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Building The Wireless Future

CTIA

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Randall S. Coleman
Vice President for Regulatory Policy and Law

October 24, 1997

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Mr. William F. Caton
Secretary
Federal Communications Commission
1919 M Street, NW, Room 222
Washington, DC 20554

Re: CC Docket No. 95-116, Number Portability

Dear Mr. Caton:

On Thursday, October 23, 1997, CTIA and representatives of certain of its member companies met with Christopher Wright, David Solomon, Suzanne Tetreault and Debra Weiner of the Commission's Office of General Counsel. The topic of the meeting was the current implementation date for CMRS-to-CMRS number portability and the need for an extension of that date for technical reasons. The attached documents were distributed at the meeting.

CTIA was represented by Lori Messing, Michael Altschul, David Don and the undersigned. CTIA member companies were represented by the following persons: Jon Chambers (Sprint PCS), William Roughton (Primeco PCS), Betsy Granger (Pacific Bell Mobile Services), Gina Harrison (SBC Communications), Glenn Rabin (ALLTEL), Georgina Lopez-Ona (Western Wireless) and John Scott (Bell Atlantic Mobile).

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

Sincerely,

Randall S. Coleman

Attachments (3)

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NUMBER PORTABILITY

Building The Wireless Future

CTIA

***Ex Parte* Presentation**
October 23, 1997

CC Docket 95-116

- "... 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." *First Memorandum Opinion and Order on Reconsideration*, CC Docket 95-116, March 6, 1997, at para. 19.

- "If it becomes apparent that the wireless industry is not progressing as quickly as necessary to meet the deadlines for providing querying capability and service provider portability, the Wireless Telecommunications Bureau Chief may waive or stay the implementation dates for a period of up to nine months." *Id.*, at para. 134.

- It has become apparent that a stay of the implementation dates is required, despite the efforts of the wireless industry to develop the capabilities required to provide number portability.

- Industry efforts, coordinated by CTIA's Number Portability Sub-task Group, have identified an unexpectedly large number of technically difficult and expensive implementation issues.

- Not only is more time required to provide CMRS number portability, CTIA's PCS members, the intended beneficiaries of the rules, believe that implementation should be delayed to permit them to invest their capital where it can have the greatest competitive impact, *i.e.*, in building out systems, in marketing, and in providing phones to existing CMRS customers.

- Based on real-world marketing experience, number portability is not as important competitively as coverage, marketing, and providing phones to customers of incumbent CMRS carriers. The large amount of capital required to implement number portability can be spent more effectively on these other competitive issues.

- FCC action deferring CMRS Number Portability deadlines is needed immediately as capital budgets are now being prepared for FY 1998.

- The WTB should defer for nine months the June 30, 1999, implementation date based on the unresolved technical implementation issues.

- CTIA and its members also will seek deferral of CMRS Number Portability from the full Commission based on the competitive factors.

CTIA Number Portability Forum

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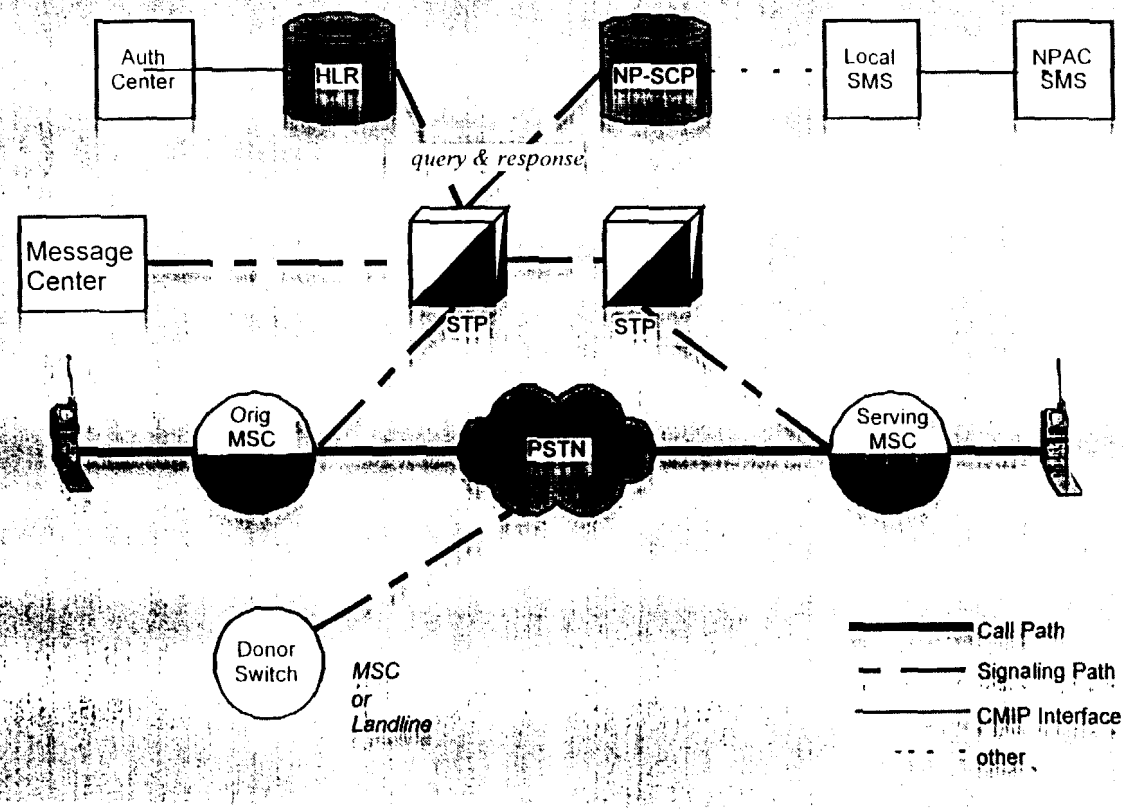
CTIA Report

Figure 3-1: *WNP Network Reference Model*



Wireless Number Portability Impacts

- Mobile Stations
- Air Interfaces
- IS-41 Signaling
- GSM Signaling
- Home Location Register
- Mobile Switching Center
- Interconnection Types
- Signaling Transfer Points
- Global Title Translation
- NP-SCP
- Customer Care and Provisioning
- Billing
- Maintenance
- Data Administration
- Service and Network Reliability
- Human Factors
- Service Impacts

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CTIA
Report on
Wireless Number Portability

Created by the Number Portability Sub-task Group

on behalf of the

Cellular Telecommunications Industry Association

Number Advisory Group

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REVISION HISTORY

Version	*Date*	*Remarks*
1.0	April 14, 1997	Initial Publication

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 strategies are noted where appropriate. Proprietary implementations are outside the scope of this document.

This document focuses only on Wireless Number Portability (WNP), mainly on the case of a subscriber porting to a WSP. 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.

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:

- *Service Provider Portability* is 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." [1]
- *Location Portability* is 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." [2]

  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.)
- *Service Portability* is 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." [3]
- *Home Serving Area* - the geographic area of coverage provided by a WSP where subscribers may originate and terminate calls without incurring roaming charges.
- *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).

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[1] FCC *Number Portability Report and Order*, CC Docket 95-116, July 2, 1996 paragraph 172.

[2] ibid., paragraph 174.

[3] ibid., paragraph 172.

- *Number Portability Administration Center Service Management System (NPAC-SMS)* - a Service Management System (SMS) responsible for storing and broadcasting to service providers NP data updates within a region for ported DNs. The NPAC-SMS(s) is owned and maintained by a neutral, third-party.
- *Local Service Management System (LSMS)* - an SMS responsible for distributing the NP data updates from the NPAC-SMS to the service provider's NP-SCP, typically is owned and maintained by the service provider.
- *Mobile Station (MS)* "is 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 address a wireless service subscriber.
- *Directory Number (DN)* - any E.164 10-digit dialable number assigned to address a wireline or a wireless subscriber. DNs are inclusive of MDNs.
- *Mobile Station Identifier (MSID)* - either a 15-digit E.212 formatted International Mobile Station Identification (IMSI) or 10-digit Mobile Identification Number (MIN).
  - *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. [5]
  - *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 and is designed to contain a NANP-formatted number (e.g., NPA-NXX-XXXX). This number, as an MSID, may be equivalent to the value of a dialable MDN. MIN is the prevalent identifier in AMPS networks.
- *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 owner of the number.
- *Recipient Network* - the network to which a subscriber ports.

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[4] IS-41.1 Rev C

[5] *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.

1.4 Background

1.4.1 The FCC Order

The FCC *Number Portability Report and Order, 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.[6]

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."[7]
- "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."[8]
- Interim number portability measures are not required for WSPs.[9]
- Service and Location portability are not required at this time.[10] In addition, changes between wireline service providers and broadband CMRS providers or among broadband 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.[11] 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.[12]
- The issue of regional number portability databases and their content and administration is assigned to the North American Numbering Council (NANC).[13]

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[6] FCC *Number Portability Report and Order*, CC Docket 95-116, July 2, 1996, paragraph 172.

[7] ibid., paragraph 165.

[8] ibid., paragraph 166.

[9] ibid., paragraph 169.

[10] ibid., paragraph 181.

[11] ibid., paragraph 172.

[12] ibid., paragraph 157.

The FCC did not mandate a specific method for number portability but has recognized that the Location Routing Number (LRN) method is currently preferred by much of the industry, although not tested.[14] A field test of LRN as it applies to the wireline industry is scheduled for execution in Chicago through the summer of 1997.[15] [16] The intent of the test is to prepare for the wireline implementation and currently does not include the wireless solution. Refer to Section 1.7 regarding trial report availability.

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." [17]

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:

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[13] ibid., paragraphs 91-102.

[14] ibid., paragraph 46.

[15] ibid., paragraph 79.

[16] FCC *First Memorandum Opinion and Order on Reconsideration*, CC Docket 95-116, March 6, 1997, paragraph 79.

[17] FCC *Number Portability Report and Order*, CC Docket 95-116, July 2, 1996, paragraphs 48-59.

(a) "...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." [18]

(b) "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." [19]

(c) "...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)." [20]

1.4.2 Wireless Industry Studies

During August, 1996, CTIA released a Notice of Request for Information (RFI) to the telecommunications industry. The goal of the RFI was to solicit potential methods available to the wireless industry for number portability implementation. CTIA received more than one hundred inquiries leading to several substantive responses.[21] A Number Portability Forum was held October 9-11 in Las Vegas to review the presentations of the responses and find consensus on an approach to NP in the wireless industry.

On January 22, 1997, CTIA released to both TIA and Committee T1 standards committees a Standards Requirements Document (SRD) entitled *Wireless Number Portability CTIA Standards Requirement Document*. It provided the appropriate committees with an initial look into the requirements of WNP on current and future standards.

The FCC has sponsored a forum for agreeing to NP concepts via a Working Group under the North American Numbering Council (NANC). Since CMRS providers are regulated at the federal level (as opposed to the state level) and their participation in number portability is mandated, the involvement of WSPs and consideration of related wireless specific issues has become more crucial. This document is not intended to supersede any decisions made by these committees but is intended to capture portability as it involves WSPs.

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

[19] ibid., paragraph 136.

[20] ibid., paragraph 137.

[21] Contact CTIA for more information.

1.5 Assumptions

The following assumptions are made throughout the WNP architecture:

- 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.
- 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.
- This document makes no assumptions regarding the number nor distribution of NPAC-SMSs, except that more than one will most likely be established and will be in place in time for WNP.
- Although this document most often refers to the number portability query database as residing on an NP-SCP, 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. It does not consider the complications of a re-seller environment in its discussions. (A facility-based WSP is one that operates at least one MSC.)

1.6 Aspects of Wireless Number Portability

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 (e.g. local loop).	A mobile directory number is not associated with any fixed physical loop.
The customer can only be served in a single static location with the same terminal.	The customer can be served over a wide geographic area with a single terminal. Mobility is inherent.
Aspects of local calling (including rating) are regulated by the states.	Aspects of local calling are not regulated by the states. Areas of local calling do not match those defined by wireline providers. Areas of local calling do not match from one WSP to another.
Incumbent LEC are bound by inter-LATA restrictions.	WSPs do not recognize the concept of LATAs.
Service Provider Portability is geographically bounded by rate centers.	Mobile-to-mobile and mobile outbound calls are not bounded by rate centers. Furthermore, wireline rate centers and similar wireless boundaries do not overlay one another.

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 telephone number by its NPA-NXX to an 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 associates 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 wireline 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 implementation of wireline service provider portability by the incumbent LECs in the top 100 Metropolitan Statistical Areas (MSAs) is 4Q97.

CMRS providers are not required to implement any technology to support wireline service provider portability by this date and thus, can continue to route calls to the donor LEC as normal. However, CMRS providers must make arrangements to complete calls to portable subscribers by December 31, 1998. Since calls made prior to this date will connect successfully nonetheless, this date is interpreted as requiring the WSP to either

- directly query a database and route the call to the proper network, or

- make business arrangements for another provider to query and properly route the call to the proper network.

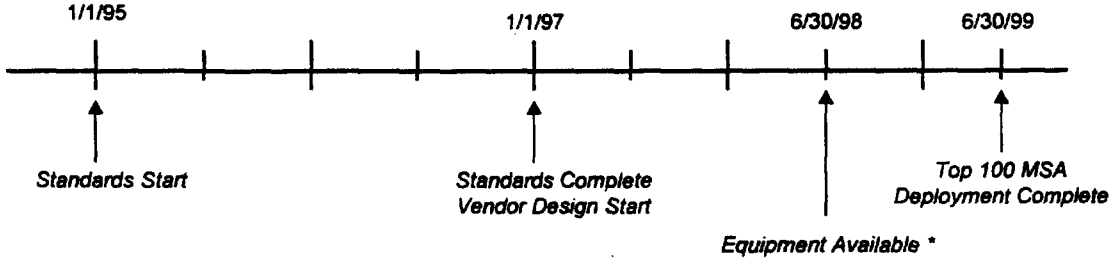
The WSP need not own nor operate the database; the WSP may have a business relationship with another entity regarding access to that entity's database.

The second critical date involving CMRS providers is June 30, 1999. By this date, WSPs must be capable of receiving and releasing wireless ported subscribers and must have all the capabilities required for service provider portability.

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. If one considers the normal development time of 2 years for standards, 18 months for equipment development beyond standards and 12 months for equipment deployment, the time line on the following page would apply.

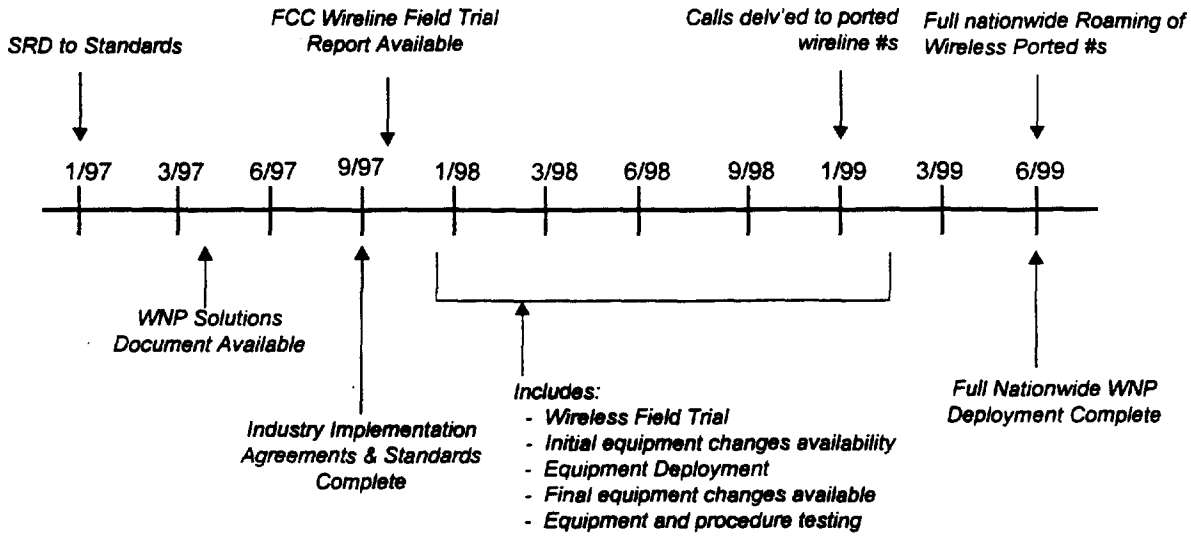
Figure 1-1 Theoretical Timeline



** Assumes typical vendor development cycle of 18 months*

In order to meet the end date, the intervals must shortened or overlapped. The following compressed timeline in Figure 1-2 is offered for consideration in planning for WNP.

Figure 1-2 Potential Timeline Necessary to Meet FCC Mandate



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

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

- *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.
- 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.

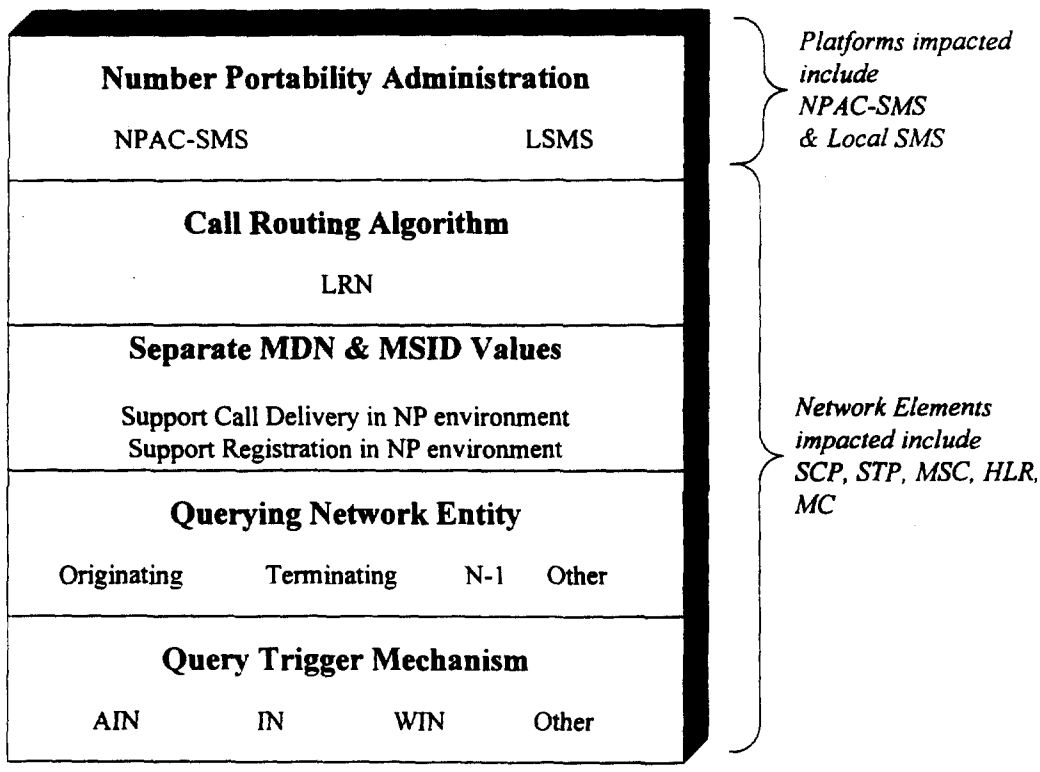
- *Calls delivered to ported wireline numbers:* This is the FCC ordered date for wireless to be able to deliver calls to ported wireline numbers within the top 100 MSAs.
- *Top 100 MSA Number Portability Deployment Complete*: This represents the time in which all wireless carriers involved in roaming 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.
- *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.
- *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-SCP database to obtain routing information. This entity could be in the Originating Network, Terminating Network, N-1 Network (i.e., the next to last capable network) or some other entity (e.g., a message center, a service node platform).
- *Query Trigger Mechanism*: This component encompasses the software procedure(s) within the querying network entity that activates a trigger and issues the query for portable NPA-NXX ranges. Possible trigger and query message mechanisms are AIN, IN, WIN or some other mechanism (e.g., IS-41) understood between an MSC and NP-SCP.

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 are significant to the Public Switched Telephone Network (PSTN) for routing a call. For an existing switch, this code is an NPA-NXX code block the switch currently serves.

A Number Portability Service Control Point (NP-SCP) maps every ported number to its serving switch's LRN. A query capable network along the route would perform a query to the NP-SCP 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-SCP is often associated with the LRN call routing method. If *N* denotes the network sequence number of the terminating network in the call path, the *N-1* network would identify the NPA-NXX of the dialed number as a portable block and would query the NP-SCP to retrieve the LRN. The subject of when to query the NP-SCP as it applies to WSPs is discussed in more detail in Section 3.

The ISUP IAM provides for an indicator noting a query has been performed. Therefore, any subsequent network need not perform additional queries.

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.

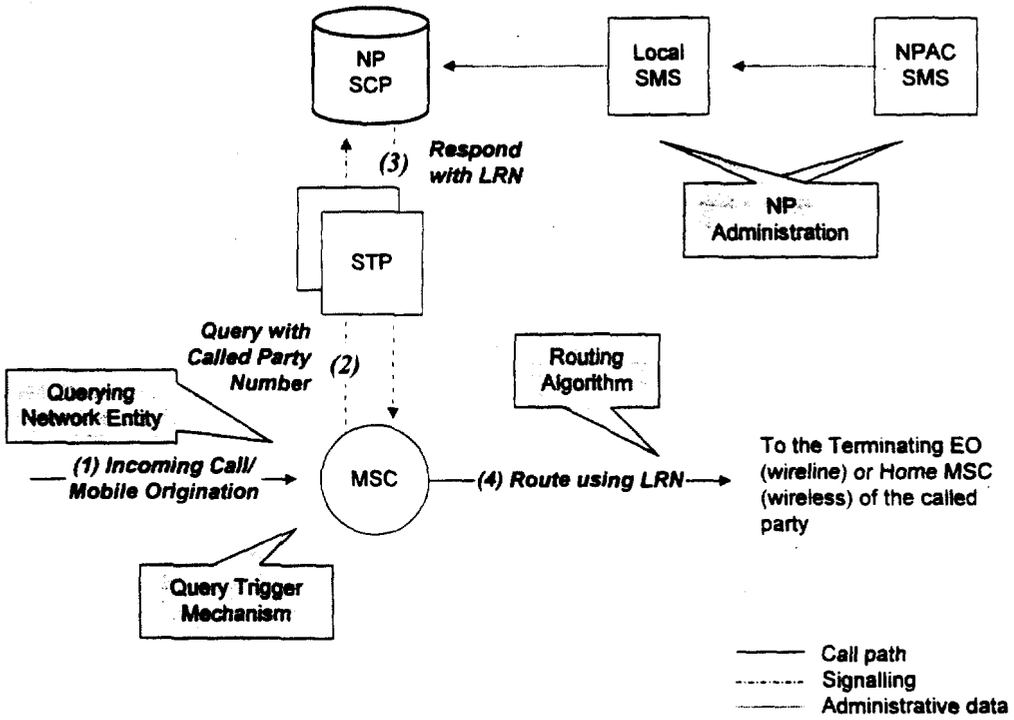



Figure 2-2 Routing with a Location Routing Number