NRRI 02-05

WHY THE SKY DID NOT FALL: A REGULATORY POLICY SUCCESS STORY CONCERNING NPA AND NANP EXHAUST AND NUMBERING RESOURCE OPTIMIZATION

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MARCH 2002

This report was prepared by the National Regulatory Research Institute (NRRI). Funding was provided by the member commissions of the National Association of Regulatory Utility Commissioners (NARUC). The views expressed herein are the author's and do not necessarily reflect the views, opinions, or policies of the NRRI, the NARUC, or any NARUC-Member Commissions.

EXECUTIVE SUMMARY

Telephone numbers in the United States are assigned according to the North American Numbering Plan (NANP), which was put into place in 1947. Under the NANP, each geographic area is assigned a numbering plan area (NPA) or area code, which is designated by a three-digit number. In 1999 the administrator of the NANP came to a preliminary projection that the NANP could exhaust as early as 2007. This projection was shocking, because expanding the NANP — by adding one or more digits to the current ten-digit dialing scheme to increase the number of available telephone numbers — would be costly, confusing, and time consuming. The impact of this projection motivated the FCC and the state commissions to take actions to optimize the use of numbering resources.

The reason for the NANP exhaust projections was that the number of area codes in service had been growing at a rapid pace. As one area code neared exhaust, it was split into two (or more) area codes, an additional area code was overlaid on top of it, or its boundaries were adjusted to give it some breathing room. As the pace of area code additions grew, so did public ire, since area code changes involve changing dialing patterns for some or all calls and may lessen individuals' senses of geographic cohesion and identity.

At first glance, it would seem that there could never be a shortage of telephone numbers. Each NPA has approximately eight million assignable numbers, and there are nearly seven hundred assignable NPA codes. Nevertheless, individual area codes were reaching exhaust and new ones were required. In some respects, the problem is not unlike the Y2K bug in that it is a legacy of decisions made decades ago: when the NANP was designed there was no competition in local telephony, and it seemed almost unthinkable that we could run out of numbers, or that numbers should be conserved.

Although some of the growth in the demand for numbers results from new services and second lines, the main reason for optimizing the use of numbering resources is to facilitate competition in telephone markets. Given the total volume of

available numbers, the "problem" appears to be more a result of inefficient utilization and management of the existing numbering resources than an indicator of any inherent shortage of telephone numbers under the existing NANP.

To the extent that a number shortage exists, it is artificial and man-made rather than signifying any fundamental scarcity. It is a "legacy system" problem resulting from the inefficiency of the traditional method of assigning telephone numbers in blocks of 10,000, the historic development of the network (which resulted in more rate centers than are optimal or necessary given modern technology), and the lack of incentives for carriers to manage their number inventory. As a result, policy actions have aimed at improving the way numbers are allocated or assigned to carriers and at encouraging or requiring carriers to improve their management of numbering resources.

The Telecommunications Act of 1996 gives the FCC exclusive jurisdiction over the NANP in the United States and permits it to delegate any portion of that jurisdiction to state commissions or other entities. The FCC recognized that state commissions are uniquely positioned to understand local conditions and the potential effects associated with new area code implementation. Therefore, the FCC authorized states to resolve various matters involving the implementation of new area codes. In addition, the FCC delegated the states some latitude in designing and implementing number conservation strategies.

Numbering conservation strategies include shifting from assigning numbers to carriers in blocks of 10,000 to pooling and assigning numbers in blocks of 1,000, consolidating rate centers within an NPA – so that carriers need fewer numbers to provide service, reclaiming unused blocks of numbers from carriers, auditing carriers' number usage and requiring usage to reach threshold utilization rates in an NPA before obtaining additional numbers, and allowing technology or service-specific NPA overlays. Each of these has the potential to improve utilization in and extend the life of individual NPAs, which, in turn, will extend the life of the NANP. Although there are costs associated with implementing many of these conservation strategies, such costs are likely to be small when compared with costs associated with expanding the NANP.

The problem of NANP exhaust was man-made; the solution was within our grasp, and regulators seized it. Actions by the FCC, state commissions, and the telecommunications industry to improve numbering resource utilization have resulted in a substantial increase in the estimated life of the NANP and made it a non-event. The success of the policies adopted by the FCC and the states resulted from several factors. First, though the FCC has plenary authority over numbering issues in the United States, it duly recognized that the states have comparative advantage in dealing with specific numbering issues and delegated to individual states the authority to deal with numbering within their jurisdictions. Second, the FCC and the states agreed on the necessity to conserve and optimize numbering resources at the NPA and NANP levels, and they took appropriate actions quickly. While national standards were being considered, states used their delegated authority to begin implementing pooling trials and other conservation measures on their own. Subsequently, the FCC mandated a nationwide rollout of pooling in all NPAs contained in the 100 largest Metropolitan Statistical Areas beginning in 2002. The FCC also imposed utilization thresholds and utilization reporting requirements to optimize the assignment and use of numbering resources. In addition, the FCC dropped its prohibition on the use of service- and technology-specific NPA overlays in favor of allowing states to deploy them on a case-by-case basis. Finally, the FCC and the states have recognized that numbering resources are essential for the development of competition at local level and viewed both pooling and the related issue of local number portability for wireless carriers as pro-competitive measures.

Results to date are encouraging. More recent projections for NANP exhaust indicate that the NANP should last for another twenty years – or more. Moreover, NANP exhaust has been tending to move farther into the future with each new projection. In the intermediate term, controversies still exist over the question of whether the FCC should permanently forbear from imposing LNP on wireless carriers and, to a lesser extent, over how service- or technology-specific overlays will be used.

In the longer term, more intelligent switches, faster databases, unassigned number porting, individual telephone numbers (blocks of a single number), and potential migration to Internet-style numbering may allow full utilization of existing numbering resources and provide almost unlimited telephone numbers.

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FOREWARD

Telephone numbers once seemed as limitless as stars in the sky or grains of sand at the shore. With the growth of competition, however, they became scarce resources and the pace of area code additions quickened. Indeed, there were projections that the North American Numbering Plan (NANP) might reach exhaust in the near future. Indeed, even by themselves, area code changes are difficult – they cause consumer confusion and often become contentious issues, especially as they become more frequent. The problem was largely the result of a number allocation system that was not designed for a competitive local telecommunications markets. Recent actions by state and federal regulators to improve the allocation of telephone numbers appear to have extended the life of the NANP by approximately two decades. This is a clear example of regulatory policy being implemented quickly and having immediate and positive results.

This report examines the history of the NANP and the problem of area code and NANP exhaust. It also describes options for conserving numbering resources and policies implemented to date, and it provides data on current projections for NANP exhaust.

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March 2002

ACKNOWLEDGEMENTS

The author wishes to thank several people for their contributions to this report. The state commission staff members of the State Coordinating Group that deals with numbering issues were most helpful in providing insights. The author has benefited from participating on their conference calls and listserve. At the NRRI, Vivian Witkind Davis provided helpful comments, and Carmell Brown took great pains in preparing the final draft. NRRI Research Advisory Committee members Dr. Barbara Combs of the Oregon Public Utility Commission and Peter Pescosolido of the Connecticut Department of Public Utility Control a made a number of useful suggestions. This report is better for their assistance and guidance; such errors as may remain are, however, the sole responsibility of the author.

Introduction

The United States uses a ten-digit telephone numbering system that assigns telephone numbers according to the North American Numbering Plan (NANP), which was put into place in 1947. Under the NANP, each geographic area is assigned a numbering plan area (NPA) or area code, which is designated by a three-digit number.[1] Within an NPA, a seven-digit local dialing system is used.[2]

The original 1947 NANP assigned 86 area codes to the continental United States. Area codes did not cross state boundaries, and each state was assigned at least one area code.[3] At the end of 1991, the United States had 119 area codes in service. From 1984 through 1994, only 9 new area codes were activated. From 1995 onward, however, area codes began to be added rapidly. Over 240 area codes were in service by the end of 2000, and the North American Numbering Plan Administrator (NANPA) reported that 37 additional area codes might be required by the end of 2001.[4]

The Alarm

In January 1999, the NANPA, Lockheed Martin CIS (now NeuStar), came to a preliminary conclusion that the NANP could exhaust as early as 2007.[5] NANP exhaust would mean that there were no additional NPA codes that were available to be assigned to relieve NPAs that were forecasted to exhaust; all NPA codes would either be in service or reserved to relieve NPAs previously identified as being in danger of exhaust. It must be noted, however, that this conclusion assumed a 12 percent annual rate of

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[1] Some "area codes" are not geographically defined. These include the 800, 888, 900, and other non-geographic area codes that designate specific services rather than specific locations.

[2] Each telephone number in the NANP is ten digits in length, with the format: NXX-NXX-XXXX, in which N represents any digit 2-9, and X is any digit 0-9. The first set of NXX digits is the numbering plan area (NPA) code, often called simply the *area code*. The second set of NXX digits is the exchange or *central office code* or prefix. The final set of four XXXX digits is the *line number*. Under the traditional assignment method, all 10,000 numbers in a central office NXX code must be in the same rate center and must also be served by the same operating company. In most cases, both call billing and call routing use the NPA-NXX to determine the cost of the call and route the call to the correct switch and line.

[3] Alaska and Hawaii were not covered in the original plan.

[4] See FCC 00-429, Second Report and Order, Order on Reconsideration in CC Docket 96-98 and CC Docket 99-200, and Second Further Notice of Proposed Rulemaking in CC Docket 99-200, released December 29, 2000, para. 4 and note 8 citing an NANPA report on NPAs planned but not in service.

[5] See Lockheed Martin CIS, *North American Numbering Plan Exhaust Study*, April 22, 1999, p. 1-3.

growth in NPAs. The projected time line for NANP exhaust was between 2006 and 2012, depending on the assumed NPA growth rate.[6]

If it were to reach exhaust, the NANP would have to be expanded by adding one or more digits to the current ten-digit dialing scheme to increase the number of available telephone numbers. Expanding the NANP would be costly— estimates have been from 50 to 150 billion dollars.[7] And it would take time to design and implement an NANP expansion plan.[8] However, before committing to expansion of the NANP, there are many strategies that are available and can add years to the life of the existing NANP.

FCC Actions to Protect NPAs and the NANP

The *Numbering Plan Exhaust Study* had an almost immediate impact: as a result, the FCC took several steps to address the problem of number exhaust at both the micro (NPA) and macro (NANP) levels. CC Docket 99-200 was opened to consider numbering resource optimization, and the FCC issued a Notice of Proposed Rulemaking (FCC 99-122) and First, Second and Third Reports and Orders (FCC 00-104, FCC 00-429, and FCC 01-362, respectively) in that Docket.[9]

The major policies adopted by the FCC were (1) a shift toward thousand-block number pooling rather than the historic allocation of numbers in central-office code, or NXX, blocks of 10,000 numbers, and (2) a move to impose number utilization thresholds, requiring carriers to use a certain percentage of assigned numbers before

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[6] See Ibid., p. 2-10.

[7] See NANC Meeting Minutes, February 17-18, 1999, pp. 12-13. Given the range of the estimates, it appears that the cost of expanding the NANP is highly uncertain and depends on the method used to expand the NANP.

[8] As part of expanding the NANP (adding extra digits), telecommunications networks and switches would have to be re-engineered. In addition, much end-user customer premise equipment such as PBX equipment, cellular phones, and automatic dialing devices (e.g., alarm monitoring services and point-of-sale terminals) would require upgrading or reprogramming. Moreover, end users would need to be educated on interim and permanent changes in dialing procedures.

[9] See FCC 99-122, Notice of Proposed Rulemaking in CC Docket No. 99-200, Numbering Resource Optimization, released June 2, 1999; FCC 00-104, Report and Order and Further Notice of Proposed Rulemaking in CC Docket No. 99-200, Numbering Resource Optimization, released March 31, 2000; FCC 00-429, Second Report and Order, Order on Reconsideration in CC Docket NO. 96-98 and CC Docket NO. 99-200, and Second Further Notice of Proposed Rulemaking in CC Docket NO. 99-200, Numbering Resource Optimization, released December 29, 2000; and FCC 01-362, Third Report And Order And Second Order On Reconsideration In CC Docket No. 96-98 And CC Docket No. 99-200, released December 28, 2001.

obtaining more. These policies are intended to increase the efficiency of the number-assignment process and raise carriers' utilization rates for numbers already assigned to them.

In its *First Report and Order*[10] the FCC mandated that carriers required to be LNP-capable are also required to participate in thousands-block number pooling, which is to be deployed first in NPAs located in the largest 100 Metropolitan Statistical Areas, or MSAs. In addition, Commercial Mobile Radio Service (CMRS) providers are required to implement thousands-block number pooling in areas where pooling is implemented after November 24, 2002, when their forbearance from LNP requirements expires. Also, states that had implemented their own pooling trials under authority delegated from the FCC are required to bring these trials into conformity with the national pooling framework.

In its *Second Report and Order,*[11] the FCC imposed a numbering utilization threshold of 60% – which will increase to 75% over the three years – before carriers can obtain additional numbers in their service area. Carriers are also required to prepare Numbering Resources Utilization/Forecasting (NRUF) forms (Form 502), which replaced the Central Office Code Utilization Survey (COCUS). If these filing requirements are enforced, Carriers may not be able to obtain additional numbers without filing an NRUF.[12]

Number pooling relies on local number portability (LNP) technology, which allows subscribers to switch among LECs without changing their telephone numbers. The existence of LNP capability is a prerequisite for implementation of number pooling in an NPA. Pooling allows up to ten carriers to share a single NXX code in a rate center, thus promoting more efficient utilization of numbering resources and prolonging the life of individual NPAs and, by extension, prolonging the life of the existing 10-digit NANP. LNP technology proved to have an unexpected but useful capability. In the

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[10] FCC 00-104.

[11] FCC 00-429.

[12] See *NANPA Report to the NANC*, November 28-29, 2000, p. 3.

wake of the World Trade Center tragedy of September 11, 2001, NeuStar was able to port numbers between a single carrier's switches, making service recovery easier and faster than would otherwise have been the case.[13]

Number pooling also requires LECs to file number utilization reports and return or "donate" unused thousand number blocks (1K blocks) contained within their existing NXX code allocations. Returned or reclaimed 1K blocks are placed into inventory by a Pooling Administrator. These 1K blocks, as well as all unallocated NXX codes in an NPA, form the "pool" or inventory that is available for allocation to requesting carriers. Pooling also requires that carriers account for their inventory of numbers – numbers that are not assigned or in use, aging, reserved, or reasonably required for growth, may be reclaimed and returned to the pooling inventory.

Up until now, state number pooling trials have been conducted under authority delegated to the state commissions by the FCC.[14] NeuStar has been chosen by the FCC to administer implementation of pooling on a national level, beginning with the 100 largest MSAs. The first round of implementation of pooling on a national level is scheduled to begin in March 2002. Number pools will be established in approximately 21 NPAs each quarter.[15]

At present, only wireline carriers are required to be LNP-capable and participate in pooling trials. Although number pooling will extend the life of the NANP by many years if applied only to wireline carriers, it will have an even stronger impact if applied to wireless (CMRS) carriers, as well.

Verizon Wireless has petitioned the FCC to forbear from imposing the wireless local number portability requirements scheduled to take effect on November 24, 2002. Among those opposed to such forbearance are the state commissions. At their Annual Meeting in November 2001, the National Association of Regulatory Utility

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[13] See Amy Putnam and Marcel Champagne, *Disaster Recovery: Using Local Number Portability and Pooling Functionality*, NeuStar presentation to NARUC's Staff Subcommittee on Telecommunications, Philadelphia, Pennsylvania, November 9, 2001.

[14] At present, over thirty states have requested or received delegated authority to implement pooling trials. Nineteen states have pooling trials underway. See the Appendix, below, for details.

[15] See FCC NRCC 01-22, *Federal Communications Commission's Common Carrier Bureau Selects NeuStar, Inc. as National Thousands-block Number Pooling Administrator*, June 18. 2001.

Commissioners (NARUC) passed a resolution urging the FCC to deny the Verizon Wireless petition on the grounds that permanent forbearance from local number portability requirements would impair competition in wireless telephony and lead to inefficient use of numbering resources. Moreover, in the event the FCC grants the petition and forbears from imposing wireless number portability, the NARUC urged the FCC to require wireless carriers to participate in pooling.

Wireless carriers now account for more than a third of working telephone numbers, and the number of wireless subscribers is growing several times faster than the number of wireline subscribers.[16] Thus the effectiveness of number conservation plans will be hampered if wireless carriers are excluded from them.[17] In its *Third Report and Order*, the FCC declined to extend the deadline for CMRS carriers to participate in pooling in areas covered by pooling plans.[18]

Can We Really Run out of Telephone Numbers?

Until fairly recently, area-code changes were a nuisance and a bother, especially as they began to be more frequent, but there was little thought that we might actually run out of numbers.[19] The April 1999 *Numbering Plan Exhaust Study* raised concern that the NANP might exhaust and have to be expanded – by adding an 11th digit for

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[16] The FCC reports that there were about 194 million wireline and 101 million wireless telephone subscribers at the end of 2000. Moreover, the number of wireless subscribers grew by 27 percent during 2000. See *Local Telephone Competition: Status as of December 31, 2000* (Washington, D.C.: Federal Communications Commission, Common Carrier Bureau, Industry Analysis Division), May 2001. Numbers allocated to pagers are not included in these calculations.

[17] Under present FCC rules, wireless carriers must be LNP capable by November 24, 2002. Once they are LNP capable, it becomes more feasible for them to participate in pooling.

[18] See FCC 01-362, para. 1.

[19] As noted above, there were 86 original area codes assigned. The original area codes all had a 1 or a 0 as the middle digit. The first area code (201 in New Jersey) was activated in 1951. Between 1947 and 1995, all area codes followed the original numbering scheme, and a few new area codes were added each year. It took nearly 50 years before the original set of area codes was exhausted. In 1995, the network was upgraded to accept 2 through 9 as the middle digit of an area code, and the first "new" area code (334 in Alabama) was assigned. Since then, the number of area codes assigned has exploded. See NeuStar, *An Introduction to Numbering,* September 28, 1999, available at http://www.nanpa.com/pdf/intro_numbering.pdf , p. 2.

example. Although this could be accomplished, the cost would be great both in money and in consumer confusion and irritation, and nobody wants to do that for a long, long time.

In some respects, the problem is not unlike the Y2K bug in that it is a legacy of decisions made decades ago: when the NANP was designed there was no competition in local telephony, and it seemed almost unthinkable that we could run out of numbers, or that numbers should be conserved. The *Numbering Plan Exhaust Study* got the attention of the FCC, the industry, and state regulators. As a result, several groups within the North American Numbering Council (NANC) are attempting to find solutions to the problem.[20]

At first glance, it would seem that there could never be a shortage of telephone numbers. Each NPA has approximately eight million assignable numbers, and there are nearly seven hundred assignable NPA codes.[21] Thus, the NANP contains nearly 5.5 billion possible unduplicated ten-digit numbers.[22] Based on this, it would be possible to have 684 x 7.92 million = 5.417 billion phone numbers without expanding the NANP. Moreover, an additional 2 million numbers could be made available per area code. This would require expanding the D digit — allowing an NXX central-office code could begin with a 0 or a 1, which it cannot now do. This would increase available numbers by approximately 25 percent. However, because the NANP was not originally designed for efficient use of numbering resources or to accommodate competition, it has some built-in limitations that limit our ability to fully utilize all of these numbers.

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[20] These include both a Numbering Resource Optimization Working Group and a NANP Expansion/ Numbering Optimization Issue Management Group.

[21] By current convention, an area code can be any three digit number from 200 to 999. However, all of those are not actually available as areas codes.

[22] Each NPA or area code has just under 8 million numbers available. To be exact, there are 792 available NXX codes – blocks of 10,000 numbers (792 x 10,000 = 7,920,000 available numbers). The eight N11 NXX codes in each area code are reserved for special uses (911, etc). The NANPA has reported that, although there are 800 possible NPAs, only 692 NPAs will be available at the time of NANP exhaust, and only 684 of them are assignable. Of the 684 assignable NPA codes, 344 are assigned and 289 are in service. Of the 340 unassigned NPA codes, 250 of them are reserved, leaving 90 NPAs that are available for future reservation or assignment. See *NANPA Report the NANC*, September 19-20, 2000, p. 4 and *NANPA Report to the NANC*, January 16-17, 2001, p. 5.

For some time, the supply of numbers appeared to be essentially limitless, and there were few incentives to make optimal use of numbering resources.[23] More recently, however, telephone numbers have become scarce resources. In many areas of the country, they are in such short supply that providers of new services and entrants into telecommunications markets might experience difficulty acquiring sufficient numbers for their needs.[24] Although some of the growth in the demand for numbers results from new services and second lines, the main reason for optimizing the use of numbering resources is to facilitate competition in telephone markets. It is simply a fact that competitors cannot offer service unless they have access to numbers.

The demand for telephone numbers has increased dramatically with the growth of wireless telephones and pagers. The demand for numbers has also increased due to the use of additional lines for fax machines and Internet access. In addition, certain services such as General Motors' *On-Star™* roadside assistance service require an allocation of telephone numbers, and some point-of-sale devices (vending machines and gas pumps) also require phone numbers, as do ATM machines. Moreover, some CLECs provide service to unified messaging services, such as e-fax and j-fax, which use large quantities of numbers in a rate center.[25]

Even though some numbers had become stranded (in area codes or NXX codes that were not well utilized) prior to the advent of local competition, the main reason for the growth of area codes in the recent past is competition in local telephone markets – and the way numbers were traditionally allocated. In addition, some local number

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[23] Telephone numbers were not allocated efficiently because there appeared to be no reason to do so, and there were little or no incentives for efficient allocation and use of numbers. The NANP was a common property resource – like the atmosphere, water, and other natural resources. As a result and in divergence from the implications of Adam Smith's "invisible hand" concept, the impact of individual self interest does not improve the common welfare. Instead, such resources are subject to overuse that can reduce the common welfare as described by Hardin. See Garrett Hardin, "The Tragedy of the Commons," *Science*, 162 (1968): 1243-1248.

[24] In some NPAs, providers must enter a lottery to determine which of them can receive new NXX codes. In some cases, when an NPA is in jeopardy of reaching exhaust, NXX allocations are frozen, making it impossible for a new provider to offer service. Such measures are interim steps taken while an area-code relief plan (addition of a new area code by split, overlay, or boundary realignment) is developed and implemented, a process which takes at least six months to a year.

[25] Unified messaging services allow end users to receive multiple types of messages (such as voicemail and faxes) at a single phone number; end users do not need to answer the call personally, so the messages can be sent to any phone number. Received messages can be digitized and delivered to the end user via e-mail. Providers of unified messaging services can operate efficiently by obtaining a large number of NXXs in a few rate centers.

portability plans use remote call forwarding, which requires two numbers per line – one number that the caller dials and another number to which the call is ultimately routed by the local exchange routing guide (LERG).[26]

When an area code runs out of numbers, a new area code must be created or opened. However, area code changes are messy: nobody likes to be shifted into a new area code; area code splits harm geographic identity; and businesses and individuals have to inform people of their new area code. In addition, if an area code is added via an overlay rather than a split, FCC rules require all callers to dial extra digits.[27] The speed with which new area codes were being opened and the consumer frustration thus created might have been sufficient to call for conservation and optimization of numbering resources, but the threat of NANP exhaust really put the issue on the front burner.

The problem can be put into perspective by considering a recent NANPA report on the NPA inventory.[28] The NANPA report classifies 125 NPA codes as being unassignable or set aside for special purposes,[29] leaving 675 assignable codes.[30]

- Of the 675 assignable codes, 363 are currently assigned, and 312 are unassigned.
- Of the 363 assigned codes, 309 are in service and 54 are awaiting implementation.

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[26] This form of LNP allows existing customers to switch carriers while retaining their current number.

[27] An area code split results in some calls that were seven-digit local calls becoming ten-digit calls. Use of an overlay requires that all local calls become ten-digit calls. The principal reason for requiring ten-digit dialing for all calls after an overlay is to create a level playing field that treats new carriers and their customers the same as the incumbent carrier and its customers.

[28] See *NANPA Report to the NANC, October 16-17, 2001*, p. 3.

[29] These include 8 N11 codes, 80 N9X expansion codes, 20 codes in two blocks reserved by INC (37X and 96X), 4 codes set aside by INC for 88X expansion (883-5 and 887), 9 codes set aside to avoid confusion with Mexican wireless users roaming in the US (521-9), 2 non-dialable toll point codes (886 and 889), and the 555 and 950 codes.

[30] Since the NANP serves Canada, Mexico, and parts of the Caribbean, some NPA codes are not assigned in the United States. The exact number of assignable codes may vary somewhat, but the January 2001 NPA inventory report classified 116 NPA codes as being unassignable or reserved, leaving 684 NPA codes assignable or available. See *NANPA Report to the NANC, January 16-17, 2001*, p. 5.

- Of the 309 codes in service, 296 are geographic and 13 are non-geographic.[31]
- Of the 312 unassigned codes, 48 are easily recognizable codes (ERCs) currently allocated for non-geographic use, and 264 are general purpose codes.
- Of the 48 unassigned ERCs, 11 are reserved[32], leaving 37 available.
- Of the 264 general purpose codes, 222 are reserved[33], leaving 42 NPA codes available.

In early 2000, the FCC stated that, absent measures to slow the rate at which numbering resources are being used, the NANP could exhaust within ten years.[34] However, given the total volume of available numbers, the "problem" appears to be more a result of inefficient utilization and management of the existing numbering resources than an indicator of any inherent shortage of telephone numbers under the existing NANP. To the extent that a number shortage exists, it is artificial and man-made rather than signifying any fundamental scarcity. It is a "legacy system" problem resulting from the inefficiency of the traditional method of assigning telephone numbers in NXX codes or blocks of 10,000, the historic development of the network, and the lack of incentives for carriers to manage their number inventory.[35]

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[31] These are the 456, 500, 600, 700, 710, 800, 877, 866, 880, 881, 882, 888, and 900 NPAs.

[32] These include codes reserved for future PCS expansion (522, 533, 544, 566, 577, 588) and codes reserved for Canada (622, 633, 644, 655, 677, 688). Canada has also reserved 699, which is counted as an expansion code.

[33] Reserved codes are NPA codes identified and set aside for NPAs that are predicted to exhaust within twenty years based on the NRUF/COCUS data. Also included are twenty additional NPA codes reserved for Canada.

[34] See FCC 00-104, para. 6. It must be noted, however, that the projected NANP exhaust date has been moving further into the future.

[35] The problem with the traditional method of number assignment was demonstrated in April 1999 when the new 323 area code was declared to be in jeopardy immediately after being split from the 213 area code in the Los Angeles area rather than lasting for ten or even five years. See FCC 99-122, para. 4.

The State Role

The Telecommunications Act of 1996 gives the FCC exclusive jurisdiction over the NANP in the United States and permits it to delegate any portion of that jurisdiction to state commissions or other entities.[36]

Recognizing that state commissions are uniquely positioned to understand local conditions and the potential effects associated with new area code or NPA implementation, the FCC has authorized the states to resolve various matters involving the implementation of new area codes, subject to FCC rules and guidelines governing the administration of telephone numbers. The specific authority delegated to the states includes determining the boundaries of a new area code, the time frame for its introduction, and the mechanism for introducing the new area code.[37] In addition, the FCC has delegated to the states some latitude in designing and implementing number conservation strategies. In its *Third Report and Order*, the FCC lifted its ban on service-specific and technology-specific overlays and stated that authority to implement this area code relief option will be granted to the states on a case-by-case basis.[38]

Number Conservation or Optimization Strategies

Because area code changes are often contentious and the NANP is not inexhaustible, there is a need to utilize the existing numbers within an NPA more efficiently.[39] Fortunately, several strategies or techniques exist for available for conserving or optimizing numbering resources. The strategies aim either at assigning

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[36] See 47 U.S.C. § 251(e)(1).

[37] Under the FCC's rules (47 C.F.R. § 52.19), states can introduce new area codes through the use of a geographic split, an area code boundary realignment, or an all-services area code overlay. Although the states have considerable discretion, the FCC's Common Carrier Bureau has urged states to conform to the industry's area code relief planning guidelines, and has stated that it may review plans that are clearly inconsistent with them. See Letter from Lawrence E. Strickling, Chief, Common Carrier Bureau, to Lawrence G. Malone, General Counsel, NYDPS, dated December 3, 1999 at 2.

[38] See FCC 01-362, para. 1. This gives state commissions another tool for crafting an area-code relief plan in addition to the previously available tools –all-services overlays, NPA splits, and boundary realignments.

[39] Although some NXX codes have high utilization rates, others do not. An FCC analysis reported that 46% of non-rural carriers' allocated numbers were assigned. Non-rural ILECs reported a 58% utilization rate, but non-rural CLECs average utilization rate was only 9.6%. In addition, 70% of CLEC NXXs had utilization rates that were less than 3%. See Craig Stroup and Peyton Wynns, *Numbering Resource Utilization in the United States*, Federal Communications Commission, Common Carrier Bureau, Industry Analysis Division, December 2000, p. 5, Table 2, and Table 4.

numbers in a more efficient manner or at inducing more careful management of carrier number inventories. In all cases, the strategies aim at improving the overall utilization rate of numbering resources. They include:

- Thousands-number pooling – assigning numbers to carriers in 1,000 number blocks vs. the 10,000 number block allocations that have been used historically. The FCC has allowed a number of states to implement thousands-number pooling trials to determine the efficacy of this conservation technique, and nationwide pooling will be implemented beginning in March 2002.[40]

- Rate-center consolidation – combining some rate centers within an NPA to reduce the amount of numbers needed to serve an NPA. Because numbers are used to determine billing for toll calls as well as routing, a carrier must have an allocation of numbers in each rate center within an NPA. The more rate centers there are in an NPA, the more numbers a carrier needs to have a footprint in that NPA.[41] To the extent that technology and competition are pointing towards the virtual elimination of distance as a factor in pricing toll calls, and local calling areas are becoming larger, it is probably the case that fewer rate centers will be needed. One analysis blames much of the numbering crisis on the existence of too many rate centers:

> The numbering resource problem ultimately boils down to ... the extraordinarily large number of geographically minute rate centers in most Numbering Plan Areas (NPAs). The highly granular rating area structure was created nearly a century ago at a time when distance between the calling and called parties was a major component of the total cost of a telephone call. Today's telephone network architecture

[40] Although the technology for pooling exists, there are some issues of cost recovery for administration of pooling and necessary upgrades to various databases including the routing data base system (RDBS) from which local exchange routing guide (LERG) is created and the line information data base (LIDB).

[41] If numbers are assigned in 10,000-unit blocks, a carrier needs 10,000 numbers in each rate center. The greater the number of rate centers in an NPA, the more numbers a carrier needs to offer service. The FCC has urged states to consider rate-center consolidation as a number conservation technique in conjunction with thousands-number pooling. However, rate-center consolidation may make it more difficult to split area codes, since one criteria for designing an area code split is not to split rate centers. Not splitting rate centers in an area-code split is a guideline rather than an inviolable rule. Nevertheless, rate-center splits do complicate the process. Pooling and rate-center consolidation may lead to greater use of overlays, even though overlays require ten-digit dialing.

> has all but eliminated distance as a cost driver — in fact, the major interexchange carriers have all adopted distance-insensitive "postalized" pricing of their interstate long distance services.[42]

Ironically, rate-center consolidation may be less of an issue in densely populated, relatively compact NPAs. The larger an NPA is in area, the more rate centers it is likely to contain. Indeed, some NPAs have several hundred rate centers, so reducing the number of rate centers by half could conserve many numbers, even if pooling is not in place in an NPA.[43]

It must be noted that there may be some interaction between the impact of rate center consolidation and thousands block number pooling. The amount of reduction in demand produced by rate center consolidation will be less in an area where pooling is in place due to the fact that carriers will not need an entire NXX code per rate center even without rate center consolidation.[44]

- Number Reclamation – requiring carriers to return unassigned numbers after some time period, so that they cannot warehouse or hoard unassigned numbers indefinitely. To the extent that unassigned numbers are not in clean blocks of at least a thousand, this would require a workable plan for porting unassigned numbers between carriers.[45] A number of states have required carriers to return unused numbers, but the numbers are relatively small. However, when combined with thousands-number pooling, number

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[42] See *Where Have All the Numbers Gone? Rescuing the North American Numbering Plan from Mismanagement and Premature Exhaust*, second edition (Boston, Massachusetts: Economics and Technology, Inc., June 2000): ii. Available at http://www.econtech.com/library/whatng.pdf.

[43] Imagine an NPA with 200 rate centers. A carrier that wanted to serve the NPA would have to be allocated at least one NXX code in each rate center. That's a minimum of 2 million numbers, possibly more if the carrier anticipated serving more than 10,000 lines in any individual rate center. Although this may appear to be somewhat artificial, an ILEC and three CLECs could exhaust the NPA. Cutting the number of rate centers by half or more would have an immediate impact on the minimum amount of numbers a carrier would need to serve the NPA. The FCC has not mandated rate center consolidation. Nevertheless, it continues to state that rate center consolidation is "an attractive numbering resource optimization measure" and encourage the state commissions to consolidate rate centers as expeditiously as possible. See, for example, FCC Common Carrier Bureau, DA 01-2013 (released August 24, 2001), para. 9.

[44] See *NENO IMG Minutes, October 18, 2001*, p. 2. Available at http://www.nanc_Chair.org/docs/neno/neno_img_minutes_101801.doc

[45] Implicit in number reclamation is the notion that carriers should be urged or induced to assign numbers as close to sequentially as possible so as to contaminate as few blocks as possible.

reclamation, has some potential for reducing the number of unassigned numbers.[46]

- Utilization Thresholds – requiring carriers to assign a certain percentage of allotted numbers in an NPA or rate center before being allotted more (i.e., before obtaining a "growth code"). The FCC's current plan includes a utilization threshold of 60%, which will increase to 75% over the next three years before carriers can get additional numbers in their service area. The use of higher utilization thresholds may lead carriers to manage their number inventories more efficiently.[47]

  Both number reclamation and the use of utilization thresholds will involve state commissions in auditing and evaluating carrier use of numbers.[48] Utilization audits combined with number reclamation and other techniques should have a significant impact on reducing the need for new area codes and lengthening the life of the NANP.[49]

- Market-based strategies – charging carriers for numbers allocated to them. Although this might make them more cautious in requesting or inventorying numbers, carriers are generally against paying for numbers. In addition, charging for numbers might create a property-rights mentality and could lead

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[46] Number pooling may rely on carriers to donate unused blocks of numbers to the pool. Number reclamation does not rely on voluntary donations. Instead, rules are devised that identify excess number allocations and return them to the pool.

[47] Not all unused or unworking numbers are available for assignment or use. Each company employs a database to manage its inventory of numbers. When a customer disconnects service, the database will show that number as being unavailable; the number will be allowed to "age" for a time and will not be assigned to a new customer during this aging period. If a number is aging, it is shown as assigned or unavailable when a new customer connects. Similar treatment is given reserved numbers. There is usually a period of time between the day a number is assigned to a customer and the day service is connected. During this period the number is classified as "reserved," so that it will not be assigned to another customer. The use of thresholds may lead companies to shorten the aging period and/or the reserve period so that more of their allocated numbers are available for assignment.

[48] For example, an audit of number utilization in the 310 NPA conducted by the California PUC Staff showed that approximately three million numbers were not in use. Thus, at a time when area-code relief was being considered, over 40 percent of the numbers in the NPA were not being used. See California Public Utilities Commission Telecommunications Division, *Audit Report on the 310 Area Code*, February 16, 2001.

[49] In its *Third Report and Order*, the FCC reaffirmed state commissions' authority to conduct independent audits of carriers' numbering resource utilization so long as they are not duplicative of the national audit program. See FCC 01-362, para. 1.

to number squatting. Allowing carriers to sell some of their numbers to other carriers could also increase incentives for carriers to hoard numbers for possible resale. Moreover, some or all of the cost of acquiring numbers in a market-based approach would be passed on to consumers.

- Technology or service overlays – putting certain services (e.g., wireless) in their own area codes. Although much of the impetus for overlays comes from wireless technologies, a service-specific overlay might include services that generally do not require numbers from a specific geographic area such as some data services, automatic teller machines (ATMs), and unified messaging services. Similarly, a technology-specific overlay could include broader groups of technologies such as non-pooling carriers, for example.[50]
- Expanded or multi-NPA overlays – an NPA that overlays more than one existing NPA. These might be service specific for uses that are not geographically based (e.g., *On-Star™*).[51]
- Unassigned number porting (UNP) – porting numbers that are yet unassigned to customers between carriers. The fact that they are yet unassigned allows a carrier needing numbers to serve a customer to receive numbers from another carrier to serve its customers. This method differs from pooling in that the unassigned numbers are not put into a pool and administered by a neutral pooling administrator. Instead, numbers are transferred directly from one LNP-capable carrier to another. UNP uses Location Routing Number (LRN) technology to allow a carrier with a few customers in a rate center to obtain just a few numbers rather than a 10K or even a 1K allocation.[52]
- Individual telephone number pooling (ITN) – allowing numbers to be allocated to carriers in increments as small as a single number. This might be the next

[50] See FCC 01-362, para 69.

[51] Note that the 800, 888, and 900 NPAs may be considered a form of expanded overlay.

[52] For a thorough discussion of Unassigned Number Porting, see *Industry Numbering Committee (INC) Report on Unassigned Number Porting (UNP)*, Alliance for Telecommunications Industry Solutions, January 8, 2001. Available at http://www.atis.org/pub/clc/inc/lnpa/010108027.doc

logical step after thousands-number pooling, but it would require further upgrades to databases and LERGs.

- Full local number portability (LNP) – although it would require modifications to the databases and LERGs, this would allow numbers to be assigned on an individual basis from a common pool of available numbers. At present, LNP applies only to customers changing carriers; new customers are assigned numbers out of the carrier's number allocations.

Each of the strategies listed above has promise for extending the life of individual NPAs and, by extension, the life of the NANP. There are costs associated with implementing many of them. However, the costs and difficulties associated with implementing them are likely to be small when compared with the costs of expanding the NANP.

Assessing the Impact of Number Conservation Strategies

Regulators have only recently been making number resource conservation and utilization a priority and implementing number conservation policies. The results are scant to date, but they are encouraging on both a national and an NPA level.

- In April 1999, NeuStar was projecting NANP exhaust in 2007. By April 2000 NeuStar had revised its timeline for NANP exhaust. At that time, the then-projected exhaust date was between 2012 and 2019, depending on assumptions, but that forecast made no attempt to account for the impact of any number optimization measure (e.g., rate center consolidation, 1K block pooling) that might be planned or implemented after April 1, 2000.[53]
- In September 2000, NeuStar presented revised estimates based on a range of assumptions regarding pooling. Although the projected date of NANP exhaust varied depending on the assumptions made, the earliest date indicated for NANP exhaust was 2015, and NANP exhaust was not indicated until after 2039 under optimistic assumptions.[54]

[53] See *NANPA Report to the NANC*, June 20-21, 2000, pp. 2-4.

[54] See *NANPA Report to the NANC*, September 19-20, 2000, pp. 5-7.

- As of September 2001, NANP exhaust was not indicated until 2025.[55] This projection was based on an average NXX code demand rate of 11,600 codes assigned per year. Under various assumptions, the projected NANP exhaust date ranged from 2022 to 2038.
- The NANPA has noted that the demand for NXX codes had slowed considerably.
  - From January through September 2001, CO (NXX) code assignments averaged 927 per month. After adjusting for code returns, the net code assignment rate averaged 410 per month. This may be compared with the period from January through September 2000, in which an average of 1,353 codes were assigned per month. The net code assignment rate averaged 1,073 per month after adjusting for code returns.[56]
  - From January through September 2001, the number of assigned NPAs increased by 19 (from 344 to 363). The number of in-service NPAs increased by 20 (from 289 to 309). The number of in-service geographic NPAs increased from by 20 (from 276 to 296). The number of assigned NPAs awaiting implementation decreased by 1 (from 55 to 54).[57]
- At the individual-NPA level, the first number pooling trials were implemented in the 847, 630, and 312 area codes in Chicago and 212 and 718 in New York. In June 1998, Illinois implemented a thousands block pooling trial in the

[55] This projection assumes that pooling will be implemented in NPAs having 50 percent or more of their rate centers located in the 100 largest MSAs and that wireline carriers' demand for NXX codes will be reduced by 50 percent in NPAs with 25 or more rate centers and 30 percent in NPAs with 24 or fewer rate centers and that wireless carriers' demand for NXX codes will decrease by 10 percent. In addition, the NANPA projected NANP exhaust under other assumptions (more extensive pooling, faster and slower demand for NXX codes, greater impact of pooling on the demand NXX codes). Under various assumptions, the projected NANP exhaust date ranged from 2022 to 2038. The NANPA indicated that in comparing the current NANP exhaust projections to those make in September 2000, the primary difference resulted from applying the assumed percent reduction in NXX code demand resulting from wireline pooling applied *only* to wireline demand, not total demand and from applying the assumed percent reduction in wireless demand *only* to CMRS demand. Under the assumption of 13,300 assigned codes per year, the NANP exhaust date moved from 2029 to 2024 under the newer assumptions. See *NANPA Report to the NANC, October 16-17, 2001*, pp. 8-10.

[56] See *NANPA Report to the NANC, October 16-17, 2001*, p. 2.

[57] See *NANPA Report to the NANC, October 16-17, 2001*, p. 4.

847 NPA, which had been believed to be nearing exhaust and was forecast to need relief in early 2000. Present plans call for the new 224 NPA to overlay 847 in January 2002.[58]

- In California, pooling has been in effect in the 310 NPA since mid-2000. The California PUC Staff reports that pooling satisfied the numbering needs of all companies participating in the pool without opening a single NXX code. Prior to pooling, it was estimated that 128 codes would have been opened to satisfy the demand for numbers. It has been estimated that pooling has avoided the need to open NXX codes and extended the life of the 310 NPA by at least 18 months. Moreover, the California PUC Staff noted that the positive experience in the 310 NPA is mirrored in the 415, 714 and 909 NPAs, where the numbering needs of companies have been met without opening a single NXX code, saving 44 NXX codes in these three NPAs. Finally, the California PUC Staff reports that pooling benefited the carriers by reducing the time necessary to acquire numbering resources: prior to implementing pooling, it took at least 66 days to activate a new NXX code; with number pooling, blocks of a thousand numbers can be assigned and activated within three weeks.[59]
- Maine, which has a single NPA (207), was scheduled to add an overlay NPA in the summer of 2000. Instead, to avoid the economic impact and divisiveness of an additional area-code, the PSC implemented thousands-block number pooling in June 2000. Pooling has been given credit for delaying exhaust of the 207 NPA – it is currently projected to last until 3rd quarter 2002, but pooling and other conservation measures may allow it to

[58] The 847 NPA was created in January 1996 and was nearing exhaust barely two years later. The extent to which the extension of the life of the 847 NPA is due to pooling *per se* is not clear, since many CLECs scaled back their projections and demand for numbers as they realized that their plans were overly optimistic.

[59] See California Public Utilities Commission Telecommunications Division, *Report on the 619 Area Code*, March 13, 2001, at 31. Available at http://www.cpuc.ca.gov/published/report/5695.htm#P579_71281 .

last for many years beyond that.[60] In fact, the NANPA's most recent projection is for the 207 NPA to reach exhaust in the third quarter of 2005.[61]

- The NANPA's June 2001 projections of NPA exhaust indicate that the time to exhaust of the NPAs in which pooling has been or soon will be implemented increased by an average of nearly two years since the last projections were made.[62] Moreover, recent updates to NANPA's June 2001 exhaust projections revised the projected exhaust dates for twelve NPAs, adding an average of approximately fifteen months to projected NPA exhaust date. The revisions resulted from a variety of factors including changes in demand, rationing amounts, and recovery or return of NXX codes.[63]
- As for the impact of pooling on individual NPAs, the NANPA has recently stated that the impact of pooling on an NPA is likely to be inversely related to the NPA's overall utilization rate at the time pooling is implemented. In other words, demand for additional numbering resources will decrease most in NPAs with low utilization and least in NPAs with high utilization rates.[64] The NANPA assumes that:
  - Pooling will have no impact on the demand for new NXX codes in NPAs with existing utilization of 60% or greater.
  - Pooling will result in a slight (ten percent) reduction in demand for NXX codes in NPAs with utilization rates between 40 and 60 percent,

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[60] See NeuStar, *The State Scene*," 3, no. 2 (March/April 2001), p. 2, quoting Maine PSC Chair Thomas L. Welch. Available at http://docs.nanpa.com/pdf/newsletters/state_scene_march_april.pdf .

[61] See NeuStar, *2001 NRUF and NPA Exhaust Analysis: June 1, 2001 Update.* Projected NPA exhaust dates are dated April 2001. Available at http://docs.nanpa.com/pdf/NRUF/nruf061501results.pdf

[62] Ibid. Calculations by the author.

[63] See NANPA, *2001 NPA Exhaust Analysis: Changes as of November 5, 2001*, available at http://docs.nanpa.com/pdf/NRUF/deltanruf011105.pdf. Calculations by the author.

[64] The NANPA calculates an NPA's utilization rate as the sum of all the telephone numbers reported by the carriers as being "Assigned" divided by the sum of all the telephone numbers reported as "Assigned," "Reserved," "Aging," "Administrative" and "Available." See *NANPA Report to the NANC,* June 18-19, 2001, p. 3.

  - Pooling could result in a 25 to 35 percent decrease in the demand for NXX codes in NPAs with less that 40 percent utilization.[65]

- Based on data from NPAs in which pooling trials are underway, the NANPA believes that wireline carriers' demand for NXX codes will fall by 70 percent during the first year of pooling (compared to the same NPA being non-pooled, and assuming that the NPA is not under rationing). In the second year, pooling will result in a 60 percent decrease in the demand for new NXX codes. After the second year of pooling, the decrease in demand for new NXX codes in an NPA will stabilize at 50% of demand without pooling.[66] Recently reported data collected by the FCC points towards more efficient utilization of numbering resources by the carriers.[67]

  - As of June 30, 2001, reporting carriers had nearly 470 million telephone numbers assigned and more than 603 million were available for assignment. Thus, there are more numbers available for assignment than numbers assigned. Moreover, the inventory of available numbers does not include numbers in NXXs that have not yet been assigned to a carrier, nor does it include 112 million numbers classified as being in intermediate, reserved, aging and administrative categories.[68] These data are presented in Table 1.

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[65] Ibid.

[66] Ibid., p. 5.

[67] See Craig Stroup, *Numbering Resource Utilization in the United States as of June 30, 2001,* FCC, Common Carrier Bureau, Industry Analysis Division, November 2001. Available at http://www.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/IAD/utilizationjun2001.pdf

[68] See *Numbering Resource Utilization in the United States as of June 30, 2001*, Table 1. Intermediate numbers are those that one carrier has assigned to another carrier (or to a non-carrier) so that the numbers may then be assigned to an end user. Administrative numbers include test numbers and other numbers used for network purposes.

Table 1

Number Utilization by Carrier Type
(as of June 30, 2001)

Type of Carrier	Numbers Available (000's)	Numbers Assigned (000's)	Utilization %
ILEC	587,407	305,938	52.1
CLEC	255,959	27,942	10.9
Cellular/PCS	246,786	111,734	45.3
Paging	95,131	23,621	24.8
Total for all Reporting Carriers	1,185,284	469,235	39.6

Source: Stroup, *Numbering Resource Utilization in the United States as of June 30, 2001,* Table 1(based on NeuStar data).

- The larger carriers that are required to report utilization at the thousands-block level had higher utilization rates than the smaller (rural) carriers that reported at the ten-thousands-block level.[69]
- For utilization of individual NXXs, the median for ILECs was 57.9%, compared with a median of 46.3% for cellular/PCS carriers, 13.2% for paging carriers, and just 0.4% for CLECs. In fact, at least 30% of NXXs allocated to CLECs had no assigned numbers.[70]
- The demand for new NXX code assignments has slowed dramatically. This is shown in Table 2.

[69] See Ibid., Tables 2 and 3.

[70] See Ibid., Table 4.

Table 2
Net Quarterly NPA-NXX Code Assignments

Period		NPA-NXX Code Net Assignments[71]
1998	Q3	1,554
	Q4	2,375
1999	Q1	3,019
	Q2	4,598
	Q3	4,038
	Q4	3,448
2000	Q1	3,777
	Q2	3,203
	Q3	2,679
	Q4	2,089
2001	Q1	1,370
	Q2	1,816
	Q3	501

Source: Stroup, *Numbering Resource Utilization in the United States as of June 30, 2001,* Table 12 (based on NeuStar data).

The Future

The various number conservation strategies discussed above all have promise. Especially when implemented consistently, early, widely, and in concert with one another, these strategies should have a positive impact on utilization rates and lead to more efficient use of telephone numbers. Given more efficient use of numbers, individual NPAs will last longer, and the NANP will last for many more years.[72] There is

[71] Net assignments = assigned - returned.

[72] Even though it is important that numbers be assigned and utilized efficiently, It might be argued that there are plenty of numbers left. As noted above, the NANP contains over 5 billion possible numbers (even without the D-digit), and only 1.1 billion were allocated as of December 31, 2000.

no doubt that expanding the existing NANP would be very costly,[73] but technological improvement and convergence may point the way toward a migration to internet-type numbering which could completely change the way we view telephone numbers.

An example of the convergence of telephone numbers and internet addresses, is shown by NeuStar's announcement of the public test phase of its testing of the global electronic numbering standard named ENUM,[74] which translates an international telephone number into a series of Internet addresses or Uniform Resource Locators (URLs). NeuStar states that the ENUM standard will enable telephones to access Internet services and information, and vice versa. The ENUM protocol can also be applied to a number of additional services such as unified addressing for fax machines, e-mail, instant messaging and web sites. Moreover, ENUM is a convergence technology that bridges the Internet and the public switched telephone network (PSTN). It will facilitate voice over the Internet protocol (VOIP) by providing a mechanism that enables callers on the PSTN to easily connect with VOIP users, and vice versa.[75]

The Impact of Policy

Although in 1999 there did, indeed, appear to be a genuine numbering crisis in the making, regulators rose to the challenge. The problem was man-made; the solution was within our grasp, and regulators seized it. Actions by the FCC, state commissions, and the telecommunications industry to improve numbering resource utilization have resulted in a substantial increase in the estimated life of the NANP. In 1999 NANPA

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[73] The farther into the future NANP expansion is pushed, the more easily it may be to accommodate it, since future generations of telephone switches, PBX machines, and other CPE could be engineered with NANP expansion in mind. Given the pace of advances in telephone switches, the next generation could be designed to transition to an expanded NANP. The gradual transition to high-definition television (HDTV) might be used as an example. Also, although not of the same magnitude, there was no outcry when long-distance carrier access codes (CACs) were expanded from five digits (10288, for example) to seven digits (1010288, for example) to accommodate the increased number of IXCs.

[74] In discussing NeuStar's ENUM program, Jeff Ganek, Chairman and CEO of NeuStar, said:

> ... we have arrived at the apex of true convergence. ... market forces have been driving greater consolidation of data and voice networks ....

See "NeuStar Launches Initiative to Further the Convergence of Telephony and the Internet," NeuStar Press Release, April 24, 2001.Available at http://www.neustar.com/pressroom/announcements/press_release.cfm?press_id=32. See also, Richard Shockey, "ENUM: Phone Numbers Meet the Net," *Communications Convergence* 9, no. 7 (July 2001): 20-30.

[75] See Jeffrey Ganek, *E Pluribus ENUM!*, presented at the Telecom Policy Summit, Washington, D.C., October 1, 2001. Available at http://www.itu.int/osg/spu/infocom/enum/ganek.pdf

estimates that NANP exhaust was likely to occur between 2006 and 2012, and the NANC estimated that NANP exhaust was likely to occur between 2005 and 2016. This may be compared with a recent NANPA study, which estimates that NANP exhaust is likely to occur well beyond 2020.[76] Moreover the NANPA estimates that, given the impact of thousands-block number pooling, NANP exhaust is not likely to occur until sometime between 2025 and 2034.[77]

Current projections are for the date of NANP exhaust to be twenty or more years distant, and the projected NANP exhaust date has been tending to move further into the future. The near-term impact of conservation and the longer-term impact of network enhancements and convergence have the potential to make NANP exhaust and expansion largely a non-event like Y2K. This is a regulatory policy success story: The fact that regulators became aware of the problem and took actions to avoid potentially harmful consequences made it a non-event. There are intermediate term controversies such as the question of permanent forbearance by the FCC from imposing LNP requirements on wireless carriers and the impact of service- and technology-specific NPA overlays and how much flexibility the states will have in designing and implementing them. In the longer term, more intelligent switches, faster and more accessible databases, unassigned number porting, individual telephone numbers, and more intelligent CPE devices may make it possible to have effectively unlimited numbers.

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[76] See *NANPA Report to the NANC, October 16-17, 2001.*

[77] See FCC 01-362, Third Report And Order And Second Order On Reconsideration In CC Docket No. 96-98 And CC Docket No. 99-200 (released December 28, 2001), para. 1 and n. 2.

APPENDIX

POOLING STATUS & TIMELINE BY STATE AND NPA

TABLE A-1

STATES AND NPAs WITH POOLING CURRENTLY ON LINE

State	NPA(s)	Petition for Delegated Authority	FCC Granted Authority	State Com. Order	Mandated Implement.	Pooling Admin. Designated	Start Pool Alloc.
California	310	11/3/99 & 4/23/99	9/15/99	11/4/99	3/18/00	NeuStar	3/11/00
California	323	4/23/99	9/15/99	2/9/01	8/25/01	NeuStar	8/25/01
California	408	4/23/99	9/15/99	2/9/01	5/12/01	NeuStar	5/12/01
California	415			1/31/00	7/29/00	NeuStar	7/21/00
California	510	4/23/99	9/15/99	2/9/01	6/29/01	NeuStar	6/29/01
California	650	4/23/99	9/15/99	2/9/01	6/8/01	NeuStar	6/8/01
California	714	11/3/99 & 4/23/99	9/15/99	1/31/00 & 4/21/00	10/6/00	NeuStar	9/29/00
California	909	4/23/99	9/15/99	4/21/00	12/8/00	NeuStar	12/1/00
California	818	4/23/99	9/15/99	4/21/00	3/24/01	NeuStar	3/17/01
California	916	4/23/99	9/15/99	2/9/01	7/28/01	NeuStar	7/28/01
California	925	4/23/99	9/15/99	2/9/01	9/29/01	NeuStar	9/29/01

TABLE A-1

STATES AND NPAs WITH POOLING CURRENTLY ON LINE

State	NPA(s)	Petition for Delegated Authority	FCC Granted Authority	State Com. Order	Mandated Implement.	Pooling Admin. Designated	Start Pool Alloc.
Colorado	303 / 720	12/16/99 & 4/28/00	7/20/00	9/27/00	5/1/2001 Changed from 3/10/01	NeuStar	3/10/01
Connecticut	203	7/28/99	11/30/99	12/8/00	2/26/01	NeuStar	2/26/01
Connecticut	860	7/28/99	11/30/99	6/14/00	10/6/00	NeuStar	10/6/00
Florida	305	4/2/99	9/15/99	3/6/01	5/28/01	NeuStar	5/28/01
Florida	561 West Palm Beach MSA	4/2/99	9/15/99	5/31/00	2/5/01	NeuStar	2/5/01
Florida	561 Fort Pierce-Pt. St. Lucie MSA	4/2/99	9/15/99	10/20/00	9/17/01 Mandate date changed from 4/30/01	NeuStar	9/17/01
Florida	904 Jacksonville MSA	4/2/99	9/15/99	5/31/00	4/2/01	NeuStar	4/2/01
Florida	904 Daytona Beach MSA	4/2/99	9/15/99	10/20/00	7/16/01	NeuStar	7/16/01
Florida	954 / 754	4/2/99	9/15/99	5/31/00	1/22/01	NeuStar	1/22/01

TABLE A-1

STATES AND NPAs WITH POOLING CURRENTLY ON LINE

State	NPA(s)	Petition for Delegated Authority	FCC Granted Authority	State Com. Order	Mandated Implement.	Pooling Admin. Designated	Start Pool Alloc.
Illinois (Chicago)	312				8/30/99	NeuStar	
Illinois (Chicago)	630				8/16/99	NeuStar	
Illinois (Chicago)	847	1st Trial (Pre Port)			6/1/98	NeuStar	
Illinois (Chicago)	708				4/3/00	NeuStar	
Illinois (Chicago)	773				10/1/99	NeuStar	
Iowa	515	11/10/99	7/20/00	4/3/01	8/15/01	NeuStar	8/15/01
Iowa	641	11/10/99	7/20/00	4/3/01	8/15/01	NeuStar	8/15/01
Maine	207	3/17/99	9/29/99	11/4/99	6/1/00	NeuStar	6/1/00
Maryland	240 / 301	8/11/00	2/13/01	4/12/01	8/15/01	NeuStar	8/15/01
Maryland	443 / 410	8/11/00	2/13/01	4/12/01	9/15/01	NeuStar	9/15/01
Massachusetts	339	8/3/00	2/13/01	3/2/01	5/1/01	NeuStar	5/1/01

TABLE A-1

STATES AND NPAs WITH POOLING CURRENTLY ON LINE

State	NPA(s)	Petition for Delegated Authority	FCC Granted Authority	State Com. Order	Mandated Implement.	Pooling Admin. Designated	Start Pool Alloc.
Massachusetts	351	8/3/00	2/13/01	3/2/01	5/1/01	NeuStar	5/1/01
Massachusetts	413	8/3/00	2/13/01	3/2/01	8/1/01	NeuStar	8/1/01
Massachusetts	774	8/3/00	2/13/01	3/2/01	5/1/01	NeuStar	5/1/01
Massachusetts	857	8/3/00	2/13/01	3/2/01	5/1/01	NeuStar	5/1/01
Nebraska	402	9/14/99	7/20/00	8/8/00	7/1/01 Mandate date changed from 2/17/01 & 5/1/01	NeuStar	2/17/01
New Hampshire	603	9/15/99	11/30/99	1/7/00	5/1/00	NeuStar	5/1/00
New Hampshire	603*			1/7/00		NeuStar	1/27/01
New Jersey	201 / 551	6/9/00	2/13/01	5/4/01	7/31/01	NeuStar	7/31/01
New York	212	1st Trial (Port on Demand)			7/1/98	NeuStar	
New York	212	2/19/99	9/15/99	3/17/00	8/31/01 Mandatory pooling - changing to pre-port	NeuStar	8/31/01

TABLE A-1

STATES AND NPAs WITH POOLING CURRENTLY ON LINE

State	NPA(s)	Petition for Delegated Authority	FCC Granted Authority	State Com. Order	Mandated Implement.	Pooling Admin. Designated	Start Pool Alloc.
New York	315	2/19/99	9/15/99	3/17/00	2/1/01	NeuStar	2/1/01
New York	315*	2/19/99	9/15/99	3/17/00	2/1/01	NeuStar	5/1/01
New York	347	2/19/99	9/15/99	3/17/00	4/30/01	NeuStar	4/30/01
New York	516	2/19/99	9/15/99	3/17/00	7/1/00	NeuStar	7/1/00
New York	516*	2/19/99	9/15/99	3/17/00		NeuStar	
New York	518	2/19/99	9/15/99	3/17/00	9/15/00	NeuStar	9/15/00
New York	518*	2/19/99	9/15/99	3/17/00	9/15/00	NeuStar	9/15/00
New York	585 split off of NPA 716	2/19/99	9/15/99	12/2/99	8/17/02	NeuStar	
New York	607	2/19/99	9/15/99	3/17/00	6/30/01	NeuStar	6/30/01
New York	631	2/19/99	9/15/99	3/17/00	6/30/01	NeuStar	6/30/01
New York	646	2/19/99	9/15/99	3/17/00	4/30/01	NeuStar	4/30/01

TABLE A-1

STATES AND NPAs WITH POOLING CURRENTLY ON LINE

State	NPA(s)	Petition for Delegated Authority	FCC Granted Authority	State Com. Order	Mandated Implement.	Pooling Admin. Designated	Start Pool Alloc.
New York	716	2/19/99	9/15/99	12/2/99	4/1/00	NeuStar	4/1/00
New York	716*	2/19/99	9/15/99	12/2/99		NeuStar	
New York	718				3/1/99	NeuStar	
New York	718	2/19/99	9/15/99	3/17/00	8/31/01 Mandatory pooling - changing to pre-port	NeuStar	8/31/01
New York	845	2/19/99	9/15/99	3/17/00	4/30/01	NeuStar	4/30/01
New York	914	2/19/99	9/15/99	3/17/00	4/30/01	NeuStar	4/30/01
New York	917	2/19/99	9/15/99	3/17/00	8/31/01	NeuStar	8/31/01
North Carolina	704 / 980	11/29/99	7/20/00		9/14/01	NeuStar	9/14/01
Oregon	541	3/7/00	7/20/00	2/6/01	7/1/01	NeuStar	7/1/01
Pennsylvania	610 / 484	12/27/99 & 4/24/00	7/20/00	12/20/00	4/27/01	NeuStar	4/27/01

TABLE A-1

STATES AND NPAs WITH POOLING CURRENTLY ON LINE

State	NPA(s)	Petition for Delegated Authority	FCC Granted Authority	State Com. Order	Mandated Implement.	Pooling Admin. Designated	Start Pool Alloc.
Texas	210 San Antonio MSA			7/6/01	10/1/01	NeuStar	10/1/01
Texas	512	7/5/99	11/30/99	1/20/00	8/1/00	NeuStar	7/13/00
Texas	512*				9/15/00	NeuStar	9/8/00
Utah	801/ 385	10/25/99	7/20/00	8/10/00	3/1/01	NeuStar	3/1/01
Virginia	804 / 434	11/29/99	7/20/00		6/15/01	Telcordia	6/15/01
Virginia	757	11/29/99	7/20/00		10/12/01	NeuStar	10/12/01

Source: Author's adaptation of NeuStar data.
Source data available at: http://www.numberpool.org/timeline_by_state/index.htm
Notes:

* = Dates for contaminated blocks

*** = 3 business days after version 3.0 of the pooling software is turned up

**** = or until version 3.0 of the pooling software is available, whichever is sooner

TABLE A-2

STATES AND NPAs WITH POOLING TURN UP IN PROGRESS

State	NPA(s)	Petition for Delegated Authority	FCC Granted Authority	State Com. Order	Mandated Implement.	Pooling Admin. Designated	Start Pool Alloc.
Arizona	602	12/23/99	7/20/00	8/29/01	2/14/02	NeuStar	2/14/02
Arizona	480	12/23/99	7/20/00	8/29/01	3/14/02	NeuStar	3/14/02
California	619	4/23/99	9/15/99	2/9/01	10/27/01	NeuStar	10/27/01
California	562	4/23/99	9/15/99	2/9/01	11/24/01	NeuStar	11/24/01
California	858	4/23/99	9/15/99	2/9/01	12/29/01	NeuStar	12/29/01
Indiana	219	9/20/00 & 10/11/00	3/13/01	6/22/01	1/1/02	NeuStar	1/1/02
Indiana	317	9/20/00 & 10/11/00	3/13/01	6/22/01	12/1/01	NeuStar	12/1/01
Massachusetts	781	8/3/00	2/13/01	3/2/01	1/1/02	NeuStar	12/31/01
Massachusetts	978	8/3/00	2/13/01	3/2/01	2/1/02	NeuStar	2/1/02
Massachusetts	508	8/3/00	2/13/01	3/2/01	3/1/02	NeuStar	3/1/02
Massachusetts	617	8/3/00	2/13/01	3/2/01	4/1/02	NeuStar	4/1/02
Missouri	314	9/13/00	3/13/01		1/2/02	NeuStar	1/2/02
Missouri	816	9/13/00	3/13/01		2/1/02	NeuStar	2/1/02

TABLE A-2

STATES AND NPAs WITH POOLING TURN UP IN PROGRESS

State	NPA(s)	Petition for Delegated Authority	FCC Granted Authority	State Com. Order	Mandated Implement.	Pooling Admin. Designated	Start Pool Alloc.
New Jersey	973	6/9/00	2/13/01	5/4/01	1/16/02	NeuStar	1/16/02
New Jersey	862 overlay of 973	6/9/00	2/13/01	5/4/01	12/1/01	NeuStar	12/1/01
New Jersey	732	6/9/00	2/13/01	5/4/01	2/15/02	NeuStar	2/15/02
New Jersey	848 overlay of 732	6/9/00	2/13/01	5/4/01	12/1/01	NeuStar	12/1/01
Oregon	503 / 971	3/7/00	7/20/00	2/6/01	12/01/01**** changed from 10/01/01	NeuStar	12/1/01
Pennsylvania	412 / 724				10/29/01	NeuStar	10/29/01
North Carolina	919 / 984			5/23/01	10/26/01	NeuStar	10/26/01
North Carolina	919 / 984*			5/23/01	10/26/01	NeuStar	11/28/01
North Carolina	336			9/12/01	2/15/02	NeuStar	2/15/02
Pennsylvania	570			8/2/01	2/28/02	NeuStar	2/28/02
Pennsylvania	717			8/2/01	3/14/02	NeuStar	3/14/02
Texas	832 Houston MSA			7/6/01	11/1/01	NeuStar	11/1/01
Texas	281 Houston MSA			7/6/01	12/1/01	NeuStar	12/1/01

TABLE A-2

STATES AND NPAs WITH POOLING TURN UP IN PROGRESS

State	NPA(s)	Petition for Delegated Authority	FCC Granted Authority	State Com. Order	Mandated Implement.	Pooling Admin. Designated	Start Pool Alloc.
Texas	713			7/6/01	1/1/02	NeuStar	1/1/02
Tennessee	615	11/17/99	3/13/01	12/12/00	***	NeuStar	***
Tennessee	901	11/17/99	7/20/00		***	NeuStar	***
Washington	509	12/8/99	7/20/00	11/1/00	1/8/02	NeuStar	n/a
Washington	360				2/15/02	NeuStar	2/15/02
Virginia	540 & 276 276 is the split of 540	11/29/99	7/20/00		11/2/01	NeuStar	11/15/01

Source: Author's adaptation of NeuStar data. Source data available at http://www.numberpool.org/timeline_by_state/index.htm

Notes:

* = Dates for contaminated blocks

*** = 3 business days after version 3.0 of the pooling software is turned up

**** = or until version 3.0 of the pooling software is available, whichever is sooner

TABLE A-3

STATES WITH DELEGATED AUTHORITY AND WITH POOLING PENDING

State	Petition for Delegated Authority	FCC Granted Authority
Wisconsin	8/5/99	11/30/99
Ohio	9/13/99	11/30/99
Louisiana	9/25/00	2/13/01
Minnesota	8/29/00	3/13/01
Vermont	11/29/00	3/13/01
West Virginia	12/12/00	3/13/01
Oklahoma	9/20/00	3/13/01
Michigan	1/30/01	8/23/01

Source: NeuStar Source data available at http://www.numberpool.org/timeline_by_state/index.htm

TABLE A-4

STATES WITH DELEGATED AUTHORITY PENDING AT THE FCC

State	Petition for Delegated Authority
Georgia	11/19/99
South Carolina	4/25/01

Source: NeuStar. Source data available at http://www.numberpool.org/timeline_by_state/index.htm