I. SWITCHING

When the FCC made switching a UNE in August 1996, CLECs had deployed fewer than 100 switches. ALTS, the CLEC trade association, claims that CLECs operated only 65 switches before the 1996 Act. Since that time, and despite CLECs' right to obtain unbundled switching from ILECs, CLECs have deployed over 600 new switches of their own. ALTS reports that CLECs had 667 switches by the end of 1998.[1] According to Bellcore's *Local Exchange Routing Guide* (LERG) database,[2] 167 different CLECs had deployed 724 switches in 320 cities as of March 1999.[3] *See* Map 1, Figure 1, & Appendix A. The RBOCs and GTE, by comparison, have deployed only 220 new switches since the 1996 Act.[4]

These numbers make clear that even smaller CLECs are readily able to deploy their own switches – just as many private, corporate users deploy their own private branch exchanges. Over 150 CLECs have actually deployed switches – even though the top-five CLECs alone represent over 70 percent of total CLEC revenues.[5] *See* Figure 2. CLECs that serve only a few markets have deployed switches (*e.g.*, XIT Communications, Rio Communications[6]), so have CLECs that are very small in terms of revenue (*e.g.*, Waller Creek, Otter Tail[7]).

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[1] *See* The Council of Economic Advisors, National Telecommunications and Information Administration, *Progress Report: Growth and Competition in U.S. Telecommunications 1993-1998*, Feb. 8, 1999; ALTS Press Release, *The Telecommunications Act of 1996: Progress After Three Years*, Jan. 21, 1999. Another source reports that, as of year-end 1998, 86 CLECs had deployed 579 switches in 186 cities, with another 250 switches planned. *See* New Paradigm Resource Group, *The 1999 CLEC Report*, at Ch. 6 pp. 9-11, Ch. 8 pp. 1-117 (10th ed. 1999) ("*1999 CLEC Report*"). According to another industry database, CLECs had deployed 611 switches as of December 1998. *See* CLECInfo, *On Target Mapping*, Feb. 1999.

[2] Bellcore, TR-EQP-000315, *Local Exchange Routing Guide*, Mar. 1, 1999 ("*March 1999 LERG*"). On March 9, 1999, Bellcore changed its name to Telcordia. *See* S. Salamone, *Bellcore Morphs Into Telcordia Technologies*, TechWeb News, Mar. 10, 1999.

[3] According to another industry database, 152 CLECs had deployed switches as of year-end 1998. *See* CLECInfo, *On Target Mapping*, Feb. 1999.

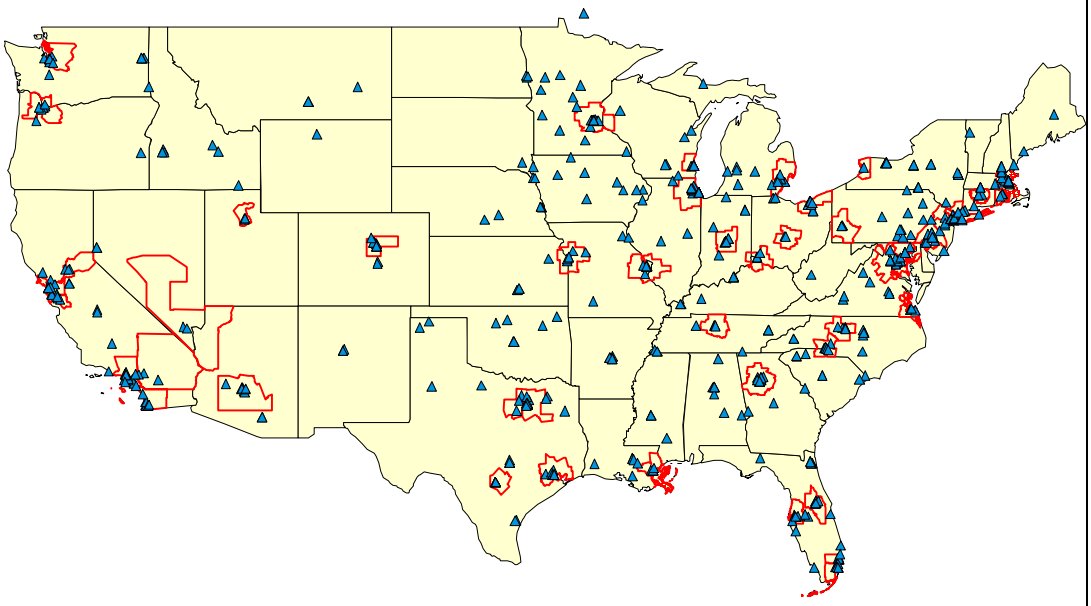
[4] *See* Bellcore, TR-EOP-000315, Local Exchange Routing Guide, Apr. 1, 1996; *March 1999 LERG*.

[5] The top 5 CLECs in terms of revenues are: AT&T, MCI WorldCom, Intermedia, McLeod, and ICG. *See 1999 CLEC Report* at Ch. 6 pp. 28-30. AT&T and MCI WorldCom alone make up 55 percent of CLEC revenues. *See id.*

[6] XIT serves Dalhart and Stratford Texas with one Lucent 5ESS Switch. *See id.* at Ch. 11, XIT profile p.1. Rio serves three Oregon cities (Eugene, Medford, and Bend) with a Class 5 switch. *See id.* at Rio profile pp. 2-3.

[7] Waller Creek had 1998 revenues of $600,000 and one switch. *See id.* at Waller Creek profile pp. 1-2. Otter tail had 1998 revenues of $610,000 and one switch. *See id.* at Otter Tail Profile pp. 1-3.

Map 1. CLEC Switches

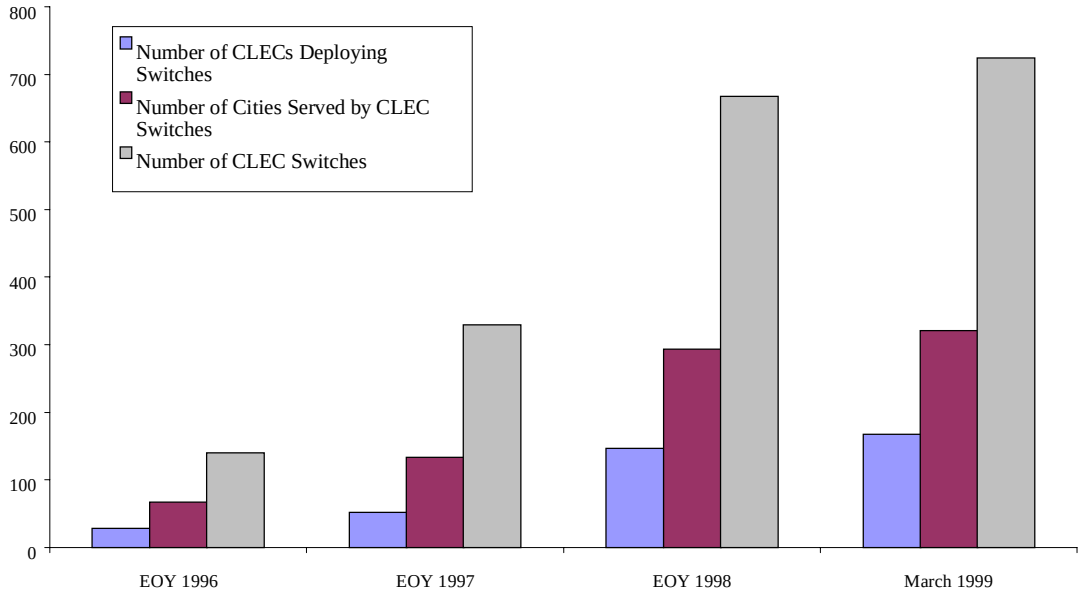


CLEC Switch

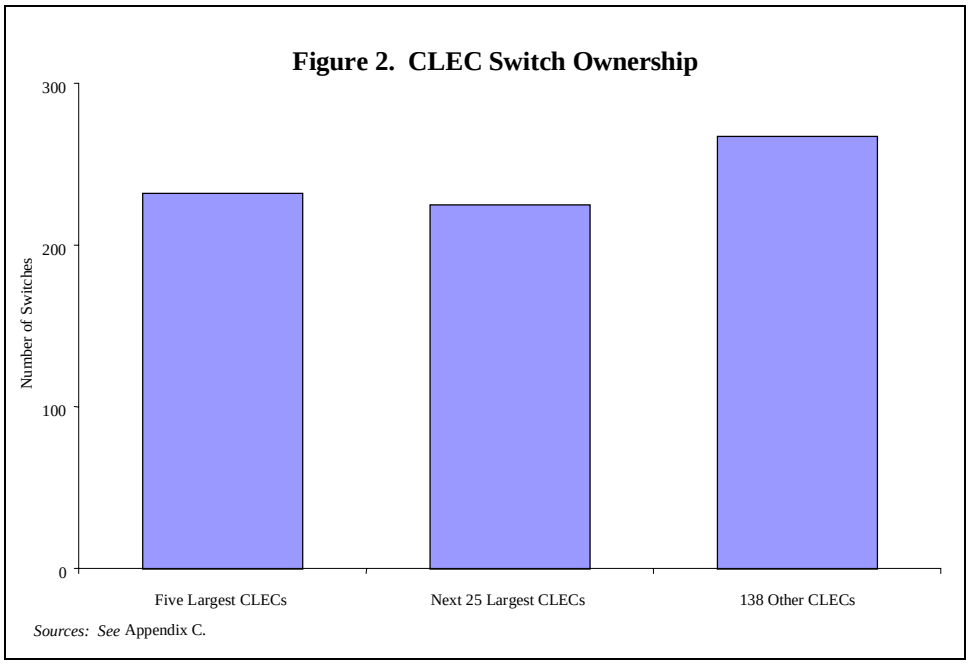
Borders of Top 50 MSAs

Source: *March 1999 LERG.*

Figure 1. CLEC Switch Deployment



Sources: See Appendix C.



A. ILEC Rate Exchange Areas Served By CLEC Switches

A CLEC that operates its own switch must obtain telephone numbers for that switch in order to serve local customers. A CLEC can obtain numbers in one of two ways. *First*, it can obtain NXX codes from the North American Numbering Plan administrator. *Second*, a CLEC can port a number from an ILEC's switch to its own switch. Until the implementation of long-term number portability (LNP), CLECs relied primarily on the first method. Since the implementation of LNP, CLECs increasingly have used ported numbers to win ILEC customers, while continuing to use NXX codes to serve new customers.[8]

Each telephone number is associated with a unique "rate exchange area." A rate exchange area is the basic building block for the local switching services provided by incumbent local carriers.[9] This is typically a specific geographic area drawn around a single point on a map – that point being the "rate center."[10] The rate center is often the

[8] It is also possible for a CLEC that is seeking to sign up a new customer to encourage that customer first to obtain service from an ILEC, and then immediately to disconnect that service, permitting the CLEC to port the ILEC-assigned phone number to its own switch.

[9] *See* FCC, Industry Analysis Division, Common Carrier Bureau, *Local Competition*, at 41 (Dec. 1998) ("*FCC Local Competition Report*") ("Rate exchange areas are geographically defined areas within which calls that originate and terminate (*i.e.*, remain within the area) are considered local calls."); *id.* ("Rate exchange areas form the building blocks of a LATA.").

[10] *See Petition for Declaratory Ruling and Request for Expedited Action on the July 15, 1997 Order of the Pennsylvania Public Utility Commission Regarding Area Codes 412, 610, 215, and 717*, 13 FCC Rcd 19009, 19013 n. 7 (1998) (defining "rate center" as a "telephone company-designated geographic location[] assigned vertical and horizontal coordinates within an area code.") (*citing* Newton's Telecom Dictionary, 11th Edition, at 498 and Local Exchange Routing Guide (LERG), Volume 2, Section 1 at 24 (March 1997)).

location of an incumbent phone company's central-office switch.[11] *See* Figure 3. In many areas there is an exact, one-to-one correlation between phone company switches and rate centers. *See* Figure 4. The original model was that calls that originated and terminated on the same, single switch would be treated as "local," while those handed off to other switches were "toll."[12] This is still often the case.[13] In more densely populated urban areas, however, a single rate exchange area will more typically represent a tight geographic cluster of ILEC switches, though the "rate center" will typically coincide with the location of one of the ILEC's central office switches. *See* Figure 5. Although each ILEC switch typically serves only a single rate center, CLECs can and do use their switches to serve multiple rate centers. *See* Figure 6.

Both the FCC and state regulators have concluded that the rate exchange area is the starting point for assessing competition in the provision of switching services.[14] "[A]ll presently available landbased telephone hardware and software on the market is designed to work in the context of rate centers."[15] This means that "[f]acilities-based CLECs must mirror the ILECs' rate center structure so that rating and routing of calls can be correctly performed."[16]

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[11] Alternatively, it may be chosen as a post office or other central building within a particular community. *See generally Bill Langworthy, et. al. vs. Calaveras Telephone Company (U 1004-C) and Pacific Bell (U 1001 C)*, Decision No. 98-09-015, Case No. 97-01-013, *12 (CPUC Sept. 3, 1998) ("Many of the older exchange rate centers were established at the location of the post office or of another federal building within the given community or city and not at the actual location of the telephone central office. This ancient custom appears to have its origin when, prior to the existence of the Federal Communications Commission (FCC)(1943) the Postmaster General had certain authority to fix rates and interconnection on a nondiscriminatory basis.").

[12] Thus, 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* at 41.

[13] A few states have implemented "rate center consolidation" under which once separate rate centers are combined in order to prevent NXX code exhaustion. *See, e.g., Relief Plan for the Exhaust of the 612 Area Code*, 1998 Minn. PUC LEXIS 93, *1 (Jun. 4, 1998); *DPUC Review of Management of Telephone Numbering Resources In Connecticut – Reopening*, 1998 Conn. PUC LEXIS 187, *39 n.7 (Jul. 8, 1998); *Rate Center Consolidation within 303 Area Code*, 1998 WL 394296 (Colo.P.U.C.), *1 (Jun. 23, 1998).

[14] Moreover, MapInfo, an industry-leading compiler of telecommunications databases, recently created the RatecenterInfo database, noting that "Rate Centers are increasingly becoming the telecom region of choice for Competitive Local Exchange Carriers (CLECs) and Internet Service Providers (ISPs) when determining areas of operations." MapInfo, *Telecom MapInfo Data*, http://www.atmapping.com/solutions/ratecenterinfo.html.

[15] *Petition of NEXTLINK Pennsylvania, L.L.P. for Arbitration of an Interconnection Agreement with Bell Atlantic-PA, Inc., Pursuant to the Telecommunications Act of 1996*, Pennsylvania Public Utility Commission, Docket No. A-310260F0002 (Interconnection Arbitration), *98 (May 22, 1998).

[16] *Re Exhaustion of Central Office Codes*, Public Service Commission of The State of Missouri, Case No. TO-98-212, *49; 187 P.U.R.4th 100, (Aug. 4, 1998).

Figure 3

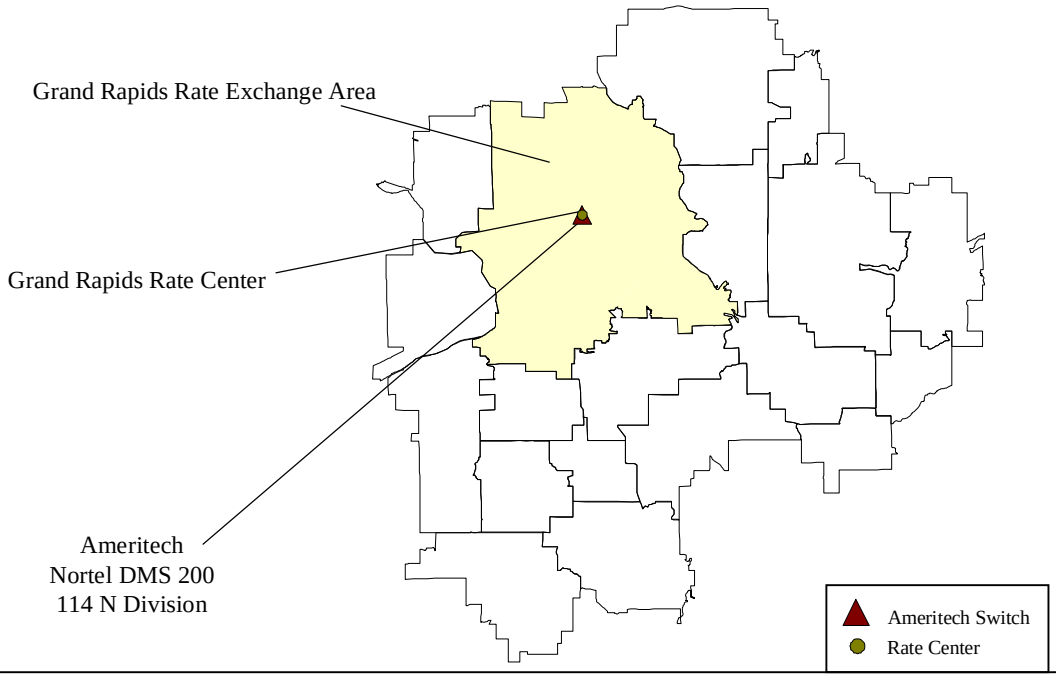


Figure 4

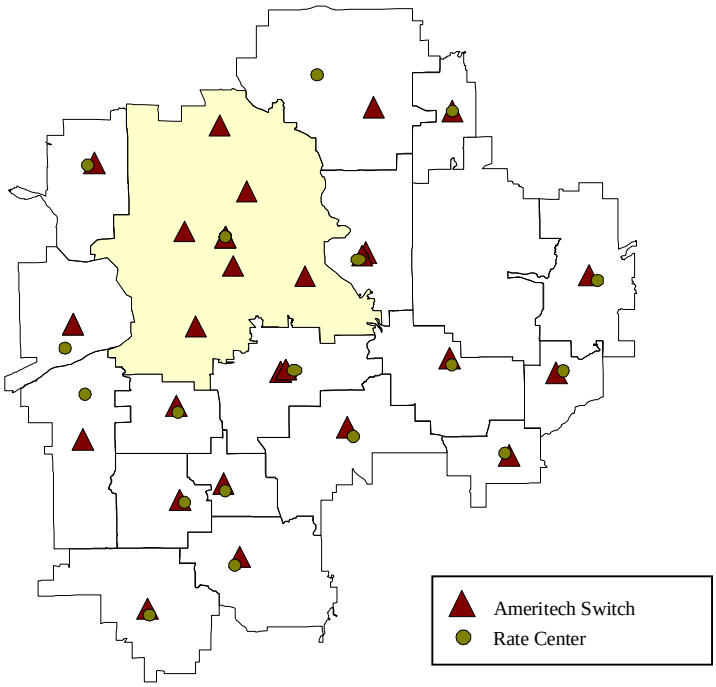


Figure 5

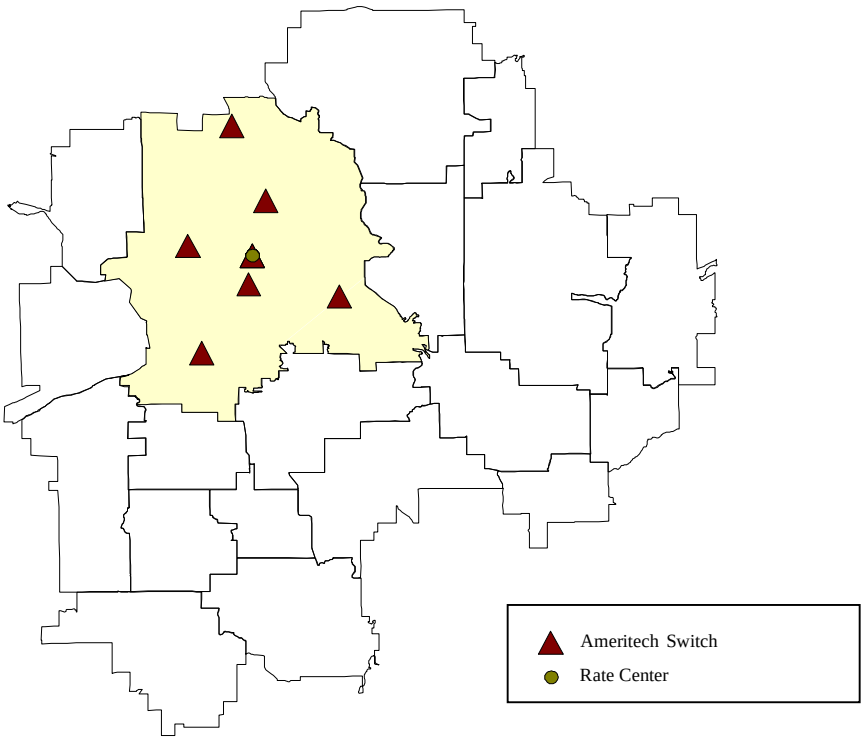
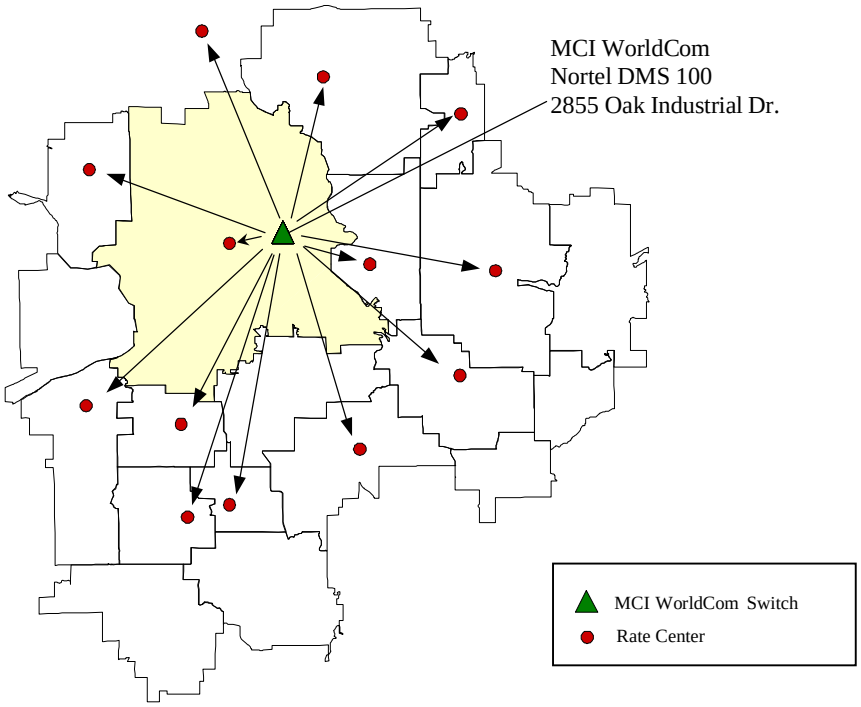


Figure 6



1. Rate Exchange Areas Where CLECs Have Obtained NXX Codes. In its December 1998 *Local Competition Report*, the FCC sets out a detailed analytical methodology for identifying "new entrants in the switched market," and for quantifying the extent of competition in that market.[17] The FCC's framework evaluates competitive switch providers based on where such competitors have obtained NXX codes.[18] It is a straightforward matter to apply the FCC's own framework. We have merely updated the numbers using the most current data from the LERG database. The data were current as of March 1999.[19]

As of that date, over one third of all BOC and GTE rate exchange areas in the United States were served by at least one CLEC voice switch.[20] Eighteen percent were served by at least two CLEC switches. Twelve percent were served by at least three. Nearly eight percent were served by four or more. In some of the BOC regions, the totals are considerably higher. *See* Table 1 & Map 2.

Table 1. Rate Exchange Areas Where CLECs Have Obtained NXX Codes

	Percentage of Rate Exchange Areas Served by:			
	1 or more CLEC switch(es)	**2 or more**	**3 or more**	**4 or more**
Ameritech	47	36	26	21
Bell Atlantic	59	38	27	19
BellSouth	33	26	17	12
GTE	15	11	6	4
SBC	38	31	23	20
U S WEST	31	24	14	9

Source: March 1999 LERG.

[17] *FCC Local Competition Report* at 41.

[18] The FCC states that "[a] local service competitor that own a telephone switch must acquire a numbering code for that switch before commencing operation as a facilities-based CLEC providing mass market telephone service." *Id.*

[19] By contrast, the FCC's data were current as of Third Quarter 1998. *See Id.*

[20] According to the LERG, there are 19,591 rate centers in the U.S. of which approximately 10,100 are served by the BOCs and GTE. By comparison, there are 11,571 BOC and GTE wire centers. *See* Scholosser Geographic Systems Inc., *Wire Center Premium Database for U.S. States* (1998). In dense urban areas there are often many wire centers within a single rate exchange area.

INSERT MAP 2

These are highly conservative numbers. They count only CLEC switches actually up and running; CLECs could readily extend the geographic reach of existing switches, or deploy still more switches.[21] And they count only conventional circuit switches, though fax, e-mail, and data, along with a growing volume of voice traffic, too, are now being switched on packet rather than circuit switches. Moreover, as discussed in the following section, these numbers ignore the fact that CLECs do not need an NXX code to provide service in a particular rate exchange area – the CLEC may instead obtain a ported number from an ILEC.

The Commission's 1998 framework for analyzing competition in the market for switching services is based on well established and easily verified facts about telephone network operations.

Telephone numbering codes are currently assigned to all CLECs (and ILECs) in blocks of 10,000. Industry guidelines, established at the direction of the FCC,[22] direct every CLEC that obtains a numbering code ("NXX code") to specify the rate exchange area it intends to serve, and the switch from which it intends to provide service.[23] Even if regulators didn't so require, network engineers would. The NXX code – the first three digits of an ordinary telephone number – tells other switches in the network where to route traffic. Thus, when a customer dials the number 202-370-1000, all the switches in the U.S. network must recognize that "202" switches are located in Washington, D.C., and that "370" calls are terminated through the e.spire switch located at 1275 K Street, Northwest. To provide switching services, e.spire must first be assigned a block of numbers like those beginning with "370."

The FCC compiles information on where CLECs have obtained NXX codes.[24] Bellcore's LERG database compiles precisely the same information, but updates it more frequently. CLECs may begin using a code as soon as it is assigned, and under existing

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[21] In reaching this total we have counted only Class 5 end office, host, and remote switches, and 4ESS switches that AT&T is using to provide competitive local service. *See* Appendix A.

[22] *See* ATIS, Central Office Code (NXX) Assignment Guidelines, INC 95-0407-008, Reissued Jan. 27, 1999, at 1 & n.1, ("*CO Assignment Guidelines*") ("these guidelines were developed at the direction of the FCC," which sent "a letter to NANPA dated June 21, 1991," to develop number allocation procedures).

[23] *See CO Assignment Guidelines* at 6-7 (§ 4.1); *see also FCC Local Competition Report* at 41. In order to obtain the code, "[t]he applicant must be licensed or certified to operate in the area, if required, and must demonstrate that all applicable regulatory authority required to provide the service for which the central office code is required has been obtained." *CO Assignment Guidelines* at 8 (§ 4.1.4). It is possible for a local reseller to obtain a numbering code, and the FCC's data includes a small number of resellers that have done so. But the LERG indicates whether a particular CLEC is using its numbering codes to provide resale service using an ILEC's switch or facilities-based service using its own switch. According to the LERG, only 157 of the roughly 13,700 NXX codes that CLECs have obtained are being used for resale.

[24] *See FCC Local Competition Report* at 41-111 (reporting such information by state and by LATA).

industry guidelines, no CLEC may reserve an NXX code for more than 18 months without actually activating it to provide service.[25]

In sum, the FCC's own reports, updated by means of the industry's standard database, provide exact, unambiguous data on which CLECs are using their own switches to serve which rate exchange areas. Each CLEC switch has assigned to it one or more NXX codes.[26] Each NXX code is associated with a rate center, which corresponds to one or more ILEC switches within the rate exchange area. Although each ILEC switch typically serves only a single rate exchange area, CLECs can and do use their switches to serve multiple rate exchange areas.

It is on this basis that we arrive at the numbers set out at the beginning of this section. CLECs are already using their own switches to serve over one third of BOC and GTE rate exchange areas. The numbers are much higher than that in major markets.[27] *See* Table 2.

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[25] *See CO Assignment Guidelines* at 10 (§ 4.4) ("If a reserved code is not activated within 18 months, the codes will be released from reservation."); *see also FCC Local Competition Report* at 41 (quoting same). Moreover, "[r]equests for code assignments cannot be made more than 6 months prior to the requested effective date." *CO Assignment Guidelines* at 15 (§ 6.1.2). *But see id.* at 10 (§ 4.4) (permitting a six months extension when the use date is missed to uncontrollable circumstances such as hardware, software, or regulatory delays).

States may impose even more stringent use-it-or-lose-it requirements. *See, e.g.*, *Order Instituting Rulemaking On The Commission's Own Motion Into Competition For Local Exchange Service*, Decision No. 98-07-096, California Public Utilities Commission, July, 23, 1998 (requiring code activation within six months, with possible six-month extension); *Illinois Commerce Commission On Its Own Motion vs. All Telecommunications Carriers Holding 847 NXX Codes*, No. 98-0497, Illinois Commerce Commission, Dec. 16, 1998 (requiring code activation "in a timely manner"); *Petition Of NPA Relief Coordinator Re: 412 Area Code Relief Plan*, Docket No. P-00961027, Pennsylvania Public Utility Commission, July 15, 1997 (requiring code activation within 9 months).

[26] An NXX code may also be assigned to a CLEC facility other than an actual end office, remote, or host circuit switch. *See CO Assignment Guidelines* at 5 ("CO codes are assigned to entities for use at a Switching Entity or Point of Interconnection they own or control."). We have included only NXX codes assigned to Class 5 end office, remote, or host switches. One complication is that, for some CLECs, the LERG lists a particular CLEC having a switch in a particular location with a particular NXX but, according to other sources (*e.g.*, the CLECinfo database and CLEC websites), that location does not contain an actual switch. For example, the LERG lists Intermedia as having five Nortel DMS 500s at five different locations (each in a different rate exchange area) in the Washington DC MSA, even though other sources indicate that Intermedia has only one DMS 500 within that MSA. Intermedia ostensibly has other equipment (*e.g.*, interconnection points or multiplexers) located within these rate exchange areas that it uses to provide service within those areas, and to or from which it is capable of routing calls using its one switch. Examples such as this confirm the fact that CLEC switches in one rate center substitute for ILEC switches in distant rate centers. In such instances, we have attributed only one switch to Intermedia, but have attributed to that switch all of the NXX codes of all Intermedia switching entities located within the same city or MSA.

[27] The following table and examples represent minimums based on assigned NXX codes.

Table 2. Rate Exchange Areas in Top 50 MSAs Where CLECs Have Obtained NXX Codes				
	Percentage of Rate Exchange Served by:			
	1 or more CLEC switch(es)	2 or more	3 or more	4 or more
1. Los Angeles-Long Beach	92	88	75	71
2. New York	78	56	46	39
3. Chicago	78	67	58	48
4. Philadelphia	81	67	43	33
5. Washington, DC	50	43	36	34
6. Detroit	96	94	67	45
7. Houston	85	56	44	37
8. Atlanta	80	73	67	64
9. Boston	99	87	74	61
10. Dallas	73	44	24	24
11. Riverside-San Bernardino	72	39	22	16
12. Phoenix-Mesa	33	17	8	8
13. Minneapolis-St. Paul	38	15	8	4
14. San Diego	85	68	65	65
15. Orange County	96	87	83	83
16. Nassau-Suffolk	44	22	8	8
17. St. Louis	31	18	12	9
18. Baltimore	88	75	61	46
19. Pittsburgh	98	45	14	2
20. Oakland	10	93	83	72
21. Seattle-Bellevue-Everett	100	70	52	48
22. Tampa-St. Petersburg-Clearwater	80	80	80	80
23. Cleveland-Lorain-Elyria	71	61	53	47
24. Miami	100	100	100	80
25. Newark	95	77	64	51
26. Denver	100	80	80	80
27. Portland-Vancouver	81	58	42	29
28. San Francisco	100	83	71	71
29. Kansas City	74	61	42	32
30. San Jose	100	92	67	58
31. Cincinnati	24	6	0	0
32. Fort Worth-Arlington	95	63	37	32
33. Norfolk-Va. Beach- Newport News	55	30	15	10
34. Sacramento	92	60	44	28
35. San Antonio	73	45	9	9
36. Indianapolis	37	16	11	8
37. Orlando	100	100	80	60
38. Milwaukee-Waukesha	93	66	34	21
39. Fort Lauderdale	100	100	100	100
40. Columbus, OH	35	28	18	15
41. Las Vegas	56	0	0	0
42. Charlotte-Gastonia-Rock Hill	68	48	28	20
43. Bergen-Passaic	96	85	33	22
44. New Orleans	36	7	4	4
45. Salt Lake City-Ogden	100	100	75	50
46. Buffalo-Niagara Falls	42	23	19	13
47. Greensboro-Winston-Salem	100	38	38	25
48. Nashville	90	45	34	31
49. Hartford	28	21	13	4
50. Providence-Fall River-Warwick	100	74	56	22
Source: March 1999 LERG				

For example, 14 CLECs operate 23 switches in the Washington, DC MSA.[28] Fifty percent of the rate exchange areas in the MSA are served by at least one CLEC switch; 43 percent are served by two or more; 36 percent by three or more; and 34 percent by four or more. *See* Map 3. AT&T operates a Nortel DMS 100 to serve 37 rate exchange areas, and two Lucent 4ESSs to serve 21 more. MCI WorldCom operates three DMS 100s and an Ericsson AXE-10, which collectively serve 31 rate exchange areas. e.spire and Intermedia each operates two switches, serving 29 and six rate exchange areas, respectively. Allegiance, Commonwealth, Focal, Frontier, Jones Intercable, Global NAPs, Net2000, RCN, Teligent, and Winstar each operates one switch.

In the Denver MSA, 10 CLECs operate 12 switches.[29] All of the rate exchange areas in the MSA are served by at least one CLEC switch; 80 percent are served by four or more. *See* Map 4. AT&T operates a DMS 100 that serves 46 rate exchange areas, and a 4ESS that serves six. MCI WorldCom operates a DMS 100 that serves four rate exchange areas. Convergent, Frontier, Great West, ICG, NEXTLINK, Optel, Teligent, Time Warner and WinStar also operate one switch each.

In the Dallas MSA, 17 CLECs operate 22 switches.[30] Seventy-three percent of the rate exchange areas in that MSA are served by at least one CLEC switch; 44 percent are served by two or more; 24 percent by four or more. *See* Map 5. AT&T operates a DMS 100 and a Lucent 5ESS, which together serve 57 rate exchange areas. MCI WorldCom operates three switches – a DMS 100 (76 rate exchange areas), a Nortel DMS 10-S (10 rate exchange areas), and an AXE-10 (one rate exchange area). Allegiance operates a 5ESS (26 rate exchange areas) and a Nortel DMS 500 (one rate exchange area). CoServ, Frontier, Great West, GST, ICG, Intermedia, Multitechnology Services, NEXTLINK, Nortex, Optel, Southside, Teligent, Westel, and Winstar each operates one switch.

In the Detroit MSA, there are eight CLECs operating 11 different switches.[31] Ninety-six percent of the rate exchange areas in the MSA are served by at least one CLEC switch; 94 percent are served by two or more; 67 percent by three or more; and 45 percent by four or more. *See* Map 6. AT&T operates a DMS 500 that serves 104 rate exchange areas, and a Lucent 5ESS that serves 110. MCI WorldCom operates a Siemens DE4 EWSD RCU Switching System that serves 31 rate exchange areas, an AXE-10 that serves 34, and a DMS 100 that serves eight. Coast to Coast, Focal, KMC Telecom, MediaOne, Phone Michigan, Teligent, and WinStar each operates one switch.

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[28] The Washington, DC MSA consists of 80 different rate centers. Bell Atlantic is the incumbent LEC in the entire MSA.

[29] The Denver MSA consists of 5 different rate centers. U S WEST serves the entire Denver MSA.

[30] The Dallas MSA consists of 55 different rate centers. SBC and GTE jointly serve the entire MSA.

[31] The Detroit MSA consists of 78 different rate centers. Ameritech serves the entire Detroit MSA.

In the Atlanta MSA, 13 CLECs operate 19 different switches.[32] Eighty percent of the rate exchange in the MSA are served by one or more CLEC switches; 73 percent are served by two or more; 67 percent are served by three or more; 64 percent are served by four or more. *See* Map 7. AT&T operates a 5ESS that serves one rate exchange area, a DMS 100 that serves 34, and a 4ESS that serves two. MCI WorldCom operates a DMS 100 (four rate exchange areas), AXE-10 (one), and two DE4 EWSD RCUs (11 and 26). Intermedia operates two DMS 500s that together serve nine rate exchange areas. Allegiance, Business Telecom, e.spire, Frontier, ICG, Media One, MGC, NEXTLINK, Teligent, and WinStar each operates one switch.

In the Tampa MSA, five CLECs operate seven different switches.[33] Eighty percent of the rate exchange areas in Tampa are served by four or more CLEC switches. *See* Map 8. MCI WorldCom operates a DE4 EWSD RCU that serves eight rate exchange areas. Intermedia operates a DMS 10 and DMS 10S that serve one rate exchange area each. e.spire, National Telecommunications, and WinStar each operates one switch.

[32] The Atlanta MSA consists of 45 different rate centers. BellSouth is the incumbent LEC in the entire MSA.

[33] The Tampa MSA consists of 10 different rate centers. GTE serves the entire Tampa MSA.

INSERT MAP 3

INSERT MAP 4

INSERT MAP 5

INSERT MAP 6

INSERT MAP 7

INSERT MAP 8

2. Rate Exchange Areas Where CLECs Can Port ILEC Numbers. CLECs do not need to obtain NXX codes in order to provide local service using their own switches. CLECs instead can obtain numbers by porting them from ILEC switches. Section 251(b)(2) of the 1996 Act requires all local exchange carriers to provide "to the extent technically feasible, number portability in accordance with requirements prescribed by the Commission." Once an ILEC has implemented LNP on a switch, CLECs can port local numbers from the ILEC switches to CLEC switches in the same geographic area, or, indeed, to CLEC switches located at any distance from the ILEC switch.

Under FCC rules, incumbent LECs are required to implement LNP only upon request, in switches that CLECs specifically designate as their competitive targets.[34] This approach, the FCC concluded "allows carriers to focus their resources where competitors plan to enter, which is where number portability is likely to have the most impact in the short run on the development of competition for local services."[35] Number portability is implemented only on ILEC switches that CLECs have formally designated as targets of their "actual competitive interest."[36]

The FCC directed the industry and state commissions to determine "the most efficient means of identifying those switches within the top 100 MSAs in which carriers have expressed interest."[37] That process, through which CLECs formally designated the ILEC switches against which they intended to compete, began in June 1997. The vast majority of facilities-based CLECs participated. Each one formally submitted a list of ILEC switches against which it intended to compete. The process was concluded in March 1998. By December, 1998, the BOCs and GTE had implemented LNP in the designated switches.

The LERG database now lists all ILEC switches in which LNP has been implemented. Using the LERG, we can further determine the specific rate exchange areas associated with each switch. In light of the LNP switch-designation proceedings, and the regulatory backdrop against which they occurred, it is entirely reasonable to infer that all rate exchange areas served by an LNP-capable ILEC switch face direct competition from CLEC switches. Indeed, any other inference requires an assumption of bad faith by CLECs – an assumption of deliberate misrepresentation to federal and state regulatory authorities.

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[34] In the 100 largest MSAs, LECs are required to provide number portability only in switches for which a competing carrier "has specifically and reasonably requested the provision of number portability." *Telephone Number Portability*, First Reconsideration Order, 12 FCC Rcd 7236, 7272-77 (1997) ("*First Reconsideration Order*"). With respect to a switch located outside of the top 100 MSAs, a CLEC may submit a request to a LEC to implement LNP in that switch, and LECs must fulfill such requests within six months. *Id.* at 7298.

[35] *Telephone Number Portability*, Third Report, 13 FCC Rcd 11701, 11714 ¶ 20 (1998).

[36] *First Reconsideration Order*, 12 FCC Rcd at 7277 n.225.

[37] *Telephone Number Portability*, Third Memorandum and Opinion on Reconsideration, 13 FCC Rcd. 16090, ¶ 5 (1998). The Commission established "minimum criteria" to guide this process. *See id.*; *First Reconsideration Order*, 12 FCC Rcd at 7272-73.

In BOC and GTE regions, CLEC switches may currently obtain ported numbers on 39 percent of all BOC and GTE switches, which serve 29 percent of all BOC and GTE rate exchange areas. In some of the BOC regions, the totals are considerably higher. *See* Table 3.

Table 3. Rate Exchange Areas Where CLECs Can Obtain Ported ILEC Numbers

	Percentage of BOC/GTE switches that are LNP-capable	Percentage of BOC/GTE rate exchange areas served by LNP-capable switches
Ameritech	53%	43%
Bell Atlantic	50%	52%
BellSouth	35%	27%
GTE	14%	10%
SBC	54%	46%
U S WEST	27%	9%

Source: March 1999 LERG.

Only the CLECs themselves can disclose precise data on how many numbers have actually been ported within each particular rate exchange area. It is, however, reasonable and conservative to assume that a CLEC switch can, at a minimum, serve the entire MSA in which it is located. Every CLEC switch, in other words, is effectively capable of competing directly against every LNP-enabled ILEC switch located in the same MSA.

Based on this methodology, we find that, within the 50 largest MSAs, CLEC switches may currently obtain ported numbers on 81 percent of all BOC and GTE switches, which serve 75 percent of all BOC and GTE rate exchange areas. Sixty-four percent of these MSAs contain switches of at least 5 different CLECs; 18 percent contain switches of at least 10 different CLECs. *See* Table 4.

Table 4. Rate Exchange Areas in Top 50 MSAs Where CLECs May Port ILEC Numbers				
MSA	**Number of CLECs with Switches**	**Number of CLEC Switches**	**Percentage of LNP-Capable BOC/GTE Switches**	**Percentage of BOC/GTE Rate Exchange Areas Served by LNP-Capable BOC/GTE Switches**
1. Los Angeles-Long Beach	13	16	81 %	96 %
2. New York	10	12	85 %	98 %
3. Chicago	12	19	78 %	67 %
4. Philadelphia	13	24	88 %	91 %
5. Washington, DC	13	23	64 %	90 %
6. Detroit	7	11	63 %	50 %
7. Houston	9	10	80 %	61 %
8. Atlanta	12	19	92 %	89 %
9. Boston	15	21	93 %	98 %
10. Dallas	16	22	79 %	76 %
11. Riverside-San Bernardino	1	3	80 %	68 %
12. Phoenix-Mesa	8	10	95 %	100 %
13. Minneapolis-St. Paul	9	12	75 %	31 %
14. San Diego	7	8	90 %	97 %
15. Orange County	3	4	81 %	96 %
16. Nassau-Suffolk	3	4	88 %	98 %
17. St. Louis	8	8	53 %	31 %
18. Baltimore	6	10	88 %	89 %
19. Pittsburgh	4	5	85 %	60 %
20. Oakland	3	3	93 %	100 %
21. Seattle-Bellevue-Everett	9	11	84 %	52 %
22. Tampa-St. Petersburg-Clearwater	5	7	94 %	60 %
23. Cleveland-Lorain-Elyria	7	9	97 %	58 %
24. Miami	10	12	82 %	60 %
25. Newark	6	7	81 %	82 %
26. Denver	9	12	91 %	100 %
27. Portland-Vancouver	7	9	70 %	52 %
28. San Francisco	6	7	95 %	100 %
29. Kansas City	4	6	92 %	61 %
30. San Jose	3	3	83 %	100 %
31. Cincinnati	4	5	50 %	62 %
32. Fort Worth-Arlington	2	2	92 %	79 %
33. Norfolk-Virginia Beach-Newport News	3	3	84 %	75 %
34. Sacramento	3	3	89 %	80 %
35. San Antonio	7	9	82 %	82 %
36. Indianapolis	5	7	83 %	68 %
37. Orlando	7	10	73 %	80 %
38. Milwaukee-Waukesha	6	7	98 %	76 %
39. Fort Lauderdale	7	7	88 %	100 %
40. Columbus, OH	2	2	68 %	45 %
41. Las Vegas	2	2	Sprint is ILEC	Sprint is ILEC
42. Charlotte-Gastonia-Rock Hill	6	8	71 %	56 %
43. Bergen-Passaic	1	2	89 %	96 %
44. New Orleans	7	7	86 %	75 %
45. Salt Lake City-Ogden	4	6	39 %	50 %
46. Buffalo-Niagara Falls	1	1	82 %	74 %
47. Greensboro-Winston-Salem-High Point	5	6	88 %	88 %
48. Nashville	4	4	85 %	76 %
49. Hartford	3	4	90%	65%
50. Providence-Fall River-Warwick	6	6	85 %	89 %
Source: March 1999 LERG.				

B. CLECs Can Extend the Reach of Existing Switches

Many CLECs use their switches to serve more than one rate exchange area. According to the March 1999 LERG, the average CLEC switch in BOC and GTE territory has NXX codes for 14 rate exchange areas. Both the FCC and state regulators have recognized that CLEC switches can be expected to serve much larger areas than ILEC switches typically do.[38]

AT&T maintains that when used with a digital loop carrier, a single switch can readily serve customers within a 125-mile radius.[39] MCI uses switches in Seattle to reach suburbs in Tacoma, Wash (27 miles), in Baltimore to reach suburbs in Rockville, Md. (32 miles), and in New York City to reach Queens (12 miles), lower Westchester County (15 miles) and Nassau County (16 miles).[40] ITC Deltacom uses a switch in Birmingham, Alabama to serve Huntsville (90 miles) and Montgomery (84 miles), and a switch in Columbia, South Carolina to serve Greenville (100 miles) and Charleston, Charlotte, North Carolina (85 miles), and Atlanta, Georgia. (190 miles).[41] Focal Communications uses a switch in downtown Chicago to serve Utica, Illinois (80 miles) and Morocco, Indiana (66 miles).[42]

Switch manufacturers have specifically designed their equipment to meet CLECs' need to serve large geographic areas. *See* Table 5. Nortel's Remote Switching Center-S (RSC-S) "[e]xtends a full complement of host switch features to subscribers up to 650 miles from a DMS-100 or DMS-500 host, [and] up to 100 miles from a DMS-10 host."[43] Lucent's 5ESS "enables a remote switching module to be located in a different Local

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[38] *See, e.g.*, *Telephone Number Portability*, First Report and Order and Further Notice of Proposed Rulemaking, 11 FCC Rcd 8352, 8449 n. 539 (1996) ("A new entrant will employ equipment capable of serving a larger area per switch, and serve fewer customers in each area served by one switch, than incumbent LECs do presently. As a result, one switch of a new entrant could serve all customers in a certain area, while the incumbent LEC must use two or more switches to serve all customers in that area."); Report of Texas Number Conservation Task Force, posted 12/15/97, http://www.npac.com/regions/southwest/swdocs/texas/txNumberConservation.htm ("[CLECs] are likely to provide service using a network architecture which is not a mirror image of the ILEC infrastructure. Specifically, the area served by a CLEC switch is likely to be much larger than that of the ILEC and may/will cover a multitude of existing rate centers.").

[39] *See* Petition of AT&T Corp. to Deny Application at 24, GTE Corp. Transferor, and Bell Atlantic Corp. Transferee, For Consent to Transfer of Control, CC Docket No. 98-184 (FCC filed Nov. 23, 1998) ("Such technology has a range of about 125 miles, which would permit it to be used in conjunction with the contiguous provider' switch in its nearby home territory."). Robert Bork recently reiterated this claim in a letter to the FCC prepared on AT&T's behalf. *See* Memorandum from Robert H. Bork to FCC Chairman William E. Kennard (Apr. 7, 1999).

[40] *See* D. Braun, *Carrier Adds To Network, Broadens Offerings – MCI Goes After Local Phone Market*, InternetWeek, Mar. 3, 1997.

[41] *See* ITC Deltacom, Inc., Form 10-K, Mar. 30, 1998; Rand McNally, *Commercial Atlas and Marketing Guide* (1999).

[42] *See* Focal Communications website, http://www.focal.com/about/af_service_areas.html.

[43] Nortel Networks, *Remote Switching Center-S*, http://www1.nortelnetworks.com/pcn/products/rscs.html.

Access Transport Area (LATA) and up to 600 miles from the host."[44] According to Lucent, this provides "emerging competitors with the ability to expand networks and service offerings cost-effectively, using RSMs where previously this may not have been feasible." Using Castle Network's switching platform, "a CLEC serving Chicago can cost-effectively expand to support the Milwaukee area."[45]

Table 5. CLECs Using Remote Switches

Remote Switch Type	CLEC
Lucent 1AESS Remote	Westel
Lucent 5ESS Remote	ACC National Telecom; Framco; Frontier ; MCI WorldCom; US Xchange
Lucent 5ESS-2000 VCDX	ACC National Telecom; Advanced Telcom Group; Buckeye Telesystem; Business Telecom; Columbia Telecommunications; Dakota Telecommunications; Kings Deer Telephone Company KMC Telecom; LEC Unwired; Multitechnology Services Ovation Communications; Paetec Communications; RCN; US LEC; US Xchange; WinStar; XIT Telecommunication & Technology
Nortel DMS 10 Remote Equipment Module	Cumby Telephone Cooperative; Green Hls Telecom Svc Intermedia
Nortel DMS 10 Remote Line Concentrating Module	Mark Twain Communications Company
Nortel DMS 100 Remote Line Module	CommChoice; Commonwealth Telecom Services; GST; Hawarden Municipal Utilities; Knology MCI WorldCom; Service Electric Telephone
Nortel Remote Line Concentrating Module	Commonwealth Telecom Services; GST
Nortel Remote Switching Center	Advanced Network Communications; Alltel Crystal Communications; Farmers And Business Mens Telephone Company General Communication; Goldfield Access Network GST; Infotel Communications; Intermedia Knology; Lost Nation; MCI WorldCom; MGC Communications Shellsburg Telecommunications
Remote Digital Switching Equipment	Commonwealth Telecom Services; Electric Lightwave Multitechnology Services; Service Electric Telephone
Sources: *March 1999 LERG*; *see* Appendix A.	

[44] Lucent, *The 5ESS-2000 Switch Product Family*, http://www.lucent.com/netsys/5ESS/family/sm_switch.html.

[45] J. Caron, *Switches Get Personal*, tele.com, Jan. 25, 1999.

C. LATAs Served By CLEC Switches

Current CLEC practices support the conclusion that the effective footprint of a CLEC switch is the entire LATA in which the CLEC switch is located.[46] The effective footprint of a switch ultimately depends on how much it costs to haul traffic from distant points to that switch. Some CLECs read existing tariff and interconnection agreements as entitling them to "free" transport LATA-wide – in their view, the ILEC is required to deliver traffic to the CLEC's switch, wherever it may be located in the LATA.[47] The CLEC, in other words, maintains that its switch should be treated in the same manner as an interexchange carrier "point-of-presence." It has long been settled that an IXC is entitled to serve an entire LATA from a single POP.[48]

We do not address here whether CLECs are in fact entitled to free transport LATA wide; the matter is under investigation in several states.[49] For our purposes, it is sufficient to note that many CLECs do currently take advantage of such arrangements, obtaining NXX codes in one rate exchange area, and leaving it to the ILEC to transport the traffic to a CLEC switch situated in another rate center.[50] Such arrangements permit CLECs to charge local rates to what are, in effect, intraLATA toll calls to a wide variety

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[46] In its analysis of "new entrants in the switched market," the FCC itself reports NXX data by LATA. *See FCC Local Competition Report* at 41-112.

[47] Under section 271, BOCs are not permitted to deliver calls across LATA boundaries. *See* 47 U.S.C. § 271(a).

[48] *See*, *United States v. Western Elec. Co.*, 552 F. Supp. 131, 228 (D.D.C. 1982) (AT&T Decree § IV(F)); *United States v. Western Elec. Co.*, 569 F. Supp. 990, 1027 n. 192 (D.D.C. 1983) (clarifying that BOCs were required to provide access to only one point per LATA); 47 U.S.C. § 251(g) (preserving equal access and interconnection obligations in place when the Act was passed).

[49] *See*, *e.g.*, Notice of Investigation at 11, *Investigation into Use of Central Office Codes (NXXs) by New England Fiber Communications L.L.C. d/b/a Brooks Fiber Communications*, Docket No. 98-758, (Maine P.U.C. Oct. 6, 1998) (proposing to outlaw such arrangements on the ground that it "creates a serious risk of erosion of the distinction between local calling . . . and toll calling that is embodied in the ILECs' terms and conditions and in regulatory policy."); *see also* ALJ's Ruling Soliciting Comments on Rating and Routing Issues Pursuant to Decision (D.) 97-12-094, Rulemaking 95-04-043, Investigation 95-04-044 (CA PUC filed July 22, 1998) (investigating such arrangements); First Amended Verified Complaint, *Illinois Bell Telephone Company d/b/a Ameritech Illinois vs. Focal Communications Corp. of Illinois*, Docket No. 98-0526 (Ill. Commerce Comm'n Aug. 3, 1998) (complaining against such arrangements and seeking relief from providing free LATA-wide transport).

[50] The fact that a CLEC is using a switch to originate a call in one rate center and terminate it another further supports the analysis in section A.1 above. With respect to every call that originates and terminates in a different rate center, only one of which contains a CLEC switch, a decision must be made as to which rate center – the originating or terminating – the CLEC switch should be assigned, or whether to assign the switch to both. We have conservatively assigned the CLEC switch to only one rate center –the rate center to which the NXX is assigned.

of customers, including ISPs,[51] voice mail providers, and large business (particularly those with telecommuting employees).[52]

To the extent that CLECs actually do receive free LATA-wide transport from ILECs, the effective footprint of their switches must be expanded accordingly.[53] And attributing a LATA-wide shadow to CLEC switches of course increases, quite significantly, the overall level of competition in the switching market. According to the FCC's data, 87 of 193 LATA are served by 1-4 CLEC switches, 13 LATAs are served by 5-8 CLEC switches, and 4 LATAs are served by 9-12 CLEC switches.[54]

The LERG permits a more detailed, rate-exchange-area-based analysis. Assuming that every CLEC switch is capable of serving all rate exchange areas in the LATA in which the switch is located, 94 percent of all BOC and GTE rate exchange areas in the United States would be served by at least one CLEC voice switch. Eighty percent would be served by at least two CLEC switches. Seventy percent would be served by at least three. Sixty-two percent would be served by four or more. *See* Map 9.

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[51] *E.g.*, Brooks Fiber has obtained NXX codes to attract ISP customers in Maine. *See* Notice of Investigation at 11, *Investigation into Use of Central Office Codes (NXXs) by New England Fiber Communications L.L.C. d/b/a Brooks Fiber Communications*, Docket No. 98-758, (Maine P.U.C. Oct. 6, 1998) (FILL IN).

[52] *E.g.*, Focal Communications offers its Virtual Office Service, which its describes as follows on its Web Page:

> Here's how it works: your business is given telephone numbers throughout the city and suburbs, so that your employees always have access to a local telephone number. The employee dials a local Focal telephone number using their residential telephone service. The telephone company central office routes the call to Focal's central office, which in turn routes the call over dedicated T1s from Focal's central office to your business' server. The costs to your business include the T1 trunks between Focal's switch and the server at your business, and the local telephone numbers. The cost to your employee is the cost of an everyday local telephone call they are billed for on their residential telephone bill. If the CLEC's customer is an ISP, voice mail provider, or other entity that re-assigns the number, this would then apply to the customer of that entity, which is indirectly a customer of the CLEC (as it uses the CLEC switch).

[53] Even in the absence of free transport, the LATA may be the appropriate footprint for a single CLEC switch. *See* NewSouth Communications, *Network Strategy*, http://www.newsouth.com/site91498/HTML/strategy.html (NewSouth, a self-described "non-digging switch-based CLEC," has deployed "one full digital switch for each LATA to serve the local market."); *ISPs Strongarm GTE for SS7 Bypass Savings*, Communications Today, Nov. 10, 1998 (noting that, using SS7 networks, CLECs "can backhaul local numbers from an entire LATA region into one location and terminate them all on that one switch.").

[54] *See FCC Local Competition Report* at Table 4.13. We have included only CLECs that have been holding NXX codes for 18 months or more. By contrast, the FCC sums all CLECs holding numbering codes, and reaches the following results: 111 LATAs served by 1-4 CLECs; 28 LATAs served by 5-8 CLECs; 9 LATAs served by 9-12 CLECs; 12 LATAs served by 13 or more CLECs. *See id.* Chart 4.7.

INSERT MAP 9

D. CLECs Can Buy Additional Voice Switches

CLECs may also extend their service territory by deploying new switches. Within BellSouth's region alone, 30 CLECs already have plans to deploy an additional 95 switches.

The market for central office switches is served by numerous manufacturers.[55] Costs have been driven down rapidly by advances in digital technology.[56] On a per-line basis, prices declined over 60 percent from 1986 to 1996,[57] and were projected to fall another 12 percent by 2000.[58] As a result, newer buyers – like CLECs – typically pay less for switching than older buyers – like ILECs.

The three major U.S. switch manufacturers have designed switches specifically with CLEC needs in mind, including the need to start small.[59] Nortel offers the DMS-10 Local Switch "at a price that has put it at the center of the entrepreneurial strategies of Competitive Local Exchange Carriers across North America."[60] Nortel's larger DMS-500 offers "a cost-effective vehicle for cable operators and competitive access providers to quickly enter local exchange markets today."[61] Lucent markets its flagship 5ES-2000 directly to CLECs, noting that "[w]ith a minimal investment in hardware, real estate and staff, emerging competitors can quickly provide telecommunications services and support a large number of customers and services with our 5ESS®-2000 Switches."[62] Siemens' DCO switching system "is a local switching exchange designed to serve the small to medium size markets as well as a low cost solution for Competitive Local Exchange Carriers (CLECs)."[63] These switches support a full range of services – local, long-

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[55] According to the LERG, CLECs have purchased switching equipment from at least 10 different manufacturers: Alcatel/DSC, Ericsson, Excel, Harris, Lucent, Mitel, Nortel, Northern Electric, Siemens, and Stromberg-Carlson. *See* Appendix A.

[56] *See generally* Deutsche, Morgan, Grenfell, Inc., *Telecom Equipment*, Mar. 27, 1998, at 69.

[57] *See* Northern Business Information, *U.S. Central Office Equipment Market: 1996 Database*, Version 1.0, at 27 (Jan. 1997).

[58] *See id.*

[59] *See* W. Tucker, *Is Switch Partitioning Feasible for CLECs?*, Mar. 1999, http://www.phonelpusmag.com/search/archive/pp/articles/931carri.html ("The wide variety of vendors and products allows a CLEC to acquire a switching solution tailored to fit its customer and market needs.").

[60] Nortel Networks, *PCN: Product Portfolio – DMS-10 Carrier Class Switching System*, http://www1.nortelnetworks.com/pcn/products/dms10.html. According to Nortel, the DMS-10 is "[d]esigned for small to medium applications;" it "provides the competitive service provider with low market entry and overall life cycle cost. This means quick payback and higher operating margins." *Id.*

[61] Nortel Networks, *DMS-500 Local & Long Distance Switch Product Information*, http://www1.nortel.com/broadband/dms/500/product_cc.html.

[62] Lucent, *Build a Flat, Flexible Network*, http://www.lucent.com/netsys/5ESS/family/build.html.

[63] Siemens Information and Communications Networks, *Siemens DCO Solutions*, http://www.icn.siemens.com/icn/products/digital/dco.html. Siemens further describes its switch as "an efficient and economical solution for competitive local exchange carriers (CLECs) seeking to enter switched, integrated services markets," and as "an ideal system for CLECs entering new markets." *Id.*

distance, ISDN, Internet access, wireless, and Advanced Intelligent Network (AIN) Services.[64]

Many of the new, smaller switch manufacturers target the CLEC market exclusively.[65] Castle Networks' C2100 Services Mediation Platform is "designed to extend the range of Class 5 services to smaller markets where it is not cost effective to use 5ESS or DMS 500, while providing a platform for the creation of new services."[66] The C2100 "will enable CLECs to both lower their barriers to entry and enable advanced services."[67] Coyote Technologies' DSS switch "is designed to secure the customer threshold and economic benefits of smaller switches, without some of the feature compromises that smaller switches impose."[68] Coyote's switching solutions "provides CLECs . . . with cost effective, scalable solutions that enable them to enter new markets with revenue-generating services."[69] Sattel manufactures switches designed for CLECs that compete in smaller and medium-sized markets.[70]

CLECs can deploy their own switches much more quickly than some regulators apparently believe.[71] Since the 1996 Act, CLECs and equipment manufacturers have

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[64] *E.g.*, Nortel's DMS-500 can be used to provide both local and long distance services, offering "a cost-effective vehicle for cable operators and competitive access providers to quickly enter local exchange markets today and garner new subscriber revenues." Nortel website, http://www1.nortel.com/broadband/dms/500/product_cc.html. Lucent offers AnyMedia capability for its 5ESS switch, which enables carriers to switch **"**ISDN voice and data, local voice and long distance calls, Internet access, wireless PCS, Advanced Intelligent Network (AIN) Services, interactive video and multimedia services." Lucent website, http://www.lucent.com/wirelessnet/products/networks/5ess_adv.html. Siemens' EWSD switch "provides a single switch platform solution for local and long distance services. Siemens website, http://www.icn.siemens.com/icn/news/1998/98082402.html.

[65] *See* L. Wirbel, *Startups to Storm Switch Market*, tele.com, Jan. 15, 1999 ("Most of the newcomers are targeting competitive local exchange carriers (CLECs).").

[66] C. Nicoll, *Castle Networks and Verticle Networks Address Turnkey Solutions*, Current Analysis, Jan. 27, 1999, http://www.castlenetworks.com/newsroom/news_reviews/cn012799-01.html. The C2100 starts at $101,500 and is available for customer shipment in July 1999. *Id.* Castle Notes that: "[S]erver-based switches promise carriers very low-cost market entry, particularly into small cities where return on investment (ROI) may appear most risky." The president of Castle Networks noted "CLECs can only compete with incumbents by replacing the old incumbent tools with a new architecture of distributed switches and servers." *Id.*

[67] P. Lambert, *Startup Castle Networks to "Unbundle" Class 5 Switch*, Dec. 1998, http://castlenetworks.com/newsroom/news_reviews/cn120098-02.html.

[68] Coyote Technologies, *Capitalizing on Local Exchange Opportunities*, http://www.coyotetech.com/pressrel/ctpr980309a.asp.

[69] *Id.* Coyote further notes that its DSS can be "readily deployed even in the early days of a carrier launch. It can be installed at a low line threshold – below 500." *Id.*

[70] Sattel explains that: "A scalable switch could enable a market participant to enter into and test a new market at a relatively low initial capital cost per port by purchasing a less expensive switch with a smaller port capacity that could be expanded in the future as the business grows." The Diana Corporation, 1997 Annual Report, at 8 (1997).

[71] *See Local Competition Order*, 11 FCC Rcd at 15705-6, . 411 (citing testimony of Illinois Commission in support of claim that switch purchase and installation can take up to 2 years). The testimony that the FCC relies on refers to the average time for all carriers – ILECs and CLECs – to install

worked together to speed switch deployment times. Lucent has developed "prefab central offices" specifically to reduce installation times for CLECs.[72] According to Lucent, "the entire process, from prefab to the deployment of service takes 40 days."[73] e.spire states that its typical switch installation takes "'[n]o longer than 28 weeks' from the time a competitive provider places an order with its switch vendor to the time the switch is turned up."[74] Many CLECs are now at the stage of deploying remote switches to link up to large units already in operation, and remotes can be put into operation very quickly.[75] Vendors offer systems on a "turnkey" basis, supplying all the technical expertise needed to get switches up and running.[76] Labor markets are of course fluid, too, and CLECs can hire "human capital" away from ILECs or others as they need it. And major CLECs like AT&T and MCI WorldCom acquire the expertise they need by acquiring companies (like MFS and TCG) already fully engaged in local exchange markets.

Equipment manufacturers are helping CLECs finance switch purchases. Industry analysts note that "[w]hen Wall Street runs the other way, CLECs increasingly turn to equipment suppliers for funding. Financing deals were becoming more evident in late 1998 and are expected to continue this year."[77] Lucent has committed to provide up to $2 billion in equipment financing for WinStar,[78] and $250 million for KMC Telecom

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switches, even though CLECs may install switches much more quickly than ILECs because they do not need to perform timely cutovers of existing customers.

[72] *See* Breakaway Strategies, *Prefab COs Speed Market Entry*, Insight, Fall-Winter 1998, at 9 (*quoting* Michael A. Sternberg, president and CEO, KMC Telecom: "Lucent has taken central office technology out of the traditional commercial office space and paced it for transport into four modular, concrete buildings, each measuring 11 feet by 26 feet and weighing 42 tons.").

[73] *Id.* at 10. KMC Telecom, a CLEC that has used Lucent's prefab COs, notes that "[w]ith Lucent's prefab COs, we have been able to chop four to six months off our installation cycle, meet our aggressive service plans and start generating revenues on schedule with our business plans." *Id.* at 9 (quoting Michael A. Sternberg, president and CEO, KMC Telecom). The prefabs "have saved KMC almost 40 percent over traditional methods." *Id.* at 10.

[74] *ASCI Refines Switch Deployment Game Plan, Switching Strategies for C-LECs*, Sept. 1997, www.clec.com/latest/switch/switchindex.cfm (*quoting* Mark Fuller, vice president of switch services management, ACSI). Press Release, *RNK Selects Siemens DCO Central Office Switch for CLEC Network Backbone*, Nov. 11, 1998, http://www.icn.siemens.com/icn/news/1998/98111101.html (*quoting* RNK President Richard Koch as stating that his company obtained a switch from Siemens and was "able to get it up and certified in a month. The people at Siemens really bent over backwards with amazingly dedicated customer service.").

[75] ITC Deltacom notes that remote switches "can be installed more quickly than DMS-500 switches." ITC Deltacom, Inc., Form 10-K, Mar. 30, 1998.

[76] *E.g.*, "[Intermedia's] telecommunications equipment vendors actively participate in planning and developing electronic equipment for use in Intermedia's network." Intermedia Communications, Inc. Form 10-K, filed Mar. 25, 1998.

[77] P. Brown, *Telecom Act Turns Three*, tele.com., Jan. 25, 1999.

[78] *Id.*

(expandable up to $600 million).[79] Nortel signed a three-year, $170 million deal with Net2000 that finances both equipment and professional services.[80] Nortel and Teligent have entered into an equipment purchase and vendor financing contract valued at $780 million over 5 years.[81] Siemens has invested more than $100 million in CLECs.[82] According to one CLEC executive, "One vendor was offering me 125 percent financing, so every time I needed to make payroll, I bought a switch."[83]

E. Additional Substitutes for Incumbent LEC Voice Switches

CLECs can and do provide competition to incumbent LEC switches by deploying equipment other than Class 5 central office switches. Long-distance switches, packet-data switches, wireless switches, and PBXs, can all be used to substitute, in varying degrees, for incumbent LEC switches.

1. Long-Distance Carriers' Switches. Switches like Nortel's DMS-500 and Lucent's 5ESS are now routinely configured to support both local and long-distance services.[84] In January 1997, AT&T introduced its "Digital Link Service," which uses its installed base of 4ESS switches to offer a bundle of local and long distance services.[85] To provide this service, AT&T upgrades its "switches to perform class 5 local-switching functions and . . . [makes] . . . software changes in the private branch exchanges (PBXs) that are located on the customers' premises."[86]

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[79] KMC Telecom to Expand State-of-the-Art Data and Voice Networks, PR Newswire, Feb. 4, 1999.

[80] P. Brown, *Telecom Act Turns Three*, tele.com., Jan. 25, 1999.

[81] L. Luna, Nortel Pays to Play in Broadband Wireless: LMDS Auction Could be Dud, Radio Comm. Report, Nov. 10, 1997, at 1.

[82] P. Brown, *Telecom Act Turns Three*, tele.com.

[83] *Handled Improperly, IPOs Can Hurt, Not Help, CLECs Are Warned*, Communications Today, Feb. 20, 1998 (*quoting* Chris Edgecomb, CEO of Star Telecom).

[84] Sattel's DSS switch "can perform Class 4 switching (when connecting other switches in a tandem configuration) or Class 5 Central Office ("CO") switching (when connecting individual customers to the PSTN)." The Diana Corporation, 1997 Annual Report, at 8 (1997). Carrier Access Corp.'s Access Exchange Nodal Switching software "acts as a tandem switch to a Class 4 toll switch," turning "'Class 4 toll switches into mini local exchange switches." K. Cholewka, *Versatility for Class 4 Switch*, Telephony, Jan. 19, 1998.

[85] AT&T refers to this new service as its "4E local solution".because it provides AT&T with "the ability to take the existing network configurations of [its] large customers [who have dedicated access lines into AT&T's 4ESS switches], add local traffic and route it accordingly." J. Dix and D. Rohde, *AT&T Plots Invasion of Baby Bell Turf, Network World*, July 8, 1996, at 1 (quoting Harry Bennett, vice president and general manager of AT&T.s local services division). AT&T trials of the service in 35 states have attracted 2,500 businesses, and AT&T planned to extend the service to 45 states by February 1999. *See* D. Weimer, *AT&T Offers Local Service to Medium, Large Businesses*, The Palm Beach Post, Jan. 28, 1997, at 4B.

[86] Deutsche Morgan Grenfell Inc., *AT&T Corp. - Company Report*, Jan. 29, 1997, at 2. AT&T has described the software changes that must be made to PBXs as "minor" and "easy to implement." *AT&T Ready to Launch Local Phone service for Business Customers*, Jan. 27, 1997, http://www.att.com/press/0197/970127.bsc.html. The credit rating company, Duff and Phelps, explained that "AT&T's Digital Link

AT&T is already using 34 of its roughly 145 4ESS switches to provide competitive local service in 379 different rate exchange areas.[87] If AT&T opted to use all its existing 4ESS switches to provide local service in addition to long-distance, and served an average of 10 rate exchange areas with each 4ESS, the company would serve approximately 15 percent of the rate exchange areas in BOC and GTE territory.

2. Wireless Switches. All of the major switches in the marketplace today are likewise capable of handling both wireline and wireless communications.[88] 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. According to the March 1999 LERG, wireless carriers operate over 3300 switches in the U.S., approximately 2500 of which are owned by carriers other than the BOCs and GTE.

Moreover, wireless and wireline markets are gradually converging, as the price of wireless service continues to fall rapidly.[89] AT&T is already aggressively marketing its "Digital One Rate Plan" as a direct substitute for wireline service.[90]

3. Packet Switches. Data traffic already equals or exceeds voice traffic on phone networks,[91] and the volume of data traffic is growing much faster than voice.[92]

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strategy is not nearly as capital-intensive as building a stand alone network." Duff & Phelps Credit Rating Co., *AT&T – Company Report*, Aug. 13, 1997, at 8.

[87] J. Rendleman, *AT&T: Now for the hard part; Company Business and Marketing*, PC Week, Mar. 22, 1999 (AT&T has 145 4ESS switches); *March 1999 LERG* (AT&T is using 34 of these to provide local service); *id.* (rate exchange area calculation).

[88] Lucent's 5ESS-2000 AnyMedia Platform supports "wireless, landline, gateway, toll, local, advanced ISDN, and other applications coexisting on the same exchange." Lucent website http://www.lucent.com/wirelessnet/products/networks/5ess_adv.html. Nortel's 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." Nortel website, http://www1.nortelnetworks.com/pcn/products/dms100.html. Ericsson's AXE is "a vital part in next generation networks, the strategy behind Ericsson's commitment to bridging telecom and data in fixed and mobile networks." Ericsson website, http://www.ericsson.se/switching/. The Siemens EWSD digital switch can serve as "a platform for all call processing applications." Siemens website, http://www.siemens.de/ic/networks/products/carriswn/index.htm. Alcatel's 1000 switch handles "mobile switching, fixed switching, data switching, and value-added IN-based services." Alcatel website, http://www.alcatel.com/telecom/ssd/products/highlit/multifunctiona/.

[89] The FCC's Wireless Bureau has noted that "wireless and wireline technologies are increasingly competing for a single pool of minutes-of-use," and that "wireless providers can compete for local access by creating pricing plans that encourage their customers to use mobile phones as substitutes for wireline phones." *Implementation of Section 6002(b) of the Omnibus Reconciliation Act of 1993; Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services*, Third Annual CMRS Competition Report at 27-28, FCC 98-91, (rel. June 11, 1998). *See also* Section III.B.2 of this report.

[90] In announcing the plan, AT&T Chairman Michael Armstrong stated that one of AT&T's target groups for this service is those customers who see PCS service as a replacement for wireline service. According to Mr. Armstrong, "[p]retty soon, someone's going to wonder why that [wireline] phone is sitting there." *AT&T Wireless Joins Sprint PCS in Single-Rate Offer, But Adds Contracts*, Communications Daily, May 8, 1998, at 7-8.

Packet switches thus already compete directly with circuit switches for at least one major segment of traffic. Fast packet networks will soon occupy center stage, not only for data traffic, but for voice too.[93]

Long-distance carriers, ISPs, and CLECs – not ILECs – are the major buyers and operators of packet switches.[94] Precise counts are not available, however. According to New Paradigm Resource Group's *1999 CLEC Report*, CLECs had deployed 874 data switches as of December 1998.[95] By comparison, the LERG reports that the BOCs and GTE have deployed 663 packet switches.[96] But both sources vastly understate the extent of competitive packet switching, because neither counts ISPs or Internet backbone operators.[97]

AT&T currently ranks as the nation's largest provider of frame relay switching services,[98] followed by Sprint and MCI WorldCom.[99] These switches are already being

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[91] *See, e.g.*, Address of FCC Chairman William E. Kennard, National Telephone Cooperative Association, Annual Meeting, Feb. 10, 1999 ("[L]ast year, Internet data traffic eclipsed voice traffic on phone lines."); J. Kedersha, et al., Cowen & Company, Crosskeys – Company Report, Rpt. No. 2647958, at *4 (Mar. 18, 1998) ("Data traffic now exceeds voice traffic for US carriers.").

[92] *See, e.g.*, First Marathon Securities Ltd., *Voice Over Internet Protocol*, Dec. 11, 1998, at 2 ("within the next three years, IP data traffic is forecast to outstrip voice traffic several times over."); Remarks of Commissioner Susan Ness Before the Policy Summit of the Information Technology Association of America, Washington, DC, Mar. 30, 1998 ("While voice traffic increases at a modes pace of 8 or 10 percent a year, data traffic is skyrocketing.").

[93] As AT&T CEO Michael Armstrong has noted, "we're going from the circuit switched world to a packet world." Remarks of AT&T Chairman & CEO, Michael Armstrong, *Networking: The New Generation Comes of Age*, Jan. 26, 1999, www.att.com/speeches/99/990126_cma.html.

[94] One leading manufacturer of packet switches, FORE Systems, has estimated that half of its service provider revenue comes from emerging carriers such as CLECs and cable operators. *See* Painewebber Inc., *Network January Review - Industry Report*, Report-No: 2624791. Ascend sells "primarily to ISPs and competitive local exchange carriers (CLEC)." T. Greene, *Ascend Buys Clout In Carrier Markets*, Network World, Aug. 10, 1998. Another major packet switch manufacturer, 3Com, has launched a series of product offerings intended exclusively for CLECs. *See* Furman Selz LLC, *Telecommunications/Competitive Local Exchange Carriers*, Report No. 2653156, Jun. 16, 1998.

[95] *See 1999 CLEC Report* at Ch. 6, pp. 15-16.

[96] The LERG lists CLECs as having 50 packet switches as of March 1999.

[97] The *1999 CLEC Report* does not count the vast packet-switched networks of the two largest CLECs – AT&T and MCI WorldCom. LERG counts only switches that interconnect with long-distance switches; the purpose of the LERG is to enable long-distance carriers to route calls to specific switches. And many, if not most, packet switches are used in private networks, which would not be registered in the LERG.

[98] On March 23, 1999, AT&T announced that it would begin providing "local" ATM Service in 41 cities using AT&T's "existing" switching platform. AT&T, News Release, AT&T First To Provide Seamless End-to-End Asynchronous Transfer Mode, Mar. 23, 1999. In the Fall of 1998, AT&T announced that it would provide local frame relay services. AT&T Press Release, *AT&T First to Offer Seamless 'Any-Distance' Frame Relay Service, Extends Reach with Loacl Frame Offer*, Nov. 23, 1998. MCI WorldCom has likewise announced the availability of its Metro ATM service in more than 350 cities nationwide. The service lets customers connect to other business sites within the same LATA.

deployed to siphon local voice traffic off ILEC voice networks.[100] Numerous other CLECs have announced major investments in packet switches to provide IP telephony in addition to circuit-switched local-service offerings.[101] Overall, packet switches are much more cost-efficient than circuit switches, and therefore even easier for CLECs to deploy.[102]

4. PBX Systems. PBX systems compete directly with switch-based Centrex services. The FCC has reached this conclusion.[103] So have numerous state commissions.[104] And analysts recognize that PBX and Centrex offer "essentially the

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[99] *See* J. Rendleman, *Sprinting Forward; Sprint Data Services Strategy Leverages Core Networking And Technological Capabilities*, PC Week, Jul. 20, 1998, at N29 ("Sprint was the second-largest provider, behind AT&T, of frame relay services in terms of U.S. revenues, with 20.2 percent of the total $2.5 billion frame relay market. In ATM revenues, Sprint had 21.7 percent of the overall $183.5 million U.S. market in 1997, again second only to AT&T, according to Vertical Systems Group, in Dedham, Mass.").

[100] *See, e.g.*, *Bridging the Edge*, America's Network, Mar. 1, 1999 ("AT&T, Sprint, and MCI WorldCom are all calling for ATM at the business premises, so they'll be bringing voice calls in over ATM signaling."); K. Gerwig, *Executive Orders – A New Survey Reveals What IT Executives Want-And Fear-From Convergence*, tele.com, Feb. 22, 1999 (AT&T's new Integrated Network Connection (INC) lets business customers "buy a single AT&T network connection to combine their voice with frame relay and Internet data traffic over an ATM circuit that extends to their premises.").

[101] Sprint invested $2 billion to construct its ION network, which will "carry pin-drop quality voice traffic over an ATM network and seamlessly connect to any public switched network. Sprint claims its ION "will obsolete the telcos' traditional circuit-switched networks." R. Higgins, *Paying the Piper*, Communications News, at 36 (Feb. 1, 1999). MCI WorldCom offers "On-Net" services, which "allows business customers to combine voice and data traffic from local U.S. and international locations onto one seamless, end-to-end network." WorldCom Press Release, *MCI WorldCom Unveils New "On-Net" Communications Services For Businesses*, Sept. 28, 1998. Intermedia claims "the highest [packet] switch density in the industry," and boasts "more frame relay nodes in place than the combined total of America's top three local telephone companies." Intermedia Communications, *At A Glance*, http://www.intermedia.com/pressroom/ataglance.html.

[102] *See, e.g.*, P. Brown, *Telecom Act Turns Three*, tele.com (second-generation CLECs are developing "much cheaper" alternatives to Class 5 switches, such as ATM switches); Intermedia Communications, Inc. Form 10-K, filed Mar. 25, 1998 ("An ATM switch can handle approximately ten times as many calls as a voice switch and costs approximately one tenth as much as a voice switch"); R. King, *Data Leaves Voice Standing Still*, Headend, Jul. 1998 (*quoting* Level 3 CEO James Q. Crowe: "Packet switching has a better performance/cost ratio than ATM or conventional class 4/5 switches, and the difference is growing.").

[103] *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, 7447 (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."); *Id.* (Centrex-ETS, and PBX-ETS switching services "are increasingly being used to provide similar switching functions for customers . . . The switching services appear to be directly competitive . . ."); *KLF Electronics v. Indiana Bell Telephone*, Memorandum Opinion and Order, 1 FCC Rcd 502, 502 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.").

[104] *See, e.g.*, Indiana, Cause No. 37558, Mar. 20, 1985 (finding that PBX and Centrex are competitive alternatives to one another and that "therefore the market for Centrex is also highly competitive."); Ohio, Case Nos. 89-719-TP-ATA and 89-720-TP-AEC, May 31, 1989 (finding that Centrex

same capabilities."[105] As of year-end 1997, there were nearly 44 million installed PBX lines in the United States.[106]

PBXs can serve the needs of companies both large and small.[107] Many new PBX vendors have developed PC-based products designed for small and mid-sized businesses with 100 workstations or fewer.[108] Altigen sells a PBX called "AltiServ" which was described by PC Magazine as superior to traditional PBXs in "product maturity, usability, and price."[109] Centrepoint Technologies sells a "micro PBX" to small businesses for under $500.[110] These products offer features that a traditional PBX cannot offer, such as web access to voice mail.[111] PBX systems are now available for as few as two lines, and can be created with small hardware and software additions to Windows-based PCs.[112]

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switching and features should be classified as competitive and should be granted contract pricing authority for such services.).

[105] G. Lawyer, *CLECs Fashion Centrex Services for Small Businesses, National Customers*, 1998, www.phoneplusmag.com/search/archive/xc/articles/8c1feat3.html. *See also*, 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.").

[106] Multimedia Telecommunications Association, *1998 Multimedia Telecommunications Market Review and Forecast*, at 92 (1998). Between 1994 and 1997, PBX line shipments have grown at a compounded annual rate of 10.3 percent. *See id.* at 90. That growth rate accelerated in 1998. *See* M2 Presswire, *Telecommunications Manufacturers Continue to show Steady Growth*, Jan. 14, 1999.

[107] *See 1998 Multimedia Telecommunications Market Review and Forecast* at 94 ("The PBX can be used by small companies to serve their basic call-control needs by providing a system to handle voice messaging, voice mail, fax, and e-mail with protection from obsolescence. The PBX is also appropriate for large companies that may have more sophisticated needs with respect to the integration of voice and data.").

[108] W. Hersch, *PC PBX Progress*, Computer Reseller News, Mar. 29, 1999 http://www.techweb.com/se/directlink.cgi?CRN119990329S0059.

[109] Altigen Communications, Inc. http://www.altigen.com.

[110] Compugalaxy Home Page, http://projects.netxactics.com/compugalaxy/listproducts.asp.

[111] *See* R. Tehrani, *The Voice/Data Switch: Your Next PBX*, Call Center Solutions, Vol. 17, No. 7, at 14.

[112] *See, e.g.*, Alactel, *Online Product Guide, Alcatel 2740/2750*, http://www.alcatel.com/telecom/mbd/products/products/opg/products/2740.htm (describing PBX-equivalents "for residential and small business" with a "maximum of 2 analog trunk lines and 8 extensions"); Press Release, *Netphone Introduces Telephony Industry's First ISDN PCI Board for Windows NT-Based PBXs*, http://www.netphone.com/press.htm (describing PC-based PBX system); *Artisoft Wins Two Product of the Year Awards from CTI Magazine; Televantage and Visual Voice Products Recognized for Technical Innovation*, Business Wire, Feb. 2, 1999 (describing TeleVantage, a PC-PBX application, that serves up to 48 trunk lines and 144 extensions).