CTIA
Building The Wireless Future
Cellular Telecommunications Industry Association

July 20, 1998

EX PARTE OR LATE FILED

Ms. Magalie Salas
Secretary
Federal Communications Commission
1919 M Street, N.W., 2nd Floor
Washington, D.C. 20554

ORIGINAL

Re: Ex Parte Presentation
CC Docket No. 95-116

Dear Ms. Salas:

On Friday, July 17, 1998, the Cellular Telecommunications Industry Association ("CTIA") represented by Michael Altschul, Vice President, General Counsel; Lori Messing, Manager for Technology Resources; and Lolita D. Smith, Staff Counsel, met with Steve Weingarten, Chief, Commercial Wireless Division, Janice Jamieson and Clint Odum, Attorney Advisors, Commercial Wireless Division, and Jeanine Poltronieri, Associate Bureau Chief, regarding the above-referenced proceedings. The parties discussed CTIA's position on the matter and the need for the Commission to act without further delay, in conjunction with CTIA's legal filings in the docket. CTIA also provided the attached document at the meeting.

Pursuant to Section 1.1206 of the Commission's Rules, an original and one copy of this letter are being filed with your office. If you have any questions concerning this submission, please contact the undersigned.

Sincerely,

Lolita D. Smith

No. of Copies rec'd 0+1
List ABCDE

CTIA-Building the Wireless Future

CTIA
Report on
Wireless Number Portability

Version 2.0

July 7, 1998

Created by the Number Portability Sub-task Group

on behalf of the

Cellular Telecommunications Industry Association

Numbering Advisory Group

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REVISION HISTORY

Version	*Date*	*Remarks*
1.0	April 14, 1997	Initial Publication
2.0	June 8, 1998	Update Publication per industry progression.

1. INTRODUCTION

1.1 Purpose and Scope

The purpose of this document is to characterize the network architecture and operational procedures necessary for the support of Number Portability (NP) in the wireless industry per Federal Communications Commission (FCC) order *Number Portability Report and Order, CC Docket 95-116.* This document represents consensus agreements among members of the Cellular Telecommunications Industry Association (CTIA). This document is applicable to analog Advanced Mobile Phone System (AMPS), Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA), and Global System for Mobile Communications (GSM) providers (including digital Specialized Mobile Radio (SMR) providers), alike. Differences among Wireless Service Providers (WSP) technologies and implementation aspects are noted where appropriate. Proprietary implementations are outside the scope of this document.

This document focuses only on Wireless Number Portability (WNP), where WNP encompasses numbers (wireline or wireless) porting to a WSP, numbers porting out of a WSP, as well as routing calls to ported numbers (wireline or wireless). WSPs have some fundamental differences with regard to service and network operations as compared to wireline service providers; therefore, certain aspects of NP concepts and definitions have different relevance to WSPs. This document will explain how the wireless solution will account for such differences.

The primary audience for this document is WSPs and wireless equipment and service vendors who assist in the definition, development and deployment of WNP. This document may also benefit other groups such as the wireline industry. It assumes the reader is familiar with the wireless telecommunications technologies.

This document is not intended to supercede any regulatory decisions regarding Number Portability but is intended to describe portability as it involves WSPs.

Revision 2.0 of this document supercedes all previous versions and incorporates the industry progress over the year since the original architecture baseline. It includes enhanced details in switch processing, enhanced details on provisioning and porting processes, further delineation of the MSID/MDN Separation, a definitive Short Message Service recommendation, as well as roaming and billing impacts.

The remaining sections of the introduction present necessary background information to establish a foundation for the WNP architecture, including the following:

- WNP goals,
- NP history,
- NP definitions and interpretations for WNP, and
- WNP assumptions as applicable to this document.

1.2 Solution Goals

The WNP solution as documented here has been developed in accordance with the following significant goals in order to uphold wireless call processing and mobility management:

- Minimize impact on existing networks.
- Continue to allow for roaming and roaming agreements with more than one service provider in any serving area per negotiated business arrangements.
- Do not inhibit the future growth of wireless technology.
- Support the long-term efficient use of numbering resources.
- Support wireless existing and changing service areas without inhibiting competition.

1.3 Definitions

Readers should use the following definitions when reading this document:

- *Default Routing* –

  (a) Routing on the first six digits of the called Directory Number (DN) without first performing the number portability query (also referred to as *normal routing).*

  (b) Querying and routing from the donor network to the recipient network when the call has been routed to the donor network without first having been queried.

- *Directory Number (DN)* – any E.164 dialable number assigned to a wireline or a wireless subscriber. A DN can be a 10-digit number in the context of the Number American Numbering Plan (without a country code) or up to 15 digits for an international number (country code included).
- *Donor Network* – the network from which a subscriber ports. If the subscriber has ported more than once, the first network to release the subscriber is referred to as the original donor network. The original donor network is also the original assignee (i.e., NPA-NXX code holder) of the number.
- *Home Serving Area* – the geographic area of coverage provided by a WSP where subscribers may originate and terminate calls without incurring roaming charges.
- *International Mobile Station Identifier (IMSI)* – a 15-digit non-dialable number associated with a specific service provider and unique to each mobile station. It is programmed into the mobile station and used to identify the mobile, its home network, and its country. [1],[2]

[1] *International Mobile Station Identity (IMSI) Assignment Guidelines and Procedures*, Prepared by a Wireless Industry Forum, Sponsored by CTIA and PCIA, Version 1, February 12, 1996.

[2] Recent international standards activities have altered the scope of this parameter resulting in a pending change to the acronym to *International Mobile Subscriber Identifier.*

- *Local Service Management System (LSMS)* – an SMS responsible for distributing the NP data updates from the NPAC-SMS to the service provider's NP Database (NP DB), typically owned and maintained by the service provider.
- *Location Portability* – defined by the FCC as "the ability of users of telecommunications services to retain existing telecommunications numbers without impairment of quality, reliability, or convenience when moving from one physical location to another." [3]

  Location portability should be distinguished from the inherent mobility of wireless communication. Location portability in a wireless environment refers to a subscriber's ability to retain his/her directory number when moving from the serving area of one home system to another or changing the wireline rate center associated with the mobile directory number. (Refer to Section 1.6 for more details.)
- *Mobile Station (MS)* – "the interface equipment used to terminate the radio path at the user side. It provides the capabilities to access network services by the user." [4]
- *Mobile Directory Number (MDN)* – a 10-digit North American Numbering Plan (NANP) directory number assigned to a wireless service subscriber. MDNs are a subset of DNs. With the separation of MSID and MDN, MDNs can be international numbers up to 15 digits in length, whereas in the past the MDN could be international number in which the numbering plans including country code were 10 digits or less.
- *Mobile Identification Number (MIN)* – a 10-digit non-dialable number associated with a specific service provider and unique to each mobile station (as an MSID). It is programmed into the mobile station. As it is 10-digits in length and originally used as a NANP-formatted number (e.g., NPA-NXX-XXXX), this number, as an MSID, may be equivalent to the value of a dialable MDN.
- *Mobile Station Identifier (MSID)* – either a 15-digit E.212 formatted International Mobile Station Identification (IMSI) or 10-digit Mobile Identification Number (MIN).
- *Mobile Station ISDN (MSISDN)* – the GSM term for mobile directory number. An MSISDN is an E.164 number. In North America, it is an 11-digit number (country code "1" followed by the 10-digit NANP number). In the case of an international subscriber roaming, it can be up to 15-digits.
- *Mobility* – the ability of a mobile station (and thus subscriber) to move temporarily from one location to another and still obtain telecommunication services (i.e., roaming), and to be in motion while continually accessing telecommunication services (i.e., hand-off).
- *Number Portability Administration Center Service Management System (NPAC-SMS)* – a Service Management System (SMS) responsible for receiving, storing and broadcasting to service providers NP data updates for ported DNs within a region. The NPAC-SMS(s) is owned and maintained by a neutral, third-party.

[3] Number Portability *First Order and Report and Further Notice on Proposed Rulemaking*, paragraph 174.

[4] IS-41.1 Revision C

- *Recipient Network* – the network to which a subscriber ports.
- *Service Portability* – defined by the FCC as "the ability of users of telecommunications services to retain existing telecommunications numbers without impairment of quality, reliability, or convenience when switching from one telecommunications service to another service provided by the same telecommunications service provider." [5]
- *Service Provider Portability* – defined by the FCC as "the ability of end users to retain the same telephone numbers as they change from one service provider to another." [6]

1.4 Background

1.4.1 The FCC Order

The FCC Number Portability *First Order and Report and Further Notice on Proposed Rulemaking, CC Docket 95-116,* dated July 2, 1996, mandates that all Commercial Mobile Radio Service (CMRS) providers provide the capability to deliver calls from their network to ported numbers anywhere in the United States by December 31, 1998. Furthermore, the order mandates that these providers offer service provider portability, including support for roaming, by June 30, 1999.[7]

The following are some key excerpts from the original FCC report and order:

- "We require all cellular, broadband PCS, and covered SMR carriers to have the capability of querying appropriate number portability database systems in order to deliver calls from their networks to ported numbers anywhere in the country by December 31, 1998."[8]
- "We require all cellular, broadband PCS, and covered SMR carriers to offer service provider portability through out their networks, including the ability to support roaming, by June 30, 1999. ... We believe a nationwide implementation date for number portability for cellular, broadband PCS, and covered SMR providers is necessary to ensure that validation necessary for roaming can be maintained."[9]
- Interim number portability measures are not required for WSPs.[10]
- Service and Location portability are not required at this time.[11] In addition, changes between wireline service providers and broadband CMRS providers or among broadband

[5] Number Portability *First Order and Report and Further Notice on Proposed Rulemaking*, CC Docket 95-116, July 2, 1996, paragraph 172.

[6] Ibid. paragraph 172.

[7] Ibid., paragraph 172.

[8] Ibid., paragraph 165.

[9] Ibid., paragraph 166.

[10] Ibid., paragraph 169.

[11] Ibid., paragraph 181.

CMRS providers are considered changing service providers and not service. Thus, service provider portability includes wireless to wireless, wireline to wireless as well as wireless to wireline.[12] As mentioned in the introduction, this document focuses on those scenarios in which a subscriber ports to a wireless provider.

- Customers may need to purchase new equipment (e.g. mobile station) when switching among CMRS providers.[13]
- The issue of regional number portability databases and their content and administration is assigned to the North American Numbering Council (NANC).[14]

The FCC has recognized the Location Routing Number (LRN) method of routing as preferred by much of the industry. The FCC, in its original order, established a list of nine performance criteria which must be met by any number portability method:

(1) "support existing network services, features, and capabilities;

(2) efficiently use numbering resources;

(3) not require end users to change their telecommunications numbers;

(4) not require telecommunications carriers to rely on databases, other network facilities, or services provided by other telecommunications carriers in order to route calls to the proper termination point;

(5) not result in unreasonable degradation in service quality or network reliability when implemented;

(6) not result in any degradation of service quality or network reliability when customers switch carriers;

(7) not result in a carrier having a proprietary interest;

(8) be able to accommodate location and service portability in the future; and

(9) have no significant adverse impact outside the areas when number portability is deployed."[15]

On March 6, 1997, the FCC issued its *First Memorandum Opinion and Order on Reconsideration*, CC Docket No. 95-116 to further clarify and rule on several outstanding inquiries regarding NP. The following points are notable:

[12] Ibid., paragraph 172.

[13] Ibid., paragraph 157.

[14] Ibid., paragraphs 91-102.

[15] Ibid., paragraphs 48-59.

- "...we find criterion four... is, from a practical perspective, unworkable. ... Thus, criterion four does not appear to be necessary in order to implement the statutory definition of number portability." [16]
- "We clarify that by June 30, 1999, CMRS providers must (1) offer service provider portability in the 100 largest MSAs, and (2) be able to support nationwide roaming. Although we have not provided a specific phased development schedule for CMRS providers as we have for wireline carriers, we expect that CMRS providers will phase in implementation in selected switches over a number of months prior to the June 30, 1999, deadline for deployment." [17]
- "...CMRS carriers need only deploy local number portability by this deadline in the 100 largest MSAs in which they have received a specific request at least nine months before the deadline (i.e., a request has been received by September 30, 1998)." [18]
- "CMRS providers must provide number portability in those smaller areas within six months after receiving a request or within six months after June 30, 1999, whichever is later." [19]

On August 18, 1997, the FCC issued its *Second Order and Report*, CC Docket No. 95-116. The following paragraphs have particular interest to the wireless community:

- "We adopt the NANC's recommendation that the N-1 carrier be responsible for ensuring that databases are queried, as necessary, to effectuate number portability." [20]
- "The efficient provisioning of number portability requires that all carriers know who bears responsibility for performing queries." [21]
- "If the N-1 carrier fails to perform the query, the call is routed, by default, to the LEC that originally serviced the telephone number... In light of these network reliability concerns, we will allow LECs to block default routed calls, but only in specific circumstances when failure to do so is likely to impair network reliability." [22]
- "Although CMRS providers are not responsible for querying calls until December 31, 1998, we urge them to make arrangements with LECs as soon as possible to ensure that their calls are not blocked. We note that if a LEC performs database queries on default routed calls, the LEC may charge the N-1 carrier, pursuant to guidelines the Commission will establish regarding long-term number portability cost allocation and recovery." [23]

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[16] FCC *First Memorandum Opinion and Order on Reconsideration*, CC Docket 95-116, March 6, 1997, paragraph 19.

[17] Ibid., paragraph 136.

[18] Ibid., paragraph 137.

[19] Ibid., paragraph 137.

[20] FCC *Second Order and Report*, CC Docket 95-116, August 18, 1997, paragraph 73.

[21] Ibid., paragraph 74.

[22] Ibid., paragraph 76.

[23] Ibid., paragraph 78.

- "... when a ported telephone number is disconnected, that telephone number be released or "snapped-back" to the original service provider assigned the NXX." [24]

1.4.2 Wireless Industry Studies

In response to the FCC First Order and Report (July, 1996), CTIA released a Notice of Request for Information (RFI) to the telecommunications industry in August, 1996. The purpose of the RFI was to solicit potential implementations of number portability in the wireless telecommunications environment. CTIA received more than one hundred inquiries leading to several substantive responses.[25] A Number Portability Open Forum was held October 9-11 to review presentations of the responses and achieve consensus on a common approach.

On January 22, 1997, CTIA released to both the TIA (i.e., TR46 and TR45.2) and Committee T1 (i.e., T1S1.6, T1P1.5) standards committees the *Wireless Number Portability CTIA Standards Requirement Document (SRD)*. The SRD provided initial high-level requirements for WNP on current and future standards. These standards committees began and continue to work on defining switch requirements and protocol standards as appropriate to number portability.

On April 11, 1997, CTIA released the first version of *The CTIA Report on Wireless Number Portability* providing a comprehensive overview of the wireless systems impacts. On June 26-27, CTIA sponsored an open forum to present an overview of the document and ensure telecommunications consensus before moving forward.

CTIA has continued to sponsor work on various number portability issues, including establishing guidelines for Mobile Identification Numbers (MIN) administration and sponsoring a series of Subject Matter Expert (SME) workshops held in San Antonio, September, 1997, and Albuquerque, January, 1998. The SME Workshops dealt with a variety of subjects including care and provisioning, billing, Short Message Service, and NPA-based service impacts. The output of these workshops is reflected in this document update and other discussion forums.

Many WSPs have become active participants in the various committees under the North American Numbering Council (NANC), i.e. the Wireless/Wireline Integration Task Force (WWITF) dealing with WNP impacts on baseline wireline architecture and on the NPAC-SMS.

1.5 Assumptions

The following assumptions are made throughout the WNP architecture:

- This document only addresses Service Provider Portability.
- When a subscriber ports, the subscriber's current terminal equipment may or may not be compatible with the new SP's technology. A subscriber may need to purchase a new mobile station in order to obtain the services from a new WSP. Therefore, a subscriber may or may not port his or her mobile station.

[24] Ibid., paragraph 79.

[25] Contact CTIA for more information.

- The NPAC-SMS will contain a record for each ported wireline DN and each ported MDN (within the area that it serves).
- Service providers are responsible for maintaining the integrity of their copy of the NPAC-SMS data.
- Each subscriber is identified by at least one unique NANP directory number that will port with the subscriber from one service provider to another.
- Although this document most often refers to the number portability query database as residing on an NP DB, the WNP Solution does not preclude a WSP from locating the number portability query database on another platform such as an STP.
- This document details service provider portability for facility-based WSPs and provisioning aspects related to resellers. (A facility-based WSP is one that operates at least one MSC.)
- Number Pooling, although built upon the Number Portability technology, is outside the scope of this document.

1.6 Aspects of Wireless Number Portability

NOTE: The boundaries of portability, specifically porting between wireline and wireless, was addressed at various forums and has been documented in the LNP Administration (LNPA) Working Group Report on Wireline/Wireless Integration, May 8, 1998. This topic is now in front of the FCC. As a consequence, this section has not fundamentally changed from Revision 1.0.

Because wireless service providers have some fundamental differences in their network operation and services as compared to wireline, differences arise in the design and implementation of wireless number portability. These differences impact how and when subscribers can port to a wireless service provider. To appreciate these aspects, this section presents an overview of these differences, a logical discussion toward explaining wireless portability boundaries, as well as the definition of those boundaries.

1.6.1 Differences between Wireless and Wireline

The differences between wireline LECs and WSPs that impact the definition of portability are summarized in Table 1-1.

Table 1-1 Wireline versus Wireless Calling Aspects

Wireline	*Wireless*
A directory number is associated with a stationary physical facility (i.e. local loop).	A mobile directory number is not associated with any fixed physical facility.
The subscriber can only be served using the same terminal only at a single location.	The subscriber can be served using the same terminal over a wide geographic area.

Wireline	*Wireless*
	Mobility is inherent.
Areas of local calling (including rating) are regulated by the states.	Areas of local calling are not regulated by the states. Areas of local calling do not match those defined by wireline providers nor do they match from one WSP to another. Mobile-to-mobile and mobile-to-land calls are not bounded by rate centers.
Incumbent LEC are bound by LATA restrictions.	WSPs may or may not be bound by LATA restrictions.

The FCC definition of service provider portability does not distinguish between wireless or wireline service providers. However, since service provider portability should not disrupt current call rating, the inclusion of a WSP and the added complexities of the above differences must be carefully evaluated.

The definition of location portability infers that the number is associated with a physical, fixed facility. It involves changing rate centers associated with a number which presents significant impacts in rating the call of the originating party when the called party has moved their number to another rate center. However, the landline rate center definitions are not required to rate calls originated by wireless subscribers.

In light of these differences and in order to preserve the integrity of routing and rating of calls to wireless subscribers, whether ported or not, adjustments in interconnection and business agreements (e.g., Points of Interconnection (POI)) may be required.

1.6.2 Geographic Boundaries

1.6.2.1 Wireline Boundaries

In order to understand how wireless can participate in the FCC order without changing the wireline call rating, understanding call rating is fundamental. The concept of "rating" was created by wireline carriers as a method to capture distance related costs in billing. This concept has been adopted by LECs for local calls as well as by IXCs for toll calls. Local carriers accomplished distance rating by defining a *rate center* as a geographic area associated with a single V(ertical) and H(orizontal) coordinate. Each NPA-NXX and its line numbers are associated with a single rate center, often defined as the area served by a single switch (or a combination thereof). The distance related component of rating a call between two telephone numbers is, in essence, based on the difference of the two coordinates of their associated rate centers. Toll and long distance carriers adopted the same concept except that several rate centers may be aggregated to form a *rate district*. The rate district concept was then used to rate calls terminating outside of the local calling area (i.e., inter-city calls).

Today, wireline carriers associate wireless numbers (as defined by NPA-NXX) with a specific wireline rate center for mobile terminated calls. A wireline carrier can rate a wireline-to-

wireless call based on the rate center V&H coordinates associated with calling and called party numbers.

A common assumption for service provider portability is that a subscriber originating a call should not be rated differently because of the called party's service provider or porting status. If a wireline subscriber originates a call, the rating should be the same regardless if the called party has ported to a WSP or where the serving MSC is located. Preserving the rating can be accomplished by WSPs having an interconnection agreements with the wireline SPs. Uniform treatment by wireline providers of calls to wireless subscribers continues to be an issue. Will the rating be based on the original wireline rate center or the fact that the subscriber is being served by a WSP? This issue remains for further study.

Rating calls to a portable wireless number is calculated using the rate center associated with the called party number (not the LRN). WNP does not define any requirement that a WSP obtain an LRN for every rate center associated with their serving area in order to accept a wireline subscriber desiring to port.

1.6.2.2 Wireless Boundaries

WSPs may rate calls originated by mobile subscribers; however, WSPs are not obligated to use the same physical boundaries of wireline rate centers or rate districts. Instead, WSPs utilize the concept of a geographical area referred to as a *Home Serving Area* (HSA). HSAs are typically much larger than the geography defined by a wireline rate center; for example:

- Basic Trading Area
- Metropolitan Service Area
- Major Trading Area

A WSP may define a portion of the above as a HSA or combine several of the above into a larger area. Unlike wireline rate centers which are regulated by the state utility commissions, HSAs are not subject to state jurisdiction (or any jurisdiction for that matter). Thus, the size of the HSA is a business decision of the WSP and frequently differs from one WSP to another.

Subscribers that originate calls within their HSA do not incur roaming charges. A WSP may define different "bands" or calling scopes within or across multiple HSAs which indicate that all mobile originated calls that terminate within the same "band" are rated the same.

1.6.2.3 Mobility versus Location Portability

Wireless users have the inherent ability to move while using their service; it is important to view this as *mobility*, not location portability. Being mobile does not impact the billing or rating for a wireline originated call. Mobility may impact the wireless subscriber through call forwarding charges and/or roaming fees.

Location Portability with respect to wireless is the ability to change Home Serving Areas or change the wireline rate center associated with the MDN. In this case, the wireless billing paradigm is impacted in the same way as with wireline location portability. For the wireless

subscriber, this allows them to use their mobile set in a different area without incurring the roaming fees previously encountered .

1.6.3 Porting To and From

With wireline portability, any movement (i.e., relocation of the physical point of service) is technically considered location portability. However, it is recognized that the wireline implementation of service provider portability can "accommodate" a limited amount of location portability. That is, as long as the serving location is within the same rate center, the NP implementation does not impact billing or rating. Relocating outside the present rate center introduces significant billing and rating implications.

However, once a subscriber ports to a WSP, mobility is inherent. A subscriber can utilize the mobile station independent of any wireline rate center boundary. Furthermore, the subscriber can use the mobile station outside any HSA (subject to roaming agreements and charges). This mobility is transparent whether the subscriber chooses to actually relocate their residence or not.

1.6.3.1 Porting to a Wireless Service Provider

It is assumed that in order to be a recipient network, the WSP must have an FCC license to serve the location of the subscriber. The WSP is also assumed to provide radio coverage over the physical location where service was previously obtained by the ported subscriber. Serving the subscriber via a roaming agreement with another WSP does not constitute eligibility. Finally, WSPs are not required to have switching facilities within the same rate center area as the ported subscriber's DN NPA-NXX.

Given a WSP is eligible to receive a ported subscriber as defined in the above paragraph, the following criteria must be met to preserve the billing paradigm:

- A wireless subscriber can port the MDN to another WSP as long as the wireline rate center associated with the MDN is geographically located within the HSA of the involved WSPs.
- A wireless subscriber can port the MDN to a wireline SP as long as the resulting wireline SP is geographically located within the wireline rate center associated with the MDN's NPA-NXX.
- A wireline subscriber can port the DN to a WSP as long as the rate center associated with the wireline number is geographically located within the HSA of the involved WSP.

1.6.3.2 Porting to Wireline Service Provider

A subscriber that ports to a wireline carrier may have originally had their number assigned by a WSP. In this case, calls from other wireline subscribers should still be rated the same as before.

Each wireless number is associated with a rate center from a wireline perspective. The rate center may or may not be the same rate center where the wireless switch is located. Furthermore, the wireless subscriber may or may not reside in the rate center associated with their MDN. Consequently, to maintain consistent rating from the calling party's perspective

porting from a WSP to a wireline service provider can only occur when the resulting wireline service is geographically located within the wireline rate center associated with the ported MDN.

Abiding by such constraints does not impact wireline rating. Wireline calls rated on the called party number would continue to be rated the same. Assuming the subscriber has not moved, then from a rating perspective, the situation analogous to a subscriber using the mobile station at the subscriber's residence. Once the subscriber has ported to a wireline provider, that subscriber is constrained to using the telephone number only at a fixed location.

1.7 Critical Dates

1.7.1 Regulatory Mandates

Several dates are included in the FCC order concerning portability implementation. The earliest date involves wireline service provider portability and mandates the LECs to start implementation in the top 100 Metropolitan Statistical Areas (MSA) in 4Q97 with completion by December 31, 1998.

CMRS providers are mandated to complete calls to ported wireline subscribers by December 31, 1998. In reality, CMRS providers could continue to route calls to the donor Local Exchange Carrier (LEC) as normal prior to this date and these calls will complete successfully. More specifically, once an area opens for portability, CMRS providers have the following options:

(a) implement the ability to query a number portability database and direct the call to the proper serving network; or

(b) default route the call to the original NPA-NXX code holder, requesting[26] the original carrier to query and route the call to the proper network.

The latter can be achieved with or without establishing a business contract with the original code holder. The difference between having and not having a business contract is specified by the service provider performing the query and may be influenced by such aspects as query volume or length of contract. Lack of a negotiated business contract does not imply that calls will not be completed.

The second date involving WSPs is September 30, 1998, 9 months prior to the June 30th, 1999 milestone for wireless number portability. WSPs are only required to provide number portability in switches serving the top 100 MSAs if they have received a specific request for number portability at least 9 months before the deadline. Consequently, all carriers wishing to compete with wireless in the top 100 MSAs must initiate a request to a WSP for deployment of number portability by September 30 1998. Cellular, broadband PCS, and covered SMR providers must make available lists of their switches for which deployment has and has not been requested. This process will ultimately result in the need to identify specific NPA-NXXs for portability, given that a single wireless witch serves a wider geographic area than a single MSA.

[26] The receiving provider may offer concessions for pre-arranged business agreements (a.k.a. prearranged routing).

Since the notification to compete would require a formal request, the wireless industry is examining the potential of establishing a third party "clearinghouse" to facilitate the logistics associated with this specific activity. This function of initiating formal local number portability requests is also required for the "smaller areas" beyond the top 100 MSAs after the June 30, 1999[27]. Industry discussion of the notification process are still underway with the objective of achieving the function at the least cost, industry-wide.

The next critical date for WSPs is June 30, 1999. By this date, WSPs in the top 100 MSAs (which requests for WNP were previously indicated) who have been identified in the notification process must be capable of receiving and releasing porting subscribers and must have all the capabilities required for service provider portability. All WSPs involved in roaming must continue to support nationwide roaming for both ported and non-ported wireless subscribers, in areas both in and outside the top 100 MSA boundaries.

Requests for deployment of WNP in areas outside the top 100 MSAs follow the same procedures established for wireline carriers:

> "As in the wireline context, carriers may submit requests for deployment of number portability in areas outside the 100 largest MSAs at any time. CMRS providers must provide number portability in those smaller areas within 6 months after receiving a reuqest or within siz months after June 30, 1999, whichever is later." [28]

1.7.2 Implementation

In order to consider the ability to comply with the FCC mandated dates, the aspect of standards and equipment availability must be considered. Historically, the following intervals have been experienced:

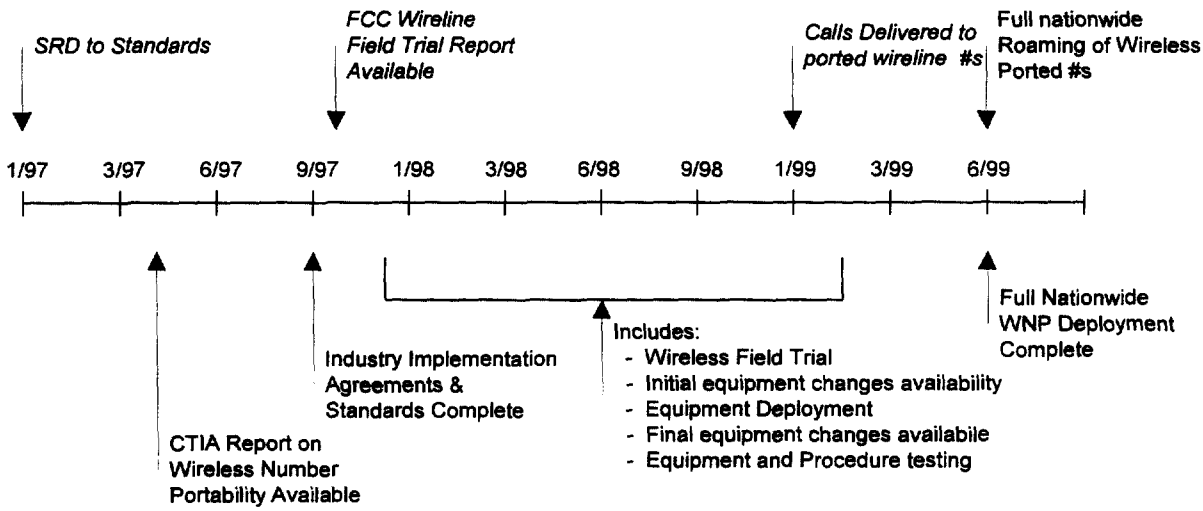
- standards development can take 2 years,
- implementation lead time is 18 months, and
- network wide deployment spans 12 or more months.

Certain activities to some extent can be performed in a parallel manner, and the industry has learned to accelerate activities. Consequently, in the previous version of this report, the timeline in Figure 1-1 was offered for consideration in planning for WNP which shortened various intervals:

[27] Ibid., paragraph 137.

[28] Ibid., paragraph 137.

Figure 0-1 Potential Timeline Necessary to Meet FCC Mandate (Original)

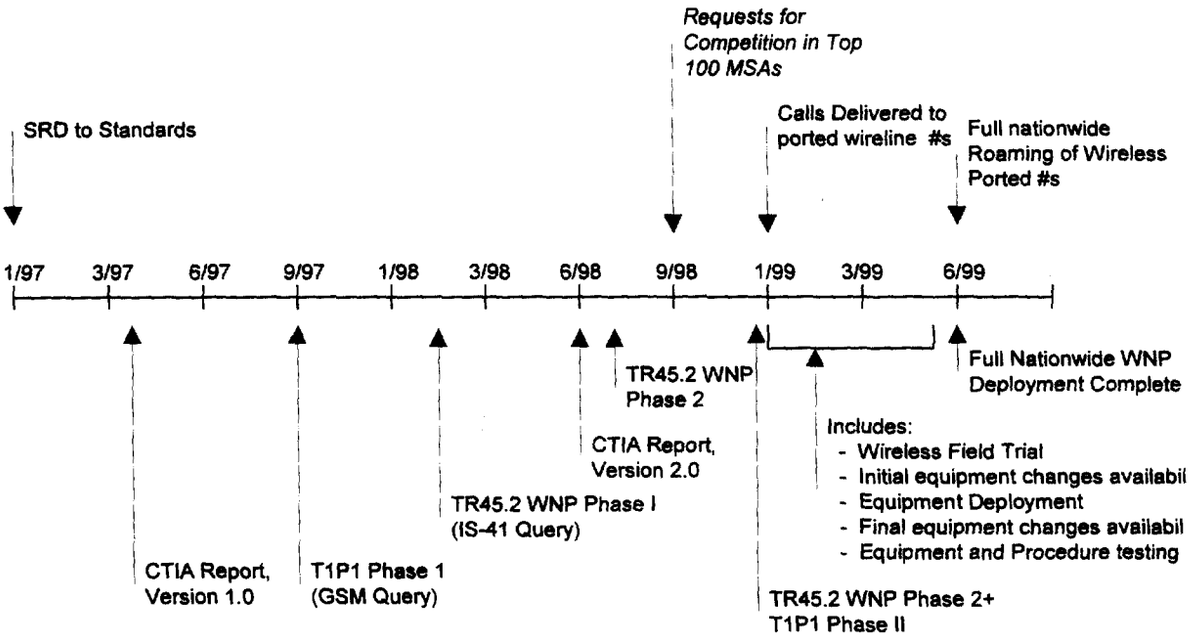


Note: the time points above the line are either actual or derived by the FCC.

Since the Version 1.0 release of this document, various industry activities concerning WNP have occurred, including activities in T1P1 (developing GSM-based PCS 1900 standards), T1S1 (establishing national switching requirements and signaling standards), and TR45 (developing the IS-41 protocol standards).

Not all of these activities were completed in 1997 as originally estimated in Figure 1-1. Therefore, Figure 1-2 reflects the revised standards schedules (for TR45.2 and T1P1) and emphasizes the various activities that must occur prior to June 30, 1999.

Figure 1-2 Potential Timeline Necessary to Meet FCC Mandate (Revised)



The following is a short description for each of the time points:

- *Standard Requirement Document (SRD) to Standards*: This is a completed activity. The initial CTIA SRD on WNP was delivered to TIA, TR45.2, TR46 and T1P1 in January, 1997.
- *WNP Solutions Document*: This point represents the release of this document.
- *FCC Field Trial Report Available for Wireline*: This is the FCC ordered date for a report of the field trial of wireline
- *Industry Implementation Agreements and Standards Complete*: This is a derived date based on the time needed to develop and deploy equipment to meet the FCC dates. This substantially shortens the typical interval to develop standards and come to industry agreement.
- *TR 45.2 WNP Phase 1*: This represents the IS-41 based signaling standards that define the MSC to NP DB query and associated procedures.
- *TR 45.2 WNP Phase 2*: This represents the IS-41 based signaling standards necessary to support the MIN and MDN separation for call processing.
- *TR 45.2 WNP Phase 2+*: This represents the IS-41 based signaling standards necessary to support ancillary wireless procedures, such as Short Message Services.
- Bracketed area illustrates the time frame in which all of the following items much be accomplished in some form:

- *Wireless Field Trial*: A field trial of the wireless solution must be made prior to deployment of equipment on any significant scale due to the fundamental impacts of these changes. Due to the limited time available, this trial must be on a limited scope and short time frame. Other forms of testing will also be necessary to prepare for and supplement the trial.

- *Initial Equipment Changes Available:* This date represents the initial availability of any equipment changes to meet the December 31, 1998, date for delivery of calls to ported wireline numbers. This is an evolutionary step to the final wireless solution, not a separate step.

- *Equipment Deployment*: This represents the time required to deploy the needed new equipment, software and changes throughout the industry - a significant task for the wireless industry as nationwide roaming requires all participating carriers to have this capability.

- *Final Equipment Changes Available*: After the initial testing of the equipment and software, a number of adjustments are normally expected. This milestone represents the point in time that the final changes would be available for deployment.

- *Equipment and Procedures Testing*: Even with a field trial, each carrier will need to test the deployment of equipment and procedures within their specific environment to ensure proper operation of maintenance customer care, billing procedures, et al.

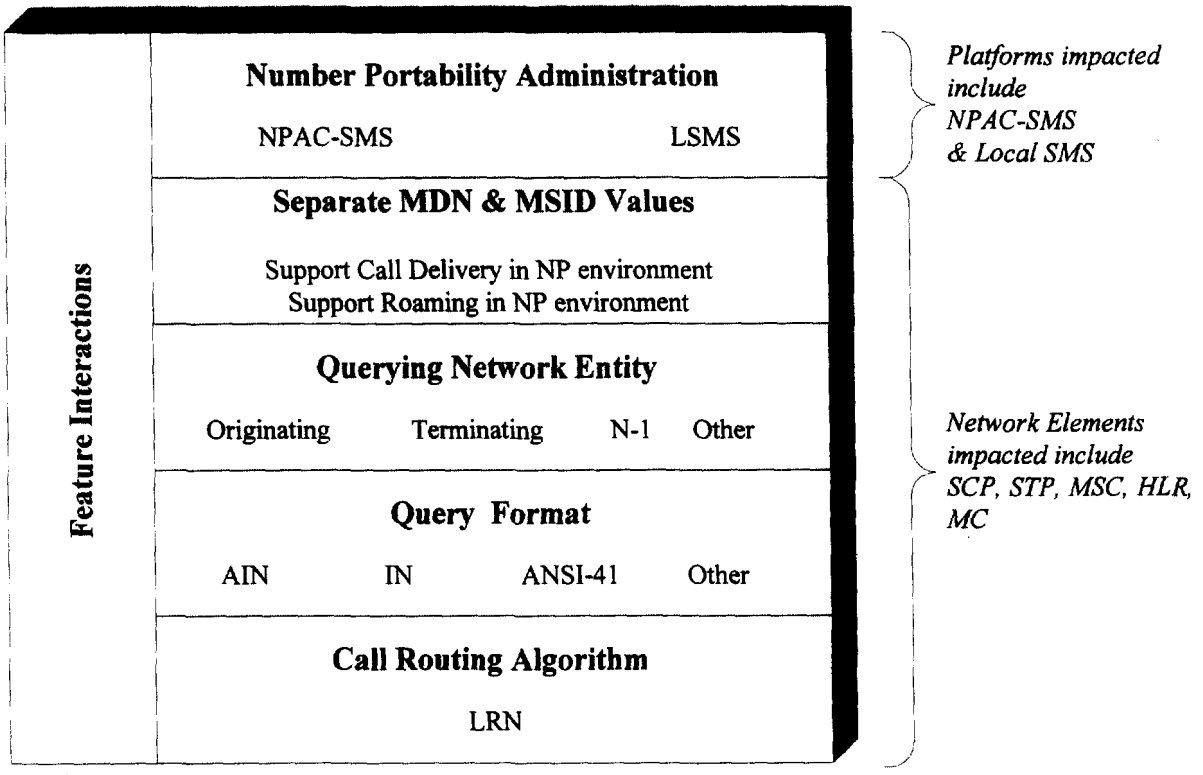
- *Calls delivered to ported wireline numbers:* This is the FCC ordered date for wireless to be able to deliver calls to ported wireline numbers within the top 100 MSAs.
- *Top 100 MSA Number Portability Deployment Complete*: This represents the time in which all wireless carriers involved in roaming have deployed the necessary equipment and software to support number portability.
- *Full Nationwide Roaming of Wireless Ported Numbers*: This represents the time in which all needed equipment is deployed and roaming involving ported numbers can be activated. All necessary coordination, services and systems are deployed and operational.

2. WIRELESS NUMBER PORTABILITY

2.1 Solution Overview

Figure 2-1 displays a model of the building blocks for implementing WNP. An explanation of the model follows the figure.

Figure 2-1 Wireless Number Portability Building Blocks



The five building blocks as illustrated in the figure are defined as follows:

- *Number Portability Administration*: This component contains the NPAC-SMS and LSMS which disseminate information regarding ported subscribers.
- *Separation of MDN and MSID*: This component reflects the separation of the MDN and MSID and its significance to wireless registration and call delivery.
- *Querying Network Entity:* This component defines the network entity capable of querying to the NP DB database to obtain routing information. This entity could be in the Originating Network, Terminating Network, N-1 Network (i.e., the next to last network) or some other entity (e.g., a message center, a service node platform).

- *Query Format*: This component defines the syntax of the protocol used to query the number portability database. Possible query formats include IS-41 based, AIN or IN based. There are also references to a pre-IN capability (also referred to as the toll free or 800 capability) which could be implemented in a early AIN or stand-alone environment. Use of a particular query format does not imply nor preclude the implementation of switch processing capabilities. Specifically, use of an AIN or IN based query format does not require, nor preclude, the MSC from implementing AIN, IN or WIN capabilities.
- *Call Routing Algorithm*: This component identifies the routing method by which calls are routed to the subscriber's new service provider (either wireless or wireline). The method is LRN.
- *Feature Interactions:* This component signifies the impacts of the other components on many, if not most, existing wireless features and services.

The right side of the figure maps the major functional hardware platforms to the building blocks. These building blocks drive the following major impacts to today's wireless network architecture:

(a) Incorporate call routing based on an LRN.

(b) Move to separate MDN and MSID values.

- Make the MDN the portable number; keep the MSID as a non-portable number and controlled by the wireless service provider. This separation is essential in order to avoid 10 digit translation in mobile registration and, equally important, in support system processing (e.g., roaming tables).

- Allow the MSID to be either a MIN or an IMSI.

(c) Support Global Title Translations (GTT).

The three items listed above are discussed in more detail. Also, Sections 3 (network architecture) and Section 4 (operations and administration) expand on the various points in the figure in greater detail.

2.2 Location Routing Number Call Routing

The Location Routing Number (LRN) is a 10-digit NANP-formatted Network Routing Address assigned to a switch. Of these10 digits, the first six (i.e., NPA-NXX) are significant for routing a call. For an existing switch, the LRN is assigned from an NPA-NXX code block uniquely assigned to the carrier and from which the switch currently serves.

A Number Portability Database (NP DB) maps every ported number to its serving switch's LRN. A query capable network along the route would perform a query to the NP DB to obtain the LRN associated with the called party's 10-digit DN in order to correctly route the call based on NPA-NXX translation of the LRN. The network then sets up the subsequent leg of the call by sending an ISUP Initial Address Message (IAM) with the LRN.

The concept of the N-1 network performing the query to the NP DB is associated with the LRN call routing method. If *N* denotes the network sequence number of the terminating network in the call path, the next-to-last, or *N-1,* network would identify the NPA-NXX of the dialed number as a portable block and would query the NP DB to retrieve the LRN. If involved, an IXC would typically be designated the *N-1* carrier. If the wireless service provider does not have a direct connect with an IXC, the call could be routed in accordance with an interconnect agreement with the LEC without changing the *N-1* responsibility.

The following scenario should not be over-looked: a wireless carrier provides service in an Rural Service Area (RSA) which is within the same LATA as any one of the 100 largest MSAs; even though that wireless carrier does not provide service within that MSA, it will route calls that terminate within that MSA over a local exchange carrier, thus making the wireless carrier the *N-1* carrier. Therefore, it is responsible for the correct routing of all calls originating on its system and terminating to the MSA.

The summary, the LRN routing method is characterized by the following:

(a) It does not require a single unique network address for each ported number. The network address for ported number is associated with the ported-to switch address.

(b) Call routing remains consistent with current call routing schemes.

Figure 2-2 illustrates a typical LRN routing of a call to a ported subscriber.

Figure 2-2 Routing with a Location Routing Number