



White Paper

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Mobile Number Portability Network Correction

In a globally integrated telecommunications community, local regulatory changes can have effects that reverberate worldwide. The implementation of number portability initiatives in many key markets created new opportunities and improved the consumer's experience, but terminating calls into number-portability countries became more difficult, confusing and expensive as a result. Awareness is only now emerging regarding the intercountry routing challenges posed by number portability, and the market has yet to embrace an effective solution. Telecommunications pioneer Arbinet has introduced several initiatives to address cost and routing inefficiencies in a global number portability environment.

What Is Number Portability?

Number portability allows end users to keep their phone number when they switch service providers. Regulators embraced mobile number portability to promote healthy competition between mobile carriers. Changing numbers, while not impossible, was an obstacle that discouraged customers from switching mobile service providers. Carriers were sometimes lulled into a degree of complacency about serving their existing customers. Number portability made it easier for customers to shop around for the best deal and shifted the market to a "consumer-centric" number ownership model, rather than the "carrier-centric" number ownership model that was previously in place.

The result was lower prices and greater customer satisfaction. In all, number portability sparked a new wave in customer acquisition for competitive mobile carriers that continues to this day.

During the last 10 years, a robust ecosystem has formed around number portability. Most of this ecosystem has focused on implementing number portability within a particular country, since number portability is either a country-specific regulatory edict or one mandated regionally – as in the case of the European Union.

However, the impacts of number portability on intercountry traffic have largely flown under the radar, despite their large and growing impact. A detailed look at mobile number portability within Europe – a representative market with a significant population of mobile users and several years of number portability experience – illustrates key trends and points toward possible solutions to the challenges around global number portability.

In Europe, EU lawmakers mandated mobile number portability under the Universal Service Directive, which became effective on July 25, 2003. Each country was allowed to implement number portability with the methodology and technology that best matched existing carrier architectures and customer needs. In addition, carriers' rates were reviewed and set periodically to encourage competition as well as to allow

new entrants to recover hefty initial investments while competing effectively with established mobile providers.

Impact of Number Portability Today

Inter-country global traffic in 2007 reached approximately 329B minutes, of which 115B minutes, or 35 percent, terminated to mobile telephone numbers.¹ No official numbers exist, but best estimates suggest that of these 115B mobile terminated minutes globally in 2007, 37.8 percent were to mobile number portability countries, for a total of 43.5B minutes directly impacted by mobile number portability. Across markets, that number is experiencing a double-digit rate of growth per year.

Assuming, on average, 10 percent of these minutes are to ported numbers within portability-enabled countries, a potential 4.35B minutes are being incorrectly rated per year. Collectively, these minutes may be incurring as much as €65M, or \$96M,² in unnecessary transit penalty costs³ and several times that in misrated Mobile Termination Rate (MTR) charges (higher or lower). This is a significant impact on an industry continually looking to cut costs.

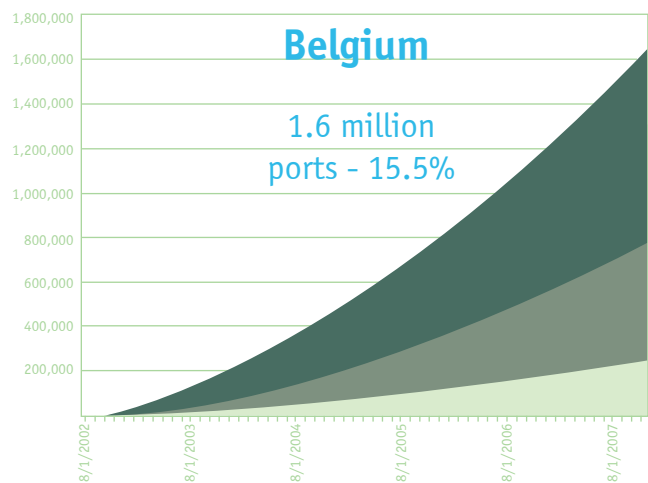
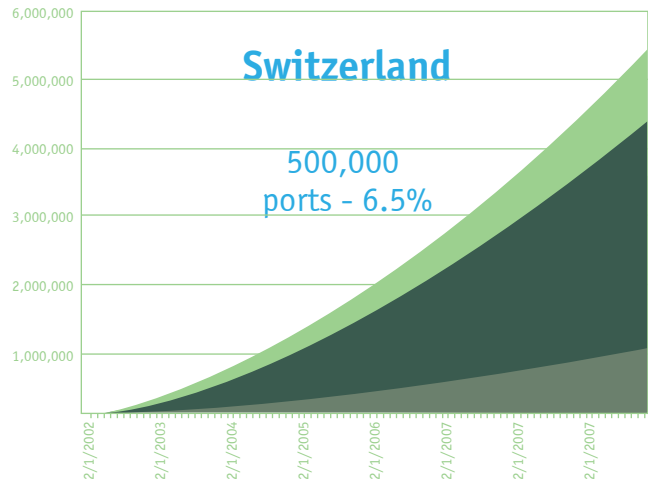
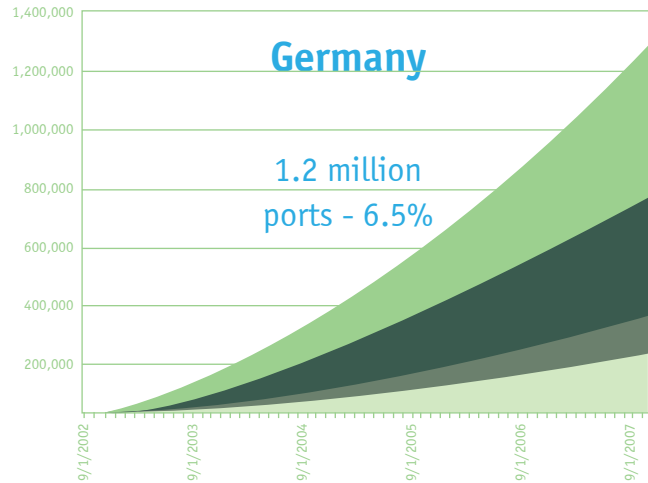
A Swiftly Growing Problem

The chart below illustrates the degree of portability uptake by EU countries.

France	1.8%	Germany	1.3%
Switzerland	6.5%	Netherlands	11.3%
Italy	12.8%	Sweden	14.6%
Belgium	17.4%	Finland	58.4%
USA	22.9% ⁴		

This snapshot does not factor in the growth rate of mobile traffic, the portability uptake lag created by multi-year consumer contracts, and the increased competition in the mobile sector since portability began.

The rate of mobility growth in Europe was 21.7 percent in 2004.⁵ Globally, it averages 22.5 percent per year and is still climbing strong into 2008, according to projections. A few examples of that growth, and of the amount of porting between in-country mobile carriers, are shown at right.



1 Source: Telegeography 2006 – Global Traffic Statistics & Commentary – Data exact or extrapolated.

2 Source: European currency conversion rate in Wall Street Journal dated 12/14/07 at \$1.47 to €1.00 Euros.

3 Using a known 1.5 Euro cent-per-minute penalty rate times the number of ported minutes.

4 Source: Jonathan Banks, SVP for Law & Policy, U.S. Telecom Association to the Committee on Commerce, Science & Transportation, 7/12/2007 statement of 57M ports divided by June 2006 FCC report of 219M US mobile subscribers less 3 percent wireline-to-wireless ports.

5 Source: Telegeography 2006 – Global Traffic Statistics & Commentary: Mobiles p. 58-59.

As both the total amount of mobile traffic and the percentage of ported numbers increase, so too will the total number of misrouted minutes and the overall financial impact on carriers.

How International Calls are Routed

In order to understand the degree of the mobile number porting problem, one must understand how calls are routed today to get from the point of origin to their ported or unported destination.

The originating international carrier receives the call from an end user directly or indirectly and uses the dialed number embedded in the C7 or SS7 signaling stream to decide how best to route the call. The dialed number is then analyzed by the switch or an external SCP based upon the ITU codes assignment schema (Country Code [1-3 digits], National Number [max. 15 digits]) and matched against their Least Cost Routing (LCR) system for how best to route the call. In some terminating country cases, the national number is broken down further to define different cities, regions, fixed carriers or mobile carriers. These designations are typically fixed and predictable until number portability is implemented.

Each sub-route may be at a different rate and therefore, based upon the LCR logic, may be sent to a different long-haul carrier to complete or sent down a bilateral route they may share with the in-country operator. The LCR will also determine routes based on needed call quality, rates and other business rules.

Regardless of final route decided by the LCR business rules, the call will be onward routed to a carrier serving the destination country based on the presumed-to-be-correct assigned code of the final terminating carrier. It is this presumption and the uncertainty that number portability injects into this process that is at the heart of portability problems.

Once the call reaches the designated in-country carrier, that carrier utilizes any one of the four following technologies to determine which carrier currently serves a particular mobile telephone number. These four main technologies have been adopted to deal with in-country number portability corrections.

1) All-Call Query

Requires central database, all calls queried for status (most efficient)

2) Query on Release

Requires central database, only query ported

3) Call Dropback

No central database

4) Onward Routing

No central database, additional circuit for duration of call (least efficient)

Depending upon the mechanism encountered, a transit penalty charge may be assessed to cover the cost of an additional call leg, if the routing is identified as incorrect.

For all methods, the originating carrier remains unaware of the final destination of any particular call, what percentage of its calls are ported, which ones were more expensive and which ones were less (assuming the lower-priced call is even passed back to the originating carrier) and if a transit penalty was applied or not. The bill that hits them in 30, 60 or 90 days cannot be validated and may have added up to a relatively large sum.

Global Number Portability Creates Price Uncertainties

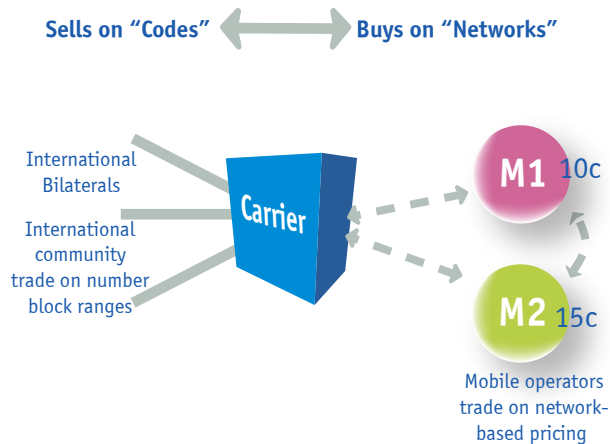
Increasing uptake of number portability increases uncertainties around the rate an originating carrier will be charged for a call to a portability-enabled country. Each originating carrier knows the termination rate to a mobile number based on codes-based routing.

However, if that number has been ported, the originating carrier has no visibility into the true rate.

The rate to a ported number may be the same, higher or lower than is suggested by codes-based routing. In some countries, this amount is significant; in others, a transit penalty of at least 1.5 Euro cents⁶ may apply to each minute of the ported call.

These uncertainties have largely been absorbed by transit carriers that carry the call to the terminating mobile carriers. However, the rate uncertainties have manifested themselves in terms of inflated blended rates sold

to originating carriers. These rates are based on the original codes definition with an assumption on the likely volume of calls ported to higher-priced networks (see diagram below).



Unfortunately, as the pressure increases on transit carriers to reduce rates, they search for carriers with lower “ported” assumptions with the natural result that their costs have to increase to handle these ported calls. Add a less scrupulous “cherry-picking” carrier into this mix with a deliberate attempt to pass off a high volume of ported calls, and the whole structure starts to disintegrate.

Variable MTR Spreads

Rate uncertainties are amplified by the sometimes wide spread between mobile termination rates (MTR) within the country – in some cases varying as much as 100 percent between established PTT-owned mobile carriers and new entrants offering advanced 3G-capable voice and data networks.

Regulators endorse these MTR differentials to enable new entrants to recover high-priced spectrum and advanced network start-up costs.

An example of one country in Europe where the rate differential compounds the number portability economic pain point is Poland, depicted in the diagram below.

Poland Example



Some countries, such as Germany, have MTRs that are closer. Others, such as Italy, have even wider rate spreads, caused by new 3G entrants charging privately established, even higher, mobile termination rates outside the regulated and established MTRs.

The Danger of Cherry Picking

The above-referenced MTR differentials also provide “cherry-picking” opportunities for some carriers that have partial or complete knowledge of the ported number universe in a destination country. That knowledge can help them concentrate ported traffic and send it to codes-based sellers. These calls appear to be to codes-based, low-priced, mobile carrier destinations, but are in fact ported to higher-priced mobile destinations. This leaves the codes-based carrier with a higher cost than they had predicted based on portability penetration, effectively handing them a negative margin. This cherry-picking gamesmanship has been going on in telecommunications for years, and number portability opens up new opportunities for certain unscrupulous carriers with advanced knowledge to take advantage of unsuspecting codes-based sellers.

A recent analysis of traffic being routed to the Proximus codes in Belgium conducted for one international carrier found that they were receiving seven times as many calls ported to Base – a higher-cost mobile operator – than they would have expected given the true portability percentages in that country.

⁶ Please note: The transit penalty illustrated above is one known transit penalty encountered in several key European countries. Transit penalties are levied in each country and may be higher, the same or lower. The figure, while accurate in some but not all markets, is used here for illustrative purposes only.

Unpredictable Cost Structures

Passing those surprise differential costs back to originating carriers leaves them with several economic, business and accounting challenges. These include:

- 1) Unauditable changes in terminating mobile carrier rates
- 2) Possible transit penalties passed back to the originating carrier
- 3) Inability to identify which carrier sent the higher volume of ported calls
- 4) Altered costs charged back outside normal quarterly operating windows, making Sarbanes-Oxley (SOX) and other accounting compliance requirements next to impossible to meet
- 5) Insertion of extra switches and connections to onward-routed calls, increasing post dial delay and degrading quality

Finding a Solution

While legislating uniform MTRs and eliminating ported number transit penalties would solve the financial aspects of the portability problem, both fee structures provide important benefits to the mobile market, and there are no in-country constituencies for eliminating them. Waiting for a regulatory solution is not a viable approach to the international number portability problem.

An ideal solution would leave in place the current regulatory framework but provide access to mobile number portability (MNP) databases to inter-country carriers as well as in-country carriers.

Opening MNP databases to the originating carrier allows it to effectively determine the terminating carrier on a call-by-call level and rate the calls based on the true terminating price. With this data, the originating carrier can make the best choice on how to route to the network-correct carrier or to an appropriate surrogate, and eliminate back-billing problems.

This optimal solution nonetheless faces three challenges:

- Negotiating the regulatory and technical hurdles associated with accessing and processing databases established to different standards in each country

- Devising ways to send traffic to destination carriers that isn't mistaken as errantly routed calls, triggering unnecessary transit penalty and erroneously charged MTRs
- Creating ways to deal with traffic for carriers with large differences in technical capabilities

These challenges, while large, are not insurmountable and are presently being broadly addressed by Arbinet on a commercial basis.

Arbinet's Solutions

Arbinet has been in the international voice business for nearly a decade, assisting carriers of all sizes to route traffic efficiently and effectively around the globe. With the advent of number portability, Arbinet has created a series of products that helps carriers, regardless of their technology and size.

External Switched Minute Solution

For smaller carriers, Arbinet offers a traded minutes solution. For certain number-portability countries, an originating carrier can send its minutes to Arbinet, who then delivers that traffic via high-quality carriers. This arrangement offers competitive pricing by eliminating the portability risk premium.

Internal Switch-Based Solution

For carriers wishing to maintain call control and complete calls using their own facilities, but who do not have the ability to query external databases, Arbinet offers a switch-based query solution. This configuration utilizes an Arbinet switch to filter traffic on a signaling level. Arbinet returns calls for number-portability-implemented countries to the originating carrier tagged with the various terminating mobile carriers. This allows the originating carrier to identify ported numbers and route calls accordingly using its own facilities and routes.

Internal Query-Based Solution

For carriers with sophisticated switching architectures, Arbinet has assembled a growing and constantly updated database for number-portability destinations that carriers can query. Carriers maintain call control and are able to direct their traffic correctly. The information also empowers

carriers to negotiate new interconnection agreements with terminating carriers, driving unnecessary costs out of the process and improving call quality simultaneously.

Looking Forward

Number portability empowers consumer choice and drives higher levels of service and competition. However, it also creates challenges in both in-country and intercountry call routing. Successful steps toward solving in-country challenges suggest that intercountry challenges are ultimately solvable as well. However, little effort has been devoted to the intercountry challenge to date.

Arbinet and other pioneers have debuted solutions that will ease the number portability burden, resolve existing financial impacts and restore efficient network routing. Arbinet is working with carriers to craft a response to realize cost reduction, quality improvement and account resynchronization. To participate in the industry conversation around global number portability, visit globalnumberportability.org, where blogs, forums and other interactive features explore the latest developments in international routing in a number portability environment.

While most of this paper has been devoted to voice calls, the same principles apply to SMS and MMS routing as well. For text and multimedia-style calls, number portability poses even greater challenges as the calls may simply not complete to a ported number. Neither the sender nor the recipient may be aware the message was lost. Mobile number portability correction takes on an ever-greater sense of urgency for mobile text and multimedia messaging.

Authors

George A. Grabowich has served in vice-presidential positions at several communications and web-based companies during the past 25 years. His telecommunications experience has concentrated in both the wireless and wireline areas with companies such as Arbinet, Portable Internet, Passport Corporation, AT&T Local Services, Teleport Communications Group, RAM Mobile Data (formerly owned by Cingular), Metromedia Communications and ITT.

Jim Guy joined Arbinet in November 2006 and is primarily responsible for the services development and deployment of the Mobile Solutions product suite. With 34 years of experience in global telecommunications ranging from research, strategy and systems technology, he has worked at leading service providers such as British Telecom, Concert Communications, Teleglobe Inc. and Equant (Orange Business Services).

Notes

