
SIGNALING SYSTEM SEVEN: A CASE STUDY IN LOCAL TELEPHONE COMPETITION

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Congress enacted the Telecommunications Act of 1996 ("1996 Act") to "promote competition and reduce regulation in order to secure lower prices and higher quality services for American telecommunications consumers and encourage the rapid deployment of new telecommunications technologies."¹

The 1996 Act sought to revolutionize the local telephone market by introducing competitive mandates that forced incumbent local exchange carriers ("ILECs") to offer access to pieces of the telephone network infrastructure to competitors at wholesale prices.² Although many competitive local exchange carriers³ ("CLECs") and third-party providers⁴ complain that

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¹ Pub. L. No. 104-104, 110 Stat. 56 (codified in various Sections of 47 U.S.C.) [hereinafter *1996 Act*].

² See THE COMMUNICATIONS ACT: A LEGISLATIVE HISTORY OF THE MAJOR AMENDMENTS, 1934-1996 31 (Max D. Paglin et al. eds., Pike and Fischer, Inc. 1999) [hereinafter COMMS. ACT LEGISLATIVE HISTORY] ("The Telecommunications Act of 1996 brought the most substantial changes in the regulation of telecommunications services since adoption of the Communications Act in 1934."); see 47 U.S.C. §251 (2000) (requiring incumbents to offer network elements to competitors on an unbundled basis.). The unbundling requirements were primarily directed to the Regional Bell Operating Companies ("RBOCs" or "Baby Bells") who, despite regulatory and legislative pressure, still maintained a near monopoly of the local telephone market. All RBOCs are ILECs, but not all ILECs are RBOCs. This article's analysis of local competition in signaling focuses on the regulation of and actions by the RBOCs.

³ There were few providers offering meaningful local competition to the RBOCs when Congress enacted the 1996 Act. The competitive carrier industry experienced a rapid rate of growth between 1997 and approximately 2000. "The business case [for CLEC growth] was compelling enough for investors and vendors to embrace it enthusiastically. These financial backers lavished companies in the space with remarkable funding and an unusual mandate:

regulators have not done enough to ensure an equitable marketplace, the 1996 Act and the ensuing competition has indisputably changed the landscape of the industry in many respects.⁵ For example, in 1995, the last full year before passage of the Act, less than one percent of the total end-users' access lines were served by a carrier competing with the Regional Bell Operating Company ("RBOC").⁶ As of December 2003, more than sixteen percent of the total end-

Grow as fast as possible, regardless of any damage to the bottom line." Bob Ferchat & Tony Carlson, *Telecom—Dead or Alive?*, The CEO Refresher, at <http://www.refresher.com> [hereinafter *Telecom—Dead or Alive?*]. The grandiose plans of many CLECs came to a crashing end in 2001. "Bloodied with red ink and freefalling stock prices, many high-profile competitors have closed their doors, and several appear to be following." Liane H. LaBarbra, *Regional Carriers Thriving amid National CLEC Wreckage*, TELEPHONY.ONLINE, at http://telephonyonline.com/ar/telecom_regional_carriers_thriving/index.htm (June 17, 2002) ("Though most national CLECs are gone or are gasping for air, some smaller, regional providers see opportunity amid the current conditions . . ."). The remaining CLECs have built a viable business model based on investment in network infrastructure independent from the ILEC. See THE CEO REFRESHER, *TELECOM—DEAD OR ALIVE?*, at <http://www.refresher.com/ceo.html> (last visited Jan. 21, 2005).

Like all good cons the pitch was based on truth, but truth exaggerated to drive unreasonable levels of expectation for wealth creation at unsustainable rates . . . It is unlikely that the boom times of 1998-2001 will occur again in precisely the same way. That's not necessarily a bad thing, for there is something to be said for steady if unspectacular growth and profitability." Even in 1998, some analysts were predicting a flip-side to the outrageous growth of the telecom boom[;] with a boom, there's always a bust.

Dan O'Shea, *Bang Boom Bust: VC Firms Are Sizing Up the Wild New Carrier Industry*, TELEPHONY.ONLINE, at http://telephonyonline.com/ar/telecom_bang_boom_bust/index.htm (Sept. 7, 1998); see also Mike Farrell, *ICG Tanks, Depressing Other CLECs*, MULTICHANNEL NEWS (Oct. 2, 2000) ("Stocks in the once-hot competitive local-exchange carrier sector dropped like stones last week in the wake of discouraging news from ICG Communications Inc.").

⁴ Third-party providers of competitive services are the true success story of the 1996 Act. In the years since passage of the Act, a cottage industry has developed whereby third-party vendors develop services to sell to CLECs as a bypass to the ILEC network and services. However, the 1996 Act made for some strange bedfellows. CLECs invested in data providers and reaped significant rewards. Abby Christopher, *Enemy Mine: The Data CLEC Investment Paradox*, TELEPHONY.ONLINE, Nov 29, 1999 ("[T]he terms and conditions of relationships among data CLECs and their investment partners and strategic partners are tenuous at best. Longer term, even data CLECs with wholesale business models and their strategic investment partners may find themselves at odds over who will build and brand value-added IP services.").

⁵ During Section 271 proceedings commenced by RBOCs seeking authorization to enter the InterLATA, the long distance market in each state, CLECs offered evidence alleging the RBOC obstructed competition in some fashion. See *In re App'n by SBC Comms., Inc., Southwestern Bell Tel. Co., and Southwestern Bell Comms. Services, Inc. d/b/a Southwestern Bell Long Distance Pursuant to Section 271 of the Telecomm. Act of 1996 to Provide In-Region InterLATA Services in Texas*, *Memorandum Opinion and Order*, 15 FCC Rcd. 18354, paras. 68-69 (2000) (finding that SBC had sufficiently opened its markets to satisfy the competitive checklist and gain approval of its application, despite CLECs' complaints that SBC's ordering processes resulted in blocked trunks and ultimately lost customers).

⁶ See *Local Competition Report*, FCC, Industry Analysis Division, Common Carrier Bu-

user switched access lines, nearly 30 million customers, belonged to CLECs.⁷

Over the last eight years, the broad reaching policy goals and implementation of the statutory language of the 1996 Act have been the subject of numerous seminars, articles and discussion.⁸ In a further effort to examine the evolution of competition in the local market, this article focuses on how an essential telecommunications technology service, Signaling System Seven (“SS7”), has achieved competitive results through the implementation of the local competition provisions articulated in the 1996 Act, and evaluates whether similar competitive results can be achieved in other aspects of local telecommunications services.⁹

I. EVOLUTION OF THE PUBLIC SWITCHED TELEPHONE NETWORK

The Public Switched Telephone Network (“PSTN”) grew from a mere 260,795 telephones in 1892¹⁰ to the virtually complete integration of telecommunications technology into every home in America currently enjoyed in the United States.¹¹ For decades, monopoly interests controlled development of the network and necessarily emphasized deployment of basic telephone

reau 5 (Dec. 1998).

⁷ See *Local Competition Statistics*, FCC, Industry Analysis Division, Common Carrier Bureau 1 (June 2004). At least one CLEC serves customers in 75% of the nation’s zip codes. *Id.* at 3. Customers enjoy even more robust competition in 14% of the nation’s zip codes where there are at least ten CLECs offering service. *Id.* at 4.

⁸ Robert W. Crandall et al, *Do Unbundling Policies Discourage CLEC Facilities-Based Investment?*, B.E. J. IN ECON. ANALYSIS & POL’Y (2004) (“Our results indicate that facilities-based line growth relative to UNE growth was faster in states where the cost of UNEs was higher relative to the cost of facilities-based investment.”); Michael F. Finn, *The Public Interest and Bell Entry into Long-Distance Under Section 271 of the Communications Act*, 5 COMM.LAW CONSPECTUS 203 (1997); Philip J. Weiser, *Federal Common Law, Cooperative Federalism, and the Enforcement of the Telecom Act*, 76 N.Y.U. L. REV. 1692 (2001); Stacy Schwartz, *Telephone Competition Under the 1996 Telecommunications Act*, 9 MEDIA L. & POL’Y 33 (2001) (examining the competitive effects of the 1996 Act on the local markets using Bell Atlantic’s Section 271 approval in New York as an example of success); Kimberly L. Sharkey, Comment, *Confusion in the Wake of the Telecommunications Act of 1996*, 28 FLA. ST. U. L. REV. 831 (2001).

⁹ A case study allows a more concrete examination and evaluation of competition in local telephony than can be done in the abstract.

¹⁰ See COMMS. ACT LEGISLATIVE HISTORY, *supra* note 2, at 33-34. The patent law initially protected Alexander Graham Bell’s monopoly on the telephone. The period of patent protection has been characterized as a “stagnant” period for growth of telephone ownership.

¹¹ Telephone service comprises approximately 2% of household expenditures in the United States. Paul Zimmerman, *Reference Book of Rates, Price Indices, and Household Expenditures for Telephone Service*, FCC, Wireline Competition Bureau, iv. (July 1, 2004). The average monthly charge for local telephone service is \$24.75. *Id.* at Table 1.1.

service.¹² The evolution of the PSTN was made possible by technology that added increasing flexibility and efficiency over many years. It evolved from an initial regulatory regime dedicated to first preserving the monopoly position in the local markets of the Bell Operating Companies, to a regulatory commitment to open the markets to competition.¹³

A. Technological Development of the PSTN Led to Advancements in the Signaling Network

The telephone invented by Alexander Graham Bell in 1876 carried a voice signal from the receiver to the listener.¹⁴ The quality of the signal, and thus the quality of the voice pattern, improved over time.¹⁵ In the late 1800s, the telephone continued to require an operator to complete the call to the requested party.¹⁶ In 1889, the rotary dial was introduced which allowed customers to directly connect to the desired number.¹⁷ The Bell Telephone Company dominated the telephone service market, but the low level of subscribership made holding a monopoly position less than a remarkable accomplishment.¹⁸ Slowly, telephone technology and marketing improved, and more households connected to the “Bell System.”¹⁹

The Bell System grew, but faced competition from independent carriers.²⁰ The American Telephone and Telegraph Company (“AT&T”) was formed to

¹² See COMMS. ACT LEGISLATIVE HISTORY, *supra* note 2, at 34 (“AT & T . . . changed the telephone industry from a competitive industry to a shared monopoly.”).

¹³ See *In re Implementation of the Local Competition Provisions in the Telecomm. Act of 1996*; Interconnection Between Local Exchange Carriers and Comm'l Mobile Radio Service Providers; *First Report and Order*, 11 FCC Rcd. 15499, paras. 1-5 (1996) [hereinafter *Local Competition Order*] (discussing evolution of telecommunications regulation and specific impacts of the 1996 Act).

¹⁴ See STEVEN SHEPARD, TELECOM CRASH COURSE 131 (McGraw Hill 2002) [hereinafter TELECOM CRASH COURSE].

¹⁵ See *id.* at 130-35.

¹⁶ In 1889, a Kansas City undertaker, Almon Brown Strowger, suspected that his calls were being diverted to a rival. Upon investigation, he discovered the wife of his arch business rival had taken the position of operator and was passing calls to her husband. Furious, Strowger devised a mechanism to connect calls mechanically without the interference of an operator. Strowger continued his work on telephony technology and eventually patented an automatic switch. See Tom Farley's *Telephone History Series* (2004), at <http://www.privateline.com/TelephoneHistory2/HistoryA2.html> (last visited Oct. 12, 2004) [hereinafter *Telephone History Series*].

¹⁷ Telephone technology continued to advance which led to a more marketable product. See *id.*

¹⁸ See TELECOM CRASH COURSE, *supra* note 14, at 130-33.

¹⁹ See *id.*, at 132-34.

²⁰ See *Telephone History Series*, *supra* note 16.

serve the long distance needs of the Bell customers.²¹ Independents were not allowed to connect to AT&T's system which led to isolation for those customers.²² Under significant pressure from the Department of Justice in 1913, AT&T revised its position and allowed independents to connect to the long distance network for a fee.²³ The nationwide PSTN was born.

Most of the voice trunks deployed in the United States only carried one voice conversation at a time.²⁴ The demand for trunk capacity rapidly increased, and in the 1970s, "planners foresaw that availability would be far outstretched by the mid-1980s even if more and more cables were laid."²⁵ Therefore, a great effort was made to convert the PSTN from analog to digital to allow existing trunks to carry multiple calls simultaneously.²⁶ An essential part of that conversion was the development and deployment of a signaling system capable of handling the demands of a dynamic digital network.²⁷ Signaling refers to the information needed to connect one telephone to another in order to complete a telephone call.²⁸

²¹ *See id.*

²² Cables were laid to join the exchanges, thereby allowing the connection of subscribers of one exchange to talk to subscribers of another. These cables became known as "trunks." The term "trunk" was "taken from the Middle Ages when water delivery, rather than being in pots or tanks, was made by pumping water along 8 inch bored trunks of Elm with tapered ends for joining." *The History of the Telephone*, at <http://www.dupre.co.uk/fsindinf7.htm> (last visited Oct. 12, 2004) [hereinafter *The History of the Telephone*].

²³ *See Telephone History Series, supra* note 16. One strategy used by the Bell System to develop and preserve its monopoly was to isolate independents as much as possible. AT&T even refused to sell independents equipment. Under threat of an antitrust action, Thomas Vail, the CEO of AT&T, divested the company of Western Union stock, agreed not to purchase any more independent telephone companies without government approval, and to finally connect the independents with the AT&T long distance system. *Id.*

²⁴ A trunk is "a communication line between two switching systems." HARRY NEWTON, *NEWTON'S DICTIONARY* 714 (17th Ed. 2001). [hereinafter *NEWTON'S DICTIONARY*].

²⁵ *The History of the Telephone, supra* note 22.

²⁶ *See id.*

²⁷ "From the introduction of Strowger's automatic exchange, subscribers signaled the telephone number they wanted by turning a dial. As each number was dialed, pulses were sent down the exchange line." *Id.* The pulses had to be transmitted one at a time and thus it took a great deal of time to completely communicate to the network what number you were dialing. In the 1960s, dial tone signaling was introduced. Each key on the keypad represented a combination of tones which was recognizable by the exchange. Dial tone significantly increased the speed at which a call could be connected. *Id.*

²⁸ In the *Triennial Review Order* ("TRO"), the Commission stated that "STPs are packet switches that provide access to the SS7 network and route SS7 among service switching points and service control points. These are the traffic controllers of the SS7 network and typically consist of highly reliable computers running special software." *In re Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers; Implementation of the Local Competition Provisions of the Telecommunications Act of 1996; Deployment of Wireline Services Offering Advanced Telecommunications Capacity, Report*

The increasingly digital PSTN required a more independent means of communicating between the calling subscriber and the receiving subscriber.²⁹ Multifrequency signaling used the voice trunk for signaling and then carried the call on the same trunk.³⁰ The communication was faster, but it still occurred “in-band”³¹ so it failed to provide the versatility the network really needed. Development of “out-of-band” signaling allowed the signaling required for call completion to occur on a separate facility than the voice trunk.³² The transition from in-band to out-of-band signaling greatly improved the utilization of the PSTN and solved the capacity problems caused by overuse of trunk facilities.³³

The increasing use of computer technology in the 1980s greatly sped the development of network technology and the pursuit of enhanced telecommunications services.³⁴ The PSTN experienced significant change as methods of call processing and network management transformed to provide the enhanced services demanded by increasingly sophisticated users.³⁵ Enhanced services, including caller identification, three-party calling, call forwarding and call waiting required rapid communication between networks and seamless interface with countless databases.³⁶ The telecommunications industry focused its research and development resources on technological advancements, and the result was a separation of signaling from the voice portion of the PSTN.

and Order and Order on Remand and Further Notice of Proposed Rulemaking, 18 FCC Rcd. 16978, para. 546 n.1682 (2003) [hereinafter *TRO*].

²⁹ LAWRENCE HARTE ET AL., *SIGNALING SYSTEM 7 1-2* (Althos Publishing 3d ed. 2003) [hereinafter *HARTE, SIGNALING SYSTEM 7*].

³⁰ See TRAVIS RUSSELL, *SIGNALING SYSTEM #7 4* (4th ed. 2002) [hereinafter *RUSSELL, SIGNALING SYSTEM #7*].

³¹ “In-band” refers to the location of the signaling. When the signaling occurs on the same facility as the eventual voice call it is considered to be “in-band.” NEWTON’S *DICTIONARY*, *supra* note 24, at 346. When the signaling occurs on a separate facility it is considered to be “out-of-band.” *Id.* at 504.

³² The FCC examined signaling technology and alternatives in the *Local Competition Order*. It concluded that ILECs had to provide access to their signaling networks because “alternative signaling methods, such as in-band signaling, would provide a lower quality of service.” *Local Competition Order*, *supra* note 13, at para. 482.

³³ See generally *The History of the Telephone*, *supra* note 22.

³⁴ See generally *RUSSELL, SIGNALING SYSTEM #7*, *supra* note 30.

³⁵ See generally *id.* “What was once an obscure, little-known technology has become one of the industry’s most prized possessions.” *Id.* at 1.

³⁶ HARTE, *SIGNALING SYSTEM 7*, *supra* note 29, at 1-2.

B. The Rise of Out-of-Band Signaling

The telephony networks could not sustain an acceptable level of quality³⁷ in the face of the rapid growth of telecommunications devices and increasing demand of consumers as they added multiple telephone lines at their homes to accommodate the Internet, fax machines, and wireless telephones.³⁸ Prior to the use of out-of-band signaling, the PSTN could not have supported the increased volume of users and data.³⁹ When signaling must occur on the same voice trunks intended for traffic, the capacity is too quickly exhausted and ultimately wasted on calls that cannot be completed.⁴⁰

Out-of-band signaling segregates the set up functions of a call to a physically separate network from the voice trunks.⁴¹ The voice trunk is not engaged unless a call is successfully completed, which avoids the wasted use of a valuable voice trunk.⁴² Out-of-band signaling has the “effect of moving the intelligence out of the PSTN and into a separate network where it could be somewhat centralized and therefore made available to a much broader population.”⁴³ The separate network also allows for the transport of more data at higher speeds and allows for signaling at any time in the duration of the call rather than only in the initiation.⁴⁴

The modern signaling network does more than just connect the sender to the receiver, although that remains the underlying goal.⁴⁵ The signaling network

³⁷ Consumers experienced diminishing quality in increasing delays in connection of their telephone calls. See generally TELECOM CRASH COURSE, *supra* note 14.

³⁸ “Another implication of competition, number portability, greatly increases the potential use of SS7 networks. In addition, the ongoing development of new, enhanced services applications requires quick and reliable SS7 routing capabilities.” Dan O’Shea, *The Network That’s Never Done*, TELEPHONY.ONLINE, (Sept. 15, 1997) [hereinafter *The Network That’s Never Done*]. In 1947, carriers had access to only 86 area codes. Only 61 new codes were added over the next 50 years. However, due to increased demand, over 100 new area codes were activated in the 1980s. See *In re Numbering Resource Optimization, Report and Order and Further Notice of Proposed Rulemaking*, 15 FCC Rcd. 7574, para. 1-6 (2000).

³⁹ See TELECOM CRASH COURSE, *supra* note 14, at 146-148.

⁴⁰ RUSSELL, SIGNALING SYSTEM #7, *supra* note 30, at 3-4.

⁴¹ *Id.* at 2-4. See also *Signaling System 7*, at <http://www.iec.org/online/tutorials/SS-7/index.html> (last visited Oct. 13, 2004) [hereinafter *SS7 Tutorial*].

⁴² HARTE, SIGNALING SYSTEM 7, *supra* note 29.

⁴³ TELECOM CRASH COURSE, *supra* note 14, at 147.

⁴⁴ Signaling during a call makes enhanced features, such as call waiting, possible. See *SS7 Tutorial*, *supra* note 41.

⁴⁵ SS7 allows wireless networks to communicate with wireline networks, which represents one of its premier benefits. Kathleen Cholewka, *Sending the Right Signals: SS7 Technology, the Wireline Stalwart, Can Beef Up PCS Networks, Too*, TELEPHONY.ONLINE, at http://telephonyonline.com/ar/telecom_sending_right_signals/index.htm (Feb. 9, 1998) (“SS7 lets wireless providers use intelligent network features by allowing communications with databases and servers that contain information about both wireline and wireless subscribers. This allows services such as mobility management and roaming.”).

engages when a caller picks up the phone and dials a number. The information is transported from the caller to the Signal Switching Point ("SSP"), an SS7 capable voice switch, serving that home to a Signal Transfer Point ("STP"), a routing packet switch.⁴⁶ The STP takes the information and determines which SSP serves the call's destination and routes the information accordingly.⁴⁷ The receiving SSP checks the line for availability and sends that information back along the same path. If the line is busy, that information is passed to the originating SSP, which gives the caller a busy signal. The entire transaction occurs in a small fraction of a second without engaging a single voice trunk. If the line is available, the originating SSP designates a voice trunk to carry the conversation and gives the caller a ring while the receiving SSP does the same for the receiving telephone.⁴⁸ Only when the receiving phone is answered does a voice trunk engage. The work done by the signaling network seems instantaneous to the caller and receiver.⁴⁹

C. Signaling System Number Seven: Versatility and Utility

The telecommunications industry has experienced explosive change and growth in recent years.⁵⁰ Consumer demand for better and faster

⁴⁶ See RUSSELL, SIGNALING SYSTEM #7, *supra* note 30, at 63-65. The FCC identified the STP as the essential element of a signaling network in the *Local Competition Order*. "Virtually all parties agree that physical access, or interconnection, to the incumbent LEC's SS7 network should occur at the STP, because it provides essential network functions that are not preformed by other SS7 network elements." *Local Competition Order*, *supra* note 13, at para. 464.

⁴⁷ RUSSELL, SIGNALING SYSTEM #7, *supra* note 30, at 63-66.

⁴⁸ *Id.* at 64-65 ("The SSP is the local exchange in the telephone network.").

⁴⁹ *Id.* at 1-3. The use of 800-number translation services provides a relatively simple example of how out-of-band signaling works. See NMS COMMUNICATIONS, SS7 AND INTELLIGENT NETWORKING APPLICATIONS, at <http://www.nmscommunications.com/white-papers/pdf/SS7andIntelligentNetworkingApplications.pdf> (last visited Oct. 12, 2004) [hereinafter NMS COMMUNICATIONS]. When a caller dials an 800-number, the local Central Office ("CO") switch, which acts as an SSP, detects that the call requires special handling and automatically initiates an Intelligent Network ("IN") trigger function. When the trigger is activated, the SSP sends a message through the STP to a remote database system, referred to as a service control point ("SCP"). This message is used by the SSP to request information regarding the handling of the call. Based on the trigger presented and the call characteristics, the SCP determines the appropriate action and sends the information back to the SSP. The SSP then handles the call in the appropriate manner. This exchange of information allows the translation information to be passed seamlessly from the caller's switch to the called party's switch.

⁵⁰ HARTE, SIGNALING SYSTEM 7, *supra* note 29. The last fifteen years have brought unprecedented change in technology that has vastly increased the type of services offered by telecommunications carriers. Consider that in 1991, the FCC was just beginning to understand what a uniform signaling protocol could bring to users. See *In re Rules and Policies Regarding Calling Number Identification Service*, *Notice of Proposed Rulemaking*, 6 FCC

communications devices has driven the change and growth.⁵¹ The dramatic increase in data services has also contributed to the overall growth of the industry.⁵²

SS7⁵³ is the dominant protocol used to run the signaling networks that enable today's rapid and complex communication.⁵⁴ Approximately \$1.8 billion is spent annually on SS7 infrastructure within the PSTN.⁵⁵ SS7 allows a highly efficient exchange of information used for call establishment, billing, routing and information-exchange functions.⁵⁶ SS7 facilitates the rapid transmission of data traffic, making it a crucial component for the provision of telecommunications services.⁵⁷ Many industry players have begun to

Rcd. 6752, para. 1 (1991) ("With the increasing deployment of Signaling System No. 7 switching technology, a panoply of new services is becoming available to callers.").

⁵¹ Press Release, Blackberry, *BlackBerry Surpasses One Millionth Subscriber Milestone*, at http://www.blackberry.com/news/press/pr-03_02_2004.shtml (last visited Feb. 3, 2004) ("This is an important threshold for BlackBerry and even a positive industry indicator since BlackBerry is now the first integrated wireless data platform to reach the one million subscriber mark.") (quoting Mike Lazaridis, Pres., Co-CEO and Founder of Research In Motion).

⁵² See Tim McElligott, *Alternative SS7*, TELEPHONY.ONLINE, at http://telephonyonline.com/ar/telecom_alternative_ss/index.htm (Mar. 5, 2004) [hereinafter *Alternative SS7*].

⁵³ SS7 was developed using the concept of protocol layering. "A layered protocol consists of modular programs, each designed to perform certain groups of functions, and each designed to be able to offer its functionalities to other modules." *SS7 Network Architecture Tutorial. I*, offered via Internet interface by SS8 Solutions, at <http://www.SS8.com/User-Parts.pdf> (2001). The layered protocol approach was adopted in 1983 when some of the major Telecom companies began to realize the numerous problems that were developing because computers of numerous types were attempting to communicate with each other over network connections. As you might expect, version six preceded the successful Signaling System Number Seven.

⁵⁴ A SS7 network must include at least two signal switching points ("SSPs") and one pair of signal transport points ("STP"). The STP acts like a traffic cop in the network directing the signals coming in to the correct SSP. This configuration removes the requirement that all of the SSPs be connected to one another. A diagram of a typical SS7 network can be found on the Internet, at <http://www.ss7.com> (last visited Jan. 21, 2005). The tutorial is an excellent explanation of the network process for signaling.

⁵⁵ *Alternative SS7*, *supra* note 52 ("SS7 networks are still growing at 16% year over year.").

⁵⁶ "Signaling systems facilitate the routing of telephone calls between switches and are necessary components of providing circuit-based telecommunications services." *TRO*, *supra* note 28, at para. 542 (citing *Local Competition Order*, *supra* note 13, at para. 455). SS7's functionality includes setup and tear down of a telephone call, the called party's number, an indication of national, international, or other subscriber information, and the nature of the circuit (satellite or terrestrial). See Creativst, Glossary Section, at <http://www.creativst.com/cgi-bin/M/Glos/st/GetTerm.pl?GetTerm=ss7> (last visited Oct. 12, 2004).

⁵⁷ Out-of-band signaling addresses two significant inevitable problems with traditional, in-band signaling: 1) 35% of all toll calls are not completed because the phone is busy or there are equipment problems. The circuit time used in signaling is "substantial, expensive,

investigate the integration of SS7 into an IP platform to further enhance the speed and volume of data traffic that can be transmitted.⁵⁸ SS7 continues to be a vibrant technology that adapts to the changing requirements of telecommunications networks and services.⁵⁹ Indeed, “[t]he industry now recognizes that SS7 holds the key to some very valuable network information that can have a big impact on carriers’ future operational costs and competitiveness.”⁶⁰ That network information, such as caller identification, has become an indispensable service offering that would not be otherwise be available without the versatility offered by SS7.⁶¹

Out-of-band signaling, initially called Common Channel Interoffice Signaling (“CCIS”), was first developed by AT&T as a packet-switched network.⁶² The crux of AT&T’s new signaling approach was the use of packet switches called signaling transfer points. At approximately the same time AT&T was working on a signaling protocol in the United States, the urgent need for an all-digital network also became apparent to the international community.⁶³ The International Telecommunications Union (“ITU”) commissioned a study to explore the possibility of an all-digital network.⁶⁴ The result was a series of standards now known as SS7.⁶⁵ SS7 “continues to be an important strategic element, not only because of its pervasive deployment

and wasteful.” 2) In-band signaling is vulnerable to fraud while out-of-band signaling maintains several built-in fraud detection devices. NEWTON’S DICTIONARY, *supra* note 24.

⁵⁸ HARTE, SIGNALING SYSTEM 7, *supra* note 29.

⁵⁹ *The Network That’s Never Done*, *supra* note 38 (“SS7 networks have been strategically developed using architectures that can be expanded easily by adding new links through the deployment of signal transfer points and SCPs.”).

⁶⁰ *Id.* (quoting Andy Belcher, general manager for SS7 at Hewlett-Packard).

⁶¹ See R. Brough Turner, *SS7 The Old Standby*, TELEPHONY.ONLINE, at http://telephonyonline.com/ar/telecom_ss_old_standby/index.htm (July 10, 2000). There are some disadvantages to SS7. “It’s a very telecom-specific protocol running on a very telecom-specific infrastructure. It shares little with the rest of the computer industry, so it has been slow to take advantage of widely available, higher bandwidth technology.” *Id.* The disadvantages of SS7 only factor into the relationship of SS7 and IP telephony. Experts believe that SS7 can be made to suit IP-based products in the future. “As new services are deployed over an IP backbone, service providers can directly access SS7 messages and transport them over IP networks to signaling gateways, where they can go back into the traditional telephone network.” *Id.*

⁶² There were six signaling systems prior to the advent of SS7, but they existed only on paper. The immediate predecessor to SS7 was actually deployed on a limited basis, but not until an international standard was developed were companies willing to invest in building signaling infrastructure. See SS8 Networks, SS7 Network History Tutorial, at <http://www.ss7.com/History.pdf> (last visited Oct. 12, 2004).

⁶³ See *id.* (giving a comprehensive history of the development of SS7).

⁶⁴ After World War II, the ITU became a United Nations Treaty Organization. It was tasked with setting international standards for telecommunications. Standardization was essential to seamless communication between countries. See *id.*

⁶⁵ RUSSELL, SIGNALING SYSTEM #7, *supra* note 30, at 1.

today, supporting many revenue-generating applications, but because it is also a critically important infrastructure for emerging packet-based Next Generation Networks (NGN).⁶⁶

SS7 networks are physically distinct networks that shadow the voice component of the PSTN.⁶⁷ The significance of the separate facilities cannot be understated. Many of the benefits of SS7 arise from the fact that the signaling needed to set up and complete a telephone call does not require any participation from the portion of the network, the voice trunks, which will eventually carry the call.⁶⁸ Voice trunks are an expensive, finite commodity in the network. Reserving their use for successful calls dramatically decreases how much the trunks need to be engaged and, consequently, how many voice trunks a carrier must purchase and maintain.⁶⁹

II. THE 1996 ACT INTRODUCES REGULATED COMPETITION TO THE LOCAL TELEPHONE MARKET AND TO SIGNALING

The provision of telephone service was once considered a “natural monopoly.”⁷⁰ AT&T and its Bell Operating Companies, which together held an unshakable grip on both the local and long distance markets, did everything they could to encourage that belief.⁷¹ By 1982, the FCC and courts could no longer ignore the Bell efforts to prevent competition.⁷² In an effort to settle a landmark antitrust suit, AT&T and the Justice Department entered into a Consent Decree, commonly known as a Modification of the Final Judgment (“MFJ”).⁷³ The MFJ stipulated that the 22 Bell Operating Companies be

⁶⁶ See NMS COMMUNICATIONS, *supra* note 49.

⁶⁷ The industry considers “SS7” synonymous with “signaling” because the SS7 protocol is universal for telephony signaling. NEWTON’S DICTIONARY, *supra* note 24, at 623; *Mobile Networking*, White Paper, at <http://www.mobilein.com> (last visited Oct. 12, 2004) (“SS7 is a critical component of modern telecommunications systems.”). SS7 networks utilize a packet switch which is the precursor to packet-based voice telephony. See FCC Chairman Michael K. Powell, Remarks at the NSTAC XXVII Executive Session Luncheon at U.S. Chamber of Commerce (May 19, 2004) (“Innovative entrepreneurs are replacing yesterday’s slow, limited networks with many different types of high-speed, full-service digital networks, such as BPL, WIFI, FTTH, Cable Modem and DSL.”). The industry hopes to duplicate the speed and efficiency of the SS7 network in the voice network by utilizing packet technology. (“Packets, like water flowing toward a downhill destination, are tenacious in seeking out alternate paths.”).

⁶⁸ RUSSELL, SIGNALING SYSTEM #7, *supra* note 30, at 63-64.

⁶⁹ See *id.* at 304-09 (describing the role of SS7 in call set-up and tear-down).

⁷⁰ See TELECOM CRASH COURSE, *supra* note 14, at 136-38.

⁷¹ See COMMS. ACT LEGISLATIVE HISTORY, *supra* note 2, at 48-49.

⁷² *Id.* at 48. (“The testimony and the documentary evidence adduced by the government demonstrate that the Bell System has violated the antitrust laws in a number of ways over a lengthy period of time.”).

⁷³ United States v. AT&T, 552 F. Supp. 131, 184-85 (D.D.C. 1982), *aff’d mem. sub*

organized into seven RBOCs independent from the AT&T parent company.⁷⁴ The MFJ also prohibited the RBOCs from providing any interexchange or long-distance services so long as they “retained the ability to use local monopolies to impede interexchange competition by engaging in discrimination and cross-subsidization.”⁷⁵ The MFJ imposed “nondiscrimination obligations and detailed requirements that BOCs provide all interexchange carriers (“IXCs”) with equal access” to the RBOC facilities at ‘cost-based’ rates”.⁷⁶

After the MFJ, AT&T was met with increasingly effective competition in the long-distance market, which was evidenced by rapidly dropping per-minute charges.⁷⁷ Even with the MFJ limitations in place, the RBOCs continued to wield firm monopoly power in the local telephone market.⁷⁸ The burgeoning competition in the long distance market gave hope to legislators that they could replicate that success with sufficient incentives.⁷⁹ A groundswell built for fundamental reform of telecommunications law and policy. According to William J. Byrnes, at least four basic forces led to a major statutory overhaul: the need to give more specific interconnection direction in the statute, the BOC desire for relief from MFJ limitations on their entry into long-distance service and manufacturing, the need to re-allocate jurisdiction between the FCC and the state agencies, and growing support for deregulation.⁸⁰ Reform came in the

nom. Maryland v. United States, 460 U.S. 1001 (1983). Several excellent articles have been written discussing the MFJ in great detail. See generally Warren G. Lavey & Dennis W. Carlton, *Economic Goals and Remedies of the AT&T Modified Final Judgment*, 71 GEO. L.J. 1497 (1983); Steven Semeraro, *The Antitrust-Telecom Connection*, 40 SAN DIEGO L. REV. 555, 561-62 (2003); see also William E. Kovacic, *The Modern Evolution of U.S. Competition Policy Enforcement Norms*, 71 ANTITRUST L.J. 377, 455-56 (2003) (discussing the placement of the MFJ in the broader landscape of antitrust law).

⁷⁴ COMMS. ACT LEGISLATIVE HISTORY, *supra* note 2, at 49. Massive consolidation in the industry has whittled the original seven RBOCs down to four. The remaining RBOCs are BellSouth, Qwest Communications, SBC Communications and Verizon Communications.

⁷⁵ *Id.* (noting further that the RBOCs transferred interexchange assets to AT&T upon divestiture).

⁷⁶ *Id.*

⁷⁷ See Brian Quinton, *Nickel Defense: AT&T Strives to Protect Long-Distance Revenues*, TELEPHONY.ONLINE, at http://telephonyonline.com/ar/telecom_nickel_defense_att/index.htm (Sept. 6, 1999) (describing AT&T’s strategy to compete with the 5-cent-a-minute plans offered by Sprint and MCI); cf. Kevin Fitchard, *Minute Waltz*, TELEPHONY.ONLINE, at http://telephonyonline.com/ar/telecom_minute_waltz/index.htm (Jan. 26, 2004) (“Wireline telecom is starting to emulate wireless. Specifically carriers are dropping the per-minute charges that characterized long-distance telecom in the U.S. since the industry’s inception.”).

⁷⁸ COMMS. ACT LEGISLATIVE HISTORY, *supra* note 2, at 49-50.

⁷⁹ See H.R. NO. 104-204, at 202 (1996) (contained in THE TELECOMMUNICATIONS ACT OF 1996: LAW & LEGISLATIVE HISTORY (Robert E. Emeritz *et al.* eds., 1996)).

⁸⁰ COMMS. ACT LEGISLATIVE HISTORY, *supra* note 2, at 50. (“The fact that nearly all of the major players in the legislative deliberations wanted something badly furnished the pre-

form of the 1996 Act.⁸¹ The 1996 Act represented a ground-breaking effort to introduce competition to the local telephone market.⁸²

A. The Beginning of Local Competition: The 1996 Act⁸³

After much debate, Congress passed the 1996 Act which dictated that each RBOC open its local market to competition.⁸⁴ While the 1996 Act contained several arguably onerous obligations on the part of the RBOCs to open the local market, it also offered the RBOCs the opportunity to enter the then lucrative long distance market if they could demonstrate compliance with a 14-point competition checklist.⁸⁵ Congress intended for this multi-layered approach to yield measurable competition in the local market.⁸⁶

When Congress enacted the 1996 Act, it intended to create an environment to foster competition that would ultimately benefit the consumer.⁸⁷ Some manifestations of competition are more evident than others and, therefore, more visible to the end user. The drafters of the legislation understood that for consumer-level competition to develop in the local market, Congress, the FCC and the State Commissions had to micromanage the wholesale elements of local telephony to produce the intended effect.⁸⁸ Congress believed that in

requisite for the arranging of a compromise package.”).

⁸¹ See 1996 Act, *supra* note 1.

⁸² The Communications Act of 1934 received only modest revision in the 62 years between its passage and the Telecommunications Act of 1996.

⁸³ This article focuses on the traditional provision of local telephone service. The emergence of wireless telephony as a viable competitor to the traditional network exceeds the scope of this case study, but it is worthy of discussion and will likely shape future discussions of competition by Congress. See Travis Larson, *Growth Continues to be Hallmark of Wireless Industry*, at <http://releases.usnewswire.com/GetRelease.asp?id=126-10152003> (last visited Oct. 12, 2004) (“The Cellular Telecommunications & Internet Association (CTIA) today released its mid-year 2003 data survey results, which show skyrocketing data revenues and strong annual growth in overall revenues, subscribership and usage.”).

⁸⁴ See 47 U.S.C. §251 (2000). Max Paglin’s treatise provides an outstanding historical perspective of the Communications Act of 1934. See also COMMS. ACT LEGISLATIVE HISTORY, *supra* note 2.

⁸⁵ 47 U.S.C. §271(2)(B)(i)-(xiv) (2000). The competitive checklist includes: interconnection, nondiscriminatory access to network elements, nondiscriminatory access to the poles, ducts, conduits, and rights-of-way, local loop transmission, local transmission, local transport, local switching, nondiscriminatory access to 911, E911, directory assistance and operator call completion services, white pages directory listings, local number portability, nondiscriminatory access to databases and associated signaling, dialing parity, reciprocal compensation and resale.

⁸⁶ See generally THE TELECOMMUNICATIONS ACT OF 1996: LAW & LEGISLATIVE HISTORY (Robert E. Emeritz et al. eds., 1996) (providing a detailed discussion of the legislative history of the 1996 Act).

⁸⁷ Pub. L. No. 104-104, 110 Stat. 56.

⁸⁸ See generally 47 U.S.C. §251 (2000); *In re* Implementation of the Local Competition

order for true competition to develop, interconnection must be facilitated, and building blocks of the incumbent-owned local network, including signaling, must be made available to competitors at a wholesale⁸⁹ cost.⁹⁰

Signaling was one of the original network elements Congress identified as essential.⁹¹ Congress identified fourteen essential network elements that the RBOC had to demonstrate were irrevocably available to CLECs before the RBOC could offer interexchange service.⁹² In implementing the 1996 Act, the Commission acknowledged that access to signaling networks was critical to build local competition.⁹³

Congress envisioned local competition flourishing upon passage of the 1996 Act.⁹⁴ In actuality, years of litigation and political maneuvering plagued

Provisions of the Telecommunications Act of 1996, *Third Report and Order and Fourth Further Notice of Proposed Rulemaking*, 15 FCC Rcd. 3696 (1999) [hereinafter *UNE Remand Order*] (prohibiting incumbent LECs from separating currently combined network elements before providing them to requesting carriers), *rev'd and remanded sub nom. United States Telecom Ass'n v. FCC*, 290 F.3d 415 (D.C. Cir. 2002), *cert. denied sub nom. WorldCom, Inc. v. United States Telecom Ass'n*, 538 U.S. 940 (2003).

⁸⁹ The appropriate definition of the wholesale cost for unbundled network elements ("UNEs") sparked a robust debate and much contemplation by the FCC. See *Local Competition Order*, *supra* note 13, at paras. 630-740. The FCC adopted Total Element Long-run Incremental Cost ("TELRIC") as the method to calculate what an RBOC could charge a CLEC. *Id.* at para. 672.

⁹⁰ Joan Engebretson, *The Great Wait*, TELEPHONY.ONLINE, at http://www.telephony-online.com/ar/telecom_great_wait/index.htm (Jan. 4, 1999) ("Incumbents claim they have opened their markets to competition and they have rolled out the red carpet for CLECs as wholesale customers. But some CLECs say the process of obtaining unbundled elements from incumbents is still too complicated."). The elements of the incumbent's network must be provided to CLECs at a low cost. Prices for the UNEs rests with the individual state commissions. The result is a wide range of price for the same element. For example, "an unbundled loop . . . costs anywhere from \$2.59 in Chicago to more than \$70 in rural Arkansas." *Id.*

⁹¹ 47 U.S.C. §271(c)(2)(B)(x) (2000) (outlining the competitive checklist of the essential pieces of the incumbent network that must be irrevocably open to competition prior to RBOC entry into the interexchange market).

⁹² *Id.*

⁹³ See *Local Competition Order*, *supra* note 13, at para. 455 ("Signaling systems facilitate the routing of telephone calls between switches. Most LECs employ signaling networks that are physically separate from their voice networks, and these "out-of-band" signaling networks simultaneously carry signaling messages for multiple calls.").

⁹⁴ Even the FCC believed that the market was ripe for local competition. *Implementation of the Telecomm. Act of 1996 Before the House Subcomm. on Telecomm. and Finance*, 104th Cong. (1996) (statement of former FCC Chairman Reed E. Hundt).

The Telecommunications Act of 1996 creates a mechanism, whether through agreement or through arbitration, for connecting complex telecommunications networks plug to plug . . . We will also continue to work with our state and local colleagues, the industry, consumers and this Subcommittee to fulfill the Act's promise of open and competitive markets and the benefits of communications for all Americans.

Id.

implementation of the 1996 Act. This litigation altered the FCC's initial vision of competition in the telecommunications markets, but much more significantly, it delayed the full implementation of Congress' vision.⁹⁵

B. The Heartache of Implementation: The Local Competition Order and the Formative Litigation

The FCC was tasked with implementing the 1996 Act. The Commission issued three primary orders: the *Local Competition Order*,⁹⁶ the *Universal Service Order*,⁹⁷ and the *Access Reform Order*.⁹⁸ The *Local Competition Order* contained the majority of rules designed to implement Congress' vision for the local telephone markets. In drafting the *Local Competition Order*, the FCC considered signaling to be so essential to a successful, modern telecommunications network, it was one of the original enumerated unbundled network elements ("UNEs") that RBOCs were required to offer to all CLECs.⁹⁹

Almost immediately upon adoption, the FCC's *Local Competition Order* faced legal challenges that ultimately reached the United States Supreme Court.¹⁰⁰ The litigation created significant uncertainty in the industry during

⁹⁵ *AT & T Corp. v. Iowa Utils. Bd.*, 525 U.S. 366 (1999). The Supreme Court generally upheld the FCC's exercise of jurisdiction in implementing rules affecting intrastate telecommunications. *Id.* at 385. The Court likewise upheld the Commission's definition of network element and its application to OSS and vertical switching functions. *Id.* at 386-387. The FCC's pick and choose rules were upheld with some reservations. *Id.* at 395-97. However, the Court rejected the FCC's conclusions regarding the "necessary and impair" standard in the 1996 Act. *Id.* at 387-92.

⁹⁶ See *Local Competition Order*, *supra* note 13, at para. 6. (referring to its Orders as the "competition trilogy," The FCC stated, "[T]he rules that we adopt to implement the local competition provisions of the 1996 Act represent only one part of a trilogy.").

⁹⁷ *In re Fed.-State Joint Bd. on Universal Serv., Report and Order*, 12 FCC Rcd. 8776 (1997) [hereinafter *Universal Service Order*].

⁹⁸ *In re Access Charge Reform, Price Cap Performance Review for Local Exchange Carriers, Transport Rate Structure and Pricing, End User Common Line Charges, First Report and Order*, 12 FCC Rcd. 15982, at paras. 1-5 (DATE) [hereinafter *Access Charge Reform Order*].

⁹⁹ *Local Competition Order*, *supra* note 13, at para. 482.

Access to signaling systems continues to be a critical element to providing competing local exchange and exchange access service. The vast majority of calls made over incumbent LEC networks are set-up and controlled by separate signaling networks. Incumbent LECs argue that access to signaling systems and associated databases is already available from other providers and therefore, they should not have to unbundled them for access by competitors.

Id. Other required UNEs included: loops, switching, interoffice transmission, and Operational Support Systems ("OSS"). *Id.* at para. 27.

¹⁰⁰ See *Iowa Utils. Bd. v. FCC*, 120 F.3d 753 (8th Cir. 1997); *AT & T Corp. v. Iowa Utils. Bd.*, 525 U.S. 366 (1999).

the years the courts debated the fate of the 1996 Act.¹⁰¹

The FCC's jurisdiction was the primary challenge to the *Local Competition Order*.¹⁰² The State Commissions and the CLECs argued that the FCC's rules implementing the 1996 Act exceeded the jurisdiction granted to it in the Communications Act of 1934.¹⁰³ In 1997, the Eighth Circuit agreed and vacated most of the FCC's rules.¹⁰⁴ Upon appeal, in 1999, the Supreme Court reversed most of the Eighth Circuit's findings, but the Court did find that the FCC needed to give more careful thought and consideration to the "necessary and impair" standard.¹⁰⁵ Although the FCC was directed to review its unbundling rules, the majority of its rules implementing the local competition envisioned by Congress were firmly established, albeit three years later than anticipated.¹⁰⁶ The unbundling rules, which effected the regulation of signaling, continued to plague the Commission.

Following the Supreme Court decision, a flurry of investment and growth in the telecommunications industry ensued.¹⁰⁷ New CLECs quickly emerged and began reselling telecommunications services.¹⁰⁸ Resale presented an easy mechanism for entry into the market, but it did not encourage CLECs to make the substantial capital investment required to construct an independent telecommunications network.¹⁰⁹ Even at the height of the CLECs' business cycle, some analysts cautioned against exponential CLEC growth.¹¹⁰

¹⁰¹ See generally *id.*

¹⁰² *Id.* at 374.

¹⁰³ *Id.* Other issues under review included the extent to which a network element had to be unbundled and the validity of the FCC's interpretation of the "pick and choose" provision of the 1996 Act. *Id.*

¹⁰⁴ *Iowa Utils. Bd. v. FCC*, 120 F.3d 753, 796 (8th Cir. 1997). The Court said it found nothing in the 1996 Act clear enough to overcome the presumption favoring state authority in the 1934 Act. The Court described the presumption as "hog tight, horse high, and bull strong, preventing the FCC from intruding on the states' intrastate turf." *Id.*

¹⁰⁵ *AT&T v. Iowa Utilities Bd.*, 525 U.S. 366, 387-88 (1999).

¹⁰⁶ *Id.* at 388. The Supreme Court directed the FCC to "reevaluate the unbundling obligations of Section 251 of the Telecommunications Act of 1996." *UNE Remand Order, supra* note 88, at para. 1.

¹⁰⁷ See Engebretson, *supra* note 90.

¹⁰⁸ The 1996 Act required RBOCs to offer essential pieces of the network for resale at below-cost rates. Phillip J. Britt, *The Resale Route*, TELEPHONY.ONLINE, at http://telephonyonline.com/ar/telecom_resale_route/index.html (Jan. 11, 1999) ("The local resale market, which has grown to more than 1000 active competitive local exchange carriers, was projected to have more than 3 million access lines and \$5 billion in revenues by the end of 1998, according to The Association for Local Telecommunications Services.").

¹⁰⁹ *Id.* ("Although local carriers can choose to build their own telecommunications infrastructures-as MFS and Teleport did before the telecom act-it's much more effective to resell local service . . . Building requires a significant capital investment that few carriers are willing to make.").

¹¹⁰ *Id.* ("Such fast growth isn't for everyone. 'Speed can be dangerous,' Gavillet [Ron Gavillet, Executive VP of Strategy for USN Comm.] says. 'Control is critical.'").

Regardless of the growth in the CLEC business, true competition failed to truly develop in the local market until the RBOCs took advantage of the “stick and the carrot” approach contained in the 1996 Act.

C. Local Competition Begins to Emerge: RBOCs Seek Section 271 Approval

The 1996 Act created the opportunity for the RBOCs to shed “the last vestiges of the Modification of Final Judgment” and enter into the long distance marketplace.¹¹¹ The RBOCs enthusiastically reached for the “carrot” of long distance entry.¹¹² Although the process was slow and required monumental fact-finding on the state level, the RBOCs worked diligently to open the local markets to enough competition to meet the required elements in the 1996 Act.¹¹³

Ameritech made the first effort to meet the 14-point checklist, albeit unsuccessfully at first, to gain approval from the FCC to enter the lucrative long distance market.¹¹⁴ The FCC articulated and refined the requirements of local competition and the specific demands of the 14-point checklist through its examination of the early RBOC applications. The resulting orders each went a little further in explaining the FCC’s vision of local competition than the bare rules.¹¹⁵ Bell Atlantic received the first approval from the FCC to offer

¹¹¹ *Implementation of the Telecommunications Act of 1996 Before the House Subcomm. on Telecomm. and Finance*, 104th Cong. (1996) (statement of Reed E. Hundt, former Chairman of the FCC).

¹¹² RBOCs invested incredible resources in attempting to prove to State Commissions and the FCC that they met the competitive checklist. CLECs likewise expended resources in disputing the claims of the RBOCs and extract concessions from the RBOCs to further enhance the competitive environment. In the midst of RBOC concessions, there was a Congressional movement to provide protection to RBOC interests. See Internet Freedom and Broadband Deployment Act of 2001 H.R. 1542. The proposed legislation shielded RBOCs from regulation of interLATA data regulation. Opponents of the legislation argued that it would slow CLEC infrastructure investment. See News Briefs, *TECH L.J.* (June 1, 2001).

¹¹³ See *Implementation of the Telecommunications Act of 1996 Before the House Subcomm. on Telecomm. and Finance*, 104th Cong. (1996) (statement of Reed E. Hundt, former Chairman of the FCC). Chairman Hundt expressed his concern to Congress that the relationship between the Bells and the long distance carriers was inherently inequitable. “[T]he long distance companies need the BOCs to complete a call, whereas no BOC needs a long distance company to complete a local call. Nor will any BOC need a long distance company as an ally to go into the long distance market.” *Id.*

¹¹⁴ Ameritech filed its application for entry into the Michigan market on January 2, 1997. See WIRELINE COMPETITION BUREAU, FCC, RBOC APPLICATIONS TO PROVIDE IN-REGION, INTERLATA SERVICES UNDER § 271, at http://www.fcc.gov/Bureaus/Common_Carrier/in-region_applications/ (last visited Jan. 17, 2005).

¹¹⁵ The first order approving an application for Section 271 approval was approximately 700 pages. The subsequent Orders specifically referred to and built upon the analysis proffered in the initial Order. *In re* Application by Bell Atlantic New York for Authorization Under Section 271 of the Communications Act To Provide In-Region, InterLATA Service

long distance to its local territory in New York on December 22, 1999.¹¹⁶ The Commission found, among other things, that Bell Atlantic met its obligation to provide nondiscriminatory access to signaling networks.¹¹⁷ Although Bell Atlantic's application met strenuous opposition by competitors, no CLEC argued that Bell Atlantic's provision of signaling was deficient or even offered anecdotal evidence of failure in the signaling network.¹¹⁸

It took almost four years for the remainder of the RBOCs to gain approval to enter the long distance market in all states. The FCC approved the last RBOC's Section 271 Application, Qwest, in Arizona, on December 3, 2003.¹¹⁹ The lack of significant controversy regarding signaling lends further credibility to the growing competition in the signaling market. The network elements, such as interconnection and loops that CLECs could only procure from the RBOC, received strenuous argument and voluminous evidence from disgruntled CLECs in the 271 proceedings before the individual state commissions and the FCC.¹²⁰

D. Rise of Competition in the Signaling Market

In 1997, Telephony.Online declared: "[t]he quiet period is over for SS7."¹²¹ By that time, investment in the signaling network had slowed because most

in the State of New York, 15 FCC Rcd. 3953 (Dec. 22, 1999) [hereinafter *Bell Atlantic 271 Order*].

¹¹⁶ *Id.*

Our decision today approving Bell Atlantic's application represents the culmination of extensive federal and state efforts implementing the Telecommunications Act of 1996.

This action builds on the experience that this Commission has gained from reviewing prior Section 271 applications and developing rules to implement Section 251 of the Communications Act.

Id. at para. 2.

¹¹⁷ *Id.* at para. 366. The Commission notes that no commentators allege that Bell Atlantic failed to meet Checklist Item 10. *Id.*

¹¹⁸ *Id.*

¹¹⁹ "This Order, granting the final Section 271 application, marks the end of a long, transformative process that has opened local telecommunications markets and augmented long distance competition throughout the country." *In re* Application by Qwest Comm. Int'l Inc. for Authorization to Provide In-Region, InterLATA Services in Arizona, FCC 03-309 (Dec. 3, 2003) (separate statement of Commissioner Kathleen Q. Abernathy).

¹²⁰ See *Bell Atlantic 271 Order*, *supra* note 115, at paras. 63-80 (discussing interconnection) and paras. 268-336 (discussing local loops).

¹²¹ *The Network That's Never Done*, *supra* note 38. Prior to the 1996 Act, RBOCs controlled their SS7 networks, but were required to provide access. See Elkhart Tele. Co. v. Southwestern Bell Tele., *Memorandum Opinion and Order*, 11 FCC Rcd. 1051, DA 95-2342 (1995) (holding that despite party disagreement about appropriate pricing mechanism, SWBT could not deny access to rural ILEC under Section 201(a) of the 1934 Act). *Id.* at para. 34.

local exchange carriers had purchased the two signal transfer points per Local Access and Transport Area (“LATA”) required by the FCC.¹²² The passage of the 1996 Act and the increase in CLECs changed the status quo. CLECs needed to either lease SS7 capacity from the incumbent carriers or construct their own SS7 infrastructure.¹²³ However, the required signaling infrastructure represented a substantial capital investment, so most CLECs sought to lease capacity or seek other alternatives.¹²⁴

SS7 networks are designed to be physically separate from the voice network.¹²⁵ The physical independence of the signaling network from the traditional voice network creates an opportunity for third-party vendors to provide signaling services as a stand-alone service from the traditional infrastructure required to provide voice and data services. Competitors have seized this opportunity to provide a commercial alternative to the incumbent-owned network.¹²⁶

1. Third-Party Vendors Offer Competitive Alternative to RBOC Signaling Networks

Third-party signaling providers seized the opportunity to provide an alternative to the RBOCs’ network and their efforts generated genuine competitors to the RBOCs for all signaling services.¹²⁷ Several prominent vendors, such as Illuminet (owned by VeriSign) and SNET, began offering comprehensive signaling services to CLECs.¹²⁸ Interexchange carriers created

¹²² *The Network That’s Never Done*, *supra* note 38. Signal transfer points (“STPs”) act as the “traffic cop” in the signaling network. STPs route signaling messages from the two signal switching points (“SSPs”). The presence of the STPs prevents each of a carrier’s SSPs from having to be directly connected to every other SSP.

¹²³ *Id.*

¹²⁴ *Id.*

¹²⁵ RUSSELL, SIGNALING SYSTEM #7, *supra* note 30, at 63-64.

¹²⁶ *See, e.g.*, VeriSign website, at <http://www.verisign.com/telecom/products/network/ss7.html> (last visited Oct. 31, 2004). Illuminet, owned by VeriSign, has become one of the largest and most aggressive marketers of a nationwide alternative signaling network.

¹²⁷ Sellers of SS7 offer numerous services including the basic connection services and enhanced services such as access to databases for caller identification information. Services can be divided into two central categories: basic call set-up and enhanced services. The basic function of the Integrated Services Digital Network User part in the SS7 system is to control setup, connection, and release of the circuit switched network connection between the subscriber line exchange terminations.” LAWRENCE HARTE ET AL, SIGNALING SYSTEM 7 BASICS 61 (Althos Publishing 3d ed. 2003). The Transaction Capabilities Application Part (“TCAP”) “provides non-circuit related information transfer capabilities and generic services to application.” *Id.* at 77.

¹²⁸ *See generally* VERISIGN.COM, at <http://www.verisign.com/telecom/products/network/ss7.html> (“Leverage the power of the largest independent SS7 in North America without the cost or complication of building your own network.”). Other providers, such as SS8

a side business of leasing SS7 connectivity to wireless providers.¹²⁹ Even CLECs saw the potential in offering SS7 to other CLECs.¹³⁰ Although this section focuses on the competitive providers of signaling service, it is worth noting that there is also significant competition in the development of SS7 technology.¹³¹

However, it took time for the third-party vendors to develop reliable signaling networks.¹³² A failure in the SS7 network creates catastrophic failure in the affected portion of the PSTN.¹³³ In 1999, the FCC conducted a proceeding reevaluating the “necessary and impair” standard as required by the FCC in *Iowa Utilities Board v. FCC*.¹³⁴ During that process, several CLECs expressed concern to the Commission over the ability of third-party signaling vendors to match the reliability and efficiency of the RBOC signaling network.¹³⁵ The FCC concluded in the *UNE Remand Order*, “[t]he ubiquitous nature of an incumbent LEC’s signaling network provides it with advantages that competitive LECs cannot achieve through use of alternative signaling networks.”¹³⁶ Over time, the third-party providers invested additional capital in

Networks, Intel, and Cisco, offer SS7 development platforms for enhancing existing SS7 networks. See also <http://www.SS8networks.com>; <http://www.intel.com/network/csp/solutions/ss7/7194ovr.htm>. (last visited Nov. 10, 2004).

¹²⁹ Kathleen Cholewka, *Sending the Right Signals: SS7 Technology, the Wireline Stalwart, Can Beef Up PCS Networks, Too*, TELEPHONY.ONLINE, at http://telephony-online.com/ar/telecom_sending_right_signals/index.htm (Feb. 9, 1998) (“Major carriers, such as AT&T, Sprint and MCI also lease SS7 connectivity to wireless providers.”).

¹³⁰ *ICG Telecom Acquires SS7 Business of Pace Network Services*, COMM. TODAY, Aug. 16, 1996, LEXIS, Nexis Library, COMTDY File.

¹³¹ *Alternative SS7*, *supra* note 52 (“Signaling is really just the message-based interaction necessary to initiate certain activities. It will certainly be a key enabler for almost every useful technology in the Internet.”) (quoting John Yoakum, senior manager in emerging business with Nortel’s signaling solutions group).

¹³² *UNE Remand Order*, *supra* note 88, at para. 397, n.777.

¹³³ *Illuminet Says Fiber Facility Failure Caused SS7 Outage*, COMM. TODAY, Mar. 2, 1998, LEXIS, Nexis Library, COMTDY File. (“Illuminet Inc. said a fiber facility failure caused a disruption in signaling between SS7 routers in Mattoon, Ill. and Rock Hill S.C., creating a telephone outage that shut down the New York Mercantile Exchange earlier this week.”).

¹³⁴ The FCC’s reexamination of the necessary and impair standard yielded the *UNE Remand Order*. The FCC redefined the standard and applied it again to the elements, including signaling, it believed the RBOCs needed to offer to CLECs on an unbundled basis. *UNE Remand Order*, *supra* note 88, at para. 397.

¹³⁵ *Id.* at para. 397, n.777. Time Warner cited “alternative vendors’ inability to attain personnel with the requisite skill and experience to operate a reliable SS7 signaling network.” *Id.* Cox stated that the “use of third party vendors can result in delays and errors that would not result if a CLEC is connected directly with the ILEC signaling system.” *Id.* (internal quotes omitted).

¹³⁶ *Id.* at para. 395. CLECs were changing their approach to SS7 even while the FCC was writing the *UNE Remand Order*; see also *CLEC Takes Command of Its Own SS7 Network*, COMM. TODAY, Jan. 21, 1999, LEXIS, Nexis Library, COMTDY File. (“Vancouver-

their signaling infrastructure and developed a generally more reliable product, which resulted in a network much more comparable to the RBOCs' signaling networks.¹³⁷

The third-party vendors offer a versatility that, in some circumstances, the RBOCs cannot match.¹³⁸ For example, a CLEC may typically purchase one functionality, such as basic call set-up, from the RBOC and other services, such as enhanced database services, from the vendor without being required to purchase the other.¹³⁹ This ability to tailor the signaling services it needs gives the CLEC added flexibility to meet its needs.

One of the principal differences in the services offered by an RBOC versus a third-party provider is the potential scope of service. Most third-party providers offer access to a nationwide signaling network that exceeds what a typical RBOC can offer. The four remaining RBOCs maintain elaborate signaling networks in their respective regions, but the signaling product offered by an RBOC does not extend beyond its service area.¹⁴⁰ CLECs may purchase access to the RBOC network, but for nationwide signaling, the CLEC must negotiate with each RBOC.¹⁴¹ In contrast, the third-party vendors combine their own networks with access to each of the RBOC networks to offer CLECs one point of access for nationwide coverage.¹⁴² This functionality sets the offering of the third-party vendors apart from the RBOCs and demonstrates authentic competition.

2. *Signaling Litigation Further Defines Competitive Relationships*

Development of competition in the signaling market led to proposed

based GST Telecommunications, Inc., a competitive local exchange carrier hopes to jump ahead of competitors in the race to converge voice and data by supporting its own signaling system seven network.”).

¹³⁷ SS7 equipment vendors also stepped up investment during this time period. *See Profitable Relationship Pressed For SS7 and IP*, COMM. TODAY, Mar. 5, 1999, LEXIS, Nexis Library, COMTDY File.

¹³⁸ A small CLEC with a limited service area may be better served by dealing directly with the RBOC. The benefits of a third-party vendor are more dramatic for a larger regional or national CLEC who needs more dynamic services and a national service. *TRO*, *supra* note 28, at para. 545.

¹³⁹ *See generally* SS8 Networks website, at <http://www.SS8networks.com> (last visited Oct. 31, 2004).

¹⁴⁰ *See generally* SBC Accessible Letter, at http://www.sbc.com/Large-Files/MI-LD2/Supplemental_Appendix_I/Tab_0005/CLECALL03-053.doc (May 2, 2003) (refers to SBC's 13-state SS7 infrastructure in discussion of need of customers to adhere to Telcordia standards).

¹⁴¹ *Id.*

¹⁴² *Illuminet Says Fiber Facility Failure Caused SS7 Outage*, COMM. TODAY, Mar. 2, 1998, LEXIS, Nexis Library, COMTDY File.

changes in the pricing structure for signaling.¹⁴³ Prior to the 1996 Act, signaling was provided by the RBOCs and the cost was embedded in the historic pricing structure.¹⁴⁴ The unbundling of signaling triggered a fundamental change in how RBOCs charged for access to the network. CLECs, and other customers requiring access to the signaling network, purchased signaling either pursuant to an interconnection agreement or the RBOC tariff. The process of detangling signaling costs led to tariff revisions for many RBOCs, which inevitably led to litigation.

In one signaling dispute, several CLECs challenged BellSouth's attempt to revise the signaling section of its Florida tariff before the Florida Public Service Commission ("PSC").¹⁴⁵ BellSouth, like many RBOCs, sought to revise the mechanism by which the CLEC, and other purchasers of signaling, were billed for SS7 services. BellSouth defended its revised tariff and stated that it was attempting to assign the costs of signaling to the user of the service, through a per-message charge, rather than leave cost recovery embedded switched access.¹⁴⁶ Unfortunately, the practical effect of this approach increased signaling costs to CLECs which few state commissions would allow, because it was perceived as harmful to competition.

In February 2003, the Florida PSC issued a decision on the majority of issues in the case. It upheld some of the issues in favor of BellSouth but ultimately found BellSouth could not increase the price of signaling for local competitors via tariff.¹⁴⁷ Ultimately, the parties entered into a stipulation whereby BellSouth withdrew its per message charge and reverted to the higher switching cost that existed prior to the tariff revision.¹⁴⁸

¹⁴³ See generally *In Re Ameritech Operating Companies, Petition for Waiver of Part 59 of the Commission's Rules to Establish Unbundled Rate Elements for SS7 Signaling*, DA-96-446 (March 26, 1996). Ameritech was the first Bell to separate the cost of signaling from access charges. By revising its tariff and creating separate rate elements, Ameritech was able to charge for SS7 as a stand alone service. *Id.*

¹⁴⁴ *Id.*

¹⁴⁵ Joint Petition, US LEC of Florida, Time Warner Telecom of Florida, and ITC Delta-Com Communications, *Objecting To and Requesting Suspension of Proposed CSS7 Access Arrangement Tariff Filed By BellSouth*, at <http://www.psc.state.fl.us> (filed Feb. 15, 2002) [hereinafter *In re US LEC*].

¹⁴⁶ *In re US LEC*, Stipulation between the parties (filed June 7, 2004).

¹⁴⁷ *In re US LEC*, Vote Sheet. The PSC agreed that contrary to BellSouth's contention, its SS7 tariff was not revenue neutral.

¹⁴⁸ *In re US LEC*, Stipulation between the parties (filed June 7, 2004). It is interesting to note that it took over two years for the SS7 complaint to reach resolution.

III. COMPETITION TAKEN TO THE NEXT LEVEL: THE TRIENNIAL REVIEW ORDER

Since the passage of the 1996 Act, the FCC, the telecommunications industry and academia have all attempted to assess the success of the local competition provisions of the Act.¹⁴⁹ Deciding whether the 1996 Act has succeeded or failed usually depends on who is doing the assessment and what factors they examine. One option is to examine the net effect on the consumer, which the FCC has done at regular intervals.¹⁵⁰ Another, arguably more

¹⁴⁹ KEVIN A. HASSETT & LAURENCE J. KOTLIKOFF, AT&T, THE ROLE OF COMPETITION IN STIMULATING TELECOM INVESTMENT (Oct. 2002) (“[S]trengthening competition in the telecom sector is the key to restoring telecom investment.”); see also DALE N. HATFIELD & DAVID E. GARDNER, AN ESSAY ON COMPETITION, INNOVATION, AND INVESTMENT IN TELECOMMUNICATIONS (1997); see also Solveig Singleton, Written Submission of the Competitive Enter. Inst., delivered at the Dep’t of Commerce, Int’l Trade Division Manufacturing Roundtables Proceeding, available at <http://www.cei.org/pdf/3634.pdf> (July 18, 2003) (“[T]he regulatory regime has been plagued by uncertainty due to litigation and overlapping state and federal jurisdiction . . . U.S. regulatory policy encouraged broad, unsustainable investment in telecommunications companies that added no real economic value to the networks.”). *Id.* at 1 [hereinafter *Singleton Statement*].

¹⁵⁰ The FCC collects competition data from several sources and reports that data on a regular basis. For example, the FCC maintains a webpage dedicated to competition. See <http://www.fcc.gov/competition> (last visited May 31, 2004) (“The FCC’s strategic goal for competition is to support the Nation’s economy by ensuring that there is a comprehensive and sound competitive framework for communications services.”). Further, the Commission issues biannual reports regarding local competition statistics. See, e.g., INDUSTRY ANALYSIS AND TECHNOLOGY DIVISION, WIRELINE COMPETITION BUREAU LOCAL TELEPHONE COMPETITION: STATUS AS OF JUNE 30, 2003, (2003) (“We present here summary statistics of the latest data on local telephone service competition in the United States as reported in the Commission’s local competition and broadband data gathering program (Form 477).”). FCC Commissioners regularly report to Congress on the status of competition. See *Competition Issues in the Telecomm. Industry Before the Senate Comm. on Commerce, Science, and Transportation*, 108th Cong. (Jan. 14, 2003) (statement of FCC Chairman Michael K. Powell) (“Seven years into the Act there is notable success—though perhaps significantly less in some markets than originally expected, and perhaps in different form than was first envisioned.”); see also *Competition Issues in the Telecomm. Industry Before the Senate Comm. on Commerce, Science, and Transportation*, 108th Cong. (2003) (statement of FCC Commissioner Kathleen Q. Abernathy) (“The telecommunications marketplace is more competitive than at any time in history, with the wireless sector enjoying the most robust competition.”); see also *Competition Issues in the Telecomm. Industry Before the Senate Comm. on Commerce, Science, and Transportation*, 108th Cong. (2003) (statement of FCC Commissioner Michael J. Capps) (“In 2002, we teed up issues that have the potential to substantially remake the communications landscape of America for many years to come.”); see also *Competition Issues in the Telecomm. Industry Before the Senate Comm. on Commerce, Science, and Transportation*, 108th Cong. (2003) (statement of FCC Commissioner Kevin J. Martin) (“Unfortunately, the impact of this downturn has not been limited to the companies in the telecommunications sector. Employees and their families throughout the nation have experienced real pain resulting from the downturn and the numerous bankruptcies that have occurred.”); see also *Competition Issues in the Telecomm. Industry Before the Senate Comm. on Commerce, Science, and Transportation*, 108th Cong. (2003) (statement of

comprehensive and reliable option is to examine whether competition has developed at the wholesale level.¹⁵¹ Examining the evolution of competition at the wholesale level provides a more accurate snapshot of whether competition is actually emerging in the local market.¹⁵² Although the growth of competition in one wholesale service cannot be considered conclusive, it provides valuable evidence in evaluating whether the 1996 Act and the FCC's competitive policies implementing the Act have succeeded.

A. Competition's Report Card: The *Triennial Review Order*

The unbundling of RBOC network elements represents an essential component of the wholesale competition envisioned in the 1996 Act.¹⁵³ The evolution of the FCC's rules and their application to various UNEs demonstrate how difficult it can be to strike the right balance between opening the market to competition and not unfairly disadvantaging the RBOCs.¹⁵⁴ The FCC's unbundling rules, first articulated in the *Local Competition Order*, then the *UNE Remand Order*, have continued to undergo revision and judicial scrutiny.¹⁵⁵ At the heart of the issue remains the question of which network elements must be offered to CLECs on an unbundled basis.¹⁵⁶ To make this determination, the 1996 Act requires the FCC to consider whether "the failure to provide access to such network elements would *impair* the ability of the

FCC Commissioner Jonathan S. Adelstein) ("In our decision-making, we cannot undermine the competition that has emerged to date. If competition is to flourish, the FCC cannot lose sight of the different ways that Congress explicitly sought to bring it about.").

¹⁵¹ Some commentators have discussed the effect on competition in the wholesale market. See *Singleton Statement*, *supra* note 149. CEI argues that the FCC's regulations concerning UNEs discourage "efficient investment" in the telecommunications sector. This article does not take a position on that conclusion, but does suggest that there are signs of successful competition that are contraindicative of CEI's conclusion.

¹⁵² Some commentators suggest that competition in the local telephone market should not be judged on the number of wireline providers, but on the existence of both wireline and wireless providers competing for local market share. See *Singleton Statement*, *supra* note 149.

¹⁵³ See 47 U.S.C. §251 (2000).

¹⁵⁴ Although most CLECs would probably deny it, the 1996 Act "transferred an important set of property rights from incumbents to entrants." See generally ROBERT S. PINDYCK, MANDATORY UNBUNDLING AND IRREVERSIBLE INVESTMENT IN TELECOM NETWORKS. WHITE PAPER (Jan. 2004).

¹⁵⁵ See *UNE Remand Order*, *supra* note 88, at 3707. The *UNE Remand Order* requires ILECs to "offer unbundled access to signaling links and signaling transfer points (STPs) in conjunction with unbundled switching, and on a stand-alone basis." *Id.*

¹⁵⁶ The FCC requires UNEs be priced using TELRIC. See *Local Competition Order*, *supra* note 13, at paras. 674-703. TELRIC is a "method of figuring out what phone service should cost based on incremental cost of equipment and labor, not counting the embedded cost." NEWTON'S DICTIONARY, *supra* note 24, at 692.

telecommunications carrier seeking access to provide the services it seeks to offer.¹⁵⁷ Significant judicial review has been given to the FCC's efforts to implement the "impairment" standard. More than eight years after passage of the 1996 Act, the FCC continues to struggle to construct rules that pass judicial muster.¹⁵⁸ The D.C. Circuit has examined, and rejected, the FCC's treatment of impairment on several occasions.¹⁵⁹

The most recent manifestation of the UNE impairment rules was in the FCC's *TRO*, which was the FCC's direct response to the Court's rejection of its earlier attempt to define "necessary and impair."¹⁶⁰ The Commission adopted the general principles of the *TRO* in February 2004, but due to internal wrangling, the final rules were not released until August 2004.¹⁶¹

The FCC delegated much of the required analysis to the state commissions and provided specific guidelines for the states to use to determine whether or not barriers to competition continue to impair CLECs.¹⁶² It is commonly recognized that one of the most contested UNEs is switching. In the *TRO*, the FCC focused on whether switching met the necessary and impair standard.¹⁶³ Rather than make a determination, the FCC adopted a national presumption that no impairment existed in the enterprise market and impairment does exist in the mass market.¹⁶⁴

¹⁵⁷ 47 U.S.C. §251(d)(2) (2000) (emphasis added).

¹⁵⁸ The FCC's first effort to implement the impair standard required a network element to be unbundled if "the quality of the service the entrant can offer, absent access to the requested element, declines and/or the cost of providing the service rises." *Local Competition Order*, *supra* note 13, at para. 285. The Supreme Court struck down the FCC's definition as unreasonable and remanded the issue to the FCC. *AT&T Corp. v. Iowa Utilities Bd.*, 525 U.S. 366, 389-90 (1999).

¹⁵⁹ In response to the Supreme Court's rejection of its impairment standard, the FCC adopted an alternate view that found impairment if "taking into consideration the availability of alternative elements outside the incumbent's network, including self-provisioning by a requesting carrier or acquiring an alternative from a third-party supplier, lack of access to that element *materially diminishes* a requesting carriers' ability to provide the services it seeks to offer." Implementation of the Local Competition Provisions of the Telecommunications Act of 1996, *Third Report and Order*, 15 FCC Rcd. 3696, 3725 (1996) (emphasis added). However, the Court found the FCC's analysis insubstantial and rejected the revised rules on a number of grounds. *United States Telecomm. Ass'n. v. FCC*, 290 F.3d 415, 421-26 (D.C. Cir. 2002) [hereinafter *USTA I*].

¹⁶⁰ After the D.C. Circuit rejected portions of the *UNE Remand Order* in *United States Telecom Ass'n v. FCC*, 359 F.3d 554 (D.C. Cir. 2004) [hereinafter *USTA II*], the FCC again rewrote its unbundling rules and articulated them in the *TRO*. The D.C. Circuit again reviewed the rules and vacated the essential analysis regarding impairment. *USTA II*.

¹⁶¹ See *TRO*, *supra* note 28, at paras. 1-6.

¹⁶² See *id.* at paras. 179-196.

¹⁶³ See *generally id.* at paras. 211-97 (mass market which includes residential and small business customers), 298-342 (enterprise market which includes the remaining large business customers).

¹⁶⁴ *Id.* The FCC gave the states ninety days to rebut the presumption regarding the en-

The FCC's *TRO* received mixed reviews, but the overwhelming tenor was negative.¹⁶⁵ The FCC's delegation of regulatory responsibility to the States created profound uncertainty in the markets and among industry analysts.¹⁶⁶ The telecommunications service and manufacturing markets plummeted following the release of the *TRO*.¹⁶⁷

Not surprisingly, litigation commenced immediately.¹⁶⁸ After extensive briefing and argument, the D.C. Court of Appeals vacated much of the *TRO* and remanded it back to the FCC for further consideration.¹⁶⁹ The resulting confusion among industry and state commissions created mass chaos.¹⁷⁰ The CLECs, led by AT&T, and NARUC sought a stay of the *TRO* from the Supreme Court.¹⁷¹ Although the Court denied the request, the status quo has been voluntarily sustained by a pledge from the RBOCs not to implement any change before the end of 2004.¹⁷² The FCC is currently working on new UNE rules.¹⁷³ FCC Chairman Michael Powell, who dissented from the majority of

terprise market and nine months to rebut the presumption regarding mass market switching. *Id.*

¹⁶⁵ See *Singleton Statement*, *supra* note 149. ("Reconciling the need for certainty with calls for 'granularity' and close attention to particular geographic markets is not easy. But the majority's view in the Triennial review seems to neglect the need for certainty entirely.").

¹⁶⁶ *The FCC Presses Auto-Destruct*, THE ECONOMIST, Mar. 1, 2003 ("America's telecoms firms are puzzled by the rules that emerged from the chaos. The big local phone companies-the 'Baby Bells'-said they would sue the government: unsurprisingly, as Mr. Powell's dissent reads like an invitation to do just that.").

¹⁶⁷ Following the FCC's *TRO*, "SBC, BellSouth, Verizon and Qwest lost over 12 billion dollars. Wireless and equipment companies like Nortel and Lucent posted hundreds of millions in losses as well." *Singleton Statement*, *supra* note 149, at 5-6. *The FCC Presses Auto-Destruct*, THE ECONOMIST, Mar. 1, 2003 ("Smaller, financially weaker carriers such as Covad could only marvel at the government's vandalism. The first time Covad heard of a rule change that could kill half its business was on the night before the FCC's decision. Its share price has duly collapsed.").

¹⁶⁸ See *USTA II*, *supra* note 160.

¹⁶⁹ *Id.* The Solicitor General decided not to appeal the D.C. Circuit decision vacating the Commission's local telephone unbundling rules. See also, *Statement of FCC Commissioner Kevin J. Martin*, FCC News, June 9, 2004 (noting the Solicitor General's decision to not appeal the D.C. Circuit decision).

¹⁷⁰ Even chaos in the regulatory climate does not change the need for CLECs and RBOCs to do business. Negotiations over UNE prices have continued. Donny Jackson, *UNE Negotiations Still Slow*, TELEPHONY.ONLINE, http://telephonyonline.com/ar/telecom_une_negotiations_slow/index.htm (May 17, 2004) ("Most of the public action on the UNE negotiation front has concentrated on CLECs offering various proposals, none of which have generated a positive response from RBOCs publicly.").

¹⁷¹ *Supreme Court Turns Down TRO Stay Request*, TELECOM A.M., June 15, 2004, available at LEXIS, News & Business Library.

¹⁷² *Id.* ("Little immediate change is expected because interconnection agreements remain in effect and the Bells have promised to keep the status quo until the end of the year.").

¹⁷³ "My fellow Commissioners and I will promptly turn to writing a set of sound rules that ensure access to incumbent networks where competition is truly impaired." FCC

the *TRO* provisions vacated by the D.C. Circuit Court, has reaffirmed his commitment to writing local competition rules that will pass judicial review. Chairman Powell announced, "I am committed to developing competition rules that comply with the court's mandate and are faithful to the statutory objectives of the Telecommunications Act."¹⁷⁴ Chairman Powell believes a primary objective of the new UNE rules must be to encourage "increased investment in infrastructure that will continue to drive down prices for advanced services."¹⁷⁵ A consistent criticism of the FCC's former policy is that the UNE price controls developed by the Commission discourage the build-out of new facilities.¹⁷⁶ The new rules will likely limit the ability of CLECs to indefinitely lease network elements from the RBOCs at the artificially low TELRIC prices currently mandated.¹⁷⁷

B. Maturation of Competition in the Signaling Market: the Convergence of Competition and Regulation

As discussed above, the FCC released the long-awaited *TRO* on August 21, 2003.¹⁷⁸ The Commission opined that the state of competition in the signaling market justified elimination of an ILEC's obligation under the 1996 Act to provide unbundled access to its signaling systems.¹⁷⁹ The FCC's policy shift provides real evidence that facilities-based competition exists in signaling.

1. *The FCC's Treatment of Signaling in the Triennial Review Order*

In the seven paragraphs of the Order devoted to signaling, the Commission

Chairman Michael K. Powell Announces Plans for Local Telephone Competition Rules, FCC News, June 14, 2004 (quoting Chairman Michael K. Powell).

¹⁷⁴ *Id.*

¹⁷⁵ *Id.*

¹⁷⁶ *Singleton Statement*, *supra* note 149, at 3 (citing comments of FCC Commissioner Kathleen Q. Abernathy, quoted in *Abernathy Describes 'Limited' FCC Role in Wake of WorldCom Woes*, WASHINGTON TELECOM NEWSWIRE, July 9, 2002 ("CLECs were given access to 'just about every conceivable element' of an incumbent's network at TELRIC prices. This 'overstimulated' the entry of CLECs who rushed into the market to take advantage of these rates . . . 'Telecom by its very nature is very capital intensive. Long-term investment, long-term business strategies take a long time to become profitable.'").

¹⁷⁷ Companies like AT&T have requested that the FCC employ an incremental step away from UNE-P rather than an abrupt vacation from the requirement that an RBOC offer UNE-P to CLECs at TELRIC. See *AT&T Announces Tentative Agreement to Lease McLeodUSA Network*, XCHANGE, at www.x-changemag.com/hotnews/47h617054.html (July 6, 2004).

¹⁷⁸ See *TRO*, *supra* note 28.

¹⁷⁹ *Id.* at paras. 542-48.

significantly altered the regulatory paradigm of signaling.¹⁸⁰ The Commission held that where an ILEC does not have to provide switching as a UNE, likewise signaling no longer must be provided as a UNE¹⁸¹:

[I]n the instances in which incumbent LECs will be required to provide access to switching as a UNE, carriers purchasing the switching UNE must also gain access to incumbent LEC signaling. In all other cases, however, we determine that there are sufficient alternatives in the market available to incumbent LEC signaling networks and competitive LECs are no longer impaired without access to such networks as UNEs for all markets.¹⁸²

The Commission based its conclusion on the “maturity” demonstrated in the last several years in the signaling market by acknowledging that “[t]he record reflects that multiple alternative providers are available to provide rival signaling services to competitive LECs.”¹⁸³ Where CLECs deploy their own switches, the Commission found no barrier to obtaining signaling or self-provisioning signaling capabilities.¹⁸⁴ The market opportunities to acquire signaling absolve the ILEC of the requirement of “offering access to signaling as a UNE under Section 251(c)(3) of the Act.”¹⁸⁵

The national scope of the signaling networks of ILECs and alternative

¹⁸⁰ *Id.* at para. 545.

¹⁸¹ *Id.* at para. 545. The Commission devoted considerably more resources to describing the test for whether switching must be provided as a UNE. The Commission found that there is no CLEC impairment to justify a switching UNE in the enterprise (business) market due to the deployment of switches to serve customers at a DS1 level and higher. However, the Commission did generally find impairment in the mass (residential) market where there has been very little deployment of competitive switches. The *TRO* provides certain “triggers” to assist the states in their analysis of the impairment standard.

¹⁸² *Id.* at para. 544.

¹⁸³ *Id.* at para. 545. ILECs face significant competition for signaling customers. Signaling provider, Illuminet, for example, was purchased by VeriSign which increased its ability to market its services to a broad range of users. Carolyn Duffy Marsan, *VeriSign CEO Talks About Strategy and the Integration of NSI*, NETWORKWORLD FUSION, available at http://www.nwfusion.com/news/2002/131440_04-15-2002.html (Apr. 15, 2002).

¹⁸⁴ The proliferation of signaling providers building networks lends support to the FCC’s support of competition in the signaling market. See, e.g., Press Release, Lucent Technologies Signs Deal With Gateway, at <http://www.lucent.com/press/0300/00-0313.nsa.html> (Mar. 13, 2000) (Lucent announced it has signed a \$30 million agreement with Gateway Networks to develop a next-generation fiber network including SS7. “The Lucent ICD for softswitch is the first commercially available, standards-based SS7 gateway designed to alleviate congestion on voice networks by diverting data calls away from circuit switches.”); *Tellabs Introduces Next-Generation Switch* (June 7, 1999) (on file with author) (“The AN2100 GX system incorporates media adaptation, call processing, SS7 signaling and service creation functions into a uniquely flexible, scalable platform, which enables service profilers to reduce costs and create revenue-generating services faster than traditional methods.”).

¹⁸⁵ See *TRO*, *supra* note 28, at para. 545. The Commission refers to no other section of the Act as relevant in a discussion of SS7. Notably, there is no implication that §251(b)(5) dealing with reciprocal compensation has any place in the discussion. *Id.*

providers led the Commission to apply its analysis on a national scope.¹⁸⁶ This conclusion effectively insulates the decision from action on the State level to implement rules different than those articulated by the Commission. Although much of the *TRO* was vacated by the D.C. Circuit Court of Appeals, the Court affirmed the FCC's finding of no impairment for signaling.¹⁸⁷ The CLECs objected to the Commission's findings concerning call-related databases, but few challenged the signaling conclusions.¹⁸⁸ Ultimately, the Court upheld the FCC's decision that related to both signaling and databases.¹⁸⁹

2. Regulation of Signaling is not Unfettered

Although the FCC's *TRO* determines that the signaling market has matured,¹⁹⁰ which the D.C. Circuit Court affirmed, that determination appears to conflict with the statutory language in Section 271 of the 1996 Act.¹⁹¹ RBOCs have not been relieved of their obligations under 47 U.S.C. § 271(c)(2)(B)¹⁹² to provide access to loops, switching, transport, and signaling.¹⁹³ The FCC has interpreted this provision as requiring an RBOC to "demonstrate that it provided requesting carriers with nondiscriminatory access to: (1) signaling networks, including signaling links and signaling transfer points; (2) certain call-related databases necessary for call routing and completion, or in the alternative, a means of physical access to the signaling transfer point linked to the unbundled database . . ."¹⁹⁴ Commentators and competitors have questioned whether the FCC's finding of non-impairment for the RBOC UNE obligation in the *TRO*, including signaling, implicitly removes the RBOCs' Section 271 obligation to provide the UNEs.¹⁹⁵ An RBOC

¹⁸⁶ *Id.* at para. 547. The impairment test requires a determination of granularity to determine what role the states have in implementing the Commission's determination. *Id.*

¹⁸⁷ *USTA II*, *supra* note 160.

¹⁸⁸ *Id.* at 50.

¹⁸⁹ *Id.*

¹⁹⁰ *See TRO*, *supra* note 28, at para. 547.

¹⁹¹ 47 U.S.C. §271(c)(2)(B)(x) (2000). Signaling represents only one of the UNEs that are implicated by both Section 271 and the *TRO*. Several products are required by the competitive checklist but have also been found to be competitive markets. *TRO*, *supra* note 28, at paras. 522-60.

¹⁹² 47 U.S.C. §271(c)(2)(B)(x) (2000). Checklist Item Ten requires "[n]ondiscriminatory access to databases and associated signaling necessary for call routing and completion." *Id.*

¹⁹³ *See TRO*, *supra* note 28, at para. 653.

¹⁹⁴ *In re Application by Bell Atlantic New York for Authorization Under Section 271 of the Communications Act To Provide In-Region, InterLATA Service in the State of New York*, *Memorandum Opinion and Order*, 15 FCC Rcd. 3953, para. 365 (Dec. 22, 1999).

¹⁹⁵ *Verizon Deploys FTTP in Hopes of Regulatory Relief*, TELECOM A.M., Aug. 3, 2004, available at LEXIS, News & Business Library. "While Verizon has made a big deal about

theoretically risks FCC enforcement actions, or worse, if it refuses to provide access¹⁹⁶ to signaling under a theory that the *TRO* negates the statutory obligations contained in Section 271.¹⁹⁷

This regulatory catch-22 may create uncertainty for competitors as they attempt to discern the real impact of the *TRO* on the signaling market.¹⁹⁸ The intersection of the *TRO* and Section 271 has real implications for interpreting the ultimate effect of the FCC's determination of competition. An argument can be made that Congress could not have intended Section 271 and the checklist to cancel out the benefits of developing competition.¹⁹⁹ If Section 271 is not read as flexible, the outcome would be difficult to reconcile with the competitive intentions of the 1996 Act. A company which has successfully demonstrated adequate local competition and compliance with the competitive checklist to attain Section 271 authority to offer long distance would be penalized by having to continue to provide products on an unbundled basis that have been determined to be competitively available. The lack of significant controversy regarding SS7 during the Section 271 proceedings at the FCC suggests that even in that context there is little justification for

laying fiber-to-the-premises (FTTP) in its former GTE states, but it also is quietly deploying FTTP in more regulated former Bell Atlantic states in hopes of gaining better regulatory treatment soon." *Id.* "[T]he company is still seeking clarification that it doesn't have to unbundle FTTP facilities under Sec. 271 of the Telecom Act in those states. Although the FCC eased broadband unbundling requirements under Sec. 251, there's still uncertainty about Bell obligations under Sec. 271." *Id.*

¹⁹⁶ It must be noted that the requirement to provide access to UNEs does not equal an obligation to provide those UNEs at TELRIC prices.

¹⁹⁷ See 47 U.S.C. §271(d)(6)(3)(A) (2001). The Commission may revoke the 271 authority to offer interexchange service if the RBOC has "ceased to meet any of the conditions required for such approval." See, e.g., State of Maine Public Utilities Commission, Verizon-Maine Proposed Schedules, Terms, Conditions and Rates for Unbundled Network Elements and Interconnection and Resold Services, Dkt. No. 2002-682, 12 (Sept. 3, 2004).

We find that a reasonable interpretation of the condition we placed upon Verizon during our 271 proceeding, and the condition it committed to fulfill, requires Verizon to include both its section 251 and 271 unbundling obligations in its wholesale tariff filed in Maine. Indeed, the reasons underlying the condition apply even more today when the legal and regulatory landscape has become increasingly confusing and complex, making it difficult to completely address and negotiate all the issues that might arise in an interconnection agreement negotiation.

Id.

¹⁹⁸ At least one RBOC has publicly expressed its hope that regulatory treatment will become more consistent between Sections 251 and 271. *Verizon Deploys FTTP in Hopes of Regulatory Relief*, TELECOM A.M., Aug. 3, 2004, available at LEXIS, News & Business Library.

¹⁹⁹ The FCC has suggested that if a UNE listed in Section 271 is not required to be unbundled under Section 251(c)(3), the RBOC does not have to offer the UNE in compliance with the Commission's pricing rules. *UNE Remand Order*, *supra* note 88, at 3709. However, that declaration was made prior to actual commitments made by RBOCs pursuant to Section 271 Applications.

continuing to require unbundling.

IV. SUCCESSFUL COMPETITION IN THE WHOLESALE SIGNALING MARKET: LESSONS FOR OTHER WHOLESALE SERVICES

Competition has not emerged in every aspect of the local telecommunications market.²⁰⁰ Yet, the signaling market was subject to similar regulatory circumstances as services that failed to develop meaningful competition. The case study presented in this article suggests that the lessons learned in the signaling arena may be applied to other services.

The FCC has declared the signaling market “mature.”²⁰¹ The existence of genuine competition where none existed prior to the 1996 Act demonstrates measurable success. Carriers have a real choice regarding the purchase of signaling services. Not only can they self-provision signaling, they can purchase signaling from the incumbent carrier, or contract with several third-party providers who offer nationwide signaling service, which represents a much more comprehensive product than what is offered by the incumbent.²⁰²

Pointing to SS7 as an example of competitive success generates as many questions as answers and requires further discussion to be useful in policy planning.²⁰³ The essential question is: Why have a few services produced competition where others have failed? The answer may be found in the particularities of the technology and service; however, the ultimate answer likely lies with the existence of third-party service providers willing to provide a legitimate alternative to purchasing SS7 as a UNE from the RBOC.²⁰⁴

²⁰⁰ The debacle of the *TRO* has hindered the growth of competition by creating profound uncertainty in the market. Commissioner Copps has recently said he would “welcome an item on how to bring line sharing back after [the *TRO*] was vacated by the courts.” *Powell Seeks Copps, Adelstein Agreement on Interim TRO Rules*, TELECOM A.M., Aug. 4, 2004, available at LEXIS, News & Business Library. He went further to say, “in light of the lethal damage this Commission has inflicted on telephone competition, goodness knows we need any kind of competitive vehicle we can get.” *Id.*

²⁰¹ See *TRO*, *supra* note 28, at para. 545.

²⁰² See, e.g., VeriSign website, at <http://www.verisign.com> (last visited Jan. 21, 2005) for a description of the nationwide signaling service offered by a third-party provider.

²⁰³ The FCC found sufficient evidence of competition in additional service markets which led the FCC to conclude there is no impairment in those services. See *TRO*, *supra* note 28, at paras. 533-60. The FCC specifically found no impairment in shared transport, packet switching, call-related databases. The availability of viable alternatives was the principle justification for its conclusion. In contrast, the FCC found that OSS Functions should continue to be offered as a UNE. “[W]e find that the systems, databases, and personnel that the incumbent LEC uses to provide OSS functions represent an extensive infrastructure that would be difficult, if not impossible, for competitors to duplicate.” *Id.* at para. 564.

²⁰⁴ Third-party providers are offering services other than signaling. “Like CNAM and LIDB databases, there are third-party vendors available to provide competitive carriers access to Toll Free Calling and LNP databases. For instance, Illuminet’s SS7 network pro-

The independence of the signaling network from the underlying PSTN encouraged the development of competing networks. Evidence suggests that signaling is not an anomaly and that competitors are seeking similar options in other critical telecommunications services.²⁰⁵ An examination of the 14-point competitive checklist articulated in Section 271 demonstrates other services that have begun to experience competition. For example, even though the underlying framework was found deficient by the Court, in the *TRO*, the FCC did establish a national presumption that competition exists in the enterprise switching market.²⁰⁶ Vendors have started to offer other essential services that were once dominated by the RBOCs, including directory assistance and operator services.²⁰⁷

Some portions of the PSTN may always be less susceptible to competition, like the local loop, but even those pieces of the network may cease to belong to the RBOCs. The historic wisdom predicted that the RBOCs will forever maintain a lock on the local market due to the “last mile problem,” but advances in technology and developing competition has put that conclusion in serious doubt.²⁰⁸ CLECs and other providers have sought technological

vides access to all toll free numbers in the country for call-routing.” See *TRO*, *supra* note 28, at para. 555 (citation omitted).

²⁰⁵ See, e.g., *AT&T, McLeodUSA Reach Agreement on Residential, Business Local Phone Service*, TELECOMWEB, at <http://www.telecomdirectnews.com/do.php/120/8479?29> (July 8, 2004). AT&T and McLeod proposed to the FCC that they would enter into a tentative agreement under which AT&T would provide local phone service over McLeod’s network in select states. In a joint press release, AT&T and McLeodUSA said “finalization of the agreement requires regulatory clarity in support of facilities-based competition.” *AT&T Announces Tentative Agreement to Lease McLeodUSA Network*, at <http://www.x-changemag.com/hotnews/47h617054.html> (last visited June 1, 2003). The companies want the FCC to preserve access to network components controlled by RBOCs at stable rates. Whether the FCC will be willing to accommodate that request is unclear, but it clearly signals a shift to alternative providers of loop services for CLECs like AT&T. *Id.*

²⁰⁶ See *TRO*, *supra* note 28, at para. 451 (“[W]e establish a national finding that competitors are not impaired with respect to DS1 enterprise customers that are served using loops at the DS1 capacity and above.”).

²⁰⁷ For example, AT&T offers operator services on a wholesale basis as part of its calling card network. See *ATT.com*, at http://www.business.att.com/content/wholesale_card_platform.pdf. (last visited Nov. 1, 2004).

²⁰⁸ “In many communities, last-mile technology represents a major remaining challenge to high-bandwidth applications such as on-demand television, fast Internet access and Web pages full of multimedia effects.” See *searchNetworking.com*, at http://www.searchnetworking.techtarget.com/sDefinition/o,,sid7_gci213568,00.html (last visited Nov. 1, 2004). Wireless providers provide a revolutionary new method to bypass the traditional RBOC bottleneck. “Bypassing the copper wires that connect a phone company’s central offices to its customers, these wireless Internet service providers can deliver broadband more cheaply than digital subscriber lines (DSLs) and can reach out to rural homes and others not currently served at all except by dial-up.” *Id.*; see also Steven M. Cherry, *The Wireless Last Mile*, IEEE SPECTRUM ONLINE, at <http://www.spectrum.ieee.org/WEBONLY/publicfeature/sep03/wire.html> (Sept. 2003); Tam

alternatives to gain entrance to the home.²⁰⁹ Some have been more successful than others, but the general trend points to more competition by fewer, stronger carriers.²¹⁰

The current chaos of the telecommunications markets, attributable to regulatory gaffes and changing technology, suggests that the FCC will be making some tough decisions in the near future.²¹¹ The most recent breakthrough technology is Voice Over Internet Protocol ("VoIP"), which utilizes the Internet rather than the PSTN to connect a telephone call.²¹² Regulation of VoIP is in its infancy, but the FCC has commenced a rulemaking proceeding, and its preliminary VoIP decisions indicate that regulation of VoIP will draw careful distinctions between regulation of PSTN and purely Internet-based services.²¹³ At least one FCC Commissioner has acknowledged that the

Harbert, *That Long, Lonesome Last Mile*, ELECTRONIC BUSINESS ONLINE, at <http://www.reed-electronics.com/eb-mag/article/CA411912?industryid=217> (May 1, 2004).

²⁰⁹ *Voice over Internet Protocol Before the Senate Comm. on Commerce, Science, and Transportation*, 108th Cong. (Feb. 24, 2004) (statement of FCC Chairman Michael K. Powell) [hereinafter Powell Statement].

We [the FCC] have championed the deployment of multiple broadband networks in order to rid ourselves of the intractable 'last mile' problem. We have pushed for greater deployment of DSL, cable modem, 3G wireless, WIFI, Ultra Wide Band, satellites and broadband over power lines, just to name a few new services already in commercial use.

Id.

²¹⁰ The consolidation of competitive carriers following the telecom crash has produced fewer, but much stronger, competitors. Also leveling the playing field is new technology, such as Voice over Internet Protocol ("VoIP"). Brand names like AT&T have joined smaller, start-up companies and have lent a great deal of credibility to the technology by doing so. See Ellen Muraskin, *AT&T's VoIP Rollout Heats Up Price War*, EWEEK.COM, at <http://www.pcmag.com/article2/0,1759,1621731,00.asp> (July 8, 2004). Even the AT&T brand may not be enough to save the company from financial ruin. *S&P Cuts AT&T Debt Rating to Junk*, TELECOM A.M., Aug. 4, 2004, available at LEXIS, News & Business Library. S&P cut AT&T's debt rating based on declining financials and changes in the telecommunications industry. "We anticipate that competition will intensify from other large long distance carriers, the regional Bell operating companies and cable TV companies in the near-to-intermediate term, further affecting AT&T's weak operating margins." *Id.*

²¹¹ See Christopher Stern, *So Long to Long-Distance?* WASH. POST, Aug. 5, 2004, at E1.

What began as a slow change has been accelerating in the past year or so, upending an industry long viewed as a steady utility. A combination of deregulation and new technologies has spawned a sometime bewildering choice of pricing plans for consumers from different players—traditional phone giants, wireless firms, cable systems and Internet companies.

Id.

²¹² "When packetized, voice applications are virtually identical to any other Internet application, such as email or instant messaging. Consequently, would-be entrepreneurs are just a website and a server away from offering services that mirror those of a 'phone' company." Powell Statement, *supra* note 209, at 1-2.

²¹³ See *In re* Petition for Declaratory Ruling that AT&T's Phone-to-Phone IP Telephony Services are Exempt from Access Charges, *Order*, 19 FCC Rcd. 7457 (Apr. 2004). AT&T

regulatory challenges presented by VoIP are “formidable.”²¹⁴ Going forward, the only certainty is that the FCC and industry will likely draw upon past successes to determine the best path to go forward. The emergence of competition in the signaling market provides an excellent example for the FCC to use as a starting point.

Perhaps the strongest lesson to be gleaned from the signaling experience is that meaningful infrastructure investment yields demonstrable competition.²¹⁵ It has been said that “[t]he Telecom Act envisioned a world of independent physical networks competing with each other to provide telecommunications services in local markets.”²¹⁶ In the signaling context, investment in networks provided a reliable alternative to the RBOC-owned networks. Although some argue that building redundant networks wastes resources and harms competition, the signaling case study suggests otherwise.²¹⁷

sought a ruling that its phone-to-phone IP telephony services are exempt from access charges. The FCC found that “the service that AT&T describes is a telecommunications service upon which interstate access charges may be assessed.” See generally *In re IP-Enabled Services*, *Notice of Proposed Rulemaking*, 19 FCC Rcd. 4863 (Mar. 10, 2004). AT&T’s service relied upon the PSTN for at least a portion of the service so the FCC regulated it accordingly. In contrast, early indications suggest that purely Internet-based telecommunications services will not be hindered by the onerous PSTN regulatory framework.

²¹⁴ Commissioner Kathleen Q. Abernathy, *Overview of the Road to Convergence: New Realities Collide with Old Rules*, 12 COMMLAW CONSPECTUS 133, 133 (2004) (“In a world where different platforms are used to provide functionally equivalent services, regulators must harmonize distinct regulatory frameworks. The challenge is formidable, however, because the statutory framework that guides the FCC was written before this technological explosion.”).

²¹⁵ Robert S. Pindyck, *Mandatory Unbundling and Irreversible Investment in Telecom Networks 2* (Dec. 2003) (working paper available at <http://ssrn.com/abstract=480381>).

²¹⁶ *Id.*

²¹⁷ Mark Cooper, CONSUMER FEDERATION OF AMERICA, *COMPETITION AT THE CROSSROADS: THE FUTURE ROLE OF STATE PUBLIC UTILITY COMMISSIONS IN MAINTAINING TELECOMMUNICATIONS COMPETITION 2*, at <http://www.cispa.org/CFA%20UNE%20study-%20Oct7-2003.doc> (2003).