

Wireless Number Portability (WNP)

Challenge and Opportunity in the Wireless Telecommunications Industry



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“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 service provider portability, including the ability to support roaming, throughout their networks by June 30, 1999.”

—FCC Ruling, July 2, 1996
(Docket No. 95-116)

+ Overview

Number Portability is a telecommunications network feature that enables end-users to retain their telephone numbers when changing service providers, service types, and/or locations. “Pursuant to the statutory requirement in Section 251 (b)(2) of the Telecommunications Act of 1996 to provide telephone Number Portability, we require all LECs to begin to implement a long-term service provider portability solution that meets our performance criteria in the 100 largest Metropolitan Statistical Areas (MSAs) no later than October 1, 1997, and to complete deployment in those MSAs by December 31, 1998, and that Number Portability must be provided in these areas by all LECs to all telecommunications carriers.”

The Telecommunications Act of 1996 tore down most of the significant barriers to unfettered competition in telecommunications. However, the inability of end-users to retain their telephone numbers when changing service providers or types could potentially dissuade consumers from making such a change. Such a simple, yet considerable obstacle might significantly hinder competition and the growth of the industry as a whole. With the addition of Section 251 (b) (2) to TA 96, Congress addressed this obstacle by defining Number Portability and requiring that all carriers deploy it. FCC Docket No. 95-116 (In the Matter of Telephone Number Portability) and subsequent FCC orders and reconsiderations reinforced Congress’ mandate and set the machinery in motion to implement Number Portability.

Today, wireline NP has been implemented within the top 100 MSAs in the U.S. as mandated, and is gradually being adopted outside of these areas. As of November 30, 2000, over 11 million wireline numbers nationwide had been ported.

The FCC order also set an aggressive implementation schedule for the wireless industry. However, the Cellular Telecommunications Industry Association (CTIA), acting on behalf of the wireless community, has asked for and received two separate deadline extensions. The FCC’s current mandate requires that wireless carriers, including cellular and personal communications service (PCS) carriers, implement service provider portability by November 24, 2003.

When fully and nationally implemented by both wireline and wireless providers, Number Portability will remove one of the most significant deterrents to changing service, providing unprecedented convenience for consumers and encouraging unrestrained competition in the telecommunications industry.

+ Service Provider Portability

Service provider portability, as defined in the Telecommunications Act of 1996, is the ability of end users to retain, at the same location, existing directory numbers as they change from one service provider to another. Historically, all directory numbers (DNs) in one NPA-NXX were assigned to a single telephone switch. The incumbent had a significant advantage in retaining customers by controlling or, in effect, owning the customer's telephone number. If a customer wanted to change local service providers, he or she was faced with the significant inconveniences of a new phone number, including distributing the new number to all of his or her family, friends, and business contacts. So, in order to facilitate competition at the local exchange, the FCC mandated that phone numbers be portable among local exchange competitors (ILECs, CLECs, cellular, etc.).

+ Wireless NP Status, Requirements, Architecture, and Processes

Current Status and Requirements

The initial rollout of NP in 1997 affected only wireline carriers, in the top 100 Metropolitan Statistical Areas (MSAs), with additional rate areas implemented by request only. However, the industry and the FCC recognized that wireless subscribers call ported wireline subscribers and may eventually want to change carriers while retaining the same wireless telephone number. Therefore, the FCC considered and wrote several memoranda to address wireless portability issues:

- The original Docket, 95-116, mandated that all cellular, broadband Personal Communications Services (PCSs), and covered Specialized Mobile Radio (SMR) providers query appropriate Number Portability databases to deliver calls from their networks to ported wireline telephone numbers. The first phase dictated that calls be delivered to the ported telephone number on the wireline side; the second phase required service provider portability be provided by the wireless industry. The FCC's first Reconsideration Memorandum clarified that PCSs would have to provide portability in the 100 largest MSAs as well as simultaneously supporting nationwide roaming.
- The Second Order and Report cited exclusions for wireless. It concluded that licensees should not be required to provide Number Portability if they do not compete in the market for two-way, inter-connected, real-time voice services as well as excluding those licensees providing primarily dispatch and data services. A decision on geographic portability implementation was deferred in this report.
- The Third Order and Report covered cost recovery and query responsibility. In terms of wireline or wireless carriers query responsibility, obtaining routing information to a ported telephone number, the N-minus-one carrier (i.e., the carrier immediately preceding the terminating carrier) is responsible for performing the query to an NPDB to retrieve the LRN. If involved, an IXC carrier would typically be the N-1 carrier.

On February 9, 1999, the Wireless Telecommunications Bureau granted the wireless industry a nine-month implementation stay, as requested by the Cellular Telecommunications Industry Association (CTIA). The FCC further decided that the deadline for wireless portability implementation would be extended until November 24, 2003.

Network Elements

Architecturally, there are seven basic components required to deploy NP: the Mobile Switch Center (MSC), the Signaling Transfer Point (STP), the Service Control Point (SCP), the SCP Management Server (SCP MS), the Local Service Management System (LSMS), the Number Portability Administration Center (NPAC), and Service Order Administration (SOA) system.

NP Methodology and Issues in a Wireless Environment

While the basic infrastructure for wireless and wireline NP is the same, wireless service providers face some fundamental differences associated with service and network operations design and implementation. One significant architectural difference is that the Mobile Switch Center (MSC) replaces the Signal Switching Point (SSP) of the wireline model. These centers must be able to generate an NP query to the SCP (via the STP network) when a call is placed to a telephone number in a ported domain. A query is generated on any call to an NPA-NXX that has been marked as portable in the Local Exchange Routing Guide (LERG) and NPAC with at least one ported number. Based on the nature of most wireless technologies, the Mobile Identification Number (MIN) has been identical to the Mobile Directory Number (MDN). In order to satisfy the FCC directive to support nationwide roaming, wireless carriers using this identification assignment process will need to separate the two numbers. In addition, industry groups have identified supplementary hurdles to overcome, including rate center parity issues, directory listing issues, and wireline-to-wireless porting intervals and billing issues. Currently, these issues have either been referred to or are being addressed by a variety of official industry bodies, including the FCC, Order and Billing Forum (OBF), and NANC.

For accessing Number Portability information and processes in a wireless environment, the wireless Mobile Switch Center (MSC) replaces the Service Switching Point (SSP) within the network architecture. In order to implement Number Portability, a wireless provider's MSC(s) must be able to process calls destined to ported subscribers. In Phase I this is strictly a wireline ported subscriber call, originating at a mobile station. This requirement expands to include wireless ported subscribers in Phase II. Whether now or later, the provider will need to provision software to recognize the specialized trigger mechanisms required for querying capability. A trigger is defined and implemented in the MSC in order to launch the NPDB query to obtain necessary routing information for call completion. Wireless providers should discuss the trigger mechanism and software provided by the MSC vendor in preparation for implementation.

In addition to the MSC switching software modifications, wireless providers must ensure that global title (GT) routing is supported from the switch. Typically, this means a routing indicator in the called party address of the Service Connection Control Part (SCCP) portion of the TCAP message. Routing to the NPDB can either be done using global title (GT) or Destination Point Code/Subsystem Number. Benefits to GT routing include support of and ability to use a regionally distributed architecture as well as load balance functionality across databases and associated linksets. Previously, wireless carriers did not access “enhanced services” databases and as a result opted to not implement GT routing.

On the other end of the process from NP data access, wireless providers must also be able to upload information on their own ported numbers to the appropriate NPAC for access by other providers. A service order administration (SOA) system provides the necessary functionality to interface with the wireless provider’s order and provisioning systems to update the NPAC for access by all other carriers, wireless and wireline. The SOA’s primary functions may include the following: subscription audit request/management, data administration, data transfer to the NPAC, report generation, bulk file parse and upload, subscription tracking, legacy order entry interface, and logging. Depending on an individual service provider’s requirements, the SOA may interface with multiple NPACs to allow for nationwide Number Portability. The carrier-to-SOA connection may be custom-designed to interface with existing carrier order entry systems. However, the SOA interface to the NPAC is a common management information service element (CMISE), providing subscription management functions as well as logging, error reporting, and alarm functions. Specific industry-approved interface requirements are contained in the NANC Functional Requirements Specifications (FRS) and Interoperable Interface Specification (IIS).

Other issues that wireless carriers should consider as they ramp up for full porting implementation include: NPAC certification, inter-company testing, MIN administration, network and OSS integration, directory listings, troubleshooting, inter-connection agreements, cost recovery and bill reconciliation, and the Inter-Carrier Communications pre-porting process.

Phase 1: Call Completion in a Portable Environment

Phase 1 involves delivering calls to ported wireline telephone numbers. Wireless carriers capable of launching Number Portability Request (NPREQ) messages and equipped with switch trigger capabilities may participate in this initial phase of WNP. Capability is contingent upon the following:

- Wireless service providers must have the Location Routing Number (LRN) switch software upgrade implemented for call delivery in their service area.
- The MSC must also have the capability to launch queries using Global Title data, i.e., launching queries to an Alias Point Code (APC) and Translation Type (TT), rather than routing on Destination Point Code and Subsystem Number (DPC/SSN).

Call Flow: Wireless to Ported Wireline Number

1. A mobile subscriber dials a wireline number that is ported. The MSC queries an internal table that identifies all portable NPA-NXXs.
2. If the NPA-NXX is marked as portable, the MSC queries the NPDB using the IS-756 Number Portability Request (NPREQ) message containing the directory number (DN) derived from the dialed digits.
3. If the dialed number is found in the NPDB, the LRN identifying the recipient switch is returned in the response or (npreq) message. The Routing Digits [ROU_TDGT_S] parameter includes the LRN associated with the ported DN.
4. The MSC selects the appropriate trunk group based upon LRN. If the call is routed using ISUP signaling, the LRN is populated in the Called Party Number parameter (CdPN) and the Ported Number Translation indication (FCI) bit is set to “number translated,” identifying that the LRN query has been performed.
5. The call is handed off to the appropriate network and the recipient switch terminates the call.
6. If the destination DN has not been ported, the NPREQ response message would not contain any parameters.

Phase 2: Wireless Number Porting

Phase II implementation encompasses the process of porting a customer from wireless to wireless service providers, as well as the complete integration of the wireline and wireless porting process. In this phase, all pieces of the NP functional architecture are required, including SOA capabilities for uploading a wireless provider’s information on its own ported numbers to the appropriate NPAC for access by other providers. These pieces are described in Section III C. NP Methodology and Issues in a Wireless Environment (above) and in Section E. Inter-Carrier Communications (ICC) Requirements and Specifications (below).

Inter-Carrier Communications (ICC) Requirements and Specifications

Inter-Carrier Communications (ICC) encompasses the standards, technologies, and processes of exchanging data among wireless service providers. The operational requirements and technical specifications for Inter-Carrier Communications regarding wireless Number Portability are defined by the Cellular Telecommunications Industry Association (CTIA). These standards represent a consensus developed by the members of the CTIA Numbering Advisory Working Group and apply to all Commercial Mobile Radio Service (CMRS) carriers.

In January 1998, the CTIA sponsored a workshop on Inter-carrier Communications, which resulted in a recommendation by the CTIA to adopt a phased approach to WNP Inter-Carrier Communications. Given the short compliance timeline (initially), in its August 1998 report on wireless Number

Portability, the CTIA specified a modified version of the wireline Local Service Request (LSR) for Inter-Carrier Communications for the initial phase. It suggested that the second phase eliminate the wireline LSR method from the wireless porting process and consider enhancements or alternatives enabling wireless carriers to exchange porting information through third-party communication process.

The current wireline pre-porting process, using the LSR method, takes 24 hours for completion. However, in recognition of unique requirements of CMRS providers, experts agreed that wireless carriers should complete the entire wireless-to-wireless port within two and a half hours, of which only 30 minutes is allotted for the Inter-Carrier Communications portion. The CTIA Report defines the requirements to achieve the 30-minute interval, as recommended to the FCC by the NANC.

+ Number Portability Deployment Options

Especially for wireless providers, the costs and effort involved to deploy the entire infrastructure necessary to tie Number Portability elements together can prove prohibitive. The industry has seen the development of a variety of deployment options, ranging from a full self-deployment to outsourcing the entire process. Before deciding on an approach, each provider should evaluate not only the costs associated with implementation and ongoing operation of the system as well as flexibility, time to market, technical expertise, and internal resources. Wireless carriers must closely examine and compare their own needs, capabilities, and intentions to determine how best to deploy and manage Number Portability.

“N-1” Call Routing

The FCC adopted NANC’s recommendation that the carrier in the call routing process immediately preceding the terminating carrier, designated the “N-1” carrier, be responsible for ensuring that the database queries are performed. If that designated N-1 carrier in the call path has no NPDB system and has not made arrangements with another NPDB provider, the call will proceed to the original switch network without a look-up. The terminating network, upon determining that a query has not previously been done, will automatically route a query to its own NP database. The terminating network is then authorized to charge the N-1 carrier for the database query. While passing the responsibility to another carrier is the least complicated option for a carrier, it tends to be expensive on a per-query basis and may not be the most cost-effective option, particularly as more exchanges are marked as portable. This deployment strategy only addresses call completion to ported numbers. Service providers must also implement a SOA system.

Inter-Connection Contract

Some large carriers, usually BOCs, offer full service NP data access, switch, and transport. The originating carrier may contract for these services through the regional provider, so that any NP database query in that region will go to that BOC's database. Similar to N-1 Call Routing, but with a formalized agreement with one or more Number Portability providers and generally lower per-query costs. A national provider utilizing this method will require negotiating and maintaining numerous inter-Connection agreements. This deployment strategy only addresses call completion to ported numbers. Service providers must also implement a SOA system.

Full Self-Deployment

Full self-deployment of a comprehensive Number Portability system involves the ownership, administration, and management of all of the network elements, interfaces, and processes described above. Full self-deployment allows the carrier to control all of its elements and processes, but introduces such challenges as maintaining and upgrading the software, hardware, and processes, in addition to regression testing as necessary and when required by industry standards. NP creates an environment in which service providers must keep up with their own enhancements as well as keep elements current with NPAC release upgrades and change orders. Carriers may want to determine which criteria are important in each business environment and evaluate the option against alternatives available.

Partial Self-Deployment

Partial self-deployment includes connection to a service bureau, which provides part of the equipment, connectivity, and services needed for comprehensive Number Portability service. This method relieves carriers of some of the responsibility and expense as they gear up towards a complete internal implementation. This relatively new option allows a carrier to deploy one or more of its own network elements, most likely an STP and/or SCP, necessary for accessing routing data, and directly connect these elements to the service bureau's LSMS system for a charge. This arrangement provides a completely functional NP system for the carrier while at the same time enabling the carrier to retain control over more of its network elements and processes. Partial self-deployment requires less initial capital outlay and fewer ongoing resources from the carrier than full self-deployment. This option may prove cost-effective in high-volume environments over time, but requires more administration than full service options offered by third-party providers.

Full Service Bureau

Similar to inter-connection contracting, but offered by a non-carrier provider. Outsourcing to a service bureau providing a Service Order Administration, LSMS, and/or NPDB platform allows carriers to share access to NP services and resources without incurring the initial capital outlay and ongoing effort of full or partial

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self-deployment. On a per-query basis, service bureau pricing tends to be less expensive than N-1 routing and comparable to inter-connection contracting. A full service bureau with a nationwide footprint eliminates the need to negotiate arrangements with various regional providers. The service bureau typically assumes virtually all responsibilities for provisioning, maintenance, management, and administration as supported by the service and agreed upon by the two parties. VeriSign provides a full service solution. For more information, please visit our Web site at www.verisign.com/telecom/products.

+ Conclusion

By removing one of the most significant barriers to unrestrained competition, Number Portability is perhaps the most exciting opportunity in the telecommunications industry since divestiture. The challenges and opportunities created by Number Portability, especially Service Provider Portability, are enormous, with over \$50 billion in wireless revenues in the U.S. at stake, according to the Telecommunications Industry Association (TIA). The wireless providers that are able to carefully analyze their network and administrative infrastructures, select the best NP solution for their needs, successfully deploy NP, and exploit the new-found freedom of customer choice that Number Portability enables, will position themselves for success in a truly competitive environment. And wireless providers that launch Number Portability initiatives now are likely to enjoy a significant competitive advantage in the future.