NORTH AMERICAN NUMBERING COUNCIL

Wireless Number Portability Operations

Risk Assessment Report:

LAUNCHING WIRELESS POOLING OR PORTING WITHOUT UBIQUITOUS SEPARATION OF THE MIN & MDN

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1. PURPOSE & SCOPE

The purpose of this report is to identify and determine risks associated with non-compliance of the separation of the Mobile Identification Number (MIN), also referred to as MSID (Mobile Station Identification), and Mobile Directory Number (MDN) for all wireless service providers (SPs) in the implementation of Wireless Pooling and Wireless Number Portability. This document discusses the impacts in the event at least one SP is not compliant.

There are primarily two cellular network protocols in use in North America. SPs who use the ANSI-41 protocol are "MIN based" and use the MIN for wireless network provisioning and registration. These SPs will be impacted in the event of non-compliance with the MIN-MDN separation. SPs who use the Global System for Mobile Communications (GSM) protocol are "International Mobile Station Identifier (IMSI) based" and use the IMSI for wireless network provisioning and registration. The potential for these SPs to be impacted is based on business decisions made by individual SPs, roaming, and other interoperability functions. For the purpose of this report, we will not distinguish between IMSI and MIN based SPs. References will be made to "all wireless SPs" throughout this document with the understanding that there is a much greater impact to MIN-based SPs than IMSI-based SPs.

There are various amounts of work to be done by wireless providers[1] depending on where service is provided, i.e. inside or outside the top 100 MSAs (Metropolitan Statistical Areas), as defined in the 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. All wireless SPs will ultimately need to meet the same requirements in order to support porting once they have received a request to open a code for portability. While wireless providers who have licenses outside the top 100 MSAs need only initially support roaming of ported or pooled numbers by November 24, 2002, those who have licenses within the top 100 MSAs must be fully compliant with all aspects of wireless number portability by November 24, 2002. On November 24, 2002, porting and pooling wireless SPs must be able to accommodate the assignment of MDNs and MINs that have different values. It is vitally important that all wireless providers have their network and OSS systems configured, tested, and implemented so that as of November 24, 2002 wireless SPs within the top 100 MSAs can port customers and those outside the top 100 MSAs can support roaming for all ported and pooled numbers with and without different MIN and MDN values. The network and OSS work also ensures:

- the visited network will register roaming subscribers correctly
- the switch will record the roamer call correctly
- the switch will pass correct information about the roamer to other network providers
- the roaming customer will be billed correctly

the serving company will format the out-collect call detail record correctly

The purpose for this report is to describe some of the adverse impacts to customer service if at least one wireless SP has not implemented the necessary network and OSS changes by November 24, 2002 to support assignment of different numbers for the MIN and MDN.

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[1] Refer to the Wireless Number Portability Technical, Operational and Implementation Requirements Phase II, adopted by NANC on September 19, 2000

For the remainder of this report, the term "non-compliant carrier" will refer to any and all wireless SPs who have not implemented the necessary network, OSS support, and process upgrades and modifications to support the separation of the MIN and MDN, required for thousands block pooling and WLNP and specified in IS-756-A and IS-841. In the event that there is at least one non-compliant carrier, consequences will occur. The overall impact of these consequences will depend on the number of non-compliant carriers. This document, however, does not address an assumed number of non-compliant carriers, but attempts to identify and discuss the impacts of non-compliance.

2. REGULATORY BACKGROUND

2.1. Number Portability and Mandatory Support of Nationwide Roaming

On July 2, 1996, the FCC Common Carrier Bureau (CCB) released its First Report and Order in the Number Portability Docket (CC Docket No. 95-116, FCC 96-286). This order required all cellular, broadband Personal Communications Service (PCS), and covered Specialized Mobile Radio (SMR) providers to have the capability of delivering calls from their networks to ported numbers anywhere in the U.S. by December 31, 1998. Wireless SPs refer to this as Phase I of Wireless Number Portability. In addition, Commercial Mobile Radio Service (CMRS) providers were ordered to offer SP Portability, including the ability to support roaming, throughout their networks by June 30, 1999. Wireless SPs refer to this as Phase II of Wireless Number Portability.

In August of 1997, the FCC released a Second Report and Order addressing various long-term number portability implementation issues. Among the actions taken in the Second Report and Order, the NANC was directed to develop standards and procedures regarding the provision of number portability by CMRS providers.

Previous activities of the LNPAWG and associated Task Forces focused primarily on the wireline segment of the industry. The implementation of number portability by wireline SPs was addressed by the LNPAWG in the following documents:

The *Architecture and Administration Plan for Local Number Portability.*
The *LNPA Technical & Operational Requirements Task Force Report, dated April 25, 1997. Refer to* http://www.fcc.gov/ccb/Nanc/lnpastuf.html.

The LNPAWG also addressed wireless and wireline integration issues in four subsequent reports entitled:

Local Number Portability Administration Working Group Report on Wireless Wireline Integration, dated May 8, 1998.

Local Number Portability Administration Working Group 2nd Report on Wireless Wireline Integration, dated February 5, 1999.

Local Number Portability Administration Working Group 3rd Report on Wireless Wireline Integration, dated September 30, 2000.

Wireless Number Portability Subcommittee Report on Wireless Number Portability Technical, Operational, and Implementation Requirements – Phase II , September, 2000

Two extensions were granted for the implementation of Phase II Wireless Number Portability.   The first extension was granted per a Memorandum Opinion and Order released September 1, 1998 (DA 98-1763), by the Wireless Telecommunications Bureau.

This order extended the deadline from June 30, 1999 to March 31, 2000 to provide additional time for the wireless industry to develop standards to ensure efficient deployment of wireless number portability.   In this order, it was reiterated that CMRS providers offer number portability in the top 100 Metropolitan Statistical Areas (MSAs), as well as the ability to support nationwide roaming.   The orders explicitly name the 100 MSAs that are applicable to porting.[2]   The second extension was granted by the CCB in a Memorandum Opinion and Order released February 9, 1999 (FCC 99-19).   The CCB granted a Cellular Telephone Industry Association (CTIA) petition to forbear from imposing wireless SP portability until the completion of the five-year build out period for broadband PCS.   This extended the deadline to November 24, 2002.

2.2.   Number Pooling and Mandatory Support of Nationwide Roaming

On December 29, 2000, the FCC Common Carrier Bureau released its Number Resource Optimization Second Report and Order, Order on Reconsideration (CC Docket No. 96-98 and CC Docket No. 99-200), and Second Further Notice of Proposed Rulemaking (in CC Docket No. 99-200).   This order requires all cellular, broadband Personal Communications Service (PCS), and covered Specialized Mobile Radio (SMR) providers to participate in Number Pooling within the same geographic areas as covered in the order for Number Portability, or as specified by the FCC in future rulings.

Included in this order is the requirement for the selection of a Pool Administrator. One of the tasks of the Pool Administrator is to document a rollout schedule for the orderly implementation of Number Pooling. The start date for the rollout of wireline pooling is to be nine months after selection of the Pool Administrator.   Many states have begun wireline pooling trials prior to the March 2002 start date for the implementation of national pooling.

Also, in this order is the recognition that wireless SPs will not be ready to fully support Number Pooling until November 24, 2002 – coincident with the mandated date for Wireless Number Portability.   Much of the work required for Number Pooling is also required for Number Portability, i.e.

- deployment of the LNP query capability in the MSC;
- wireless network separation of the MIN and MDN in the HLR, MSC, and other wireless network systems;
- billing/message processing separation of MIN and MDN,
- separation of MIN and MDN in other adjuncts
- support of the X2 CIBER record;
- and for SPs within the top 100 MSAs, provisioning with MIN/MDN separation.

Because of this, it is expected that, on November 24, 2002, wireless SPs will participate in Number Pooling in all rate centers where Number Pooling has been implemented up to

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[2] Reference FIRST REPORT AND ORDER AND FURTHER NOTICE OF PROPOSED RULEMAKING, CC Docket 95-116, RM 8535, adopted June 27, 1996, Para 166 .

that time. Also on this date, it is expected that all wireless SPs in the country will be able to support the MIN / MDN separation to preserve nationwide roaming.[3]   Following are excerpts from the mandates that address roaming requirements:

- "We require all cellular, broadband PCS, and covered SMR providers to have the capability of delivering calls from their networks to ported numbers anywhere in the country by December 31, 1998, and to offer SP portability, including the ability to support roaming, throughout their networks by June 30, 1999."[4]
- "We also reiterate our view that a regulatory mandate is necessary to the full implementation of wireless number portability, in order for it to support nationwide roaming. The ability to support nationwide roaming requires that all wireless carriers, even those outside major markets, to configure their networks to support number portability, regardless of whether there is consumer demand for LNP among customers in their home markets. Thus, without the establishment of a regulatory requirement, wireless carriers who successfully develop SP LNP could be unable to offer its full benefits because their customers would not be able to roam on the networks of other wireless carriers that do not support LNP."[5]

3.   TECHNICAL REQUIREMENTS TO SUPPORT POOLING AND PORTING

The following clearly defines roaming:

- Two facility based wireless SPs are always involved when a wireless customer roams.
- The "home carrier" is the SP who has entered subscriber information in their HLR (Home Location Register)
- The "serving carrier" is the SP whose network is currently providing service to the customer.

3.1.   Ubiquitous Separation of the MIN and MDN

The MIN is the identifier that was first used by Advanced Mobile Phone Service (AMPS) cellular systems, and since adopted by most Cellular and PCS standards that contain an "AMPS" compatibility mode (e.g. IS-91 "AMPS", IS-88 "N-AMPS" (Narrowband Advanced Mobile Phone Service), IS-54 and IS-136 "D-AMPS" (Digital Advanced Mobile Phone Service) and IS-95 "CDMA" (Code Division Multiple Access)).

Currently, wireless SP networks using AMPS, CDMA, and TDMA (Time Division Multiple Access) perform handset registration, call processing, provisioning, customer care and billing based upon a single number---the MIN.   Traditionally, the MIN has also been used

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[3] Second Report and 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; adopted 12/7/00

[4] FIRST REPORT AND ORDER AND FURTHER NOTICE OF PROPOSED RULEMAKING, CC Docket 95-116, RM 8535, adopted June 27, 1996, Para 5

[5] Cellular Telecommunications Industry Association's Petition for Forbearance From Commercial Mobile Radio Services Number Portability Obligations and Telephone Number Portability, CC Docket 95-116, Adopted Feb 16, 1999, §. 41 The ability to support nationwide roaming requires that all wireless carriers,

by wireless SPs within the North American Numbering Plan (NANP) serving area as the 10-digit MDN. MDNs are administered by NANPA (North American Numbering Plan Administrator).

After November 24, 2002, in a number pooling environment and where pooling is in effect, wireless SPs will be assigned MDNs in blocks of 1,000 by the pooling administrator. In those areas where pooling has not been ordered, MDNs will be assigned in full codes by NANPA . MINs will be assigned by a new entity known as the MBI (MIN Block Identity) Administrator and will be assigned in a block of 10,000 MINs (i.e., an MBI).[6]

Wireless SPs outside of the top 100 MSAs will continue to request a new NPA-NXX code from NANPA for use as MDNs, and will also be able to receive the corresponding MBI from the MBI Administrator. By obtaining MBIs that match their MDNs, wireless SPs outside of pooling areas will not have to accommodate different values in their provisioning systems for the MIN and MDN.[7] However, upon receiving a Bona Fide request to open a code for porting, wireless SPs outside of the top 100 MSAs will need to accommodate different values for the MIN and MDN in their provisioning systems.

In a pre-LNP environment, existing AMPS, TDMA and CDMA subscribers will still have the same value for both the MIN and MDN. When a subscriber ports, the MDN and MIN become separate and distinct. The ported subscriber's MDN will remain unchanged and port with the subscriber. The MIN that was assigned to the ported subscriber will remain with the donor SP, and the new SP will assign a new MIN to the ported subscriber from its own MIN inventory. The donor network can reuse the relinquished MIN for another subscriber. It is probable that the same 10-digit number may be used for a dialable number, in either the wireless or wireline network, and a MIN in a wireless network at the same time.

In the Porting/Pooling environment, all wireless SPs within the United States will need to support the MIN and MDN separation in order to support nationwide roaming. This will include network hardware and software upgrades as well as some back-office systems upgrades to support:

- proper handset roamer registration,
- roamer billing
- identification of the calling party number (ANI, Automatic Number Identification) for such items as Calling Party Number, E911 call-back number, and long distance billing.

3.2. Network Hardware / Software Upgrades

In a wireless number portability / number pooling environment, certain hardware/software upgrades are necessary by all wireless SPs to support the separation of the MIN and MDN. Specifically, for a serving carrier, the Visitor Location Register (VLR) needs to be updated to accommodate both a MIN and an MDN for each roamer that registers on the system. In addition, the switch software needs to be updated so that the call detail records that are generated by the switch contain the MIN and MDN as well as LRN if appropriate.

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[6] MIN Block Identifier Assignment Guidelines and Procedures, Draft version 1.15, Feb., 1999; Section 3.6
[7] MIN Block Identifier Assignment Guidelines and Procedures, Draft version 1.15, Feb., 1999; Section 8.6, and 9.1.12.

Phase II call completion software is required for any switch on which wireless portable NXX codes will be homed. Phase II call completion switch software supports the delivery of calls to portable NXX codes, handling of incoming calls routed using an LRN, and cause value code 26 (misrouted call to a ported number).

When a call is routed to a switch, the Phase II call completion software will do the following:

- determine if the call was routed based on an LRN
- recognize that the LRN is its own LRN
- determine it is not a working number within that switch and if it is not a pooled number then return Cause Code 26
- retrieve the dialed number from the Generic Address Parameter (GAP)
- use the dialed number to terminate the call

3.3.   IS-41 Rev C Compliance

Revision C of the IS-41 standards provides for passing both MIN (Mobile Identification Number) and the MDN (Mobile Directory Number) in the IS-41 messaging to accommodate the split of the MIN and MDN fields for wireless number portability. While it is certainly true that roaming customers can register on a visited system which uses a version of IS-41 prior to Rev C, and that calls can be delivered to and originated by these roamers, the impacts and implications of roaming on a system that has not been upgraded to IS-41 Rev C go beyond call delivery and call origination. Various issues and impacts resulting from not upgrading to IS-41 Rev C are discussed in the balance of this report.

The following two points summarize the split of the MDN and MIN (a.k.a. MSID):

- With the introduction of number portability, all IS-41 transactions, which are based on mobile station identification, should use the MSID where MIN was used prior to number portability.
- With the introduction of number portability, all IS-41 transactions, which are based on subscriber identification (as opposed to mobile station identification), should use the MDN where MIN was used prior to number portability.

The impact of these two points is potentially on every IS-41 message. Below are diagrammed registration transactions on a non-compliant Home system and Visited System. These two examples illustrate how the IS-41 signaling is incomplete if a subscriber registers on a non-compliant system. These diagrams will be referenced later in this report.

3.3.1 Registration #1: Home System Non-compliant with IS-41 Rev C or Later
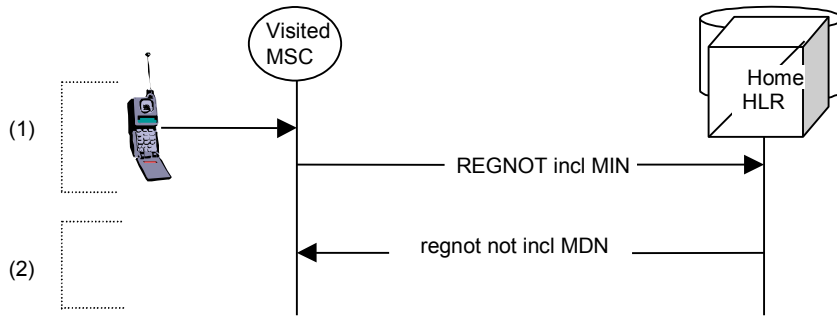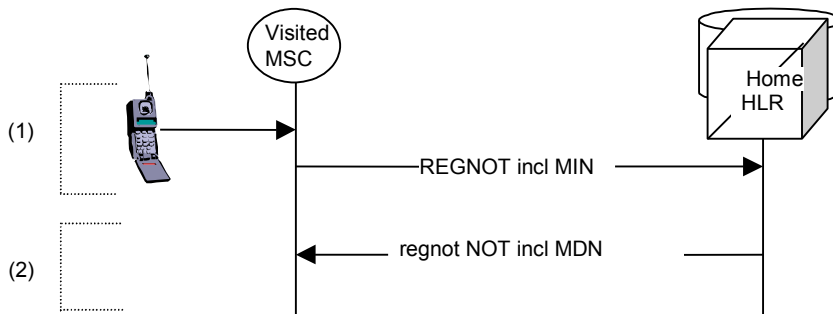

Step 1: Mobile handset registers with the visited MSC: the visited MSC (IS-41 Rev C compliant) sends a Registration Notification message to the home HLR using the MIN parameter.

Step 2: The home HLR returns a Registration Notification Return Result message without an MDN parameter due to IS-41 Rev C non-compliance.

If SPs are not at least IS-41 Rev C compliant, they will not format a return result with an MDN parameter.

The MDN will not be returned to the visited system.

3.3.2 Registration #2: Visited MSC/VLR Non-Compliant with IS-41 Rev C or later:

Step 1: Mobile handset registers with the visited MSC; visited MSC sends pre-IS-41 Rev C Registration Notification to the home HLR with the MIN parameter.

Step 2: Since the visited network is not IS-41 Rev C compliant, the home HLR returns a Registration Notification Return Result message without the MDN parameter.

Step 3: Since the visited network is not compliant with IS-41Rev C or later, the MDN was not returned because it was never requested.

In both cases above (3.3.1 and 3.3.2), the lack of compliance with IS-41 Rev C will cause the MIN to be used as the MDN in providing a call-back number, caller-id number, and ANI. This may cause potential incorrect billing of roamer usage by the home SP, incorrect/invalid call-back number for 911/Emergency Services, or incorrect billing by an IXC, if used.

3.4. Roaming Message Exchange

Problems will occur if not all wireless SPs in the country support the de-coupling of the MIN and MDN. This section addresses the formatting of billing records for roamer usage by the serving carrier. When wireless customers roam, they are said to be "served by a visited system". In other words, they are not on their "home system". In order for the owner of the visited system to send roaming charges back to the owner of the home system, an industry standard call detail record has been defined. This record is called a CIBER record. CIBER is an acronym that stands for Cellular Intercarrier Billing Exchange Roamer. The CIBER record is a standard data structure with various fields, or data elements, some of which are required to be populated while others are optional. In order to support Number Portability (and coincidentally, Number Pooling), CIBER records have been modified to add the MDN and the LRN elements. In the past, all CIBER call detail records were two-digit numbers ending in zero. The record number for those CIBER records, which have been modified to support porting and pooling, are two-digit numbers ending in two and are referred to as the "X2" records.

If a serving carrier has completed all the upgrades identified in 3.1 through 3.3 above, they will be able to provide call delivery, call origination, and correct identification of the originating party for all roamers. However, if the serving carrier has not upgraded their back-office systems to pass the appropriate information to the home carrier, there may still be problems. If the serving carrier is still using the CIBER 2.0 record, there is no provision for MDN or LRN. In this case, the serving carrier may be able to correctly format a CIBER 2.0 record, but the billing carrier may not be able to bill the correct customer or correctly apply an appropriate discount without the MDN and LRN information.

Currently, application of some discounts that are very prevalent in the industry are dependant upon the ability to determine the company providing service to the originating number, the terminating number, or both. Prior to pooling and porting, SPs could base the determination of the type of service and company providing service on the NPA-NXX of the originating and terminating numbers of a call. In an LNP environment, the originating number and/or terminating number cannot be used since they may have been ported or assigned from a non-native block of numbers obtained from the pool administrator. In order to properly apply some discounts, a SP would need to be able to determine the carriers that provide service to the originating and terminating directory numbers (MDNs or wireline dialable numbers). In a porting and pooling environment, this is only possible by knowing the Location Routing Number (LRN) associated with the terminating number or the Jurisdiction Information Parameter (JIP) associated with the originating switch. There is no provision to pass these values in the CIBER 2.0 records[8]. Likewise, there is no provision to pass the MDN in the CIBER 2.0 records. On the other hand, if the serving carrier is able to format an X2 record, but has not made any of the upgrades discussed in 3.1 through 3.3 above, they would either populate the MDN field with zeroes or populate it with the same value that is used for the MIN. In addition, they may or may not be able to provide an LRN for those cases where the terminating number

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[8] It should be noted that currently there is no provision to pass the JIP in the CIBER X2 record.

is ported or pooled. These situations would cause the billing carrier to create inaccurate customer bills.

While the implementation of wireless number portability in a roaming environment requires the use of the X2 record, no editing requirements exist to ensure that valid MDNs are being populated. This may pose risks to the accurate billing of roaming calls.

3.4.1 Impact to Home Customers if Roamer Billing is Incorrect Due to Non-compliant LNP/CIBER X2 Roamer Partner

Because the support of roaming is mandated where roaming is allowed, it is necessary that all wireless carriers comply with the CIBER X2 records created to accommodate wireless local number portability. This record enables service provides to capture both the MIN and MDN when supplying roaming records to a clearinghouse.

If some carriers do not comply with the CIBER X2 record and continue to use the prior record format, then they will be unable to supply both the MIN and MDN associated with roaming records and roaming customers with ported/pooled numbers, roaming on networks owned by these companies, are likely to be billed incorrectly. If the serving carrier populates the MIN in the 2.0 record, then only the MIN will be provided back to the home carrier. If the home carrier guides usage based upon the MDN, then they will either be unable to bill for the record, or they will interpret the MIN to be an MDN and guide the usage to the wrong number. If the MDN is a ported or pooled number this will result in billing the wrong customer. If home carriers base guiding of usage on the MIN, and the serving carrier delivers the MIN in the 2.0 record, then billing should not be adversely impacted. However, as noted below, the MIN is not always available on the switch call detail record.

If a wireless serving carrier continues to utilize the CIBER 2.0 record and incorrectly populates the MDN instead of the MIN, then the wrong carrier could receive the CIBER record. If the MIN and MDN are different the wrong carrier would be billed for roaming traffic and a customer could be billed for usage they did not generate as the bill was sent to the carrier of the MDN not the MIN. If the customer's MIN and MDN are the same, then the correct carrier should receive the CIBER records and the billing of the usage should not be adversely impacted.

There are instances when a switch's call detail record will not contain an MIN for a call origination. This can occur when a mobile originated call tandems through a second switch prior to termination or routing to the PSTN. Some wireless implementations of services such as Enhanced Directory Assistance are configured to route a 411 call to the DA provider and from the DA provider directly to the LEC for completion. The wireless company then receives call detail records from the LEC so they can bill toll charges. These call detail records will only have the MDN of the originating mobile – not the MIN. Some wireless networks are configured to tandem specific types of calls through specific switches for completion. In these cases, the call detail records that record at the tandem switch will not contain the MIN of the originating mobile phone. They will contain only the MDN. Currently, call detail records of this type are out-collected based on the originating mobile number, which is coincidently the same as the MIN. In the future, SPs that have configurations such as these will need to make provision to retain copies of the call detail record from the originating switch to match with the record from the "tandem" or LEC switch in order to obtain the MIN for out-collect purposes. If the MDN is still used, the wrong company will receive the out-collect charges and possibly bill the wrong end user.

Moreover, although the CIBER X2 record requires the MDN field to be populated, the use of the X2 record is not required. Further, even if the X2 record is utilized, CIBER allows for invalid MDNs to be populated (e.g., all zeros). Additionally, there is no provision for the JIP (Jurisdiction Information Parameter) in the CIBER X2 record. Where the LRN can be used to determine the SP who owns the terminating switch, the JIP can be used to identify the SP that owns the originating switch.

3.4.2 CIBER Billing Fraud

The importance for CIBER X2 compliance can be underscored by the possibility of serving networks allowing free un-billable calls by inbound roamers, serving networks billing the wrong home carrier, and/or home carriers billing the wrong subscriber.

The wireless industry is concerned and engaged in battling usage fraud, which is widespread in the telecommunications industry. Certainly, if a customer discovers that he is not being billed for certain usage, the word will spread rapidly. In those cases where a customer has a MIN and MDN that have different values, and the customer is roaming, if the serving network and back-office systems have not been updated, it is very likely that there will be some usage that will not be billed. The potential billing problems that have been identified in previous sections of this report will be exploited by customers until they are corrected. It is the responsibility of each SP to monitor their systems to ensure that all usage is being billed correctly.

3.5.   Care

Typically, in today's environment, when a roamer calls Customer Care of the serving carrier, the MIN of the roamer handset is displayed on the console of the Customer Care screen. The MIN is used not only to identify the home system / SP of the roamer, but to also provide the customer's call-back number in the event that the call is inadvertently dropped or the question/problem cannot be resolved immediately. In order to have the same functionality with the separation of the MIN and MDN, two numbers will need to be displayed on the console – the MIN to determine the customer's home system / SP and the MDN to provide a call-back number. In the event the visited system is not compliant with the separation of the MIN and MDN, only the MIN will be available. Customer Care will not be able to initiate a call to the roaming customer. If Customer Care attempts to call the customer back using the MIN, as they can in today's matching MIN/MDN environment, and the customer has different MIN and MDN values, then Customer Service would terminate to the wrong customer.

3.5.1 Customer & Customer Care Representative Training Issue with Separation of MIN and MDN

With the rollout of pooling and wireless number portability, there exists the potential for confusion on the part of the customer and the customer care representative with respect to the MIN and the MDN. Generally, the customer will have little to no knowledge of their MIN, while they will be familiar with their dial-able telephone number, or their MDN. Depending on the capabilities of the handset vendors and handset models, the handset will either display both the MIN and MDN or just the MIN. A handset display of only the MIN presents challenges for both the customer and the customer care representatives when troubleshooting call processing problems.

3.5.2 Troubleshooting Problems for Roaming Customers

If a customer with a ported or pooled number roams into a serving market that does not support the separation of the MIN and MDN, call processing troubleshooting efforts by the serving carrier will be impacted. The serving carrier's customer care representatives can only look up the MIN in the VLR for troubleshooting, while, the customer will only know their MDN.   If the care representative mistakenly looks up the MDN in the VLR, they will either see the records for another customer's MIN, or no data at all. Without knowing the customer's MIN, the non-compliant serving carrier cannot provide support for troubleshooting.

Serving carriers who do not support the separation of MIN and MDN have potential problems with Home Customer Care routing. When a wireless customer dials 611, *611, or #611 while roaming on a system that provides Home Customer Care, the call is routed to the Home Customer Care vendor. That vendor then re-routes the call, based on the ANI, to the appropriate terminating number for the customer's home Customer Care or Roaming Operations center as determined by the home SP. The Home Customer Care provider relies on the SP's technical data sheets for a listing of the NPA-NXXs assigned to each SP. With the split of the MIN and MDN, and the very real possibility of non-compliant SPs, the MIN may be sent as the ANI for a call to 611. In that case, the roamer's call would be mis-routed to the wrong Customer Care center.

3.6.   Carrier Issues

WNP impacts of the separation of the MIN and MDN on wireline carrier's networks can be divided into these categories:

- Call Processing &Feature Interoperability
- Recording & Fraud.

With WNP and Thousands-Block Pooling, mobile subscribers will have their MIN assigned separately from their MDN. During call set-up, the MIN is the "non-directory" number that is passed over the air interface and used to query the HLR or VLR. The MDN will be obtained from the HLR/VLR's registration query response and will be used for call processing in the PSTN. Non-WNP compliant MSCs will not recognize the MDN parameter in the HLR/VLR's registration query response and will use the "non-directory" number, the MIN, for all call processing where the MDN should have been used.

This will result in "non-directory" numbers being signaled in either the Calling Party Number (CgPN) and/or Charge Number parameters of the ISUP IAM call setup message. Impacts to call processing and billing are listed below.

3.6.1 Impacts on Call Processing and Feature Interoperability

Call processing in wireline networks uses Calling Party Number Parameter and/or Charge Number parameter for many ANI/Calling Party based services. The following are examples of when the services will not function correctly if the MIN is used in place of the MDN:

- CgPN based routing (e.g., 8YY service): There are 8YY calls whose destination routing is dependent on CgPN. This type of routing is broken if a MIN is received in the CgPN.
- Marketing statistics (e.g., 8YY services): The calling party information is captured for marketing statistics and establishing customer databases.
- Call Screening: There are originating line screening and fraud control procedures based on the calling party number.
- Caller ID and Calling Name Delivery: Caller ID and Name presentation would be incorrect.
- Return Call: For return call, the call would be routed based on the MIN and not the MDN yielding unknown results.
- LIDB services: Ensuring alternate billing verification for operator service calls.

3.6.2 Impacts on Billing Data Recording and Fraud

If the wireline carrier assumes the switch call detail record has recorded the MDN, and instead it is the MIN, then the wireline call record cannot reliably identify the caller. Losses from unbillable calls would likely increase exponentially as end users discover these calls could not be billed.

3.7.   E911

The impacts to E911 are related to the registration process on a home or visited system when the SP is non-compliant with IS-41 Rev C or later. Currently, the serving MSC for a roaming customer, assumes the MIN value sent by the mobile station on registration is the same as the MDN. While the MIN is a 10-digit number, which may have the same format as a telephone number, it is not the same as the telephone number (MDN) for a ported subscriber. Consequently, if the MIN is delivered to the PSAP for a ported subscriber, that value cannot be used to call back the subscriber.

In Sections 3.3.1 and 3.3.2, roamer registration on a visited system was discussed. The main impact of either the home or visited system not being at least IS-41 Rev C compliant is that the MDN of the roaming customer would not be available to the visited system/network. In the case of a call to 911, there would either be no call-back number sent to the PSAP, or the MIN would be erroneously sent as the call-back number. In either case, there would be no way to re-establish contact with the customer who made the call to 911. In the second case where the MIN, instead of the MDN, is sent to the PSAP as the call-back number, the wrong person will be reached if there is a working telephone number with the same value as the MIN.

4. SUMMARY

4.1. Risk to SPs

Lack of ubiquitous compliance with the separation of the MIN and MDN poses risks to SPs such as degraded services being provided to their customers, increase in fraud attempts, incorrectly billed calls, decreases in revenues, and increased customer care and troubleshooting costs.

Degraded Service to Customers:

Features and functionalities that are currently provided to customers may suffer; thereby hurting the reputation of the SP's brand and causing increased port-outs or discontinued service. Although the service degradation might occur while roaming outside of the SP's network, customers may likely associate any difficulties they experience with their home SP. Further, degraded service may pose safety risks to the customer in the case of E911 issues. Some of the call processing features based on calling party number may not function properly. While these issues may financially impact the SPs in the form of legal action taken against them, the detriment to the community and customers may be manifested in serious safety and health consequences.

Increase in Fraud Attempts:

As stated in sections 3.4.2 and 3.6.2, the implementation of pooling and porting without the ubiquitous separation of the MIN and MDN will lead to increased opportunities for fraud. Until they are corrected, potential billing problems that have been identified in this report will be exploited by some customers.

Incorrectly Billed Calls:

Without the correct MIN and MDN information, usage could be guided to the wrong customer as reported in section 3.4.

Decreases in Revenue:

- Roaming Revenues - Through a statistical analysis of clearing house data it was determined that about 47% of roaming traffic occurs outside of the initial top 100 MSAs, as listed in FCC 96-286 and FCC 01-362. This means that there is a potential risk of loss of roaming revenues of up to 47%, depending upon the number of non-compliant service providers.
- Long distance revenue is also at risk if the MDN is not recorded properly, preventing the inter-exchange carrier from correctly identifying the billable party. This could lead to billing the incorrect party or result in the inability to bill for those calls.
- Inability to bill for features and services as discussed in Section 3.

Customer Care & Troubleshooting Costs:

- A handset display of only the MIN presents challenges for both the customer and the customer care representatives when troubleshooting call processing problems. The problems, as discussed in Section 3.5, will lead to increased calls to customer care and increased call hold times.
- With MIN and MDN separation there are now two 10-digit numbers involved in trouble resolution. Isolation of problems, from the network to the invoice, become more complex as evidenced throughout this document. These issues traverse multiple organizations within a corporation, and they require many resources for resolution.

4.2. Recommended Courses of Action

- All wireless SPs must upgrade their systems to be compliant with IS-756-A and support IS-41 Rev C or greater, to accommodate the separation of the MIN and MDN. This includes SPs both inside and outside of the top 100 MSAs/CMSAs.

- All wireless SPs must guide usage to customer accounts based on the MIN/MDN combination to ensure usage is allocated to the correct account.

- All wireless SPs must implement the CIBER X2 records both inside and outside the Top 100 MSAs.

- All wireless SPs should upgrade their Customer Care screens to support the separation of the MIN and MDN. This includes SPs both inside and outside of the top 100 MSAs/CMSAs.

- All wireless SPs must ensure that the true MDN is passed to IXCs in the signaling record.

APPENDIX A – OTHER INFORMATION ABOUT WNP & POOLING - DOCUMENTS & WEBSITES

Other WNP & Pooling Documents:

1) NANC WNPSC Report on Wireless Number Portability Technical, Operational & Implementation Requirements Phase II
2) CTIA Report on Wireless Number Portability
3) FCC Ruling (Docket 95-116) – Order
4) FCC 1st Reconsideration Memorandum
5) FCC 2nd Order & Report
6) FCC 3rd Order & Report
7) FCC Stay & Forbearance – Delay
8) CTIA Numbering Advisory Working Group Report on Wireless Inter-carrier Communications
9) Wireless Number Portability Timeline Phase 2
10) Wireless Reseller Process Flows
11) INC LRN Assignment Guidelines
12) NANC LNPA-WG 1st, 2nd, & 3rd Reports on Wireless Wireline Integration
13) INC Report on Number Portability
14) INC Pooling Guidelines
15) TRQ No. 01 April 1999 Number Portability Operator Services Switching Systems
16) TRQ No. 02 April 1999 Number Portability Switching Systems
17) TRQ No. 03 April 1999 Number Portability Database and Global Title Translations
18) TRQ No. 04 July 1999 Thousand Block Number Pooling using Number Portability
19) Thousand Block NXX-X Pooling Administration Guidelines (INC 99-0127-023)
20) MBI Administration Guidelines
21) TIA/EIA-41-D Enhancements for Wireless Number Portability

Useful Websites:

1) www.npac.com (NPAC Home Page)
2) www.global.ihs.com (Global Engineering Documents
3) www.t1.org/t1p1/_P1-GRID.HTM
4) www.atis.org/atis/clc/inc/incdocs.htm (INC Documents)
5) www.fcc.gov/ccb/Nanc/
6) www.fcc.gov/ccb/Nanc/nanchot.html (NANC Hot Topics)
7) www.fcc.gov/ccb/Nanc/nancordr.html (NANC Related Orders)
8) www.fcc.gov/ccb/Nanc (NANC Home Page)
9) www.ported.com
10) www.nist.gov/ext_links/industry/industy.html
11) www.industry.net/c/orgindex/tia
12) www.nanpa.com
13) www.webproforum.com
14) www.numberpool.org/
15) www.wirelessvendors.com
16) www.wirelessadviser.com
17) www.atis.org/pub/clc/inc/lnpa/99012723.doc