North American Numbering Council

Local Number Portability Administration
Working Group

Final
Report on Out of LATA Porting & Pooling
For
Disaster Relief
After
Hurricane Katrina

April 12, 2006

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1. Introduction

The LNPA Working Group published the "Interim Report on Out of LATA Porting and Pooling for Disaster Relief after Hurricane Katrina" on November 16, 2005. That report was issued as "interim" in order to expeditiously provide available information to telecommunications providers and to regulatory and administrative bodies.

This "final" report is issued to provide further information concerning the restoration of numbers to the appropriate LATA, additional lessons learned, and potential alternatives to porting or pooling numbers outside the LATA.

This report replaces the interim report in its entirety, and it is therefore not necessary for the reader to correlate the two reports.

2. Executive Summary

On August 29, 2005, Hurricane Katrina slammed into the Louisiana, Mississippi, and Alabama Gulf Coast leaving extensive damage in its wake. Millions of customers were out of service, and there was extensive damage to both wireline and wireless switching centers, facilities, cell sites, and to 9-1-1 call centers. With many switching centers damaged or totally destroyed by extreme winds and/or flooding, service providers explored ways to expeditiously move telephone numbers into working switches. The Federal Communications Commission (FCC) temporarily relaxed numbering rules in order to permit service providers to move numbers to remote locations without regard to Toll Message Rate Center or Local Access Transport Area (LATA) restrictions. Service providers began using Local Number Portability (LNP) and/or Number Pooling to move numbers from the non-working switches into working switches in other locations. This report focuses on the technical aspects of suspending the rules that prohibit porting or pooling outside LATA boundaries.

Moving numbers to working switches was typically more advantageous for wireless subscribers than for wireline subscribers. When the wireless subscribers were moved to working switches, they had originating service and some terminating service. With wireline service, no originating or terminating service is possible as there is no facility to the subscriber. If a wireline number is moved to a working switch, remote call forwarding can be used to route terminating calls to other subscriber locations or to voice mail.

The edit in the Number Portability Administration Center (NPAC) that prevents assignment of out of LATA Location Routing Numbers (LRN) to a ported number or a pooled block was suspended thereby allowing numbers to be ported or pooled across LATA boundaries. This allowed wireless subscribers to have originating service and some level of terminating service. It would allow wireline subscribers to forward some terminating calls to other locations or voice mail.

Many calls would not complete because a Regional Bell Operating Company (RBOC) cannot deliver calls across LATA boundaries. Other calls fail because of trunk group overloading as the groups were not sized to handle the increased loads resulting from the massive unplanned movement of telephone numbers.

The Local Number Portability Administration (LNPA) Working Group considers the actions taken by the North American Numbering Council (NANC) and the FCC to temporarily relax numbering rules to be appropriate, thereby allowing telecommunications service providers to immediately act to restore service to the extent possible. Moving numbers, even across LATA boundaries, is a viable method, especially for wireless carriers, to restore service. However, the Working Group believes that many carriers moved numbers across LATA boundaries after Hurricane Katrina without a full understanding of the consequences.

This document describes situations encountered, lists pros and cons for consideration when moving numbers, and provides recommendations in preparation for future disasters.

3. **Background**

On Monday, August 29, 2005, Hurricane Katrina struck the Gulf Coast causing extensive damage in Louisiana, Mississippi, and Alabama. In addition to the damage caused by hurricane force winds, extensive flooding occurred especially in the vicinity of New Orleans, Louisiana. The flooding in and around New Orleans was exacerbated by failure of the levies in areas of the city that are actually below sea level.

The destruction caused by Hurricane Katrina put more than 3 million telephone lines out of service in the three states. There was extensive damage to wireline switching centers and interconnection trunks. Thirty-eight 9-1-1 call centers were out of service. The wireless network also sustained considerable damage with more than 1000 cell sites out of service.[1] Wireless switching centers were damaged as well.

Immediately after the hurricane subsided, telecommunications companies began extraordinary efforts to restore service. As soon as technicians were allowed into the area, maintenance forces were on-site to begin restoration and provisioning of temporary services. Among the efforts, banks of portable phones, wireless handsets, cells on wheels[2], etc., were made available to emergency workers and to allow survivors to contact family in other locations. Generators, pumps, and other equipment were brought in to sustain the temporary service and to begin physical restoration and cleanup. Many of the telecommunications employees had suffered personal losses themselves, but continued to work to restore overall service. In the tradition of the telecommunications industry, the workers looked for ways to reinstate service as expeditiously as possible.

[1] Written statement of Kenneth P. Moran, Director, Office of Homeland Security Enforcement Bureau, Federal Communications Commission. Hearing on Ensuring Operability during Catastrophic Events before the Committee on Homeland Security Subcommittee on Emergency Preparedness, Science, and Technology, US House of Representatives, October 26, 2005.

[2] Cells on wheels are portable cellular towers.

To that end, number porting and pooling techniques were used to rapidly move subscribers from non-working switches to working switches. This report analyzes the benefits and drawbacks of such action.

Subsequent to Hurricane Katrina inflicting catastrophic damage to the Louisiana, Mississippi, and Alabama coast lines, Hurricanes Rita and Wilma hit the Texas-Louisiana coast and southern Florida respectively. While both caused significant damage, neither was as devastating as Katrina. This report will concentrate on events associated with Katrina realizing that lessons learned will apply in other disastrous situations.

3.1. Situation

In the aftermath of Katrina, both wireless and wireline telecommunications companies were working to restore service. Wireline companies had facilities damaged or destroyed by high winds and flooding. Wireless carriers had cell towers destroyed, and facilities connecting switches to towers destroyed. Both wireless and wireline carriers had switches that were either damaged or totally destroyed by the hurricane.

Many service providers moved their customers' telephone numbers from the switches that were out of service to working switches in other locations. Depending on the type of service provider (wireless or wireline) and the location of the "ported-to" switch, varying service levels were restored using number porting or pooling functionality.

3.2. FCC Order Suspending Numbering Rules

The FCC adopted and released an order on September 1, 2005, that suspended many numbering rules for a period of 90 days (August 27 to November 27, 2005). The Commission recognized "that telecommunications service must be restored to the hurricane victims as quickly as possible and we find that waiver of the Commission's local number portability and number assignment rules is a reasonable and practical means for doing so." [3]

The Commission waived the rules to the extent necessary to permit carriers to port numbers from the hurricane affected area to remote locations on a temporary basis. This waiver applied to carriers providing service in the states of Louisiana, Mississippi, and Alabama. The waiver also applied to the numbering administrators to the extent necessary to support carriers in the affected areas.[4]

[3] FCC Order 05-161, September 1, 2005.
[4] FCC Order 05-161, September 1, 2005, paragraph 3.

4. Actions Taken

4.1. Service Provider Actions

With the temporary suspension of porting and pooling location rules, some service providers used LNP or number pooling to move telephone numbers from non-working switches to working switches in other locations. Effects of moving the numbers varied depending on whether the numbers are moved within rate center boundaries, across rate center boundaries, or across LATA boundaries. Effects also depend on the type of network attempting to originate calls to these ported or pooled numbers.

Moving numbers to another switch serving the same rate center has no negative effects on call routing or rating; however, calls may fail due to overloading of inter-switch trunk groups designed for smaller volumes. Current LNP rules allow movement within the rate center.

Moving numbers to a switch that does not serve the porting numbers' rate center may affect terminating call rating and billing. Calls will be routed to the number based on the LRN of the new switch. However, terminating calls will be rated as if the number were still in the original rate center, and calls may fail due to overloading of inter-switch trunk groups.

If the telephone numbers are moved outside the LATA, routing and billing problems may be encountered in addition to failure of calls caused by overloading inter-switch trunk groups. In normal circumstances, the NPAC has a software edit that prohibits a service provider from porting a number to an LRN that is outside the LATA. Section 5 of this document contains a discussion of the issues associated with porting outside the LATA.

4.2. Changes to the NPAC

The only change made to the NPAC database was to suspend the edit that prevents a service provider from assigning an out of LATA LRN to a ported number or pooled block. The North American Portability Management (NAPM) LLC approved suspension of the NPAC edit in the Southeast NPAC Region[5] on August 31, 2005. The edit was restored on November 27, 2005, matching the period of suspension of numbering rules ordered by the FCC.

4.3. Numbers Ported or Pooled Out of LATA to Provide Temporary Service

In the Southeast NPAC Region, approximately 2000 telephone numbers were ported across LATA boundaries after Hurricane Katrina. Additionally, about 300 blocks of existing numbers were moved across LATA boundaries using number pooling. The 300 blocks that were moved

[5] The NAPM also approved suspension of the LATA edit in the Southwest NPAC Region in connection with Hurricane Rita. The LATA edit was restored in the Southwest Region on November 7, 2005, and was restored in the Southeast region on November 27, 2005.

using pooling represent up to 300,000 telephone numbers[6] that were moved. The pooled blocks contain both working and vacant numbers. About one quarter million customers were moved across LATA boundaries using individual number porting or block pooling.

While not in the purview of this report, some quantity of telephone numbers were ported within the rate center and LATA to restore service, but it has proven difficult to differentiate between those ported because of Katrina and normal porting activity. Additionally, the incumbent RBOC used Advanced Intelligent Network (AIN) service to provide temporary service to approximately 600 telephone numbers.

5. Impacts of Porting or Pooling Numbers Outside the LATA

Porting and pooling numbers outside the LATA to restore service has mixed results. Depending on the type of carrier, some level of customer service can be restored. This section describes the effects of porting and pooling out of LATA and the resulting problems encountered in the aftermath of Hurricane Katrina. Appendix A provides a summary of the pros and cons in matrix format for easy reference.

As stated previously, there were many numbers ported or pooled outside the serving LATAs after Hurricane Katrina. For example, many numbers were moved from the New Orleans LATA to the Houston LATA. Due to differences in technology and service, the benefits are much more pronounced for wireless subscribers than for wireline subscribers, but full service is not restored in either case. It is important for service providers to be aware of all the impacts.

5.1. Wireless Service

If a wireless subscriber's home switch is out of service but the Home Location Register (HLR) is still in service, that subscriber can originate calls as a roamer/traveler if within range of a working cell tower, but cannot receive calls since terminating calls route through the home switch. If the HLR is out of service, the subscriber will not have originating or terminating service since there would be no way to register elsewhere as a valid user.[7] Porting or pooling a wireless number to a working switch in another LATA gives the customer originating service and some terminating service. Moving the number creates a new home location, and the subscriber can be served from that switch or register as a roamer/traveler in another area. Terminating calls will route through the "new" home switch.

When a wireless number is moved to another LATA, the subscriber will have originating telephone service and some degree of terminating service. Calls from many locations and carriers will complete, however, calls from wireline subscribers in the affected LATA[8] that are served by

[6] Each block contains 1000 telephone numbers, but the quantity moved would be less any numbers that were already ported away from the service provider currently assigned the block or blocks.
[7] The subscriber will still have 9-1-1 access if within range of a working cell tower even if not registered.
[8] The affected LATA is the LATA where the disaster occurred.

the RBOC will not complete normally. RBOCs are prohibited from carrying traffic across LATA boundaries. Calls to these numbers appear to be local, but querying the LNP database will return an out of LATA LRN. RBOC switch generics are coded to block this type of call or to hand them off to an Inter-exchange carrier (IXC).

Calls from locations outside the affected LATA to the ported or pooled numbers[9] will complete if the calls are queried by the originating carrier or the IXC (N-1 query) and routed to the new switch. Calls from locations outside the affected LATA that are default routed to the RBOC in the affected LATA will fail. When such a call reaches the RBOC tandem in the affected LATA, a query is made and an out of LATA LRN is returned. The RBOC switch is not capable of routing the call across LATA boundaries.

The inability of RBOC switches to route these calls caused many customer trouble reports after Katrina. Complaints were received by both the RBOC carrier and the carriers who ported out of LATA. Not only would calls originated by RBOC customers fail, but any calls to the ported out of LATA numbers that were default routed to the RBOC would fail as well. In situations where calls are routed to IXCs, billing records are generated for calls that should be routed as local. This causes billing confusion and disputes that must be resolved.

RBOC switches treat the blocked calls as switching errors and log the failures. In the case of one switch type, parts of the switch network shut down when thresholds are exceeded as the switch logic "believes" that internal problems exist.

Telecommunications trunk routes are sized to handle forecasted loads. Moving large quantities of telephone numbers inside or outside of LATA boundaries suddenly routes large volumes of calls over trunk groups that were not sized to handle such loads. Many customers received "all circuits busy" indications.

There should not be any problems with 9-1-1 call originating service for wireless numbers ported or pooled out of LATA. However, the National Emergency Number Association (NENA) representative participating in the study indicated that in some cases call backs failed due to the RBOC inability to route calls across LATA boundaries.

5.2. Wireline Service

Porting or pooling wireline telephone numbers out of LATA does not offer as many advantages as with wireless numbers. When a number is moved to a working switch, there is no originating or terminating service as there is no facility to a wireline set. However, when the number is placed in another switch, remote call forwarding can be used to route the call to another customer location not affected by the disaster, or to a voice messaging system.

[9] As an example, consider that a New Orleans number ports out of LATA to Houston. If a caller in Nashville were to dial the number, it would be recognized as an inter-LATA call and handed off to an IXC. The IXC should query the call, receive an LRN for Houston and deliver the call.

If wireline numbers are ported out of LATA, the same routing problems are incurred as with the wireless numbers. If a number is ported out of LATA, and then remote call forwarded to another location, calls from RBOC customers in the affected LATA will not complete or will be handed off to an IXC. Billing confusion and disputes occur for local calls that are completed through an IXC.

As with wireless numbers ported or pooled out of LATA, calls from locations outside the affected LATA will complete and be forwarded as long as they are originating or N-1 queried. Default routed calls to the RBOC switch will fail.

Moving large volumes of numbers to other LATAs would have the same effects on inter-LATA trunk routes as with wireless numbers. Trunk groups may be overloaded and many calls will receive "all circuits busy" indication.

Failed calls indicate switching errors, and, as described in the previous section, can cause some switch types to remove network elements when thresholds are exceeded.

There was no RBOC porting or pooling out of LATA in the Southeast NPAC Region.

5.3. Administration and Cleanup

After restoration of switches, towers, and facilities, numbers must be moved back to switches in the correct LATA and rate center. It is imperative that good records of the numbers moved outside the LATA be kept to facilitate prompt restoration in the correct LATA.

The NPAC administrator has indicated that all 300 pooled blocks have been restored to the correct LATA.

As of the end of March 2006, there were still about 1000 telephone numbers ported out of LATA in the Southeast NPAC region. All carriers are encouraged to move the numbers back to the correct LATA as soon as possible. Customers whose numbers are not in the correct LATA may not be receiving all of their telephone calls. Calls to these numbers from RBOC subscribers in the affected LATA will fail.

Customers whose numbers were ported or pooled outside of the LATA experienced varying levels of degraded service. When numbers were restored to the correct LATA, full service was returned.

6. Lessons Learned from Porting or Pooling Out of LATA

The carrier representatives involved in generating this report compiled their observations as to "lessons learned." These observations are listed below:

1. Moving numbers to working switches even if out of LATA is a viable method to restore partial service. However, carriers should be aware of the consequences associated with such action and that full service is not restored.
2. Due to regulatory restrictions and switch design to comply with those restrictions, inbound calls from RBOC subscribers will fail or be routed through an inter-exchange carrier.
3. Calls routed through an IXC will generate toll charges for local calls and create confusion and billing disputes.
4. Large volumes of customer trouble tickets were generated due to calls from the RBOC failing to complete.
5. More service provider education and/or industry communication is needed to insure that all participants are aware of the benefits and short comings of actions taken.
6. More customer education is needed to explain the impacts of porting their numbers out of LATA and what level of service restoration they can expect in this situation.
7. The time frame to move subscribers to the out of LATA switches was longer than anticipated due to maximum nightly porting/pooling limitations established by the industry.
8. Carriers have experienced problems when porting/pooling the numbers back, and it took longer than porting/pooling them out. (For example, voicemail platform issues, new trunk install issues, facility testing issues, internal system delays, etc.)
9. Moving large volumes of telephone numbers to another location overloads trunking facilities that were designed for smaller forecasted loads.
10. Accurate record keeping is a must for moving numbers back to the correct locations as service is restored.
11. Moving telephone numbers across LATA boundaries does restore some level of service to many subscribers (especially to wireless subscribers).
12. Relaxing the "out of LATA" edit in the NPAC creates the potential for numbers not associated with restoration to be ported erroneously in other parts of the NPAC region.

Other alternatives should be considered before automatically moving numbers across LATA boundaries. As discussed, many calls will not be delivered due to the design of RBOC switches that cannot carry calls across LATA boundaries. It is also very significant that trunk groups sized for lesser volumes will be overloaded, and many calls that are routed across the LATA boundary will not be delivered due to unavailability of a trunk facility.

7. Potential Alternatives to Porting/Pooling Out of LATA for Service Restoration

In some situations, solutions other than porting/pooling out of LATA may be applicable. Some examples of possible alternatives are the use of Advanced Intelligent Network (AIN) capability, call forwarding, central office code transfer process, or assignment of new telephone numbers. It is important to note that whenever large quantities of numbers are relocated, there will be network implications regardless of the method used. Trunking and switch capacities must be con-

sidered. More information about these alternatives and their impacts can be found in Appendix C.

8. Future Steps and Recommendations

The LNPA Working Group recommends that service providers carefully consider alternatives and consequences before porting or pooling numbers out of the serving LATA as a service restoration method. In general, porting or pooling out of LATA is more advantageous for wireless carriers than for wireline carriers, but even then not all calls will be delivered. Before moving numbers out of LATA, alternatives such as porting to working switches inside the LATA, call forwarding solutions, AIN solutions, or assigning new telephone numbers should be considered. It may be determined that porting out of LATA is still the best solution, but that determination should be made with an understanding that there might be unintended consequences.

Porting or pooling out of LATA allowed service providers to move numbers to working switches on an expedited basis. As a lesson learned from the Katrina experience, continuing evaluation of impacts and alternatives would be advisable before suspension of the NPAC edit in the future. Suspension of the LATA edit in an NPAC region allows numbers to be ported out of LATA erroneously in other parts of the region not affected by the disaster. The edit was developed and implemented to stop this troublesome problem. Some lessons learned comments from providers have indicated that moving the numbers out of LATA was not as easy to do or as much of a cure as they had initially believed it would be.

If porting or pooling numbers out of LATA appears to be advantageous, then it should be done selectively, and records kept for expeditious return to the correct switch. In such cases, the service providers should make best effort attempts to educate consumers as to expectations. Service providers should move the numbers back to appropriate LATA as soon as practical in order to restore full service to the customers.

8.1. Issues for NANC or FCC Consideration

Under the circumstances, the LNPA Working Group believes that the NANC and FCC took appropriate action in relaxing numbering rules and allowing industry bodies and individual carriers to take emergency actions to restore service. This prompt action allowed service providers to respond quickly. Relaxing the rules gave the Pooling Administrator, the North American Numbering Plan Administrator, and the North American Portability Management LLC the freedom needed during the disaster recovery.

The LNPA Working Group recommends that the FCC and the NANC take similar actions in any future disastrous situations. Temporarily relaxing numbering rules will thereby allow service providers to expeditiously make decisions and take action in the best interest of providing service to their customers.

With the number and variety of telecommunications providers currently serving customers in the United States, the LNPA Working Group feels that more education is needed as to the pros and cons of porting numbers across rate center and LATA boundaries. The Working Group requests that NANC share information such as contained in this report with its members, the industry associations participating in NANC activities, conferences, etc. Service providers should be encouraged to follow through with restoration of telephone numbers to the appropriate LATA as soon as practical.

Appendix A: Porting/Pooling Outside the LATA for Disaster Relief "Pros & Cons"

After Hurricane Katrina, number portability and/or number pooling were felt to be effective means of restoring service to customers in the affected areas. Accordingly, the NPAC edit that prevents porting across LATA boundaries was temporarily suspended. Some level of service can be restored in some scenarios, but other problems can be introduced. These problems can be especially pronounced if the numbers are ported across a LATA boundary. Some of the pros and cons that should be considered are enumerated in this document.

Wireless Service Providers

Pros	• Wireless Customer has originating service at new location if ported to a working switch. Assumption is that former switch and HLR is no longer in service.
	• 9-1-1 access will still function properly for the wireless ported subscriber.
	• Customer has partial terminating service at new location.
	  o Calls from the same wireless carriers will complete.
	  o Many calls from other wireless carriers will complete.
	  o Many calls from wireline carriers outside the affected LATA will complete.

Cons	• Cannot receive calls from many wireline subscribers in the affected LATA. • 9-1-1 callbacks from PSAPs may not complete. • Trouble reports from customers complaining about failed calls. • Billing confusion and disputes (locals calls billed as toll calls). • Possible Trunk route overloading in areas where customers are ported to. • Default routed calls from non-affected LATAs won't complete to the customer. If IXC does not query, LATA tandem in affected LATA will query and receive an LRN that it cannot route out on. • Potential adverse wireline switch effects. (Some switch types will automatically take corrective action when call failure thresholds are reached.) • Administrative recordkeeping and required cleanup.

Wireline Service Providers

Pros	• Can possibly use remote call forwarding from "ported-in" switch to route terminating calls to another customer location and working number or voice mail. Preference would be to port the customer to a working switch within the affected LATA.
Cons	• No originating service (no facility to customer location). • Cannot receive calls from many wireline subscribers in the affected LATA. • 9-1-1 access will not work properly. In the unlikely event that a local facility

	was established in the "new" LATA, the 9-1-1 systems would not be set up to route these numbers. Delivery of the caller's location/address and phone number to the PSAP may not be possible. • Trouble reports from customers complaining about failed calls. • Billing errors (locals calls billed as toll calls). • Possible Trunk route overloading. • Default routed calls from non-affected LATAs won't complete. • Potential adverse wireline switch effects. (Some switch types will automatically take corrective action when call failure thresholds are reached.) • Administrative recordkeeping and required cleanup.

Appendix B: Glossary

AIN	Advanced Intelligent Network
FCC	Federal Communications Commission
HLR	Home Location Register
IXC	Inter-exchange Carrier
LATA	Local Access Transport Area
LERG™	Local Exchange Routing Guide – Refers to Telcordia® LERG™ Routing Guide[10]
LNP	Local Number Portability
LNPA	Local Number Portability Administration
LRN	Location Routing Number
NANC	North American Numbering Council
NENA	National Emergency Number Association
NAPM LLC	North American Portability Management Limited Liability Company
NPAC	Number Portability Administration Center
PSAP	Public Safety Answering Point
RBOC	Regional Bell Operating Company

[10] Telcordia is a registered trademark and LERG Routing Guide is a trademark of Telcordia Technologies, Inc.

Appendix C: Potential Alternatives to Porting Out of LATA for Service Restoration

The use of porting and pooling to move numbers to working switches is a viable means of temporary service restoration even if the numbers are moved out of LATA. However, moving them out of LATA does have impacts that the service provider should be aware of when making such a decision.

This section includes some possible alternatives to consider in lieu of porting out of LATA. Each has advantages and disadvantages, and every effort is made to identify the impacts so that informed decisions can be made. In each case, service providers should be aware of impacts to existing trunk routes and switch capacities.

AIN Solutions

Advanced Intelligent Network (AIN) functionality has been deployed by many local exchange and inter-exchange carriers in their networks to provide enhanced services and disaster recovery capability to their respective customers. AIN solutions were deployed by some carriers post-9/11 in order to redirect calls to some affected customers in Manhattan to working locations outside the impacted area. Like Local Number Portability (LNP), AIN utilizes a trigger and query mechanism to very briefly suspend call processing while the switch retrieves routing and/or billing instructions from an external database. Call processing is then resumed based on the instructions received from the AIN database.

AIN can be used to redirect calls to alternate numbers and destinations, including numbers associated with Internet Protocol (IP) Gateways for those customers who have moved their service from the PSTN to an IP network as a result of a disaster, even though the number dialed by the calling party would normally route to a different location. This call redirection to a different location and number is transparent to the calling party during call processing. In addition, depending on the call scenario and how the call is carried, billing to the calling party can be inhibited or modified based on instructions from the external database. One advantage that AIN offers is the ability to pre-design the service logic in the external database and preset the AIN triggers in the appropriate switches for call redirection at multiple levels – from a single telephone number, at the NXX code level, up to an entire NPA. Once the database service logic and switch triggers are set in place, it is then a matter of activating the redirection functionality in a disaster scenario in order to begin redirecting calls as designed. In some instances, customer-specific redirection service options can be managed by the customer via a telephone user interface. On a larger scale, the applicable service provider can activate the necessary redirection functionality.

The least complex call redirection scenario would occur when the original target switch in a disaster area is still functioning, but individual end users served by that switch have been impacted such that they no longer have telephone service at their original locations. In this scenario, AIN triggers only need to be set in one switch – the original target switch. Like call forwarding, AIN

could be used to redirect calls reaching the original destination switch still in service to other numbers and locations served by the same switch, or to other numbers and locations served by other switches within and outside the same rate center and LATA. Billing to the calling party should not be impacted, however, similar to call forwarding, calls redirected to destinations outside the rate center or LATA could be subject to toll billing on the "redirected leg" of the call, and billable to the called party. Local exchange and Inter-exchange carriers implementing such an AIN solution should be aware of the billing implications of their call redirection design and ensure their customers understand the implications. In some call scenarios, billing may possibly be inhibited as part of the service logic design, but as stated previously, this is dependent on the call scenario, the destination of the redirected leg of the call, and the carriers required to route and complete the redirected call.

A more complex call redirection scenario, and more applicable to the Hurricane Katrina-stricken areas, is the case where both the original target switch and the end user locations served by the switch, are no longer in service. In this scenario, an AIN solution could be designed by capable carriers whereby AIN triggers could be set in multiple end office switches, access tandems, and inter-exchange carrier switches serving the impacted LATA. As is the case with the first scenario, calls could be redirected to other numbers and locations served by other switches within and outside the same rate center and LATA. The difference in this scenario, however, is that for calls originating in the impacted LATA, redirection could take place in the originating switch and/or applicable local access tandem, and is not dependent on the original target switch being in service. For calls originating outside the impacted LATA, AIN triggers could be set in access tandems in the impacted LATA to appropriately redirect calls. Again, carriers must be cognizant of the billing implications of any AIN design that triggers at the originating end of the call, both to the calling and called parties.

In addition to any billing implications, as is the case with any solution that results in a large volume of call redirection, when making preparations in advance, carriers must understand as much as possible prior to implementation of a solution the impacts to their respective network, including interoffice facilities (trunks), switch processing, and SS7 network load and capacity.

Call Forwarding Solutions

When the facility to the customer premise is destroyed but the switch is still in service, call forwarding can be used to route calls bound for the telephone number to other locations or to a cell phone number. This might pertain to wireline service or it might pertain to wireless service when a tower serving an area is destroyed.

If the serving switch is down, but there is another working switch in the rate center, then the number could be ported to the working switch and call forwarded from there. Porting to another switch in the rate center has less negative impact than to porting outside the LATA.

Using call forwarding to redirect the incoming call to another location does not restore full service to the customer, but it allows incoming calls to be delivered to a working number at another location that can presumably deal with the calls that would have been destined to the out of ser-

vice number. As with the AIN alternative, incoming calls can also be forwarded to numbers associated with Internet Protocol (IP) Gateways for those customers who have moved their service from the PSTN to an IP network as a result of a disaster. Calls cannot be originated from the forwarded number, but would rather be made from the forwarded to number or another number at that location.

There should be no impact to the calling subscriber billing if the call is forwarded to a switch in the same rate center; however, calls forwarded outside the rate center or LATA may be subject to toll billing on the forwarded portion of the call and billable to the called party.

Carriers should understand that any time large volumes of numbers are relocated or redirected, there will be network implications that must be considered. Trunking and switching capacities must be considered.

Emergency Movement of Codes to Working Switches using the Telcordia® LERG™ Routing Guide[11] Code Transfer Process

In some situations where entire switches are out of service and the restoration effort may be prolonged, entire NXX codes may be moved to working switches using the LERG Routing Guide code transfer process. This solution might be used as part of a permanent restoration process. For example, if a small switch were to be demolished by a disaster, the NXX codes might well be moved into a nearby switch. Trunk group resizing and outside facility restoration would need to be addressed. The LERG Routing Guide code transfer process will account for changing the routing of calls from other switches.

Telcordia® has produced an expedited process as follows:

Emergency Network Changes or Expedited NXX Code Opening Notification:

> The LERG Routing Guide Emergency Notifications (EN) and Urgent Immediate Emergency Notifications (IEN), produced by Telcordia®, provide a means of notifying the Industry of an expedited NXX Code opening or a network change during a national disaster.
>
> The Emergency Notification (EN) product is published every Tuesday and the Urgent Immediate Emergency Notifications (IEN) are sent out on the same day as long as they are received by Telcordia® Routing Administration (TRA) no later than 1:30p.m. Eastern Time.
>
> If an EN or IEN is required, the procedures to be followed are documented in Telcordia® Rating and Routing Information Notices RRIN 09-05 and RRIN 12-02.1.

[11] Telcordia is a registered trademark and LERG Routing Guide is a trademark of Telcordia Technologies, Inc.

Assignment of New Telephone Numbers

Rather than port or pool telephone numbers to another LATA to restore service, new numbers from the other LATA could be assigned. The numbers could be temporary or permanent depending on the strategy of the serving telecommunications provider and/or the wishes of the customer. There are, of course, pros and cons associated with this alternative and again, benefits and drawbacks must be carefully considered.

If a new number from the other LATA is assigned to the customer, then all calls including those from the local RBOC would route properly. Assigning out of LATA numbers would most likely be done by wireless service providers, but when the new number is dialed by an RBOC customer, it would be seen as an out of LATA number, and immediately handed off to an inter-exchange carrier. Assuming no trunk overloading, the call would complete to the subscriber.

A major drawback to this solution is that the customer handset would have to be replaced or re-programmed with the new number. The customer would have full originating and terminating service, but would have to notify others about the new number. If the number is temporary during the term of the restoration effort, the old number would have to be reinstated, and, once again, the customers would have to notify others that service has reverted back to the original number.

While calls would be routed properly by the local RBOC, rating and billing would apply for any call routed through an inter-exchange carrier. Each service provider would have to decide how to address this issue.

There would be no advantage to assigning new numbers from switches within the rate center rather than porting/pooling existing numbers to such a switch. Calls to numbers ported or pooled within the rate center will route normally. And since wireless carriers are not bound by the same rate center restrictions that wireline carriers are, there is no real advantage to assigning numbers from other switches within the LATA rather than porting or pooling the existing numbers to the working wireless switch within the LATA.