certified equipment is expected in the market by the second half of 2004, *WIMAX FAQs* at 2.

[59] *LEA Comments* at 4; D. Pescovitz, *10 Technologies To Watch in 2004*, CNN.com (Dec. 25, 2003), http://www.cnn.com/2003/TECH/ptech/12/23/bus2.feat.tech.towatch ("802.16: WiMax enables wireless networks to extend as far as 30 miles and transfer data, voice, and video at faster speeds than cable or DSL. It's perfect for ISPs that want to expand into sparsely populated areas, where the cost of bringing in DSL or cable wiring is too high.").

fixed-wireless technology.[60] The adoption of a common standard and the fact that the technology is maturing also have caused the costs of deploying fixed wireless to drop.[61] As one industry observer notes, "[f]irms like Winstar and Teligent 'used nonstandard gear,' . . . 'Once it becomes standardized, that brings down the cost.'"[62] The new standard also enables operators to build scale more easily.[63] It is now estimated that these advances could make "last-mile WiMAX connections cheaper than cable and DSL solutions."[64]

2. Broadband over Power Lines

According to Chairman Powell, "Broadband over Power Line [BPL] has the potential to provide consumers with a ubiquitous third broadband pipe to the home."[65] Recent evidence confirms the near-term promise of this emerging broadband alternative. At least two commercial BPL rollouts are currently underway – one in Manassas, Va., the other in Cincinnati, Ohio.[66]

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[60] *WIMAX Overview* at 2; *Strategy Analytics: Fixed Wireless Broadband Heads Home*, M2 Presswire (Nov. 19, 2003) ("'Advances in the underlying technology have relaxed the line-of-sight constraints that used to make residential installations an expensive and uncertain proposition,' says Tom Elliott, Vice President of Consulting with Strategy Analytics."); *see also id. (*A single base station "provides total data rates of up to 280 Mbps . . . which is enough bandwidth to simultaneously support hundreds of businesses with T1/E1-type connectivity and thousands of homes with DSL-type connectivity."); Intel Corp., White Paper, *IEEE 802.16 and WiMAX – Broadband Access for Everyone* at 3 (2003) ("a single 'sector' of an 802.16(a) base station . . . provides sufficient bandwidth to simultaneously support more than 60 businesses with T1 connectivity.").

[61] M. Angell, *Techs Again Tout Fixed Wireless*, Investor's Business Daily at A06 (May 7, 2003) ("'With a standard in place, that makes for a better selection of chips and should bring down the price of the technology,' said Margaret LaBrecque, president of the newly established WiMax Forum. LaBrecque also serves as marketing manager for Intel's broadband wireless group."); D. Molta, *[News Without the Noise] – 802.16a: Sedan or Mack Truck?* Network Computing (Aug. 7, 2003) ("As IEEE standardizes on a metropolitan wireless MAC interface and WiMax pushes the OFDM physical-layer interface, it's predictable that the cost of base-station equipment and subscriber modems will come down."); *Fixed Wireless as Residential Access Sees Renewed Life*, Electronic News (Nov. 24, 2003) ("Reduced equipment costs, improved performance, and an aggressive set of vendors and wireless ISPs are making fixed wireless a serious broadband contender in rural towns and urban fringes.") (quoting Tom Elliott, VP, Strategy Analytics).

[62] M. Angell, *Techs Again Tout Fixed Wireless*, Investor's Business Daily at A06 (May 7, 2003) (quoting Roger Marks, Chair, 802.16 Working Group); *see also* M. Hogan, *To the WiMAX: A New Protocol Spices Up the 802.X Alphabet Soup*, Entrepreneur (Dec. 1, 2003) ("WiMAX equipment could cost less than a quarter of current technology, with prices starting under $ 2,000.") (citing Intel marketing manager Margaret LaBrecque).

[63] *WiMAX Overview* at 3 ("Easy addition of new sectors supported with flexible channels maximizes cell capacity, allowing operators to scale the network as the customer base grows.").

[64] M. Hogan, *To the WiMAX: A New Protocol Spices Up the 802.X Alphabet Soup*, Entrepreneur (Dec. 1, 2003) (citing Intel marketing manager Margaret LaBrecque); *see also* M. Stone & D. Chang, *Great Expectations for WiMAX*, Wireless Data News (Dec. 17, 2003) ("It's true that WiMAX infrastructure likely will be less expensive than existing infrastructure, and the lower entry costs will encourage new market entrants.").

[65] *Inquiry Regarding Carrier Current Systems, including Broadband over Power Line Systems*, Notice of Inquiry, 18 FCC Rcd 8498, Separate Statement of Chairman Michael K. Powell (2003); *see also Broadband*, National Journal's Technology Daily (Dec. 16, 2003).

[66] *See Plug into the Internet via Prospect Street Broadband*, Utility Connection at 2 (Feb. 2004), http://www.manassascity.org/documents/Utilities/Utility%20Connection/Utility%201_04.pdf (Prospect St. Broadband's "Zplug" service "was activated in portions of the Wellington and Battery Heights neighborhoods [in Manassas, Va.] in January, and will soon be available in other areas."); D. Kumar, *Utilities Revise Broadband-over-Power-Line Rollout Schedules*, Comm. Daily (Dec. 9, 2003) ("[O]nce the [network build-out] is completed in mid-

Other commercial BPL rollouts are planned or will be considered in the coming months.[67] BPL trials have been conducted in at least eight states by some of the nation's largest utility providers.[68] It is estimated that "one-third of electric utility companies are considering or already using BPL."[69] The Power Line Communications Association estimates that "broadband over power line will reach between 750,000 and 1 million customers by the end of 2004."[70] Independent industry analysts estimate that "BPL will encompass six million power lines by 2006, promising revenues of $3.5 billion."[71]

2004, [the city] expects to provide service to all 15,000 electric customers."); S. Kreiger, *Innovative Web Access To Shock Manassas*, Potomacnews.com (Oct. 18, 2003); *Cinergy and Current Communications To Offer Broadband Services over Power Lines*, Business Wire (Mar. 2, 2004) (announcing that companies "are beginning to offer broadband over power line (BPL) services in the greater Cincinnati, Ohio area"); D. Kumar, *Utilities Revise Broadband-over-Power-Line Rollout Schedules*, Comm. Daily (Dec. 9, 2003) ("Under current plans, Cinergy will pass 30,000-40,000 homes in Ohio in the first year and 250,000 in 3 years.").

[67] *See, e.g., Muni in Upstate New York Views BPL Project as Plan with Little Risk, Plenty of Potential*, Electric Utility Week (Dec. 1, 2003) ("DVI intends to . . . begin sales to Penn Yan's 3,000 customers, which include 355 commercial customers, in January, said Marc Burling, CEO of DVI."); D. Kumar, *Utilities Revise Broadband-over-Power-Line Rollout Schedules*, Comm. Daily (Dec. 9, 2003) ("[IdaComm] CEO Chris Britton said the technical trials would take another 2-3 months to complete, after which a market trial, which was larger in scope, was planned: 'So we will make a decision on going commercial probably in the summer of 2004.'"); *Cinergy and Current Communications To Offer Broadband Services over Power Lines*, Business Wire (Mar. 2, 2004) (BPL "expansion is planned for Northern Kentucky and Indiana").

[68] D.T. Dang, *Utilities Test Potentially Revolutionary High-Speed Data Transmission System*, Baltimore Sun (May 11, 2003) ("such as Ohio's American Electric Power, New York's Consolidated Edison and Pennsylvania Power and Light"); Amperion, Inc. Press Release, *Amperion, Inc. Announces Powerline Communications Testing Agreement with PPL Electric Utilities* (Sept. 23, 2002); Amperion, Inc. Press Release, *Amperion Announces High-Speed Powerline Trial with Progress Energy* (May 1, 2003); Current Technologies, LLC Press Release, *Cinergy and Current Technologies Conduct 100-Home Test Market of the Current Technologies Powerline Communications in Ohio* (June 24, 2002); Current Technologies, LLC Press Release, *FCC Chairman Powell Visits Current Technologies Broadband over Power Line Network in Potomac, Maryland* (April 9, 2003); *Comments of Ameren Energy Communications, Inc. at 2*, Inquiry Regarding Carrier Current Systems, including Broadband over Power Line Systems, ET Docket No. 03-104 (FCC filed July 7, 2003); IDACOMM Press Release, *Amperion and IDACOMM Launch Broadband Over Powerline (BPL) Pilot in Boise, Idaho* (Jan. 6, 2004); Comments of Main.net Communications, Ltd. at 3, *Inquiry Regarding Carrier Current Systems, including Broadband over Power Line Systems*, ET Docket No. 03-104 (FCC filed July 7, 2003); Comments of Hawaiian Electric Company, Inc. at 1, *Inquiry Regarding Carrier Current Systems, including Broadband over Power Line Systems*, ET Docket No. 03-104 (FCC filed July 2, 2003); Wall Street Transcript Corp., Investext Rpt No. 8707372, CEO Interview: Joan Freilich – Consolidated Edison Inc. – Company Report at *4 (May 2, 2003); *Muni in Upstate New York Views BPL Project As Plan with Little Risk, Plenty of Potential*, Electric Utility Week (Dec. 1, 2003). *See also Inquiry Regarding Carrier Current Systems, including Broadband over Power Line Systems*, Notice of Inquiry, 18 FCC Rcd 8498, Separate Statement of Chairman Michael K. Powell (2003) ("Power line networks are being tested today in a dozen states around the country and are a testament to the incredible innovations taking place in broadband network technologies.").

[69] J. Breen, *et al.*, Thomas Weisel Partners, *Broadband over Power Lines: Finally . . . After All Those Years* at 2 (May 3, 2004) ("*Thomas Weisel BPL Report*").

[70] W. Rodgers, *Power To Interfere?*, Tampa Tribune, MoneySense at 10 (Jan. 5, 2004). In February 2004, EarthLink invested $500,000 in BPL provider Ambient; EarthLink had teamed with Ambient in its BPL pilot with Con Edison. *See* Comm. Daily (Feb. 23, 2004).

[71] *At CompTel Fall 2003: What's The Next Big Thing*, Comm. Today (Oct. 13, 2003) (citing Gartner Group research).

The economics of deploying BPL are now very favorable, and technological hurdles have been overcome. The core infrastructure – power lines that extend to virtually every home and business in the nation – is already in place. Beyond that, "the cost for additional equipment ranges from about $50 to $250 per home passed, depending on housing density," which is "substantially less than the cost of introducing cable modem or DSL service in new areas."[72] Installation is inexpensive and quick. "A utility worker can connect a piece of communications equipment to a medium-voltage line in about 10 minutes."[73] And, "[i]n most cases, there is no need to send a truck or utility worker to each home to set up equipment. A consumer needs only to plug in a $70 power line modem, typically used for home networking."[74] Technological hurdles "also have now been economically cleared."[75] For example, transmitting a signal through power transformers, "one of the biggest obstacles to making power line communications work,"[76] can now be circumvented by no fewer than three different methods.[77]

BPL can be used to provide high-speed access at speeds comparable to or faster than DSL and cable, and at comparable prices.[78] Cinergy noted that its "[h]igh-speed Internet access in the trials achieve[d] speeds over 2 megabits/second."[79] Companies plan to sell BPL service at

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[72] C. Berg, *PPL Tests Broadband Internet Service*, Morning Call at A1 (Apr. 27, 2003); *see also* P. Davidson, *High-speed Net Coming to a Plug Near You?*, USA Today (Apr. 14, 2003) ("Costs recently have fallen to $50 to $160 per home passed, suppliers say. 'The breakthrough is that cheaper silicon has made this possible on a large scale,' says Amperion CEO Philip Hunt. This is much cheaper than what cable and phone giants had to spend beefing up their networks with fiber or copper, as well as adding broadband gear. At first, they spent $750 to $1,000 per home passed, though costs lately have fallen to $200 to $400, Jupiter's Joe Laszlo says.").

[73] *Tampa, Fla.-Area Electric Utility May Offer New Outlet for Broadband*, Tampa Tribune (Oct. 6, 2003); *id*. ("BPL is cheap to install.").

[74] D.T. Dang, *Utilities Test Potentially Revolutionary High-Speed Data Transmission System*, Baltimore Sun (May 11, 2003).

[75] Comments of Current Technologies, LLC. at 4, *Inquiry Regarding Carrier Current Systems, including Broadband over Power Line Systems*, ET Docket No. 03-104 (FCC filed July 7, 2003); *see also* J. Mears, *Broadband over Power Lines Closer to Reality*, Network World (June 2, 2003) ("Today, companies . . . have developed technology to move bits across medium- and low-voltage lines.").

[76] C. Berg, *PPL Tests Broadband Internet Service*, Morning Call at A1 (Apr. 27, 2003); *see also* P. Davidson, *High-speed Net Coming to a Plug Near You?*, USA Today (Apr. 14, 2003) ("The biggest roadblock, however, is the transformer that converts medium-voltage current (10,000 to 69,000 volts) to the low voltages (220/110) that enter your home. It can swallow data signals whole.").

[77] *See* P. Davidson, *High-speed Net Coming to a Plug Near You?*, USA Today (Apr. 14, 2003) ("Ambient and Current Technologies bypass the transformer with a special wire that carries the data, while only electric current passes through the transformer. Main.Net relies on packet-chopping technology to slip the data intact through the trash-can-sized transformer. And Amperion's Wi-Fi antennas wirelessly link the Internet signal to the customer before it gets to the transformer."); *see also* C. Berg, *PPL Tests Broadband Internet Service*, Morning Call at A1 (Apr. 27, 2003).

[78] *See* D. Kumar, *Utilities Revise Broadband-over-Power-Line Rollout Schedules*, Comm. Daily (Dec. 9, 2003) ("symmetrical speeds of 1.5 Mbps to 2 Mbps"); C. Berg, *PPL Tests Broadband Internet Service*, Morning Call at A1 (Apr. 27, 2003) ("[Main.net President Joe] Marsilii said Main.net's system can achieve speeds up to 1.8 megabits per second – faster than DSL and about as fast as the best cable modems. And, he said, the next generation of technology will be five times faster than that.").

[79] Comments of Cinergy Corp. at 1-2, *Inquiry Regarding Carrier Current Systems, including Broadband over Power Line Systems*, ET Docket No. 03-104 (FCC filed July 7, 2003).

rates comparable to or less than those of other access services.[80] For example, Prospect Street Broadband, the company with which the City of Manassas has partnered in the nation's first commercial BPL rollout, offers residential high-speed Internet access for only $26.95 per month.[81]

3. Satellite

Satellite is another broadband alternative that has begun a resurgence. As one industry observer has noted, "satellite broadband will be on the upswing again in 2004."[82]

One of the two main broadband satellite providers – Hughes Network Systems – reported 180,000 customers for its DIRECWAY service as of year-end 2003.[83] The recently approved merger between General Motors/Hughes and News Corp.[84] will allow News Corp. to "work aggressively to ensure that broadband services are available to as many American consumers as possible. . . . News Corp. believes it is critical that consumers have a vibrant set of broadband choices that compete with cable's video and broadband services on capability, quality, and price."[85] In October 2003, MCI began reselling Hughes's DIRECWAY service to "small-to-medium businesses and enterprises."[86] MCI notes that "with today's broadband satellite technology . . . you can connect remote employees and offices wirelessly while experiencing the

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[80] *See, e.g., Muni in Upstate New York Views BPL Project as Plan with Little Risk, Plenty of Potential*, Electric Utility Week (Dec. 1, 2003) ("[DVI] plans to offer basic Internet service to residents for $29.95/month, with business customers paying $89.95/month at speeds that are comparable to digital subscriber line and cable Internet service"); S. Strangmeier, *Consumers to Surf Power Lines*, Natural Gas Week (Dec. 5, 2003) ("BPL proponents claim it costs less than major cable and telephone services at about $29.95/month."); C. Berg, *PPL Tests Broadband Internet Service*, Morning Call at A1 (Apr. 27, 2003) ("[P]ower line communications will be significantly cheaper than its competitors."); A. Szoke, *Electric Utilities Try to Plug in to High-Speed Internet in Peoria, Ill., Area*, Journal Star (Apr. 22, 2003) ("Some utilities have said they may be able to offer [BPL] at a cost of $30 to $40 a month for residential users compared to the $40 to $50 average monthly charge for broadband.").

[81] *See* Prospect Street Broadband, *Products and Services*, http://www.prospectstreet.com/psb/Products/ResidentialServices.htm; D. Kumar, *Utilities Revise Broadband-over-Power-Line Rollout Schedules*, Comm. Daily (Dec. 9, 2003).

[82] R. Brown, *et al.*, *Smooth Sailing or the Perfect Storm?*, CED (Jan. 1, 2004); *see also ISCE Panelists See Big Satellite Broadband Growth*, Satellite Week (Aug. 25, 2003) ("Michael Agnostelli, SES Americom vp-business strategy, said that for the first time DBS TV services cost less…than cable TV. 'There's no reason satellite broadband can't cost less than [DSL or cable modem],' he said: 'The technology is well positioned to hit the cost point and performance point that consumers are looking for.'").

[83] DirecTV Group Inc., Form 10-K (SEC filed Mar. 17, 2004) (residential and small office/home-office customers in North America).

[84] *General Motors Corp. and Hughes Electronics Corp., Transferors, and The News Corp. Ltd., Transferee*, Memorandum Opinion and Order, MB Docket No. 03-124, FCC 03-330 (rel. Jan. 14, 2004).

[85] Consolidated Application for Authority to Transfer Control at 31, *Application of General Motors Corp. and Hughes Electronics Corp., Transferors, and The News Corp. Ltd., Transferee*, MB Docket No. 03-124 (FCC filed May 15, 2003).

[86] MCI, *Enterprise, Internet Broadband Satellite*, http://global.mci.com/us/enterprise/internet/broadbandsat/.

same advantages that many terrestrial options offers, such as speed, security and reasonable costs."[87]

The other main satellite provider – StarBand – emerged from bankruptcy in November 2003 with most of its customer base intact.[88] The company has introduced new hardware and service offerings targeted at mass-market customers that offer lower prices and higher speeds than were previously available.[89] StarBand's residential service begins at $50 a month. *See* Table 5.

Finally, WildBlue Communications plans to introduce broadband satellite service in the Ka-band during 2004.[90] The National Rural Telecommunications Cooperative (NRTC) has agreed to a distribution partnership with WildBlue, and members of NRTC will offer WildBlue's service across the country.[91] According to NRTC President and COO Bob Phillips, "[NRTC is] confident that WildBlue is the best solution to deliver affordable high-speed satellite Internet access to rural America," and that "virtually every home and small business in the continental United States will finally have access to the most advanced telecommunications services available."[92]

4. 3G Mobile Wireless

In recent months, third-generation ("3G") wireless services have taken another step closer to becoming a full-fledged competitor in the broadband market. These new 3G networks rely on IP in place of traditional communications protocols used on wireless networks,[93] enabling

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[87] *Id.*

[88] *Starband to Emerge from Bankruptcy Protection by Month's End*, Satellite Week (Nov. 24, 2003) ("Starband is expected to emerge from bankruptcy protection late this month with a revamped sales staff. . . . Starband has 38,000 subscribers, having lost 2,000 since filing for bankruptcy protection in U.S. Dist. Court, Wilmington, Del., in May 2002.").

[89] *See, e.g., StarBand Unveils Faster Modem*, Satellite News (Aug. 4, 2003) ("StarBand . . . has introduced a modem designed to provide peak download speeds of up to one megabit per second (Mbps) and upload speeds of 100 kilobits per second (Kbps)."); *Starband to Emerge from Bankruptcy Protection by Month's End*, Satellite Week (Nov. 24, 2003) ([Starband] recently introduced model 480 Pro satellite modem that's designed for small-business market . . . will be priced at $899 with a one-year contract carrying a $149 monthly fee; $599 with 2- and 3-year pacts that have $149 and $139 monthly charges. On the consumer side, Starband will continue with the model 360 satellite modem and price ranging from a starter kit at $699 with a one-year contract and a $39 monthly fee that provides download speeds up to 250 kbps to $199-$699 standard plans that are based on 2- and 3-year contracts. The 2- and 3-year agreements charge $99 a month for the first year, then drop to $59 and $49, respectively.).

[90] WildBlue Communications Press Release, *NRTC to Offer WildBlue Satellite Broadband Services* (Aug. 25, 2003) ("WildBlue will deliver affordable two-way wireless broadband services via satellite, direct to homes and small offices, throughout the continental United States in 2004. WildBlue is expected to be the first to launch the Ka-band spot beam satellite technology designed to lower the cost of providing consumers high-speed Internet access via satellite. The WildBlue system also will leverage proven terrestrial cable modem technology, resulting in lower customer equipment and installation costs; a critical requirement in satellite-based consumer services."); R. Brown, *et al., Smooth Sailing or Perfect Storm?*, CED (Jan. 1, 2004).

[91] WildBlue Communications Press Release, *NRTC to Offer WildBlue Satellite Broadband Services* (Aug. 25, 2003).

[92] *Id.*

[93] *See, e.g., Internet Protocol Phone: Communication is a Necessity*, BusinessWorld (Jan. 27, 2004) ("IP is

providers to offer advanced wireless features. One new feature that wireless providers hope to provide is Push-To-Talk,[94] which is a service that one wireless provider – Nextel – currently dominates.[95] These new wireless networks also are expected to greatly increase the use of wireless networks for data transmission,[96] and to compete directly with fixed broadband services such as cable modem and DSL in the provision of high-speed Internet access.[97]

In September 2003, Verizon Wireless launched a 3G wireless network in Washington, DC and San Diego.[98] Verizon's 3G service using EvDO technology provides Internet access at speeds of 300-500 kbps, with bursts up to 2 Mbps.[99] As one analyst notes, the download speeds of EvDO networks are "comparable to those of DSL and cable modems."[100] In January 2004, Verizon announced that it will spend over $1 billion deploying its EvDO network over the next two years, allowing it to reach many major metropolitan areas across the country.[101] This puts pressure on other wireless providers to follow suit.

AT&T Wireless has announced plans to deploy next-generation W-CDMA technology capable of providing download speeds of 384 kbps in four cities by the end of 2004.[102] Sprint

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the basis of the internet, and the standard that will eventually be used for most wireless 3G (third generation) network infrastructure.").

[94] *See, e.g.*, S. Flannery, *et al.*, Morgan Stanley, *Nextel: Quick Comment: Mixed Quarter, Churn Ticks Up* at 2 (Apr. 22, 2004) ("Cingular plans to become the fourth national carrier to offer [Push To Talk] with a launch this quarter."); R. Prentiss, *et al.*, Raymond James, *AT&T Wireless* at 4 (Apr. 26, 2004) ("[AT&T Wireless] is rethinking when to launch [Push to Talk] . . . . The reason behind the delay is not just to save capital but also to have a coordinated effort for inter (non-iDEN) carrier capability (i.e., push-to-talk calls between customers from other carriers).").

[95] *See, e.g.*, B. Bath, Lehman Brothers, *Wireless Services Industry Update: CTIA – Carriers Bullish on 04 Data* at 1 (Mar. 25, 2004) ("Nextel currently retains a significant lead over its competitors").

[96] *See, e.g.*, 10 Downing Street Press Release, *Strategy To Deliver Best Outcomes for Consumers from the Competition in Electronic Networks* (Dec. 2, 2002) ("New wireless networks, including 3G, are expected to complement wired networks for data transmission, but not to replace them."); *At Last, 3G Rollouts Show More Boom Than Bust*, Wireless Data News (Dec. 17, 2003) ("'The next generation of CDMA architecture will be driven by person-to-person communications,' said Adam Gould, CTO of CDMA for Nokia Mobile Phones. 'We'll see an evolution of voice services first, then higher-quality packet switching and then music. Data will go from downloads to more person-to-person without a fixed, PC-like IP address.'").

[97] *Merrill Lynch, Everything over IP* at 36 ("Pressure [from IP wireless] is likely to be felt in two directions, with fixed broadband and VoIP services (such as WiFi) cutting into the mobile opportunity, and mobile broadband services potentially taking some of the [High-Speed Data] market opportunity.").

[98] Verizon Wireless Press Release, *Wireless Broadband Data Service Introduced in Major Metro Areas* (Sept. 29, 2003).

[99] Verizon Wireless Press Release, *Verizon Wireless Announces Roll Out of National 3G Network* (Jan. 8, 2004).

[100] B. Richards, *et al.*, CIBC World Markets, Investext Rpt. No. 7305232, Sierra Wireless Inc. – Company Report at *2 (Mar. 6, 2003).

[101] Verizon Wireless Press Release, *Verizon Wireless Announces Roll Out of National 3G Network* (Jan. 8, 2004); V. Mamelak, Netaxis Bleichroeder, *Verizon* at 3 (Dec. 1, 2003).

[102] AT&T Wireless Press Release, *AT&T Wireless Outlines Actions It Will Take to Meet 2003 Goals* (Jan. 28, 2003) (announcing plans to rollout W-CDMA in four cities (Dallas, San Diego, San Francisco, and Seattle) by year end 2004); G. Lynch, *Dropping EDGE Could Regain Edge for AT&T*, America's Network (Feb. 1, 2001).

has begun conducting trials of EvDO.[103] Nextel is conducting a trial of Flarion's next-generation wireless platform, which provides bandwidth of between 1-3 Mbps.[104]

C. There Is Extensive Broadband Competition for Large Business Customers

Recent evidence also confirms that there is extensive competition for broadband services provided to large business customers. As Verizon has previously explained, this segment of the broadband market differs from other segments both because it is more mature, with competitors having first entered the market two decades ago, and because it is national in scope.[105] As the Commission has found, it is comprised of customers that typically demand end-to-end services provided across LATAs, states, and often countries.[106]

A January 2004 report by Schwab Soundview Capital Markets provides further confirmation of this, and shows that it is AT&T and the other large interexchange carriers – not the ILECs – that dominate this segment of the market. As the report notes, "ATM and frame relay services constitute the majority of telecom spending by businesses and nearly 85% of revenue opportunity within ATM and frame relay services is in long distance service offerings."[107] This analyst notes that, as of January 2004, AT&T, MCI, and Sprint together controlled 79 percent of the Frame Relay market and 60 percent of the ATM market.[108] And because the Frame Relay market is much larger than the ATM market, these companies' share of the combined market for broadband services provided to large businesses is approximately 75 percent.[109] AT&T's Chairman has boasted that his company is the nation's "largest private line/frame relay/ATM provider."[110]

Although some parties have argued that the IXCs often provide Frame Relay and ATM services using facilities obtained from ILECs, the fact that these carriers have nonetheless come to dominate the retail market is definitive proof that they are able to compete effectively. For example, as the D.C. Circuit recently found in analogous circumstances, the fact that IXCs may

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[103] *See, e.g.*, K. Fitchard, *Rollout Kicks Off 3G's Amazing Race*, Telephony (Oct. 6, 2003) (Sprint ran a trial of EvDO in Boise, Idaho); S. Marek, *U.S. Spotlight Shines on EV-DO*, Wireless Week (Apr. 15, 2003), http://www.wirelessweek.com/article/CA292170 (Sprint PCS affiliate Ubiquitel has been testing its own EvDO network).

[104] C. Larsen, *et al.*, Prudential Equity Group, LLC, *Wireless Services: CTIA Trade Show Take-Aways* at 3 (Mar. 24, 2004).

[105] *Verizon November 13, 2003 Ex Parte* at 17.

[106] *See, e.g., Triennial Review Order* ¶ 302 ("Enterprise market customers . . . prefer a single provider capable of meeting all their needs at each of their business locations which may be in multiple locations in different parts of the city, state or country.").

[107] M. Bowen, *et al.*, Schwab Soundview Capital Markets, *AT&T Corp.* at 2 (Jan. 21, 2004).

[108] *See id.* at 3.

[109] IDC estimated total frame-relay revenues of $7.44 billion for 2003, while total ATM revenues were estimated at $1.98 billion. *See* R. Kaplan, IDC, *U.S. Frame Relay Services Forecast, 2002-2007* at Table 2 (Mar. 2003); R. Kaplan, IDC, *U.S. ATM Services Forecast, 2002-2007* at Table 2 (Mar. 2003).

[110] David Dorman, Chairman and CEO, AT&T, *Presentation for Credit Suisse First Boston Media and Telecom Week* at 6 (Dec. 11, 2003) ("*Dorman/AT&T Presentation*").

be using special access services as an input in the broadband data services they provide to end-user customers has not changed the fact that the retail market for broadband services provided to large businesses is "rapidly expanding and prosperous," with competition "not only . . . surviv[ing] but . . . flourish[ing]."[111] In any event, these parties greatly exaggerate the limitations on the availability of competitive facilities. Time Warner Telecom has recently stated that "[w]hile [RBOCs] have lot of fiber deployed, I don't know that they have more buildings connected than we do in all cases. In certain markets they may; in others they may not.[112] In December 2003, AT&T noted that its network now "touches virtually all Fortune 1,000 companies."[113]

Moreover, the availability and use of alternative last-mile broadband facilities for large businesses is rapidly increasing, just as it is for other segments of the broadband market. A recent study by In-Stat/MDR found that 41 percent of "enterprises" (businesses with 5,000 or more employees) were using cable modem service, 40 percent were using fixed wireless, and 21 percent were using satellite, in place of or in addition to other alternatives such as high-speed ILEC lines.[114] With respect to the "middle market" (businesses with between 500 and 5,000 employees), 32 percent were using cable modem, 29 percent fixed wireless, and 9 percent were using satellite.[115] In addition, the study finds that 40 percent of enterprise businesses and 38 percent of middle-market businesses plan to use cable modem in the next 12 months, and that 54 percent and 44 percent, respectively, plan to use fixed wireless within that time.[116]

These findings are consistent with the fact that both cable operators have increasingly been going after large businesses. Cox Business Services "provides a range of advanced communications services, including high-speed Internet access . . . for companies of all sizes."[117] Cox's Business Services division estimated that it has already garnered 10-13 percent of the market (based on revenue) in areas where its services are currently available.[118] Comcast boasts that it provides "best in class fiber-based Metropolitan Area Network (MAN) services by utilizing thousands of miles of existing fiber infrastructure."[119] As the Yankee Group notes, "[t]he focus of Comcast Business Communications . . . is fiber-to-the-building and passive optical networking (PON)."[120] Time Warner Cable is "delivering cost effective, high capacity

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[111] *United States Telecom Assn. v. FCC*, No. 00-1012, Slip. Op. at 30-31 (D.C. Cir. Mar. 2, 2004).

[112] E. Gubbins, *A Conversation with Time Warner Telecom's Mike Rouleau*, TelephonyOnline (Oct. 29, 2003), http://telephonyonline.com/ar/telecom_conversation_time_warner/index.htm (quoting Mike Rouleau, Time Warner Telecom senior vice president of business development).

[113] *Dorman/AT&T Presentation* at 6.

[114] *In-Stat/MDR December 2003 Study* at 19, Table 9.

[115] *Id.*

[116] *Id.* at 19, Table 10.

[117] Cox Communications, Form 10-K (SEC filed Mar. 31, 2003).

[118] Cox Communications, presentation before the UBS Media Week Conference (Dec. 2003), http://phx.corporate-ir.net/phoenix.zhtml?c=76341&p=irol-presentations.

[119] Comcast Commercial Services, *Data Services*, http://www.comcast-ccs.com/frames.asp?section=products_and_services&page=data_description.

access solutions to several Fortune 500 customers."[121] Charter is moving "'up-market' to compete in Enterprise RFP environment;"[122] it reports that 9 percent of its business subscribers are medium or large businesses.[123]

[120] M. Lauricella, *et al*., The Yankee Group, *Cable MSOs: Ready to Take Off in the Small and Medium Business Market* at 7 (Mar. 2002).

[121] Road Runner Business Class, *High Speed Internet*, http://www.twcbroadband.com/products/hsd.php (Jan. 13, 2004).

[122] T. Cullen, senior vice president, Advanced Services, Charter Communications, presentation before the Smith Barney Citigroup Entertainment, Media & Telecommunications Conference, at 23 (Jan. 7, 2004).

[123] Charter Communications, presentation before the UBS Media Week Conference, at 19 (Dec. 11, 2003) (reporting that 91% of business customers are small businesses).

APPENDIX B
VOICE-OVER-IP PRICE COMPARISONS

Table 1. New York-Northern New Jersey-Long Island, NY-NJ-PA MSA

	Circuit-Switched				VoIP						Wireless*	
	Verizon Freedom	**AT&T One Rate USA**	**MCI Neighbor-hood Complete**	**Z-Tel Z-Line HOME Unlimited**	**Cablevision Optimum Voice**	**Vonage Premium Unlimited**	**AT&T Call Vantage**	**voiceglo Unlimited**	**VoicePulse America Unlimited**	**Packet8 Freedom Unlimited**	**Cingular Nation GSM 600**	**T-Mobile Get More (National)**
Price per Month	$60	$55	$50	$50	$35	$30	$40	$30	$35	$20	$50	$40
Taxes, Fees & Surcharges**	$15+	$15+	$14+	$14+	none	$2-$4	$4-$5	none	$1-$2	$1	$8+	$7+
Local	Unlimited				Unlimited						600 A, unltd. N/W, unltd. M-M mins; rollover	600 A, unltd. N/W minutes
Local Toll	Unlimited				Unlimited							
Long Distance	Unlimited				Unlimited							
International	Unlimited to Canada				Unlimited to Canada			Unlimited to Canada				
Call Waiting	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Caller ID	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Call Forwarding	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
Voicemail	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓

* Abbreviations used for wireless plans: A – Anytime; N/W – Night/Weekend; M-M – Mobile-to-Mobile; unltd. – unlimited; rollover – unused minutes are carried over to the next billing cycle.

** Taxes, fees, and surcharges are approximate.

Table 2. Los Angeles-Long Beach-Santa Ana, CA MSA

	Circuit-Switched				VoIP					Wireless*	
	SBC All Distance Connections	**Comcast Connections Any Distance**	**MCI Neighbor-hood Complete**	**Z-Tel Z-Line HOME Unlimited**	**Vonage Premium Unlimited**	**AT&T Call Vantage**	**voiceglo Unlimited**	**VoicePulse America Unlimited**	**Packet8 Freedom Unlimited**	**Cingular Nation GSM 600**	**T-Mobile Get More (National)**
Price per Month	$49	$49	$40	$50	$30	$40	$30	$35	$20	$50	$40
Taxes, Fees & Surcharges**	$12+	$12+	$11+	$12+	$2	$5	none	$1	$1	$8+	$7+
Local	Unlimited				Unlimited					600 A, unltd. N/W, unltd. M-M mins; rollover	600 A, unltd. N/W minutes
Local Toll	Unlimited				Unlimited						
Long Distance	Unlimited				Unlimited						
International					Unlimited to Canada		Unlimited to Canada				
Call Waiting	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Caller ID	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Call Forwarding				✓	✓	✓	✓	✓	✓	✓	✓
Voicemail	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓

* Abbreviations used for wireless plans: A – Anytime; N/W – Night/Weekend; M-M – Mobile-to-Mobile; unltd. – unlimited; rollover – unused minutes are carried over to the next billing cycle.

** Taxes, fees, and surcharges are approximate.

Table 3. Chicago-Naperville-Joliet, IL-IN-WI MSA

	Circuit-Switched					VoIP				Wireless*	
	SBC All Distance Connections	**Comcast Connections Any Distance**	**AT&T One Rate USA**	**MCI Neighbor-hood Complete**	**Z-Tel Z-Line HOME Unlimited**	**Vonage Premium Unlimited**	**voiceglo Unlimited**	**VoicePulse America Unlimited**	**Packet8 Freedom Unlimited**	**Cingular Nation GSM 600**	**T-Mobile Get More (National)**
Price per Month	$49	$49	$49	$50	$50	$30	$30	$35	$20	$50	$40
Taxes, Fees & Surcharges**	$12+	$12+	$12+	$12+	$12+	$2	none	$1	$1	$8+	$7+
Local	Unlimited					Unlimited				600 A, unltd. N/W, unltd. M-M mins; rollover	600 A, unltd. N/W minutes
Local Toll	Unlimited					Unlimited					
Long Distance	Unlimited					Unlimited					
International						Unlimited to Canada					
Call Waiting	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Caller ID	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Call Forwarding			✓		✓	✓	✓	✓	✓	✓	✓
Voicemail	✓			✓	✓	✓	✓	✓	✓	✓	✓

* Abbreviations used for wireless plans: A – Anytime; N/W – Night/Weekend; M-M – Mobile-to-Mobile; unltd. – unlimited; rollover – unused minutes are carried over to the next billing cycle.

** Taxes, fees, and surcharges are approximate.

Table 4. Philadelphia-Camden-Wilmington, PA-NJ-DE-MD MSA

	Circuit-Switched					VoIP				Wireless*	
	Verizon Freedom	**RCN Megaphone**	**AT&T One Rate USA**	**MCI Neighbor-hood Complete**	**Z-Tel Z-Line HOME Unlimited**	**Vonage Premium Unlimited**	**voiceglo Unlimited**	**VoicePulse America Unlimited**	**Packet8 Freedom Unlimited**	**Cingular Nation GSM 600**	**T-Mobile Get More (National)**
Price per Month	$55	$50	$50	$50	$50	$30	$30	$35	$20	$50	$40
Taxes, Fees & Surcharges**	$13+	$13+	$13+	$13+	$13+	$2	none	$1-$2	$1	$8+	$7+
Local	Unlimited					Unlimited				600 A, unltd. N/W, unltd. M-M mins; rollover	600 A, unltd. N/W minutes
Local Toll	Unlimited					Unlimited					
Long Distance	Unlimited					Unlimited					
International	Unlimited to Canada					Unlimited to Canada					
Call Waiting	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Caller ID	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Call Forwarding	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
Voicemail	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓

* Abbreviations used for wireless plans: A – Anytime; N/W – Night/Weekend; M-M – Mobile-to-Mobile; unltd. – unlimited; rollover – unused minutes are carried over to the next billing cycle.

** Taxes, fees, and surcharges are approximate.

Table 5. Dallas-Fort Worth-Arlington, TX MSA

	Circuit-Switched					VoIP					Wireless*	
	SBC All Distance Connections	**Comcast Connections Any Distance**	**AT&T One Rate USA**	**MCI Neighbor-hood Complete**	**Z-Tel Z-Line HOME Unlimited**	**Vonage Premium Unlimited**	**AT&T Call Vantage**	**voiceglo Unlimited**	**VoicePulse America Unlimited**	**Packet8 Freedom Unlimited**	**Cingular Nation GSM 600**	**T-Mobile Get More (National)**
Price per Month	$49	$50	$49	$50	$50	$30	$40	$30	$35	$20	$50	$40
Taxes, Fees & Surcharges**	$12+	$13+	$12+	$13+	$13+	$2	$5	none	$1	$1	$8+	$7+
Local	Unlimited					Unlimited					600 A, unltd. N/W, unltd. M-M mins; rollover	600 A, unltd. N/W minutes
Local Toll	Unlimited					Unlimited						
Long Distance	Unlimited					Unlimited						
International						Unlimited to Canada		Unlimited to Canada				
Call Waiting	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Caller ID	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Call Forwarding			✓		✓	✓	✓	✓	✓	✓	✓	✓
Voicemail	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓

* Abbreviations used for wireless plans: A – Anytime; N/W – Night/Weekend; M-M – Mobile-to-Mobile; unltd. – unlimited; rollover – unused minutes are carried over to the next billing cycle.

** Taxes, fees, and surcharges are approximate.

Table 6. Miami-Fort Lauderdale-Miami Beach, FL MSA										
	Circuit-Switched				**VoIP**				**Wireless***	
	BellSouth Value Answers Premier	**AT&T One Rate USA**	**MCI Neighbor-hood Complete**	**Z-Tel Z-Line HOME Unlimited**	**Vonage Premium Unlimited**	**voiceglo Unlimited**	**VoicePulse America Unlimited**	**Packet8 Freedom Unlimited**	**Cingular Nation GSM 600**	**T-Mobile Get More (National)**
Price per Month	$55	$55	$50	$50	$30	$30	$35	$20	$50	$40
Taxes, Fees & Surcharges**	$14+	$14+	$13+	$13+	$2	none	$1	$1	$8+	$7+
Local	Unlimited				Unlimited				600 A, unltd. N/W, unltd. M-M mins; rollover	600 A, unltd. N/W minutes
Local Toll	Unlimited				Unlimited					
Long Distance	Unlimited				Unlimited					
International					Unlimited to Canada					
Call Waiting	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Caller ID	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Call Forwarding	✓	✓		✓	✓	✓	✓	✓	✓	✓
Voicemail			✓	✓	✓	✓	✓	✓	✓	✓

* Abbreviations used for wireless plans: A – Anytime; N/W – Night/Weekend; M-M – Mobile-to-Mobile; unltd. – unlimited; rollover – unused minutes are carried over to the next billing cycle.

** Taxes, fees, and surcharges are approximate.

Table 7. Washington-Arlington-Alexandria, DC-VA-MD-WV MSA

	Circuit-Switched				VoIP				Wireless*	
	Verizon Freedom	**Starpower Ultra Unlimited Long Distance**	**MCI Neighbor-hood Complete**	**Z-Tel Z-Line HOME Unlimited**	**Vonage Premium Unlimited**	**voiceglo Unlimited**	**VoicePulse America Unlimited**	**Packet8 Freedom Unlimited**	**Cingular Nation GSM 600**	**T-Mobile Get More (National)**
Price per Month	$50	$52	$50	$50	$30	$30	$35	$20	$50	$40
Taxes, Fees & Surcharges**	$10+	$10+	$10+	$10+	$2	none	$1	$1	$8+	$7+
Local	Unlimited				Unlimited				600 A, unltd. N/W, unltd. M-M mins; rollover	600 A, unltd. N/W minutes
Local Toll	Unlimited				Unlimited					
Long Distance	Unlimited				Unlimited					
International	Unlimited to Canada				Unlimited to Canada					
Call Waiting	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Caller ID	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Call Forwarding	✓	✓		✓	✓	✓	✓	✓	✓	✓
Voicemail	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

* Abbreviations used for wireless plans: A – Anytime; N/W – Night/Weekend; M-M – Mobile-to-Mobile; unltd. – unlimited; rollover – unused minutes are carried over to the next billing cycle.

** Taxes, fees, and surcharges are approximate.

Table 8. Houston-Baytown-Sugar Land, TX MSA

	Circuit-Switched				VoIP					Wireless*	
	SBC All Distance Connections	**AT&T One Rate USA**	**MCI Neighbor-hood Complete**	**Z-Tel Z-Line HOME Unlimited**	**Vonage Premium Unlimited**	**AT&T Call Vantage**	**voiceglo Unlimited**	**Packet8 Freedom Unlimited**	**BroadVoice Unlimited USA**	**Cingular Nation GSM 600**	**T-Mobile Get More (National)**
Price per Month	$49	$49	$50	$50	$30	$40	$30	$20	$20	$50	$40
Taxes, Fees & Surcharges**	$12+	$12+	$13+	$13+	$2	$5	none	$1	$2	$8+	$7+
Local	Unlimited				Unlimited					600 A, unltd. N/W, unltd. M-M mins; rollover	600 A, unltd. N/W minutes
Local Toll	Unlimited				Unlimited						
Long Distance	Unlimited				Unlimited						
International					Unlimited to Canada		Unlimited to Canada				
Call Waiting	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Caller ID	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Call Forwarding		✓		✓	✓	✓	✓	✓	✓	✓	✓
Voicemail	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓

* Abbreviations used for wireless plans: A – Anytime; N/W – Night/Weekend; M-M – Mobile-to-Mobile; unltd. – unlimited; rollover – unused minutes are carried over to the next billing cycle.

** Taxes, fees, and surcharges are approximate.

Table 9. Atlanta-Sandy Springs-Marietta, GA MSA

	Circuit-Switched					VoIP				Wireless*	
	BellSouth Value Answers Premier	**Comcast Connections Any Distance**	**AT&T One Rate USA**	**MCI Neighbor-hood Complete**	**Z-Tel Z-Line HOME Unlimited**	**Vonage Premium Unlimited**	**voiceglo Unlimited**	**VoicePulse America Unlimited**	**Packet8 Freedom Unlimited**	**Cingular Nation GSM 600**	**T-Mobile Get More (National)**
Price per Month	$55	$50	$50	$50	$50	$30	$30	$35	$20	$50	$40
Taxes, Fees & Surcharges**	$14+	$13+	$13+	$13+	$13+	$2	none	$1	$1	$8+	$7+
Local	Unlimited					Unlimited				600 A, unltd. N/W, unltd. M-M mins; rollover	600 A, unltd. N/W minutes
Local Toll	Unlimited					Unlimited					
Long Distance	Unlimited					Unlimited					
International						Unlimited to Canada					
Call Waiting	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Caller ID	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Call Forwarding	✓		✓		✓	✓	✓	✓	✓	✓	✓
Voicemail				✓	✓	✓	✓	✓	✓	✓	✓

* Abbreviations used for wireless plans: A – Anytime; N/W – Night/Weekend; M-M – Mobile-to-Mobile; unltd. – unlimited; rollover – unused minutes are carried over to the next billing cycle.

** Taxes, fees, and surcharges are approximate.

Table 10. Detroit-Warren-Livonia, MI MSA

	Circuit-Switched					VoIP				Wireless*	
	SBC All Distance Connections	**Comcast Connections Any Distance**	**AT&T One Rate USA**	**MCI Neighbor-hood Complete**	**Z-Tel Z-Line HOME Unlimited**	**Vonage Premium Unlimited**	**voiceglo Unlimited**	**VoicePulse America Unlimited**	**Packet8 Freedom Unlimited**	**Cingular Nation GSM 600**	**T-Mobile Get More (National)**
Price per Month	$49	$49	$49	$50	$50	$30	$30	$35	$20	$50	$40
Taxes, Fees & Surcharges**	$11+	$11+	$11+	$11+	$11+	$2	none	$1	$1	$8+	$7+
Local	Unlimited					Unlimited				600 A, unltd. N/W, unltd. M-M mins; rollover	600 A, unltd. N/W minutes
Local Toll	Unlimited					Unlimited					
Long Distance	Unlimited					Unlimited					
International						Unlimited to Canada					
Call Waiting	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Caller ID	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Call Forwarding			✓		✓	✓	✓	✓	✓	✓	✓
Voicemail	✓			✓	✓	✓	✓	✓	✓	✓	✓

* Abbreviations used for wireless plans: A – Anytime; N/W – Night/Weekend; M-M – Mobile-to-Mobile; unltd. – unlimited; rollover – unused minutes are carried over to the next billing cycle.

** Taxes, fees, and surcharges are approximate.

APPENDIX C
ADDITIONAL VOIP SERVICES

Plan	Service Price	Local/Local Toll/ Long Distance	Required Equipment*
American Int'l Telephonics	prepaid minutes	4.9¢/min. to PSTN	free software
BuddyTalk	free	unlimited to BuddyTalk users; 4¢/min. (prepaid) to PSTN	free software
Crystal Voice LIVE	$19.99/yr. (renew for $14.95/yr.)	unlimited to LIVE users; 3.9¢/min.to PSTN	free software
Dialpad Monthly 300	$7.50	300 min.	free software
Dialpad Monthly 500	$9.99	500 min.	free software
Dialpad Monthly 1200	$19.99	1200 min.	free software
Free IP Call	free	unlimited to Free IP users	SIP telephone or SIP software
Free World Dialup	free	unlimited to FWD & partner members	IP phone or free FWD software
iConnectHere Per Minute	none	2.4¢/min.+	free software
iConnectHere N. America 400	$5.95	400 min.	free software
iConnectHere N. America 1000	$10.95	1000 min.	free software
ICQPhone	free	unlimited to ICQPhone users; 2¢/min. (prepaid) to PSTN	free software
InPhonex Basic Membership	free	unlimited to InPhonex members	free software
InPhonex Premium Membership	$19.99/yr.	300 min. to PSTN + choice of prepaid long-distance options: 125-1250 min. for $4.95-$39.95	free software
MeritCall FreedomFone	activation fee: $19.99 (currently waived)	unlimited to MeritPhone users; 1.9¢/min. to PSTN	FreedomFone
Net2Phone VoiceLine Basic	$8.99	unlimited inbound; 2.9¢/min. outbound	Innomedia MTA3328-2 Telephone Adapter
Net2Phone VoiceLine	$9.99	unlimited to VoiceLine users; unlimited inbound/300 min. outbound to PSTN	Innomedia MTA3328-2 Telephone Adapter
	$14.99	unlimited to VoiceLine users; unlimited inbound/500 min. outbound to PSTN	
Primus Talk	prepaid minutes	3.9¢/min.	free software
SIP Phone	free	unlimited to anyone with a SIPphone or SIPadapter	SIPphone or SIPadapter
SIP Phone Virtual Number	$3.99/mo. (6 mo.) or $2.99/mo. (1 yr.)	3¢/min.	SIPphone or SIPadapter
Skype	free	unlimited to Skype users	free software
SnapTel	prepaid minutes	2.9¢/min.	free software
TechTerra TerraCall	free	unlimited SIP-to-SIP; 1.49¢/min. (prepaid) to PSTN	free software

*In addition to PC sound card and handset or headset.
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APPENDIX D
TABLE & FIGURE SOURCES

Table 1. Deployment and Availability of VoIP Services

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Appendix A. Broadband Competition: May 2004

Table 1. Cable Modem and DSL Subscriber Growth: 3Q 2003-1Q 2004

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Table 6. Typical Small-Business Offerings by Alternative Broadband Providers

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StarBand. StarBand, *StarBand Small Office*, http://www.starband.com/smalloffice/more.asp; StarBand, *StarBand Small Office*, http://www.starband.com/smalloffice/index.asp; StarBand, *StarBand Telecommuter*, http://www.starband.com/telecommuter/index.asp.

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Appendix B. Voice-over-IP Price Comparisons

Tables 1-10.

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MCI. MCI, *The Neighborhood Built by MCI*, http://www.theneighborhood.com/res_local_service/jsps/default.jsp.

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Packet8. Packet8, *Area Codes and Rate Centers*, http://www.packet8.net/about/areacodes.asp; Packet8, *Residential Plans*, http://www.packet8.net/about/services.asp; Packet8, *FAQs (Taxes)*, http://www.packet8.net/support/faqs/index.asp?action=ViewFAQ&SolutionID=158.

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BuddyTalk. BuddyTalk, *What is BuddyTalk*, http://www.buddytalk.com/what-is.htm; Buddy Talk, *Frequently Asked Questions*, http://www.buddytalk.com/faq.htm; Buddy Talk, *PC-to-Phone Calling Rates*, http://www.buddytalk.com/pc-to-phone-rates.html.

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Free IP Call. Free IP Call, *About Us*, http://www.freeipcall.com/rubrique_en.php?id_rubrique=11#txt_64.

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SIPphone. SIPphone, *Home*, http://www.sipphone.com/; *SIPphone*: SIPphone, *Virtual*, http://sipphone.com/virtual/SIPphone, *Minutes*, http://sipphone.com/minutes/; SIPphone, *Learn How it Works*, http://sipphone.com/learn/.

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