

The Impact of Wireless Number Portability Regulations

Maggie Lee

Senior Technical Analyst on Local Number Portability

Illuminet

Introduction

Number portability is a circuit-switch network feature that provides consumers with the ability to change service providers, locations, or service types without changing their telephone numbers. The Telecommunications Act of 1996 mandated competition in all aspects of the telecommunications industry. With this, Congress directed local phone companies to offer telephone number portability. The Federal Communications Commission (FCC) led the charge to ensure implementation of Number Portability (NP).

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. In addition, the industry and the FCC recognized that wireless subscribers do call ported wireline subscribers and may eventually want to change carriers while retaining the same telephone number. With that in mind, the FCC wrote and considered several additional orders 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 databases¹ to deliver calls 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 excluded those carriers not providing service in the market for two-way services and real-time voice services. A decision on geographic portability implementation was deferred in this report.

¹ The routing information includes the location routing number (LRN), which is a 10-digit NANP-formatted Network Routing Address assigned to a switch. Of these 10 digits, the first six (i.e. NPANXX) serve as the network address and issued to route calls to ported numbers. The LRN is obtained by querying a NPDB using a directory number as the input. The LRN contained in the response is then used to route the call to the recipient (new SP) switch. If the dialed number has not ported the call will be complete as usual to the original customer switch. For an existing switch, the LRN is assigned from a 'homed' NPANXX code unique to one carrier.

- The Second Order and Report also addressed call blocking. The order instructed that local-exchange carriers (LECs) are allowed to block defaulted routing calls from wireless carriers, in specific circumstances - when failure to do so is likely to impair the network. Some incumbent local-exchange carriers (ILECs) misinterpreted this to mean blocking unqueried calls from wireless carriers was permitted. Much of this confusion has been straightened out through the LNP Regional Operation team meetings. In the spirit of cooperation, as wireline and wireless carriers attend these joint meetings, such issues eventually get resolved.
- 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 prior to the terminating carrier) is responsible for performing the query to a Number Portability DataBase (NPDB) to retrieve the LRN. If involved, an InterExchange (IXC) carrier would typically be the N-1 carrier.
- On February 9, 1999 the FCC issued a stay and forbearance in which 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 wireless portability implementation would be extended until November 24, 2002. This is typically known as Phase II of number portability.

The FCC also instructed the North American Numbering Council (NANC) to determine which number portability method to employ. Several routing methods were investigated but the Location Routing Number (LRN) method appeared to be the most efficient and is now successfully implemented in the wireline arena. The NANC then initiated the Local Number Portability Working Group (LNPA-WG) and its appropriate sub-committees as needed. Sub-committees convened thus far include the National Number Pooling, Slow Horse, as well as the Wireless Number Portability, which identifies integration issues between the wireless and the wireline industries.

What Is Number Portability, and How Is It Implemented?

As mentioned, number portability is the ability of end users to change service providers (SPs), locations, or service types without changing their telephone numbers. Prior to number portability, changing SPs required end-users to accept a new number or if available, use a switched based, remote call forwarding. Once number portability (NP) is implemented in an MSA, the Incumbent Local Exchange Carrier (ILEC) or the Regional Bell Operating Company (RBOC) can remove the remote call-forwarding tariffs. Further, the FCC 1st Order & Report did not require interim NP measures for wireless service providers (WSPs). The order did require that NP should be 'transparent' to consumers – meaning remote callers are automatically connected to ported subscribers, requiring no procedural or dialing changes to the originating caller.

Number portability is driven by local-loop competition. A recent survey indicated that 90 percent of business customers would not change their service providers if they had to change telephone numbers. A similar survey determined that residential customers, for the most part, agreed. Thus, number portability for wireline was implemented.

In order to implement nationwide number portability for wireline and wireless SPs as seamlessly as possible and to ensure an even playing field for all, NANC recommended sub-dividing the

country into seven regions (Canada, the 8th has since been added), closely resembling the seven RBOC regions. Under this structure, each region hosts a neutrally owned and operated Number Portability Administration Center (NPAC) which manages collection and distribution of ported number data for call routing. A single company (NeuStar) maintains all eight NPACs. The service provider's NPAC connectivity depends on individual operating locations. A service provider might only operate in the West Coast (WC), for example, and require only one connection to the WC Region NPAC. However, for a service provider operating on the East and West Coast, two NPAC connections or instances would be needed. National service providers must have associations with all NPAC regions. The cost factor is significant: the more territories your company operates in, the more expensive NPAC connectivity becomes.

Number Portability Functional Architecture

Now is the time for WSPs to begin building their NP network for both call delivery and the porting process. There are a number of components that make up the NP network configuration. The following section describes the elements directly impacted by the actual porting of numbers and network data download. A variety of other back office systems also require changes to accommodate NP, such as billing, inventory and operational support systems. Each WSP should investigate and implement changes to these systems as necessary for a smooth transition.

The wireless Mobile Switch Center (MSC) must be able to process a call destined to a ported subscriber. 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 WSP 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. Each SP should discuss the trigger mechanism and software provided by the MSC vendor in preparation for implementation.

The Service Order Administration (SOA) system is a high-speed interface between an internal provisioning system and the NPAC(s). The SOA functionality is used for porting in and porting out telephone numbers between SPs. A service provider can choose to develop their own in-house system, contract with a service bureau, purchase a system from SOA software vendor or use a Low Tech Interface (LTI). The Local Service Management System (LSMS) is also an interface between the SP and all or some of the NPACs, depending again on the SPs business model. The LSMS accepts downloads over a mechanized interface for managing call routing information and call completion. Data processed via the LSMS is then downloaded to the network elements. SPs have a variety of options for deploying LSMSs in the network similar to the SOA options. With both the SOA and LSMS, strict interface guidelines must be followed. The Functional Requirement Specifications (FRS) describes the entire NPAC behavior, and the Interoperability Interface (IIS) specifications provide the interface rules between the NPAC, SOA, and LSMS. Even if a third party handles SOA and/or LSMS, familiarity with these documents is necessary to ensure proper construction. Likewise, ongoing changes to the interface requirements must be accounted for and incorporated into the systems.

The network function that provides routing addresses for ported numbers during the query process, as well as default routing for portable NPANXXs, is provided using some type of database platform. Additional layers of software manage downloads from the LSMS into the database platform, such as the Service Control Point (SCP) or a Signal Transfer Point (STP). The SP must ensure that the chosen architecture is capable of storing the number of ported telephone

numbers currently being forecast including pooled numbers, and processing incoming queries or transactions per second (TPS) volumes on the network.

Wireless carriers are building networks now in conjunction with Phase I (call delivery) and planning readiness for full wireless porting implementation. There are options for carriers, some more expensive and resource-intensive than others.

Service-Provider Options for Call Delivery and Port Process

The wireless SP has the same options for call delivery as the wireline carrier did in Phase I. The choices include: deploy or upgrade the MSC to allow NP query triggering to a database; contract with an interconnecting SP (i.e. RBOC) to provide query functionality for all required originating calls, or default dip (dump) to an ILEC or an N-1 carrier without procuring some interconnection agreement. Default dips to either the ILEC or the N-minus-one carrier, is not necessarily recommended. While it may be the easiest solution, defaulting could prove to be the most expensive in terms of per query charges.

Phase II implementation encompasses the complete integration of wireline and wireless porting process. It is in this phase that all pieces of the NP functional architecture are required. These pieces are described in the previous section but keep in mind that the choices are varied – build in-house, mix or match elements with a variety of vendor products, an independent Service Bureau arrangement or contract with an ILEC. Regardless of the options available, wireless carriers must begin to put those pieces together to allow ample time for installation, testing, method and procedures creation, training etc. to avoid a last minute rush.

Network Elements

Network service elements to consider include provisioning, or the SOA functionality. A service provider can interface to any number of NPAC regions for SOA, depending on the providers operating areas. The LSMS receives TN downloads from the NPAC and transmits to the local database which hours the routing information for a ported telephone number. Once the number is ported, and the provisioning process has been completed, TN resides on the new service provider's switch, a request for activation is submitted through the NPAC. The NPAC then broadcasts the routing information (the LRN for that ported TN) and the service provider identification to all associated LSMSs and subsequently the NP database. If the service requires global title translation (GTT), it also comes from the NPAC and is loaded into a database. GTT is a transactional capabilities application part (TCAP) query of a database, to look up the ported TN routing data, and provide a response to enable the query-originating switch to terminate to the proper end-office. LNP data access allows a service provider to query the database for the LRN and 10-digit GTT on ported numbers.

The SP must also consider who will provide them SS7 switch and transport to the NP databases to obtain call routing information. NP switch and transport uses an industry standard NP protocol and supports three different types of TCAP query and response messages. The Advanced Intelligent Network (AIN) query type for AIN switches, an intelligent network (IN) query, and a NPREQ or NumberPortabilityRequest, which is a slightly different type of TCAP query. With the exception of Personal Communication Service (PCS) 1900, wireless carriers are using the NumberPortabilityRequest query format. Regardless of the message type each performs the same functionality – queries a database, retrieves information, and returns a response. It is important that each SP understands the TCAP query used in their embedded base and ensure the database vendor of choice is capable of supporting that query type.

(E)9-1-1, Location-Based Requests, and Roaming

An MSC can connect to the Emergency Service Provider (ESP) in several ways and current arrangements typically do not automatically forward the mobile station callback number to the ESP. FCC Docket 94-102 mandates that communications providers deliver a wireless E9-1-1 caller's, callback and location information to the ESP. In the proposed portability configuration, the Mobile Directory Number (MDN) must be provided to the ESP for call back purposes and this requires modification. The impact of number portability is such that the MSC must be modified to forward that MDN and not the Mobile Station Identifier (MSID).

In a wireline to wireless port, a scenario could occur in which the call back from emergency services gets routed incorrectly. If the wireless phone is activated for service prior to the completed port activation by the NPAC, and the customer calls 911, the correct MDN for callback will still be delivered to the ESP. However, until the port activation is completed and the NPAC has downloaded the new routing information to the network, a callback attempt to this MDN would be routed to the old wireline switch instead of the wireless switch resulting in incomplete return call routing from emergency personnel.

Another 911 issue exists during a "mixed service" period between NPAC activation by the wireless carrier and disconnect by the wireline carrier. If a call to 911 is placed from the wireline phone and subsequently, the emergency service attendant attempts to return the call, the attendant's call would be routed to the wireless phone instead of to the wireline phone from which the emergency situation was reported. That is, the ESP attendant cannot reestablish the connection to the wireline phone during the "mixed service" interval. This will occur for virtually all calls in this situation.

The exchange of telephone data, as well as the maintenance of the integrity and content of the data, between a E9-1-1 provider and companies participating in NP must be managed effectively. Timing of updates or activates at NPAC is critical for both the "unlock" and migration of 9-1-1-data. Unlock is the action required by a 9-1-1 service provider upon notification from a donor company making the end user's number record available for the recipient company to replace the customer details and Company ID. Migration is the term used to describe the inward transaction the recipient company submits to the 9-1-1 provider, which signifies movement of telephone service from a donor company. In June 1997 the National Emergency Number Association (NENA) published recommended standards for Service Provider Local Number Portability [NENA-02-006].

Docket 95-116 states that wireless providers must support nationwide roaming. In order accomplish this, the mobile dialing number (MDN) and the mobile identification number (MIN) must be separated—particularly in light of the way the wireless number portability architecture is built. The same 10 digits will not be used for both the MIN (MSID) and the directory number. Since the architecture itself is built on the separation of the MIN and the MDN, handset changes may be required.

Overall industry experts advise that NP is inconsistent with original E9-1-1 design and therefore drives new requirements for call routing control and database management.

Number Pooling

Number pooling is a number administration and assignment process, which allocates numbering resources to a shared reservoir for code relief and number conservation. Number pooling is currently being trialed in some states and successfully employed for specific codes in Illinois. The wireless community is involved in discussions on number pooling. However, based on a September 1999 order from the FCC, wireless will be exempt from participating as they currently are not in a complete porting mode (i.e. wireless carriers are without NPAC to LSMS connectivity.) The national number pooling methodology currently under development requires that the LRN method, along with NPAC implementation be used. There has been discussion around the possibility of alternative methods of pooling that would allow wireless carriers to participate but to date no consensus or ruling has been mandated.

Wireline carriers in number pooling areas currently have specific Industry Numbering Council (INC) guidelines to follow. The participating carriers must contribute numbers to the pool and provide forecasts in order to obtain numbers. Pooling is currently limited to within single-rate center boundaries. Pooling participants will interact with a Pooling Administrator (PA), as approved and contracted by the Regional Limited Liability Corporations (LLCs).

The preferred method of number pooling is the pre-port of a 1,000 block of TNs as assigned to a carrier by the PA. Other methods discussed include individual telephone-number (ITN) pooling method and or unassigned number porting. ITN is the allocation of individual TNs (as opposed to a block of 1000) from a common pool also administered by the PA.

While the wireless community is not required to participate initially in number pooling, the September 1999 ruling did dictate that the Number Administrator will ensure that 10,000 number blocks are available for assignment to wireless carriers. This safeguard ensures wireless carriers are not prevented or disabled from operating in a pooling environment.

More Hurdles to Jump

While the basic infrastructure for wireless and wireline NP are the same, wireless service providers have some fundamental differences associated with service and network operations design and implementation which have been identified. Some of the differences and hurdles to overcome include rate center parity issues LATA vs. non-LATA boundary restrictions and stationary wireline local loop vs. no fixed physical facility for wireless subscribers. Some of these issues are being addressed at the FCC.

In addition to the MSC switching software modifications previously mentioned, WSPs need to 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 (SCP) portion of the TCAP message. Routing to the NPDB can either be done using global title translations (GTT) or Point Code/Subsystem Number. Benefits to GT routing includes 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 have opted to not implement GT routing. WSPs should check with switch vendors for feature availability, scheduling and costs.

Other issues wireless carriers should consider as they ramp up for full porting implementation include: intercompany testing; telephone directory listings for customers who opt to switch their wireline service to a wireline provider and wish to publish directory information; troubleshooting;

interconnection agreements; cost recovery and bill reconciliation, as well as the Intercarrier Communications pre-porting process.

Conclusion

By the end of January 2000, 5.36 million telephone numbers were ported including the United States, Canada and pooled Illinois numbers. Historical information indicates approximately 500,000 numbers are porting each month. We certainly expect this number to grow in the future as wireless providers begin to port and more pooling activity takes place. Some very good documentation exists on implementation of number portability. The *CTIA Report on Wireless* and the NANC LNPA-WG 2nd Report on Wireless Wireline Integration are excellent examples. Both of these documents explain the issues and activities required from the wireless carrier's perspective, to implement number portability. As all industry forums and sub-committee meetings are open to the public, SPs participation is encouraged and needed.