Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Review of the Section 251 Unbundling	)	
Obligations of Incumbent Local	)	CC Docket No. 01-338
Exchange Carriers	)	
	)	
Implementation of the Local Competition	)	
Provisions in the Telecommunications	)	CC Docket No. 96-98
Act of 1996	)	
	)	
Deployment of Wireline Services	)	
Offering Advanced Telecommunications	)	CC Docket No. 98-147
Capability	)	

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Prepared for and Submitted by
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TABLE OF CONTENTS

I. COMPETITIVE OVERVIEW I-1

A. Competitive Facilities and Networks. I-1

B. Competitive Lines Served. I-5

C. Capital Investment I-10

D. Revenues. I-12

E. Outlook. I-15

II. LOCAL SWITCHING II-1

A. CLEC Circuit Switches. II-4

1. Geographic Areas Served by CLEC Circuit Switches. II-5

2. Use of CLEC Switches To Serve Mass-Market Customers. II-10

B. Packet Switches as Substitutes for Circuit Switches. II-20

C. Wireless Switches as Substitutes for Circuit Switches. II-33

III. INTEROFFICE TRANSPORT III-1

A. Fiber-Based Collocation. III-1

B. CLEC Fiber. III-6

C. Wholesale Suppliers of Local Fiber. III-8

IV. LOCAL LOOPS IV-1

A. High-Capacity Loops. IV-1

1. CLEC Fiber as a Substitute for High-Capacity ILEC Loops. IV-1

2. CLECs Are Making Little Use of Unbundled High-Capacity Loops. IV-6

B. POTS Loops. IV-8

1. Cable Networks as Substitutes for ILEC Loops IV-9

2. Mobile Wireless as Substitute for POTS Loops IV-12

3. Direct Competitive Overbuild of ILEC Loops. IV-15

C. Broadband Loops. IV-18

V. FACILITIES-BASED COMPETITION VERSUS RESALE V-1

A. Efficient Facilities-Based Entry. V-3

1. Incremental Development of Facilities-Based Competition. V-4

2. Economies of Scope and Scale..... V-6

3. Emergence of Competitive Resale Markets. V-9

4. Geographic Expansion V-11

B. The Failure of Non Facilities-Based Competition. V-13

1. The Failure of UNE-Platform Competition. V-14

2. The Failure of the DLEC Model. V-14

C. Anti-Competitive Impacts of Expanding UNEs into Competitive Markets. V-18

1. Conversion of Special Access Circuits to UNEs. V-18

2. Conversion of Transmission Services for Wireless Carriers. V-20

3. Conversion of Broadband Services for Information Service Providers. V-22

D. Facilities-Based Investment in New Broadband Infrastructure. V-22

APPENDICES

APPENDIX A. ESTIMATING CLEC LINES

APPENDIX B. CLEC CIRCUIT SWITCHES

APPENDIX C. WIRE CENTERS IN THE TOP 100 MSAS WHERE CLECS HAVE ACQUIRED CUSTOMERS THROUGH PORTED NUMBERS

APPENDIX D. RATE EXCHANGE AREAS IN THE TOP 100 MSAS WHERE CLECS HAVE OBTAINED NXX CODES

APPENDIX E. CLEC PACKET SWITCHES

APPENDIX F. WIRELESS SWITCHES

APPENDIX G. COMPETITIVE COLLOCATION PROVIDERS IN THE TOP 50 MSAS

APPENDIX H. HOT-CUT PERFORMANCE

APPENDIX I. CLECS PROVIDING ATM AND FRAME RELAY

APPENDIX J. ADDITIONAL INFORMATION ON SOFTSWITCHES

APPENDIX K. CLEC NETWORKS BY MSA

APPENDIX L. ESTIMATING CLEC SPECIAL ACCESS MARKET SHARE

APPENDIX M. ADDITIONAL SOURCES (including full citations for short cites used in this report)

I. COMPETITIVE OVERVIEW

The Commission conducted its last comprehensive review of local exchange competition in 1999. Since that time, CLEC customer bases have been growing at significant rates, more than tripling in the last three years. ILECs are losing roughly an equal number of lines to wireless and cable networks as they are to wireline CLECs. At least 10 million wireline access lines already have migrated to wireless networks, and several million more have migrated to cable networks. For three years running, the number of lines served by ILECs has declined – a trend never witnessed before in a century of growth of telephone service. And competitive alternatives are available to far greater numbers than are actually subscribing today.

A. Competitive Facilities and Networks.

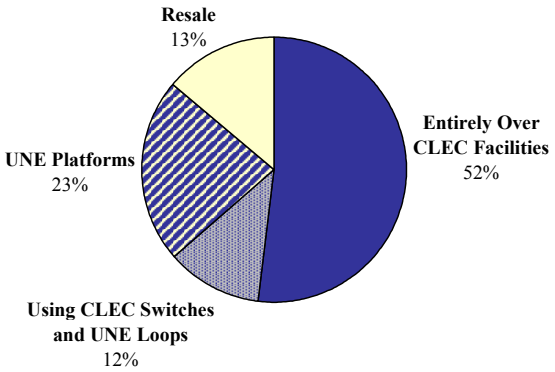
The competitive networks of CLECs, wireless carriers, and broadband providers have all grown significantly in the three years since the Commission conducted its last comprehensive UNE review. *See* Table 1. The number of cities with CLEC networks has increased by more than 70 percent, CLEC fiber has grown by more than 80 percent, CLEC circuit switches and packet switches have both nearly doubled, and buildings served by CLECs have more than tripled. *See id*. CLECs now serve more lines using entirely their own facilities (including their own local switches and loops) than they do by relying entirely on ILEC networks (through resale or the UNE Platform). *See* Figure 1. All of these figures are conservative, because they are drawn from public sources or from the necessarily limited data available to the BOCs.

Table 1. Competitive Networks

		YE 1998	YE 2001
Wireline CLECs	Cities with Voice Networks	540	930
	Circuit Switches	700	1,300
	Packet Switches	860	1,700
	Route Miles of Fiber (local and long-haul)	100,000	184,000
	Average Number of CLEC Networks in Top 100 MSAs	10	16
	Buildings Served (on- and off-net)	106,000	330,000
	Homes with access to cable telephony service	<2,000,000	>10,000,000
Wireless	% of population in counties with 3 or more wireless operators	n/a	>91
	% of population in counties with 5 or more wireless operators	n/a	>75
	Wireless Carriers Offering Data Services	2	7
Broadband	% of homes with access to cable modem service	20	66-77
	% of homes with access to two-way satellite	0	>90
	Markets with MMDS	0	58

Sources: See Appendix M.

Figure 1. Breakdown of CLEC Lines by Mode of Entry*



*The number of lines provided entirely over CLEC facilities and using CLEC switches is based on the number of E911 listings CLECs have obtained. Because the actual number of lines that CLECs are serving with their own switches is likely much higher, this method will, if anything, understate the percentage of all lines that CLECs are serving in whole or in part over facilities they have deployed themselves. The number of lines that CLECs are serving entirely over CLEC facilities was derived by subtracting the total number of stand-alone POTS loops from the total number of CLEC E911 listings.

Switches.[1] At the time of the last UNE review, CLECs had deployed approximately 700 traditional local circuit switches. Today, CLECs operate approximately 1,300 *known* local circuit switches. CLECs are now using their switches to serve no fewer than *16 million* local lines, and *likely closer to 23 million* local lines, a more than three-fold increase since 1998. CLEC switches are now so geographically widespread that they are being used to serve actual local customers in wire centers that contain approximately *86 percent* of the Bell companies' access lines.

CLECs are using their switches to serve mass-market customers as well as large business customers. As of year-end 2001, CLECs were serving at least *three million* residential lines using their own switches, and were offering service to millions more. Circuit-switched cable telephony has been deployed in 20 states and is now available to more than 10 million U.S. homes – approximately 10 percent of the mass market. Cable telephony is now available ubiquitously in some smaller states (*e.g.*, Cox service in Rhode Island) and to a large and growing fraction of homes in a number of larger states (*e.g.*, AT&T service in and around Pittsburgh, Boston, Chicago, and the Bay Area, and Cox service in San Diego, Orange County, and the Tidewater area of Virginia).

Packet and wireless switches are now placing significant, additional competitive pressure on the ILECs' traditional circuit switches. Some eight million users now have broadband cable or wireless data links that terminate directly on a competitive packet switch, bypassing ILEC circuit switches altogether. Since the last UNE review, the installed base of the CLECs' *known* packet switches has nearly doubled, from 860 to more than 1,700. The number of wireless subscribers has increased from about 69 million as of year-end 1998, to an estimated 130 million today. A rapidly growing number of subscribers are using wireless service as a substitute for second and additional lines, and some consumers have abandoned wireline service entirely in favor of wireless. And wireless switches are displacing *usage* on wireline switches even more

[1] *See* Section II.

rapidly. Wireless carriers have deployed hundreds of switches, which handle an estimated 12 percent of all U.S. phone calls.

Interoffice Transport.[2] It is clearly economical for competitors to run fiber-optic networks to a large fraction of ILEC wire centers. Since the time of the last UNE review, CLECs have increased their fiber networks from approximately 100,000 route miles to at least 184,000 route miles, and the majority of this fiber is used for local transport. The number of CLEC networks in the 150 largest MSAs – which encompass nearly 70 percent of the U.S. population – has grown from approximately 1,100 to approximately 1,800 in the last three years. Local fiber also is now being supplied to CLECs by carrier-agnostic wholesale suppliers, utility companies, and interexchange carriers. CLECs are now using their own fiber networks to capture between 28 and 39 percent of all revenues for special access services, which are provided through a combination of transport and high-capacity loops.

CLECs that provide competitive transport typically do so by collocating transmission equipment in an ILEC central office and connecting that equipment to their own fiber-optic network. This "fiber-based collocation" supplies the simplest and most unambiguous indicator of the extent of competition in the transport market. As of year-end 2001, one or more CLECs had obtained fiber-based collocation in BOC wire centers that contain more than half of all business lines served by the Bell companies. As of that same date, one or more CLECs had obtained fiber-based collocation in more than 60 percent of all BOC wire centers with more than 10,000 business lines. These figures are highly conservative because, with all the competitive fiber that has been deployed, a considerable amount of traffic also now bypasses ILEC wire centers completely.

High-Capacity Loops.[3] CLEC fiber networks now pass through a large number of commercial office buildings, which contain an even larger number of high-volume customers. CLECs now serve at least 156 million voice-grade equivalent circuits, the majority of which are provided over high-capacity lines. And CLEC fiber networks are now so extensive that they readily can be – and routinely are – extended as needed to pick up additional traffic from new, off-net customers. CLECs accordingly serve the vast majority of their customers using their own last-mile facilities. For example, CLECs serve between four and seven times more business customers over high-capacity fiber that the CLECs own themselves, than they do over loops obtained from ILECs. CLECs have purchased only 70,000 high-capacity loops in the four BOCs' regions combined. Virtually all of the high-capacity loops that CLECs have purchased are DS-1 loops; CLECs have purchased only 140 DS-3 loops, and not a single loop above the DS-3 level.

POTS Loops.[4] Technologies that compete directly against traditional POTS loops are rapidly being deployed across the country. Cable telephony services were available in only a few markets at the time of the last UNE review. Today, they have been expanded to the point where they are now offered to more than 10 percent of all U.S. homes; that figure is projected to

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[2] *See* Section III.

[3] *See* Section IV.A.

[4] *See* Section IV.B.

rise rapidly over the next few years. As noted above, cable telephony is now available ubiquitously in some smaller states and to a large and growing fraction of homes in a number of larger states.

Wireless services compete much more significantly against wireline than they did at the time of the last UNE review. The quality of wireless services has improved significantly in the last three years, and prices have dropped dramatically. More than 90 percent of the U.S. population now lives in counties served by three or more mobile wireless operators; more than three-quarters of the population live in counties served by five or more. Two in five Americans have a mobile phone.

Broadband Loops.[5] Broadband loops represent an increasing share of all loops provided to mass-market customers – more than 6 percent as of year-end 2001. Broadband cable modem service is now available to more than two-thirds of the residential population. Cable operators serve more than twice the number of broadband subscribers as ILEC networks, and satellite and fixed wireless providers offer additional competition. Two satellite providers now offer two-way broadband service nationwide. Broadband wireless services also are much more widely available today than they were three years ago.

Interconnection of Competitive Networks and ILEC Networks. Since the last UNE review, CLECs have significantly increased the level of interconnection between their networks and ILEC networks, and the amount of traffic exchanged between them. *See* Table 2. The number of CLEC collocation arrangements has grown nearly six-fold since the Commission conducted the last UNE review. *See id.* End offices serving more than 80 percent of all BOC access lines now have one or more CLEC collocators.[6] The number of CLEC interconnection trunks has more than quadrupled since the last UNE review. *See* Table 2. Minutes of traffic exchanged on these trunks have increased by about five-fold. *See id.*

Table 2. Interconnection of CLEC and ILEC Facilities

	Collocation Arrangements		Interconnection Trunks		Minutes Exchanged	
	1998	**2001**	**1998**	**2001**	**1998**	**2001**
Verizon*	1,100	7,000	663,000	3.4 million	32 billion	193 billion
SBC**	2,000	9,900	541,000	3.1 million	23 billion	125 billion
BellSouth	870	4,700	326,000	1.3 million	21 billion	98 billion
Qwest	240	3,300	285,000	927,000	20 billion	78 billion
Total	**4,300**	**24,900**	**2 million**	**9 million**	**96 billion**	**493 billion**

Totals may not equal sum of parts due to rounding. *1998 collocation arrangements exclude the former GTE service area. Minutes exchanged data exclude CLEC-terminated minutes for the former GTE service area. **1998 minutes exchanged data exclude the Ameritech service area.

[5] *See* Section IV.C.

[6] *See* Section II.A, Table 10.

B. Competitive Lines Served.

Since the last UNE review, CLECs, wireless, and broadband providers have very significantly increased the number of customers and lines that they serve. *See* Table 3. There has been especially large growth in the number of lines that CLECs serve with their own facilities. By contrast, ILEC access lines have steadily declined in each of the last three years, an unprecedented trend in a century of steady annual growth. *See* Figure 2.

CLECs serve no fewer than 16 million lines and likely closer to 23 million lines – including approximately three million residential lines – wholly or partially over facilities they have deployed themselves, facilities that invariably include their own local switches.[7] These line totals represent a more than three-fold increase since 1998, and a more than thirty-fold increase in facilities-based residential lines. Many of the lines that CLECs serve are high-capacity lines; CLECs now serve at least 156 million voice-grade equivalent circuits.[8] CLECs also serve more than 9 million lines – including more than 5 million residential lines – via resale of ILEC service or through the UNE Platform. The corresponding figures three years ago were approximately 2.7 million CLEC lines, including 1.5 million residential lines. Today, the largest CLECs serve more than one million access lines each, and large numbers of CLECs serve 500,000 or more. *See* Figure 3.

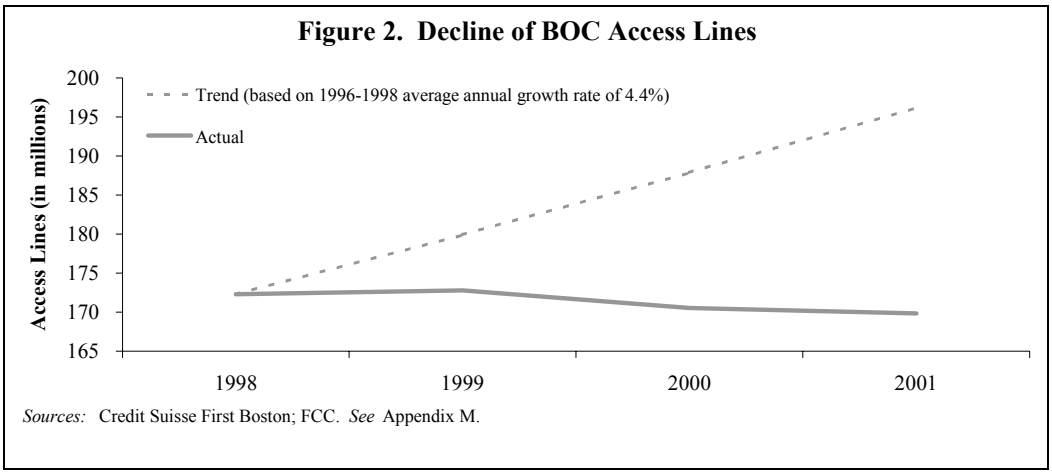
Table 3. Competitive Lines/Subscribers

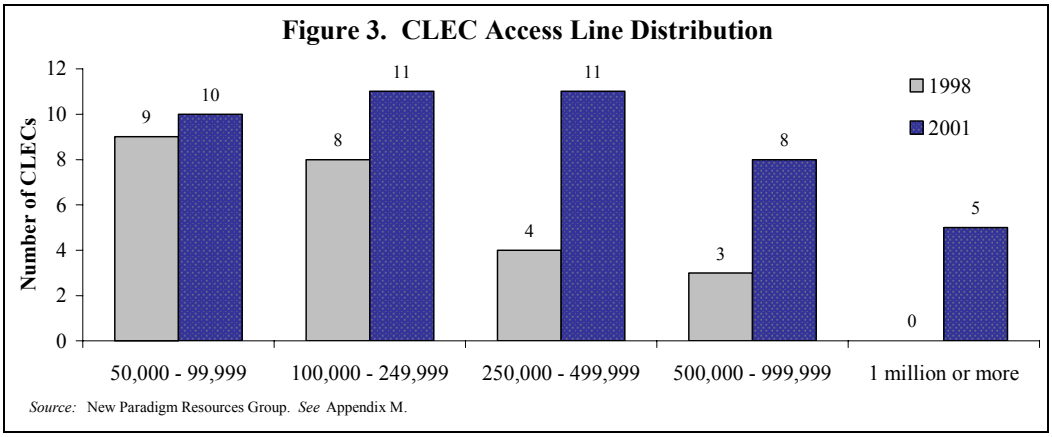
		YE 1998	YE 2001
Wireline CLECs	Facilities-Based Business Lines	5-6 million	13-20 million
	Facilities-Based Residential Lines	>80,000	3 million
	Resale/UNE-P Business Lines	1.2 million	3.8 million
	Resale/UNE-P Residential Lines	1.5 million	5.6 million
Wireless	Wireless Subs.	69 million	130 million
	Wireless Data Subs.	n/a	6.7 million
Broadband	Cable Modem Subs.	<300,000	7.5 million
	Fixed Wireless/Satellite Subs.	0	>200,000

Sources: See Appendix M.

[7] *See* Section II.A.

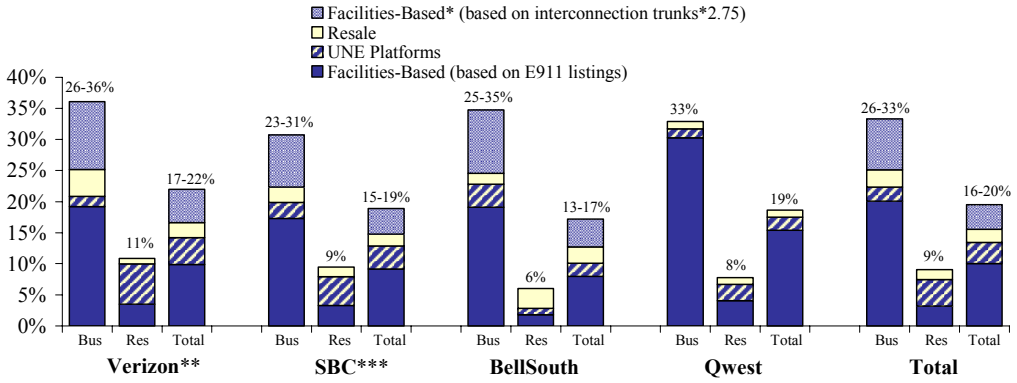
[8] *See* Sections II.A & IV.A; *see also* Table 4, *infra*, and Appendix A.





The CLECs' share of access lines in BOC regions is at least 16 percent, and likely closer to 20 percent. *See* Figure 4. Their share of BOC residential lines is approximately 9 percent, and their share of BOC business lines is at least 26 percent, and likely closer to 33 percent. In some BOC regions, the CLECs' share of lines is even higher. And, as noted above, at least two-thirds of all CLEC lines are provided wholly or partially over facilities they have deployed themselves.

Figure 4. Percentage of Total Access Lines Served by CLECs in BOC Regions



*The totals for facilities-based lines based on interconnection trunks multiplied by 2.75 represents the additional lines produced by this methodology over the number of E911 listings that CLECs have obtained.
**Verizon data do not include CLEC or ILEC lines in the former GTE service area.
***SBC data do not include CLEC or ILEC lines in Connecticut and Nevada.

Even at their lower end, the totals for facilities-based lines that we report here are considerably higher than the totals that CLECs themselves have reported to the FCC for incorporation into the FCC's February 2002 *Local Telephone Competition Report*. As discussed in Appendix A, however, our low-end totals have been obtained from CLEC-supplied listings in the E911 databases. For obvious reasons, these databases are highly reliable; ILECs and CLECs alike have the strongest possible incentives to maintain them accurately. In filing their line-total reports with the FCC, by contrast, many CLECs do not appear to be following the Commission's express instructions relating to the conversion of high-capacity lines into "voice-grade equivalent lines."[9] In contrast, the CLECs *do* make a distinction between lines and "voice-grade equivalents" in the reports they make to investors and securities regulators. *See* Table 4. The Commission indicates that CLECs *collectively* report serving a total of only 8.6 million lines wholly or partially over their own facilities. Yet AT&T alone has informed the investment community that the company serves "over 30 million" voice-grade equivalent lines over its own network. And 11 other CLECs that report their voice grade equivalent lines to investors have reported serving an additional 125 million voice-grade equivalent lines.

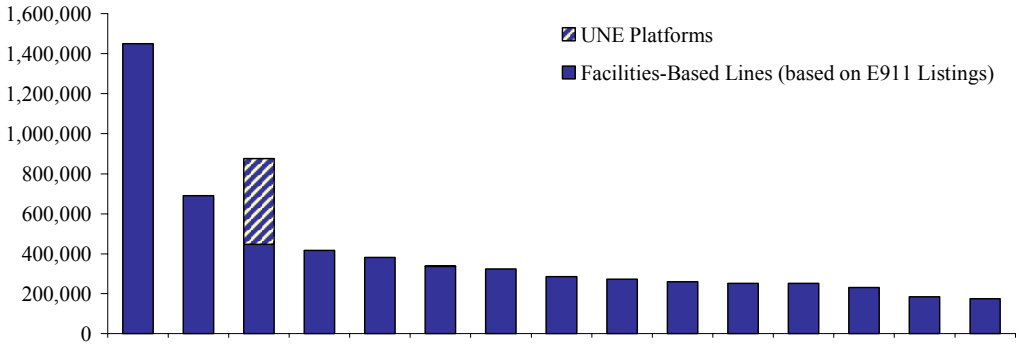
[9] The FCC's instructions specify that carriers are to report "voice-grade *equivalent* lines," which it defines as "a line or channel that directly connects an end user to a carrier and allows the end user to originate and terminate local telephone calls on the public switched network." FCC, *Instructions for the Local Competition and Broadband Reporting Form*, FCC Form 477 at 5-6 (data as of Dec. 31, 2001) (emphasis in original).

Table 4. CLEC Reporting of Voice-Grade Equivalent Lines to Investors		
	CLEC-Reported Totals	
WorldCom	76.4 million	"as of December 31, 2000, our domestic local voice grade equivalents had increased 98% to 65.5 million versus the prior year amount." "Voice Grade Equivalents 2001: **76,415,566**" – WorldCom, Inc., Form 10-K (SEC filed Mar. 13, 2002)
AT&T	>30 million	"Over **30 [million]** DS0 equivalents." – D. Dorman, President, AT&T, *Presentation Before the Lehman Brothers T3 Telecom, Trends & Technology Conference* (Dec. 6, 2001)
XO	21.2 million	"Voice Grade Equivalents (VGE, 64 Kbps capacity), a measure used by XO to evaluate the utilization of its network, grew to **21.2 million** in the fourth quarter of 2001." – XO Comm. Press Release, XO Communications Reports 74 Percent Increase in Annual Revenues and Reduced EBITDA Losses (Feb. 14, 2002)
Time Warner Telecom	16.7 million	"DS-0 Equivalents: **16,736,000**" as of YE01 – Time Warner Telecom Press Release, *Time Warner Telecom Announces Fourth Quarter Results* (Feb. 5, 2002)
Adelphia Bus. Solutions	4.6 million	"Voice Grade Equivalent Circuits: **4,624,032**" – Adelphia Business Solutions, Form 10-Q (SEC filed Nov. 13, 2001)
KMC Telecom	3.6 million	"Total lines (DS-0 equivalents – the combination of access lines and dedicated lines) grew to over **3.6 million** at the end of the third quarter 2001." – KMC Telecom Press Release, *KMC Telecom Reports Financial and Operational Results for the Third Quarter 2001* (Nov. 8, 2001)
Cox	1.8 million	"Voice Grade Equivalent Circuits: **1,773,340**" as of YE01." – Financial Data *attached to* Cox Press Release, *Cox Communications Announces Fourth Quarter Financial Results for 2001* (Feb. 12, 2002)
CTC	589,000	"Access Line Equivalents in Service at **589,000**" as of YE 2001 – CTC Communication Press Release, *CTC Communications Group Announces Fourth Quarter and Year End Results, Restructured Lease Financing Agreement and Amended Bank Facility* (Mar. 7, 2002)
CoreComm/ ATX	495,000	"Toll-related access line equivalents: **495,300**" as of 3Q01 – CoreComm Press Release, *CoreComm Limited Announces Financial Results for the Third Quarter of 2001* (Nov. 14, 2001)
Pac-West	235,000	"Total DS0 equivalent lines in service, which include wholesale and on-network retail DS0 line equivalents, were **235,244** in the fourth quarter of 2001." – Pac-West Press Release, *Pac-West Telecom Announces Fourth Quarter and Year-End 2001 Results* (Feb. 12, 2002)
PaeTec	233,000	"PaeTec . . . has installed **232,848** access line equivalents." – PaeTec Press Release, *PaeTec Exceeds 232,000 Access Lines* (Feb. 5, 2002)
Integra	>120,000	"more than **120,000** ALEs" [access line equivalents] as of YE01 – Integra Press Release, *Integra Telecom Reports Strong 2001 Growth* (Feb. 4, 2002)
Total	**156 million**	

As the totals for facilities-based competition make clear, CLECs have achieved significant economies of scope and scale, and have done so largely without relying on UNEs. More than half of all competitive lines are served entirely over CLECs' own facilities, and nearly two-thirds of competitive lines are served by CLECs' own switches. *See* Figure 1, *supra*. Moreover, these totals demonstrate that CLECs have chosen initially to focus on the most lucrative customer segments, and have therefore made much larger inroads than their count of lines would suggest. Indeed, as discussed below, the CLECs' share of revenues is considerably higher than their share of lines.

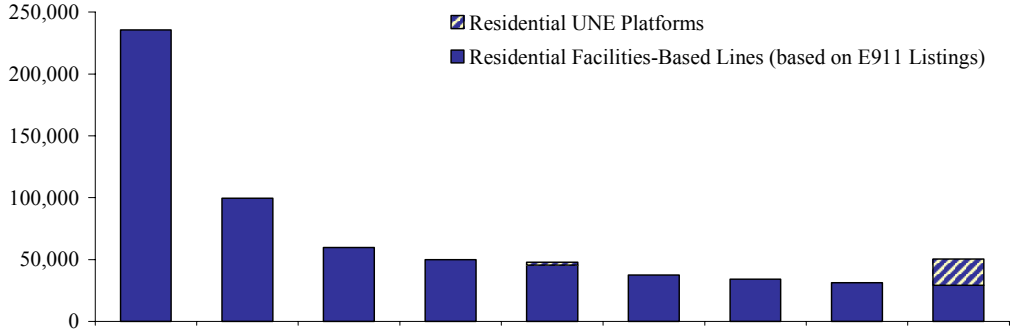
To the extent that CLECs continue to rely on the UNE Platform, market experience demonstrates that they are not migrating UNE-Platform customers to their own facilities to any significant degree (if at all) – despite the fact that they have already deployed the switches they need to do so, and have already built up very large customer bases. *See* Figures 5 & 6.[10] Indeed, many CLECs that have obtained UNE Platforms concede that they have no plans to convert these customers to their own switches. Contrary to the intent of the Commission's unbundling rules, these CLECs are treating UNE-Platform competition as an end in itself, rather than as a stepping stone to facilities-based competition. And in doing so, they are devaluing the efforts of CLECs that have decided to make the investment in facilities-based competition.[11]

Figure 5. Use of UNE Platforms by Top 15 Switch-Based CLECs Other Than AT&T and WorldCom



Top 15 CLECs represented include: Allegiance Telecom, Cablevision Lightpath, Choice One, Cox, Electric Lightwave, Focal Communications, ICG, Intermedia, McLeodUSA, Mpower, Net2000, RCN, Sprint, WinStar, and XO.

Figure 6. Use of UNE Platforms by CLECs Providing Service to 25,000 or More Residential Lines Using Their Own Switches*



*Excludes CLECs providing service over cable facilities. Does not include CLECs in Qwest's region.

CLECs providing service to 25,000 or more facilities-based residential lines include: ALLTEL, Broadview, Cavalier Telephone, Intermedia, Knology, McLeodUSA, RCN, TDS, and TOTALink.

[10] *See* Sections II.A & V.B.

[11] *See* Section V.B.

ILECs are also rapidly losing lines due to competition from wireless and cable providers.[12] Wireless phones compete directly for second lines, and to a lesser (but growing) extent for primary lines. Analysts estimate that about 10 million total access lines were replaced by wireless lines as of year-end 2001. Approximately 70 percent of all residential broadband subscriber lines are provided over cable networks, and two out of every three new broadband subscribers choose cable modem service.

Finally, a great deal more traffic is migrating off of ILEC networks than the migration of lines would indicate.[13] E-mail and instant messaging (IM) now substitute for a large fraction of voice traffic. There are now 900 million e-mail accounts in the U.S. and over 60 million IM users. It is estimated that consumers in the U.S. are sending approximately 3.2 billion e-mail messages and approximately 1 billion IM messages *per day*. If only 10 percent of the 4.2 billion daily e-mail and instant messages substitute for a voice call, that is equivalent to about 750 billion minutes per year, or roughly one-third of all voice traffic that passes through ILEC networks. A large and growing fraction of e-mail and IM traffic originates and/or terminates on competitive networks. And even when carried over ILEC networks, such traffic displaces significant usage-sensitive (*e.g.*, per-minute or per-call) revenues that otherwise would be earned.

C. Capital Investment.

CLECs, wireless carriers, and broadband providers have made enormous capital expenditures to expand the availability of their services.

CLECs have invested about $50 billion in new capital expenditures since the time of the last UNE review three years ago.[14] Significant venture capital has gone into the telecommunications industry.[15] CLECs also have raised large sums from strategic and institutional investors,[16] and have obtained significant additional funding from debt markets.[17]

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[12] *See* Sections II.B & IV.B.

[13] *See* Sections II.B & II.C.

[14] *See* ALTS, *The State of Local Competition 2001* at 20 (Feb. 2001) (citing Paine Webber and NPRG).

[15] In the four full years preceding the *UNE Remand Order*, the telecommunications industry had attracted only $5 billion in venture capital dollars. In 1999 alone, the telecommunications industry raised nearly $8 billion, and in 2000 the industry raised an additional $18 billion. Telecommunications continued to attract significant additional venture capital in 2001, raising nearly $6 billion in venture capital funding. *See* PricewaterhouseCoopers, *PricewaterhouseCoopers/Venture Economics/National Venture Capital Association MoneyTree Survey, Investments by Industry 1995-2001*, http://www.pwcmoneytree.com/PDFS/National%20Aggregate%20Data%2095Q1%20-%2001Q4.xls.

[16] CLECs raised more than $7.4 billion from strategic and institutional investors in 1999, plus another $3 billion in 2000 and 2001. *See* ALTS, *The State of Local Competition 2001* at 17-18 (Feb. 2001) (1999); W.T. Scott, *et al*., Morgan Stanley, *A Brief Critique – CLEC Events of the Week* at 12 (Dec. 12, 2001) (2000/2001); XO Press Release, *XO Announced $800 Million Equity Investment from Forstmann Little and Telmex* (Nov. 29, 2001); XO Press Release, *XO Reaches Definitive Agreement with Forstmann Little and Telmex* (Jan. 16, 2002). In addition to these totals, Bill Gates's private investment groups have invested $500 million in Cox. *See* Reuters, *Gates Invests $500 Million in Cox*, CNET News.com (Jan. 24, 2002), http://news.com.com/2100-1001-822792.html.

[17] According to one source, CLECs obtained $36 billion in loans in 1999. *See NPRG CLEC Report 2002, 15th ed.*, Ch. 2 at 6.

Initial public offerings by CLECs raised $2.6 billion in 1999 and 2000.[18] CLEC market capitalization has dropped sharply in the past 18-24 months, as it has in most other high-tech sectors. But many CLECs took advantage of the stock bubble, while it lasted, to finance acquisitions, investments, and capital outlays. *See* Table 5. More recently, stronger CLECs have taken advantage of falling stock prices to purchase their weaker siblings at a bargain price.[19]

Much of this competitive investment has gone into building urban fiber networks to serve business customers. But CLECs also have invested a great deal in building out their networks to serve residential customers. Cable operators have already invested at least $8 billion to upgrade their networks to provide telephony services.[20]

Cable operators and other competitive providers also have invested heavily to provide broadband services. The National Cable & Telecommunications Association (NCTA) estimates that the cable industry has invested more than $55 billion "to provide consumers advanced broadband services" since passage of the 1996 Act.[21] Satellite and fixed wireless providers also have made very large investments to provide two-way broadband services.[22]

There has been even more investment in terrestrial wireless facilities. Cumulative capital investment in the wireless industry has jumped from $24 billion at the end of 1995 to $100 billion as of June 2001.[23] Wireless carriers spent more than $18 billion in 2000 alone on network upgrades and expansion.[24] The cumulative capital investment in the wireless network ($100B) is now roughly one-quarter of the cumulative (depreciated) capital investment in the wireline network ($360B).[25] Annual capital spending on the wireless network ($18B) is running at about half of the corresponding figure for the wireline network ($40B), and continues to grow more

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[18] ALTS, *The State of Local Competition 2000* at Graphic D (Feb. 2000); IPO Home, *2000 Year in Review – All 2000 IPOs*, http://www.ipohome.com/marketwatch/review/iporeview.asp?stats=priced.

[19] For example, Time Warner Telecom acquired GST's assets; AT&T acquired NorthPoint's assets; and WorldCom acquired Rhythms's assets. *See* Time Warner Telecom Press Release, *Time Warner Telecom Finalizes Purchase of GST Assets* (Jan. 10, 2001); AT&T News Release, *AT&T Completes Acquisition of NorthPoint Communications* (May 25, 2001); WorldCom Press Release, *WorldCom Closes Rhythms Transaction* (Dec. 5, 2001).

[20] *See*, *e.g.*, *JP Morgan Cable Industry Report* at 46 & Table 22 (the cost of upgrading a home for circuit-switched cable telephony is $825/line, and there are 10.255 million homes passed by circuit-switched cable telephony).

[21] Letter from Robert Sachs, President & CEO, NCTA, to the Honorable Member of Congress (Feb. 8, 2002).

[22] *See*, *e.g.*, *Application of EchoStar Communications Corporation, General Motors Corporation, Hughes Electronics Corporation, Transferors, and EchoStar Communications Corporation, Transferee, For Authority to Transfer Control,* Consolidated Application for Authority to Transfer Control at 46, CS Docket No. 01-348 (FCC filed Dec. 3, 2001) ("Each of ECC (EchoStar Communications Corporation) and Hughes has already made significant broadband investments and plans future deployment of additional high speed Internet access.").

[23] *See CTIA's Semi-Annual Wireless Industry Survey Results*.

[24] *See* CTIA, *Telephia Study Finds Outstanding Wireless Network Performance While Industry Experiences Rapid Growth*, http://www.wow-com.com/articles.cfm?ID=553.

[25] *CTIA's Semi-Annual Wireless Industry Survey Results*; *FCC Statistics of Common Carriers* at Table 2.7 (1995-2001 eds.).

rapidly (averaging 35 percent growth each year for the last five years, while wireline investment has grown at an average of 14 percent each year).[26]

Table 5. CLEC Mergers & Acquisition Activity			
Acquirer	**Target**	**Firm Value**	**Date Closed**
NEXTLINK	Concentric Network	$2.2 billion	June 2000
McLeodUSA	SplitRock Services	$1.8 billion	April 2000
CoreComm	ATX	$900 million	September 2000
Advanced Radio Telecom	Broadstream	$365 million	August 2000
Mpower	Primary Network	$145 million	June 2000
Choice One	US XChange	$515 million	August 2000
Covad	BlueStar	$202 million	September 2000
Gabriel	TriVergent		November 2000
Time Warner Telecom	GST	$690 million	January 2001
WorldCom	Intermedia	$5.5 billion	July 2001
McLeodUSA	CapRock	$532 million	December 2000
Hughes Electronics	Telocity	$180 million	April 2001
AT&T	NorthPoint assets	$135 million	May 2001
Allegiance	Coast-to-Coast Communications	$27 million	September 2001
Cavalier Telephone	Conectiv Communications	n/a	November 2001
WorldCom	Rhythms NetConnections	$31 million	December 2001
IDT Corp.	WinStar	$42.5 million	December 2001
Choice One	Fairpoint (comm. assets only)	undisclosed	December 2001
Comcast	AT&T Broadband	$72 billion	announced Dec. 2001
Allegiance	Intermedia Business Internet assets acquired from WorldCom	undisclosed	January 2002
Cavalier Telephone	Net2000 (VA, MD, DC)	$25 million	January 2002
Broadview Networks	Net2000 assets (NY/MA/NJ) acquired from Cavalier	undisclosed	January 2002
New Edge Networks	@Work	$1.5 million	February 2002
Cogent	Allied Riser	n/a	February 2002
Broadview Networks	Network Plus	undisclosed	announced Feb. 2002
Sources: See Appendix M.			

D. Revenues.

Though precise figures of CLEC local revenues are elusive,[27] facilities-based CLECs are now generating substantial revenues. According to New Paradigm Resources Group's *CLEC*

[26] *Compare FCC Statistics of Common Carriers* at Table 2.7 (1995-2001 eds.) *with CTIA's Semi-Annual Wireless Industry Survey Results*.

[27] Many CLECs are not public companies and do not therefore report their revenues to the Securities Exchange Commission. While most CLECs do report revenues to the FCC, the FCC releases this data in only aggregate form. Complicating matters, the revenue categories reported by the FCC have fairly amorphous parameters. For example, it is difficult to distinguish revenues generated from exchange access services from those generated from intraLATA toll and special access services. This is particularly true with respect to those revenues generated by

Report – a source relied on by the CLEC industry[28] – total CLEC revenues (excluding long distance revenues) increased five-fold between year-end 1998 ($8.5B) and year-end 2001 ($44B). *See* Figure 7.[29] New Paradigm estimates that CLEC revenues from switched local services increased from $3.5 billion in 1998 to $9.5 billion in 2001.[30] The latest revenue data compiled by the FCC show CLECs with a total of $8.5 billion in local revenues as of year-end 2000.[31] Since the time of the last UNE review, the number of CLECs earning $100 million or more has nearly doubled. *See* Figure 8.

CLECs specifically target customers that generate high levels of traffic and revenues[32] – analysts and the FCC report that the CLECs' share of revenues is between 12 and 20 percent higher than their share of lines.[33] And the CLECs' share of high-end local services is considerably higher than their share of local revenues overall. For example, the CLECs' share of special access revenues is between 28 and 39 percent.[34] The big three interexchange carriers control more than two-thirds of the revenues for ATM and Frame Relay services.[35]

CLECs that provide local services also earn significant revenues from the provision of other telecommunications services. According to New Paradigm, CLECs now earn nearly $25 billion from the provision of data and data-related services such as Internet access, frame relay,

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carriers that are both CLECs and interexchange carriers, including AT&T and WorldCom – the largest carriers in both categories – who report their revenues as both kinds of entities. *See* Appendix L.

[28] *See*, *e.g.*, ALTS, *The State of Local Competition 2001* (Feb. 2001); ALTS, *An ALTS Analysis: Local Competition Policy & The New Economy* (Feb. 2, 2001); ALTS, *The State of Competition in the U.S. Local Telecommunications Marketplace* (Feb. 2000).

[29] *See NPRG CLEC Report 2000, 12th ed.*, Ch. 1 at Table 3; *NPRG CLEC Report 2002, 15th ed.*, Ch. 3 at Table 9. "Other" revenues reported by New Paradigm (*i.e.*, reciprocal compensation and non-telecom related revenues) are excluded from these totals. Credit Suisse First Boston estimates that total CLEC revenues (excluding long-distance and data revenues) have grown from approximately $5 billion in 1998 to approximately $12.5 billion in 2001. *See CSFB 4Q00 CLEC Vital Signs Review* at Table 11 (4Q1998); *CSFB 3Q01 CLEC Vital Signs Review* at Exh. 9 (1Q 2001-3Q 2001 results; 4Q 2001 estimate).

[30] *Compare NPRG CLEC Report 2000, 12th ed.*, Ch. 1 at Table 3 *with NPRG CLEC Report 2002*, *15th ed.*, Ch. 2 at Table 8. Credit Suisse First Boston estimates that CLEC revenues from switched local services has increased from approximately $3.7 billion in 1998 to $10.8 billion in 2001. *See CSFB 4Q00 CLEC Vital Signs Review* at Table 11 (4Q1998); *CSFB 3Q01 CLEC Vital Signs Review* at Exh. 9 (1Q 2001-3Q 2001 results; 4Q 2001 estimate).

[31] *FCC Telecommunications Industry Revenues, 2002 ed.* at Table 7; *NPRG CLEC Report 2002, 15th ed.*, Ch. 2 at Table 8.

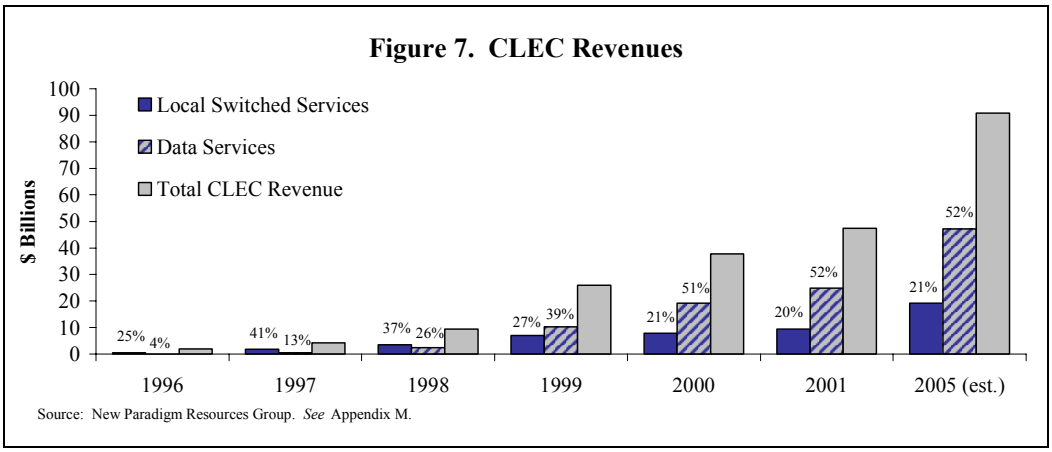
[32] *See*, *e.g.*, Legg Mason, *Telephone Wars: Local Competition Update* at 2 (May 22, 2001) ("The CLEC sales figures reflect larger market share gains than those calculated on the basis of line lost, since the majority of lines lost are of the high-usage commercial type.").

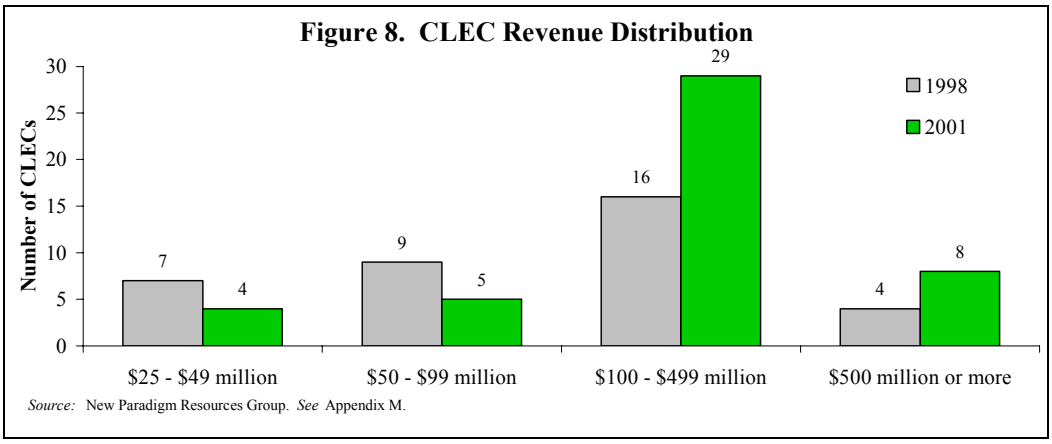
[33] *See*, *e.g., id.* at 3 (At the end of 1Q01 "the CLEC share of the total US line market was 7.6%," while "the CLEC's share of the gross industry revenues was approximately 9.2%," a difference of 21%.); *FCC Local Competition Report, Feb. 2002 ed.* at 4, Table 1 ("The share of local service revenues claimed by carriers competing with the ILECs" was 8.9% in 2000 while CLECs reported a 7.7% share of end-user switched access lines in December 2000, a difference of 15.6%); *CSFB 3Q01 CLEC Vital Signs Review* at Exh. 9 (Through 3Q01, local competitors' share of U.S. access lines was 9.7%, while local competitors' share of the local market revenues at quarter end was 10.9%, a difference of 12.4%).

[34] *See* Section V.C & Appendix L.

[35] *See* Section II.B, Figure 5.

ATM, DSL, "and other enhanced data and Web-related services."[36] CLECs other than the big interexchange carriers earn an additional $3 billion from the provision of long distance services.[37] Cable telephony providers are able to bundle video and data services with the voice services they provide, and analysts expect "video/voice" to be the "most popular" bundle of service desired by consumers.[38]





If cable companies are counted among them, CLECs earn substantial revenues in the local, high-speed data transport sector as well. Cable companies earned an estimated $2.3 billion from the provision of high-speed data services in 2001, and that figure is projected to exceed $10 billion by 2006.[39]

Wireless carriers also are competing directly with ILECs for a large and increasing share of revenues. As of year-end 2000, wireless carriers reported $62 billion in revenues, which

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[36] *NPRG CLEC Report 2002, 15th ed.*, Ch. 3 at 3.

[37] *See id.*; *see also FCC Trends in Telephone Service, Aug. 2001 ed.* at Table 10.1 ($1.3 billion in toll revenues earned by CAPs and CLECs as of year-end 2000).

[38] *JP Morgan Cable Industry Report* at 42.

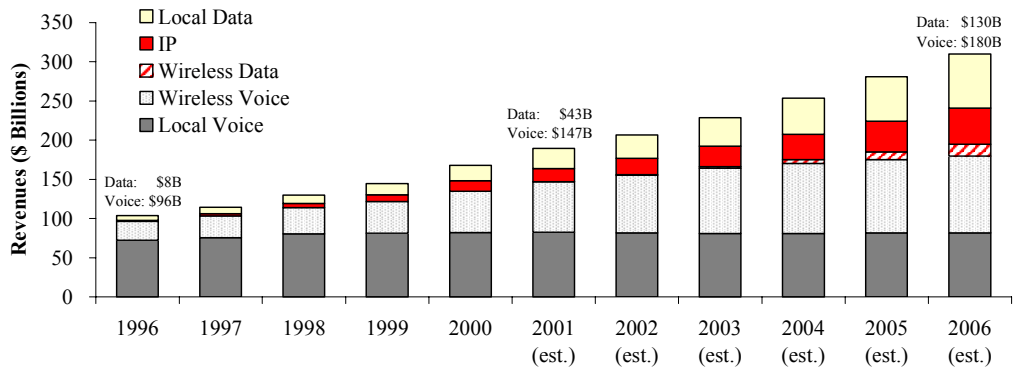
[39] *See* R.A. Bilotti, *et al.*, Morgan Stanley, Dean Witter, *Broadband Cable Television* at 9 (July 3, 2001).

represents more than half of the revenues that wireline carriers reported for local service.[40] At the time of the last UNE review, wireless revenues were at $37 billion, about one-third the amount of wireline local revenues.[41]

E. Outlook.

As a percentage of the overall telecommunications market, wireline local voice is rapidly declining, as local traffic moves on to wireless and data networks, and the volumes of data traffic continue to surge. *See* Figure 9. Wireline local voice revenues grew by an average of 2.7 percent per year between 1996 and 2001, but are expected to remain constant over the next five years.[42] While wireline local voice revenues represented approximately 44 percent of all local revenues in 2001, they are expected to represent only 26 percent by 2006.[43]

Figure 9. Wireless and Data Overtaking Voice



Source: JP Morgan H&Q. *See* Appendix M.

Cable telephony providers are expected to "have more than 10 million circuit-switched telephony customers in 2006."[44] Cable operators will have deployed IP-telephony widely by that time as well, and are expected to serve nearly five million telephony customers over packet-switched networks.[45]

Data traffic has already overtaken voice traffic on the telephone network, and data traffic is growing much faster than voice. Most access-line growth between 1996 and 2000 was due to data, with customers adding second lines as a dedicated Internet/fax line.[46] These lines are now

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[40] *See FCC Telecommunications Industry Report, 2002 ed.* at Table 1.

[41] *See CTIA's Semi-Annual Wireless Industry Survey Results*.

[42] *See JP Morgan Telecom Services 2001 Report* at Table 1.

[43] *See JP Morgan Telecom Services 2001 Report* at Table 1.

[44] *Forrester Sizing US Consumer Telecom Report* at 10.

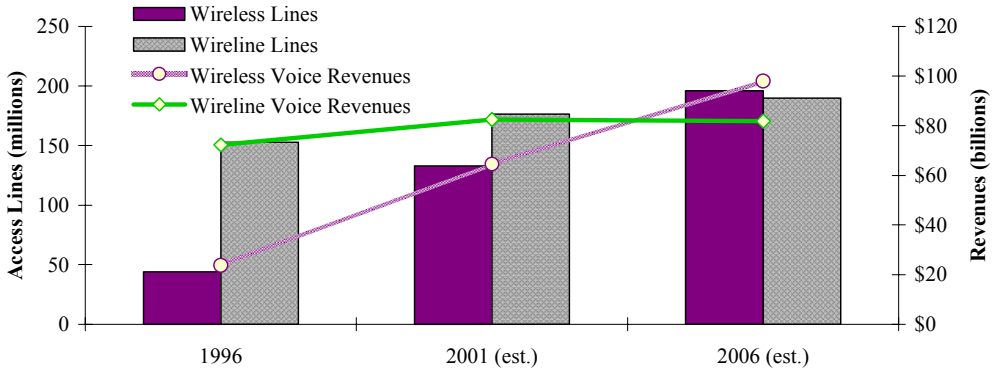
[45] *See Forrester Sizing US Consumer Telecom Report* at 10-12.

[46] *See, e.g., Gartner U.S. Residential Wireline Report* at 5 ("additional line growth rates have been significantly higher among online households than their offline counterparts.").

in rapid decline, with most customers opting for a wireless or cable connection instead of a second line.[47] By 2006, it is expected that 17 million circuit-switched lines will have been superceded (*i.e.*, rendered technologically obsolete) by wireless, cable modem, and non-DSL packet-switched connections.[48] Local data revenues are expected to grow to nearly $70 billion in the next five years.[49] By that time, data is expected to make up 46 percent of all local revenues, up from 24 percent today. *See* Figure 9. A great deal of data traffic is carried on non-ILEC networks. Cable modem is adding residential broadband subscribers much faster than DSL, and cable is expected to maintain a two-to-one lead over DSL five years from now.[50]

Wireless carriers are adding subscribers much faster than their wireline counterparts – in percentage terms, and in absolute terms, too. Some twenty million new subscribers are being added annually.[51] IDC estimates that, by 2005, wireless "lines" will have cumulatively displaced a total of approximately 20 million wirelines (counting both primary and secondary access lines).[52] Wireless minutes of use are growing at over 60 percent per year, while landline minutes are growing at "low single digits."[53] By 2003, wireless voice revenues are expected to surpass wireline voice revenues. *See* Figure 10.

Figure 10. Wireless vs. Wireline Growth



Source: JP Morgan H&Q. *See* Appendix M.

[47] *See*, *e.g.*, *id.* at 7-9 (finding that, from January to June 2001, 6 million households (6 percent of all households) have replaced a traditional telephone access line with another form of communications line, and 61.5 percent of those 6 million have chosen wireless or cable); *see also* Sections II.C & IV.B.

[48] *See Forrester Sizing US Consumer Telecom Report* at Figures 6 & 8-1.

[49] *JP Morgan Telecom Services 2001 Report* at 25.

[50] *See*, *e.g.*, *JP Morgan Telecom Services 2001 Report* at Table 16 (Nov. 2, 2001) (showing 25.9 million residential cable modem subscribers and 12.9 million residential DSL subscribers in 2006.); *see also Morgan Stanley Cable Modem/xDSL Report* at Exh. 1; Section IV.C.

[51] *See CTIA's Semi-Annual Wireless Industry Survey Results*.

[52] *See IDC Wireless Displacement Report* at Figure 23; *see also Forrester Sizing US Consumer Telecom Report* ("Over the next five years, the mobile business will take a cut at fixed-line revenues. Wireless operators will ravage the fixed-line business as 5.5 million consumers give up secondary lines, and an additional 2.3 million cut the cord on their primary line.").

[53] *3g Rollouts Inch Along, But Kagan Research Indicates Wireless Minutes Roaring Ahead, Set to Dominate Telecom Landscape by 2005 Leading Executives to Debate Market Demand, Technology and Financing at Kagan's Wireless Telecom Summit May 2-3 in New York*, Bus. Wire (Apr. 27, 2001); *see* Section II.C.

Next-generation broadband technologies are now being deployed.[54] Much of the copper distribution plant will have to be replaced with fiber in order to support the growing demand for broadband services. Wireless broadband services – both fixed and mobile – are coming, too. Analysts predict that 3G mobile networks will be widely deployed by 2004 or 2005. The Commission also has recently taken the first steps to "pave the way for new types of products incorporating ultra-wideband (UWB) technology" – devices that may be able to operate on spectrum already occupied by existing radio services without causing interference. It has also resolved to explore the introduction of "software defined radio" (SDR) technology, which could allow a single device to be quickly reprogrammed to transmit and receive on any frequency within a wide range using virtually any transmission format. There also are a host of other technologies currently under development that will be capable of provisioning wireless broadband services. These include Digital SMR, third generation mobile systems, 2 GHz MSS satellite systems, L-Band satellites, and Big LEO satellites. Recent advancements in fixed wireless technologies – particularly Non-Line-of-Sight technologies – are expected to "cause a spur in service provider deployments."

Entirely new telecommunications networks are being deployed to satisfy surging demand for high-speed packet-switched data services. Much of this new infrastructure has little relation to the old. Fiber is replacing copper in the loop; packet switches are replacing circuit switches in the central office; and the transport between these packet switches is using very different routes than the rigid point-to-point connections between central offices that have prevailed in the past. In deploying this new infrastructure, ILECs will enjoy no particular advantages over competing carriers.

Most of the broadband market that is now emerging remains up for grabs. Most of the technology that will ultimately be used to provide ubiquitous broadband service has not yet been developed. Most of the capital has not yet been committed. Most of the customers are not yet being served. And because broadband digital services will ultimately absorb and displace the old, analog voice and video, no established player in telecom, cable, or broadcast markets today has any assurance of winning any durable share of the vast digital market ahead.

[54] *See* Section V.D.

II. LOCAL SWITCHING

At the time of the FCC's last UNE review, CLECs had deployed approximately 700 local circuit switches.[1] Today, CLECs operate approximately 1,300 *known* local circuit switches. *See* Appendix B.[2] At the time of the last UNE review, CLECs were serving about six million lines using switches they had deployed.[3] As of year-end 2001, CLECs were serving no fewer than *16 million* local lines, and likely closer to *23 million* local lines – including approximately three million *residential* lines – over their own switches. CLEC switches are now so geographically widespread that they are being used to serve local customers in wire centers that contain approximately *86 percent* of the Bell companies' access lines. In the 100 largest Metropolitan Statistical Areas (MSAs), CLECs are using their switches to serve local customers in wire centers that contain approximately *96 percent* of the BOC access lines in those MSAs. *See* Appendix C. All of these figures are conservative, because they are drawn from public sources or from the necessarily limited data available to the BOCs.

More than 200 CLECs of all sizes have actually deployed local circuit switches in the Bell companies' regions. While the two largest CLECs (AT&T and WorldCom) account for more than 25 percent of these switches, the next 15 largest CLECs (measured by switch ownership) account for an additional 37 percent of all local circuit switches. *See* Figure 1. The number of CLECs operating 10 or more circuit switches has increased from 15 to 27 since the time of the last UNE review, while the number operating 20 or more has increased from 6 to 16.[4] And with the exception of AT&T and WorldCom, the 15 largest switch-based CLECs (measured by switched-based lines served) make virtually no use of unbundled switching, either on a stand-alone basis or as part of the so-called UNE-Platform. *See* Figure 2.

Cable companies have deployed large number of circuit switches that they are using, in combination with their own loops, to provide cable telephony service that bypasses ILEC networks completely. This service is now available to more than 10 percent of all U.S. homes and there are more than 1.5 million actual subscribers. Cable telephony is now available statewide in some smaller states (like Cox service in Rhode Island) and to a large and growing fraction of homes in a number of larger states (*e.g.*, AT&T service in and around Pittsburgh, Boston, Chicago, and the Bay Area, and Cox service in San Diego, Orange County, and the Tidewater area of Virginia).

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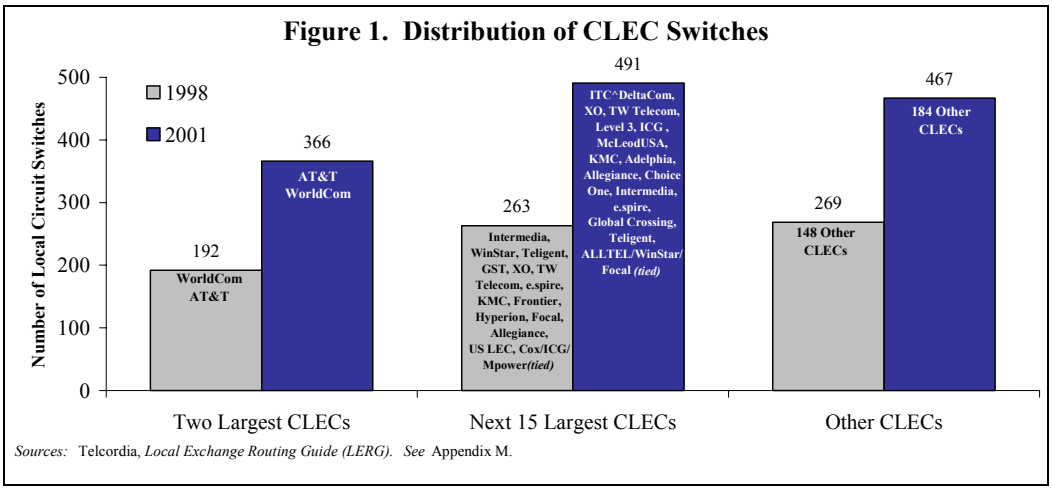
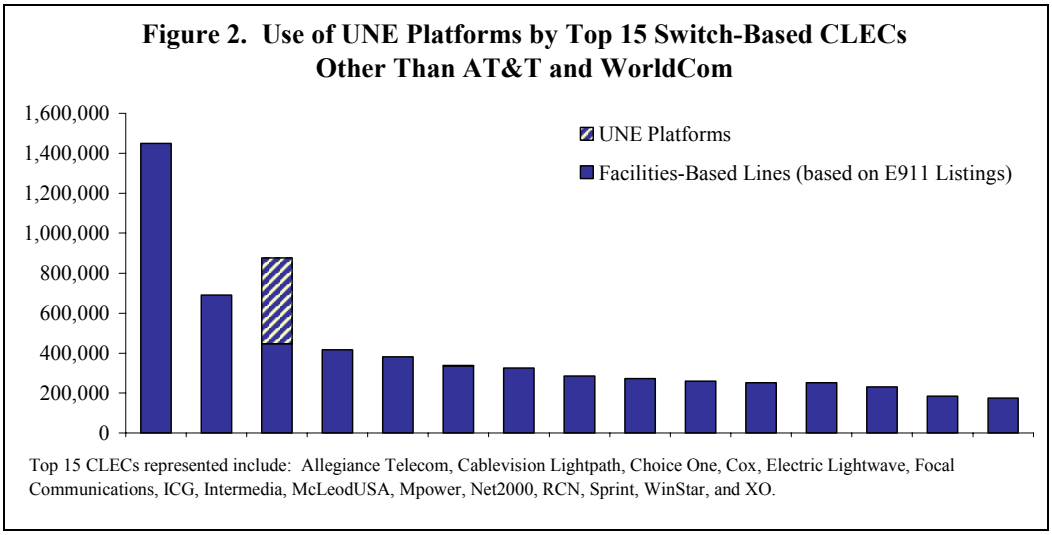
[1] *See UNE Remand Order* ¶ 254 ("As of March 1999, approximately 167 different competitors have deployed approximately 700 switches throughout the country.").

[2] *See* Telcordia, *January 2002 LERG*. New Paradigm Resources Group ("NPRG") reports that, as of year-end 2001, CLECs had deployed 1,244 circuit switches with another 92 circuit switches planned. *See NPRG CLEC Report 2002, 15th ed.*, Ch. 2 at 20. That figure is based on the circuit switches of 70 companies profiled by NPRG. *See id.* By comparison, the LERG database indicates that approximately 200 competing carriers have deployed circuit switches. *See* Appendix B.

[3] This figure is based on the number of interconnection trunks CLECs had obtained as of year-end 1998 (*see* Section I, Table 3), and assumes that for each trunk a CLEC had obtained as of that date, the CLEC was serving 2.75 lines. *See* Appendix A (describing this methodology in more detail).

[4] *See* Section V, Figure 1.





Packet and wireless switches are now placing significant, additional competitive pressure on ILECs' traditional circuit switches. At the time of the last UNE review, 36 million households still relied on dial-up connections – and thus on ILEC circuit switches – for their data services.[5] As discussed further in Section IV.C, however, nearly eight million users now have broadband cable or wireless data links instead, which bypass the circuit switch completely and terminate directly on a competitive packet switch. If all of these broadband users would otherwise be using dial-up connections, the packet switches used to provide these services now displace at least 4 percent of all circuit-switched minutes of use, even assuming that the average data line is used only as much as the average voice line. The total would be far higher if one takes into account the fact that data calls generally last much longer than voice calls. Since the last UNE review, the installed base of CLECs' *known* packet switches has jumped from 860 to more than 1,700.[6] *See* Appendix E.

[5] *See JP Morgan Cable Industry Report* at Table 13 (36.7 million online households in 1998 minus 700,000 broadband households equals 36 million dial-up households).

[6] *See NPRG CLEC Report 2000, 12th ed.*, Ch. 6 (1998 total); *NPRG CLEC Report 2002, 15th ed.*, Ch. 4 at

The dramatic rise of wireless services since the last UNE review is certainly having a similar impact on circuit-switched ILEC traffic. As of year-end 1998, there were about 69 million wireless subscribers; as of year-end 2001, there were an estimated 130 million, as compared to about 190 million wireline switched access lines.[7] Today, a large and rapidly growing number are using wireless service as a substitute for second and additional lines, and a growing number are abandoning their wireline phones altogether. There were approximately 200 billion billable minutes of wireless use in the first half of 2001, and by the end of 2001 wireless calls accounted for an estimated 12 percent of all U.S. phone calls. Many wireless carriers offer particularly attractive long-distance calling plans; when the wireless phone is used for long-distance calls, the ILEC loses traffic not only in end office switches but in access tandems, too. Wireless carriers not affiliated with the Bell companies have deployed at least 950 local switches. *See* Appendix F.

A large and growing fraction of business customers also locate switching equipment directly on their premises, which enables them to perform a portion of their local switching in-house, rather than outsource it to an ILEC's circuit switch. Today, there are approximately 56 million lines served through private branch exchanges (PBXs). A PBX performs all the local switching between the lines that connect to it directly. Moreover, a new generation of PBXs that use IP-based packet switching instead of circuit switching make PBXs economical for an even larger share of businesses.

Table 18 (2002 total). This is a highly conservative estimate. It does not include the 840 packet switches NPRG lists for competitive Independent Operating Companies, utility CLECs, data providers, or Gig-E providers. In addition, it does not include the 7,000 packet switches that NPRG lists for AT&T as of year-end 2001. According to NPRG's prior reports, AT&T had only 50 packet switches as of year-end 2000. Because one-year growth of this magnitude is unlikely, in an abundance of caution we have used the 2000 figure for AT&T's packet switches.

[7] *CTIA's Semi-Annual Wireless Industry Survey Results*; CTIA, *CTIA's World of Wireless Communications*, http://www.wow-com.com (131 million U.S. wireless subscribers as of Feb. 12, 2002); *CSFB 3Q01 CLEC Vital Signs Review* at Exh. 9 (189 million U.S. access lines as of 4Q2001).

Table 1. Competition for ILEC Circuit-Switched Local Traffic				
	Switches	**Subscribers/Lines**	**Minutes**	**Revenues**
CLEC Circuit Switches	1,300 CLEC circuit switches (plus 360 remote switches)	At least 16 million lines, and likely closer to 23 million lines served on CLEC switches	493 billion minutes originating/terminating on CLEC switches per year	$10 billion (CLECs switched local service revenues)
Wireless	950 non-BOC wireless switches	130 million wireless subscribers	500 billion minutes originating/terminating on wireless switches per year	$64 billion (wireless voice revenues)
Data	1,700 CLEC packet switches	8 million residential cable/wireless/satellite broadband subscribers	Six times more data traffic than voice Traffic over broadband connections exceeds traffic over narrowband	$2 billion cable modem revenue $6 billion CLEC/IXC ATM/Frame Relay revenue
PBX	n/a	56 million PBX lines	Intra-PBX switching on 44 percent of all business lines	n/a
Sources: See Appendix M.				

A. CLEC Circuit Switches.

By very conservative estimates, CLECs are serving no fewer than *16 million* local lines, and likely closer to *23 million* local lines – including approximately three million *residential* lines – over the local circuit switches they have deployed. *See* Table 2 & Appendix A. CLECs serve a far larger number of actual circuits using their switches, because many of the lines they serve are high-capacity lines.[8]

Table 2. Lines Served over CLEC Switches, YE 2001				
	Based on E911 listings			**Based on Interconnection Trunks***
	Business	**Residential**	**Total**	
Verizon**	3.7 million	1.0 million	4.7 million	7.8 million
SBC***	4.5 million	1.2 million	5.7 million	8.6 million
BellSouth	1.8 million	300,000	2.1 million	3.5 million
Qwest	2.9 million	500,000	3.4 million	2.5 million
Total	**13 million**	**3 million**	**16 million**	**23 million**
*Assumes a ratio of 2.75 lines per interconnection trunk. *See* Appendix A (providing basis for this methodology). ** Verizon E911 listings and interconnection trunk data do not include the former GTE service area. *** SBC E911 listings data do not include Connecticut.				

CLECs are using their switches to serve local customers in one of two ways. First, they are porting numbers from ILEC switches to their own switches using local number portability (LNP). Second, they are using NXX codes obtained from the North American Numbering Plan administrator.

[8] *See* Sections I.B, Table 4 & IV.A; *see also* Appendix A.

CLECs have ported approximately 14 million telephone numbers in the Bell companies' regions, virtually all of which have been ported since the time of the last UNE review.[9] In the last year alone, the number of CLEC ported numbers has grown by more than 70 percent. *See* Table 3. This demonstrates that CLECs have not only significantly increased their deployment of circuit switches, but also that they are now using these switches extensively to win local customers.

Table 3. Growth of Ported Numbers

	2000	2001	Growth
Verizon	2.7 million	4.7 million	77%
SBC*	3.0 million	5.1 million	73%
BellSouth	1.1 million	1.8 million	64%
Qwest	1.4 million	2.4 million	71%
Total	**8 million**	**14 million**	**73%**

Growth percentages may not equal the differences shown due to rounding. * SBC data do not include Connecticut.

1. Geographic Areas Served by CLEC Circuit Switches.

As the FCC has recognized, competition for switched services may be assessed by analyzing where CLECs have obtained ported numbers and NXX codes.[10]

The Bell companies maintain internal data of the wire centers in which CLECs have ported telephone numbers from the BOCs' switches to the CLECs' own switches.[11] Each number ported from a BOC's switch to a CLEC's switch represents a telephone served by that competitor's own switch. Each wire center in which a CLEC has obtained a ported number therefore represents a geographic area where a CLEC is actually competing for local customers today using switches that it has deployed itself.

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[9] *See Telephone Number Portability*, Third Memorandum Opinion and Order on Reconsideration, 13 FCC Rcd 16090, ¶ 2, n.7 (1998) (first requiring ILECs to implement LNP in the 100 largest MSAs by December 31, 1998).

[10] *See*, *e.g.*, *FCC Local Competition Report, Aug. 1999 ed.* at 2, 43, Tables 4.1-4.3 & 5.1 (summarizing NXX code assignment activity and supplying information on ported numbers which "should provide insights into the number of customer lines served by competitors"); *id.* at 43 (using an NXX-based analysis for identifying "new entrants in the switched market."); *id.* ("A local service competitor that owns a telephone switch must acquire a numbering code for that switch before commencing operation as a facilities-based CLEC providing mass market telephone service."); *UNE Remand Order* ¶ 254 (noting with approval SBC's evidence of competition for switching "using a methodology that tracks requesting carriers' switches by examining migration of lines using ported numbers."); *id.* ¶ 285 (relying on data of CLEC switches with NXX codes as basis for creating exception to national unbundled switching rule in Zone 1 wire centers).

[11] A wire center is "the location of a local switching facility containing one or more central offices." 47 C.F.R. § 54.5; *see id.* ("wire center boundaries define the area in which all customers served by a given wire center are located."); *see also Policy and Rules Concerning Rates for Dominant Carriers and Amendment of Part 61 of the Commission's Rules to Require Quality of Service Standards in Local Exchange Carrier Tariffs*, Memorandum Opinion and Order, 12 FCC Rcd 8115, ¶ 7, n.14 (1997) (A wire center "might have one or several class 5 central offices, also called public exchanges or simply switches.").

These ported number data demonstrate that CLECs are using their switches to serve local customers ubiquitously throughout the BOCs' regions.[12] As of year-end 2001, one or more CLECs had ported a telephone number to its own switch in 47 percent of BOC wire centers, which contain approximately *86 percent* of all BOC switched access lines, including approximately 89 percent of all *business* lines and approximately 84 percent of all *residential* lines. *See* Tables 4 & 5. Significant numbers of BOC access lines are in wire centers served by multiple CLEC switches. *See id.*

The totals are even higher in the largest metropolitan areas. In the 100 largest MSAs, one or more CLECs had ported a telephone number to its own switch in 83 percent of BOC wire centers in those MSAs, which contain approximately *97 percent* of all BOC switched access lines in those MSAs. *See* Appendix C.

Table 4. Percentage of Wire Centers Where CLECs Have Acquired Customers Through Ported Numbers

	Percentage of Wire Centers Served by:			
	1 or more CLEC switch	**2 or more**	**3 or more**	**4 or more**
Verizon	44	32	26	22
SBC	47	35	28	25
BellSouth	58	39	32	28
Qwest	43	32	26	23
Total	**47**	**34**	**28**	**24**

Table 5. Percentage of Access Lines in Wire Centers Where CLECs Have Acquired Customers Through Ported Numbers

	Percentage of BOC Switched Access Lines in Wire Centers Served by:											
	1 or more CLEC switch			**2 or more**			**3 or more**			**4 or more**		
	Bus.	**Res.**	**Tot.**	**Bus.**	**Res.**	**Tot.**	**Bus.**	**Res.**	**Tot.**	**Bus.**	**Res.**	**Tot.**
Verizon	90	83	85	84	75	79	80	69	73	75	64	68
SBC	88	83	85	82	75	77	74	66	69	70	62	65
BellSouth	94	90	91	85	79	80	79	71	74	73	65	67
Qwest	89	83	85	82	75	77	75	68	71	71	64	66
Total	**89**	**84**	**86**	**83**	**76**	**78**	**77**	**68**	**71**	**72**	**63**	**66**

[12] For purposes of this report we have included in the analysis switches owned by CLECs that have declared bankruptcy. Most such CLECs are still operational. Moreover, switches are a sunk investment, so if one company ceases to use its switch it is highly likely that another company will quickly seize the opportunity to do so (and will probably be able to obtain the switch at a fire-sale price). In addition, even though some CLECs may now be experiencing financial troubles, the fact that they were able to deploy so many switches at one time is still highly probative of the ability of CLECs to deploy switches generally. In any event, switches operated by CLECs that have declared bankruptcy (as of March 31, 2002) represent no more than 17 percent of the total counted for purposes of this report.

The areas that CLECs are capable of serving with their own switches also can be determined based on the NXX codes that CLECs have obtained. Each NXX code is associated with a "rate exchange area" served by an incumbent LEC.[13] The rate exchange areas where CLECs have obtained NXX codes are the areas where CLECs have determined they may use their own switches to compete directly with incumbent LECs.

Telcordia's *Local Exchange Routing Guide* (LERG) database contains the location of each CLEC switch, the NXX codes associated with those switches, and the rate exchange areas served by those NXX codes.[14] These data demonstrate that, as of year-end 2001, one or more CLECs had obtained an NXX code to serve approximately 47 percent of BOC rate exchange areas, and that significant numbers of rate exchange areas are served by multiple CLEC switches. *See* Table 6. In the 100 largest MSAs, one or more CLECs had obtained an NXX code to serve more than 85 percent of BOC rate exchange areas in those MSAs. *See* Appendix D.

Table 6. Rate Exchange Areas Where CLECs Have Obtained NXX Codes

	Percentage of Rate Exchange Areas Served by:			
	1 or more CLEC switch	**2 or more**	**3 or more**	**4 or more**
Verizon	43	26	20	16
SBC	46	25	14	8
BellSouth	64	41	29	19
Qwest	46	21	13	10
Total	**47**	**27**	**19**	**14**

The percentage of wire centers and rate exchange areas served by CLEC switches is a highly conservative measure of the extent to which CLECs actually serve – or have the ability to serve – customers using their own switches.

First, the data count only CLECs switches actually up and running, and only the locations that are presently served by these switches. CLECs could readily extend the geographic reach of existing switches, or deploy still more switches. As the Commission has found, whereas each ILEC switch typically serves only a single rate exchange area, CLECs can and do use their switches to serve multiple rate exchange areas.[15] As one CLEC explains, "[t]he advent of fiber

[13] Rate exchange areas are "geographically defined areas within which calls that originate and terminate (*i.e.*, remain within the area) are considered local calls." *FCC Local Competition Report, Dec. 1998 ed.* at 41, n.17.

[14] In the *Triennial Review Notice*, the FCC asked whether the LERG database "is a reliable indication of whether competitors can serve the mass market using their own switches." *Triennial Review Notice* ¶ 57. As an initial matter, while the LERG is itself a reliable source of the geographic areas to which CLECs have access with their switches, we also rely here on ported number data to make this showing. Thus, even if the Commission were concerned about the reliability of the LERG, it may rely on this alternative source of data. Moreover, as discussed below, once a CLEC has deployed a switch and is using that switch to serve business customers, it may readily expand the use of that switch to serve mass-market customers. Indeed, many competing carriers have done just that.

[15] *See UNE Remand Order* ¶ 261 ("switches deployed by competitive LECs may be able to serve a larger geographic area than switches deployed by the incumbent LEC, thereby reducing the direct, fixed cost of purchasing circuit switching capacity and allowing requesting carriers to create their own switching efficiencies."); *id.* ¶ 258

optic technologies and multi-function switching platforms have, in many cases, allowed carriers . . . to serve an entire statewide or LATA-wide customer base from a single switch platform."[16]

CLECs themselves report that they can and do use their switches to serve very large geographic areas – as large as an entire LATA, an entire state, or even multiple states. AT&T has stated that its "local switches serve geographic areas that are comparable to the areas served by SWBT's tandem switch."[17] For example, AT&T claims to serve both the entire Dallas LATA (LATA 552) and the entire Houston LATA (LATA 560) with one local switch apiece, whereas SBC serves these LATAs with 8 and 7 tandem switches, respectively, plus dozens of end-office switches.[18] Numerous other CLECs have made similar claims. *See* Table 7.

Table 7. Use of CLEC Switches to Serve Large Geographic Areas

WorldCom	"WorldCom uses state-of-the-art equipment and design principles based on technology available today . . . which makes it possible to access and serve a large geographic area from a single switch." "[W]hile WorldCom uses 4 local switches and a transport network to serve these [26] rate centers, BellSouth utilizes 5 local tandems and a multitude of end offices to serve this area."
ICG	"[T]he ICG switch provides services to customers in a geographic area at least as large as that serviced by the ILEC tandem."
AT&T	"It is important to note that in some cases, the AT&T switch serving a LATA is not physically located in the LATA."
Intermedia	"Instead of deploying a multiplicity of switches to cover an area, as is BellSouth's custom, Intermedia deploys a single switch to cover a very large area. Intermedia can do this because the switches it deploys are very capable and have a very large capacity." "From this map, it is clear that all the areas we serve in Jacksonville, Orlando, Tampa and Miami are each served by a single switch. This is a great deal of territory, all covered by four Intermedia switches."
US LEC	"For example, in the Jacksonville market, out network is designed to facilitate traffic termination to the same market as 2 BellSouth tandem switches. Our central office acts as tandem switch and as end office switch for the same 19 rate centers served by the two BellSouth switches."
Sources: See Appendix M.	

Switch manufacturers have specifically designed their equipment to meet CLECs' needs to serve large geographic areas.[19] For example, Lucent's 5ESS – the most popular circuit switch

("facilities-based competitors need not deploy switches in exactly the same network configuration as an incumbent, thus allowing competitors to achieve their own unique and competitive efficiencies by deploying their own switches.").

[16] Prefiled Direct Testimony of Michael Starkey, ICG, NC Docket No. P-582, Sub. 6 at 21 (NC PUC filed May 27, 1999).

[17] Direct Testimony of Jon A. Zubkus on Behalf of AT&T Communications of Texas *et al.*, *Proceeding to Examine Reciprocal Compensation Pursuant to Section 252 of the Federal Telecommunications Act of 1996*, Docket No. 21982, at 3 (TX PUC filed Mar. 17, 2000).

[18] *Id.* ("[T]he TCG switch in Dallas serves the entire 552 LATA which SWBT also serves with 8 tandems. In Houston, the TCG switch serves the entire 560 LATA which SWBT also serves with 7 tandems.").

[19] *See*, *e.g.*, Lucent Technologies, *5ESS 2000 – Switch Mobile Switching Center*, http://www.lucent.com/products/solution/0,,CTID+2008-STID+10048-SOID+824-LOCL+1,00.html (5ESS provides "a unique and very attractive low-cost solution . . . to support growth opportunities in startup areas where existing

among CLECs – has "[r]emote switching capabilities" that make it possible to serve customers that are 2000 miles away from the host."[20] As of December 2001, CLECs had deployed approximately 360 remote switches in addition to the more than 1,300 host switches they have deployed.[21]

CLECs also may extend their competitive reach by deploying new switches or expanding the capacity of existing switches. In the last few years, switch manufacturers have made it easier and more cost-effective than ever for CLECs to purchase and deploy new circuit switches.[22] Switches have modular designs that enable a carrier to start small and add capacity as they grow.[23] The latest generation of switches also has very large maximum capacities – as much as 600,000 lines.[24]

Second, the data are based only on conventional CLEC circuit switches, even though all forms of circuit-switched traffic (including fax, e-mail, and data) are now being switched on packet rather than circuit switches. As described in Section II.B below, CLECs are rapidly

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traffic may not justify installing a standalone" switch.); Nortel Networks, *DMS-10 Carrier Class Switching System, Remote Switching Center-S*, http://www.nortelnetworks.com/products/01/dms-10/rscs.html. (Nortel remote switches "[e]xtend[] a full complement of host switch features to subscribers up to 650 miles from a DMS-100 or DMS-500 host, up to 100 miles from a DMS-10 host.").

[20] Lucent Technologies, *5ESS Switch*, http://www.lucent.com/products/solution/0,,CTID+2002-STID+10055-SOID+935-LOCL+1,00.html ("*Lucent 5ESS Website*"); Lucent Technologies, *5ESS 2000-Switch Mobile Switching Centre (MSC)*, http://www.lucent.com/products/solution/0,,CTID+2008-STID+10048-SOID+824-LOCL+1,00.html.

[21] Telcordia, *January 2002 LERG*.

[22] *See*, *e.g.*, Lucent Technologies, *Maximize Your Opportunities With the Remoting Capabilities of the 5ESS-2000 Switch*, http://192.11.229.2/livelink/163997_Brochure.pdf (CLECs may "establish a presence in a new or small market at minimal cost," and "without making major capital investments."); P. Korzeniowski, *Pieces of Concern – The Communications Market Is One Big Puzzle, and CLECs Are Scrambling To Find the Right Fit*, tele.com (May 29, 2000) (quoting Pat Price, Lucent's director of switch product marketing: "We've cut the size of our switch in half and disabled some residential services, so a CLEC should be able to install a new central office switch in a month"); M. Reddig, *Top 10 Advances in Switching* (quoting Dan Lakey, senior market manager for CLECs, Taqua Systems: "Even the legacy switching products are consolidating common equipment into half as many cabinets and increasing port density on line and trunk modules."); Ericsson Marketing Brochure, *AXE Local 7.2*, http://www.ericsson.com/multiservicenetworks (AXE Local 7.2 switch reduces "costs for installation, operation and maintenance" with "new options for remote control [that] sav[e] time and money on service personnel.").

[23] *See*, *e.g.*, *Lucent 5ESS Website* (5ESS "allows growth in increments simply by adding modules"); Nortel Networks, *DMS-10 Carrier Class Switching System*, http://www.nortelnetworks.com/products/01/dms-10/index.html (DMS-10 is specifically "[d]esigned for small to medium applications"); Siemens Press Release, *Siemens Debuts Denser Version of Its World-Leading Class 5 Switch to Meet Service Demands and Space Limitation* (June 4, 2001) (EWSD SX switch is "finding great popularity with carriers of all sizes who need exceptional functionality on a smaller footprint.").

[24] *See*, *e.g.*, Siemens A.G., *EWSD Powernode*, http://www.siemens.ie/fixedoperators/CarrierNetworks/switching/ewsd.htm ("The EWSD PowerNode can handle up to 600,000 subscribers and 240,000 trunks per switch and it supports ultra large Remote Switching Units, which can handle up to 50,000 subscribers or 8,500 trunks. The EWSD PowerNode is based on your current EWSD infrastructure, which qualifies it as a tool to consolidate your network."); Lucent Technologies, *Products and Services – 5ESS® Switch*, http://www.lucent.com/products/solution/0,,CTID+2002-STID+10055-SOID+935-LOCL+1,00.html ("A full-sized 5ESS® switch serves up to 250,000 subscriber lines and over 100,000 trunk lines."); Nortel Networks, *Products – DMS 500: DMS 500 System Advantage*, http://www.nortelnetworks.com/products /01/dms500/collateral/74038.16-09-97.pdf (the Nortel DMS-500 can support up to 122,278 lines and 45,288 trunks).

deploying packet switches to provide data services, and also are increasingly using these switches to provide voice services. The tabulated data also exclude wireless switches, even though wireless networks now switch at least one-quarter of the amount of voice traffic as wireline networks.[25]

Third, the tabulated data exclude PBXs. The FCC and independent analysts have all reached the conclusion that PBX systems compete directly with circuit-switched services.[26] As of year-end 1998, there were 45 million installed PBX lines in the United States.[27] As of year-end 2001, the number had grown to 56 million.[28] This means that on approximately 44 percent of all ILEC switched access lines serving business customers at least some of the switching was done by a switch other than an ILEC's own circuit switch.[29]

2. Use of CLEC Switches To Serve Mass-Market Customers.

As of year-end 2001, CLECs were serving approximately *three million* residential lines using their own switches. CLECs that are serving mass-market customers using their own switches have typically done so either by expanding the services on their existing large-customer-focused networks, or by expanding the geography of their existing broad-customer-based networks into adjacent territories. This service and geographic expansion typically involves the use or extension of existing facilities, not the conversion of unbundled local switching leased from an ILEC.

Service-Based Expansion To Serve Mass-Market Customers. CLECs have generally deployed switches to serve large business customers, in the first instance. Having done so, however, it is both straightforward and cost-effective for them to use these same switches to serve mass-market customers, and facilities-based CLECs are now doing so aggressively. *See* Table 8. Indeed, the wire centers in which CLECs already are serving business customers also contain the vast majority of all residential lines. As noted above, for example, the wire centers in

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[25] *See* note 141, *infra*.

[26] *See*, *e.g.*, *Amendment of Part 69 of the Commission's Rules Relating to Private Networks and Private Line Users of the Local Exchange*, Notice of Proposed Rulemaking, 2 FCC Rcd 7441, ¶ 44 (1987) (decision to apply the surcharge to Centrex leakage as well as PBX leakage was "based upon a recognition that Centrex and PBX switches competed directly with one another."); *KLF Electronics v. Indiana Bell Telephone*, Memorandum Opinion and Order, 1 FCC Rcd 502, 503 n.3 (1986) ("Centrex service performs some of the same functions performed in a PBX, and therefore telephone exchange carriers offering Centrex compete with companies . . . that provide PBX switches."); H. Peterzell, *Centrex III – Some Other Considerations* (May 8, 1998), http://www.phonehelp.com/p-1-31.htm ("I know of nothing that can be accomplished with either of these technologies [PBX and Centrex] that cannot be accomplished with the other. Functionality, interestingly enough, is not a consideration.").

[27] Multimedia Telecommunications Association, *1998 Multimedia Telecommunications Market Review and Forecast* at 92 (1998).

[28] *Id.* (installed base of nearly 44 million PBX lines as of year-end 1997); Multimedia Telecommunications Association, *2001 Multimedia Telecommunications Market Review and Forecast* at 105, 108 (2001) (12 million new add-on PBX lines shipped between 1998 and 2001) (2001 add-on lines estimated using average percentage of shipments attributed to add-on lines, 1998-2000).

[29] This figure was derived as follows: PBX lines in use today (55,868,000) divided by combined Business Switched Access Lines and Special Access Lines (128,015,263). *FCC Statistics of Common Carriers, 2000/2001 ed.* at Table 2.4.

which CLECs have ported numbers to their own switches contain 84 percent of all BOC residential access lines, in addition to 89 percent of all BOC business lines.

Cable operators have used a comparable at-the-margin strategy for getting into mass-market voice service. Here, video and data services have provided the economic entry point that has justified the initial build out of the network. The cable telephony that has been commercially deployed to date relies on the same type of circuit-switches that ILECs and CLECs use. *See* Table 9. At least five cable operators – including AT&T, Cox, Comcast, Cablevision and Insight – have actually deployed commercial circuit switched cable telephony.[30] Circuit-switched cable telephony has been deployed in 20 states and is now available to more than 10 million U.S. homes – approximately 10 percent of the mass market.[31] More than 1.5 million homes subscribe.[32] Cable operators are adding over 70,000 customers a month for their residential telephony services.[33] By the end of 2002, circuit-switched cable telephony is expected to be available to more than 11 percent of all homes, with an estimated 2.4 million of these homes actually subscribing.[34]

In some states, cable telephony is already far more widely available than nationwide averages suggest. For example, the Commission has recognized that Cox already has the "capability to provide cable telephony service to 75 to 95 percent of Rhode Island customers."[35] AT&T offers cable telephony services to large fractions of the nearly three million homes its cable network passes in the Boston Area,[36] the approximately 600,000 homes it passes in the Pittsburgh area,[37] the 3.5 million homes it passes in the Chicago area,[38] and the 2.7 million

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[30] *See* M. Stump and K. Brown, *Comcast Plunges Into Telephony*, Multichannel News at 5 (Dec. 24, 2001); *Cabling Home*, Nashville Bus. J. at 17 (Feb. 1, 2002); *Eighth Video Competition Report*; T. Kerver, *Operator of the Year*, Cablevision (Oct. 22, 2001). There currently are two major cable operators – AT&T and Cox – and a third smaller one, Insight, that are actively deploying circuit-switched cable telephony to new areas. *See* Yahoo! Business, *AT&T and Comcast Remain On Watch Neg* (Dec. 20, 2001), http://biz.yahoo.com/bw/011220/202353_1.html; K. Darce, *Local Phone Arena Gets New Players*, Times-Picayune at 1 (Feb. 8, 2002); Insight Communications, *Services*, http://www.insight-com.com/services/.

[31] *See JP Morgan Cable Industry Report* at Table 22; *NCTA Cable Telephony Report* at 2.

[32] *See* NCTA, *US Cable Telephony Subscribers (in Thousands 1998-2001*), http://www.ncta.com/industry_overview/indStats.cfm?statID=13.

[33] *See NCTA Cable Telephony Report* at 1.

[34] *See JP Morgan Cable Industry Report* at Table 22.

[35] *See*, *e.g.*, *Rhode Island Order* ¶ 105.

[36] *See* Dan Somers, President and CEO, AT&T Broadband, *Operational Overview*, AT&T Broadband, Investor Presentation, July 2001, at 16 (stating that AT&T's network in Boston has "2.9 million homes passed," that "plant upgrades [are] nearly complete, [to be] able to offer complete bundle," and that there is already "11% telephony penetration" and ">100k customers.").

[37] As of mid-2000, AT&T offered cable telephony to at least 165,000 of its approximately 400,000 subscribers in the Pittsburgh Area. *See Company Offers Free Phone Service in Bid for Customers*, Associated Press State & Local Wire (Aug. 31, 2000); NCTA, *Top 25 Cable Systems*, http://www.ncta.com/industry_overview/aboutIND.cfm?indOverviewID=56. AT&T's network passes roughly 600,000 homes, assuming a nationwide cable penetration rate of approximately 66 percent.

[38] *See* Dan Somers, President and CEO, AT&T Broadband, *Operational Overview*, AT&T Broadband, Investor Presentation, July 2001, at 17 (stating that AT&T's network in Chicago has "3.5 million homes passed," a

homes it passes in the Bay Area.[39] And, as discussed below, most major cable operators have stated that they soon plan to deploy cable telephony even more broadly by relying on packet-switched, IP-based technology.

Table 8. CLECs Providing Facilities-Based Residential Service

CLEC	State	
ALLTEL	AR, FL, NC, NE, OH, PA	"ALLTEL began offering local telephone service to area [Raleigh] residents this week, two months after launching local telephone service to [Raleigh] area businesses."
AT&T	CA, CT, FL, GA, IN, KY, MD, MA, MN, NH, PA, UT, VA, WA	"AT&T Broadband now markets cable telephony to approximately seven million households in 16 markets, has over one million customers (or 14.8% of its marketable homes with penetration rates reaching 30% in some communities), and continues to expand the availability of competitive local telephony services to homes throughout the former TCI and MediaOne footprints."
BayRing	NH	"BayRing owns and operates two CLASS 5 Digital Switches that are housed at the Pease International Tradeport in Portsmouth, NH"; "offers residential and business customers competitively priced local, long distance, Internet and dedicated access services."
Broadview Networks	MA, NJ, NY, PA	"Broadview Networks…is a network-based electronically integrated communications provider (e-ICP) serving small and medium-sized businesses and communications-intensive residential customers in the northeastern and mid-Atlantic United States."
Cablevision	CT, NJ, NY	"[Cablevision] provides residential telephone and cable modem internet access service in portions of the greater New York City metropolitan area and parts of southern Connecticut." "At December 31, 2000, the Company served approximately 239,000 modem subscribers and approximately 12,000 residential telephone subscribers."
Cavalier Telephone	DE, MD, PA, VA	"Cavalier targets business and residential customers, the latter composing 60 percent of its customer base. It generally markets residential services to employees of the various businesses it serves."
CenturyTel	LA	"The Company is currently offering CLEC services to residential and small and medium sized business customers in Shreveport and Monroe, LA. CenturyTel will employ an 'edge-out' strategy for its CLEC expansion."
Comcast	MI	"It now seems that Comcast has 15,000 circuit-switched telephony customers across a base of 150,000 homes passed in 12 Michigan towns, including Ann Arbor, Birmingham and Dearborn."
CoreComm	IL, MI, OH, PA, WI	"CoreComm is a national, partially facilities-based CLEC serving both the residential and the business markets, primarily in the Midwest and the Northeast."
Cox	AZ, CA, CT, LA, NE, OK, RI	"[B]y March 31, 2001 Cox Communications was serving 300,000 residential customers using 410,000 residential access lines, making Cox the equivalent of the 12th largest telephone company in the country."
CTC Exchange	NC	"The CLEC is deploying two strategies…The second as a Greenfield that the Company calls SLEC…building infrastructure in new residential and business developments."

"strong telephony roll-out" with "backbone and headend segments of rebuilds nearly complete," "18% telephony penetration" and "some suburbs have 40% penetration.").

[39] *See id.* at 18 (stating that AT&T's network in the Bay Area has "2.7 million homes passed," "backbone and headend segments of rebuilds nearly complete," "19% telephony penetration" and "many communities in high 20s").

Table 8. CLECs Providing Facilities-Based Residential Service		
CLEC	**State**	
CTSI	NY, PA	"CTSI will continue to focus on its three original 'edge-out' markets (Wilkes-Barre/Scranton/Hazleton, Harrisburg and Lancaster/Reading/York, PA). CTSI has its own host switches in Harrisburg and in Wilkes-Barre, PA. CTSI serves the Lancaster/Reading/York market with remote switches connected by fiber to CTSI's Harrisburg host switch."
Grande Communications Network, Inc.	TX	"Grande Communications is building a ground-up deep fiber broadband network to homes and businesses. Grande will deliver high-speed Internet access, local and long distance telephone and cable television entertainment services over its own advanced broadband network to communities in Texas."
Insight	KY	"Insight Communications Co. is moving forward on a cooperative voice deal it signed last year with AT&T Broadband. Insight has rolled out primary-line cable telephony in Louisville, Ky., a system that serves 25,000 marketable homes."
Knology	AL, FL, GA, SC, TN	"Knology Broadband offers residential and business broadband services, including analog and digital cable television, local, and long distance telephone, high-speed Internet access service, and other services including broadband carrier services (BCS) using two-way high capacity hybrid fiber/coaxial Interactive Broadband Networks."
LecStar	AL, FL, GA, KY, MS, NC, SC, TN	"LecStar Corporation is a facilities-based integrated communications carrier (ICC)." "LecStar offers a full array of fixed wire-line voice, data, Internet and operator services to business and residential customers throughout BellSouth's Southeastern operating territory."
NTELOS	KY, VA, WV	"NTELOS Inc…is a regional telecommunications provider offering a wide range of services to business and residential customers in Kentucky, Virginia and West Virginia." "NTELOS is pursuing an edge-out build strategy. NTELOS enters markets that are physically proximate to its existing ILEC operations and uses its brand and existing infrastructure to expand into them."
NTS Communications, Inc.	NM, TX	"The Company currently offers facilities-based local telephone service in the cities of Amarillo, Lubbock, Abilene, Wichita Falls, Midland/Odesa, San Angelo, and San Angelo TX, and also in Albuquerque, NM." "With NTS's facilities-based local dial tone product, you use NTS's network facilities – not those of the traditional telephone company."
RCN	CA, DC, MA, NY, PA	"Our multi-service network is presently operating in Boston, Manhattan, Lehigh Valley, Washington, D.C., San Francisco, Queens, Chicago, and Philadelphia. . . . The Company's telephone switching network utilizes either the Lucent 5ESS-2000 or the Nortel DMS-100 switching platforms as the local switching element, and the network is designed to provide highly reliable lifeline telephony service. In each of the markets which are operational, a telephone switch is installed and fully operational."
Rio	OR	"Rio Communications has invested $1 million to set up its own switch in Eugene, said Ed Marcotte, president and part-owner of Rio. The 5-year-old, Eugene-based firm operates roughly 1,000 phone lines, serving about 30 customers. It is adding about 500 business lines a month and hopes to launch residential service by the fall, Marcotte said."
Sources: See Appendix M.		

Table 9. Commercial Circuit-Switched Cable Telephony Deployment			
	Homes Passed for Cable Telephony	**Cable Telephony Subscribers**	**Future Plans**
AT&T	approximately 7 million	1 million (EOY2001)	AT&T expects to expand service to approximately 5-6 million homes per year
Cox	Orange County; San Diego; Omaha; Oklahoma City; Phoenix; Tucson; RI; CT; Tidewater area, VA	400,000 (EOY2001)	"Since December [2001], Cox has launched residential phone service over its cable television network in St. Charles and St. Bernard parishes. Phone service will be extended to Jefferson Parish by mid-summer [2002] and to Orleans by the end of the year, Cox spokesman Steve Sawyer said."
Comcast	150,000	40,000 (EOY2001)	Using AT&T switches, plans soon to deploy circuit-switched telephony to 1 million Comcast homes
Cablevision	Long Island, NY	12,500 (June 2001)	Plans to deploy IP Telephony more broadly
Insight	Louisville, KY	2,000 (Oct. 2001)	The first telephony customers have been connected in parts of the Louisville, KY and Evansville, IN systems, with launches to follow in Lexington, KY and Columbus, OH later this year.
Sources: See Appendix M.			

Geographic Expansion to Mass-Market Customers. As discussed in more detail in Section IV.B.3, a number of incumbent local exchange carriers have been pursuing edge-out strategies, pushing into the territories of adjacent ILECs.[40] For example, CTSI – the CLEC subsidiary of Commonwealth Telephone (the second largest ILEC in Pennsylvania) – operates a competitive voice network in Verizon's service territory in Wilkes-Barre, Harrisburg, and Lancaster that serves business and residential customers.[41] ALLTEL has deployed competitive facilities – including switches – adjacent to its ILEC service territories in Little Rock, Charlotte, Cleveland, Jacksonville, and Tallahassee.[42]

Some existing cable telephony providers also are engaging in geographic expansion, and many other cable operators could no doubt do so. For example, AT&T's merger partner,

[40] *See, e.g., NPRG CIOC Report 2001*, Ch. 2 at 1 ("[Competitive Independent Operating Companies ('CIOCs')] target RBOC markets that are geographically proximate to their existing ILEC holdings. This 'edge-out' strategy allows the CIOC to take advantage of the synergy of its ILEC and CLEC operations while entering typically underserved non-urban markets. CIOCs are able to employ infrastructure, brand, and local experience to gain market penetration and achieve profitability."); *id*. Ch. 2 at 2 ("All CIOCs target business customers and depending on individual market characteristics, also target residential customers through the use shared lines or through infrastructure overbuilds.").

[41] *See* Commonwealth Telephone Enterprises, Inc., Form 10-K (SEC filed Mar. 27, 2001); *NPRG CLEC Report 2001, 14th ed.*, Ch. 13 – CTSI, Inc. at 7; CTE Press Release, *CTE Announces Restructuring of CTSI Subsidiary* (Dec. 6, 2000).

[42] *See* ALLTEL, *Coverage Maps: National Map*, http://www.alltel.com/news_information/maps/download/bigjpgs/US.jpg; *NPRG CIOC Report 2001*, Ch. 7 at 8-9. In March 2002, ALLTEL announced that it will discontinue its CLEC operations in seven of ten states (representing less than 20 percent of ALLTEL's CLEC access lines); however, the company has not identified which states will be affected by this change. *See* ALLTEL Corp., Form 10-K405 (SEC filed Mar. 5, 2002).

Comcast, states that it can easily and cheaply use AT&T's existing switches to provide residential telephony service to Comcast's existing cable subscribers.[43] Comcast's Treasurer, John Alchin, states that "'when you look at what AT&T has already done in terms of infrastructure and the huge investment they've made . . . we can more easily piggyback off that in an economically efficient way.' Between 70% and 80% of Comcast's existing systems are within 'striking distance' of existing AT&T Broadband switching services . . . 'making the incremental roll-out of telephony in Comcast legacy systems compelling.'"[44] Comcast plans to roll out circuit-switched phone service to as many as one million Comcast households upon closing its proposed merger with AT&T.[45]

Collocation and Hot-Cut Issues. As discussed in Section IV.A, CLECs that serve large business customers with their own switches typically do so directly through fiber connections they have deployed. Mass-market customers do not always generate enough traffic to justify a fiber link, so many CLECs that seek to serve such customers with their own switch will do so through an unbundled loop obtained from an ILEC. In order to do so, the CLEC will first obtain collocation in the ILEC's central office. Where the customer that the CLEC seeks to serve already is receiving dial-tone service from the ILEC, the CLEC will typically request that a hot cut be performed on the loop serving that customer. A hot cut involves moving the end-user customer's loop from the ILEC's switch to the CLEC's switch.

At the time of the *UNE Remand Order* the Commission declined to curtail availability of the switching UNE primarily because of the time and cost associated with obtaining collocation space and local loops through the hot-cut process.[46] Concerns about collocation and hot-cut performance have been fully addressed since the time of the last UNE review, however.

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[43] *See*, *e.g.*, *Cable Companies Tell Analysts They're Confident About Prospects*, Warren's Cable Regulation Monitor (Jan. 14, 2002) ("With switches already in place in 8 of 10 biggest U.S. markets, only $5-$50 million is needed to be invested to complete phone service for residences."); M. Farrell, *AT&T Wants to Tweak Digital Packages Again*, Multichannel News (Jan. 14, 2002) ("[Comcast President Brian] Roberts had been lukewarm on cable telephony in the past – before the merger agreement, Comcast had said repeatedly that it would wait for lower-cost Internet-protocol telephony to become a reality – but he's now one of its biggest proponents. . . . Roberts said telephony can be rolled out in Philadelphia and Detroit for between $5 and $50 per customer, because AT&T has already invested in the switching infrastructure in those markets. That $5 to $50 cost would mainly power the phone service at each customer home."); J. Borland, *Comcast, AT&T Cable Deal To Create Net Giant*, CNET News.com (Dec. 20, 2001) ("Steve Burke, president of Comcast Cable, said in Thursday's conference call that introducing phone services to Comcast customers could generate $600 million to $800 million annually within the next five years. 'If we overlay their expertise, their investment, their people and learning, and roll out telephony to our footprint, it could represent a very significant opportunity,' he said.").

[44] M. Scanlon, *AT&T Broadband Deal Lets Comcast Accelerate Telephony*, Cable World (Jan. 7, 2002).

[45] *See* Applications and Public Interest Statement of AT&T Corp. and Comcast Corporation at 38, *Application for Consent to the Transfer of Control of Licenses, Comcast Corporation and AT&T Corp., Transferors, to AT&T Comcast Corporation, Transferee*, MB Docket No. 02-70 (FCC filed Feb. 28, 2002) ("Comcast President (and AT&T Comcast CEO) Brian L. Roberts has announced that the merged company intends to begin to deploy telephone service in the Philadelphia and Detroit markets currently served by Comcast, after closing, bringing facilities-based local telephone choice to about one million additional homes.").

[46] *See UNE Remand Order* ¶¶ 269-271.

The Commission has expanded the range of collocation options and imposed standard time limits.[47] And collocation in BOC regions has risen very sharply. At the end of 1998, for example, CLECs had obtained roughly 4,000 collocation arrangements in BOC regions; by year-end 2001 there were approximately 25,000 CLEC collocation arrangements in place. CLECs are now collocated in central offices that serve approximately 81 percent of BOC access lines – including approximately 79 percent of BOC residential lines. *See* Table 10.

Table 10. Collocation by Region

	Verizon	SBC	BellSouth	Qwest	Total
Collocation Arrangements YE 1998	1,100 (excl. GTE)	2,000	870	240	**4,300**
Collocation Arrangements YE 2001	7,000	9,900	4,700	3,300	**24,900**
% of Residential Lines in WCs served by collocation	74	83	77	84	**79**
% of Business Lines in WCs served by collocation	84	87	87	90	**86**
% of Total Lines in WCs served by collocation	78	85	80	86	**81**

Totals may not equal sum of parts due to rounding.

The availability in the market of alternatives to traditional collocation also has been greatly expanded in recent years due to the rapid rise of alternative collocation providers (so-called collocation "hotels"), which give competitive local carriers places to deploy their switches and interconnect their networks. These companies provide "high-security facilities operated by independent companies that put telecom gear as close as possible to incumbent central offices without actually being there."[48] They permit CLECs to "easily connect with, and hand off traffic to, the IXCs and each other."[49] They allow "[m]ost new business telecom providers . . . to bypass the traditional infrastructure."[50] Today, there are alternative collocation providers in virtually all major metropolitan areas throughout the country. *See* Appendix G.

With respect to hot cuts, any concerns about hot-cut performance have been reduced as both sides have gained further experience and worked out the rough spots in their respective processes. Indeed, since the *UNE Remand Order*, the FCC has repeatedly found that BOC

[47] *See*, *e.g.*, *Deployment of Wireline Services Offering Advanced Telecommunications Capability*, Order on Reconsideration and Second Further Notice of Proposed Rulemaking, 15 FCC Rcd 17806 (2000); *Deployment of Wireline Services Offering Advanced Telecommunications Capability*, Fourth Report and Order, 16 FCC Rcd 15435 (2001).

[48] D. Culver, *Construction Boom for Colocation*.

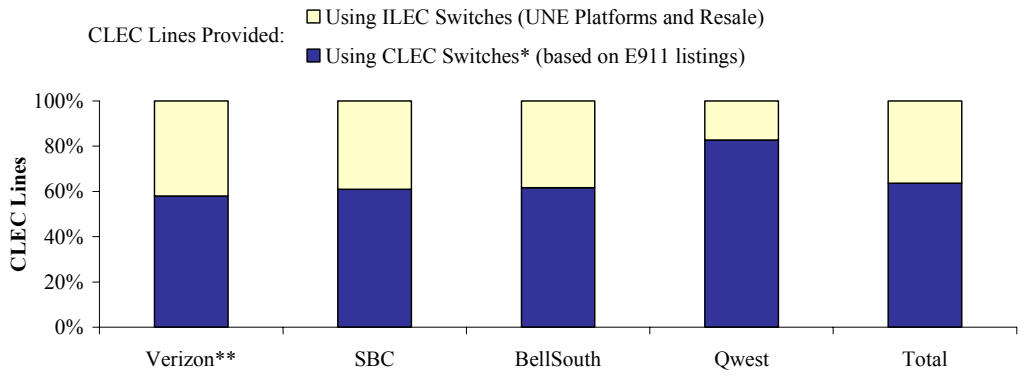
[49] A. Lindstrom, *Checking Out Carrier Hotels,* America's Network (Nov. 1, 1997).

[50] V. McCarthy, *Local Carriers Take Over Office Buildings,* Interactive Week (May 22, 2000), http://www.zdnet.com/intweek/stories/news/0,4164,2574580,00.html (quoting Sean Dohety, president, Urban Media).

performance in providing hot-cuts to CLECs is satisfactory.[51] And, as demonstrated in Appendix H, the Bell companies' hot-cuts performance is now excellent.

Migration of Mass-Market UNE-P Customers to CLEC Switches. Collectively, CLECs use their own switches to serve most of their customers. *See* Figure 3. Some CLECs, however, continue to rely primarily on the UNE Platform, which of course includes the switching element, to serve mass-market customers.[52] These CLECs maintain that they remain dependent on ILEC switches to serve mass-market customers because they "cannot rationally invest in switches . . . until they have used UNE-P to build up a customer base."[53] But that assertion cannot be squared with the economics of switch deployment, and with the actual marketplace track record that other CLECs have established.

Figure 3. Breakdown of CLEC Lines by Mode of Entry



*The number of lines provided entirely over CLEC facilities and using CLEC switches is based on the number of E911 listings CLECs have obtained. Because the actual number of lines that CLECs are serving with their own switches is likely much higher, this method will, if anything, understate the percentage of all lines that CLECs are serving in whole or in part over facilities they have deployed themselves.
**Verizon data do not include the former GTE territory.

It certainly is clear that some CLECs are not migrating mass-market UNE-Platform customers to their own facilities, and have no plans ever to do so. In New York, for example, AT&T and WorldCom together provide UNE-P service to well over one million residential customers[54] – enough customers, in other words, to fill five to ten switches. Together, AT&T

[51] *See*, *e.g.*, *New York Order* ¶ 291; *Massachusetts Order* ¶ 159; *Connecticut Order* ¶ 13; *Pennsylvania Order* ¶ 86; *Texas Order* ¶ 256; *Kansas/Oklahoma Order* ¶ 199; *Arkansas/Missouri Order* ¶ 102.

[52] In the Bell companies' regions, approximately two-thirds of all platforms are used to serve residential customers, and the percentage is even higher in Verizon's and SBC's regions (80 percent and 70 percent, respectively). Most of the platforms used in the business sector appear to be used to serve small business customers, which the FCC previously has held are part of the same "mass market." *See*, *e.g.*, *Bell Atlantic/NYNEX Merger Order* ¶ 70. For example, nearly 25 percent of all platforms used to serve business customers are sold in BellSouth's region, and half of those are sold to business customers with only 1-3 lines.

[53] Ex Parte Letter from Robert W. Quinn, AT&T, to William F. Caton, FCC, CC Docket No. 01-347 (Mar. 1, 2002).

[54] S. Alexander, *Judge Recommends Qwest Be Fined for Impeding Local Service by AT&T; But AT&T Says It Won't Enter Market*, Star Trib. (Feb. 26, 2002) (AT&T vice president Tom Pelto said that AT&T uses the UNE-Platform to provide local residential phone service to about 1 million people in New York.); M. McDonald, *Local*

and WorldCom also operate 28 local circuit switches in New York state.[55] Yet these two carriers do not appear to have converted any residential customers in New York to their own switches.[56] The experience has been no different in other states where AT&T and WorldCom have signed up large numbers of UNE-P customers. Other CLECs that have obtained UNE Platforms to serve mass-market customers also have conceded that they have no plans to convert these customers to their own switches, even after they have acquired a large customer base. They view UNE-P competition as an end in itself, rather than as a stepping stone to facilities-based competition.

Their position is based on business judgment, however, not on any economic imperatives. The UNE-P-forever CLECs have simply decided that there is more to be gained from relying on UNEs at TELRIC prices than from deploying their own facilities.

To begin with, many other CLECs *are* deploying switches to serve mass-market customers. Indeed, most of the CLECs that have deployed one or more switches, and that also serve mass-market customers, make little if any use of unbundled BOC switching. Leaving aside service provided over cable networks, at least nine CLECs in Bell company regions provide facilities-based service to 25,000 or more residential lines (based on their E911 listings). *See* Figure 4. Seven of the nine buy *no* UNE-P service at all. The remaining two represent only 3 percent of all facilities-based residential lines. But for one of these two CLECs, UNE Platforms represent only five percent of the residential lines that this carrier serves.

The same circuit switch in the same wire center can and routinely does serve both business and residential customers – ILECs use *their* switches in precisely that way, and many CLECs do too. For example, many of the cable operators that are now providing circuit-switched cable telephony are doing so using switches deployed originally by their CLEC affiliates to serve business customers.[57] With switching, perhaps more so than with any other

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Phone Fight Gets Put on Hold, Crain's N.Y. Bus. at 1 (Mar. 5, 2001) (WorldCom accumulated 400,000 customers in New York).

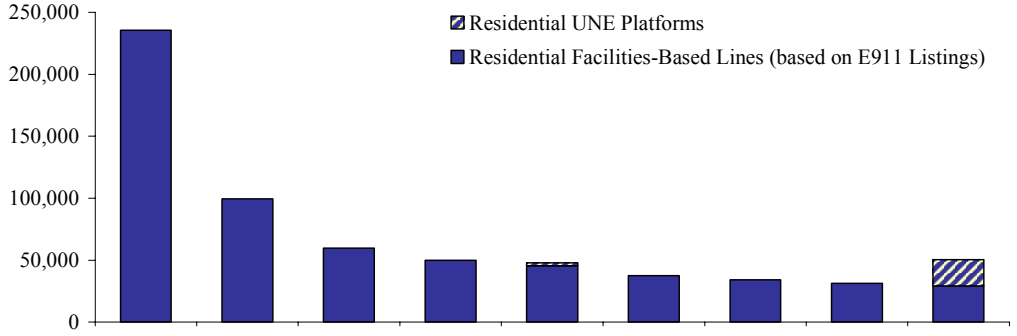
[55] *See* Appendix B.

[56] *See* Declaration of Vijetha Huffman ¶ 5, *attached to* Comments of WorldCom, Inc., *Application of Verizon New Jersey, Inc., Bell Atlantic Communications, Inc. (d/b/a Verizon Long Distance), NYNEX Long Distance Company (d/b/a Verizon Enterprise Solutions), Verizon Global Networks Inc. and Verizon Select Services Inc. for Authorization To Provide In-Region, InterLATA Services in New Jersey*, CC Docket No. 01-347 (FCC filed Jan. 14, 2002) ("UNE-P . . . is the only service-entry vehicle that WorldCom uses to offer local residential service, and it is the only service-delivery option that WorldCom currently views as even potentially viable."); Supplemental Declaration of Michael Lieberman on Behalf of AT&T Corp. ¶ 20, *attached to* Ex Parte Letter of Peter Keisler, Sidley Austin Brown & Wood (representing AT&T), to William F. Caton, FCC, CC Docket No. 01-324 (Feb. 8, 2002) (AT&T has recently stated that it has not pursued a strategy of converting platform customers to its own facilities "to provide basic local residential service to customers anywhere in the country.").

[57] *See*, *e.g.*, K. Zia, Deutsche Banc Alex. Brown, Investext Rpt. No. 8089704, Cablevision Systems Corp. – Company Report at *5 (Apr. 16, 2001) ("On the cable telephony front, Cablevision has introduced a switched-circuit residential solution in its Long Island, NY and Connecticut markets, which leverages the infrastructure and switches of its CLEC subsidiary, Lightpath."); K. Zia, Deutsche Banc Alex. Brown, Investext Rpt. No. 8089709, Adelphia Communications – Company Report at *6 (Apr. 16, 2001) ("Adelphia plans to roll out residential telephony using packet-switched (IP) technology in 2002, with the substantial advantage over most others in the industry of being able to tap its relationship with its CLEC subsidiary Adelphia Business Solutions. Leveraging ABS's already laid fiber, switches, co-location agreements with ILECs and back-office infrastructure, should provide Adelphia with significant time-to-market and cost structure advantages.").

network element, residential service can readily be added at the margin. And the vast majority of residential customers are now in reach of CLEC switches already in operation. CLEC switches are up and running in wire centers that serve 86 percent of all BOC access lines. And these same wire centers serve about 84 percent of BOC residential lines.

Figure 4. Use of UNE Platforms by CLECs Providing Service to 25,000 or More Residential Lines Using Their Own Switches*



*Excludes CLECs providing service over cable facilities. Does not include CLECs in Qwest's region.

CLECs providing service to 25,000 or more facilities-based residential lines include: ALLTEL, Broadview, Cavalier Telephone, Intermedia, Knology, McLeodUSA, RCN, TDS, and TOTALink.

The only other justification that CLECs have given for their failure to convert mass-market customers from Platforms to their own switches relates to the cost of migrating the customer, not the cost of deploying or operating the switch itself. This does not establish that the UNE Platform is necessary for competition; to the contrary, it establishes that facilities-based competition will develop faster if CLECs do not build their customer base on UNE-P service at all.

As described above, the costs associated with collocation have fallen sharply since the *UNE Remand Order*, as the Commission has created numerous alternatives to traditional physical arrangements. The rates for hot cuts are set using TELRIC principles, and the BOCs' hot-cut performance is closely monitored by state commissions. As a result, the transactional costs that CLECs seeking to use their own switch must incur are no different than the costs that any other network provider – including ILECs and cable companies – would need to incur to connect loops to its own switches.

But even assuming that hot-cut costs remain significant, substantial numbers of customers that seek phone service are entirely "new" customers in that they are first-time subscribers at the location at which they are requesting service. Wireline telephone companies add approximately six million subscriber lines each year.[58] And, because people move, a significant fraction of existing customers terminate their current phone service and initiate new service at some other location every year.[59] Together, these two groups define a large base of

[58] *See FCC Trends in Telephone Service, Aug. 2001 ed.* at Table 8.1.

[59] *See*, *e.g.*, U.S. Census Bureau, *Statistical Abstract of the United States: 2001* at 28 (Nov. 2001) (from 1999-2000, 15 percent of the U.S. population, or approximately 40 million people, changed residences).

customers who can be served without incurring the transaction costs associated with moving an established customer off of an ILEC switch and on to a CLEC alternative.

B. Packet Switches as Substitutes for Circuit Switches.

CLEC packet switches are already a very significant competitive alternative to ILEC circuit switches.

Packet switches substitute for circuit switches to the extent that traffic can be routed directly to a packet switch, without first being routed through a circuit switch. All forms of telecommunications traffic can now be transmitted and switched, end-to-end, in digital rather than analog format. And because packet switches are far more efficient in handling digital traffic than circuit switches, the economics of migrating traffic from circuit to packet switches have become incredibly compelling. Indeed, there already is far more data traffic than voice traffic, even on the circuit-switched public telephone network.

Of course, the CLEC packet switches in many cases also either are or are capable of being used to provide voice services. Long-distance carriers have been migrating their traffic to high-speed packet switches for several years. Having gained a robust, profitable entry point in high-speed data, *local* providers are now offering messaging and voice services over those networks too. The number of customers with local data links to packet switches is already large and growing very rapidly. And a large and growing share of these data links connect to packet switches that competing carriers – including CLECs, wireless carriers, and cable providers – own and operate.

Direct Customer Links to Packet Switches. At the time of the last UNE review, 98 percent of online households still relied on dial-up connections – and thus on ILEC circuit switches – for their data services.[60] As discussed further in Section IV.C, however, nearly eight million residential users – or roughly 9 percent of online households – now have broadband cable or wireless data links instead, which bypass ILEC networks completely, and terminate directly on a competitive packet switch.[61] If all eight million of these broadband users would otherwise be using dial-up connections, the packet switches used to provide these broadband services now displace at least 4 percent of all circuit-switched minutes of use, even assuming that the average data line is used only as much as the average voice line.[62] The total would be far higher if one takes into account the fact that data calls generally last much longer than voice calls, and that data lines are therefore used much more, on average, than voice lines.[63]

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[60] *JP Morgan Cable Industry Report* at Table 13. *See also* D. Lathen, Cable Services Bureau, FCC, *Broadband Today: A Staff Report to William E. Kennard, Chairman, Federal Communications Commission, On Industry Monitoring Sessions Convened by Cable Services Bureau* at App. A (Oct. 1999).

[61] *See Gartner U.S. Consumer Telecommunications and Online Market Report* at Table 7-1; *Morgan Stanley Cable Modem/xDSL Report* at Exh. 3 (cable modem).

[62] This was derived as follows: (8 million cable/wireless broadband lines)/(174 million ILEC access lines + 8 million cable/wireless broadband lines). *See FCC Local Competition Report, Feb. 2002 ed.* at Table 1 (as of June 2001, the ILECs served 174 million access lines, which has been declining in each of the last three years).

[63] *See, e.g.,* T. Taesler, *Home Internet Solution – Always-On Internet Access*, Ericsson Review, Special Issue (1998), http://www.ericsson.com/about/publications/review/1998_01b/article42.shtml ("In general, Internet call

The competitive impact is certainly at least double that, when one adds in the effect of data traffic from business customers, and takes into account the fact that high-speed data links carry far more traffic per user than low-speed voice links.[64] Indeed, a recent study found that, for the first time, total hours spent on the Internet using high-speed connections have eclipsed the number of hours spent using dial-up connections.[65] And broadband access usage is growing at more than 60 percent a year, while dial-up access usage is steadily declining.[66]

Cable and DSL providers (ILECs among them) are now adding new broadband data connections at a rate of some five million new connections a year.[67] Cable supplies about two out of three of these connections.[68] But even if they are using DSL services over ILEC loops, these customers no longer rely on the ILEC switch to route their data traffic: a splitter in the central office diverts data traffic directly to a packet-switched network before it ever reaches an ILEC circuit switch.[69]

Many business customers likewise rely on high-capacity connections of some kind – such as T-1 lines, or higher capacity loops – to provide direct connections between their LANs and their data carriers. As discussed in Sections III.B and IV.A, CLECs have deployed extensive fiber networks to connect business customers directly to packet-switched networks.[70] In addition, there are a large number of carrier-agnostic wholesale fiber suppliers that operate fiber networks in most major metropolitan areas.[71] And the economic viability of deploying fiber is increasing as the demand for greater bandwidth continues to grow at rapid rates.[72]

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sessions last about 10 times longer than voice phone calls: 30 to 40 minutes on average, compared to the 3- to 4-minute duration of a voice call."); Lucent Press Release, *Lucent Technologies Media Gateway Enhancements Complement Lucent Softswitch, Providing Path to IP-Based Networks* (Jan. 16, 2001) ("Most people access the Internet by using dial-up modems connected through the public switched telephone network (PSTN). Those calls tend to last much longer than voice calls, which use up more channels and create congestion on the Internet."); S. Deng, *Engineering and Economic Benefits of Off-loading Dial-Up Traffic from the PSTN*, Nortel Networks White Paper (July 1999), http://www.nortelnetworks.com/products/library/collateral/80009.25-07-99.pdf ("The emergence of dial-up traffic is changing the PSTN traffic pattern considerably, causing network congestion. An average dial-up call lasts 20 minutes (or 12 CCS versus three CCS for a voice call), and 40 percent of the calls last an hour or longer.").

[64] *See*, *e.g.*, *Broadband 2001* at Charts 16 and 17 (as broadband users, survey participants spent on average 21.4 hours per month online, as compared to 15.9 hours with a narrowband connection. These same users also spent more time per session (32 minutes vs. 21 minutes), spent more days online (18 vs. 17) and viewed more pages per month (1,828 vs. 1,561)); Jupiter Media Metrix Press Release, *Over 40 Percent of US Online Households to Connect Via Broadband by 2006, Reports Jupiter Media Metrix* (Oct. 17, 2001) ("Broadband consumers continue to use their connections more intensively than narrowband consumers do").

[65] *See Broadband Access Usage Outpaces Dial-Up Access*, Reuters (Mar. 5, 2002).

[66] *See id.*

[67] *See TeleChoice DSL Deployment Summary* (residential DSL); *Morgan Stanley Cable Modem/xDSL Report* at Exh. 3 (cable modem).

[68] *See TeleChoice DSL Deployment Summary*; *Morgan Stanley Cable Modem/xDSL Report* at Exh. 3.

[69] *See* G. Garceau, *Network Access Economies*, Telcordia Technologies White Paper (Apr. 12, 1999).

[70] *See also* Appendix K.

[71] *See* Section III.C.

[72] *See id.*

Wireless services provide additional links to packet-switched networks. Paging spectrum is now being used extensively for e-mail and instant messaging, and new devices to support such services are emerging rapidly.[73] Cell phones, paging services (like the BlackBerry service), and personal digital assistants (PDAs) now provide wireless e-mail that is superior to dial-up wireline in that it is both mobile and "always on."[74] The Commission's *Sixth CMRS Report* concluded that about 2.5 million customers, or about 2.3 percent of all mobile telephone subscribers, were using wireless web services at the end of 2000.[75] A more recent analyst report found 6.7 million users of wireless data services.[76] Wireless data has grown from a virtually non-existent market in 1998 to $250 million in 2001, and is expected to grow to $2 billion by 2003.[77]

An increasing number of business customers also are making direct connections to packet switches using a new generation of IP-Based PBXs.[78] Although IP-PBX devices invariably provide connections (through a trunk) to the circuit-switched network, one of their key advantages is to send a great deal of voice traffic over private data networks such as a corporation's local area network or wide area network. Because traffic remains on a private network, rather than going on to the public Internet, the corporation can configure the network to optimize quality to ensure high-level voice communications.[79] IP-PBXs cost less to purchase and operate than traditional PBXs,[80] and are more flexible in terms of adding new services.[81]

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[73] *See*, *e.g.*, R. Cihra, ING Baring Furman Selz, Investext Rpt. No. 2422947, Palm Inc. – Company Report at *5 (Jan. 4, 2001) ("We see huge consumer and wireless Internet potential for handhelds, with their largest, yet still relatively untapped, opportunity in the corporate enterprise."); R. Cihra, ABN AMRO, Investext Rpt. No. 8264582, PC System & Appliances: Things to Watch in '02 – Industry Report at *2 (Nov. 7, 2001) ("[w]e see handhelds increasingly being deployed as mobile thin-clients for business-critical data access/entry."); *Legg Mason Wireless Industry Scorecard* at 28 ("We believe continued uptake of two-way messaging and lower-speed wireless data products will increase familiarity and acceptance").

[74] *See Sixth CMRS Report* at 56-74.

[75] *Id.* at 60.

[76] *See Legg Mason Wireless Industry Scorecard* at Exh. 11.

[77] *See JP Morgan Telecom Services 2001 Report* at Table 1.

[78] *See*, *e.g.*, A. Sulkin, *On-Going Evolution of IP-PBX Systems*, Bus. Comm. Review at 14 (May 1, 2000) ("The core architecture platform of PBX systems is undergoing an important transition from circuit-switched to packet-switched transmission and coding techniques."); C.Wilde, *IP PBX Basics*, Informationweek.com News (May 14, 2001), http://www.informationweek.com/shared/printArticle?article=infoweek/837/ ippbx_side.htm&pub=iwk. (An IP-PBX "delivers PBX-like services, but over IP-based LANs or WANs rather than circuit-switched networks.").

[79] *See*, *e.g.*, *VoIP: Shouldn't You Be Using It?*, Distribution Management Briefing at 14 (Nov. 27, 2001) ("With a private data network . . . an organization can . . . optimize . . . [b]y labelling voice packets, prioritising them over other traffic and using queuing techniques and buffers to control the flow of packets, organizations can ensure that packets are delivered to their destination at a constant rate."); Communications Daily at 7 (Jan. 23, 2002) (Companies that have converted their traditional PBX systems to IP local area networks report that they are "satisfied with the reliability and voice quality of these initial systems") (quoting results of study by InfoTech, *IP LAN Telephony: Probing the Shift in Market Demand*); A. Joch, *Enterprises Tuning in to a Brand-new Voice - Satisfied with Service Quality, Many Enterprises Are Expanding VOIP Use*, eWeek at 41 (June 25, 2001) (IP-PBX vendors – including 3Com and Cisco – now incorporate data-coding protocols into their VOIP hardware to give voice packets network priority when there's heavy network traffic).

[80] *See*, *e.g.*, M. Desmond, *Enterprise Technology: IP Telephony Goes to Work*, PC World.com (Aug. 2001) ("For growing small businesses – 200 users or more – 'Cisco makes [an IP] gateway that's about $25,000. But when you look at an investment into a PBX, it's typically $150,000 to $200,000 for comparable hardware.'") (quoting Ken Camp, Mill Associates); D. Drucker, *Modest Victories for VoIP – While big enterprises ponder over deployment,*

According to analyst studies, "17 percent of U.S. businesses began the implementation of IP LAN telephony in the year 2000,"[82] and, as of year-end 2001, "[m]ore than 40% U.S. companies with 500 employees or more have begun conversion of phone systems to IP telephony."[83] Analysts predict that, within the next four years, more than 80 percent of all U.S. enterprises will adopt some form of VoIP.[84] According to Frost & Sullivan, the North American IP-PBX market generated $375 million in 2000, and is expected to reach $4.8 billion by 2007.[85]

Packet Switching is Fully Competitive. The Commission has already concluded that CLECs stand on equal footing with ILECs in their ability to deploy and operate packet switches.[86] Since the last UNE review, the installed base of CLECs' packet switches has jumped from 860 to at least 1,700.[87] More than 55 CLECs have deployed packet switches.[88] *See* Appendix E. CLECs have deployed packet switches in more than 200 different cities. *See id.* In the top 100 MSAs, the average number of packet switches per MSA has grown by an average of nearly 150 percent since the last UNE review. *See* Table 11.

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smaller users find savings, InternetWeek at 24 (Sept. 17, 2001) ("The IP PBX cost about one-quarter of what a traditional PBX deployment would have cost."); S. Sleeper, *Networking Giant Finds Its Voice*, Investor's Bus. Daily (May 29, 2001) ("Because they are Web-based, [IP-PBXs] are easier to customize, cheaper to maintain than older networks and simpler to operate"); *ZDNet Tech Update: Advantages of Network PBX* (maintenance costs of IP-PBX can be cut by as much as 5 to 70 percent compared to conventional PBX equipment).

[81] A traditional PBX system is proprietary, and "customers usually have to ask their vendor to add new applications and pay for the service." C. Wilde, *IP PBX Basics*, Informationweek.com (May 14, 2001). In contrast, with an IP-PBX, "a few clicks from a management console or a Web Browser gets the job done." *ZDNet Tech Update: Advantages of Network PBX*. *See also* Sphere, *IP PBX*, http://www.spherecom.com/solutions/ippbx.htm ("Setting up new users and tasks like moves/adds/changes get done with a point-and-click instead of physically moving wires and phones.").

[82] J. Thompson, *VoIP: The Quiet Revolution*, Boardwatch Magazine (June 2001).

[83] Communications Daily at 7 (Jan. 23, 2002) (quoting results of study by InfoTech, *IP LAN Telephony: Probing the Shift in Market Demand*); *see also* S. Sleeper, *Networking Giant Finds Its Voice*, Investor's Bus. Daily (May 29, 2001) ("Sage Research Inc. of Natick, Mass., found that 52% of firms surveyed plan to install at least a partial IP system by September vs. 16% in September 2000.").

[84] *See*, *e.g.*, J. Thompson, *VoIP: The Quiet Revolution*, Boardwatch Magazine at 50 (June 2001); *see also* B. Sullivan, *IP PBX: The Quiet Storm*, Communications Today (Feb. 14, 2001), http://www.findarticles.com/cf_0/m0BMD/29_7/70458948/print.jhtml (Avaya President and CEO Don Peterson: "IP is not a question anymore. IP will be the core").

[85] K. Mayer and D. Callahan, *This Old Enterprise*, Communications Solutions (Sept. 2001); *see also id.* (Frost & Sullivan "anticipates that IP-PBX desktops will account for more than half the total number of CPE stations shipped by 2006.").

[86] *See*, *e.g.*, *UNE Remand Order* ¶ 307 ("Competitive LECs and cable companies appear to be leading the incumbent LECs in their deployment of advanced services."); *id.* ¶ 308 (packet switches "are available on the open market at comparable prices to incumbents and requesting carriers alike. Incumbent LECs and their competitors are both in the early stages of packet switch deployment, and thus face relatively similar utilization rates of their packet switching capacity. . . . It therefore does not appear that incumbent LECs possess significant economies of scale in their packet switches compared to the requesting carriers.").

[87] *See NPRG CLEC Report 2000, 12th ed.*, Ch. 6 (competing carriers had 860 packet switches as of year-end 1998); *NPRG CLEC Report 2002, 15th ed.*, Ch. 4 at Table 18. As noted above (see note 6, *supra*), this figure is highly conservative.

[88] *NPRG CLEC Report 2002, 15th ed.*, Ch. 4 at Table 18.

Table 11. Average Number of CLEC Packet Switches in Top 100 MSAs			
MSA Rank	**1998**	**2001**	**Percent Increase**
1-25	7	16	125
26-50	4	10	158
51-75	2	7	246
76-100	1	2	60
Source: New Paradigm Resources Group. *See* Appendix M.			

The two main kinds of packet switches used today are Frame Relay and ATM switches.[89] One new packet-switching technology – Gigabit Ethernet – has recently been deployed, and is growing as an alternative to Frame Relay and ATM for very high-bandwidth applications.

The largest providers of both Frame Relay and ATM services are AT&T, WorldCom, and Sprint, which control more than two-thirds of the nationwide market for these services. *See* Figure 5.[90] While the precise numbers of Frame Relay and ATM switches these carriers operate are unavailable, it is clear that they all operate vast nationwide Frame Relay and ATM networks. *See* Appendix I.[91] As one analyst has noted, "[t]he Big 3 IXCs own the U.S. frame relay market, have scale economies and are best positioned to influence users and move the market."[92] Numerous other CLECs also provide ATM or Frame Relay service. *See* Appendix I.[93] And while the Bell companies compete in the provision of these packet switching services as well, they have been significantly hampered by the fact that they cannot provide interLATA packet-switching services, despite the fact that customers typically desire a single carrier to provide both intraLATA and interLATA packet switching.[94]

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[89] *See IDC Packet Switching Report* at 1 & Figure 2 (frame relay and ATM services account for 96.4 percent of the packet-switching market).

[90] *See IDC Packet Switching Report* at Figures 9, 31 (AT&T, WorldCom, and Sprint together accounted for 65.8 percent of revenues for ATM, and 68.4 percent of revenues for frame relay in 2000); *Stratecast ATM/Frame Relay Report* at 10 ("Tier 1 service providers continue to dominate the U.S. market, controlling over 70% of the market."); *id.* at 17 ("In 2000, AT&T held the largest share of ATM service revenues, with a 36% share of [the] market; WorldCom and Sprint held the second and third leading position in the market with shares of 26% and 22%, respectively. As in the frame relay market, the RBOCs collectively represent a small share of the ATM services market.").

[91] AT&T Corp., *AT&T ATM Service, Brochure*, http://www.ipservices.att.com/brochures/atm.pdf (AT&T's domestic Frame Relay and ATM network has over 620 Points of Presence (POP)); *IDC Packet Switching Report* at 137 (700+ POPs for WCOM); WorldCom, *US Products, Data Networking, Frame Relay*, http://www.worldcom.com/us/products/datanetworking/framerelay/index.phtml (402 Frame Relay POPs); Sprint Corp., *Sprint Business, Dedicated Access, Service and Support*, http://www.sprintbiz.com/small_business/dedicated_ip/ (320 POPs).

[92] *Stratecast ATM/Frame Relay Report* at 12.

[93] The FCC already has recognized in the past that "it is precisely in the provision of services like frame relay that competition is most intense, and we acknowledge the sensitivity of the LECs' position as they face increasing competition, especially regarding these services that are likely to be related to nonregulated and highly competitive services." *Policy and Rules Concerning Rates for Dominant Carriers*, Memorandum Opinion and Order, 8 FCC Rcd 7474, ¶ 63 (1993).

[94] As noted by industry analysts and CLECs alike, Bell companies are limited in their broadband offerings due to restrictions on the provision of interLATA services. *See*, *e.g.*, *Stratecast ATM/Frame Relay Report* at 12 ("Thus far, the RBOCs have held a very small share of the frame relay market, primarily because they have only been allowed to

The newest packet-switching technology being provided in metropolitan areas is Gigabit Ethernet.[95] Competitive carriers also lead in the deployment of Gigabit Ethernet switches.[96] As one analyst notes, "metro Ethernet services [are] being aggressively marketed by companies such as Yipes[,] Time Warner Telecom, XO, and Telseon."[97] These services are now available in central business districts of top tier markets, but also are being deployed more widely. Revenues for Gigabit Ethernet are still small – most estimates say under $100 million – but are expected to grow to as much as $4 billion by 2005.[98] A recent survey of corporate users found that, although less than one percent of enterprise networks are using Gigabit Ethernet as their primary LAN transport today, nearly one-quarter expect to deploy Gigabit Ethernet within two years.[99]

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offer intra-LATA services."); WorldCom, *Metro Frame Relay Service*, http://www.worldcom.com/us/products/datanetworking/framerelay/metro (WorldCom's Metro Frame Relay service "offers an aggressive price position compared to that offered by LECs. LECs can offer local (intraLATA) service, but they aren't able to cross LATA boundaries or move into other Regional Bell Operating Company (RBOC) territories. WorldCom is in the unique position to provide both interLATA (IXC) and intraLATA frame relay service by capitalizing on our wholly owned nationwide network.").

[95] *See Broadband 2001* at 124 (Gigabit Ethernet (GigE) "Internet access providers connect large enterprises, educational institutions, and small and medium enterprises in large office buildings (MTUs) to the Internet. . . . GigE players also offer LAN-LAN connectivity, also know as transparent LAN services (TLS), to medium and large enterprises. . . . GigE service providers offer wholesale MAN connectivity, providing the infrastructure for high-speed metro backbones."); Cisco, *Technology Brief: Introduction to Gigabit Ethernet*, http://www.cisco.com/warp/public/cc/techno/lnty/etty/ggetty/tech/gigbt_tc.htm (Gigabit Ethernet is typically offered at speeds of 1.25 Gbps).

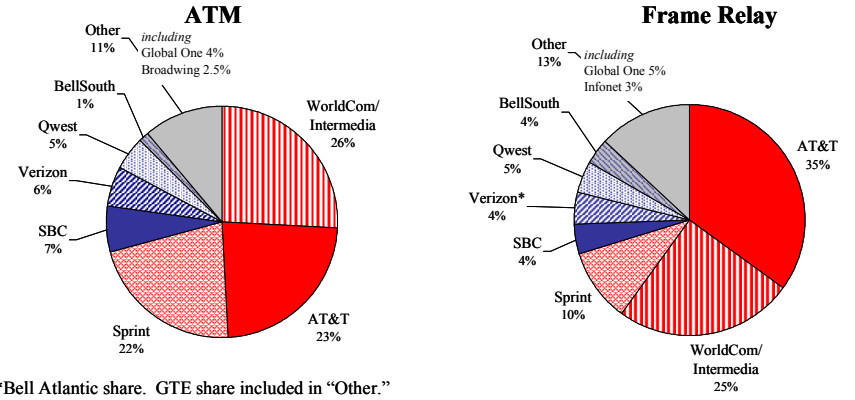
[96] *See*, *e.g.*, Yipes Communications, *Yipes Announces Nationwide Availability of Instantly Scalable Bandwidth* (Sept. 11, 2001) ("Yipes Communications, Inc. [is] the defining provider of optical Gigabit Ethernet networks"); Telseon Press Release, *Telseon Announces Service Promotion to Drive Metropolitan Gigabit Ethernet Service Adoption* (Apr. 24, 2001) ("As one of the GigE service leaders, Telseon is showing that speed and simplicity of deployment are possible in the metro optical network.") (quoting George Peabody, Aberdeen Group, Vice President and Practice Manager, Communications Infrastructure and Services).

[97] *Stratecast ATM/Frame Relay Report* at 17. *See also* S.M. Milunovich, Merrill Lynch Capital Markets, Investext Rpt. No. 2779422, Tech Strategy; All's Not Quiet on the GIGE Front – Industry Report at *1 (Apr. 10, 2001) (Yipes Communications "has built a 20-city, all-optical, all-GigE network in less than two years," which "offers at least a 5-to-1 cost advantage versus IP over ATM/SONET."); S. Clavenna, *Metro Optical Ethernet*, Lightreading.com (Nov. 13, 2000), http://www.lightreading.com/document.asp?doc_id=2472 (Cogent Communications "has built a network around the sole proposition of providing 100-Mbit/s Ethernet services to tenants of office buildings for $1000 per month, roughly the price of a traditional T1 (1.5 Mbit/s) line."); D. Allen, *Will Gigabit Ethernet WAN Services Make Us Forget About SONET?*, Network Magazine (July 5, 2001) (Telseon has more than 120 Gigabit Ethernet POPs in 20 cities).

[98] *See* L. Cooper & T. Moore, *Corporate America Implementing New Gigabit Ethernet Strategies; Industry Trend or Event*, Communications News (Aug. 1, 2001) (citing Infotech Consulting).

[99] *See id.*

Figure 5. Market Share of Nationwide ATM and Frame Relay Revenues



*Bell Atlantic share. GTE share included in "Other."

Source: R. Kaplan, IDC, *U.S. Packet/Cell-Based Services Market Forecast and Analysis, 2000-2005* at Figures 9 & 31 (2001).

Migration of Traffic to Packet-Switched Networks. Data traffic overtook voice traffic on the phone network in 1998. Since that time, the volume of data traffic has continued to grow much faster than voice.[100] CLECs in particular earn almost half of all their revenues from data services – some $27 billion is the projection for 2002.[101] Data services are the fastest growing source of CLEC revenue.[102] *See* Figure 6 & Table 12.

However it is used, whether for pure "data" (like a spreadsheet) or for data traffic (like messaging) that may in fact compete with voice, the packet switch provides an entry point for CLECs into the provision of switching services in direct competition against ILEC circuit switches. Packet switches compete against circuit switches for all traffic that would otherwise move through a dial-up circuit-switched connection, but that now is conveyed instead to a packet switch directly. And, of course, these packet switches in many cases either are or are capable of being used to provide voice services along with the more traditional data services.

Residential and business customers alike now use e-mail and instant messaging (IM) as direct substitutes for many voice calls.[103] A large and growing fraction of e-mail and IM traffic originates and/or terminates on competitive networks. And even when carried over ILEC networks, such traffic displaces significant usage-sensitive (*e.g.*, per-minute or per-call) revenues that otherwise would be earned.

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[100] *See*, *e.g.*, William E. Kennard, Chairman, FCC, The Telecom Act at Three: Seeing the Face of the Future, address at the Comptel 1999 Annual Meeting and Trade Exposition, Atlanta, GA (Feb. 8, 1999) ("last year, for the first time, data traffic eclipsed voice traffic on phone lines."); J. Linnehan, Thomas Weisel Partners, LLC, Investext Rpt No. 2295458, Company Report – Level 3 Communications at *3 (Sept. 15, 2000) ("Data traffic has surpassed voice traffic at a three to two ratio."); S. Wadhwani, Dain Rauscher Wessels, Investext Rpt No. 2150061, Avanex Corp. – Company Report at *3 (May 3, 2000) ("While voice traffic is growing at only 3%-5% annually, data traffic is estimated to be growing upward of 30%-50% annually.").

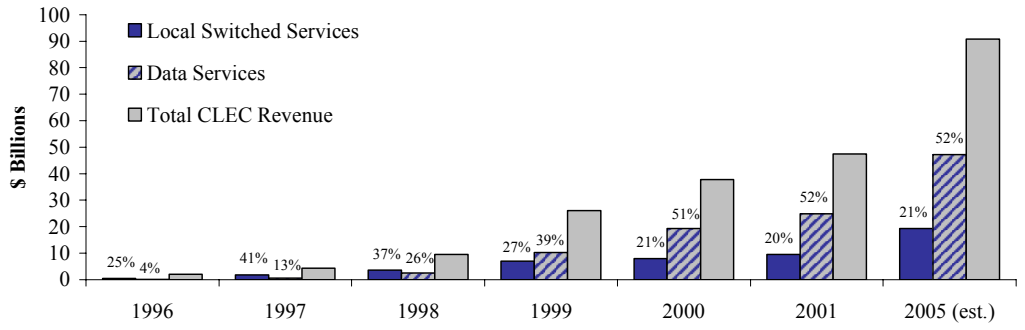
[101] *See NPRG CLEC Report 2002, 15th ed.*, Ch. 3 at Table 10.

[102] *See id.*, Ch. 3 at Table 10; Ch. 2 at Table 8; Ch. 3 at Table 9. This category includes "all data and data-related services (*e.g.*, frame relay, ATM, and Internet access)." *Id.*

[103] As the chairman of AOL's Internet division has stated, "People are not on the telephone anymore." *AOL Promises Open Instant Messenger*, ITworld.com (July 23, 2001), http://www.itworld.com/App/300/IDG010723openaol/.

There are now 900 million e-mail accounts in the U.S. and over 60 million IM users.[104] It is estimated that consumers in the U.S. are sending approximately 3.2 billion e-mail messages[105] and approximately 1 billion IM messages[106] *per day*. If only 10 percent of these 4.2 billion daily e-mail and instant messages substitute for a voice call (of 5 minutes average duration), that is equivalent to about 750 billion minutes per year, or roughly one-third of all local traffic that passes through ILEC networks.[107] And while estimates vary, consumer surveys find that the actual rate of voice substitution is considerably higher. *See* Table 13. E-mail and IM support voice services directly, too, particularly voice messaging services. Voice capabilities are already a standard feature of Instant Messaging.[108] Yahoo!, MSN and AOL all offer voice messaging services over their instant-messaging networks.[109]

Figure 6. CLEC Revenues



Source: New Paradigm Resources Group. *See* Appendix M.

[104] *See* D. Whelan, *The Instant Messaging Market*, American Demographics (Dec. 2001).

[105] *See* T. Shinkle, *Time for a New Look at Email Management*, Computer Technology Review at 48 (June 2001).

[106] *See* R. Gann, *Fast Talking Instant Messaging Software*, Internet Magazine at 140 (Jan. 1, 2001).

[107] *FCC Statistics of Common Carriers, 2000/2001 ed.* at Table 5.8 (Total 1999 Dial Equipment Minutes of 4.414 trillion divided by 2 yields 2.207 trillion conversation minutes; 750 billion/2.207 trillion = 33%).

[108] *See*, *e.g.*, S. Spanbauer, *Browsing & Beyond: We Pick 13 Must-Have Tools For Today's Internet, Including The Best In Browsers And Add-Ons, E-Mail, Instant Messaging, And Much More*, PC World (Feb. 1, 2002) ("Odigo is the only IM tool we looked at that doesn't let you do PC-to-PC voice chat."); *see also* C. Seper, *'Bots' Add Touch of Humanity, Artificial Intelligence Brings Real Business to Instant Messaging*, Plain Dealer (Dec. 31, 2001).

[109] *See* Yahoo!, *Yahoo! Pager Turns Up The Volume On Instant Messaging, New Voice Chat Feature Allows Users to Talk Live Over the Internet* (May 13, 1999); ICQ Press Release, *ICQ, Inc.and Net2Phone Sign Four-Year, Multi-Million Dollar Internet Telephony Agreement* (July 20, 1999); C. Crouch, *MSN Gives Messenger a Voice*, PC World.com (July 19, 2000); *New MSN Messenger 3.0 Is the Only IM Service to Offer Free Long Distance to the United States and Canada*, M2 Presswire (July 20, 2000); AOL Press Release, *AOL Announces Next Generation of AOL Instant Messenger – Version 4.0 – For Windows and Mac Users* (Apr. 10, 2000).

Table 12. Selected CLEC Data Service Offerings	
CLEC	**Data Offerings**
AT&T	*AT&T Local Frame Relay and ATM Services*: "provide ubiquitous, feature-rich networking options to fit your local (intraLATA) networking needs. . . ideal for companies whose primary business communications needs are heavily concentrated within one or several metropolitan areas (i.e. LATAs)."
Cablevision Lightpath	"Lightpath offers both high quality asynchronous transfer mode (ATM) and advanced frame relay data networks to support demanding high-speed data requirements."
Choice One	"Lucent's 7R/E Packet Solutions . . . will allow Choice One to create a multi-service packet network that integrates voice, video and data services all on a single converged packet network."
Global Crossing	*Frame Relay:* "Link multiple locations with a fast, reliable data transmission network." ATM: "Support multiple applications over a single connection — only ATM technology offers the Quality of Service (QoS) necessary to efficiently support voice, video, and data."
Time Warner Telecom	"National network is built on ATM technology [DS-3, fractional DS-3, DS-1 and fractional DS-1], with facility and equipment redundancies."
US LEC	"US LEC Frame Relay Service is the premier method of fast-packet data communications delivery service in the industry."
WorldCom	*Metro Frame Relay Service*: Available "to more than 350 metropolitan areas serviced by 402 points of presence (POPs) across the nation." "[O]ffers an aggressive price position compared to that offered by LECs. LECs can offer local (intraLATA) service, but they aren't able to cross LATA boundaries. . . . WorldCom is in the unique position to provide both interLATA and intraLATA frame relay service."
XO	"We also have been installing Asynchronous Transfer Mode (ATM) routers and switches in our local network, which will enable us to meet the demands of large, high volume customers."
Sources: See Appendix M.	

Table 13. Growth of E-mail and Instant Messaging
C 53 percent of consumers use e-mail daily and use it for an average of 29 minutes a day.
C IM, online chat, and mobile messaging are used for 15 minutes daily.
C 37 percent of email users have cut back on their landline calling.
C According to the Gartner Group, 60 percent of all real-time online communication – voice or text – will be driven through instant messaging technology.
C According to InsightResearch survey: "Forty-seven percent of consumers said they use instant messaging. And of those, 96 percent said they use IM at home and 20 percent use instant messaging at work. . . . Nearly half of all respondents, 49 percent, use instant messaging as a replacement for a telephone call while one third, 35 percent, use it in place of sending an e-mail."
C "American workers send and receive approximately 2.2 billion messages every day."
C In a study by Vault.com, 45 percent of respondents said e-mail has replaced phone calls.
C 73 percent of teenagers use the Internet. For one-fifth of them, instant messaging beats the telephone and e-mail as the primary channel for remote communication with friends.
Sources: See Appendix M.

It is now clear that packet-switched networks are capable of and are being used to provide voice service along with traditional data services.[110] Long-distance carriers have been

[110] Both AT&T and WorldCom, for example, have launched retail voice-over-IP (VoIP) services to business customers; this "marked the first instance of two major telecom companies visibly transitioning to all-data networking that supports voice services." M. Smetznnikov, *AT&T Bets on Voice-Over-IP*, Interactive Week (Feb. 5, 2001), http://www.zdnet.com/intweek/stories/news/0,4164,2681792,00.html .

migrating voice traffic to high-speed packet switches for several years.[111] Many CLECs have now begun to migrate their *local* voice traffic onto ATM and Frame Relay networks as well. *See* Table 14. All of the major packet switch manufacturers have developed voice capabilities for their packet switches.[112] Growth for packet-based voice equipment outpaced all other telecom gear in first half of 2001.[113] Analysts now agree that markets for both packet switches and voice-over-packet services will grow rapidly in the next few years.[114]

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[111] *See*, *e.g.*, A. Lindstrom, *Talkin' 'Bout Next-Generation Telcos* (Level 3 designed its entire long distance network around packet switches from the ground up); T.K. Horan, CIBC Oppenheimer, Investext Rpt. No. 2749262, Telecom Services: Daily Teletimes – Industry Report at *1 (Mar. 1, 1999) ("Frank Ianna, president of AT&T Corp.'s network unit announced that by the end of the year, AT&T plans to stop buying traditional voice switches (circuit switches) in its long-distance network. The company will instead buy predominantly ATM switches for its long-distance network, which will allow data and voice to be carried on the same network more effectively. We note that Sprint also announced that it would stop buying circuit switches after 1999."); Communications Daily (Apr. 14, 2000) (according to MCI Chief Technology Officer Fred Briggs, in April 2000, WorldCom announced that "[a]s part of converging voice and data services, [WorldCom] is planning to roll out this year soft switch or IP switch to handle Internet and voice services on IP backbone.").

[112] *See*, *e.g.*, C. Stix, Morgan Stanley, Dean Witter, Investext Report No. 8092537, Cisco Systems – Company Report at *3 (July 20, 2001) ("Today over half of Cisco's product lines are voice-enabled."); Lucent Technologies, *Circuit to Packet: Extending the Value of Class 4 and 5 Network Infrastructure in Metro/Edge Networks* at 1, 2 (May 2001), http://www.lucent.com/businesspartners/clp/stories/circuit-to-packet.pdf. ("The migration from circuit to packet is underway. . . . Voice traffic is beginning to move from circuit-switched networks to data networks, including the Internet.").

[113] Communications Daily at 4-5 (Aug. 28, 2001) (according to a Synergy Research Group report, "Voice over Internet protocol (VoIP) equipment totaled $784 million in first half – 40% increase in year . . . Sales of VoIP for service providers grew to $196 million (1.2 million ports) in 2nd quarter, up 81% in year").

[114] *See*, *e.g.*, *TIA Sees VoIP Nearly Doubling*, Telco Bus. Report (June 18, 2001) (The Telecommunications Industry Association has recently predicted that the voice-over-IP equipment market would nearly double this year to more than $3.3 billion); L. Cauley, *What's Ahead for . . . Phones; Internet Telephony Has Been Slow in Coming, But It's About to Get a Big Boost*, Wall St. J. at R9 (June 25, 2001) (According to Cahners In-Stat Group, carriers looking to offer voice-over-IP services spent about $1.127 billion worldwide in 2000. By 2003 that figure is expected to more than double to $2.607 billion, and again double by 2005 to about $5.855 billion."); E.R. Jackson, U.S. Bancorp Piper Jaffray Inc., Investext Rpt. No. 2442005, Sonus Networks Inc. – Company Report at *2 (Jan. 19, 2001) ("We estimate the market for next-generation voice infrastructure solutions during 2000 to reach more than $1.5 billion. The market is expected to reach well in excess of $5 billion by 2003); L.M. Harris, Josephthal, Investext Rpt. No. 2454183, Sonus Networks Inc.: Initiating Coverage – Company Report at *1 (Jan. 30, 2001) ("While the voice-over-packet switching market in 2000 was probably less than $100 million, we project that it will grow to $250 million in 2001, and to close to $6.5 billion dollars by 2005. At that point, voice-over-packet switching sales could account for 20% or more of total voice switching sales.").

Table 14. CLECs Using Packet Switches To Provide Voice Services	
CLEC	**Status of Voice-Over-Packet Deployment**
AT&T	"AT&T Corp . . . is offering voice over IP (VoIP) retail services for business, allowing the combination of voice, fax and data traffic on a single integrated IP connection managed by AT&T."
Choice One	"Lucent's 7R/E Packet Solutions, which will allow Choice One to create a multi-service packet network that integrates voice, video and data services all on a single converged packet network."
CTC	"CTC has delivered on its promise to having customers utilizing local and long distance voice services on our Cisco Powered packet-based VoIP network by the end of 2000, and its goal of being one of the first carriers to do so."
Global Crossing	"Global Crossing will complete the first phase of its U.S. VoIP network by the end of 2000, placing core VoIP gateway centers in a minimum of 15 additional cities"; "[t]he company plans to transfer its voice traffic from the circuit-switched network to the packet-based network by 2002."
Level 3	"Voice Termination from Level 3 is the first Internet Protocol-based voice product of comparable quality to the switched network because it requires no additional equipment or behavior changes on the part of your customers."
US LEC	Added high capacity ATM packet switches in all of its 23 existing switching centers in the U.S. as part of its "strategic plan to become an IP (Internet Protocol) based CLEC fully integrating voice and data services economically over high bandwidth networks."
WorldCom	"IP Communications" service "will enable businesses to move their voice traffic to an IP network and take advantage of a new generation of multimedia applications."
XO	"XO has begun the first phase of an expansive migration to packet-based switching technology, which is expected to deliver the full range of traditional and enhanced local and long distance services."
Sources: See Appendix M.	

Cable operators, who have been offering cable telephony on their own circuit switches for several years, are now migrating to packet-switched alternatives as well. The upgrades that allow cable companies to offer cable modem services also make it possible for cable to provide high-quality digital telephone service with only a small incremental investment.[115] Uniform industry standards for providing IP telephony over cable are now in place. The North American cable industry has developed and adopted the DOCSIS 1.1 standard.[116] Since the adoption of

[115] *See*, *e.g.*, *Broadband 2001* at 39 (IP telephony "requires no additional outside plant investment, draws heavily on the core data service infrastructure, and only requires modest incremental equipment investment."); J. Yoshida, *Modem Issues Put Cable Voice-Over-IP Service on Hold* ("cable VoIP service can share the same infrastructure already established for high-speed data services."); *NCTA Cable Telephony Report* at 5 ("VoIP is not only an incremental expense, it utilizes the data path the industry has already built, and should allow for easy software changes and additions to service packages, and innovative combinations of voice, data, and fax services."); *see also* G. Cooke, *Taking the Hybrid Road to IP Telephony*, CED (Dec. 2000), http://www.cedmagazine.com/ced/0012/12e.htm (a "new, hybrid cable IP telephony architecture has emerged. This new architecture enables cable operators with circuit-switched telephony equipment to begin offering converged IP services over their access network without having to forklift all of their existing circuit-switched equipment out of the network.").

[116] *See* Cable Datacom News, *Standards – Cable Modem Standards and Specifications*, http://cabledatacomnews.com/cmic/cmic3.html (The DOCSIS 1.1 specifications add key enhancements to the original standard, such as improved QoS and hardware-based packet-fragmentation capabilities to support IP telephony, and other constant-bit-rate services); CableLabs Press Release, *CableLabs® Certifies Two DOCSIS™ 1.1 Modems and Qualifies Two CMTS, Achieving Breakthrough on Advanced Devices* (Sept. 27, 2001) ("DOCSIS 1 enables cable operators to deliver twice the level of functionality while reducing operating costs by half."); J. Yoshida, *Modem Issues Put Cable Voice-Over-IP Service on Hold* (DOCSIS adds to the previous standard (DOCSIS 1.0, which was designed for cable modem service), "three key elements . . . to support toll-quality telephone calls: upstream packet fragmentation and reassembly techniques, support for a national clock, and an advanced isochronous scheduling system.").

DOCSIS 1.1, the widespread deployment of cable telephony has been awaiting "the availability of cable modems based on version 1.1 of the Data Over Cable Service Interface Specification. DOCSIS 1.1," which was first released in 1999.[117] CableLabs began its certification program for compliant products in 2000; CableLabs certified the first DOCSIS 1.1 compliant cable modems in September 2001.[118] Further tiers of certification are now nearing completion as well.[119]

Upgrading existing cable plant to provide IP telephony costs about $700 per line, or about 15 percent less than circuit-switched telephony.[120] IP telephony also has lower operating costs (by at least 5 percent) than circuit-switched telephony, owing largely to the fact that "it can share a single infrastructure with data."[121] Cable operators are currently conducting trials of IP telephony. *See* Table 15. According to analysts, widespread commercial deployment of IP cable telephony (at least as a secondary line service) will begin in late 2002 or early 2003.[122] Cable

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[117] J. Yoshida, *Modem Issues Put Cable Voice-Over-IP Service on Hold*.

[118] *See* J. Baumgartner, *MSOs Will Make Graceful Transition to DOCSIS 1.1*, CED (Jan. 1, 2002); D. Iler, *Road to PacketCable Passes DOCSIS 1.1*, Multichannel News (Nov. 26, 2001) ("The first domino in standards-based voice-over-Internet protocol (VoIP) gear hitting the market fell in late September when two cable modems and two cable-modem termination systems (CMTSs) won Data Over Cable Service Interface Specification (DOCSIS) 1.1 certification and qualification from Cable Television Laboratories Inc. . . . CableLabs certified cable modems from Toshiba America Information Systems Inc. and Texas Instruments Inc. – whose reference design was used in Toshiba's modem – and qualified CMTSs from Arris Group Inc. and Cadant Inc.").

[119] *See* J. Baumgartner, *MSOs Will Make Graceful Transition to DOCSIS 1.1*, CED (Jan. 1, 2002) ("a variety of cable operators are in the middle of evaluating CMTSs based on or upgradeable to DOCSIS 1.1."); R. Brown & J. Baumgartner, *After the Dust Settles; As Network Upgrades Approach Completion, Service Providers Aim to Launch New Services*, CED (Dec. 1, 2001) (Cox Communications Senior Vice President of Technology Development Chris Bowick: "Over the last six months or so, we've been deep into the evaluation of all the various next-generation CMTS vendors. We have selected two. . . . These are the devices that we will be deploying, or have been deploying for a while, and will continue to deploy through next year in anticipation of becoming fully 1.1-compliant. We'd like to push toward that, toward beginning to get 1.1 compliant through the end of next year."); D. Iler, *Road to PacketCable Passes DOCSIS 1.1*, Multichannel News (Nov. 26, 2001).

[120] *See*, *e.g.*, *JP Morgan Cable Industry Report* at 46; *see also* AT&T Broadband, *Investor Presentation* at 37 (July 2001) (AT&T estimates that providing primary line VoIP telephony would involve costs totaling $530-$620 per customer, including $230-$270 for switching and other outside equipment and $300-$350 for customer equipment, while circuit switched primary line telephony would cost $675); *JP Morgan Cable Industry Report* at 51 ("IP benefits from substantially lower costs in the centralized equipment that resides in the headend.").

[121] B. Michael, *Cable VoIP*, Computer Telephony at 36 (Aug. 1, 2000). *See also JP Morgan Cable Industry Report* at 46 ("IP's operating costs will probably run 5% less than those for circuit voice."); *id.* at 54 ("IP voice offers the promise of using a single hardware platform, support system, and staff for both data and telephony services," which "not only lowers capital and operating costs, but also simplifies operations and provisioning."); Nortel Networks, White Paper, *The Cable Telephony Opportunity; Increasing Profits With Integrated Telephony and Data Services*, http://www.gel.ulaval.ca/~mlecours/19504/Modem-cable/NortelCM.pdf. ("By delivering IP telephony and data services over a single DOCSIS cable modem system, headend and customer premise equipment expenditures are reduced. Additionally, operating efficiencies are gained by managing a single telecommunications platform, rather that multiple logical networks. The use of common equipment also simplifies customer provisioning and installation processes.").

[122] *See*, *e.g.*, R.A. Bilotti, Morgan Stanley, Dean Witter, Investext Rpt. No. 8202634, Cable: The Past Is Prologue to the Future – Industry Report at *5 (Oct. 5, 2001) ("We expect the cable operators to begin offering IP telephony in 2002/2003"); M. Paxton, *Cable Telephony – Moving Slowly But Surely*, CED (Jan. 2002), http://www.cedmagazine.com/ced/2002/0102/id6.htm ("most [MSOs awaiting IP telephony] remain confident that by late 2002/early 2003, cable telephony will be an important part of their service menu"); J. Baumgartner, *No Large VoIP Roll-Outs Until Late 2002*, CED at 10 (Jan. 1, 2002) ("[I]t's expected that cable operators won't rollout IP telephony in

operators are expected to deploy primary line IP cable telephony service shortly thereafter.[123] Analysts expect that there will be between five and seven million cable IP telephony subscribers by 2006.[124]

Table 15. Cable IP Telephony

Cable Operator	IP Telephony Trials	Plans For Future Deployment
Time Warner	Portland, ME Rochester, NY	As of March 2001, Time Warner planned to attract 1,000 IP voice customers by September 2001, and to then monitor usage and calling patterns before embarking on a full deployment. IP telephony "will be offered some time [in 2002] in the [Tampa] bay area and central Florida."
AT&T Broadband	Boulder, CO	"We're looking to deliver IP as quickly as possible." (Jim Wood, vice president of advanced technology, Sept. 2001)
Cox	planned	"Our strategy is to launch circuit-switched technology in our markets, and we've done that. . . . IP telephony is nearly ready for prime time. We're watching it very closely." (Tom White, Director of Marketing, Apr. 2001) "Cox is confident that IP telephony will add great value for our customers . . . We envision circuit switched and IP services will coexist in all of our networks." (Jim Robbins, CEO, May 2001)
Comcast	Alexandria, VA Union, NJ (completed) Philadelphia, PA	Customers could see IP telephony service in 2002. (Steve Craddock, senior VP of new media, Apr. 2001)
Adelphia	Buffalo, NY	As of June 2000, Adelphia expects to launch commercial service first in Buffalo. Other markets will include Pittsburgh and its suburbs, Florida, Colorado Springs, Southern California, and other areas served such as Vermont, Virginia and Ohio.
Cablevision	Long Island, NY	Cablevision's digital and interactive television service, iO, is currently available to 550,000 homes in Long Island; the company plans to roll out iO throughout its service area, passing 4.7 million homes. The iO digital box will enable the provision of IP telephony to residential subscribers. Cablevision is currently testing this service in 300 homes and intends to begin commercial deployment in 2002.
Charter	Wausau, WI St. Louis, MO	Charter plans to begin IP-telephony tests in 2002. Charter has already conducted two technical VoIP trials; the company will launch a marketing trial of both primary and secondary line IP service in Stevens Point, Wisc.

Sources: See Appendix M.

earnest until the latter part of 2002. Until then, we'll probably see more lab trials and pilot efforts in the field to make certain that everything works as advertised and that it's a service with consumer demand"); A.B. Green, Lehman Bros. Inc., Investext Rpt No. 8302989, Broadband Access Technologies at *3 (Dec. 14, 2001) ("Our sense from the cable show is that operator interest and deployments of cable telephony are a likely story for the second half of 2002."); J. Duffy, *DOCSIS Compliance Delaying Cable IP Telephony*, Network World (Aug. 13, 2001) ("It will be late 2002 or early 2003 before widespread deployments of IP-based cable telephony occur, the research firm [Cahners In-Stat Group] predicts.").

[123] *See*, *e.g.*, *JP Morgan Cable Industry Report* at 46 ("we suspect that most MSOs will deploy primary-line IP voice in 2004 or 2005"); *Strategis Group U.S. IP Cable Telephony Report* at 52-53 (predicting that AT&T, Cox, Adelphia, Comcast, and Charter will begin deploying primary line IP telephony in late 2003/early 2004).

[124] *See id.* at Table 3.9 (predicting 7.36 million IP telephony lines by 2006); *Forrester Sizing US Consumer Telecom Report* at 10-12 ("[B]y 2006, [cable companies] will reap the rewards of conversion to IP – an increased set of offerings at lowered costs – in the form of 4.8 million new packet lines.").

There are strong incentives for CLECs and cable operators to migrate to packet switching.[125] Packet switches serve the most dynamic, rapidly growing sector of the industry – the data sector. They are much more compact than circuit switches,[126] and they are much cheaper to purchase and deploy.[127]

A new generation of "softswitch" packet switches is now accelerating all of these trends.[128] They are fast enough to switch voice, data, video, and other forms of traffic; they are thus far more compact and efficient than the arrays of media-specific hardware that they can displace. Equipment manufacturers, CLECs, and industry analysts all agree that these new switches can serve as complete "replacements" for Class 5 switches. *See* Appendix J, Tables 1 & 2. Numerous CLECs have already deployed softswitches. *See* Appendix J, Table 3. The Yankee Group expects worldwide sales of softswitches to rise from $16 million in 1999 to $824 million in 2003.[129] Frost and Sullivan predicts that "providers will invest more than $39 billion in softswitch technology by 2006 and will realize $85 billion for services delivered using the technology that year."[130]

C. Wireless Switches as Substitutes for Circuit Switches.

Wireless switches substitute for wireline switches at the margin, in much the same way as packet switches do. The marginal buyer of wireline service is the residential buyer of second-

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[125] *See*, *e.g.*, A. Lindstrom, *Talkin' 'Bout Next-Generation Telcos* ("New business models based on the use of IP-oriented switches . . . enable gross margins in the 60 percent-plus range and the ability to provide differentiated offerings."); J. Boyd, *The End of the Central Office*, http://www.internetwk.com/infastructure/infra081400-3.htm (Aug. 14, 2000) ("The huge price differences between Class 5 switches and new convergent platforms will allow more start-up CLECs like ACD.net to enter the market.") (citing Andrew Clay, analyst, Aberdeen Group).

[126] *See*, *e.g.*, E.R. Jackson, U.S. Bancorp Piper Jaffray Inc., Investext Rpt. No. 2267558, Sonus Networks Inc.: Initiating Coverage – Company Report at *4 (Aug. 21, 2000) (packet switches "can result in a reduction of up to 90% in equipment space requirements.").

[127] *See*, *e.g.*, *id.* ("packet telephony offers potential reductions of up to 50% in switch per-port costs" compared to traditional circuit switches." This "[f]aster, cheaper, smaller, and more versatile switching equipment is transforming the central office."); Wall St. Transcript Corp., Investext Rpt. No. 2003080, Analyst Interview: Telecommunications – Industry Report at *3-*4 (Sept. 22, 2000) (Trent Spiridellis, Principal and Senior Equity Research Analyst, Banc of America Securities: the price performance of an IP network "doubles . . . every 20 months.").

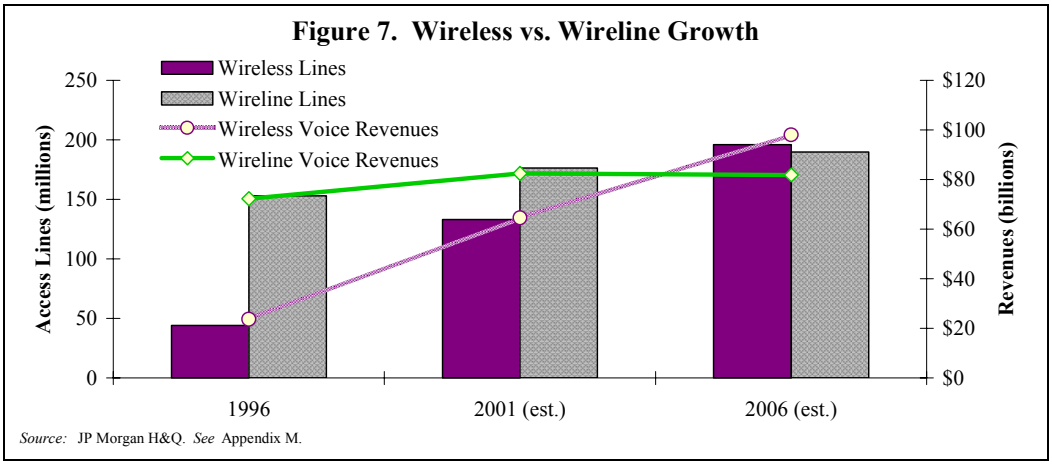
[128] *See*, *e.g.*, M. Reddig, *Top 10 Advances in Switching* ("The most important development in switching over the past 3 years has been the rapid development, innovation and standardization of softswitches.") (quoting Constantine Gavrilidis, Broadriver Communications."); *id.* ("Three years ago, softswitches were just a concept. Today they are an integral part of an important milestone in the history of telecommunications."); M. Johnston & D. Pappalardo, *WorldCom Sees Promise in Move to Softswitches*, Network World (Jan. 29, 2001) (As WorldCom's Chief Technology Officer has noted, softswitches are "not pie in the sky," but rather "stuff that we are deploying *today*.").

[129] *See* P. Korzeniowski, *Pieces of Concern – The Communications Market Is One Big Puzzle, and Clecs Are Scrambling To Find the Right Fit*, tele.com (May 29, 2000) (citing Yankee Group).

[130] M. Reddig, *Softswitches Emerge from the Shadows* (citing Frost & Sullivan, World Softswitch Markets). *See also id.* (citing estimate by The Pelorus Group, *Softswitches and Broadband Switching: The New Environment* that "the softswitch market will grow from a revenue base of $200 million in 2000 to roughly $4 billion by 2004.").

line service. And as "margins" go, this is a big one: approximately 26 percent of U.S. residential customers buy second-line service from a wireline phone company.[131]

As of February 2002, there were an estimated 130 million wireless subscribers in the United States – up from 34 million at the end of 1995[132] – as compared to the approximately 190 million users of switched landline telephone service.[133] Two in five Americans – with all adults and children included in that count – have a mobile phone.[134] Some twenty million new subscribers are being added annually.[135] Wireless carriers are adding subscribers much faster than their wireline counterparts – in percentage terms, and in absolute terms, too.[136] *See* Figure 7.



All of this wireless traffic is *switched* traffic. Wireless carriers other than those affiliated with Bell companies have deployed a total of more than 950 circuit switches nationwide. *See* Appendix F.[137] Many of the switches that wireless carriers are using are indeed the same switch types that CLECs are using – for example, the Lucent 5ESS, Nortel DMS 100, and Ericsson AXE-10.[138]

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[131] *See Forrester Sizing US Consumer Telecom Report* at 2.

[132] *See CTIA's Semi-Annual Wireless Industry Survey Results*; CTIA, *CTIA's World of Wireless Communications*, http://www.wow-com.com (131 million current U.S. wireless subscribers as of Feb. 12, 2002).

[133] *See CSFB 3Q01 CLEC Vital Signs Review* at Exh. 9; *see also FCC Local Competition Report, Feb. 2002 ed.* at 1.

[134] *See* Michael Powell, Chairman, FCC, *Consumer Policy in Competitive Markets*, remarks before the Federal Communications Bar Association, Washington, D.C. (June 21, 2001).

[135] *See CTIA's Semi-Annual Wireless Industry Survey Results*.

[136] *Compare FCC Statistics of Common Carriers, 2000/2001 ed.* at Table 4.10 (total switched access lines and residential switched access line growth, 1995-2000) *with CTIA's Semi-Annual Wireless Industry Survey Results* (estimated wireless subscribers, 1995-2000).

[137] These figures are conservative, because they are drawn from public sources or from the necessarily limited data available to the BOCs.

[138] *See, e.g.*, Lucent Technologies, *Switching Solutions, Switching, 5ESS Switch*, http://www.lucent.com/products/solution/O,,CTID+2002-STID+10055-SOID+935-LOCL+1,00.html ("The 5ESS® switch can deploy all

At the end of 2001, wireless calls already accounted for an estimated 12 percent of all U.S. phone calls.[139] There were approximately 200 billion billable minutes of wireless use in the first half of 2001, up 77 percent from June 2000, and up 34 percent from December 2000.[140] Wireless networks now switch at least one-quarter of the amount of traffic as wireline networks.[141] And wireless minutes of traffic are growing at over 60 percent per year, while landline minutes are growing at "low single digits."[142]

A second very large margin for which wireless switches compete is switched access traffic. In addition to completing local calls, local switches serve the second function of providing switched access to long-distance networks. Local access revenues represent approximately 14 percent of all local service revenues;[143] long-distance calling minutes (*i.e.*, access minutes) represent about one-quarter of all switched minutes on local plant.[144] Wireless plant certainly competes directly against wireline plant here, too.

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types and combinations of services from a single platform including wireline, wireless, voice and data."); Nortel Networks, *Products, Services & Solutions, DMS Switching Portfolio, DMS-100 Wireless Switching System*, http://www.nortelnetworks.com/products/01/dms100w/index.html (The DMS-100 "offers a flexible and cost effective way for a service provider to establish a single point of presence in both traditional wireline and wireless markets, as well as new data and internet telephony markets."); Alcatel, *Products and Services, Alcatel 1000 Multimedia Multiservice Exchange*, http://www6.alcatel.com/products/ (The Alcatel 1000 MM "handles any combination of fixed and mobile application.").

[139] *See* V. Bajaj, *Daytime Calling Clogs Spur Wireless Companies to Expand Night Minutes*, Dallas Morning News (Dec. 13, 2001) (citing David Bornowski, AT&T Wireless Services Inc.'s vice president/general manager for Texas and Louisiana). This number is projected to increase to nearly 50 percent by 2005. *See The Bull Market Report Daily*, www.bull-market.com (Jan. 12, 2001), http://www.bull-market.com/daily/Jan01/011201.htm. In terms of talk minutes, wireless is projected to account for over 40 percent of all conversation minutes by 2005. J. Sarles, *Wireless Users Hanging Up on Landline Phones*, S.F. Bus. Times (Mar. 23, 2001).

[140] *See* R. Whickham, *Don't Kid Yourself*, Wireless Review (Dec. 1, 2001), http://industryclick.com/magazinearticle.asp?releaseid=9715&magazinearticleid=136835&siteid=3&magazineid=9; *see also* CTIA, *Telephia Study Finds Outstanding Wireless Network Performance While Industry Experiences Rapid Growth*, http://www.wow-com.com/articles.cfm?ID=553 ("Minutes of use increased by 75% last year - from 147 billion minutes used in 1999 to 259 billion minutes used in 2000.").

[141] Wireline networks switch approximately 4.4 trillion local dial equipment minutes ("DEMs") per year, and there are two DEMs counted for each conversation minute, resulting in approximately 2.2 trillion originating and terminating minutes. There are 130 million wireless subscribers and the average subscriber uses 339 minutes per month (4,068 per year) on her wireless phone, resulting in approximately 529 billion originating and terminating wireless minutes per year. Both totals include toll minutes. *See* L.F. Carvalho, Morgan Stanley, Dean Witter, Investext Rpt. No. 8285600, Wireless Services: Industry Outlook: Life After 50 – Industry Report at *5 (Nov. 28, 2001) (average of 339 monthly MOUs per wireless subscriber in 2001); CTIA, *CTIA's World of Wireless Communication*, http://www.wow-com.com (130 million wireless subscribers); *FCC Statistics of Common Carriers, 2000/2001 ed.* at Table 5.8 (4.4 trillion Dial Equipment Minutes; "two [dial equipment minutes] are counted for every conversation minute").

[142] *See 3g Rollouts Inch Along, But Kagan Research Indicates Wireless Minutes Roaring Ahead, Set to Dominate Telecom Landscape by 2005 Leading Executives to Debate Market Demand, Technology and Financing at Kagan's Wireless Telecom Summit May 2-3 in New York*, Bus. Wire (Apr. 27, 2001).

[143] *See FCC Telecommunications Industry Revenues, 2002 ed.* at Table 2.

[144] *See FCC Statistics of Common Carriers, 2000/2001 ed.* at Table 5.8 (3.4 trillion local dial equipment minutes, both originating and terminating); *id.* at Table 2.5 (790 billion interLATA billed access minutes, both originating and terminating).

At least twenty million wireless customers (and counting) have plans that do not charge extra for long-distance.[145] The average price of a wireless long distance call is comparable to the average price of a long distance call made via wireline.[146] Many wireless carriers heavily market the "free long-distance" aspects of their service. Analysts report that "[t]he bundling of long distance calling at price points that are perceived as 'nearly free' to consumers is already making wireless long distance calling a more cost-effective alternative to wireline long distance calling to many wireless consumers."[147] Thus, "wireless continues to take share from wireline local and long distance usage."[148] AT&T recently noted that its wireline long-distance minutes of use were down about 10 percent, while its wholesale wireless long-distance traffic was running up about 35 percent.[149]

While wireless-wireline competition starts at the margin, it by no means ends there. Wireless is increasingly competitive with core primary-line wireline services. When the comparison is made between equivalent bundles of service, it is clear that wireless services are now price-competitive with wireline. Almost all wireline CLECs focus on selling bundles of service – not just basic access, but bundled long-distance and additional features as well.[150] And so do almost all wireless carriers. And so do most of the ILECs themselves. Regulation does require ILECs to offer unadorned, basic, local service at a very low price to all residential customers. But the vast majority of wireline customers buy much more – long-distance service, to begin with, which generates additional local-carrier revenues by way of access charges. And often, as well, other value-added features like call waiting, voice mail, and caller ID. A November 2001 Gartner Dataquest study concludes that wireless calling prices are already "competitive with, and in some case better than, wireline calling rates."[151]

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[145] *Sixth CMRS Report* at 32-33. The Strategis Group estimates that this number will grow to 90 million in 2005. *See* A. Backover, *AT&T Loss Reflects Long-Distance Shift Consumers Turn to Calling Cards, Wireless*, USA Today at 3B (Jan. 30, 2001).

[146] For example, Cricket offers long distance service at 8 cents per minute without monthly service charges or minimum usage charges. *See* Cricket, *Denver and Northern Colorado*, http://www.cricketcommunications.com/Denver_Colorado_2.asp; *see also* M. Rollins, Salomon Smith Barney, Investext Rpt. No. 2421667, Wireless by the Minute: Reviewing the Wireless Economic Model – Industry Report at *4 (Jan. 3, 2001) ("With buckets of minutes, wireless customers have a marginal cost of zero relative to wireline, which generally has a marginal cost of $0.05-$0.15 per minute.").

[147] *IDC Wireless Displacement Report* at 20. *See also* L.R. Mutschler, Merrill Lynch Capital Markets, Investext Rpt. No. 8247725, Sprint PCS Group – Company Report at *4 (Oct. 31, 2001) ("[T]he free long distance option in the Sprint PCS plan should make them attractive to subscribers that are interested in replacing wireline long distance minutes with wireless minutes.").

[148] M. Rollins, Salomon Smith Barney, Investext Rpt No. 8223022, Sprint PCS Group – Company Report at *4 (Oct. 18, 2001).

[149] *See* A. Quinton, Merrill Lynch Capital Markets, Investext Rpt No. 8232517, AT&T Corp. – Company Report at *5 (Oct. 24, 2001).

[150] *See*, *e.g.*, G.P. Miller, *et al.*, Jefferies & Co., Investext Rpt. No. 2918156, Telecom Services Weekly Update – Industry Report at *11 (Aug. 9, 1999) ("The CLECs have [] built much of their platform on offering competitively priced bundled and personalized service.").

[151] *Gartner U.S. Consumer Telecommunications and Online Market Report* at 33.

Wireless prices continue to decline rapidly – by as much as 10 to 20 percent a year in recent years.[152] While the length of the average wireless user's local call has increased, the average local monthly wireless bill has fallen from $97 in 1987 to $45 in 2001.[153] Analyst IDC attributes the dramatic growth in wireless usage, particularly in home and business locations that provide wireline access too, primarily to the fact "that wireless service pricing is rapidly approaching wireline service pricing."[154] At prices now in effect, wireless "is viewed as a cost-effective and compelling alternative to wireline."[155] Numerous analysts have reached the same conclusion.[156]

The Commission itself has agreed with this assessment in its July 2001 *Sixth CMRS Report*. It found that the wireless phone has "become a mass-market consumer device," that most wireless customers use their phones "primarily for personal calls," and that three in ten wireless users would prefer to give up their landline phone, if forced to choose, and that number rises to almost one in two among younger users.[157] The Commission's Report went on to discuss wireless services that are specifically being marketed as alternatives to wireline service.[158] Citing a Yankee Group survey, the report also found that at a quite sizable number of consumers – about 3 percent of wireless subscribers – have now abandoned wireline – in favor of wireless – entirely, "rely[ing] on their wireless phone as their only phone."[159] A more recent *USA Today*/CNN/Gallup poll found that 18 percent of cell phone users "use cell phones as their primary phones."[160]

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[152] *See*, *e.g.*, *Sixth CMRS Report* at 6.

[153] *CTIA's Semi-Annual Wireless Industry Survey Results*.

[154] *IDC Wireless Displacement Report* at 11.

[155] *Id.* at 19.

[156] *See*, *e.g.*, *Gartner U.S. Consumer Telecommunications and Online Market Report* at 41 (Gartner Dataquest: "Average mobile per-minute pricing will continue to decrease," with an "increased cross-elastic impact on wireline services."); *see also* Argus Research Company and Folio*fn*, *Sector Outlook: Telecomms Second Quarter 2001* (Second Quarter 2001), http://www.foliofn.com/content/forum/research/01Q2Telecom.pdf (Argus Research: "Pricing for wireless service has fallen to levels comparable with wireline service in many areas of the country, and more and more consumers are opting for wireless as their primary telecom connection."); J. Moran, *Phones: Cheaper and Better*, Hartford Courant at L28 (Feb. 25, 2001) ("The cost of wireless voice will continue to decline," [Peter Firstbrook, META Group research analyst] said. "You'll finally have competition for the [local phone companies]. I think we're at the transition right now where wireless prices are reaching parity with wireline.").

[157] *Sixth CMRS Report* at 32.

[158] *See id.* at 33-34.

[159] *Id.* at 32 (citing J. Sarles, *Wireless Users Hanging Up on Landline Phones*, Nashville Bus. J. (Feb. 2, 2001)). The Commission noted that CTIA estimated that this number "could be as high as 5 percent." *Sixth CMRS Report* at 32 n.207 (citing *Consumers Replacing Landline Phones with Wireless*, Knight Ridder/Trib. Bus. News (Jan. 10, 2001).

[160] M. Kessler, *18% See Cell Phones as Their Main Phones*, USA Today (Jan. 31, 2002).

III. INTEROFFICE TRANSPORT

The interoffice transport UNE comprises links between ILECs' and requesting carriers' wire centers or switches, and between ILEC switches.[1] A "wire center" is an end office where local loops terminate at an ILEC switch.[2] Interoffice transport does not include transport between an ILEC or CLEC switch and a customer.

The provision of interoffice transport is now highly competitive. The first competitors entered urban markets in 1985, and they have been laying competitive fiber optic networks ever since. The Commission first directed ILECs to provide collocation to competitive access providers in 1992.[3] Today, competitors have established fiber connections in a large fraction of BOC wire centers, which serve a significant percentage of BOC access lines. Many of the competitive transport facilities that CLECs have deployed are used to provide special access services; competitors now earn between 28 and 39 percent of all special access revenues.

As detailed below, it clearly is economical for competitors to serve an even larger number of wire centers with their networks than they currently do. With each additional mile of competitive fiber that gets deployed, the marginal cost of extending the network to reach an additional wire center gets lower. And the rise of the Internet has made it all the more attractive for CLECs to extend their fiber networks to ILEC end offices. Data connections generate a lot more traffic than voice calls do; the total volume of data traffic overtook voice traffic in 1998.[4]

A. Fiber-Based Collocation.

CLECs that provide competitive transport typically do so by collocating their own transmission equipment in an ILEC central office and connecting that equipment to their own fiber-optic network. This "fiber-based collocation" supplies the simplest and most unambiguous indicator of the extent of competition in the transport market, albeit a very conservative one that sharply underestimates the full extent of competition.

With few exceptions, competitively supplied transport begins in a CLEC collocation cage.[5] At the time of the last UNE review, the data required to determine where CLECs had

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[1] *See* 47 C.F.R. § 51.319(d)(1)(i) (defining dedicated transport as "transmission facilities . . . between wire centers owned by incumbent LECs or requesting telecommunications carriers, or between switches owned by incumbent LECs or requesting telecommunications carriers."); *id.* § 51.319(d)(1)(iii) (defining shared transport as "transmission facilities . . . between end office switches, between end office switches and tandem switches, and between tandem switches, in the incumbent LEC network.").

[2] *See Newton's Telecom Dictionary* 995 (16th ed. 2000). Wire centers vary widely in size, from fewer than 500 lines in rural areas, to over 300,000 in the most densely populated urban areas.

[3] *See Expanded Interconnection with Local Telephone Company Facilities*, Report and Order and Notice of Proposed Rulemaking, 7 FCC Rcd 7369 (1992).

[4] *See* Section II, note 100.

[5] *See*, *e.g.*, W.T. Scott, *et al.*, ING Baring Furman Selz LLC, Investext Rpt. No. 2787890, *Telecommunications/Fiber Vs. Fiberless* (Sept. 30, 1998) (quoting then-WinStar CEO, Bill Rouhana: "The fundamental underpinning of the strategy of most fiber-based companies in the industry today is that we will build to a central office, and we will co-locate with a regional bell operating company."); *id*. (quoting Allegiance Telecom CEO

obtained *fiber-based* collocation was not available.[6] It is today. The Commission's August 1999 *Pricing Flexibility Order* makes the presence of fiber-based collocation the trigger for pricing relief for special access services, and ILECs have therefore begun to compile such data systematically.[7]

As shown in Table 1, fiber-based collocation is now widespread. As of year-end 2001, *one or more* CLECs had obtained fiber-based collocation in 13 percent of the wire centers served by the Bell companies, which contain 54 percent of the business lines and 44 percent of all access lines served by the Bell companies. *See* Table 1. There also are multiple CLECs with fiber-based collocation in a large number of BOC wire centers, which contain a significant share of BOC access lines. *See id*.

Table 1. Competitive Interoffice Transport by Region

	Percentage of Wire Centers and Access Lines Served by:											
	1 or more fiber-based CLEC collocation nodes			2 or more			3 or more			4 or more		
	% Bus. Lines	% Total Lines	% WC	% Bus. Lines	% Total Lines	% WC	% Bus. Lines	% Total Lines	% WC	% Bus. Lines	% Total Lines	% WC
Verizon	55	44	12	37	25	5	28	17	3	17	10	2
SBC	50	41	13	35	25	7	23	15	4	15	9	2
BellSouth	62	53	19	52	43	13	43	34	9	34	26	6
Qwest	56	45	13	40	28	7	27	18	4	19	12	3
Total	**54**	**44**	**13**	**38**	**28**	**7**	**28**	**19**	**4**	**19**	**12**	**3**

In large metropolitan areas the totals are even higher. For example, in the 25 largest MSAs served by each BOC, an average of *one or more* CLECs had obtained fiber-based collocation in 35 percent of the wire centers served by the Bell company in those MSAs (containing 61 percent of all access lines within those MSAs). *See* Table 2. And, again, there

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Royce Holland: "We enter the market and put in switches, routers, both central office and frame-relay switches. We co-locate in a huge number of COs. We've targeted over 500 central offices to be in within the next few years. It represents a huge addressable market and then we go out and lease capacity initially, and as we reach the crossover point in terms of traffic, we either lease dark fiber or overbuild it. For instance, in New York, the crossover point is 40,000 lines. We have already moved to stage two, in which we acquired dark fiber from Metromedia Fiber Network."); KMC Telecom Holdings Inc., Form 10-K (SEC filed Apr. 17, 2001) ("[i]n all of our operational markets, we have completed our backbone construction connecting the market's central business district with outlying office parks, large institutions, the locations of long distance carriers' transmission equipment and major incumbent local exchange carrier central offices."); Adelphia Business Solutions, Form 10-K (SEC filed Apr. 2, 2001) (Adelphia claims that "[t]he broad deployment of fiber optic cable in Adelphia Business Solutions' markets typically enables connectivity among the Company, the ILEC central offices and the Company's customers."); Network Plus, Form 10-K at 13 (SEC filed Mar. 30, 2000) (Network Plus's fiber provides connections for the company's "co-location footprint.").

[6] As one analyst report notes, "detailed information on actual fiber deployment on an industry wide basis is not available." *Broadband 2001* at 92. To analyze competitive fiber, it is therefore necessary to "build a ground-up view of where such fiber is or is likely to be deployed." *Id.*

[7] *See Pricing Flexibility Order* ¶¶ 81-86, 147-152.

are multiple CLECs with fiber-based collocation in a large number of BOC wire centers in the largest MSAs, which contain a significant percentage of BOC access lines. *See id.*

Table 2. Competitive Interoffice Transport in the 25 Largest MSAs Served by Each BOC

	Percentage of Wire Centers and Access Lines Served by:							
	1 or more fiber-based CLEC collocation nodes		2 or more		3 or more		4 or more	
	% Lines	% WCs	% Lines	% WCs	% Lines	% WCs	% Lines	% WCs
Verizon	58	35	36	16	25	10	16	6
SBC	61	35	37	18	23	10	13	5
BellSouth	69	37	57	27	47	20	35	14
Qwest	60	32	38	19	25	11	18	7
Total	**61**	**35**	**40**	**19**	**27**	**12**	**18**	**7**

It is clearly economical for competitors to deploy fiber in an even larger share of wire centers than they currently serve. Some 30 percent of all wire centers contain 5,000 or more business lines, and those wire centers contain 84 percent of all business lines.[8] In those quantities, independent analysts have found that voice lines readily generate traffic in volumes sufficient to justify competitive fiber-optic transport.[9] And the actual experience of CLECs in the marketplace bears this out.

As shown in Table 3, one or more CLECs has obtained fiber-based collocation in nearly half of BOC wire centers with 5,000 or more business lines. *See* Table 3. And in wire centers with larger numbers of business lines, it is even more likely that at least one CLEC has obtained fiber-based collocation in that wire center. *See id.*

Table 3. Competitive Interoffice Transport in Large Wire Centers

	Percentage of all wire centers with *X* or more business lines that contain *Y* or more CLECs with fiber-based collocation:															
***X*=**	**5,000**				**10,000**				**20,000**				**30,000**			
***Y*=**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Verizon	51	26	16	9	66	39	27	15	78	65	50	31	93	84	69	41
SBC	38	21	11	6	51	32	18	10	73	53	41	19	80	64	45	28
BellSouth	66	51	37	25	81	75	62	47	91	91	86	75	100	100	100	100
Qwest	48	28	16	11	65	41	24	17	86	68	48	33	94	76	64	42
Total	**48**	**28**	**17**	**10**	**61**	**41**	**27**	**17**	**78**	**62**	**49**	**30**	**87**	**74**	**58**	**39**

[8] *See Broadband 2001* at 96.

[9] *See*, *e.g.*, *Broadband 2001* at 95 (Central offices "with more than 5,000 business lines . . . require [CLECs to gain] no more than 8% share [to break even] and therefore are well within the 'sweet spot' of even multiple CLECs per CO."); *see also id.* ("As might be expected, it is apparent that businesses residing with larger central offices spend up to one-third more on average per business per month than those businesses in smaller central offices.").

A fiber-based collocation test for the availability of competitive transport certainly provides a reliable indicator of which ILEC wire centers are served by competing fiber networks. It is worth emphasizing, however, that this test takes no account of the considerable amount of traffic that now bypasses ILEC wire centers completely. As one appellate court has noted, the fiber-based collocation metric "fails to account for the presence of competitors that . . . have wholly bypassed incumbent LEC facilities."[10]

This is all the more true because the ILEC wire center is no longer the only – or even the principal – point of traffic concentration. So if it is economical for a CLEC to run competitive fiber to reach an ILEC wire center, it is often economical to extend the fiber, directly to datacom hotels, large business customers, data ISPs, wireless carriers, cable headends, and countless other points of traffic concentration.[11]

Many private customers also now generate sufficient quantities of traffic to justify their own fiber optic connections. As discussed in Section IV.A, there are now direct CLEC fiber connections to tens of thousands of buildings in the U.S. – buildings that house a substantial fraction of all business customers.

CLEC networks also converge today at many other points of high traffic concentration, including interexchange carrier POPs and Network Access Points (NAPs). "Collocation hotels" – like those operated by Switch & Data, Cable & Wireless (formerly Exodus Communications), Global Switch, and Metro Nexus – create additional points of traffic concentration. These centers provide large (typically 10,000-50,000 square foot), high-security facilities to house servers, data storage equipment, and the network interface equipment used by telecom carriers and ISPs.[12] They give multiple CLECs and IXCs points at which to station their equipment and interconnect their networks.[13] Many of them are located right on the doorstep of existing ILEC wire centers.[14] In terms of how much traffic they originate and terminate, these facilities are as large as – and often much larger than – ILEC wire centers.[15] Data traffic at these centers is now

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[10] *WorldCom v. FCC*, 238 F.3d. 440, 462 (D.C. Cir. 2001) (quoting *Pricing Flexibility Order* ¶ 95). This framework also is conservative because it examines only fiber-based collocation, even though competitive carriers have obtained thousands of collocation arrangements that, although not fiber based today, could easily be modified to connect to third-party fiber.

[11] *See*, *e.g.*, *Wall Street Transcript Corp. Interview, John Peters – Sigma Networks* (John Peters, CEO, Sigma Networks: "[W]e've targeted our network to address the interconnection needs principally between all of the major sources and links of data traffic in the metro. We've targeted the major carrier hotels, the major data centers, the Internet backbone connection points 'the MAEs, the PAIXs' and the broadband backbone networks.").

[12] *See* D. Culver, *Construction Boom for Colocation*.

[13] *See* R. Duran, *Checking into Telecom Hotels*, Bus. Xpansion J. (Feb. 2001), http://www.bxjonline.com/issues/feb2001/telecom_hotels.asp.

[14] *See* D. Culver, *Construction Boom for Colocation* (collocation hotels provide "high-security facilities operated by independent companies that put telecom gear as close as possible to incumbent central offices without actually being there.").

[15] *See*, *e.g.*, R.J. Sherman, Janney Montgomery Scott, Investext Rpt No. 2121566, Exodus Communications – Company Report at *2 (Apr. 4, 2000) ("It is estimated that 50% of all Internet traffic flows from Exodus' data centers."); F. Billimoria, *et al.*, Hambrecht and Quist Inc., Investext Rpt No. 2724275, Exodus Communications – Company Report at *2 (Nov. 20, 1998) ("The company estimates that 10-12% of traffic that is carried over the Internet

growing at 100 percent a year, "and will consume 40% of total metro bandwidth by 2005."[16] Datacom hotels "tend to be concentrated in the top 15 Tier One metros, which account for 80% of demand."[17] Nonetheless, today there are alternative collocation providers in virtually all major metropolitan areas throughout the country. *See* Appendix G.

That there are many different points of traffic concentration is competitively significant in two important respects. First, high-traffic-volume nodes provide network economies of scale to many smaller competitors, by consolidating their traffic at a single physical location. To obtain competitive transport, a CLEC no longer has to grow organically; it can, instead, just locate itself in the right building. Second, the major competitive fiber-optic providers in an area are all very likely to route their networks to these locations – thus effectively providing connection to all points served by all the competing networks combined. The CLECs themselves can hand off traffic to each other, or an intermediary can bundle and resell their services as a single, integrated competitive service. Thus, while any single competitive fiber network may serve only a select number of point-to-point routes, that carrier will have access to the point-to-point networks of other competing carriers as well. The universe of total competitive fiber – not the point-to-point routes of any individual competitor – defines the geographic areas within which competitive transport facilities are now available.

Three years ago, the Commission downplayed the competitive significance of competitive transport on the ground that CLECs "require dedicated transport facilities that are more extensive than those that are currently deployed along the point-to-point routes."[18] The Commission stated that, "[w]ithout access to the incumbent's ubiquitous transport facilities, competitive LECs are faced with the delays and costs of deploying their own transport facilities to meet the demand" or "must utilize a patchwork of competitive alternatives, where available, to collect and route traffic to the required destination."[19] Whatever the merits to that concern three years ago, the market itself has overtaken it today. Competitive transport networks now overlap and converge. Today, CLECs routinely seek out competitive suppliers of fiber; the supposed administrative costs of building patchwork solutions have been readily overcome.

Marketplace experience firmly establishes that carriers will seek out competitive suppliers of fiber, even where it means relying on a patchwork of different networks, rather than the ubiquitous facilities of an ILEC.[20] This is precisely the way the competitive access business began, with the large interexchange carriers purchasing competitive fiber in just a single

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goes through an EXDS data center. They also noted that during peak periods, they are transmitting sustained levels of 2.4 gigabits/sec of traffic across the Internet, which we believe makes EXDS the 3rd or 4th largest generator of traffic.").

[16] *Lehman/McKinsey MAN Report* at 6.

[17] *Id.* at 6-7.

[18] *UNE Remand Order* ¶ 346.

[19] *Id.*

[20] *See*, *e.g.*, Joint Comments of Allegiance Telecom, Inc. and Focal Communications Corporation at 5, *Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, CC Docket No. 96-98 (FCC filed June 11, 2001) ("Where it is available, Allegiance and Focal purchase transport and fiber from third parties.").

location, at first, and slowly expanding from there.[21] AT&T and WorldCom found the business so compelling, that they spent $25 billion to acquire their two largest suppliers.[22] Today, as discussed in more detail below, CLECs are purchasing as much fiber as they can from wholesale suppliers, even though these suppliers do not necessarily offer fiber everywhere. These suppliers obviously wouldn't even be in business if CLECs were willing to purchase transport only from suppliers who offered them ubiquitous connectivity.

B. CLEC Fiber.

At the time of the *UNE Remand Order*, the Commission found that, based on market conditions at the end of 1998, "competitive LECs have deployed transport facilities along selected point-to-point routes, primarily in dense market areas."[23]

Since that time there has been a further, sharp increase in the availability of competitive alternatives to ILEC interoffice transport facilities.[24] At the time of the *UNE Remand* proceedings, for example, CLEC fiber networks spanned approximately 100,000 route miles (both local and long-haul).[25] Today, CLEC networks consist of at least 184,000 route miles of fiber (both local and long-haul).[26] While many CLECs do not publicly report how many purely local route miles of fiber they operate, information from CLECs that do release such totals confirms that the majority of this fiber is local.[27]

While CLECs have significantly expanded their own local fiber networks, there also has been a rapid increase in local fiber supplied by "carrier-agnostic" wholesale suppliers. These companies have invested well over $1 billion in deploying local fiber networks that they sell or lease to other carriers. As a result, for a growing number of CLECs, the fiber provided by these wholesale suppliers satisfies a large part of their demand for interoffice transport.

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[21] *See* Section III.B.

[22] *See* AT&T News Release, *AT&T Completes TCG Merger* (July 23, 1998); WorldCom Press Release, *WorldCom, Inc. and MFS Announce Merger to Form Premier Business Communications Company* (Aug. 26, 1996).

[23] *UNE Remand Order* ¶ 333.

[24] This competitive transport is available to wireless carriers, just as it is to CLECs. Moreover, wireless base stations and switches (MTSOs) typically handle sufficient volumes of traffic to justify new fiber connections.

[25] *See NPRG CLEC Report 2000, 12th ed.*, Ch. 6 at Table 5 (restated 1998 route miles). As described in the following note, the latest NPRG report excludes fiber for competitive Independent Operating Companies, utility CLECs, data providers, and Gig-E providers. To make an apples-to-apples comparison with the 2001 totals, we have removed from the 1998 totals the fiber for carriers that NPRG has placed in one of these categories.

[26] *NPRG CLEC Report 2002, 15th ed.*, Ch. 2 at Table 7; Ch. 4. This is a highly conservative estimate. It does not include 117,000 route-miles of fiber that NPRG lists for competitive Independent Operating Companies, utility CLECs, data providers, or Gig-E providers. Moreover, the total miles for 2001 have been adjusted downward to address the concerns that CLECs raised in the Special Access proceeding in April of 2001 (CC Docket No. 96-98).

[27] For example, of the 33 CLECs for which NPRG provides fiber-route miles, we have found only four examples (Adelphia, McLeod, Time Warner Telecom, and XO) where, based on CLECs' own public disclosures, the total route miles reported by NPRG appear to include significant amounts of long-haul fiber. At the same time, the total route miles reported by NPRG are *lower* than local-only route-mile totals provided by at least two CLECs (AT&T and Cablevision) and do not include any fiber route miles for WorldCom, which is one of the two largest CLECs.

The first competitive transport services involved the provision of "access" between large business customers and interexchange carriers. New York authorized interoffice competition in 1985, and that year Teleport built a fiber-optic network in lower Manhattan, to provide special access service to business customers, where the most concentrated wire centers in the nation reside. Sixteen other states had followed New York's lead by August 1986.[28] Institutional Communications Company (ICC), the second major CAP, was formed in 1986 in Washington, D.C.; it is now a part of MCI/WorldCom's MFS.[29] In 1987, Chicago Fiber Optic (soon to be MFS) began building a network to provide special access in downtown Chicago.[30] By 1990, CLECs had deployed 20 networks in 15 cities.[31] By 1995, 29 CAPs had deployed fiber-optic networks in approximately 100 cities, consisting of more than 21,000 route miles of fiber.[32]

Since the last UNE review, the number of "operational" and "on-net" CLEC networks in the 150 largest MSAs – which contain nearly 70 percent of the U.S. population[33] – has grown from approximately 1,100 to nearly 1,800. *See* Appendix K.[34] During this period, the average number of CLEC networks in the 150 largest MSAs grew by more than 60 percent. *See* Table 4. Today, 91 of the top 100 MSAs are served by at least three CLEC networks; 77 are served by at least seven, 59 are served by at least 10. *See* Appendix K. As these data make clear, CLEC fiber is by no means limited to dense urban areas. CLECs also have deployed fiber far outside of urban areas to reach large business customers in suburban and rural areas.[35]

Table 4. Average Number of CLEC Networks by MSA

MSA Rank	1998	2001	Percentage Increase
1-25	19.6	32.2	64%
26-50	10.2	15.0	47%
51-75	5.2	9.0	73%
76-100	4.0	6.6	65%
101-125	2.8	4.8	71%
126-150	2.8	3.4	21%

Sources: See Appendix M.

[28] *See* Semilof, *IntraLATA Competition: Lata Barrier Falls*, Network World at 11 (Aug. 25, 1986).

[29] *See NPRG 1999 CLEC Report, 10th ed.*, Ch. 2 at 3.

[30] *See NPRG 1999 CLEC Report, 10th ed.*, Ch. 2 at 3.

[31] *See* U.S. Dep't of Commerce, *U.S. Industrial Outlook* at 33-7 (1990).

[32] *See* Connecticut Research, *1995/96 Local Telecommunications Competition* at Table II-2 (7th ed. 1995).

[33] Rand McNally, *Commercial Atlas and Marketing Guide 2001* at 60-61, 83 (132nd ed. 2000).

[34] For purposes of these totals, we have counted all "voice networks" and "data networks" that NPRG's *CLEC Report 2002* lists as "operational." These totals may include some networks or parts of networks that CLECs operate with facilities leased from a third party, including an ILEC.

[35] *See also*, *e.g.*, K. Fairbank, *RAIL SWITCH; Union Pacific Develops High-Tech Subsidiary*, Dallas Morning News at 1D (Oct. 18, 2000) (Ekanet, a subsidiary of the Union Pacific railroad, "aims to provide services to underserved, primarily rural, markets west of the Mississippi River"); *Fujitsu Equipment Drives New Fiber Network Serving Northwestern South Dakota*, Bus. Wire (Nov. 6, 2000) (South Dakota Network "is now offering advanced telecommunications services to customers in rural northwest South Dakota through a 600-mile fiber-optic network").

Finally, there are new technologies on the near horizon that would enable additional fiber to be deployed without digging up city streets, which "could cut the time and cost of fiber installation in half."[36] For example, "CityNet Telecommunications aims to revolutionize the rollout of broadband services in cities by dispatching tiny robots to lay fiber-optic cables in sewer pipes."[37] The company already has agreements to deploy fiber in nine major cities (Houston, Pittsburgh, Dallas, Scottsdale, Indianapolis, Fort Worth, Omaha, San Antonio, and Albuquerque),[38] and is in talks with dozens of other cities. In April 2001, the company announced that it had secured $275 million in a new round of financing, which "underscores the novelty and promise of the . . . company's business."[39]

Many of the competitive transport facilities that CLECs have deployed are used to provide special access services. Special access revenues constitute a very large share of all interoffice transport revenues. Moreover, these revenues are highly concentrated in a relatively small number of wire centers,[40] making them an easy target for CLECs to serve with their own facilities. The Commission has found that "the revenues of competitive LECs come primarily from special access and local private line services."[41] CLECs now account for between 28 and 39 percent of all special access revenue, which is significantly larger than their share of the local exchange market as a whole.[42]

C. Wholesale Suppliers of Local Fiber.

In the past few years, there has been a dramatic increase in fiber supplied by alternative wholesale suppliers, which typically sell or lease dark fiber to other carriers, but do not

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[36] P. Davidson, *Robots Lay Fiber Optics in City Sewers*, USA Today (Nov. 27, 2000).

[37] *Id.*

[38] CityNet News Release, *City of Houston and CityNet Telecommunications Announce Agreement To Wire City with Fiber Optic Networks Through Sewers* (Jan. 9, 2002); CityNet News Release, *City of Pittsburgh and CityNet Communications Announce Agreement to Wire City with Fiber Optic Networks Through Sewers* (Oct. 26, 2001); CityNet News Release, *Mayor Touts "Smart" Alternative to Trenching Streets* (Oct. 16, 2000); CityNet News Release, *CityNet Inaugurates the First-Ever U.S. Fiber Optic Network Deployment Through City Sewer System* (Feb. 20, 2001); CityNet News Release, *CityNet Launches Last-Mile Fiber Optic Network in Indianapolis* (June 13, 2001).

[39] *CityNet Wins $275 Million in Funding*, Wash. Post (Apr. 10, 2001).

[40] *See* USTA, *Competition for Special Access Service, High-Capacity Loops, and Interoffice Transport*, CC Docket No. 96-98, at 3 & Table 1 (FCC filed Apr. 5, 2001) ("more than 80 percent of SBC's special access revenues are generated in less than 25 percent of the wire centers in which it is providing special access. In Verizon's region, more than 80 percent of special access revenues are generated from about 20 percent of Verizon's total wire centers. In Qwest's region, more than 60 percent of special access revenues are generated from 11 percent of Qwest's total wire centers. In BellSouth's region, 91 percent of special access revenues are generated from 20 percent of BellSouth's total wire centers.").

[41] *Promotion of Competitive Networks in Local Telecommunications Markets*, First Report and Order and Further Notice of Proposed Rulemaking in WT Docket No. 99-217, Fifth Report and Order and Memorandum Opinion and Order in CC Docket No. 96-98, and Fourth Report and Order and Memorandum Opinion and Order in CC Docket No. 88-57, WT Docket No. 99-217; CC Docket No. 96-98; CC Docket No. 88-57, FCC 00-366, ¶ 24 (rel. Oct. 25, 2000).

[42] *See* Appendix L & Section V; *see also* Section I.D.

themselves engage in the provision of telecommunications services. *See* Table 5.[43] Five of these alternative fiber suppliers have formed an industry coalition – the Coalition of Competitive Fiber Providers – which states that its members' business plans involve the "provision of competitive fiber-based transport services and dark fiber to competitive local exchange carriers . . . collocated in ILEC central offices."[44] The Coalition claims that its "members together represent a total capital investment of approximately $1 billion."[45] According to analysts, metropolitan fiber suppliers have raised about $2 billion in capital since the third quarter of 2000, and are still "some of the few getting capital."[46] These companies have recently raised significant additional funding through debt and vendor financing.[47] According to consulting firms Cambridge Strategic Management Partners and McKinsey & Co., "[t]he market for reselling . . . dark fiber to ISPs and telecom carriers is projected to grow from about $2 billion today to about $10 billion by 2006."[48]

Just like CLECs, alternative wholesale suppliers of fiber connect end users to their fiber rings, which in turn connect to interexchange carrier POPs and ILEC central offices.[49] Because

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[43] *See*, *e.g.*, J. Grubman, Salomon Smith Barney, *Grubman's State of the Union* at 15 (Mar. 21, 2001) ("there is an avalanche of metro capacity being deployed."); *Robertson Stephens Provides Outlook on Telecom Services*, PR Newswire (Sept. 7, 2000) ("We believe that we have reached the beginning of the end of the metropolitan bandwidth bottleneck . . . We are seeing a new generation of metropolitan bandwidth operators that will provide 100 Mbps plus connectivity at low cost to end users.").

[44] Coalition of Competitive Fiber Providers, Petition for Declaratory Ruling at 2, *Application of Sections 251(b)(4) and 224(f)(1) of the Communications Act of 1934, as amended, to Central Office Facilities of Incumbent Local Exchange Carriers*, CC Docket No. 01-77 (FCC filed Mar. 15, 2001) ("*Coalition of Competitive Fiber Providers Petition*"). The five coalition members are American Fiber Systems, Fiber Technologies, Global Metro Networks, Telergy, and Telseon.

[45] *Coalition of Competitive Fiber Providers Petition* at 2.

[46] P. Brown, *Despite Tighter Purse Strings, Cash Is Still Streaming to Metro Providers*, Tele.com (Aug. 13, 2001) (citing the Yankee Group and quoting Lehman Brothers Equity Research telecom analyst Blake Bath).

[47] *See*, *e.g.*, Looking Glass Networks Press Release, *Looking Glass Networks Nets Huge Debt Financing Round* (Mar. 2, 2001) (Looking Glass raised $275 million in debt in February of 2001); Metromedia Fiber Network Press Release, *Metromedia Fiber Network Successfully Completes $611 Million Financing Package* (Oct. 2, 2001) (Metromedia raised a total of $611 million in September of 2001); Yipes Press Release, *Yipes Closes $200 Million "C" Round of Funding* (Feb. 5, 2001) (Yipes secured $200 million in equity financing); Telseon Press Release, *Telseon Receive $175 Million in Financing* (Feb. 6, 2001) (Telseon secured $100 million in equity financing and $75 million in capital lease financing.).

[48] N. Orman, *Networking Startups Battle for Cities*, Silicon Valley/San Jose Bus. J. (Oct. 26, 2001).

[49] *See*, *e.g.*, *Coalition of Competitive Fiber Providers Petition* at 1 (emphasis added) (Our members "provide, or will provide, advanced fiber-based transport services, *including interoffice transport*, and/or dark fiber to end users and other telecommunications carriers. Coalition members together offer these services and products in virtually every region of the 'lower 48' states and the District of Columbia."); Looking Glass Networks, *FAQ*, http://www.lglass.net/aboutus/faq.jsp (Looking Glass's target customers include "Long Haul Carriers (IXCs), Incumbent Local Exchange Carriers (ILECs), Competitive Local Exchange Carriers (CLECs), Internet Service Providers (ISPs), data centers, bandwidth trading organizations, storage facility providers, wireless data providers and large enterprise customers."); *Wall Street Transcript Corp. Interview, John Peters – Sigma Networks* (John Peters, CEO, Sigma Networks: We're a Carrier's carrier. Our customers tend to be the backbone carriers that are looking to extend their reach within the metro, the service providers that host applications within the various data centers that need to get traffic to and from the various backbone networks, and then third would be broadband access networks, cable, DSL, and fixed wireless suppliers that need to interconnect their access networks into the metro to get to the data centers and the backbones.").

these alternative suppliers are "carrier agnostic," they can use their networks to serve multiple carriers at once, significantly improving the economics of deploying fiber.[50] For a growing number of CLECs, the fiber provided by these wholesale suppliers satisfies a large part of their demand for last-mile local connectivity and interoffice transport.[51] In fact, these alternative suppliers' networks are so expansive that even ILECs have begun purchasing fiber from them.[52]

In addition to this new breed of wholesale fiber suppliers, many of the nation's utility companies are now supplying local fiber to CLECs. *See* Table 6. Utility companies control a significant portion of the nation's fiber infrastructure – as much as 35 percent according to one source.[53] These companies have the advantage of being able to deploy fiber using their existing infrastructure. As one analyst notes, "If a company already has wires or pipes in the ground, the cost of entry is comparatively low."[54] Another analyst notes that "roughly half of the new metro networks being built in the United States are being constructed by utilities."[55]

Finally, several of nation's largest operators of long-haul fiber networks have recently constructed metropolitan fiber networks. *See* Table 7. These carriers have sold dark fiber on their long-haul networks to CLECs for many years, and have now begun leasing dark fiber on

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[50] *See*, *e.g.*, *Wall Street Transcript Corp. Interview, John Peters – Sigma Networks* (John Peters, CEO, Sigma Networks: "[E]ach of these metro networks requires a very large amount of traffic to drive the unit cost down to a reasonable level. So by having us deploy a common network infrastructure that can be used by many carriers, we can get the traffic volumes aggregated on our network much more easily than any individual carrier can do on their own and therefore we can drive unit cost down faster."); *id.* (John Peters, CEO, Sigma Networks: "We take a position of neutrality with regard to our customers. . . . We're a neutral provider of broadband interconnections."); Looking Glass Networks, *Collocation*, http://www.lglass.net/products/collocation.jsp (Looking Glass Networks provides "carrier-neutral facilities"); F.J. Governali, *et al*., Credit Suisse First Boston Corp., Investext Rpt. No. 2699472, Northeast Optic Network – Company Report at *3 (Sept. 10, 1998) (NEON's business plan "is lower risk than most of the emerging nationwide network builders" because it "plans to only operate as a carrier's carrier, which takes away the risk of competing with other carriers for end-user services and significantly decreases operating expenses.").

[51] *See*, *e.g.*, Allegiance Telecom Inc., Form 10-K405 (SEC filed Mar. 30, 2001) (Allegiance has leased fiber from suppliers in 25 markets, and claims that "[t]hese fiber rings are expected to provide [Allegiance] with a reliable, diverse and robust connection to most of [its] central office locations throughout a market."); *CTC Communications Announces Fully Funded Local Fiber Build-Out Plan; High Bandwidth Core Fiber Network to Be Extended to Verizon Local Switching Offices*, Bus. Wire (Dec. 19, 2000) (CTC purchased from a "number of dark fiber suppliers" "local fiber in selected geographical areas of eastern Massachusetts, southern New Hampshire, southern Maine and Rhode Island," which it claims will "extend CTC's existing high bandwidth fiber network backbone to Verizon local switching offices," and enable it to "eliminate the need for leased inter-office Verizon facilities."); Sprint Press Release, *Sprint Signs Multiyear Contract with Metromedia Fiber Network for Enhanced Access to Major U.S. Markets* (Dec. 4, 2001) (Sprint expects to begin using MFN networks in initial markets in the second quarter of 2002 and in all 10 cities by the end of 2002).

[52] *See*, *e.g.*, B. Wallace, *Bell Atlantic Eyes Further Expansion,* TechWeb (Oct. 18, 1999), http://www.informationweek.com/757/atlantic.htm (Bell Atlantic invested $550 million to gain access to MFN's local fiber networks in 50 cities); D. Rohde, *Looking for SBC Over the Horizon*, Network World Fusion (Aug. 21, 2000), http://www.nwfusion.com/columnists/2000/0821rohde.html?nf (SBC will buy local dark fiber nationwide from MFN).

[53] *See* J. Krause, *They've Got the Power*, The Standard (Dec. 27, 1999).

[54] I. McDonald, *Butterfly Companies: The Web Has Transformed These Utilities Firms*, The Street.com (Nov. 3, 2000), http://www.thestreet.com/funds/fundjunkie/1155477.html.

[55] K. Maddox, *New Era, New Partner – Old-Line Manufacturer Chooses Cinergy for Network Build*, tele.com (Mar. 5, 2001) (citing Forrester analyst Maribel Dolinov).

their metropolitan fiber networks as well. These carriers also have begun providing competitive local services to customers directly. To cite just one example, in January of this year, the District of Columbia City government agreed to lease dark fiber from Level 3 to create a high-speed data network linking government buildings at various locations across the city.[56]

[56] *Level 3 Selling Dark Fiber to District of Columbia City Government*, CLEC.com (Jan. 31, 2002), http://www.clec.com/newsprint.asp?ContentID=2147455397.

Table 5. Wholesale Local Fiber Suppliers		
	Cities with Operational and Planned(*) Networks	**Network Details**
Metromedia Fiber Networks	Seattle, Portland, San Francisco/Bay Area, Los Angeles, Phoenix, Denver, Dallas, Houston, Kansas City, Chicago, Miami, Boston, New York, Washington D.C., Atlanta	"Our existing intra-city networks consist of approximately 1,579,000 fiber miles covering in excess of 3,987 route miles in the United States."
Fiberworks	Atlanta, Charlotte, Birmingham*, Orlando*, Miami/Ft. Lauderdale*, Jacksonville*, Tampa/St. Petersburg*, New Orleans*, Raleigh/Durham*, Greenville/Spartanburg*, Nashville*, Dallas/Ft. Worth*, Austin*, San Antonio*, Houston*	"Fiberworks has installed over 3,000 fiber route miles."
American Fiber Systems	Salt Lake City, Kansas City, Nashville, Minneapolis, Cleveland AFS is developing dark fiber optic rings in 126 other cities across the country.	AFS plans to "help alleviate the band-width capacity shortage by installing more than 1.4 million miles of fiber-optic strands in second and third-tier U.S. cities over the next seven years."
Fibertech Networks	Albany, Buffalo, Rochester, Syracuse. Pending Completion: Hartford, Indianapolis, New Haven, Springfield, MA, Worcester, Columbus, Pittsburgh, Providence. Planned: 48 additional markets	Fiber Technologies "planned network infrastructure and diverse ring topology will encompass more than 40 cities, 6,400 route miles and in excess of 306,000 fiber miles."
Yipes	Santa Clara, Atlanta, Boston, Chicago, Dallas, Denver, Ft. Collins, Ft. Lauderdale, Houston, Longmont, Miami, New York, Palo Alto, Philadelphia, Pittsburgh, Riverside, San Diego, San Francisco, Seattle, Washington, D.C., Worcester	"Yipes has now over 3,600 route miles of fiber in our twenty-one markets, which is twice the route miles we had in December. With multiple fibers in each of its markets, Yipes has now lit 32,000 miles of fiber encompassing 128 metropolitan rings."
Telseon	Atlanta, Chicago, Cincinnati, Dallas, Denver, Detroit, Houston, Los Angeles, Miami, New York, Northern Virginia, Orlando, Philadelphia, Phoenix, San Diego, San Francisco Bay Area, Seattle, Silicon Valley, St. Louis, Tampa	"In 2001, Telseon increased its network points of presence from 120 to 160 locations . . . In 2002, Telseon will continue to expand its network to include multiple tenant buildings and large enterprises."
Looking Glass	Seattle, San Francisco, Los Angeles, Dallas, Houston, Atlanta, Chicago, Washington D.C., New York, Boston	With "over $15 million in signed customer contracts," Looking Glass "offers the full range of carrier class SONET, Ethernet and Wavelength lit services from 10 Mbps to 10 Gbps, along with dark fiber and carrier neutral collocation."
Northeast Optic Network (NEON)	Baltimore*, Boston, Bridgeport, Hartford, Keene, Manchester, Nashua, New Haven, New York, Newark*, Philadelphia*, Portland, Portsmouth, Providence*, Springfield, Stamford, Washington, D.C.,* White Plains, Worcester	NEON's "interstate, intercity, and local loop facilities comprise a network of approximately 1,900 route miles and more than 81,000 fiber miles."
Progress Telecom	Atlanta, Miami, New York, Raleigh, Saint Petersburg, South Florida, Tampa, Washington D.C.	"Progress Telecom incorporates approximately 130,000 fiber miles and 7,200 route miles in its network including over 150 Points-of-Presence (POPs)."
EPIK Communications	The lit network reaches 12 key cities, including the cities of Atlanta, Jacksonville, Orlando, Tampa, and Miami; EPIK is also developing fiber "metro rings" in these five cities totaling approximately 400 route miles.	EPIK has lit a 1,850 mile regional fiber in network in the Southeastern United States. EPIK is also developing fiber metro rings in Atlanta, Jacksonville, Orlando, Tampa, and Miami totaling 400 route miles.
NEESCom	Providence, Worcester, Metro West (MA region east of Worcester)	NEESCom has deployed "more than 700 route miles of dark fiber."
Sources: See Appendix M.		

Table 6. Utilities Providing Local Fiber	
Alameda Power & Telecom	"finalized a $16 million contract with Evansville, Ind.-based Vectren Communications Services for construction of a hybrid fiber optic/coaxial telecommunications network.," which "will allow the municipal utility to offer telecommunication services to its customers."
Bristol Virginia Utilities Board	"Six businesses now have high-speed Internet connections through the city's fiber-optic network, and two dozen others have requested the service. . . . Several telecommunications companies are interested in leasing the capacity to provide . . . telephone service."
Cinergy Communications	Cinergy Communications (a telecom subsidiary of Cincinnati's gas and electric provider, Cinergy Corp.) has begun leasing its fiber network that circles Cincinnati.
ConEdison Communications of New York	"ConEdison has embarked on a push to become a fiber-based carrier's carrier in the New York metro area, and is deploying all new fiber in ConEd's conduits. . . . 'If you're a retail provider and you touch our network at any POP, you could buy whatever unit of bandwidth you want into any building we have on the network,' [Peter Rust, president and CEO of ConEdison Communications] explained. 'You could go after that building, sell one or two customers, buy just what you need to cover those two customers and grow the bandwidth as you need it.'"
Edison Carrier Solutions	"San Diego's Edison Carrier Solutions has built a Southern Cal. network 2nd only to the incumbent phone provider and concentrates on SONET transport, also offering managed wavelength service and dark fiber leasing."
Electric Power Board of Chattanooga	"EPB, the [Chattanooga] city-owned electric utility, expanded two years ago into telecommunications to capitalize on the utility's fiber-optic lines originally installed to help with communications for its electricity service."
El Paso Global Networks	El Paso Global Networks (a subsidiary of natural gas and energy company El Paso Corp.) plans to spend $2 billion over the next four years on a nationwide fiberoptic network and "plans to overbuild its metropolitan areas to provide better connectivity."
FPL FiberNet	FPL FiberNet (a subsidiary of the utility holding group that includes Florida Power & Light) has a 2000 mile fiber network in Florida. It provides connectivity to major telecom centers in Florida, "including leading carrier hotels, NAP initiatives, international cable-heads and large central offices."
Grant County Public Utility District	"GCPUD will provide video services over its existing fiber-optic infrastructure, known as Zipp. When completed in 2005, the Zipp network will contain some 50,000 mi of fiber in its effort to reach 40,000 homes, businesses, and farms throughout Grant County. To date, the network passes about 7,000 homes with approximately 2,000 customers 'lit' and receiving services."
Lafayette Utilities System	"The Lafayette Utilities System has completed a 65-mile, 96-strand fiber-optic loop that offers broadband throughout the city. The loop passes within 1 mile of nearly every home in the city limits."
PPL Telecom	PPL Telecom will market its services in five metropolitan areas that company officials believe are underserved – the Lehigh Valley, Lancaster, Harrisburg, Scranton/Wilkes-Barre and Williamsport. "Our fiber, as it exists today, is within half a mile of 20,000 office buildings."
Progress Telecom	Progress Telecom is "building local metropolitan fiber networks to try to get the capacity out close to the buildings and the consumers where they need it."
Reliant Energy	Operates a 67-route mile fiber backbone in Houston.
Sempra Communications of Los Angeles	"L.A. utility firm Sempra Communications found a technique for running fiber conduit through pipelines without interrupting gas transmission and is attacking the last mile as 'the gold mine of the [telecom] industry.'
Telergy MidAtlantic	"Business customers in Northern New Jersey and Pennsylvania now have access to a powerful new source for telecommunications services. TMA combines the resources of Telergy's established telecom network with GPU's extensive last mile reach and communications construction experience."
Touch America (formerly Montana Power)	Owns and operates a 23,000-route-mile, state-of-the-art, high-speed fiber-optic network that will span 26,000-route miles, cross 40 states, and reach more than 140 major cities in 2002. Its network is used for long-haul services and "for Touch America's own direct connections to individuals and businesses through its wireless services, metropolitan fiber offerings, and private line, long-distance and Internet applications."

Table 7. Local Fiber Networks of IXCs That Supply Dark Fiber	
Company	**Cities with Operational and Planned(*) Networks**
Williams	Anaheim, Atlanta, Baltimore, Boston, Chicago, Dallas, Houston, Los Angeles, Miami, Minneapolis, New York, Newark, Philadelphia, Phoenix, San Francisco, San Jose, Santa Clara, Seattle, St. Louis, Washington, D.C. (*construction is planned in 40 more cities by the end of 2001)
Level 3	Atlanta, Baltimore, Boston, Chicago, Cincinnati, Dallas, Denver, Detroit, Jersey City, Houston, Long Island, Los Angeles, Miami, New York, Newark, Orlando, Philadelphia, Phoenix, San Diego, San Francisco, San Jose, Seattle, St. Louis, Stamford, Tampa, Washington, D.C.
Global Crossing	New York, Philadelphia, Washington, D.C., Atlanta, Miami, Dallas, Chicago, San Francisco, San Jose, Los Angeles
Qwest	Baltimore, Chicago, Dallas/Ft. Worth, Houston, Kansas City, Los Angeles, New York, Sacramento, San Francisco, San Jose, St. Louis, Washington, D.C.
Sources: See Appendix M.	

IV. LOCAL LOOPS

As the Commission has recognized, loops come in a wide range of capacities. The availability of competitive substitutes varies accordingly. In addition, the availability of substitutes varies significantly among geographic markets.

A. High-Capacity Loops.

The FCC defines a "high-capacity loop" as a loop from a customer to an ILEC central office that is capable of supporting a service at DS-1 speeds (*i.e.*, 1.544 Mbps) or higher.[1] A DS-1 facility consists of 24 individual 64 kbps DS-0 circuits, the bandwidth normally used for a single voice channel.[2] The individual circuits on DS-1 loops and higher can, however, be configured to provide any mix of voice and data services.[3] High-capacity loops are almost always provided to medium or large business customers.

As described in Section III, competitive access providers began deploying fiber networks immediately after the Bell break up, to provide interoffice transport between the ILECs' Class 5 switches and the Interexchange Carriers' Class 4 counterparts. CLECs then began extending their fiber between ILEC central offices. They then moved beyond carrier-to-carrier services, extending their fiber to provide a full range of high-capacity local services to large private customers.

The economics of supplying high-capacity loops are exactly the same in the service of large customers as they are in the service of carriers. Either way, high traffic volumes between specific pairs of points justify the deployment of new fiber. And the further the competitive fiber network runs, the more economical it becomes to add customers along the existing route, and to extend the fiber further still.

1. CLEC Fiber as a Substitute for High-Capacity ILEC Loops.

Collectively, CLECs use their own last-mile facilities to serve the vast majority of their large business customers. CLECs serve no fewer than 13 million business lines and likely closer to 20 million business lines using their own switches, yet they have obtained only about 1.5 million stand-alone unbundled loops to serve business customers. *See* Table 1.[4]

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[1] 47 C.F.R. § 51.319(a)(1) ("The local loop network element is defined as a transmission facility between a distribution frame (or its equivalent) in an incumbent LEC central office and the loop demarcation point at an end-user customer premises. . . . The local loop includes, but is not limited to, DS1, DS3, fiber, and other high capacity loops.").

[2] *See* Whatis.com, *Digital Signal X*, http://whatis.techtarget.com/definition/0,,sid9_gci212004,00.html (DS0 has "a transmission rate of 64 kbps, the bandwidth normally used for one telephone voice channel." DS1 "is 24 DS0 (64 kbps) signals.").

[3] *See* Qwest, *Data, DS1*, http://www.qwest.com/pcat/small_business/product/1,1354,140_3_2,00.html ("Each DS-1 Service comprises 24 channels that may be assigned in a wide variety of ways to support switched access, local exchange service, low-speed data, voice grade communications, audio services and digital data services.").

[4] This calculation is a conservative estimate of the number of larger business customers that CLECs serve over their own loop facilities because many of the stand-alone unbundled loops that CLECs have obtained are likely used for smaller business customers.

Table 1. CLEC Business Lines Provided Over CLEC-Owned Last-Mile Facilities			
	Total Facilities-Based CLEC Business Lines	**Unbundled Business Loops***	**Business Lines Provided Over CLECs' Own Loops**
Verizon**	3.7 – 6.8 million	467,000	3.3 – 6.3 million
SBC***	4.5 – 7.4 million	765,000	3.7 – 6.7 million
BellSouth	1.8 – 3.2 million	229,000	1.6 – 3.0 million
Qwest	2.9 million	63,000	2.8 million
Total	**13 – 20 million**	**1.5 million**	**11 – 19 million**

*ILECs do not maintain data on whether an unbundled loop is used to serve a business or residential customer. We have developed the estimate of unbundled loops used to serve business customers as follows: CLECs provide at least 3 million residential lines over facilities they have deployed themselves, and approximately 1.5 million of these lines are provided over cable telephony networks. We assume the remaining 1.5 million residential lines are provided using unbundled loops, and that all other stand-alone unbundled loops provided by ILECs to CLECs are used to serve business customers.

**Total for Verizon does not include the former GTE service area. ***Total for SBC does not include Connecticut.

Any count of "lines," however, severely underestimates the CLECs' actual share of the business market. A high-capacity line represents more market share than a low-capacity line, and CLECs tilt their businesses strongly toward the former. While CLECs as a whole supply a total of between 13 and 20 million business lines using their own switches, 12 of the CLECs included in that total supply over 156 million voice-grade-equivalent *circuits*.[5] AT&T's Business division reports serving 2.7 million "local voice lines" but "over 30M DS0 equivalents."[6]

Based on the highly conservative count of *lines* that CLECs provide over their own facilities, the CLECs now supply at least 20 percent and likely closer to 28 percent of all business lines nationwide. *See* Figure 1. That percentage is undoubtedly much higher in major metropolitan areas where the largest business customers are concentrated.[7] The FCC's own data confirm that the CLECs' share of large business customers is considerably higher than their share of the overall business market.[8]

[5] *See* Section I.B & Table 4, Appendix A.

[6] D. Dorman, President, AT&T, *Presentation Before the Lehman Brothers T3 Telecom, Trends & Technology Conference* (Dec. 6, 2001).

[7] *See, e.g.*, *UNE Remand Order* ¶ 291, n.573 ("The local competition that has developed has focused on larger business customers in large cities, not on residential or small business customers."); FCC, *Biennial Regulatory Review 2000 – Staff Report*, App. IV, Pt. 54, 15 FCC Rcd 21089, 21266 (2000) ("Competition for business customers in metropolitan areas has, in general, developed more rapidly than competition for residential customers or customers in rural areas."); *FCC Local Competition Report, Dec. 1998 ed.* at 2 ("Facilities-based CLECs appear to have concentrated in more urbanized areas.").

[8] According to FCC's most recent *Local Competition Report*, CLECs' share of the "Medium to Large Business Market" was nearly four times their share of the "residential and small business market." *FCC Local Competition Report, Feb. 2002 ed.* at Table 2.

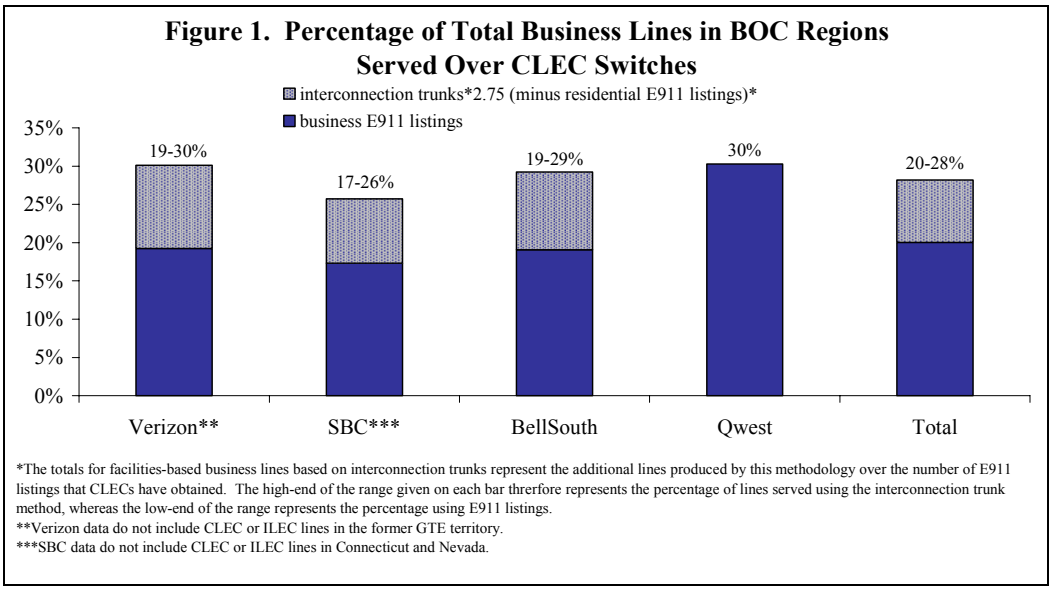

Figure 1. Percentage of Total Business Lines in BOC Regions Served Over CLEC Switches

*The totals for facilities-based business lines based on interconnection trunks represent the additional lines produced by this methodology over the number of E911 listings that CLECs have obtained. The high-end of the range given on each bar threrfore represents the percentage of lines served using the interconnection trunk method, whereas the low-end of the range represents the percentage using E911 listings.
**Verizon data do not include CLEC or ILEC lines in the former GTE territory.
***SBC data do not include CLEC or ILEC lines in Connecticut and Nevada.

These totals also are consistent with the significant inroads that CLECs have made into the special access market. The provision of special access service typically involves both a high-capacity loop and, as discussed in Section III, interoffice transport. Because special access revenues are highly concentrated among a relatively small number of wire centers, CLECs have been able precisely to target their facilities to serve this lucrative market. Today, CLECs account for between 28 and 39 percent of all special access revenue.[9]

It does not take a very far-flung network to reach a very significant number of high-volume customers. It has been estimated that, in a typical Tier-One MSA, just 200 to 300 multi-tenant units – out of an average of 15,000 or more multi-tenant units in such MSAs – generate an estimated *80 percent* of the data revenues generated in those MSAs.[10] And the top 15 MSAs generate almost 80 percent of the nation's data traffic.[11] Just four MSAs – New York, San Francisco, Washington, D.C., and Los Angeles – generate some 40 percent.[12]

Most CLECs do not report how many buildings their fiber networks serve.[13] Public data are available for only about 20 CLECs;[14] as of year-end 2001 this small subset of CLECs

[9] *See* Appendix L.

[10] *See Lehman/McKinsey MAN Report* at 8 (emphasis added) ("enterprise traffic is currently very concentrated, as in a typical Tier One MSA, 200 to 300 MTUs (of more than 15,000) constitute 80% of data revenues.").

[11] *See id.* at Figure 3.

[12] *See id.* at 6-7.

[13] *See*, *e.g.*, *CSFB 3Q01 CLEC Vital Signs Review* at Exh. 16 (total buildings data for 8 of the 14 profiled CLECs were not available); J. Atkin & D. Coleman, Dain Rauscher Wessels, *City Light: An Investor's Guide to Metropolitan Optical Services* at 11 (Mar. 22, 2001) ("Few carriers release detailed data on their fiber networks.").

[14] By comparison, there are at least 110 CLECs as well as numerous wholesale fiber suppliers that currently operate metropolitan networks. *See NPRG CLEC Report 2002, 15th ed.*, Ch. 6; Section III.C.

operated networks that served approximately 330,000 buildings.[15] This figure, however, includes "off-net" buildings – buildings served in part using facilities leased or resold from another competing carrier or an ILEC. CLECs have estimated that the number of unique office buildings served entirely by their fiber networks is roughly 30,000 nationwide.[16]

Given that CLECs route them to large commercial office buildings and other points of high traffic concentration, CLEC networks are clearly capable of serving far more high-capacity business lines than they currently do. Once they extend their network to serve one customer in a building, CLECs can vie for the business of all the other tenants, too. And CLEC fiber networks are now so extensive that they readily can be – and routinely are – extended as needed to pick up additional traffic from new customers in adjacent buildings, or down the block, and on outward, incrementally, from there. Once an initial fiber ring is deployed in a metropolitan area, extending that fiber incrementally to new customers is comparatively cheap.[17] When they deploy fiber, carriers invariably deploy far more capacity than they can use immediately, to facilitate precisely this process of incremental future development.[18] And the bigger the network grows, the more economical it becomes to extend it to reach additional, lower-traffic, lower-revenue customers.

Rapidly rising traffic volumes make the economics of deploying competitive fiber increasingly attractive. Traffic volumes from "large enterprises" – which generate half of the traffic in metropolitan markets[19] – are growing at an estimated 40 percent a year.[20] Data traffic for small and mid-size enterprises is growing at an estimated 60 to 70 percent a year.[21] As traffic volumes rise, competitive fiber networks quickly move from merely "competitive" to markedly

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[15] *NPRG CLEC Report 2002, 15th ed.*, Ch. 4 at Table 19. This is a highly conservative estimate. It excludes not only the buildings served by literally dozens of CLECs, but also does not include the 27,000 additional buildings NPRG reports for competitive Independent Operating Companies, utility CLECs, data providers, Gig-E providers, fiber layers, and other providers. *See id.* Moreover, the total buildings have been adjusted downward to address the concerns that CLECs raised in the Special Access proceeding in April of 2001 (CC Docket No. 96-98).

[16] *See* Joint Comments of Allegiance Telecom, Inc. and Focal Communications Corporation at 25, *Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, CC Docket No. 96-98 (FCC filed June 11, 2001); Comments of WorldCom, Inc. at 7, *Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, CC Docket No. 96-98 (FCC filed June 11, 2001).

[17] As the FCC has noted, "[t]he technological advances in fiber and electronics have made expansion of transport capacity relatively inexpensive. Once a competitor has infrastructure in place, the marginal cost of adding customers is not significant, and competitors are not likely to lack sufficient capacity for an extended period." Brief of FCC, Respondent, at 36, *MCI WorldCom v. FCC*, No. 99-1395 *et al*. (D.C. Cir. filed Nov. 30, 2000).

[18] *See* B. Gain & D. Dunn, *Is the Fiber Glut for Real?*, EBN (Dec. 10, 2001), http://www.ebnonline.com/story/OEG20011210S0066 ("Because excavation costs are high, many telcos overbuilt intentionally to avoid having to tear up lines to meet future demand."); O. Kharif, *The Fiber-Optic "Glut" – In a New Light*, Bus. Week Online (Aug. 31, 2001), http://www.businessweek.com/bwdaily/dnflash/aug2001/nf20010831_396.htm ("Since the total cost of laying cable can reach $1 million per mile – including everything from digging trenches to obtaining permits – telecoms often drop as much fiber into a ditch as they can. That's far cheaper than installing capacity as demand dictates."); *Federal-State Joint Board on Universal Service*, Tenth Report and Order, 14 FCC Rcd 20156, ¶ 199 (1999) ("industry practice [is to build] distribution plant to meet ultimate demand.").

[19] *See Lehman/McKinsey MAN Report* at 8.

[20] *See id.*

[21] *See id.*

superior. Next-generation technologies (SONET-lite, Metro DWDM and Gigabit Ethernet) are estimated to be 30 to 70 percent more cost-efficient than legacy networks.[22] Network capacities are rarely if ever an issue; year by year it gets easier and cheaper to boost the capacity of existing fiber by upgrading the electronics that "light" it. Data-carrying capacities are indeed doubling about every 9-10 months.[23]

In these circumstances, it is not surprising to find that CLECs and wholesale fiber suppliers widely tout their willingness to extend their networks to pick up new customers and traffic.[24] One declares that its network is "available" to all businesses that "pass within 6000 feet"[25] and will "provide[] the fiber-optic link from its access network directly into the building."[26] Another emphasizes its willingness to "work together with a customer to construct a spur to that customer from an existing fiber ring."[27] Another will "bring our fiber right up to our customers' floors in their buildings and provide them with wall-to-wall seamless connectivity."[28] Another will "provide its customers with fiber optic connectivity to virtually any location in its service territory" using a process that is "quick and efficient."[29] Another will connect to "the main Class-A buildings in a downtown business district."[30] CLECs also may extend their fiber networks through fixed wireless connections,[31] which can be deployed much more quickly and

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[22] *See id.* at 1.

[23] *See*, *e.g.*, *Industry Buzz*, Forbes (Jan. 8, 2001), http://www.forbes.com/forbes/2001/0108/154s01.html (Lucent states that "fiber-optic cable capacity will double in the first nine months of [2001]"); L. Walker, *Fiber Optimist Revolution,* Amarillo Globe-News (Oct. 15, 2000), http://www.amarillonet.com/stories/101500/ bus_fiberopt.shtml (quoting Dan Schaeffer, Cogent Communications: "Fiber is doubling its capacity to carry data every 10 months.").

[24] Time Warner Telecom's CEO, Larissa Herda, recently noted that her company was recently able to win a large-customer contract because of their "ability to construct our own fiber facilities into their seven locations in four cities within 30 days." *See Time Warner Telecom Announces Fourth Quarter Results, Conference Call* (Feb. 5, 2002).

[25] *Fiberworks to Light Up Atlanta and Alleviate Atlanta's Bandwidth Bottleneck,* Bus. Wire (Aug. 22, 2000).

[26] M. Fuller, *Fiberworks to Deploy Carrier-Agnostic All-Optical Local-Access Networks*, Lightwave (Nov. 2000).

[27] Comments of Yipes Transmission, Inc. at 13, *Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, CC Docket No. 96-98 (FCC filed June 11, 2001).

[28] A. Lindstrom, *Fiber: Part II*, America's Network (Sept. 1, 1998).

[29] F.J. Governali, *et al*., Credit Suisse First Boston Corp., Investext Rpt. No. 2699472, Northeast Optic Network – Company Report at *4 (Sept. 10, 1998).

[30] *Interview with Robert Manning, CFO, Intermedia Communications*, CNBC/Dow Jones (June 25, 1998).

[31] *See*, *e.g.,* E.G. Henderson, Duff & Phelps Credit Rating Co., Investext Rpt. No. 2988183, Telecom Services Update – Industry Report at *7 (Nov. 9, 1999) (XO Communications "establishes a wireless link to buildings first and later builds fiber to the buildings after the company has reached its desired customer penetration rate to justify building."); Comments of WorldCom, Inc. at i, *Amendment of Part 2 of the Commission's Rules To Allocate Spectrum Below 3 GHz for Mobile and Fixed Services To Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems*, WT Docket No. 00-258 (FCC filed Feb. 22, 2001) (WorldCom has "invested over $1 billion for the rights to use MMDS/ITFS spectrum in 160 markets throughout the United States"); *AT&T/TCG Application* at 7-8 ("AT&T's acquisition of TCG holds great promise for the development of facilities-based local competition by taking full advantage of the complementary aspects of AT&T's long distance and wireless networks and marketing expertise and TCG's local fiber optic and broadband wireless capabilities and rights-of-way.").

cheaply than fiber.[32]

2. CLECs Are Making Little Use of Unbundled High-Capacity Loops.

Although ILECs have made unbundled high-capacity loops available nationwide, CLECs are purchasing very few such loops. This is a further, strong indication that CLECs are able to serve the vast majority of their high-capacity customers with their own high-capacity facilities.

As shown in Table 2, CLECs have purchased only 72,000 high-capacity loops in the four Bell companies' regions combined. By comparison, CLECs have purchased approximately three million POTS loops in the BOC regions. *See* Figure 2. Virtually all of the high-capacity loops that CLECs have purchased are DS-1 loops. *See* Table 2 & Figure 2. CLECs have purchased only 140 DS-3 loops, and not a single loop above the DS-3 level. *See* Table 2.

Even the use of DS-1 loops is minuscule when viewed in relation to the number of lines that CLECs serve using their own loop facilities. CLECs have obtained approximately 72,000 unbundled DS-1 loops, while they are serving at least 12.5 million lines (and likely closer to 20 million) using their own loops. *See* Table 3; *see also* Table 1, *supra.*

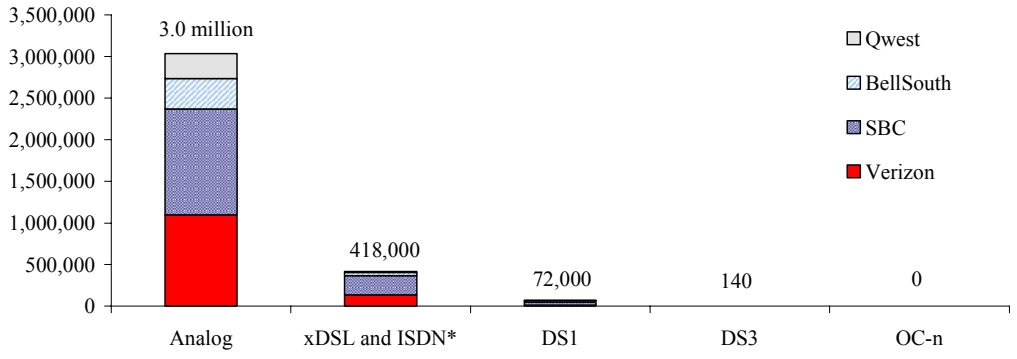
Table 2. Use of High-Capacity Loop UNEs

	High-Capacity Loops Purchased by CLECs					
	DS-1		DS-3		OC-3 or Higher	
	Total	% of all loops	Total	% of all loops	Total	% of all loops
Verizon	12,300	1%	60	0.005%	0	0%
SBC*	36,500	2%	70	0.004%	0	0%
BellSouth	18,600	4%	10	0.003%	0	0%
Qwest	4,700	2%	0	0%	0	0%
Total	**72,000**	**2%**	**140**	**0.004%**	**0**	**0%**

*Does not include Connecticut.

[32] *See, e.g.,* Wall Street Transcript Corp., Investext Rpt. No. 2003080, Analyst Interview: Telecommunications – Industry Report at *4 (Sept. 22, 2000) ("The capital efficiency of fixed wireless technology is attractive relative to the cost of deploying fiber connectivity to customer buildings. . . . fixed wireless technology lowers last-mile capital costs considerably.") (quoting Trent Spiridellis, Banc of America Telecommunications Analyst); W. Schaff, *Taking Stock: No Strings Attached*, Information Week (Feb. 22, 1999) ("Nextlink . . . has been concentrating on building fiber-optic connections to large offices and business parks. . . . Nextlink, however, intends to use the wireless system as a way to get to market faster. Once it has established service to a given location, it will build a fiber-optic connection to that location and relocate the radio equipment to another building."); WinStar Press Release, *IDT Corp. Announces the Acquisition of WinStar Communications, Inc.* (Dec. 20, 2001) ("WinStar's fixed wireless technology offers a solid last mile solution and is a great fit with IDT's long distance services and extensive fiber assets.").

Figure 2. Unbundled Loops by Type



*ISDN, HDSL, and IDSL loop volumes for Verizon are included in analog loop data.

Table 3. Use of High-Capacity Loop UNEs vs. Use of Self-Provided Loop
CLEC-Provided Loops = E911 Listings – Total Unbundled Loops

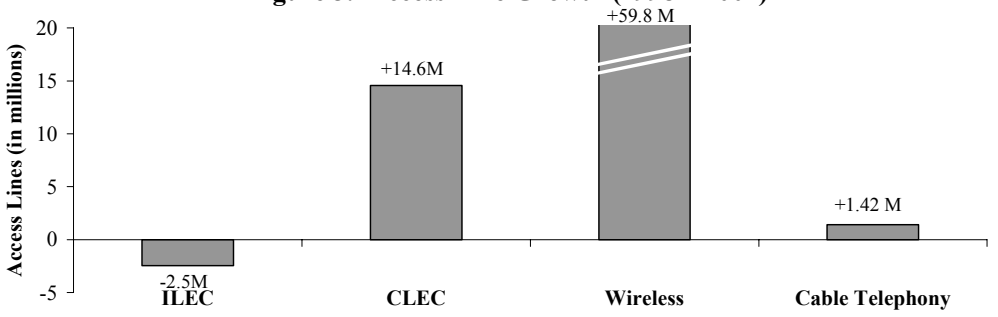
State	DS-1 Loops	CLEC-Provided Loops	State	DS-1 Loops	CLEC-Provided Loops
Alabama	1,200	116,000	Nevada	320	19,000
Arizona	270	517,000	New Hampshire	540	66,000
Arkansas	1,100	41,000	New Jersey	480	334,000
California	14,000	1,604,000	New Mexico	2	18,000
Colorado	240	571,000	New York	2,600	1,120,000
Delaware	660	12,000	North Carolina	2,600	179,000
Florida	3,900	482,000	North Dakota	50	5,800
Georgia	2,300	509,000	Ohio	1,600	207,000
Idaho	10	32,000	Oklahoma	790	100,000
Illinois	970	908,000	Oregon	1,300	332,000
Indiana	400	141,000	Pennsylvania	3,500	608,000
Iowa	7	45,000	Rhode Island	330	71,000
Kansas	1,500	24,000	South Carolina	1,900	79,000
Kentucky	470	30,000	South Dakota	20	31,000
Louisiana	3,000	103,000	Tennessee	2,900	214,000
Maine	190	(2,300)	Texas	9,300	500,000
Maryland	490	256,000	Utah	120	258,000
Massachusetts	1,700	733,000	Vermont	20	4,200
Michigan	1,700	260,000	Virginia	1,100	431,000
Minnesota	620	477,000	Washington	2,000	645,000
Mississippi	390	16,000	Washington, D.C.	100	145,000
Missouri	2,800	145,000	West Virginia	290	(6,000)
Montana	30	5,100	Wisconsin	1,600	173,000
Nebraska	5	114,000	Wyoming	1	(250)
			Total	**72,000**	**12.5 million**

Data do not include the former GTE service area and Connecticut.

B. POTS Loops.

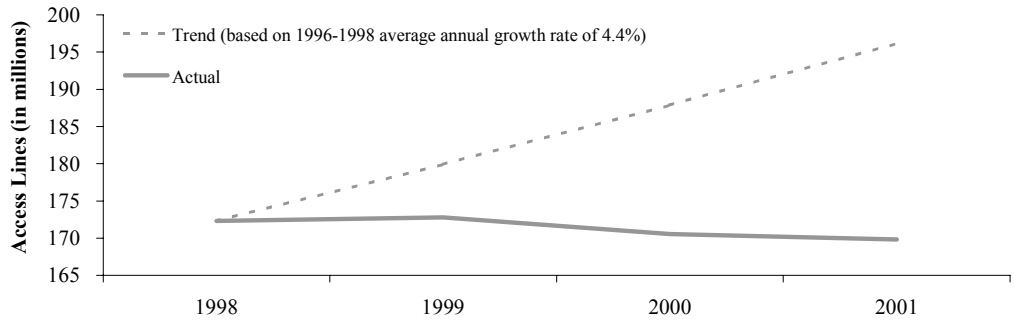
Technologies that compete directly against traditional POTS loops are rapidly being deployed across the country. Today, ILECs are losing about as many lines to wireless and cable networks as they are to wireline CLECs.[33] The number of lines served by ILECs has declined for the last three years running – a trend never witnessed before in a century of telephone service.[34] *See* Figure 3. And the trend is all the more dramatic given the year-over-year growth that ILECs have historically experienced. *See* Figure 4.

Figure 3. Access Line Growth (1998 – 2001)



Sources: Credit Suisse First Boston, JP Morgan H&Q, Kinetic Strategies, and NCTA. *See* Appendix M.

Figure 4. Decline of BOC Access Lines



Sources: Credit Suisse First Boston; FCC. *See* Appendix M.

[33] *See*, *e.g.*, R. Chopra, *et al*., Deutsche Banc Alex. Brown, *Competitive Local Exchange Carriers (CLECs)* at 9 (Jan. 15, 2002) (estimating that SBC has lost an equal number of lines to CLECs and "technological substitution"); *Gartner U.S. Residential Wireline Report* at 5 ("A number of key factors contribute to this decline [in ILEC lines]: residential dial tone competition and customer adoption of new modes of communications that effectively displace 100-year-old-telephone technology."); *see also JP Morgan Telecom Services 2001 Report* at 41.

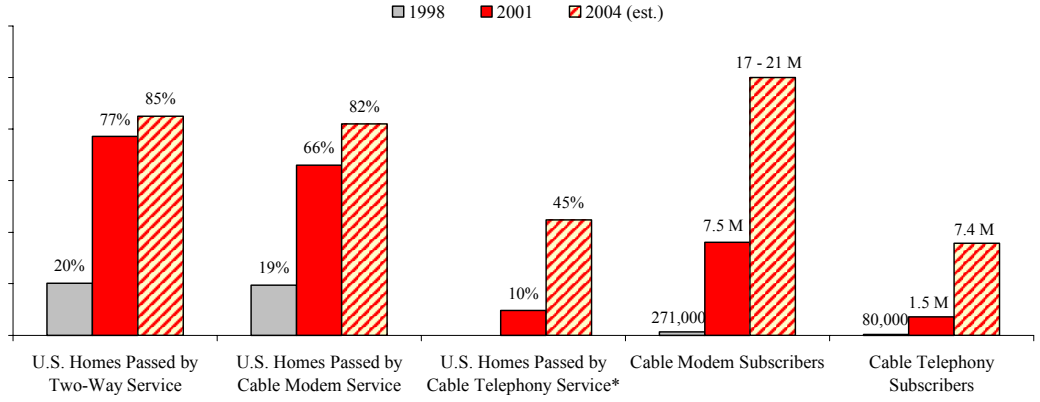
[34] ILEC end user lines declined from 181 million in December of 1999, to 179 million in June of 2000, to 177 million in December of 2000, and 174 million in June of 2001. *See FCC Local Competition Report, Feb. 2002 ed.* at Table 1; *see also Gartner U.S. Residential Wireline Report* at 5 ("With the release of second quarter 2001 financial and operational results, these incumbent providers (Verizon, SBC, BellSouth, Qwest) reported aggregate reductions in the number of residence access lines served within their territories, resulting in a 1.8 percent year-over-year decline and a 0.9 percent quarter-over-quarter sequential decline."); S. Flannery, *et al.*, Morgan Stanley, Dean Witter, Telecom – Wireline: Telecom Trend Tracker: Defense is Best Strategy at Exh. 2 (Aug. 17, 2001) (Year-over-year, Verizon, SBC and BellSouth had drops in access lines of 0.4 percent, 1.1 percent, and 0.8 percent, respectively, from 2Q00 to 2Q01).

1. Cable Networks as Substitutes for ILEC Loops.

Congress anticipated the emergence of cable/telephone competition in 1996.[35] In its 1999 *UNE Remand Order*, however, the Commission was not yet ready to conclude that cable offered a viable alternative to ILEC loops, because service was still "largely restricted to residential subscribers, and [cable] generally supports only one-way service, not the two-way communications telephony requires."[36] As of year-end 1998, cable operators offered two-way capabilities to only about 20 percent of all homes (*i.e.*, to no more than 20 percent of the homes that cable served).[37]

In the past three years, cable operators have added two-way capabilities to almost all of their networks, using a hybrid-coax-fiber (HFC) architecture. *See* Figure 5. Cable operators now offer two-way capabilities to approximately 77 percent of all homes (approximately 82 percent of homes passed by cable).[38] Two-way capabilities are expected to reach 85 percent of all homes by 2004.[39] Although they depend on many of the same upgrades to the cable network,[40] these two-way capabilities have been implemented as two distinct services – (1) cable telephony, and (2) high-speed cable modem service.

Figure 5. Growth of Cable as a Voice and Data Competitor



* Data on U.S. homes passed by cable telephony in 1998 were unavailable.

Sources: See Appendix M.

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[35] *See* Senate Conference Report 104-230, *Telecommunications Act of 1996* at 148, 104th Congress, 2nd Session (Feb. 1, 1996).

[36] *UNE Remand Order* ¶ 189.

[37] *See UNE Fact Report* at III-20 & n.54.

[38] *See Broadband 2001* at Table 6.

[39] *See id.*

[40] *See NCTA Cable Telephony Report* at 1 ("[T]he same upgrades that allow cable companies to offer high-speed Internet access and digital cable service help make it possible for cable to provide high-quality digital telephone service.").

As discussed in Section II.A.2, at least five cable operators have actually deployed commercial circuit-switched cable telephony. These cable operators currently offer circuit-switched telephony services to about 10 million U.S. homes – approximately 10 percent of all homes – in 20 states.[41] In some states, cable telephony is far more widely available than that.[42] For example, Cox offers service to nearly all of the one million homes in Rhode Island, and AT&T offers cable telephony services to a large and increasing share of the nearly three million homes its cable network passes in the Boston Area, the approximately 600,000 homes it passes in the Pittsburgh area, the 3.5 million homes it passes in the Chicago area, and the 2.7 million homes it passes in the Bay Area.[43]

Nationwide, more than 1.5 million homes currently subscribe to cable telephony,[44] and 70,000 new subscribers are being added every month.[45] There are currently two major cable operators – AT&T and Cox – that are actively deploying circuit-switched cable telephony throughout their cable systems.[46] And as a result of its proposed merger with AT&T, Comcast plans soon to deploy cable telephony to about one million homes.[47]

With HFC in place,[48] cable plant can be adapted to provide bare bones switched phone service for about $800 to $825 per line.[49] This is the cost for providing "primary line" telephone

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[41] *See JP Morgan Cable Industry Report* at Table 22; *NCTA Cable Telephony Report* at 2.

[42] *See*, *e.g.*, *Rhode Island Order* ¶ 105 ("Cox has the capability to provide cable telephony service to 75 to 95 percent of Rhode Island customers.").

[43] *See* Section II.A.2, notes 37-39.

[44] *See* NCTA, *US Cable Telephony Subscribers (in Thousands): 1998-2001*, http://www.ncta.com/industry_overview/indStats.cfm?statID=13.

[45] *See NCTA Cable Telephony Report* at 1.

[46] *See* Section II.A.2, notes 37-39.

[47] *See* Applications and Public Interest Statement of AT&T Corp. and Comcast Corporation at 38, *Application for Consent to the Transfer of Control of Licenses, Comcast Corporation and AT&T Corp., Transferors, to AT&T Comcast Corporation, Transferee*, MB Docket No. 02-70 (FCC filed Feb. 28, 2002) ("Comcast President (and AT&T Comcast CEO) Brian L. Roberts has announced that the merged company intends to begin to deploy telephone service in the Philadelphia and Detroit markets currently served by Comcast, after closing, bringing facilities-based local telephone choice to about one million additional homes.").

[48] *Broadband 2001* at 39 ("In addition to high-speed Internet and other high-bandwidth applications, new HFC networks can support telephony service over the cable plant.").

[49] *See*, *e.g.*, JP *Morgan Cable Industry Report* at 51-52 (about $375 per line for the actual equipment, another $125-$150 for the labor, and $300 for customer premises equipment); AT&T Broadband, *Investor Presentation* at 37 (July 2001) ($825 per line); *NCTA Cable Telephony Report* at 10 ("Cox, which has installed 11 switches in its largest markets, estimates its switching costs at $105 per customer (assuming a penetration rate of 25 per cent of homes passed and an average take-rate of 1.5 lines per customer). In addition, Cox spends and additional $505 per customer for the Network Interface Unit (NIU), the drop, the tap and the Headend Interface Terminal (HIT). This combined variable cost of $610 per customer for the provision of local telephony is in addition to the $220 per home passed that Cox must invest to upgrade its cable plant to 750 MHz capacity and to introduce two-way interactivity. It also does not include the $100 per customer that Cox is investing to power its cable networks to ensure that telephone service continues in the event of a power failure.").

service.[50] Cable telephony systems use the same, commercial, circuit switches and perform all the same functions as ILEC POTS services.

The imminent deployment of IP cable telephony will further accelerate the availability of cable networks as a competitive substitute for ILEC voice loops. As described in Section II.B, each of the major cable operators is now conducting trials of IP cable telephony, or has indicated plans to do so. Commercial deployment of the service as a secondary-line service is expected to begin within the next year or so;[51] there are expected to be between five and seven million cable IP telephony subscribers by 2006.[52] Cable operators are expected to deploy primary-line IP cable telephony service shortly thereafter.[53]

Cable operators also provides high-speed Internet access services, which compete directly with ILEC loops that have been used mainly for connecting to the Internet. In the past, many customers bought second phone lines for their computers, to support dial-up Internet connection. Second-line usage peaked in 1999, when approximately 27.5 percent of all households were buying second lines,[54] which they used mainly as dedicated data lines.[55]

Many of those same households are now buying broadband connections instead, and about two out of three of those connections are over cable.[56] As of year-end 1998, cable modem service was available to approximately 20 million homes, or roughly 20 percent of the U.S. mass market,[57] and there were approximately 500,000 cable modem subscribers.[58] Today, the service

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[50] *See*, *Broadband 2001* at 40; *see also* AT&T Broadband, *Investor Presentation* at 35 (July 2001) ("Primary line creates maximum market opportunity: 5-10X greater voice revenue per customer; 7-8X greater cash flow per customer; Less than 10% additional upgrade and rebuild capital required.").

[51] *See*, *e.g.*, R.A. Bilotti, Morgan Stanley, Dean Witter, Investext Rpt No. 8202634, Cable: The Past Is Prologue to the Future – Industry Report at *5 (Oct. 5, 2001) ("We expect the cable operators to begin offering IP telephony in 2002/2003"); M. Paxton, Senior Analyst, Cahners In-Stat, *Cable Telephony – Moving Slowly But Surely*, CED (Jan. 2002), http://www.cedmagazine.com/ced/2002/0102/id6.htm ("most [MSOs awaiting IP telephony] remain confident that by late 2002/early 2003, cable telephony will be an important part of their service menu").

[52] *See*, *e.g.*, *Forrester Sizing US Consumer Telecom Report* at 10-12 ("[B]y 2006, [cable companies] will reap the rewards of conversion to IP – an increased set of offerings at lowered costs – in the form of 4.8 million new packet lines.); *Strategis Group U.S. IP Cable Telephony Report* at Table 3.9 (predicting 7.36 million IP telephony lines by 2006).

[53] *See*, *e.g.*, *JP Morgan Cable Industry Report* at 46 ("we suspect that most MSOs will deploy primary-line IP voice in 2004 or 2005"); *Strategis Group U.S. IP Cable Telephony Report* at 53 ("The majority of cable telephony subscribers will be lifeline IP users, and deployments are expected to ramp up considerably in 2004 and 2005."); *id.* at Table 3.9 (predicting 2.15 million lifeline IP cable telephony customers in 2004).

[54] *FCC Trends in Telephone Service, Aug. 2001 ed.* at Table 8.4 (28.6 million households with second lines in 1999); U.S. Dep't of Commerce, *USA Statistics in Brief* (2001) (103.9 million US households in 1999); (28.6 million/103.9 million = 27.5% of homes with second lines).

[55] *See*, *e.g.*, C.J. Lane, *Out of Line*, Tampa Trib. at 1 (Aug. 13, 2000) (citing Yankee Group study finding that approximately 60 percent of households with second lines use them for Internet access.).

[56] *Morgan Stanley Cable Modem/xDSL Report* at Exh. 3; *TeleChoice DSL Deployment Summary*.

[57] *See UNE Fact Report* at III-21 & n.61.

[58] *See* NCTA, *US Cable Modem Subscribers: 1998-2001*, http://www.ncta.com/industry_overview/indStats.cfm?statID=15.

is available to between two-thirds and three-quarters of all U.S. homes,[59] and approximately 7.5 million homes subscribe.[60] One respected analyst now predicts that cable "will capture around 65% of the secondary line market by 2006."[61]

2. Mobile Wireless as Substitute for POTS Loops.

At the time of the *UNE Remand Order*, the Commission concluded that wireless phones did not yet offer a sufficiently robust competitive alternative to ILEC loops to justify any cut back on availability of the loop UNE.[62] Wireless service areas were less ubiquitous; they did not offer the same functionality; their data capabilities were "generally inferior;" and their sound quality was not always as good.[63] Wireless links offered "promising" but "not yet viable alternatives" to wireline loops.[64]

As discussed in more detail in Section II.C, conditions have changed significantly since that time. Independent experts now almost uniformly conclude that wireless is a significant competitive substitute for second-line service today.[65] For example, IDC found that, as of year-end 2001, "10 million wireline access lines will have been displaced by wireless, primarily by consumers choosing wireless service over installing an additional access line at home."[66] IDC estimates that, by 2005, wireless phones will replace 30 to 35 percent of second and additional wireline access lines.[67] Many other independent analysts have reached similar conclusions.[68]

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[59] *See Morgan Stanley Cable Modem/xDSL Report* at Exh. 3 (estimating 75 million homes passed by cable modem service as of year-end 2001); *JP Morgan Telecom Services 2001 Report* at Table 15 (estimating 106.4 million US households as of year-end 2001) (74.92/106.4 = 70.4 percent of US homes passed by cable modem service); *see also NCTA Industry Statistics* (70 million homes passed by cable modem service as of November 2001); *Yankee Group Consumer Broadband Report* at 4 ("At year-end 2001, approximately 66% of the households in the United States will have cable modem service available to them."); *Broadband 2001* at Table 6.

[60] *See Morgan Stanley Cable Modem/xDSL Report* at Exh. 3.

[61] *JP Morgan Cable Industry Report* at 53.

[62] *UNE Remand Order* ¶ 188.

[63] *Id.*

[64] *Id.*

[65] Wireless service also clearly competes directly, today, against wireline payphone service and other wireline services used outside the home and regular office – hotel phones, for example. *See*, *e.g.*, *Sixth CMRS Report* at 32 & n.211; Michael Powell, Chairman, FCC, *Question and Answer with Chairman Powell*, remarks before the Forrester Research Telecom Forum (May 21, 2001) ("I haven't picked up the phone in a hotel in five years, because I use my wireless phone.").

[66] *IDC Wireless Displacement Report* at 1; *see also Zacks All-Star Analyst Issues Recommendations for 5 Stocks*, PR Newswire (Nov. 15, 2001) (Drake Johnstone, Davenport & Co.: "[C]onsumers are using their wireless phone line as a second phone line."); T. Fowler, *The Low Cost of Going Wireless; More Callers Cut Cords As Cell Phone Rates Fall*, Houston Chronicle (Aug. 8, 2001) ("Many [people] are using [wireless phones] as replacements for second lines in their homes.").

[67] *See IDC Wireless Displacement Report* at Figure 15.

[68] *See*, *e.g.*, *Forrester Sizing US Consumer Telecom Report* at 9 ("Over the next five years, the mobile business will take a cut at fixed-line revenues. Wireless operators will ravage the fixed-line business as 5.5 million customers give up secondary lines."); *JP Morgan Telecom Services 2001 Report* at Table 26 (By 2006, over 2.8 million

Wireless is now becoming increasingly competitive with primary line wireline services as well. A Yankee Group survey in early 2001 found that about 3 percent of wireless subscribers had now abandoned wireline in favor of wireless entirely.[69] A wireless industry association has estimated that the number as of that date "could be as high as 5 percent."[70] A recent *USA Today*/CNN/Gallup poll found that 18 percent of cell phone users "use cell phones as their primary phones."[71]

Many wireless carriers are now marketing their services as direct substitutes for wireline service. The Commission's *Sixth CMRS Report*, for example, describes the Cricket service offered by Leap Wireless – a service offered "at a flat rate, paid in advance each month," in order to be "competitive with traditional landline service."[72] As noted by one industry publication, the Cricket business model "has been successful enough that several regional carriers have started offering their subscribers 'Leap-alike' plans," including ALLTEL's "Boomerang," US Unwired's "Freedom Plan," and Dobson Cellular's Cellular One "Breeze" service.[73] VoiceStream's advertisements exhort customers to abandon their wireline phones,[74] and the company's CEO states that they "view wireless as a replacement for wireline."[75]

So far as service quality is concerned, wireless is now fully competitive with wireline – and better than competitive in one key respect. In almost all major markets, wireless carriers now offer digital calls with connection quality comparable to the quality of wireline service,[76]

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people will have substituted a wireless phone for a secondary line.); *Gartner U.S. Residential Wireline Report* at 11 ("Of all households reporting a residence access line replacement over the past six months, 2.3 million or 33 percent of lines were replaced with a cellular/PCS phone.").

[69] *Sixth CMRS Report* at 32 (citing Yankee Group survey cited in J. Sarles, *Wireless Users Hanging Up On Landline Phones*, Nashville Bus. J. (Feb. 2, 2001)).

[70] *Id.* at 32, n.207 (citing *Consumers Replacing Landline Phones with Wireless*, Knight Ridder/Trib. Bus. News (Jan. 10, 2001).

[71] M. Kessler, *18% See Cell Phones as Their Main Phones*, USA Today (Jan. 31, 2002).

[72] *Sixth CMRS Report* at 33-34; Leap Wireless, *Investor Relations*, http://www.leapwireless.com/cindex.html.

[73] *See* D. Mendez-Wilson, *Cricket Copycats on the Make; 'Leap-Alike' Services Hop into Markets Across the Country*, Wireless Week at 24 (Aug. 20, 2001).

[74] *See*, *e.g.*, R. Saunders, *Don't Kill the Catalyst for Telecom Competition*, Milwaukee Bus. J. (Nov. 16, 2001), http://Milwaukee.bizjournals.com/Milwaukee/stories/2001/11/19/editorial3.html ("VoiceStream Wireless, which provides service in the Milwaukee area, has launched a TV advertising campaign on ways to use your wireless phone for purposes other than conversations with friends and loved ones. One commercial shows a woman using her phone as a meat tenderizer, while another ad suggests that the phone makes a good chew toy for your Labrador retriever. The message is simple: Cellular calling plans are so cheap that you don't need the local or long-distance phone company anymore.").

[75] E. Mooney, *VoiceStream Prepares for Transnational Race for Customers*, Radio Comm. Report (Apr. 10, 2000); *see also* AT&T Wireless and VoiceStream Wireless Petition for Declaratory Ruling at 3, *Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, CC Docket No. 96-98 (FCC filed Nov. 19, 2001) ("CMRS providers offer true facilities-based competitive alternatives to incumbent LECs. Increasingly, they are viewed as full-fledged competitors of landline carriers in the provision of telephone exchange service.").

[76] *See* Telephia, *Wireless Network Performance in the U.S. Metro Areas* (July 2001) ("A comprehensive study undertaken by Telephia from data collected from November 1999 to April 2001 concluded that 'wireless customers receive a high level of service in both core and suburban areas . . . Wireless customers on average can place, hold, and complete a call of acceptable audio quality 96-99 percent of the time.'").

and in some respects (*e.g.*, operator services) often superior. Nearly 80 percent of wireless customers now subscribe to high-quality digital service;[77] dial-up wireline service, by contrast, remains overwhelmingly analog.[78] The rate of busy circuits and dropped calls on wireless networks is improving rapidly.[79] Wireless E911 location capability is now virtually the same as wireline capability, and it is being rapidly deployed.[80] And wireless service is unambiguously superior to wireline in that the wireless phone is mobile. Mobility is, self evidently, a very valuable feature, and one that has historically commanded a high price premium in the market.

Wireless is now price competitive with wireline services, particularly when the comparison is made between equivalent bundles of service. The typical wireline customer purchases not only basic local service, but also long-distance service and some number of value-added features like call waiting, voice mail, or caller ID.[81] Wireless carriers typically provide all of these add-on services, and often for no extra charge.[82] Taking into account the whole package of service most typically sold, a November 2001 Gartner Dataquest study accordingly concludes that wireless calling prices are already "competitive with, and in some case better than, wireline calling rates."[83] And wireless prices continue to decline rapidly – by as much as 10 to 20 percent a year in recent years.[84]

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[77] *See*, *e.g.*, Dr. Robert F. Roche, CTIA, *Measuring Wireless Today*, http://wireless.fcc.gov/services/cmrs/presentations/Bob_Roche_Feb_28_FCC_presentation.pdf (showing approximately 25 million analog subscribers as of June 2001, compared to about 100 million digital subscribers); *see also Sixth CMRS Report* at 6 ("[A]t the end of 2000, digital customers made up 62 percent of the industry total, up from 51 percent at the end of 1999 and 30 percent two years ago.").

[78] *See FCC Statistics of Common Carriers, 2000/2001 ed.* at Table 2.3 (162 million analog switched access lines compared to 10 million digital lines).

[79] *See*, *e.g.*, *Gartner U.S. Residential Wireline Report* at 11 ("It is only over the last year that there has been a measurable shift by consumers to replace their wireline access lines with the cellular/PCS alternative – clearly an indication that cellular/PCS has overcome the quality and reliability weakness in the mind of the consumer."); AARP, *Understanding Consumer Use of Wireless Telephone Service*, http://research.aarp.org/consume/d17328_wireless_1.html. ("Wireless telephones are becoming more popular in the United States as the cost has become more affordable and the quality of wireless service has improved.").

[80] *See*, *e.g.*, Thomas J. Sugrue, Prepared Testimony before the Subcommittee on Communications, Committee on Commerce, Science, and Transportation, United States Senate, at 6 (Oct. 16, 2001) ("Wireless location technology is available, is being deployed in networks and handsets, and is capable of accurately locating 911 callers." By October 2002, "the location of 911 calls will be reported in most instances with an accuracy of 100 meters or less. Network equipment and handsets with location capability are now being manufactured and sold to meet and exceed this benchmark.").

[81] *See*, *e.g.*, *JP Morgan Cable Industry Report* at 50 (the average voice customer generates approximately $58 in monthly revenues, only $18 of which is for basic local service; the average revenue generated for vertical features is nearly $5, and the average revenue generated in access charges is about $5.50).

[82] *See*, *e.g.*, Sprint PCS, *Sprint PCS Wireless Service Plans*, http://www1.sprintpcs.com/explore/servicePlans OptionsV2/PlansOptions.jsp (All Sprint PCS service plans include voicemail, call waiting, caller ID, numeric paging, and three way calling.); VoiceStream, *Products and Services, Rate Plans*, http://www.voicestream.com/products/services/rateplans/dc_balt.asp (all VoiceStream plans include voicemail, call waiting, caller ID, built-in paging, and conference calling).

[83] *Gartner U.S. Consumer Telecommunications and Online Market Report* at 33.

[84] *See*, *e.g.*, *Sixth CMRS Report* at 6.

3. Direct Competitive Overbuild of ILEC Loops.

A number of CLECs are now building their own all-new loop facilities to serve residential customers. The business plans of these CLECs typically involve the provision of service to one small geographic area at a time – anywhere from a single apartment building to a small cluster of homes. They also often involve the deployment of facilities that enable the provision of more than just basic voice service, but video and broadband Internet services as well.

A number of smaller incumbent local exchange carriers have established CLEC affiliates in order to "target RBOC markers that are geographically proximate to their existing ILEC holdings."[85] *See* Table 4. This geographic "edge-out" strategy enables the CLEC "to take advantage of the synergy of its ILEC and CLEC operations while entering typically underserved non-urban markets."[86] The CLEC may, for example, "leverage the excess capacity on [its] existing plant to reduce startup and entry costs."[87] In many cases, such CLECs will "begin marketing mobile wireless service in new markets before their entry into the competitive market," so that when they "enter the new wireline markets, customers are already familiar with their reputation and quality of service, providing the [CLEC] with significant competitive advantage."[88]

Another overbuild strategy involves the deployment of a broadband pipe (generally either hybrid fiber coax or pure fiber) to provision high-speed bundled service offerings to individual neighborhoods or the approximately 30-35 percent of the population that live in multi-dwelling units. *See* Table 5.[89] Several CLEC affiliates of incumbent LECs – including PennTel and Hickory Tech – have taken this approach.[90] This also has been the strategy of RCN, which has been "constructing advanced networks in select markets with high levels of population density and favorable demographics along the West and East Coasts, along with Chicago." [91] In the fourth quarter of 2001 alone, RCN added nearly 47,000 new subscriber connections (including

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[85] *NPRG CIOC Report 2001*, Ch. 2 at 1.

[86] *Id.*

[87] *Id.*, Ch. 4 at 1.

[88] *Id.*, Ch. 4 at 1-2.

[89] *See*, *e.g.*, Robert Currey, Vice Chairman, RCN Corporation, Prepared Testimony before the Senate Subcommittee on Antitrust, Business Rights, and Competition, Committee on the Judiciary, *Cable and Video: Competitive Choices*, Federal News Service (Apr. 4, 2001) ("About 30-35 percent of the population lives in multiple dwelling units (MDUs), such as apartments, cooperatives or condominiums.").

[90] *NPRG CIOC Report 2001*, Ch. 4 at 2.

[91] K. Hoexter, Merrill Lynch Capital Markets, Investext Rpt No. 8232380, RCN Corp. – Company Report at *2 (Oct. 24, 2001).

about 16,000 voice connections) to its network.[92] In the approximately four years since it began the process, RCN has built out is network to pass more than 1.5 million homes.[93]

In addition to overbuilding ILEC networks, some CLECs are pursuing a "greenfield" strategy, which involves deploying facilities in brand-new developments where there is no incumbent provider. For example, in its "Greenfield markets" in Charlotte and Raleigh, CTC deploys "our own remote switching equipment, as well as build a distribution system to in effect, become the local telephone company for each new development."[94] CTC is "working with developers and builders to become the 'official telecommunications provider' for their developments."[95] The company states that, "[b]y clustering our projects, we are able to gain capital and service efficiencies."[96] As of September 2001, CTC was "adding about 1,000 CLEC lines a month."[97] Another CLEC – BTI – is targeting new "residential developments," and was awarded a major contract for a large development in Chapel Hill that includes "three schools, a 500-acre commercial tract and 4,000 homes."[98]

Table 4. CLEC Operations of Non-Bell Company ILECs

Carriers	CLEC Operations
ALLTEL Communications	"ALLTEL has been successfully utilizing its wireless brand recognition to expand its CLEC operations into areas within its wireless footprint." "In the markets that have been operational the longest, Little Rock, AR, and Charlotte, NC, the Company has achieved 50% and 8% penetration, respectively."
Blackfoot Tel. Coop.	"Blackfoot is anticipating significant growth and is expending $7 million to build out its infrastructure."
CEI Networks	"CEI plans to expand service via an edge out strategy once it has fully deployed HFC to its initial markets in 2002."
Century Tel	"The Company is currently offering CLEC services to residential and small and medium sized business customers in Shreveport and Monroe, LA. CenturyTel will employ 'edge-out' strategy for its CLEC expansion. . . . CenturyTel has budgeted more than $20 million of its 2001 capital expenditures to support this expansion."
CTC Exchange Services	"In 1998, CT Communications began offering CLEC service in markets contiguous to its ILEC market. . . . The CLEC offers services similar to those offered by the ILEC by offering facilities based services while leveraging existing back office and billing operations of its parent."
CTC Telcom	"CTC Telcom is currently serving over 7,000 CLEC access lines in the communities of Barron, Rice Lake, and Chetek, WI. Each of its CLEC markets is adjacent to its parent company's ILEC exchanges."
CTS Telecom d/b/a Climax Tel. Co.	"The Company started offering CLEC services in 1997 to businesses in Battle Creek, Kalamazoo, Galesburg, and Scotts, MI. The CTS network employs a Lucent 5ESS 2000 switch."

[92] RCN Press Release, *RCN Announces Fourth Quarter and Year-End 2001 Results* (Feb. 8, 2002); *id.* (in 4Q01 RCN "added over 43,000 marketable homes to its broadband footprint, and is now selling multiple services to over 1.5 million homes.").

[93] *Id.*

[94] CT Communications, Form 10-K/A at 5 (SEC filed Dec. 19, 2001).

[95] *Id.* at 1; *see also* J. Engebretson, *Edging Out the Incumbent*, America's Network (Sept. 1, 2001) (CTC's "green-field business had its genesis in a project it did with the Mills Corp., a real estate investment trust that builds shopping malls nationwide. CT won the contract to provide phone service to a new mall Mills was building in BellSouth territory. It now serves every business in the mall. It also has won similar contracts for other new construction projects with Mills and other companies.").

[96] CT Communications, Form 10-K/A at 1 (SEC filed Dec. 19, 2001).

[97] J. Engebretson, *Edging Out the Incumbent*, America's Network (Sept. 1, 2001).

[98] BTI Press Release, *Meadowmont Selects BTI as Preferred Telecommunications Provider for Residents* (Mar. 31, 2000).

Table 4. CLEC Operations of Non-Bell Company ILECs	
Carriers	**CLEC Operations**
CTSI	Operates CLEC networks in Wilkes-Barre/Scranton/Hazelton; Harrisburg; and Lancaster/Reading/York, PA. "CTSI serves 94% of its access lines by its own switches and 45% of access lines are served solely by the CTSI network."
ExOp of Missouri	"ExOp currently offers a variety of services to the population of 5,000 in Kearney, a city just outside of Kansas City, MO." "Through the partnership with UtiliCorp, ExOp is expanding its fiber network and service offerings. . . into the rural communities that make up UtiliCorp's energy service territory."
Fidelity Comm. Services (FCS)	FCS began offering CLEC services in Rolla, MO in March 2001. "FCS is serving business and residential customers in Rolla from its Lucent 5ESS Class Five switch located in Sullivan, MO."
Goldfield Access Network (GAN)	"GAN is pursuing an edge-out strategy in offering its services to businesses in nearby communities where the Goldfield name has brand recognition."
Heart of Iowa Communications	"Heart of Iowa began CLEC operations in August 1998. The Company employed an 'edge-out' strategy and targeted markets adjacent to those in which it was offering ILEC services. Heart of Iowa is currently serving its CLEC markets from its single Siemens' EWSD switch."
HickoryTech	"The Company used an overbuild strategy, installing its network next to the existing US West network and laying wire directly next to residents' homes." "HickoryTech uses a host switch that is owned by its sister company and ILEC, Mankato Citizens Telephone Company. HickoryTech deploys remote switches in the markets it serves."
HTC Communications	"HTC began offering CLEC services in 1998. The Company is currently operating its CLEC business in two of its ILEC exchanges, Myrtle Beach and Conway, SC."
Mid-Maine Communications	"In 2000, Mid-Maine began operating as a CLEC in several communities in Maine. By the end of the year, the Company had expanded into 12 markets." "Mid-Maine currently offers local dial tone and DSL to business and residential customers in Auburn, Augusta, Bangor, Brewer, Ellsworth, Lewiston, Portland, and Waterville."
Mid Rivers Communications	"Mid-Rivers Communications, offers competitive telephone services to several Tier Three, Four, and Five markets, adjacent to its parent's ILEC markets, in Montana and a small portion of North Dakota. . . . Mid-River Communications serves its CLEC exchanges from its Siemens EWSD Class Five switch which is installed in Mid-Rivers' Central Offices located in Glendive, MT."
Nex-Tech	The CLEC subsidiary of Rural Telephone in Kansas is "is targeting and capturing new CLEC communities" served by SWBT
NTELOS	"NTELOS enters markets that are physically proximate to its existing ILEC operations and uses its brand and existing infrastructure to expand into them." "Wireless is marketed strongly to small and medium-sized business to gain brand recognition and trust. NTELOS later approaches these same customers to offer them CLEC service for their businesses."
Otter Tail	"Otter Tail began offering local switched service in January 1999 and currently serves four markets in Minnesota."
Panhandle Telecom. Systems	"PTSI began offering CLEC services in Perryton, TX in January 2001 . . . The Company is currently offering competitive services from its Nortel DMS-100 host switch located in Guymon, OK."
Penn Telecom (d/b/a Penntele.com)	"PTI employs an edge out strategy and has entered markets proximate to the footprint of North Pittsburgh Telephone Company." "While PTI has concentrated on small to medium-sized businesses, it is also experimenting with offering its bundled services in the two affluent suburbs of Perrysville and Sewickley."
Sharon Telephone Company	"The Company offers local phone and Internet services from its single Nortel DMS-10 switch in Sharon, WI, to the towns of Darien, WI, and Harvard, IL."
Silver Star Communications	"Silver Star Communications is currently offering competitive voice and data services in Afton, WY from its single Nortel DMS-10 switch."
TDS Metrocom	"TDS Metrocom serves three extended markets in Wisconsin, offering local dial tone, data, and Internet services to both business and residential customers."
Sources: See Appendix M.	

Table 5. Hybrid Fiber Coax (HFC) and Multi-Dwelling Unit (MDU) Providers	
RCN/Starpower	"About 30-35% of the total population lives in multiple dwelling units (MDUs), such as apartments, cooperatives or condominiums. The ability to serve this sector of the market is crucial because it is generally more profitable due to the large number of subscribers in each MDU."
Knology	Knology began operating in Montgomery, Ala., and targets towns with between 100,000 and 300,000 homes, including Augusta, Columbus, and West Point, Ga.; Huntsville and Montgomery, Ala.; Charleston, S.C.; and Panama City, Fla., and Knoxville, Tenn. Knology's network now passes 380,000 homes and 142,008 buildings. "Knology gained more than 30,000 MDU clients [in 2000] alone, a 27% increase from 1999."
MultiBand (Vicom)	"MultiBand . . . delivers local dial tone, long distance, satellite based digital cable television, and high speed internet services on one combined billing and delivery platform to residents of multi-dwelling properties."
Grande Communications	"Grande is building an advanced deep fiber broadband network that will deliver high-speed Internet, local and long-distance telephone and cable television service to homes, MDUs and businesses in the Austin/San Antonio corridor." "Grande's entire MDU portfolio . . . represents over 8,000 units."
Sources: See Appendix M.	

C. Broadband Loops.

Broadband services are provided over the telephone network using digital subscriber line (DSL) technology, which relies on the same local loop plant used to provide narrowband voice service.

DSL over ILEC loops is only one of four main last-mile technologies that is currently used to provide broadband services to mass-market consumers. The other three are cable modem, satellite, and fixed terrestrial wireless. Both consumers and providers view all four of these various broadband services as interchangeable. Two or more of the main broadband technologies are frequently available in the same geographic areas.

Cable is the clear leader in the broadband market today, by a wide and growing margin. Cable modem service is currently available to between two-thirds and three-quarters of U.S. households,[99] whereas DSL service is available to only about 45-50 percent.[100] *See* Table 6. As of the year-end 2001, there were approximately 7.5 million cable modem subscribers in the U.S., compared to 3.3 million residential DSL subscribers.[101] *See* Figure 6. According to analysts,

[99] *See Yankee Group Critical Mass Report* at Exh. 4; *Broadband 2001* at Table 6. *See also NCTA Industry Statistics* (as of November 2001, 70 million households were passed by cable modem service). The cable industry association estimates that, by year-end 2002, approximately 95 million U.S. homes (or nearly 90 percent of homes passed by cable) will have access to cable modem service. *See* NCTA, *Cable & Telecommunications Industry Overview 2001* at Chart 2 (2001) (citing Morgan Stanley, Dean Witter, *Broadband Cable Second-Quarter Review* at 9 (Aug. 29, 2001)).

[100] *See*, *e.g.*, *Yankee Group Critical Mass Report* at Exh. 4 (estimating that DSL will be available to 45 percent of all households by year-end 2001); *JP Morgan Cable Industry Report* at Figures 12 & 36 (DSL available to 43 percent of U.S. homes as of 1Q2001); P. Roche, *DSL Will Win Where It Matters*, McKinsey Quarterly 2001, No. 1 (2001) ("40 percent of all phone lines are ready for DSL").

[101] *See Morgan Stanley Cable Modem/xDSL Report* at Exh. 3 (cable modem); *TeleChoice DSL Deployment Summary* (residential DSL).

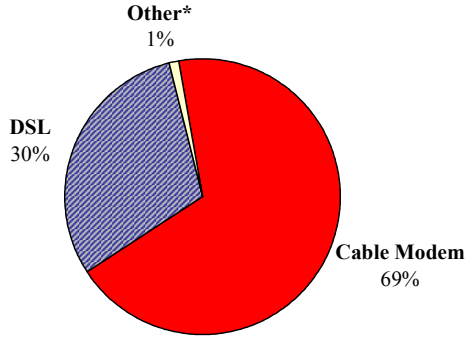
approximately one-third of all U.S. households currently have access to both cable modem and DSL service,[102] and approximately three-quarters of all homes with access to DSL also have access to cable modem service.[103]

Table 6. Availability of Broadband Services

	2001	2002	2003	2004	2005
Cable Modem					
McKinsey & Co. /JP Morgan	77%	81%	84%	85%	87%
Yankee Group	66%	77%	81%	82%	83%
DSL					
McKinsey & Co./JP Morgan	51%	60%	64%	70%	n/a
Yankee Group	45%	54%	62%	70%	74%
Satellite	50 states, covering over 90% of U.S. households				
Fixed Wireless	3%	n/a	n/a	n/a	41%

Sources: See Appendix M.

Figure 6. Market Share of Residential Broadband Subscribers YE 2001



*Satellite and fixed wireless.

Sources: Salomon Smith Barney, Morgan Stanley, Dean Witter, and TeleChoice. *See* Appendix M.

Cable is adding new subscribers at a faster rate than competing high-speed technologies. *See* Figure 7. And most analysts expect cable to maintain a considerable lead over DSL and other broadband technologies for the foreseeable future.[104] The principal reason is simply that

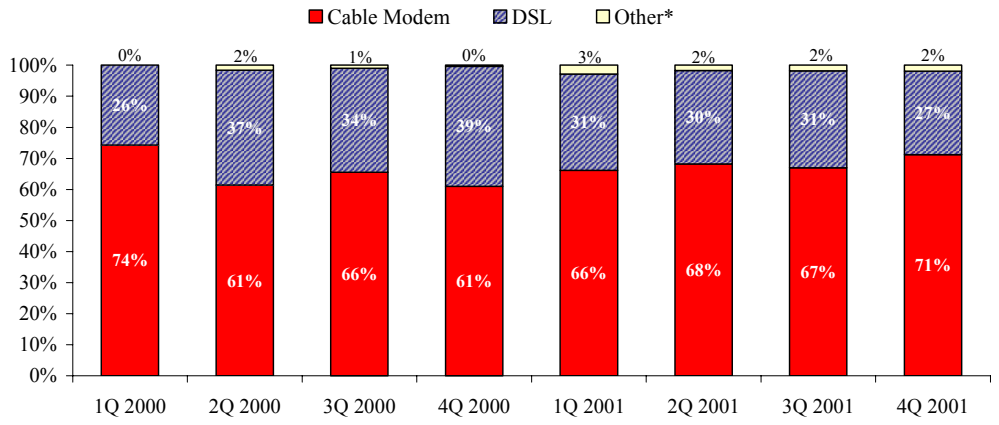
[102] *See*, *e.g.*, JP *Morgan Cable Industry Report* at Figures 12 & 36; *Broadband 2001* at Chart 25.

[103] *See*, *e.g.*, *JP Morgan Cable Industry Report* at Figures 12 & 36 (JP Morgan estimates that as of 1Q 2001, 10 percent of households had access to DSL only, and 33 percent had a choice of DSL or cable; therefore, approximately one-quarter of households with access to DSL did not have access to cable (10/43=23.3)).

[104] *See*, *e.g.*, *Broadband 2001* at Table 9 (estimating that by 2005, cable will have 51 percent of broadband subscribers, while DSL will have 37 percent.); *Yankee Group Consumer Broadband Report* at Chart 1 (predicting that by 2005, cable will have 48.5 percent of high-speed users, while DSL will have 33.8 percent); *Salomon Smith Barney Battle for High-Speed Data Report* at 1 (cable will account for 59 percent of subscribers and DSL will account for 34 percent in 2005); M. Pastore, *High Speed Access to Pass Dial-Up in 2005*, Cyberatlas (Jan. 22, 2001), http://cyberatlas.internet.com/markets/broadband/article/0,1323,10099_567101,00.html (citing Strategis Group Study

cable modem service is more widely available than DSL.[105] While analysts expect the gap between cable and DSL to narrow somewhat, it is expected that by 2005, cable will still reach 12 to 15 percent more homes than DSL will reach by that time. *See* Table 6.[106]

Figure 7. Market Share of New Residential Broadband Subscribers



*Satellite and fixed wireless.
Sources: Salomon Smith Barney, FCC, Kinetic Strategies, Morgan Stanley Dean Witter, and TeleChoice. *See* Appendix M.

Cable's advantage is that all cable plant is upgradeable; a significant fraction of the existing telephone plant is not. DSL is provided over the existing local telephone network by connecting digital modems over copper loops to the central office, and then ensuring that those loops are free from various electronics (*e.g.*, load coils) that are needed for voice service but that inhibit the provision of data services.[107] DSL service can be provided at high speeds only on loops that are 18,000 feet or shorter,[108] which means that "only about two-thirds of U.S. homes are easily addressable for xDSL."[109] And even with respect to the homes that can be upgraded,

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which finds that, in 2005, 45 percent of high speed subscribers will go with cable and 40 percent will go with DSL.); *TeleChoice Sees Slower But Still Substantial Growth in DSL*, xDSL.com (Aug. 13, 2001), http://www.xdsl.com/content/tcarticles/wp081101.asp.

[105] *See*, *e.g.*, *JP Morgan Cable Industry Report* at 36 ("Assuming that each platform takes 50% share in markets where both services are available, cable enjoys a more than 2:1 advantage in what each platform's "natural" market share would be, holding all other variables – price, performance, bundling benefits – constant.").

[106] *See*, *e.g.*, *Yankee Group Critical Mass Report* at Exh. 4 (cable modem service is expected to be available to 83 percent of households by 2005, while DSL service is expected to be available to 74 percent of households.); *Broadband 2001* at Chart 32 (projecting that about 70 percent of households will have both cable modem and DSL service available by 2005).

[107] There are two main variations of DSL: asymmetric (ADSL), which has a higher downstream than upstream transmission rate; and symmetric (SDSL), which offers an equal downstream and upstream rate. ADSL is the most common form of DSL, and is used most often with residential customers, whereas SDSL is used primarily for business customers. *See Second Advanced Services Report* ¶¶ 36-37.

[108] *See*, *e.g.*, A. Gilroy & L. Kruger, *Broadband Internet Access: Background and Issues*, Congressional Research Service – Policy Papers (May 18, 2001); D. Sweeney, *Ultra Long-Reach DSL : A Whole New Crop of Companies Aims To Boost DSL Performance*, America's Network (Sept. 15, 2001).

[109] *Broadband 2001* at 40.

cable has lower upgrade costs than DSL.[110] This means "that relative to its telco competitors, [cable] has the retail pricing power to under-price competitors while preserving an attractive return."[111]

The two wireless broadband services widely deployed today are broadband provisioned via satellite and terrestrial fixed wireless broadband (MMDS). Broadband satellite services are provided using the same constellation of Direct Broadcast Satellites (DBS) that currently provide video services to more than 17 million subscribers.[112] DBS companies have, in the last year, deployed a two-way high-speed Internet service capable of competing on equal footing with cable modems and digital subscriber lines.[113] The main fixed wireless services provided to residential customers use Multichannel Multipoint Distribution System (MMDS), which uses spectrum in the 2 GHz band.[114] WorldCom and Sprint "own most MMDS spectrum in the United States," and "have commercially deployed MMDS in a handful of markets."[115] WorldCom has recently stepped up efforts to deploy MMDS service, and has begun offering service in four new markets since the beginning of 2002.[116]

Subscribership numbers for broadband satellite remain low: there are an estimated 200,000 subscribers to two-way satellite and fixed wireless broadband services as of year-end 2001.[117] But analysts project that these totals will soon begin to rise rapidly.[118] Whereas

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[110] *See*, *e.g.*, *Broadband 2001* at 69 ("xDSL starts life at a much higher cost point (close to $800) than cable modem (about $470) primarily because cable makes use of shared head-end terminating equipment, whereas DSL requires dedicated line cards for each subscriber.").

[111] *Bear Stearns Byte Fight! Report* at 82.

[112] *See Eighth Video Competition Report*, App. C at Table C-1; SkyReport, *National DTH Counts: November 2000 – November 2001*, http://www.skyreport.com/dth_us.htm.

[113] *Broadband 2001* at 45 (a "true advantage" satellite data services have over wireline alternatives is "instant near-ubiquity").

[114] *See Broadband 2001* at 131.

[115] *Broadband 2001* at 47. In October 2001, Sprint announced the end of customer acquisition for MMDS services, and a freeze on the number of MMDS markets served "until substantial progress is made on second-generation MMDS technology. The current MMDS customer base will be maintained, as will all video services offered through the fixed wireless spectrum." Sprint Press Release, *Sprint to Terminate ION Efforts* (Oct. 17, 2001).

[116] *See* WorldCom Press Release, *WorldCom Launches New High-Speed, Fixed-Wireless Service in Lafayette* (Feb. 21, 2002); WorldCom Press Release, *WorldCom Launches New High-Speed, Fixed-Wireless Service in Pensacola* (Feb. 20, 2002); WorldCom Press Release, *WorldCom Launches New High-Speed, Fixed-Wireless Service in Springfield* (Jan. 9, 2002); WorldCom Press Release, *WorldCom Launches New High-Speed, Fixed-Wireless Service in Hartford* (Jan. 8, 2002).

[117] *See Yankee Group Fiber and Fixed Wireless Report*; *Echostar Hopes New Plan Will Boost Deal's Chances*, Communications Daily at 3 (Feb. 27, 2002).

[118] *See*, *e.g.*, *Yankee Group Consumer Broadband Report* at 4 & Exh. 1 ("[S]atellite broadband will reach 300,000 households in the United States by the end of this year and grow to 4.5 million households by the end of 2005 . . . this will translate into a market share jump from 2.81% at the end of 2001, to 14.48% at the end of 2005."); *Broadband 2001* at Table 9 (estimates show satellite market share expanding from 1 percent in 2000 to 10 percent in 2005); Business Communications Company, Inc. Press Release, *Market for Broadband Internet Access Continue to Soar* (Nov. 1, 2001) ("Two-way satellite broadband Internet access will be the fastest growing single-access technology, with expenditures growing at an AAGR of 36.6% from $ 1.14 billion (or 12.8% of all broadband related expenditures) to $ 5.42 billion, or 20.5% of expenditures.").

wireline services generally get rolled out incrementally, wireless services tend to get "turned on" for an entire geographic area in a single step. Wireless, by its nature, generally provides complete geographic coverage in a region – or, in the case of satellite service – the entire country. That wireless providers currently lag behind wireline providers in serving broadband customers reflects the none-to-all dynamic of wireless roll out, more than anything else.

Several companies also plan to offer residential broadband services using unlicensed spectrum bands, including the 2.45 GHz Industrial-Scientific-Medical (ISM) band and the 5.8 GHz Unlicensed National Information Infrastructure (UNII) band.[119] As noted above, WorldCom has recently accelerated its efforts to deploy MMDS service. Customers within "35 miles of a centrally located transmittal tower" can obtain "high-speed broadband Internet access in as little as five to ten days."[120] The Commission's staff found that the "MDS industry has invested several billion dollars to develop the band for fixed wireless data systems," and that "these systems will provide a significant opportunity for further competition with cable and digital subscriber line (DSL) services."[121]

Competitors are supplying last-mile broadband connections to small business customers, as well as residential customers. Cable operators are beginning to extend their cable networks to provide high-capacity loops to serve small and medium-sized business customers. This push is being driven by the advent of next-generation Voice-over-Internet-protocol technology, which has "solved" "previous difficulties such as [Quality of Service] problems, incompatible and incomplete standards, and lack of equipment."[122] Today, "[b]usiness trials of [Fiber to the Business] are underway . . . with deployment expected this spring."[123] Numerous cable operators already have realized that there are many businesses that lie in close proximity to their networks, and that it makes sense to build out their networks incrementally to serve them.[124]

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[119] *See Broadband 2001* at 49 ("A host of small start-ups are deploying some limited services over unlicensed bands, and some larger providers are running unlicensed spectrum trials."); S. Buckley, *MMDS Hits the Airwaves*, Telecommunications Magazine (Feb. 2001) ("IGI Consulting predicts that by 2005, there will be at least 1000 unlicensed wireless ISPs in operation and 1.3 million subscribers. . . . Unlike licensed MMDS holders that are restricted by the FCC's stringent rules, unlicensed carriers such as Clearwire, Fuzion Wireless and PSInet can set up shop immediately.").

[120] WorldCom Press Release, *WorldCom Launches New High-Speed, Fixed Wireless Internet Service in Springfield* (Jan. 9, 2002).

[121] Carroll McHenry, Chairman and CEO, Nucentrix Broadband Networks, *Third Generation Wireless*, remarks before the Senate Subcommittee on Communications, Committee on Commerce, Science and Transportation, Washington, D.C. (July 31, 2001) (citing FCC "Final Report" at 13). Fixed wireless operators offer consumer broadband services which are priced comparatively to terrestrial broadband services, such as cable modems and DSL. *See*, *e.g.*, E. Tahmincioglu, *For High-Speed Access to the Web, a Dish-to-Dish Route*, N.Y. Times (Oct. 11, 2001) ("The fixed-wireless connection…costs $40 to $60 a month, depending on the provider. Installation and equipment can total around $300 but some companies waive the fees.").

[122] TIA Press Release, *Cable's Fiber to the Business Deployment Spurred by VOIP* (Feb. 14, 2002).

[123] *Id.*

[124] *See*, *e.g.*, G. Lawyer and C. Wolter, *The Cable Giant Stirs*, Sounding Board Magazine (Dec. 1, 2001), http://www.soundingboardmag.com/articles/1c1vox.html (quoting Geoff Tudor, president and CEO, Advent Networks: "Cox realized there were 300,000 small businesses within 50 feet of their coaxial drops, easily reachable. . . That could greatly expand the network's revenue-generation potential."); C. Weinschenk, *Cable Makes Advances Into CLECs'*

Satellite providers have designed service offerings specifically targeted at small business customers. For example, Hughes offers DirecWay service, which is a "business edition Internet access" service that gives "small business[es] access to the same advanced technology that powers global enterprises."[125] The DirecWay service gives business customers the option of much higher throughput and downstream bandwidth than is available with Hughes's basic consumer offering.[126] WorldCom has announced that it would be reselling Hughes's DirecWay Service to small- and medium-sized business customers beginning in January 2002, and rebranding that service with WorldCom's name.[127]

While the provision of broadband services is undeniably competitive today, the most important competitive opportunity over the longer term centers on the chase for far more bandwidth than existing "broadband" networks currently offer. The upgrading of cable, telephone, and wireless networks will not end in the foreseeable future; appetites for bandwidth continue to grow faster than infrastructure can be built. Cable and telephone companies alike will push fiber deeper and deeper into the local exchange, until it finally reaches the home. Wireless providers will multiply and shrink cells, and boost capacities, to keep pace. Much of this new infrastructure will have little relation to the old. ILECs will accordingly enjoy no particular advantages over competing carriers in deploying this new infrastructure.

Wake, Multichannel News at 18 (Dec. 3, 2001) (Charter likewise has, in addition to over 1,300 small and medium-sized business customers, fiber connections to approximately 400 businesses; these 400 businesses serve approximately 4,200 home workers with VPNs); M. Reilly, *New Cable Modem Target: Businesses*, CityBusiness (May 18, 2001) (Michael Fox, vice president and general manager of Time Warner Cable in Minneapolis, said roughly 50,000 businesses were located within range of the company's cable service area, though one-third of the businesses already signed up needed some sort of network buildout. However, "[i]t made a lot of sense to expand into the business sector.").

[125] DirecWay, *For Small Business*, http://www.hns.com/direcway/for_small_business/learn_more/overview.htm.

[126] There are three service plans for business service: Business Basic (500 MB throughput, up to 400 kbps downstream); Business Plus (800 MB throughput, up to 750 kbps downstream); Business Premium (1000 MB throughput, up to 1000 kbps downstream). DirecWay, *Business Edition Internet Access*, http://www.hns.com/direcway/for_small_business/learn_more/business_edition.htm.

[127] WorldCom's service will be available in 600 kbps, 800 kbps, or 1 Mbps download speeds, with 128 kbps upload speeds. WorldCom's service level agreement with Hughes guarantees an upload speed of 128 kbps. J. Wagner, *WorldCom Is Now Truly Long Distance*, ISP News (Nov. 27, 2001), http://www.internetnews.com/isp-news/article/0,,8_929181,00.html.

V. FACILITIES-BASED COMPETITION VERSUS RESALE

The Commission has affirmed that, "in the long term, the most substantial benefits to consumers will be achieved through facilities-based competition."[1] "Facilities-based competition is the ultimate objective" of the Commission's competition policy."[2] At the same time, however, the Commission has attempted to craft its unbundling regulations to promote the "rapid introduction of competition in all markets."[3] The Commission's other stated objective has been to encourage CLECs "to serve the *greatest number of consumers as rapidly as possible*."[4]

Experience since the 1996 Act establishes that facilities-based competition has evolved largely apart from UNE-based forms of competitive entry – and that regulatory policies focused on promoting the indiscriminate use of UNEs advances the short-term appearance of competition over the long-term substance.

The enormous increase in facilities-based competition over the past six years has had very little to do with the availability or use of UNEs. Competitors have instead relied on facilities-based strategies from the outset. They have grown incrementally, establishing a foothold and then expanding core network facilities step by step into new geographic and product markets. Over time, this strategy has delivered robust competition to very significant numbers of both business and mass-market customers.

Overall, however, the current regulatory structure has favored the rapid proliferation of small, under-funded, technically unsophisticated competitors, over the more measured evolution of robust and durable ones. All too often, it has been easier and cheaper for a CLEC to piggy-back on the incumbent's network permanently rather than build out a network of its own. Such CLECs have attempted to enter local markets very rapidly, on a very large scale, by relying predominantly – and all too often exclusively – on UNEs. The Commission expected these competitors to rely on UNEs only until it "was practical and economically feasible to construct their own networks."[5] But many CLECs have adopted business strategies that center on long-term reliance on UNEs, with no expectation at all of ever building facilities to replace them. A significant number rely on ILEC networks from end-to-end, which they do primarily through the

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[1] *Promotion of Competitive Networks in Local Telecommunications Markets*, Notice of Proposed Rulemaking and Notice of Inquiry in WT Docket No. 99-217 and Third Further Notice of Proposed Rulemaking in CC Docket No. 96-98, 14 FCC Rcd 12673, ¶ 4 (1999); *see also UNE Remand Order* ¶ 110 ("the construction of new local exchange networks" benefits consumers, the Commission has explained, because facilities-based carriers "can exercise greater control over their networks, thereby promoting the availability of new products that differentiate their services in terms of price and quality"); Michael K. Powell, Chairman, FCC, *Digital Broadband Migration – Part II* at 4 (Oct. 23, 2001), http://www.fcc.gov/Speeches/Powell/2001/spmkp109.pdf ("Facilities-based competition is the ultimate objective" of the Commission's competition policy.); *id.* (unbundling policy "should provide incentives for competitors to ultimately offer more of their own facilities").

[2] Michael K. Powell, Chairman, FCC, *Digital Broadband Migration – Part II* at 4 (Oct. 23, 2001), http://www.fcc.gov/Speeches/Powell/2001/spmkp109.pdf.

[3] *UNE Remand Order*, 15 FCC Rcd at 3705.

[4] *Id.*

[5] *Id.* ¶ 6.

effective "resale" of ILEC service that is made possible by the unrestricted availability of the UNE Platform.

Many of the CLECs pursuing UNE-centric strategies have failed. Investors have recognized that these CLECs are engaged in highly speculative ventures of regulatory arbitrage, and offer no true value of their own. The UNE-centric CLECs have harmed their facilities-based counterparts, too. Facilities-based CLECs recognize that the unrestricted availability of UNEs priced at a regulator's estimation of long-term incremental cost can ruin a business making steep capital investments at here-and-now, real-world prices. These facilities-based CLECs view the availability of the full UNE Platform as particularly harmful to facilities based competition. *See* Table 1.

Table 1. CLECs Opposing the Availability of UNE Platforms
Allegiance Telecom, Cablevision Lightpath, Cbeyond Communications, Time Warner Telecom, XO: "[T]he evidence submitted in this proceeding since the *UNE Remand Order* was released confirms that competition is thriving in markets where the requirement to provide unbundled switching has been removed."
Allegiance Telecom: Expanding "the availability of the UNE-P" "threatens to harm those CLECs that have built their own facilities and do not need to rely on the UNE-P to serve customers."
UNE-P pricing levels "could well be too low," which "mak[es] it more difficult for efficient, facilities-based [competitive local exchange carriers] to compete."
"[O]nly carriers that make investments in networks and equipment are able to deliver the product, technology and service innovations that provide competitive alternatives to the ILEC."
Choice One: "Choice One's business experience demonstrates that new entrants can provide service to small business customers . . . without the need to rely on unbundled local switching purchased from an incumbent LEC. . . . We are unaware of any reason why another carrier could not replicate it using unbundled loops and self-deployed switches, even in second and third tier urban markets. The Commission's rules governing unbundled local switching should reflect this fundamental fact."
TCG (pre AT&T merger): The FCC should "ensure that wholesale competition does not drive out or diminish the development of strong, facilities-based competition."
Sources: See Appendix M.

Based on the first comprehensive study of its kind, one of the Commission's own economists recently found that "states with lower UNE prices have less facilities-based entry."[6] Other noted economists, scholars, and jurists have reached the same conclusion: unbundling ultimately undermines facilities-based investment.[7] If an incumbent carrier aggressively sold its

[6] James Eisner, FCC, & Dale Lehman, Fort Lewis College, *Regulatory Behavior and Competitive Entry*, for presentation at the 14th Annual Western Conference Center for Research in Regulated Industries, at 2 (June 28, 2001). According to its authors, this study does not necessarily represent the views of the FCC itself.

[7] *AT&T v. Iowa Utils. Bd.*, 525 U.S. 366, 429 (1999) (Breyer, J., concurring in part and dissenting in part) ("Increased sharing by itself does not automatically mean increased competition. It is in the *un*shared, not in the shared, portions of the enterprise that meaningful competition would likely emerge. Rules that force firms to share *every* resource or element of a business would create, not competition, but pervasive regulation, for the regulators, not the marketplace, would set the relevant terms."); M. Stanton Evans, *Last Mile Is the Hardest*, Consumers' Research Magazine (Aug. 1, 2001) (quoting economist Tom Hazlett: "Neither local phone nor cable companies will make the enormous capital investment necessary to expand broadband, he argues, if 'open access' rules require them to share the resulting infrastructure with their competitors at below-market rates."); *MCI Restarts Marketing Local Residential Service in N.Y.*, Comm. Daily (Feb. 4, 1999) (quoting James Cicconi, executive vice president and general counsel,

own services *below cost* on its own initiative, or even just pared prices down to zero-margin "imaginary network" levels, it would be accused of "predatory pricing" – of attempting to discourage or ruin real competitors that were building competing networks alongside.

The unrestricted availability of UNEs discourages new ILEC investment, too. There is no incentive to invest in risky new infrastructure when the threat of future unbundling mandates directed at those facilities eviscerates the business case for deploying them. As AT&T's chairman has put it, "[n]o company will invest billions of dollars to become a facilities-based broadband services provider if competitors who have not invested a penny of capital nor taken an ounce of risk can come along and get a free ride on the investments and risks of others."[8]

But facilities-based investment is precisely what is needed. As the Commission has recognized, "the widespread deployment of broadband infrastructure has become the central communications policy of the day."[9] This will require "the complete or near-complete replacement of copper lines with end-to-end fiber optic transmission facilities."[10] The existing UNE regime significantly discourages investment in this new infrastructure, by both the facilities-based CLECs, and by the ILECs themselves.

A. Efficient Facilities-Based Entry.

The robust levels of competition now offered by numerous CLECs establish that facilities-based competition is possible. The business strategy that works is to enter by way of high-margin markets and value-added markets: the urban carrier and business markets first targeted by local fiber companies, and the wireless and broadband markets targeted by wireless, cable, and other facilities-based providers of switches and alternative forms of transport. These have been the successful entry points; facilities-based competition for the rest of the market has spread out rapidly from there.

AT&T: "[T]he last thing that government should do is create uncertainty that would have a chilling effect on, and perhaps even retard, these investments."); A. Wilson, *Harmonizing Regulation by Promoting Facilities-Based Competition*, 8 Geo. Mason L. Rev. 729 (Summer 2000) ("Regulatory uncertainty casts a pall over capital markets and dries up critical financial support. Communications policymakers must therefore create and sustain a stable regulatory environment if they want to nurture the development of facilities-based competition."); T. Jorden, J.G. Sidak, and D. Teece, *Innovation, Investment, and Unbundling*, 17 Yale J. on Reg. 8 (2000) ("It makes no economic sense for the ILEC to invest in technologies that lower its own marginal costs, so long as competitors can achieve the identical cost savings by regulatory fiat."); 3A Phillip Areeda & Herbert Hovenkamp, *Antitrust Law* ¶ 771(b), at 175 (1996) (When a company is to "provide [a] facility and regulat[es] the price to competitive levels, then the [prospective entrant's] incentive to build an alternative facility is destroyed altogether."); R. Cowles, *et al.*, Gartner Dataquest, *UNEs: Stifling U.S. Broadband Growth and Ineffective in Promoting Local Competition* at 5 (2002) (UNE policy has resulted in a "near-complete halt to advanced infrastructure investment from the incumbents and newcomers.").

[8] C. Michael Armstrong, Chairman and CEO, AT&T, *Telecom and Cable TV: Shared Prospects for the Communications Future*, remarks before the Washington Metropolitan Cable Club, Washington, D.C. (Nov. 2, 1998).

[9] *Appropriate Framework for Broadband Access to the Internet over Wireline Facilities*, Notice of Proposed Rulemaking, 17 FCC Rcd 3019, ¶ 1 (2002).

[10] *Id.*; *see also* R. Cowles, *et al*., Gartner Dataquest, *UNEs: Stifling U.S. Broadband Growth and Ineffective in Promoting Local Competition* at 8 (2002) ("There is general recognition within the communications and information industry that fiber will ultimately be the most efficient and flexible end-to-end infrastructure").

1. Incremental Development of Facilities-Based Competition.

As demonstrated in Section I, the CLEC industry as a whole remains healthy. The most successful individual CLECs are those that have pursued a strategy of facilities-based entry. Their common business strategy has been to deploy facilities to serve high-margin markets first, then build out from there, to extend their competitive reach incrementally, into new service sectors and new geographic markets.

None of the successful competitors has emphasized factors that the Commission has at times deemed important – factors such as "ubiquity," or "rapid[]" entry to serve "the greatest number of customers."[11] None of the successful competitors has viewed ubiquitous service or instant roll-out as competitively necessary. None has proceeded on the assumption that the evolution of its business required the very rapid development of a very large footprint. To the contrary, they have prospered by emphasizing just the opposite, at the outset: smaller operations, carefully targeted at the most profitable geographic and service sectors.[12] Much broader competition has then evolved relentlessly from these facilities-based beachheads. And it has now reached the point where it is developing very rapidly indeed.

Switching. As discussed in Section II, competitive switches were first deployed by large business customers and then by competitive-access providers. This base of competitive switching capacity has since evolved, market by market, to serve smaller business customers and, most recently, residential subscribers. Adding customers and traffic at the margin has grown progressively cheaper. A switch deployed initially to serve the single large customer at a single point then serves a number of smaller customers, and then becomes part of larger network, serving additional, smaller, more widely dispersed sources of traffic.

Packet switching services have evolved in similar fashion. High-speed ATM and frame relay switches are deployed first to provide high-margin broadband data services. E-mail and messaging then begin to substitute, at the margin, for voice calls. Then two-way voice traffic migrates on to these packet switches.

As discussed in Section II, this evolutionary process is now robustly established, and the business model is well understood and mature. There are large numbers of competitive circuit switches in actual service. They can and do serve both large business and mass-market customers. Their geographic reach can be extended with trunks to remotes, and frequently is. Packet switches are multiplying even faster, and packet-switched traffic is now making very substantial in-roads into service areas traditionally served by circuit switches.

Fiber, Transport, and High-Capacity Loops. Competition has evolved in a similar fashion in the markets for transport and high-capacity loops. The interoffice transport and local

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[11] *UNE Remand Order* ¶ 107.

[12] *See*, *e.g.*, Time Warner Telecom, *Company Growth*, http://www.twtelecom.com/cgrowth.html ("growth plans focus on geographic expansion, extension into new market segments and development of new data and Internet-based products and services."); V. Bajaj, *Allegiance Will Borrow $ 350 Million to Invest*, Dallas Morning News (Sept. 19, 2001) (Allegiance has "pursued a more deliberate and slower national expansion than most of its competitors."); *Royce Holland, The Top Enterpreneurs*, Bus. Week (Jan. 14, 2002) (While its "rivals took on mountains of debt, the chief executive of Allegiance Telecom played it safe, borrowing little and expanding slowly.").

loop UNEs are both wireline facilities that transmit information between two fixed points. Here again, the early competitors first targeted a small number of high-margin opportunities, then built out from there. In the mid-1980s, "competitive access providers" ran their networks to the very largest customers in the largest geographic markets – long-distance carriers in the densest urban areas. Then, year by year, the CAPs extended both their networks and their businesses, to serve business customers, and less densely populated areas. Again, this process has matured; there are now extensive networks in place in all major urban markets.

Once a fiber network is deployed and the investment sunk, the facilities can be used to serve other on-net customers, including many whose traffic volumes would never have justified the original deployment of the network. Similarly, networks can be economically extended block by block, to points that would never have been economical to reach mile by mile. When they deploy fiber, carriers invariably deploy far more capacity than they can use immediately, to facilitate precisely this process of incremental future development.

This process of competitive evolution is now accelerating rapidly, for two reasons. Extensive competitive networks are already in place; the marginal cost of extending them to pick up new customers is far lower, now, than it was at the outset. And surging volumes of data traffic make the deployment of competitive fiber increasingly economical, for an ever-expanding base of potential customers. CLECs now routinely offer service to many business customers that are not already served by their fiber networks; the CLEC will extend its network one spur or branch at a time, to pick up the new traffic.

Narrowband Loops. Wireless has emerged as a serious competitor to the narrowband ILEC loop through a similar, at-the-margin process of upgrading the network and capturing economies of scope and scale. Wireless began as a high-priced service for the handful of high-end customers willing to pay a high premium for a mobile loop. Over time, wireless operators were able to begin competing for a greater segment of customers willing to pay for mobility. As they have built out their networks, wireless carriers have begun to compete directly for virtually all second-line loops, and for an increasing share of primary-line loops as well.

Cable, which offers not one but two important alternatives to the ILEC loop, has evolved as competitive alternative in a similar way. Coaxial cable networks were originally deployed to offer video. With these networks in place, a number of cable operators found it economical to add circuit-switched voice telephony and high-speed data capabilities. Cable now competes directly against ILEC loop for the last-mile transport of packet-switched data traffic, which now accounts for substantially more than half of all telecom traffic. And in many areas, cable competes directly with ILECs for primary line voice service as well.

Broadband. A broadband link to the packet-switched network provides a connection to all other Internet users, whether linked through telephone lines, cable modems, land-based wireless connections, or satellite connections. In the past three years, cable operators have completed outfitting the vast majority of their networks with two-way capabilities. Almost all cable operators are now rapidly deploying high-speed data capabilities. The costs of upgrading cable plant have been falling steadily, and cable operators have captured very significant economies of scope in deploying digital platforms that can be used for digital television and high-speed data, as well as packet-switched voice.

Much of the new broadband infrastructure has had little relation to the old. Fiber has replaced copper in the loop; packet switches have replaced circuit switches in the central office; and the transport between these packet switches has used very different routes than the rigid point-to-point connections between central offices. In deploying this new infrastructure, ILECs have thus enjoyed no particular advantages over competing carriers.

2. Economies of Scope and Scale.

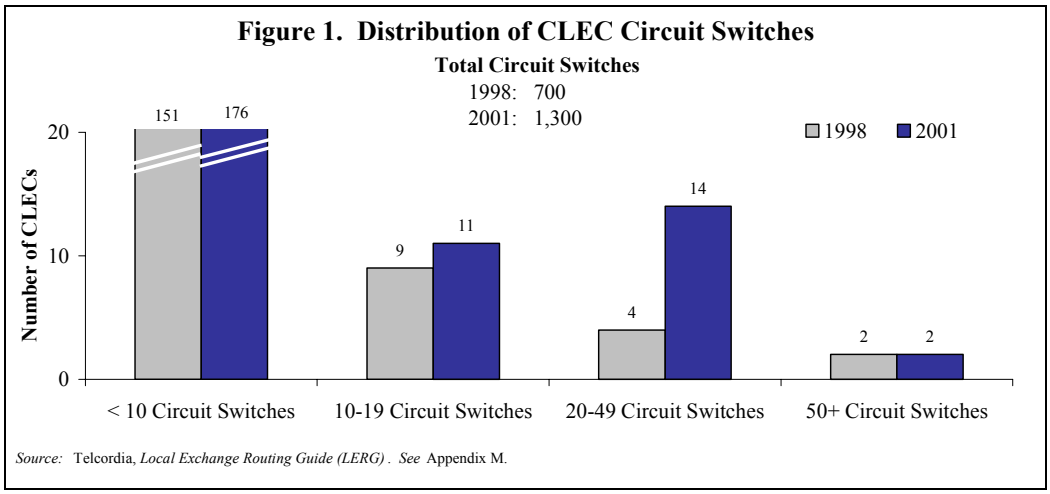
In the *UNE Remand Order*, the Commission found that, "[b]ecause competitors do not yet enjoy the same economies of scale, scope and ubiquity as the incumbent, they may be impaired if they do not have access, at least initially, to certain network elements supplied by the incumbent LEC."[13] As discussed above, however, the assumption that immediate scale and scope economies are essential to competitive success is not borne out by actual experience in the marketplace. The successful competitors have started out with high-*margin* business strategies, not high-*volume* strategies, and expanded incrementally from there. The economies of scope and scale have followed, not led, the competitive process.

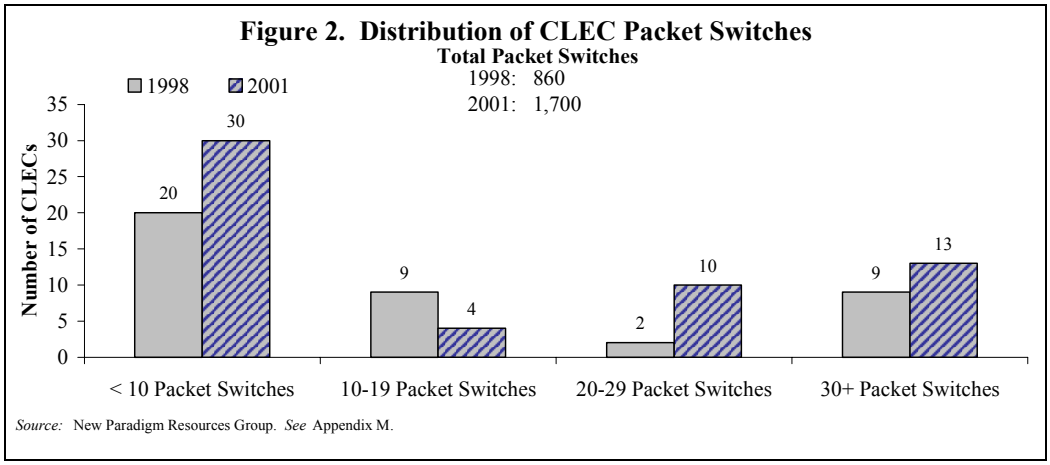
With that said, incremental growth has now culminated in a significant number of CLECs that enjoy very significant economies of scale. As Table 2 indicates, the twenty largest CLECs today have 100 percent more switches, 190 percent more fiber-route miles, and earn 150 percent more in total revenues than the twenty largest CLECs at the time of the *UNE Remand Order*. *See* Table 2.

[13] *UNE Remand Order* ¶ 14.

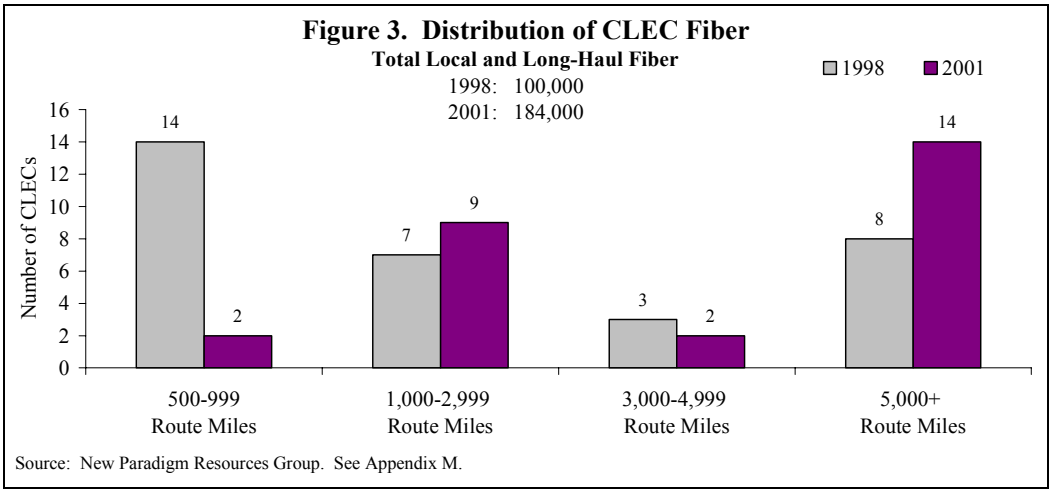
Table 2. Twenty Largest CLECs (by Revenues): 1998 vs. 2001							
1998				2001			
CLEC	**Revenues ($millions)**	**Circuit Switches**	**Fiber Route Miles**	**CLEC**	**Revenues ($millions)**	**Circuit Switches**	**Fiber Route Miles**
AT&T	$7,451	88	11,400	WorldCom	$16,716	120	n/a
WorldCom	$4,894	104	8,811	AT&T	$16,000	246	16,000
Intermedia	$713	31	839	McLeodUSA	$1,800	34	31,000
McLeodUSA	$604	4	7,120	XO	$1,180	39	20,661
ICG	$398	9	4,242	Time Warner Telecom	$775	38	15,249
General Comm.	$247	3	200	Allegiance	$545	26	5,000
RCN	$245	2	1,400	RCN	$520	10	9,030
BTI Telecom	$213	n/a	110	ICG	$480	35	5,500
ITC^DeltaCom	$172	n/a	7,800	Adelphia	$475	28	19,186
ALLTEL	$167	5	0	KMC Telecom	$450	33	2,336
GST Telecom	$163	20	6,632	Network Plus	$410	3	n/a
e.spire	$157	18	1,742	ITC^DeltaCom	$400	42	9,980
Global Crossing	$153	16	0	e.spire	$375	25	3,834
WinStar	$141	27	0	Cox	$350	13	9,000
NEXTLINK	$140	18	2,477	Focal Comm.	$345	19	n/a
Time Warner Telecom	$122	18	6,968	CTC Comm.	$336	2	8,300
CapRock Comm.	$122	n/a	800	General Comm.	$330	3	200
Ionex	$114	n/a	1,400	BTI Telecom	$320	14	4,400
Network Plus	$106	2	0	CoreComm	$300	7	n/a
Electric Lightwave	$101	7	3,091	Global Crossing	$260	24	400
Sources: Telcordia, *Local Exchange Routing Guide (LERG)*; New Paradigm Resources Group. *See* Appendix M.							

Switches. At the time of the *UNE Remand Order*, only 15 CLECs had deployed 10 or more circuit switches, and only 6 had deployed 20 or more. *See* Figure 1. Today, at least 27 CLECs have deployed 10 or more circuit switches, and at least 16 have deployed 20 or more. *See id*. The increase in the size of CLEC data networks has been equally dramatic. At the time of the *UNE Remand Order*, only 20 CLECs had deployed 10 or more packet switches, and only 11 CLECs had deployed 20 or more. Today, at least 27 CLECs have deployed 10 or more packet switches, and at least 23 CLECs have deployed 20 or more. *See* Figure 2.





Fiber, Transport, and High-Capacity Loops. At the time of the *UNE Remand Order*, only 18 CLECs had deployed 1,000 or more route miles of local and long-haul fiber, only 11 had deployed 3,000 or more, and only 8 had deployed 5,000 or more. Today, at least 25 CLECs have deployed 1,000 or more route miles, 16 have deployed 3,000 or more, and 14 have deployed 5,000 or more. *See* Figure 3.



Wireless Alternatives to the Narrowband Loop. At the time of the last UNE review, there were only three "nationwide" mobile telephony operators, as the FCC defines that term.[14] Today, there are six nationwide operators.[15] At the time of the last UNE review, the ten largest mobile wireless operators had an average of 5.1 million subscribers each. Today, the ten largest mobile operators have an average of 9.4 million subscribers each.[16]

Broadband Alternatives to the High-Frequency Loop. At the time of the last UNE review, deployment of broadband was still "in the early stages of development."[17] At that time, cable operators had only about 300,000 broadband customers.[18] Today, by contrast, cable operators have approximately 7.5 million broadband customers.[19]

3. Emergence of Competitive Resale Markets.

Across the board, competition has now advanced to the point that competitive wholesale markets are now emerging. The players in these markets are the markets' own answer to the Commission's UNE regime – they offer reasonably close analogies to unbundled network elements, at wholesale prices.

As discussed in Section III.C, there has been a dramatic increase in fiber supplied by alternative wholesale suppliers. These players typically sell or lease dark fiber to other carriers, but do not themselves engage in the provision of telecommunications services. They have raised about $2 billion in capital since the third quarter of 2000,[20] and analysts expect this market sector to grow rapidly.[21] A Web-based trading pit for the urban fiber that they provide now includes over 35 fiber wholesalers listing "over 10,000 *local* route miles" of fiber[22] in more than 60 cities.[23] For a growing number of CLECs, the fiber provided by these wholesale suppliers satisfies a large part of their demand for last-mile local connectivity and interoffice transport.

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[14] *See Fourth CMRS Report* at 9.

[15] *See Sixth CMRS Report* at 13.

[16] *Compare Fourth CMRS Report*, App. B at Table 4 *with Sixth CMRS Report*, App. C at Table 3.

[17] *First Advanced Service Report* ¶ 16.

[18] *See* Cable Datacom News, *December 1998 Highlights*, http://cabledatacomnews.com/dec98/dec98-1.html.

[19] *See Morgan Stanley Cable Modem/xDSL Report* at Exh. 3 (cable modem subscribers as of 4Q 2001).

[20] P. Brown, *Despite Tighter Purse Strings, Cash Is Still Streaming to Metro Providers*, Tele.com (Aug. 13, 2001) (citing Yankee Group and quoting Blake Bath, telecom analyst at Lehman Brothers Equity Research).

[21] According to consulting firms Cambridge Strategic Management Partners and McKinsey & Co, "[t]he market for reselling . . . dark fiber to ISPs and telecom carriers is projected to grow from about $2 billion today to about $10 billion by 2006." *See* N. Orman, *Networking Startups Battle For Cities*, Silicon Valley/San Jose Bus. J. (Oct. 26, 2001).

[22] D. Mohney, *Fiberloops.com – One-stop Shopping*, ispworld.com (Aug. 22, 2000).

[23] Fiberloops.com, *Find Fiber and Facilities Fast*, http://www.fiberloops.com/Fiberloops/home.html.

Resale markets have likewise developed for the provision of wireless services.[24] As the Commission has noted, wireless resellers "offer service to consumers by purchasing airtime at wholesale rates from facilities-based providers and reselling it at retail prices."[25] According to the Commission's *Sixth CMRS Report*, the top 20 resale providers had just over 3 million subscribers as of year-end 2000, twice as many as they did in 1999.[26] Wireless carriers hammered out wholesale contracts among themselves years ago, to cover "roaming"; intercarrier roaming rates have been rapidly declining.[27] And wireless carriers enter into wholesale deals with large corporate customers, too.[28] At least 20 percent of businesses provide wireless services to their employees through deals they have negotiated with carriers to provide discounted rates for preset call volumes.[29]

A wholesale/resale market for broadband links is now beginning to emerge as well. GTE and AOL began open access trials in 1999, proving that "[c]able providers can easily and affordably open up their networks for high-speed Internet competition."[30] Many cable companies assert that open access will occur naturally, and that it is in both their best interest and that of consumers.[31] And many have already entered into agreements to allow unaffiliated ISPs access to their networks.[32]

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[24] Early on, the Commission granted cellular A-side carriers certain rights to resell the B-side (*i.e.*, typically incumbent wireline) carriers' services, to maintain early competitive parity notwithstanding the head-start that the B-side carriers got in building out their networks. *See* 47 C.F.R. § 20.12 (b)(3). Those resale rights will expire in November 2002, however.

[25] *Sixth CMRS Report* at 34.

[26] *Id.* at 34-35.

[27] *See*, *e.g.*, *Yankee Group State of the Wireless Union Report* at 6; M. Berghausen, Morgan Stanley Dean Witter, Investext Rpt No. 8313844, AllTel Corp.: Initiating Coverage – Company Report at *3 (Dec. 21, 2001).

[28] *See*, *e.g.*, H. Smith, *Verizon Adds to Telematics Stable with Wingcast Partnership*, RCR Wireless News at 2 (Dec. 17, 2001) (The one million-plus users of General Motors' OnStar service in luxury cars, for example, are in fact served via Verizon Wireless's network. Verizon Wireless has entered into a similar agreement with Wingcast, a joint venture between Ford Motor Co. and Qualcomm.).

[29] *See*, *e.g.*, M. Hamblen, *Wireless Merger a Boon for National Coverage*, Computerworld (Sept. 27, 1999).

[30] *GTE Demonstrates Ease of Cable Open Access to Multiple ISPs; Clearwater Trial Shows One-Time Investment of Less Than $1 Per Home Would Provide Consumer Choice*, Bus. Wire (Jan. 14, 1999) (quoting AOL senior vice president George Vradenburg).

[31] *See*, *e.g.*, A. Siedsma, *Gov Watch a Question of Access*, T Sector (Feb. 1, 2001), http://www.thetsector.com/showStory.cfm?ts_story_id=838 (Bill Geppert, VP and GM of Cox in San Diego, emphasized the "strong willingness on the part of broadband providers to offer multiple ISPs as part of their platform," with Cox and other companies "moving in that direction."); M. Martin, *Cable's Connections*, Wash. Bus. J. (Jan. 28, 2000), http://washington.bcentral.com/washington/stories/2000/01/31/focus1.html (George Vradenburg, AOL: "open access promotes consumer choice in high-speed Internet service and will encourage innovation in new Internet applications."); Statements by C. Michael Armstrong, Chairman and Chief Executive Officer, AT&T Corp., in *Telecom Mergers: En Banc Hearing on Telecom Mergers To Discuss Recent Consolidation Activities in the Telecommunications Industry, Focusing on Three of the Proposed Mergers Before the Federal Communications Commission* (Oct. 22, 1998) (open access is "[f]irst . . . the right thing to do. Second, it's in our self-interest. . . . Content is essential to make money in networks. The only way to make money in networks is to have the highest degree of utilization.").

[32] *See, e.g.*, *AT&T Broadband Opens to Other ISPs*, Associated Press (Mar. 13, 2002); M. Mosquera, *Time Warner to Open Cable Network to Earthlink*, Internet Week (Nov. 20, 2000), http://www.internetweek.com/story/

4. Geographic Expansion

The Commission stated in the *UNE Remand Order* that "markets outside of major metropolitan areas . . . have seen minimal competition."[33] That is no longer the case today. CLECs are now using their facilities to serve markets of all sizes, throughout the country. For example, CLECs have obtained collocation arrangements to serve wire centers that contain more than 80 percent of the access lines in the Bell companies' regions.[34] And CLECs are using their own switches to serve customers in wire centers that contain approximately 86 percent of all lines in the Bell companies' regions.[35]

Many CLECs have specifically targeted smaller markets, often precisely because the larger markets have already become saturated with facilities-based competition. Analysts have noted that "[i]n tier 2/3 markets, fundamentals are more favorable primarily due to less available capacity."[36] More than a dozen CLECs have adopted a strategy of specifically serving smaller markets (*e.g.*, Tier II, Tier III, or Tier IV markets). *See* Table 3. In addition, many CLECs that serve larger markets, have expanded into smaller markets as well.[37]

INW20001120S0002; R. Mark, *Cox Begins Its First Open Access Broadband Trials*, Internetnews.com (Nov. 6, 2001), http://www.internetnews.com/isp-news/article/0,,8_917471,00.html.

[33] *UNE Remand Order* ¶ 11.

[34] *See* Section II.A.2, Table 10.

[35] *See* Section II.A.1, Table 5.

[36] J.M Ackor, RBC Capital Markets, Investext Rpt No. 8239217, Broadband Services – Bandwidth Pricing Update – Industry Report at *1 (Oct. 29, 2001).

[37] *See*, *e.g.*, S. Weinburg, C. Shobrook, G. Mycio and L. Singleton, *Appraising the CLEC Landscape*, Xchange Magazine (June 2000), http://www.xchangemag.com/articles/061feat1.html ("The current trend, however, shows that while CLECs are developing a foundation among first-mover small and medium-sized businesses in large markets, there is a trickling downward of services into Tier 2 and 3 markets.").

Table 3. Examples of CLECs That Have Specifically Targeted Smaller Markets	
Advanced TelCom Group	Offers "bundled Internet, broadband data, and voice services to small and medium-sized businesses in third and fourth tier markets throughout the U.S."; targets third and fourth tier cities with populations between 100,000 and 750,000 people and between 50,000 and 200,000 business access lines."
AFN Communications	"AFN is targeting underserved markets . . . 'We think this will clearly give them an opportunity to establish a beachhead. They are targeting a market opportunity that has gone untapped by the current crop of service providers.'"
BayRing Communications	"BayRing is a regional CLEC offering local, long distance, high-speed Internet service, and dedicated access to businesses in Tier 3 markets in New Hampshire and Maine."
Choice One Communications	"Our company currently provides service to clients in 30 second and third-tier markets in eleven states where there are fewer competitors than in larger metropolitan areas."
Cinergy Communications	"The focus for Cinergy Communications is toward small businesses in the region of Southern Indiana and Western Kentucky. Cinergy believes it can offer telecom services to areas that otherwise do not have many choices."
Volaris Online (formerly DUROCOM)	"DUROCOM is a full service, facilities-based provider of Internet data and broadband communications solutions to consumers and small to medium-sized businesses in tier II and tier III markets in the southeastern United States."
e.spire Communications	"e.spire's establishment of footholds in 'uncrowded' Tier 2 and Tier 3 markets represented arguably the company's most significant competitive advantage," says Lizet Tirres, research analyst, Stratecast Partners.
Crescent Telephone	"'Our proven track record in serving rural and suburban customers ideally positions Crescent Telephone to offer complete telecommunications solutions to markets historically underserved by traditional carriers,' said Jacob Roquet, GIEX president and CEO, and founder of CoastalNet and Crescent."
KMC Telecom	"KMC's business has two distinct components: serving communications-intensive customers in markets with populations between 100,000 and 750,000, referred to as Tier III markets, which larger carriers have typically overlooked; and providing data services on a nationwide basis."
Knology	Although CEO Rodger Johnson "admits his markets aren't crowded with competitors, he says the idea that second and third tier markets are less competitive is a myth. 'When you get down to markets with 100,000 [homes], you can't divide that pie up more than about three ways and make it economically viable,' he says."
LecStar Communications	"LecStar focuses on underserved markets in the south… LecStar believes these secondary cities are relatively underserved."
Lightship Telecom	"Lightship Telecom is targeting small to medium-sized businesses in Tier Two and Three markets."
NECLEC	"NECLEC offers voice and data services primarily in Tier Two, Three, and Four cities in the Northeast/Mid-Atlantic region."
Sources: See Appendix M.	

To be sure, facilities-based competition has inevitably emerged earlier in some markets, and later in others. States with larger concentrations of business customers[38] are more attractive

[38] The percentage of switched business lines as a percentage of total switched lines in the state varies from as low as 25 percent (in Tennessee) to as high as 69 percent (in Washington, D.C.). *See FCC Statistics of Common*

to competitors.[39] More rural states are more costly to serve.[40] Regulatory differences have played a major role too. As noted earlier, some states have imposed wholesale rates on ILECs that artificially suppress the emergence of facilities-based competition.[41] Some states opened their local markets to competition before the passage of the 1996 Act, and much earlier than some other states.[42] Some states have set retail rates – particularly for residential customers – very low, which also discourages entry.[43]

B. The Failure of Non Facilities-Based Competition.

Since the last UNE review, many CLECs have attempted to enter local markets very rapidly, on a very large scale, by relying exclusively, or almost so, on UNEs obtained from ILECs. The Commission at one time suggested that these competitors would rely on UNEs only until such time as it "was practical and economically feasible to construct their own networks."[44] Many of these ostensible competitors, however, have adopted business strategies that do not involve deployment of their own facilities at any time in the foreseeable future. Investors have grasped that these business models offer little if any true value to customers. Many of the CLECs pursuing UNE-centric strategies have failed.

Carriers, 2000/2001 ed. at Table 2.4. New York, California, Texas, Illinois, and Ohio are home to the greatest number of Fortune 500 company headquarters – more than 200 companies, collectively. No Fortune 500 company has established its headquarters in 10 states (Alaska, Hawaii, Maine, Montana, New Hampshire, New Mexico, North Dakota, Vermont, West Virginia, and Wyoming). *See Fortune 500 List*, Cincinnati Enquirer (Apr. 2, 2001), http://enquirer.com/editions/2001/04/02/fin_fortune_500_list.html.

[39] *See*, *e.g.*, FCC, *Biennial Regulatory Review 2000 – Staff Report*, App. IV, Pt. 54, 15 FCC Rcd 21089, 21266 (2000) ("Competition for business customers in metropolitan areas has, in general, developed more rapidly than competition for residential customers or customers in rural areas."); *FCC Local Competition Report, Dec. 1998 ed.* at 2 ("Facilities-based CLECs appear to have concentrated in more urbanized areas.").

[40] Rural populations vary widely between states, from a low of 10.6 percent in New Jersey in 1990, to a high of 67.8 percent in Vermont in 1990. *See* U.S. Census Bureau, *Urban and Rural Population: 1900 to 1990* (Oct. 1995) http://www.census.gov/population/censusdata/urpop0090.txt. Under the FCC's USF cost model, costs of providing service vary significantly (by as much as 50 percent of more) between highly rural and highly urban states.

[41] *See*, *e.g.,* James Eisner, FCC, & Dale Lehman, Fort Lewis College, *Regulatory Behavior and Competitive Entry*, for presentation at the 14th Annual Western Conference Center for Research in Regulated Industries, at 2 (June 28, 2001).

[42] *See*, *e.g.*, *Implementation of the Local Competition Provisions in the Telecommunications Act of 1996*, Notice of Proposed Rulemaking, 11 FCC Rcd 14171, ¶ 5 (1996) ("At the time the 1996 Act was signed, 19 states had in place some rules opening local exchange markets to competition, including seven states in which competing firms had already begun to offer switched local service.").

[43] *See Sprint v. FCC*, 274 F.3d 549 (D.C. Cir. 2001) (noting that one of the reasons put forward by the FCC's counsel for low rates of competition in the residential market is that "state commissions have historically set relatively low residential rates . . . allowing the incumbent monopoly to make it up in other aspects of their business."); R. Cowles, *et al*., Gartner Dataquest, *UNEs: Stifling U.S. Broadband Growth and Ineffective in Promoting Local Competition* at 7 (2002) ("Most states have frozen residential basic exchange rates at levels at or below cost. . . . it is the regulators themselves (state regulators and the FCC) that have created this regulatory barrier to competitive entry through a pricing policy that includes subsidy.").

[44] *UNE Remand Order* ¶ 6.

1. The Failure of UNE-Platform Competition.

The UNE Platform is "physically similar to resale. In each case, the CLEC uses the ILEC network to provide service to the end-user and essentially limits its own functions to marketing, inputting the order into the ILEC's systems, and billing."[45] UNE-P requires no incremental investment by a CLEC, but – because of regulatory factors alone – it is generally cheaper than deploying facilities. With the exception of certain vertical features that no more than a few Platform-based CLECs actually provide, end-user customers do not receive any services on any facilities from a UNE-Platform provider that they would not also receive in the simple resale of the ILEC's own service. UNE-P "competition" thus creates little if any opportunity for service differentiation. This competition is not value-added competition at all; it is defined not by expanding output, consumer choice, product quality, or market price, but by federal and state regulators and the TELRIC pricing regime.

As discussed in Section II.A.2, CLECs that rely on the UNE Platform argue that it provides a mechanism for CLECs to build up a customer base before they invest in facilities. But market experience since the time of the *UNE Remand Order* demonstrates that CLECs are not migrating UNE Platform customers to their own facilities to any significant degree (if at all). Many CLECs instead treat UNE-Platform competition as an end in itself, rather than as a stepping stone to facilities-based competition. These CLECs have obtained UNE Platforms to serve mass-market customers but have no plans to convert these customers to their own switches.[46] Conversely, most of the CLECs that serve mass-market customers and that *have* deployed one or more switches of their own make little or no use of unbundled switching from the BOCs.[47]

The UNE-centric CLECs are not only failing to create any facilities-based competition of their own, they have harmed their facilities-based counterparts, too. Facilities-based CLECs recognize that the unrestricted availability of UNEs priced at a regulator's estimation of long-term incremental cost can ruin a business making steep capital investments at here-and-now, real-world prices. As described above, these facilities-based CLECs view the availability of the full UNE Platform as particularly harmful to facilities based competition. *See* Table 1, *supra*.

2. The Failure of the DLEC Model.

"Data CLECs" or DLECs made a similar attempt to jumpstart ubiquitous competition, and were equally unsuccessful. Their business model centered exclusively on providing DSL services. Unlike the UNE-P competitors, the DLECs did typically deploy their own packet switches. But in the broadband market, most of the new value is in getting the broadband loop

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[45] Commerce Capital Markets, *Status and Implications of UNE-Platform in Regional Bell Markets* (Nov. 12, 2001).

[46] *See* Section II.A.2.

[47] *See* Section II.A.2, Figure 4.

itself up and running. That's a difficult challenge on any medium, but an especially difficult one on copper, which wasn't designed for broadband in the first place.[48]

The ILECs themselves have certainly found the deployment of DSL service to be a difficult and costly process[49] – with all the resources at their command, it has taken ILECS more than three years to make the service available to just over 40 percent of the homes they serve.[50] Once the infrastructure is ready for broadband service, it then takes between two and three years to break even on a new DSL customer.[51] The DLECs simply ignored these engineering and economic realities. They cultivated the belief that DSL was easy and inexpensive to deploy.[52] They promised to deploy broadband services faster and more efficiently than incumbent local telephone companies or cable operators.[53]

To grow quickly, the DLECs relied on a business model that centered around resale of the ILECs' loops, with relatively little of the CLECs' own facilities-based investment. In most of the central offices that they intended to serve, the DLECs planned to deploy only a single

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[48] *See*, *e.g.*, L. Gerhardy, *et al.*, Morgan Stanley, Dean Witter, Investext Rpt No. 2262978, Globespan: Initiating Coverage – Company Report at *12 (Aug. 17, 2000) ("While simple in theory, the deployment of high bandwidth services over infrastructures originally designed for simpler purposes has created significant challenges . . . . Most of the Tel-co's wiring infrastructure is decades old, and only a small portion of the frequency spectrum available on the wire was used. However, new digital technologies that exploit the unutilized Telco bandwidth encounter problems from the legacy analog environment for which the infrastructure was designed.").

[49] *See*, *e.g.*, P. Harvey, *The Last Mile is a Rocky Road*, Red Herring (Aug. 1, 2000) ("For DSL providers, one of the biggest hurdles has been the time and expense required to send a truck and technicians to each home that requests service."); Infinilink Corp. White Paper, *Confronting the DSL Bottleneck, or "Why Does It Take So Long to Install DSL?"* (Dec. 2000) (Truck rolls cost on average $300 each, and it takes an industry average of 2.7 truck rolls per DSL line deployed.)

[50] *See JP Morgan Cable Industry Report* at Figures 12 & 36 (estimating that DSL is available to approximately 43 percent of households as of 1Q 2001).

[51] *See*, *e.g.*, G. Miller, *et al.*, ABN AMRO, Investext Rpt No. 8150475, Sprint Corp. – Company Report at *8 (Aug. 9, 2001) ("We point out that DSL today is not profitable for a single carrier out there, including SBC, Verizon, and BellSouth. With a payback period of 18 to 24 months, we do not believe any of these carriers will turn a profit until next year, at the earliest."); *Broadband 2001* at 76 (incremental DSL customers break even on a net present value basis after 3.4 years); J. Bellace and S. Bhasin, Jefferies and Co., DSL Update: U.S. Broadband Penetration Forecasted to Increase from 11% at Year-End 2001 to 17% by Year-End 2002 at 4 (Feb. 4, 2002) ("the number of months it takes to breakeven on a DSL subscriber will decline from 24 months in 2001 to 10 months in 2005.").

[52] *See*, *e.g.*, K. Fong, *et al.*, Hambrecht & Quist Inc., Investext Rpt No. 2658327, Communications Symposium/Data Processing/Telecom – Industry Report at *39 (Apr. 16, 1998) (In early 1998, Covad's chairman proclaimed that "DSL technology is unique in that it has an almost zero cost-per-home pass, an almost zero up-front, fixed-investment cost. . . it can be deployed rapidly because no one has to dig up the streets, no one has to pay franchise fees, and no one has to get city permits to allow this technology to happen."); S. Schmelling, *DCLECs Declassified: The Big Three of Data Are So Much Cooler Than Their Name*, Upstart (Oct. 4, 1999) (Rhythms's CEO likewise noted that "on a level of difficulty, [DSL is a] two on a scale of one to ten.").

[53] For example, in December 1998 – after being operational for just 10 months – one data CLEC proclaimed that it "will be able to provide DSL service to more business customers than all the Baby Bells combined." *NorthPoint Communications Will Surpass Combined Bells' DSL Deployment*, Bus. Wire (Dec. 15, 1998); *see also* J. Henry, *et al.*, Bear, Stearns & Co., Inc., Investext Rpt. No. 2748881, Global Telecommunications: Weekly Performance Review – Industry Report at *3 (Mar. 1, 1999) ("Rather than attempting to establish blanket coverage of each market served in order to provide the densest coverage for its wholesale customers, Rhythms seems intent on establishing the most dots on its national network map as soon as possible.").

piece of equipment – a Digital Subscriber Line Access Multiplexer (DSLAM). DSLAMs vary in price depending on their capacity, but average "well under $200" per customer line – an investment of just $3 per month per line for each customer (conservatively assuming a five-year customer retention rate).[54]

The DLECs did not even intend to provide their own facilities-based connections to the Internet. Instead, they enlisted hundreds of Internet Service Providers to take charge of that end of things. The DLECs themselves acted merely as wholesale brokers – obtaining the loop from an ILEC on one side, and a connection to the Internet through an ISP on the other. The DLECs opted not even to attempt to offer voice services, which would have enabled them to collaborate and share facilities with their sibling voice CLECs.[55] This strategy, the DLECs maintained, would let them grow very rapidly, on very small capital outlays.[56]

More than 20 DLECs began providing service between 1998 and the first quarter of 2000.[57] Nine completed successful initial public offerings (IPOs), raising more than $1.3 billion in capital. The DLECs that went public had been in operation an average of less than 3 years; they had few lines in operation (an average of only 1,545); and they had a very limited cadre of employees (an average of 273). *See* Table 4. The companies themselves routinely admitted that

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[54] D. Burstein, *DSL Prime News: The Inside Source*, CLEC-Planet (Oct. 2, 2001), http://www.clec-planet.com/tech/oct2dslprimea.html; *Broadband 2001* at 70 (cost of buying and operating a DSLAM at $174 per subscriber add); ZD Net, *ZD Net Shopper, Resellers*, http://zdnetshopper.cnet.com/shopping/resellers/0-11796-1411-403544-0.html (the Paradyne HotWire 8800 DSLAM 20 slot chassis – 48VDC costs around $4200 or $210 per slot); D. Burstein, *DSL Prime Newsletter*, CLEC-Planet (May 18, 2001), http://www.clec-planet.com/tech/0517dslprimea.htm ("[T]he primary costs involved [with provisioning DSL] are the shared line ($0-6 per month) and the DSLAM (whose price is under $200/ per line, or $4/month over five years).").

[55] As with ordinary Internet access service, DSL quickly became a commodity-like service, "due to the lack of differentiation in the levels of service and increased competition amongst Service Providers." Cisco Press Release, *Cisco Announces Industry's Most Comprehensive Portfolio of Customer Premises Equipment for Value-Added Business DSL Service* (Sept. 18, 2000). *See also* V. Grover, Kaufman Brothers, Investext Rpt. No. 2205121, Network Access Solutions Corp. – Company Report at *1 (June 28, 2000) ("DLECs . . . are now heavily exposed to commoditization of the access portion of their businesses because they do not own customer relationships and therefore cannot layer enhanced services onto their revenue streams."); V. Ryan, *Headed for a Fall?*, Telephone (Dec. 18, 2000) ("DSL wholesalers are trying to rescue customers from bankrupt ISPs and adapt to the commoditization of their primary business."); K. Higgins, *Intelligence at the Network Edge*, Network World at 41 (Aug. 21, 2000) ("customers . . . increasingly regard high-speed Internet access as a commodity. To compete successfully, DSL service providers must differentiate themselves by offering a range of value-added services, including multiline, toll-quality voice service; VPNs; frame relay; videostreaming; and emerging productivity and entertainment applications.").

[56] R. King, *Run Silent; Run Deep*, Tele.com at 70 (Apr. 1998) (quoting Covad's chairman stating that reliance on ISP important in order "to be able to roll the service out quickly and get the maximum amount of volume on our service that we can."); Rhythms NetConnections, Form 10-K405 at 7 (SEC filed Mar. 30, 2000) (relying on an ISP will "increase[] volume and reduce[] costs by serving multiple resellers and leveraging their selling efforts."); NorthPoint Communications Group, Form 10-K405 (SEC filed Mar. 30, 2000) (relying on ISPs would "enabl[e] [its] sales force to focus on prospective high-volume wholesale customers; amortize the cost of [its] fixed capital expenses over large base of end users more rapidly; minimize [its] end user support costs; and achieve a nationwide presence more quickly.").

[57] An additional 18 traditional CLECs also began offering DSL services during this period.

their business models and strategies were "unproven"[58] and had not been "validated . . . in the market."[59]

Table 4. Operating Statistics for Public DLECs at Time of IPO						
	Date of IPO	**Funds Raised by IPO**	**Employees**	**Annual Revenue**	**Annual Losses**	**DSL Lines in Service**
Choice One	02/16/00	$164M	390	$11.7M	$34M	206
Covad	01/22/99	$150M	335	$2.6M	$28M	1,948
DSL.net	10/12/99	$50M	146	$184,000	$6.5M	463
Log On America	04/22/99	$25M	13	$760,000	$422,000	n/a
Mpower	05/15/98	$63M	145	$3.8M	$10.8M	0
Net2000	03/10/00	$212M	485	$28M	$39M	n/a
NAS	06/03/99	$82M	141	$4.8M	$2.5M	300
NorthPoint	05/05/99	$386M	423	$931,000	$29M	5,700
Rhythms	04/12/99	$210M	400	$528,000	$36M	650
Sources: See Appendix M.						

Then, between March and December 2000, the Internet bubble burst. The nine publicly traded DLECs lost more than 94 percent of their stock-market value. Industry insiders attributed this to the DLECs' "unsound business models," their failure to "own the physical layer," and their decision to "run[] on another firm's network."[60]

The failed DLECs were eventually absorbed by more successful CLECs, often at a bargain price. AT&T and WorldCom acquired the two largest failed DLECs – NorthPoint and Rhythms; several other DLECs were likewise acquired by successful CLECs.[61] Significantly, in

[58] NorthPoint Communications, Form S-1 (SEC filed Feb. 26, 1999).

[59] Rhythms NetConnections, Form S-1 (SEC filed Feb. 16, 1999).

[60] L. LaBarba, *Who's Saving Whom?*, Telephony (Dec. 18, 2000) (quoting Russ Intravartolo, CEO of ISP wholesaler Starnet: "There is no profitable way into DSL unless you own the physical layer."); *id.* (quoting Gary Steele, vice president of product development for PathNet: "What's going on in the industry may not be consolidation as much as it is the death of unsound business models."); M. Martin, *Caution Flags Flying as CLEC Woes Mount*, Network World (Nov. 20, 2000), http://www.nwfusion.com/news/2000/1120clec.html (quoting Current Analysis analyst Jeff Moore: "It's hard to be profitable when you're running on another firm's network."); *Regional DSL Report: Boston*, ISP Planet (Dec. 15, 2000), http://www.isp-planet.com/news/dsl_report_boston.html (quoting Vitts CEO and Chairman: The DSL providers "adhere[d] to business plans resembling those of failed dot-com retailers: grow big and fast, no matter the cost of 'buying' customers."); S. Woolley, *Highway to Hell*, Forbes (Feb. 19, 2001) ("The whole structure made zero sense from an economic standpoint.").

[61] *See*, *e.g.*, WorldCom Press Release, *WorldCom Closes Rhythms Transaction* (Dec. 5, 2001) (WorldCom acquired the assets of Rhythms NetConnections for $31 million. The deal was closed approximately one month in advance, resulting in a more than 20 percent reduction in acquisition cost.); AT&T News Release, *AT&T Acquires Assets of NorthPoint Communications* (Mar. 22, 2001) (AT&T acquired "substantially all of the assets of NorthPoint Communications" for approximately $135 million. "We are delighted to be acquiring NorthPoint's DSL assets," said Robert M. Aquilina, co-president of AT&T Consumer. "They will help us in our efforts to move aggressively to bring the full benefits of DSL to consumers and businesses. These benefits include high-speed Internet access, local and long distance calling, and exciting broadband services, including virtual private networks, among other possibilities, in the future."); Cavalier Telephone Press Release, *Cavalier Telephone Completes Purchase of Net2000 Communications*

some of these cases, the acquiring CLEC took only the assets of the failed DLEC – primarily collocation space – not its customers.[62] If they had viewed "rapid" and "ubiquitous" entry as the keys to the competitive success, the acquiring companies would presumably have done just the opposite.

C. Anti-Competitive Impacts of Expanding UNEs into Competitive Markets.

While the unbundling regime was intended to promote competition for local exchange services,[63] both interexchange carriers and wireless carriers have demanded that ILECs also unbundle the inputs used in the provision of long distance and wireless services. These complementary markets are already competitive in their own right. Extending unbundling into these markets is, therefore, not only unnecessary to assure continued competition in those markets, but also likely to undermine the competitive supply of facilities that already has emerged for the local inputs in these markets.

1. Conversion of Special Access Circuits to UNEs.

"Special access" is the name given to "a variety of services and facilities which constitute the local portion of certain interstate telecommunications lines."[64] Special access "primarily involves the provisioning of so-called 'private lines,' that is, facilities or network transmission capacity dedicated to the use of an individual customer."[65] These dedicated facilities typically "run directly between the end user and the [interexchange carrier's] point of presence (POP),"[66] or directly between two end-user locations. When ILECs provide special access circuits to interexchange carriers, the ILECs must typically build those circuits from the ground up, using a combination of local loops and interoffice transport.

The customers for special access "are IXCs and large businesses, not residential or small business end users."[67] In fact, between 78 and 89 percent of the special access revenue earned

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(Jan. 21, 2002) (Cavalier Telephone acquired the assets and customer lines of Net2000 in Virginia, Maryland, and Washington, D.C.; Broadview will acquire Net2000's assets in New York and Boston).

[62] *See*, *e.g.*, J. Borland, *AT&T Buys NorthPoint Assets*, CNET News.com (Mar. 22, 2001), http://news.com.com/2100-1033-254629.html?legacy=cnet ("AT&T is not taking over NorthPoint's customers along with the network.").

[63] *UNE Remand Order* ¶ 5 ("We continue to believe that the ability of requesting carriers to use unbundled network elements, including various combinations of unbundled network elements, is integral to achieving Congress' objective of promoting rapid competition to all consumers in the local telecommunications market."); *id.* ¶ 9 ("The unbundling standards we adopt in this Order [] seek to encourage the rapid introduction of competition in all markets.").

[64] *Investigation of Special Access Tariffs of Local Exchange Carriers*, 8 FCC Rcd 4712, ¶ 2 (1993).

[65] *Id.*

[66] *Pricing Flexibility Order* ¶ 8.

[67] *Pricing Flexibility Order* ¶ 142. *See also WorldCom v. FCC*, 238 F.3d. 449, 453 (D.C. Cir. 2001) ("Most users of special access services are companies with high call volumes."); Corrected Brief for Federal Communications Commission at 4, *WorldCom v. FCC*, No. 99-1395, *et al.* (D.C. Cir. filed Sept. 12, 2000) ("Because special access services employ dedicated facilities, special access is typically used by IXCs and large businesses with high traffic volumes."); Brief of MCI WorldCom, Petitioners and Supporting Intervenors at 3-4, *WorldCom v. FCC*, No. 99-1395, *et al.* (D.C. Cir. filed Sept. 8, 2000) ("Special access, used generally by business customers who have a high volume of

by BellSouth, Qwest, SBC, and Verizon is generated from DS-1 circuits or above (*e.g.*, DS-3, OC-3).[68] And as the Commission has recognized, DS-1 circuits "are primarily used by business customers."[69]

The largest purchasers of special access service are interexchange carriers, which use special access to transport large volumes of traffic to and from their largest business customers.[70] Between 56 and 76 percent of the special access revenue earned by BellSouth, Qwest, SBC, and Verizon is generated by interexchange carriers. The Commission has noted that long distance carriers "typically provide resold special access and private line services as part of toll service operations."[71]

Special access traffic is also highly concentrated, geographically. In each of the BOC regions, the vast majority of special access revenue is generated in a very small minority of wire centers.[72]

The special access market is already highly competitive. It was among the first to be opened to competition, and it has attracted large numbers of competitors because of the extremely large traffic volumes that it involves. The only economic argument for permitting the

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calls, is accomplished 'via a private, dedicated line…running from the customer to the IXC' . . . By contrast, switched access connections are generally used by residential customers and other customers with lower traffic volumes.") (internal citations omitted).

[68] USTA, *Competition for Special Access Service, High-Capacity Loops, and Interoffice Transport*, CC Docket No. 96-98, at 2 & Table 1 (FCC filed Apr. 5, 2001).

[69] *See*, *e.g.*, *Second Advanced Services Report* ¶ 99.

[70] The big three interexchange carriers are not only the largest purchasers of special access service from incumbent LECs, but also major self-suppliers of special access. AT&T and WorldCom, for example, each has local facilities in approximately 100 markets that likely are used to provide special access services. *See NPRG CLEC Report 2002, 15th ed.*, Ch. 6 – WorldCom at 13, 18 & AT&T at 19, 24. Sprint has stated that it is deploying local fiber rings in "20 major U.S. markets" that allow "improved access economics," and enable Sprint "to significantly reduce its special access costs." Sprint News Release, *Sprint Announces Financial Targets and Growth Strategies* (Nov. 3, 2000). Other long distance providers – including Williams, Level 3, and Global Crossing – likewise have extensive local facilities that they use to self-provide special access services. *See*, *e.g.*, C. Grice, *Williams to Expand High-Speed Network into 50 Cities,* News.com (Feb. 10, 2000), http://news.cnet.com/news/0-1004-200-1546995.html?tag=st (Williams "expects to spend $421 million over three years in order to link its proposed 33,000-mile fiber-optic 'backbone' network directly to business customers in the nation's largest cities."); Level 3 Communications, *The Level 3 Network*, http://www.level3.com/673.html (Level 3 has 57 markets in service and almost 16,000 miles of conduit in North America); Global Crossing Press Release, *Global Crossing Reports 2000 Pro Forma Cash Revenue up 36%, Recurring Adjusted EBITDA up 54% from 1999* (Feb. 14, 2001) (in 2000, Global Crossing completed metro rings in 10 cities in the United States: New York, Philadelphia, Washington D.C., Atlanta, Miami, Dallas, Chicago, San Francisco, San Jose, and Los Angeles).

[71] FCC, *Local Telephone Competition at the New Millennium* at Table 6, note **** (Aug. 2000).

[72] More than 80 percent of SBC's special access revenues are generated in less than 25 percent of the wire centers in which it is providing special access. In Verizon's region, more than 80 percent of special access revenues are generated from about 20 percent of Verizon's total wire centers. In Qwest's region, more than 60 percent of special access revenues are generated from 11 percent of Qwest's total wire centers. In BellSouth's region, 91 percent of special access revenues are generated from 20 percent of BellSouth's total wire centers. USTA, *Competition for Special Access Service, High-Capacity Loops, and Interoffice Transport*, CC Docket No. 96-98, at 3 (FCC filed Apr. 5, 2001).

conversion of special access circuits into UNEs is that it would supposedly reduce the costs of the inputs that interexchange carriers use in the provision of long distance services. But as the Commission has recognized, the long distance market already is competitive for large business customers that are the primary end-users served with special access circuits.[73] Any regulatory action that merely reduces the prices that one of the competitive suppliers of special access may charge is, therefore, unnecessary to promote long distance competition.

Any such action would devalue the assets of other competitive suppliers in this market. CLECs as a group are more significant suppliers of special access service than basic local exchange service. As the Commission has found, "the revenues of competitive LECs come primarily from special access and local private line services."[74] CLECs now account for between 28 and 39 percent of all special access revenue, *see* Appendix L, which is significantly larger than their share of the local exchange market as a whole.[75] CLECs have obtained fiber-based collocation in wire centers that contain a significant share of BOC special access revenues.[76]

2. Conversion of Transmission Services for Wireless Carriers.

Some wireless carriers suggest that CMRS base stations are equivalent to ILEC end offices, and that wireless carriers are therefore entitled to buy "interoffice transport," at UNE rates, between various points on their networks.

Wireless carriers clearly do not need access to transport UNEs to compete in wireless markets themselves. The 1996 Act authorized ILEC wireless affiliates to enter long-distance markets immediately, without waiting for any unbundling or section 271 checklist approval by their wireline affiliates.[77] As the Commission's sixth annual report ("*Sixth CMRS Report*") on competition in Commercial Mobile Radio Services (CMRS) concluded in December 2001, U.S. wireless markets are robustly competitive, and growing more so year by year.[78] While ILEC

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[73] *See Revisions to Price Cap Rules for AT&T Corp.*, Report and Order, 10 FCC Rcd 3009, ¶¶ 16-18 (1995); *see also Motion of AT&T Corp. to be Reclassified as a Non-Dominant Carrier*, Order, 11 FCC Rcd 3271, ¶¶ 88-90 (1995).

[74] *See*, *e.g.*, *Promotion of Competitive Networks in Local Telecommunications Markets*, First Report and Order and Further Notice of Proposed Rulemaking in WT Docket No. 99-217, Fifth Report and Order and Memorandum Opinion and Order in CC Docket No. 96-98, and Fourth Report and Order and Memorandum Opinion and Order in CC Docket No. 88-57, 15 FCC Rcd 22983, ¶ 24 (2000).

[75] *See* Section I.D.

[76] *See* USTA, *Competition for Special Access Service, High-Capacity Loops, and Interoffice Transport*, CC Docket No. 96-98, at 6-7 (FCC filed Apr. 5, 2001) (In 183 of the 320 MSAs served by BellSouth, Qwest, SBC, and Verizon, one or more fiber based collocation arrangements existed in wire centers that cover at least 30 percent of the incumbent LECs' special access revenues in those MSAs. In 154 of these MSAs, one or more collocation arrangements exist in wire centers that cover at least 65 percent of the incumbent LEC's special access revenues in those MSAs.).

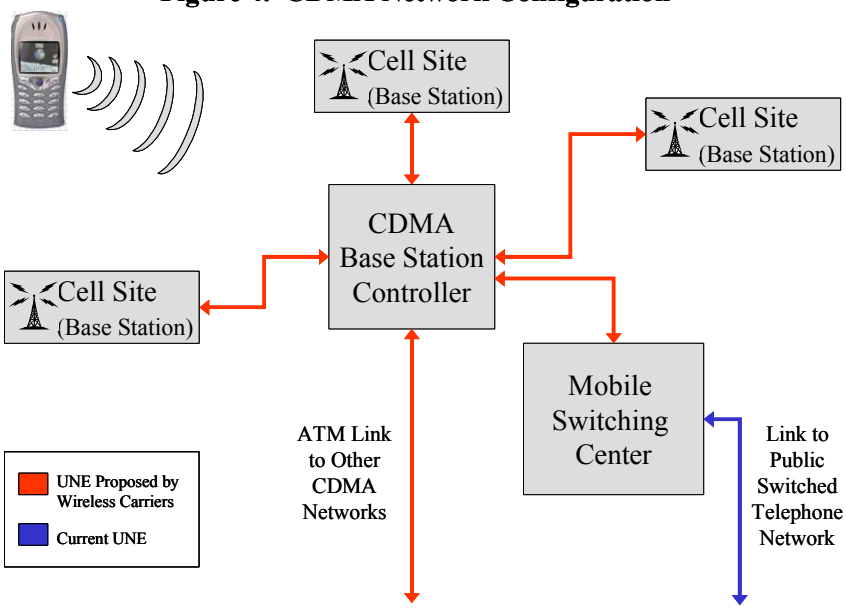
[77] 47 U.S.C. § 271(g)(3).

[78] *See*, *e.g.*, *Sixth CMRS Report* 4-5 ("In the year 2000, the CMRS industry continued to experience increased competition and innovation as evidenced by lower prices for consumers and increased diversity of service offerings."). The Commission cited that the "continued downward price trends, churn, and continued expansion of mobile networks

affiliates rank as robust competitors in wireless markets, unaffiliated wireless carriers are more than holding their own. Approximately 40 percent of the wireless market is served by carriers that are not affiliated with any ILEC.[79]

Wireless networks consist of four basic tiers. *See* Figure 4.[80] The first three tiers define the *wireless* tier of the wireless carrier's network; the fourth tier both switches wireless calls and hands them off to and from the wireline network.[81] All of the true switching is performed at the fourth level.

Figure 4. CDMA Network Configuration



The base station is not a switch – its purpose is to allocate a shared resource – wireless bandwidth – among multiple users of the network who aren't all using their wireless phones at the same time. It is the *mobile switching center* – not the base station itself – that orchestrates the intra-switch hand off when a user moves away from base station A and toward base station B. And likewise for the hand-off required when the user moves on toward a more distant base station C, which is connected to an entirely different switch. The switches themselves are linked to an ATM network that is there to support these "soft," inter-switch handoffs of live calls. The base station plays no more role in orchestrating the hand off than the wireless handset does – all of these tiers of the network remain under the direction and control of the switch. And in any

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into new and existing markets demonstrate a high level of competition for mobile telephony customers. . . . Most carriers report churn rates between 1.5 percent and 3 percent per month. . . . According to one recent survey, almost one in five wireless subscribers have switched carriers in the past year." *Sixth CMRS Report* at 21, 23.

[79] *See Legg Mason Wireless Industry Scorecard* at Exh. 8 (estimated market share as of 3Q 2001).

[80] *See* Nortel Networks, *Products and Services, CDMA Networks*, http://www.nortelnetworks.com/products/01/cdma/index.html#.

[81] *See* Nortel Networks, *The DMS-100 Wireless System* at 3, Document No. 50171.16/10-97 Issue 1.

event, the hand-offs themselves are not equivalent to switching; they occur to support efficient use of radio spectrum in a cellular architecture network, not the routing of calls between end-users.

3. Conversion of Broadband Services for Information Service Providers.

The provision of information services is highly competitive, and has been deregulated for more than 30 years. While information services providers sometimes use parts of the local exchange network to provide service to end users, they do so by obtaining tariffed services from ILECs. The 1996 Act makes clear that UNEs cannot be used to provide an information service.[82]

CLECs have nonetheless attempted to insert themselves between ILECs and information services providers by converting tariffed customer services into UNE-centered services. Various CLECs have obtained UNEs to provide connections between end-user customers and those customers' ISPs. This is what data CLECs like Covad do with respect to broadband Internet access. The CLEC in this scenario is typically little more than a regulatory fiction – a device to use a particular regulatory classification to obtain UNE-based "carrier" connections and prices lower than those available to mere "customers." The CLEC adds little if any value of its own.

The extension of UNEs into the information services realm is surely not necessary to promote competition for these services. Competition has evolved rapidly without such UNEs. For example, there are now more than 7,000 providers of narrowband Internet access, and the Bell companies collectively provide service to fewer than 6 percent of the subscribers to these services.[83] Nor is the extension of UNEs to serve ISPs necessary to promote competition in the broadband market. As discussed in Section IV.C, the provision of broadband services is already highly competitive.

D. Facilities-Based Investment in New Broadband Infrastructure.

The "widespread deployment of broadband infrastructure has become the central communications policy objective of the day." This will require "the complete or near-complete replacement of copper lines with end-to-end fiber optic transmission facilities."[84] To promote the objective, "broadband services should exist in a minimal regulatory environment that promotes investment and innovation in a competitive market."[85]

Manufacturers of computers and other types of hardware that use bandwidth are all but unanimous in their view that – as Intel CEO Craig Barrett puts it, "broadband" only "gets exciting when you get to 5 megabits per second or even 100 mbps."[86] What ranks as

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[82] *See* 47 U.S.C. § 251(c)(3).

[83] *See* P. Fusco, *Top U.S. ISPs by Subscriber: 2001 Year End*, ISP-Planet.com (Feb. 11, 2002), http://www.isp-planet.com/research/rankings/usa.html.

[84] *Appropriate Framework for Broadband Access to the Internet over Wireline Facilities*, Notice of Proposed Rulemaking, 17 FCC Rcd 3019, ¶¶ 1, 12 (2002).

[85] *Id.* ¶ 5.

[86] J. Shiver, *Intel CEO Makes Case for Broadband Aid*, L.A. Times (Jan. 28, 2002).

"broadband" today "is not sufficient to provide some of the serious content people are interested in."[87] Surveys already confirm that consumers who obtain broadband connections use the Internet more, not less.[88] Higher speed connections don't merely accelerate – and thus shorten – connections – they immediately lead to new uses and thus, *longer* connections.[89] As the Commission recognized in its *First Advanced Services Report*, broadband links become part of a self-reinforcing "virtuous cycle," in which better performance and lower per-bit price "fuels more demand" – heavier use of existing applications, and, more importantly, "demand for new applications that were not feasible before."[90] "As the cycle gains momentum . . . companies will provide new applications and services for broadband consumers, . . . consumers will demand broadband, and the virtuous cycle will accelerate."[91] *See* Table 5.

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[87] *Id*. As Intel has stressed, "the true benefits of broadband will require faster transmission speeds" – "at only 200 kbps, 'advanced services' are not capable of providing adequate transmission speeds for video." Comments of Intel Corp. at 5, *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996*, CC Docket No. 98-146 (FCC filed Sept. 24, 2001). "High-definition video requires 19.8 Mbps; DVD-quality video needs almost 4 Mbps; and even television quality requires 750 kbps or more. In fact, 'many experts set 100 Mbps as the frontier [of the Web's true potential for] general surfing to streaming high-quality, skip-free digital audio and video, as well as faster upload of graphic images and larger files.'" *Id.* Corning likewise has suggested that "[a] minimum transmission speed of 10 mbps upstream and downstream should be utilized for the purpose of defining next generation broadband capability. . . . This speed is necessary to allow for the bi-directional transmission of audio, data at 10 base-T Ethernet speeds, and compressed full motion video." Comments of Corning Inc., *Deployment of Broadband Networks and Advanced Telecommunications*, Docket No. 011109273-1273-01 (NTIA filed Dec. 19, 2001). But Corning stressed that "10 mbps is a minimal level of transmission," that the range really extends from 10 mbps to 1 Gbps. *Id.* Corning senior vice president Timothy Reagan told the House Energy and Commerce Committee that "[i]f you think that Americans will need access to information in all its forms – audio, video, and data – it is easy . . . to see that a capability in excess of 22 [Mbps] downstream and 10 [Mbps] upstream is ideal." Timothy Regan, Senior Vice President, Corning Inc., prepared witness testimony before the House Energy and Commerce Committee, Washington, D.C. (Apr. 25, 2001).

[88] *See*, *e.g.*, *Broadband 2001* at Charts 16 and 17 (as broadband users, survey participants spent on average 21.4 hours per month online, as compared to 15.9 hours with a narrowband connection. These same users also spent more time per session (32 minutes vs. 21 minutes), spent more days online (18 vs. 17) and viewed more pages per month (1,828 vs. 1,561)); Jupiter Media Metrix Press Release, *Over 40 Percent of US Online Households to Connect Via Broadband by 2006, Reports Jupiter Media Metrix* (Oct. 17, 2001) ("Broadband consumers continue to use their connections more intensively than narrowband consumers do…").

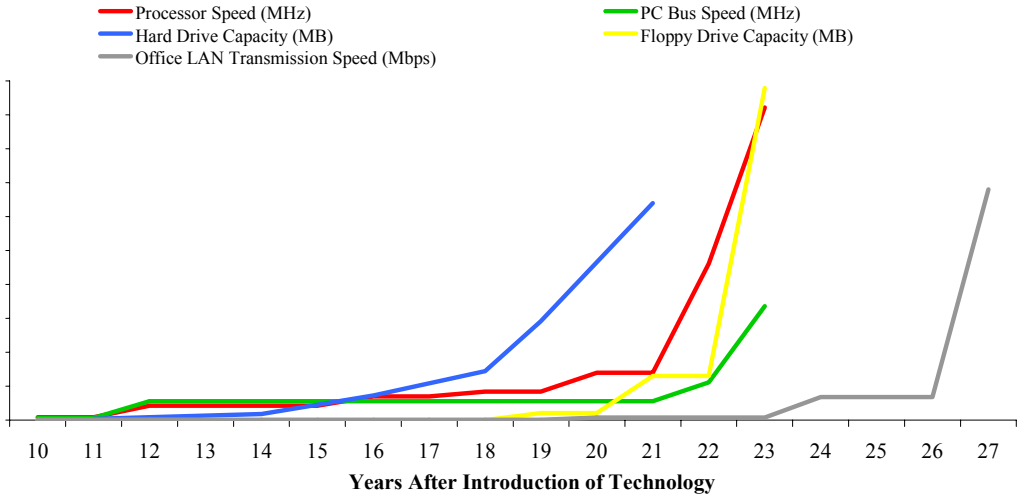
[89] According to a Broadband Watch study, customers are using broadband to engage in online activities such as shopping online (95 percent), e-mailing photos (76 percent), downloading streaming video (64 percent), downloading MP3s (61 percent), telecommuting (60 percent), creating Web pages (49 percent) and playing games (47 percent). Respondents also reported that with DSL, they are much more likely to engage in these higher-bandwidth activities: downloading MP3s: 61 percent with DSL vs. 35 percent with dial-up; downloading video: 64 percent with DSL vs. 36 percent with dial-up; and e-mailing photos: 76 percent with DSL vs. 62 percent with dial-up. *See Survey Says: DSL Users "Addicted" to Broadband*, Bus. Wire (Apr. 3, 2001). *See also* Jupiter Media Metrix Press Release, *Over 40 Percent of US Online Households to Connect Via Broadband by 2006, Reports Jupiter Media Metrix* (Oct. 17, 2001) ("Broadband users are more likely than dial-up users are to download music (46 percent of broadband users, 26 percent of dial-up users), listen to music (48 percent and 30 percent, respectively) and watch video (36 percent and 18 percent, respectively). . . . [M]ore broadband consumers conduct personal banking (48 percent and 30 percent, respectively) and stock-related activities online (35 percent and 23 percent, respectively) than dial-up consumers do.").

[90] *First Advanced Services Report* ¶ 95.

[91] *First Advanced Services Report* ¶ 96.

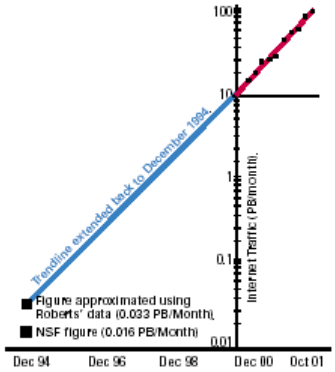
Table 5. Emerging Broadband Applications		
Application	**Minimum Speed**	
Next-Generation Game Consoles (*e.g.*, Microsoft Xbox)	200 kbps	"You need to have a broadband connection . . . to use the Xbox online service." "Broadband access makes possible an explosion of multiplayer games."
Online Gaming	200 kbps	"As broadband connections become more standard, the online gaming industry is poised to deliver gaming experiences that are more enjoyable and exciting than anything we have seen so far."
Downloading Music	200 kbps	"Most MP3 files are between 2MB and 5MB in size. Downloading that much data through a narrowband pipe is horribly tedious, especially if you're trying to build an extensive music library on your hard drive. But with cable, DSL, or satellite, the tunes reach your hard drive in a relative flash."
Internet Radio	200 kbps	"Though [Internet radio] is possible with a dialup connection, it doesn't work so well because the signal often gets clogged in the narrow pipe. But with broadband, the music or talk usually reaches your ears as it was originally sung, played, or spoken."
Telemedicine – Distance Diagnosis	384 kbps	"The majority of [distance] diagnoses could be determined using [a] 384 kbps link, with slight improvement when the bandwidth was increased to 1 mbps."
Distance Learning	384 kbps	"H.320 [the lowest speed distance-learning standard] provides high-quality images at any speed from 384 Kbps and up."
Video-on-Demand (*e.g.*, Microsoft/ CinemaNow's PatchBay)	500 kbps	"[V]ideo-on-demand will remain out of reach for most U.S. households in the near future, including all homes using dial-up internet access and even the vast majority of broadband households."
Streaming Video	600 kbps	"[A] minimum 600-Kbps and maximum 800-Kbps video stream to each modem [is] enough to provide each user half a computer screen of 'TV-quality' video synched with its audio at all times."
Full-Length Video Downloads	1 Mbps	"Downloading a full-length feature over a fast broadband connection at 1 mebabit per second (Mbps) takes about 30 minutes. Over a slow broadband connection of 128 kilobits per second (Kbps), it could take hours."
Videoconferencing	1.5 Mbps	"The target for videoconferencing is 30 fps (broadcast quality) but requires bandwidth in the range of 1.5 mbps."
Telesurgery	10 Mbps	For a recent telesurgery by a doctor in New York on a patient in France, France Telecom "needed to guarantee 10 Mbps and continuous transmission delays of less than 200 milliseconds, on both inbound and outbound links."
Sources: See Appendix M.		

Figure 5. Increase in Speed/Bandwidth of Various Technologies



Sources: See Appendix M.

Figure 6. Internet Backbone Traffic Growth



Source: Gilder Technology Report. See Appendix M.

From the consumer's perspective, demand for bandwidth – raw digital capacity and speed – has been rising very fast for the last decade – just as demand for speed and capacity in all the hardware that links up to the digital networks as been rising inexorably for the past two decades. *See* Figures 5 & 6. What ranks as "broad" today no longer will a few years hence. Most of the applications that will generate data traffic five years hence aren't running today, at least not in any way comparable to what they will become. Most of the users of "broadband services" today aren't yet using those services for what they will be using them for in the fairly near future. Most of today's "broadband" infrastructure, both wired and wireless, will have to be upgraded again and again, indefinitely into the future, to meet the continuous rise in demand.

Many residential applications are now emerging, from high-speed games to telecommuting to telemedicine, that will push residential consumers toward symmetric broadband services. As the chief of the Commission's Media Bureau recently observed, "current generation 'broadband' networks cannot support . . . killer apps, the predecessors of which are

staring us right in the face."[92] Such applications will require "next generation of broadband network – one that presumably will be symmetrical, or nearly so, and capable of delivering perhaps ten megabits per second."[93]

As the Commission itself recently concluded, much of the copper distribution plant will have to be replaced with fiber.[94] One analyst estimates that "modernizing our wireline access infrastructure will likely cost over $200 billion from start to finish," and that this investment will have to be made "without a firm grasp of what services will be demanded and at what price they will be purchased."[95]

Wireless broadband services are coming, too. A number of U.S. CMRS carriers have already deployed 2.5G[96] services which allow users to access the Internet at speeds up to 144 kbps, a significant improvement over widely deployed 2G services, with top speeds around 10 kbps.[97] 3G networks will be needed for true broadband.[98] Although the FCC has yet to allocate additional spectrum specifically for 3G wireless services, a number of companies already are in the process of deploying 3G networks over their existing spectrum. Verizon Wireless recently launched its 3G service in markets covering one-third of the company's national footprint.[99]

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[92] W. Kenneth Ferree, Chief, Cable Services Bureau, FCC, *How* Do *You Build the Information Superhighway?*, remarks at the Broadband Outlook 2002 Conference (Jan. 23, 2002).

[93] *Id*.

[94] *See Appropriate Framework for Broadband Access to the Internet over Wireline Facilities*, Notice of Proposed Rulemaking, ¶ 12, CC Docket No. 02-33, FCC 02-42 (rel. Feb. 15, 2002) ("[t]he logical technological evolution of the network is the complete or near-complete replacement of copper lines with end-to-end fiber optic transmission facilities."); *see also* I. Burgess, Credit Suisse First Boston, Investext Rpt. No. 2989479, European Telecom Equipment Weekly Update - Industry Report at *4 (Nov. 12, 1999) ("Ultimately the limitations of copper cable ensure that the economic solution is to push fibre deeper and deeper into the network, closer and closer to the user."); M. Suydam, *Passive Aggressive*, CommVerge at 40 (May 1, 2001) ("[Passive Optical Networking] is obviously much better than copper. While DSL is hot today, how long will that last? Eventually, everything will go into fiber.") (quoting Dong Liu, strategic marketing manager for networking and interface products, Agere Systems).

[95] Douglas Ashton, Bear Stearns and Co., prepared witness testimony before the House Energy and Commerce Committee, Washington, D.C. (Apr. 25, 2001).

[96] *See Sixth CMRS Report* at 48 ("the term 2.5G is used to describe the interim technologies that carriers will use while migrating from their current 2G technologies in order to offer mobile data services at higher speeds.")

[97] Carriers who have deployed 2.5G services include VoiceStream, Cingular Wireless, and AT&T Wireless. *See Legg Mason Wireless Industry Scorecard* at 28; 3G Newsroom.com, *What Is 3G?*, http://www.3gnewsroom.com/html/what_is_3g/index.shtml (updated Nov. 18, 2001).

[98] *See*, *e.g.*, J. Haring, H. Shooshan, and K. Pehrsson, Strategic Policy Research, *White Paper on Elimination of the Spectrum Cap* at 6 (Apr. 12, 2001) *attached to* Comments of Cingular Wireless LLC in *2000 Biennial Review Spectrum Aggregation Limits for Commercial Mobile Radio Services*, WT Docket No. 01-14 (FCC filed Apr. 13, 2001) ("3G services will provide the advantages of allowing internet browsing on the move, and will be 'always on' – *i.e.*, no need to establish a network connection each time the user wants to receive e-mail or surf the web.").

[99] Verizon Wireless Press Release, *Verizon Wireless Launches Nation's First Major Advanced Wireless Network: The Verizon Wireless Express Network* (Jan. 28, 2002); Verizon Wireless Press Release, *Verizon Wireless Introduces Express Network to Key U.S. Cities in the Midwest, South, Northeast and the Pacific Northwest* (Apr. 2, 2002).

Sprint PCS is expected to follow within the first half of 2002.[100] Analysts predict that 3G networks will be widely deployed by 2004 or 2005.[101]

The Commission also has recently taken the first steps to "pave the way for new types of products incorporating ultra-wideband (UWB) technology"[102] – devices that "can operate using spectrum occupied by existing radio services without causing interference,"[103] and to explore the introduction of "software defined radio" (SDR) technology that could allow a single device to be quickly reprogrammed to transmit and receive on any frequency within a wide range using virtually any transmission format.[104] There also are a host of other technologies currently under development that will be capable of provisioning wireless broadband services. These include Digital SMR, 2 GHz MSS satellite systems, L-Band satellites, and Big LEO satellites.

The strongest incentive 3G carriers and other wireless carriers have today to accelerate the roll out of their broadband wireless services is to capture from incumbent cable operators and ILECs a share of the profitable ($40-$50 per month) broadband subscription fees. A UNE policy that promotes uneconomic competition over the high-frequency portion of the ILEC loop, based on excessively discounted TELRIC prices, will surely depress investment in the high-frequency portions of the airwaves themselves.

Finally, the Commission has recognized that fixed wireless access offers "a replacement for the 'last mile' of copper wire."[105] Recent advancements in fixed wireless technologies are expected to "cause a spur in service provider deployments."[106] In particular, Non-Line-of-Sight

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[100] *See* B. Chamy, *VoiceStream Launches New Phone Network*, CNET News.com (Nov. 14, 2001), http://news.com.com/2100-1033-275853.html?; *see also Sixth CMRS Report* at App. D, Tables 1 & 2 (showing the various 3G contracts and tests/trials already underway in the U.S.).

[101] *See*, *e.g.*, *IDC Wireless Displacement Report* at 20 (By the 2003-2004 timeframe, 2.5G and 3G end-user terminals . . . are expected to be available in mass market quantities."); P. Jarich and R. Haley, Strategis Group, *Fixed Wireless: The Emerging Vendor Landscape* at 208 (Nov. 2001) ("U.S. carriers are planning to deploy high-speed mobile networks as early as year-end 2001…. the 2004-2005 timeframe is seen to be pivotal for the development of the 3G market."); T. Robillard, Salomon Smith Barney, Investext Rpt. No. 2421674, 3G Odyssey: Infrastructure the Opportunity; Timing the Risk – Industry Report at *1 (Jan. 3, 2001) ("We believe 2G capacity driven spending will represent majority of [revenues] in 01 and 02 while 3G should add to sales and is unlikely to represent majority of [infrastructure revenues] until late 03/early 04."); F. Marsala, Robertson Stephens, Investext Rpt. No. 8245695, Implications of Cingular's Technology Announcement – Industry Report at *1 (Oct. 31, 2001) ("[AT&T Wireless] currently plans to deploy third-generation W-CDMA (also called UMTS) beginning in 2003").

[102] *Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems*, Public Notice, 15 FCC Rcd 12086 (2000).

[103] FCC News Release, *New Public Safety Applications and Broadband Internet Access Among Uses Envisioned by FCC Authorization of Ultra-Wideband Technology* (Feb. 14, 2002); *id.* (these devices will permit "scarce spectrum resources to be used more efficiently.").

[104] *See Inquiry Regarding Software Defined Radios*, Notice of Inquiry, 15 FCC Rcd 5930 (2000); *Authorization and Use of Software Defined Radios*, First Report and Order, 16 FCC Rcd 17373 (2001).

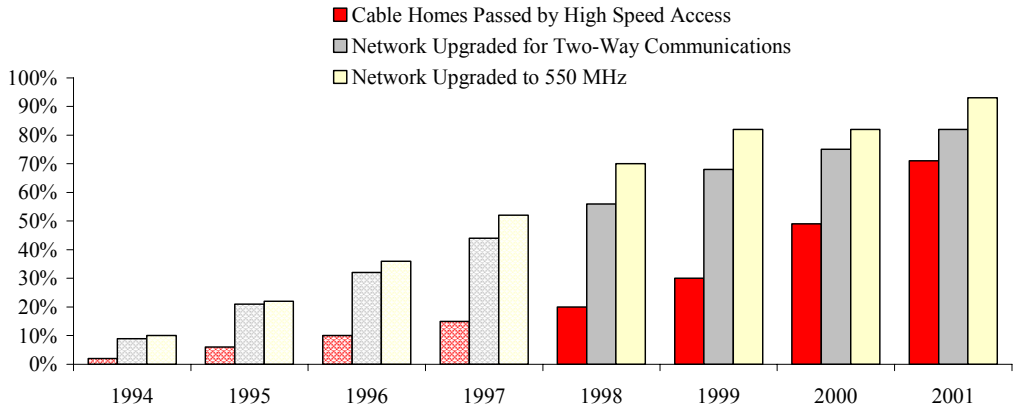
[105] *Third CMRS Report*, App. F at F-1.

[106] *See Yankee Group Fiber and Fixed Wireless Report* at 13; M. Helgeson, Dain Rauscher Wessels, *Broadband Wireless: The Worldwide Assessment* at 4 (May 17, 2001) ("With NLOS we believe at least 25% more customers can be served within the same geographical footprint. We further believe that this could mean the difference in convincing service providers to put their money into deploying the technology en masse."); C. Riggle, *Next-Generation NLOS Fixed Wireless – An NLOS Case Study*, Broadband Wireless Online (Sept. 2001),

technologies have been developed, which obviates the need for an unobstructed path between a fixed wireless transmitter and an end-user premises.[107] In addition, "[t]he incorporation of IP-based telephony capabilities in second-generation NLOS equipment will allow MMDS providers to incorporate voice applications in their service mix."[108] This is expected to prompt fixed wireless providers "to target the residential end users, thereby increasing fixed wireless availability and hence subscriber base."[109]

The Commission also has recognized that the new broadband infrastructure, both wired and wireless, will be rolled out incrementally. Network deployments are "complex and time-consuming projects that require enormous capital expenditures, a skilled labor-force, and available supply of advanced equipment."[110] As a result, even incumbent network operators "cannot upgrade all of their systems simultaneously," but instead "upgrades are a multiyear and multiphase endeavor, whereby the operator upgrades certain systems and offers new services on an incremental basis."[111] *See*, *e.g.*, Figure 7.

Figure 7. Cable Network Upgrades*



*Shaded columns represent estimated status of upgrades.

Sources: See Appendix M.

http://www.shorecliffcommunications.com/magazine/volume.asp?vol=20&story=182 ("[W]ith the recent availability of NLOS wireless solutions, MMDS carriers have a renewed competitive opportunity. MMDS carriers can deploy their networks faster and thus are positioned to capture market share from cable and DSL access providers."); B. Harter, *Is Market-Changing BWA Technology in Sight?*, Broadband Week (May 7, 2001), http://www.broadbandweek.com/news/010507/010507_wireless_tech.htm. ("A recent [Allied Business Intelligence] report calls NLOS technologies a key component in the growth of multichannel multipoint distribution services-based networks.").

[107] *Yankee Group Fiber and Fixed Wireless Report*.

[108] *Id.* at 11.

[109] *Id.* at 8.

[110] *AT&T/MediaOne Order* ¶ 150.

[111] *Id.*

Unfettered competition is almost always the best policy when markets are young, and when technology is evolving quickly.[112] And that is certainly the condition of the broadband market today. Most of the market is up for grabs, because 90-plus percent of the technology that will ultimately be used hasn't yet been built, 90-plus percent of the capital hasn't yet been committed, and 90-plus percent of the customers aren't yet being served. And because broadband digital services will ultimately absorb and displace the old, analog voice and video, it is equally true that no player in the market today has any assurance of winning any given share of the vast digital market ahead. An extraordinary transformation in technology is overtaking all the old certainties.

[112] *See*, *e.g.*, Michael Powell, Chairman, FCC, remarks before the National Summit on Broadband Deployment, Washington, D.C. (Oct. 25, 2001) ("The market is the best vehicle designed by mankind for innovation, for technology change and evolution."); *id.* ("Clearly, legal restraints can retard deployment of new services."); Michael Powell, Chairman, FCC, remarks before the Federal Communications Bar Association, Washington, D.C. (June 21, 2001) ("[B]efore 1993, many argued that we should not open up the wireless market. It was thought that two competitors in the cellular market were certainly more than sufficient. Since that market was opened and PCS introduced we have seen a phenomenal explosion in innovative, digital wireless services.").