LNPA TRANSFER WOULD CAUSE SIGNIFICANT INDUSTRY CONFLICTS

Executive Summary

The introduction of VoLTE and new services such as Web Real-Time Communication (WebRTC), Wideband Audio (HD Voice), and Machine-to-Machine (M2M), will result in a period of significant innovation in the wireless industry that will benefit customers immensely. The underlying technology will necessitate changes to just about every aspect of a carrier's infrastructure, including building a new, spectrally efficient voice-capable data network, rebuilds of essential public policy foundations like Enhanced 911 (E911), Communications Assistance for Law Enforcement (CALEA), and significant changes to back-office and billing platforms. At a time when all resources are fully dedicated to the move to HD Voice and VoLTE, the industry is also considering the future of Local Number Portability (LNP) , a platform which itself has had a profound and lasting effect on the wireless industry. This paper discusses how a change in the Administrator for LNP (the LNPA, currently Neustar, Inc.) could severely impact the strategic efforts being undertaken by service providers across the wireless market.

LNP is part of the underlying fabric of the U.S. wireless market, and plays a central part in the rollout of VoLTE networks, HD voice services, and a new generation of smart devices. Today, the process used by an individual changing providers while porting his or her number - which happens within minutes, thousands of times a day – is only the most visible part of the work that LNP enables for consumers and service providers. LNP is also vital to the evolution and protection of wireless networks as a result of technology advances, mergers and acquisitions, and disaster preparedness and/or recovery. In short, Neustar's LNPA service keeps networks and customers connected in an environment of constant and accelerating change. Neustar has worked with the industry to develop all the necessary software, standards, and procedures since the inception of LNP, and over 17 years has established a platform and service that delivers authoritative routing and rating data to all US networks with maximum availability and reliability. The accuracy and accessibility of LNP data is part of the machinery which connects every call and text across the country, and as a result is a critical part of the U.S. telecom infrastructure. A decommissioning and replacement of this infrastructure presents significant challenges and pitfalls for any service provider looking to maintain a superior customer experience while at the same time undertaking disruptive innovations inside their own networks.

We reviewed a report from Hal Singer (formerly with Navigant, now with Economists Incorporated) that places the cost of an LNPA transition at $719 million in consumer-impacting errors and service outages. We found the figures and the methodology to be good faith estimates based on the real-world consequences of the almost-certain issues attendant to any large infrastructure transition; in fact, they might be at the lower end of what can be expected. In addition to the quantifiable costs, service providers risk a host of unknown costs in deferred innovation opportunities and lost brand value. Service Providers and the FCC should consider all aspects of the potential risk before embarking on any LNPA transition.

What's at stake for carriers?

In the wireless technology arena, there is a constant race without a finish line. Customers are demanding more data, smarter devices, and more personalized services. Not long ago, EDGE networks were de rigueur. But that has changed quickly; in rapid succession, carriers have deployed 3G and 4G LTE networks, and are now developing and deploying next-generation LTE Advanced networks—all with the goal of meeting accelerating customer demand. As wireless providers upgrade from circuit-switched voice calls to communications over the Internet, it's impossible to overestimate the impacts for consumers and telecom operations. Carriers are fast readying to provide a significant upgrade to voice quality with HD Voice. The promise of CD-quality voice and rich communications services on your mobile phone has been long in coming. Customers will flock to this new technology, as it eliminates makes calls significantly clearer, extends the communication media with presence, location chat etc. The move to VoLTE and WebRTC will provide immense benefits to customers and conserve the valuable and limited spectrum the carriers own.

Despite initial implementation challenges with VoLTE, the move will result also in significantly more efficient infrastructure. This is especially welcome as voice traffic became spectrally more inefficient when carriers migrated from 2G to 3G. So with VoLTE in place, carriers will be able to make that old spectrum much more efficient as they roll out HD Voice.

And let's not forget data. Between 2008 and 2013, carriers spent more than $400 billion upgrading and expanding their networks (including $100 billion dedicated to wireless networks) to provide faster, more capable wireless data networks. And for carriers, data (and lots of it) is the coin of the realm. Demands on wireless networks will grow as data usage increases and carriers adopt more bandwidth-intensive HD Voice, Next Generation services on top of the already explosive data growth that is naturally occurring.

The investments in the new services and networks would of course be in vain if customers don't continue to spend and consume at higher levels. New efficient services thus require new devices with more functionality than ever before, and which can take advantage of the new networks and new features. The carriers share the cost in these devices with the customer, but that's an expensive up-front battle. "The network is the computer," the old saying goes. And it has never been truer in the wireless age. The functionality of the mobile device depends on the electronics in the device, and the raw computing power it provides. But to make it really work, you need the network and gobs of bandwidth. If it isn't there, just put the phone on airplane mode and play chess. Because there's not much else you can do with it. The network connection, and the speed and bandwidth that go with it, are the lifeblood of the device and the carrier. Without it, they're nothing.

To add to the complexity of the transformation of the network and the rollout of ever more devices, critical regulatory requirements still have to be met. E911 allows emergency calls to be connected on a priority basis and transmits the caller's location to the public safety dispatch centers. CALEA allows law enforcement to intercept communications and trace called party numbers. These and a host of other regulatory requirements all need to be effectively recreated by service providers on an evolved next-generation network and a reengineered back office, with no gaps in compliance.

In essence, services, networks and devices are a three-legged stool, with each leg a critical ingredient in the success of the entire business model.

Carrier M&A activity continues apace

Every year, there are more than a dozen carrier mergers—large and small—most of them unnoticed by the public at large. For example, on July 12, 2013, AT&T bought Leap Wireless.

Less than six months later, on December 11, 2013, C Spire announced it was buying Callis, a small carrier based in Mississippi.

For a large carrier or a small carrier, the integration of an acquisition is key. No integration is perfect and most of the integration work happens behind the scenes. Carriers need a smooth integration process to make these integrations painless and invisible to the customer. Fewer service interruptions translate into a higher likelihood that the purchased customers will remain with the purchasing carrier, which is an obvious value driver in the transaction.

Acquisitions are rarely a clean cutover of assets from one carrier to another. For example, when Verizon acquired Alltel in 2008, the FCC mandated divestiture of 105 markets. AT&T acquired 79 of the divested markets and Atlantic Tele-Network acquired the rest, which it then re-sold three years later to AT&T. These divestitures and subscriber transfers, like virtually all routing and rating changes between networks, rely on the continuity of the LNP system. How about the effect on customers? Anxiety about moving to an acquiring service provider mounts as part of any transition. Anticipating and avoiding these kinds of problems for a carrier is often the difference between a successful acquisition and protests to the FCC. All stakeholders—including carriers, customers, shareholders and vendors – have an interest in minimizing the risk, cost, and complexity of whatever mergers may be on the horizon. The LNP infrastructure is therefore critical to ensure thee mergers and acquisitions are seamless with respect to consumers and provide a platform for carriers to launch VoLTE and Next Generation services.

If carriers redeploy strategic resources to an LNPA transition, what should they ignore?

Wireless carriers have finite resources as they undergo these transformational technology events, which have the potential to completely reshuffle the market. The work outlined above will keep most of the engineering and IT organizations at full capacity as each provider races to out-innovate the competition and out-serve the customer. If undertaken at the same time, a shift to a new LNPA provider will take resources away from these projects, if not delaying or derailing them outright.

It comes down to this: Should customer demands be paramount, or should an LNPA transition with significant execution risk take precedence?

How did we get here?

The LNPA serves as the definitive registry for routing, rating, and billing data for telephone numbers that are no longer assigned to the original NPA-NXX code holder. After 10 years of wireless number portability and 16 years of fixed line portability, over 650 million telephone numbers have their authoritative ownership and routing information managed by the LNPA. Thanks to market competition, new number assignment, and ongoing network management, information in the registry is updated over 1.5 million times per day, and each change is broadcast to hundreds of network elements across the country in real time.

Porting a mobile phone number might seem like old hat these days. But it wasn't long ago that it was unimaginable. Before November 2003, the technology to transfer numbers between networks in near real-time was untested, and the methodology was unproven. When it came, it was a boon to customers. The hassle of having to get a new number and telling your 500 closest friends when changing wireless carriers was a thing of the past. When the process of switching carriers was made easier, everyone benefitted.

Here's what happens behind the scenes of a call to a ported number: Calls originate within the initiating service provider's switch, which first must initiate a query to a local copy of the LNPA database to see if the number has been ported, and if so what is the Location Routing Number (LRN) for the number being called. This LRN replaces the called number to determine the

definitive network address for the called party's switch, and thus the call is connected. This complex dance happens billions of time each day, unseen by the customer. A similar process is executed to deliver text messages.

Today, no one thinks about the complexities of porting a telephone number. The industry got to that position after years of work and investments. In the early years of portability, it was not uncommon for it to take several days to port a number from one carrier to another. Now, the porting process is done within minutes. Neustar and service providers worked for years building a service that today boasts the shortest porting times in the world, with near-perfect availability and reliability for consumers and operators. This record is a critical foundation for market competition, as many consumers, but especially the most valuable and highest spending consumers, simply don't change providers without taking their phone numbers with them.

A new LNPA migrating a massive database to a new infrastructure (or, worse, building a new one from scratch) will inevitably encounter a lot of the same problems that Neustar has already learned to overcome and avoid over 17 years, and will therefore trigger a significantly higher number of subscriber issues than Neustar offers today. The possibility of a change in local number portability administration could threaten brands, reputations, and business prospects for all types of carriers—from the large national carriers to the more fragile regional players. Carriers have spent years, and in some cases decades, building their brand values. So the prospect of damaging that hard-fought equity is not appetizing. Moreover, all the players in the wireless industry depend on the strength of others. So a devaluation of even one brand will affect the perceived value of all.

What could possibly go wrong with a huge database migration?

Migrating a large database is seldom a smooth exercise. Rarely do fields match up precisely. Errors are inevitable and can have broad impacts on customers and carriers alike.

For example, in 2012, Ericsson's migration of O_2's central user database caused an outage of 20 hours for 7 million customers. The aggravation and inconvenience to customers were obvious. Perhaps more importantly, the brand equity loss for O_2 was enormous, estimated to be over $1.3 billion (according to a Sept. 2013 analysis by brand marketing specialist Millward Brown).

Companies in other industries have suffered similar fates under similar circumstances. When United Airlines migrated its reservation system in 2012, the result was mayhem and tremendous financial impacts. Normally, merging airlines integrate their systems over years in a slow and methodical process. United tried a complete system integration and cut over on one day, similar to what a change in LNPA would look like—only a lot simpler. United began using Continental's reservation system, integrated Continental's 40 million frequent flyer members with United's 60 million, and changed the rules of the frequent flier program to United's. This compares to more than 650 million records in Neustar's NPAC system. On the first day of the United debacle, only 25% to 28% of its flights left on time, affecting more than 500 flights and 53,000 customers—and resulting in a 37% drop in quarterly profit. Imagine that kind of scenario—only orders of magnitude larger. The impact was billions of dollars in lost profit, brand equity, and customer service ratings. Specifically:

- United earned $840 million in 2011 and lost $723 million in 2012 – a swing of $1.6 billion. Management blamed most of its financial problems on transition issues, especially the reservation system transition.
- Brand impact estimated at over $800 million (Millward Brown, Sept. 2013)

- In April 2013, the premier airline customer service survey (Purdue / Wichita State) reported United dead last in all customer service categories. On-time performance (OTP) "suffered a partial operational meltdown during the 2012 summer season" due to the migration when its OTP in Jul-2012 sank to 64%, a 10.2 point drop year-over-year while "merger integration

headaches resulted in significant revenue degradation for the carrier in 2012" according to CAPA, a leading airline market intelligence firm.
- United's Airline Quality Rating fell from -1.45 to -2.18 from 2011 to 2012. Major airlines rarely fall below -2.00 in this survey. To this day, United's customer service ratings remain worst in their industry.
- In the period following the transition, United was the subject of 34% of all airline industry complaints and 45% of refunds – increases of approximately 50% over the prior year.

How much will an LNPA transition cost carriers?

The perceived economic benefit of an LNPA transition is the possibility of lower vendor fees. However even a basic analysis of the risks show the likelihood of unforeseen costs that easily reach hundreds of millions of dollars.

Hal Singer reports in *Estimating the Costs Associated with a Change in Local Number Portability Administration* that approximately $719 million in additional cost would accrue to carriers in the first year of an LNP administrator transition. The report notes that the costs would be in the form of service credits, hands-on customer service, operations research, and additional system testing.

Singer's cost estimates are simple calculations based on the very reasonable assumption that a change in LNPA vendor will result in some level of increased LNP error rates, and these additional errors will lead to increased customer service and engineering costs (plus a small impact for service credits). A close look shows Singers's assumptions to be straightforward and very conservative, likely underestimating the true impact.

Each year over 500 million LNP updates are received and processed by the LNPA, and each of these is delivered and confirmed to hundreds of service provider networks. This results in over 12 billion total yearly interactions between the LNPA and US networks. Given the enormous volume of critical updates, Singer estimates that even a small error rate will impact 7.1 million consumers, of which 5.5 million would contact their carrier's Customer Service department. These assumptions are very conservative. (i.e., less than one percent of LNP users would need to contact Customer Service due to errors caused by the new LNPA). Industry figures show that customer service interactions cost an average of $60 per call, while engineering involvement can cost about $100 an hour - so even a low percentage of incremental error will quickly lead to hundreds of millions in additional expense.

LNP problems are not easily solved. If each customer service call takes an hour to resolve (and when an issue like a number port goes wrong, it can be a lengthy process to clean up), that more than accounts for Singer's estimate for customer service costs. Many number portability issues cannot be solved by customer service alone, though, and engineering personnel would also need to get involved and that accounts for the additional costs.

Singer's figures are good faith estimates, and likely low-ball some figures. In sum, the categories and the amounts assigned are certainly not unreasonably high. But, these are only the costs we can most easily anticipate. Left unaddressed in Singer's paper were two extremely large risks: the strategic opportunity cost for refocusing resources on LNP instead of VoLTE and HD Voice migrations, and the potentially disastrous effects on brand equity, analogous to what happened to O2 and United Airlines in 2012. Brand value is especially hard to quantify but easy to lose. Singer did a good job identifying the knowable, quantifiable costs of LNPA change, but there are always unknowable costs, and these could easily magnify the $719 million to a much higher number.

In summary, LNP is a stable service that works exceptionally well. Given the complexities involved in changing LNPA and the monetary and human resources that would necessarily be diverted, it's difficult to understand why the industry would put such a risky scheme ahead of

ensuring that company resources are completely focused on innovation, network evolution, and consumer services that will be critical for meeting strategic goals.

Our conclusions

An LNPA transition will cause a significant conflict with the deployment of VoLTE and Next Generation Services

Today, the wireless industry is accelerating its transition from circuit-switched voice calls to packet-switched voice calls, built on VoLTE. That change will provide a significant upgrade to HD Voice, WebRTC, etc, which will be revolutionary for customers.

But this change requires an equally revolutionary change in back office systems. In addition to building a voice-capable data network, carriers will have to rebuild their E911 and CALEA infrastructure, and make massive changes to their billing networks, many of which rely on the integrity of the LNPA.

The upshot: The move to VoLTE and Next Generation services is simply too important to jeopardize with an LNPA transition.

The LNPA transition itself will likely not happen smoothly

Large database migrations are difficult and fraught with problems, as the examples we cited underscore. The LNP database is highly complex and very large. It's likely that, even with the best minds in the business managing the process, the migrated data just won't work properly. Fields won't line up, so the migration will slow to a crawl. As a result, it'll take days to port a number, and customers won't be happy.

The upshot: The LNPA transition is too risky to attempt at such a critical juncture for the industry.

The transition to a new LNPA would likely be a costly mess

An amount like $719 million isn't to be taken lightly. But that's what it will cost, at a minimum, for the industry to transition to a new LNPA. This comes at a time when the carriers and other players can ill-afford to spend that kind of money—especially when it won't improve the customer experience, make the networks more efficient or usher in a new level of service.

The upshot: The LNPA transition will be expensive and fraught with problems.

The LNPA transition could hurt carrier brands

The work carriers have put into building their brands has taken years. Each player in the wireless industry depends on the strength of others. So a devaluation of even one brand will affect the perceived value of all carriers. Plus, it increases the risks attached to the huge investments carriers are making in the same customers affected by a potential LNPA change.

The upshot: An LNPA transition could create enormous brand damage to the wireless industry.

The LNPA transition will impede and increase the costs of M&A activity

The delicate balance required for mergers and acquisitions will be hurt by the LNPA transition. Customers need to feel confidence in the change in service providers that results from mergers. So, any issues that crop up in the transition for a customer will cast a shadow over other potential mergers. Delays or additional costs for mergers like these would magnify the risk and complexity of all mergers.

The upshot: Mergers and acquisitions will slow to a crawl or stop entirely because of the issues the LNPA transition would introduce.

About the author

Roger Entner is the Founder and Lead Analyst of Recon Analytics. He is known around the globe as one of the most respected telecom experts. Over the last decade he has been frequently quoted by the world's most prestigious media outlets, such as the Wall Street Journal, the New York Times, USA Today, Financial Times, ABC, CBS, NBC, Fox, CNBC, NPR, PBS, and CNN. In the last year alone, he was referenced more than 4,000 times. In addition, Roger's research has been cited in the FCC's 8th, 11th, 13th, 14th, 15th, and 16th Annual Mobile Wireless Competition Reports to Congress. In 2012, his research was cited by the Executive Office of the President's Council of Economic Advisers in its *The Economic Benefits of New Spectrum for Wireless Broadband* report. Roger also is a regular contributor to CNET and Fierce Wireless, where he writes about customer and industry trends in the connected world.

Roger's main focus is the competitive telecom market place and how the market participants interact. He is one of the leading experts researching the wireless experience, how it influences customer behavior and how customers make choices.

Before starting Recon Analytics in January 2011, Roger was the Senior Vice President, Head of Research and Insights for the Telecom Practice of The Nielsen Company. With more than $5 billion in revenues, Nielsen is the largest consumer market research provider in the United States and around the world. Nielsen is also the largest market research provider to the telecommunications industry. In his role at Nielsen, Roger was responsible for advancing the research and thought leadership position of Nielsen in the world of telecommunications. In particular, he led the research regarding consumer behavior and consulted with the entire range of telecommunications companies—wireless operators, wireline telecommunications providers, cable television and internet service companies, mobile device providers and software providers—on how to improve their products and services.

Before that, Roger was Senior Vice President, Communications Sector at IAG Research and was part of the senior leadership team when Nielsen acquired IAG in April 2008. At IAG he was responsible for helping telecommunications providers improve the effectiveness of their advertising expenditures. Building on IAG's traditional strength in television advertising, Roger was involved in several successful engagements that expanded IAG's traditional television advertising effectiveness measurement to radio, the Internet, and mobile advertising.

Prior to joining IAG Research in 2007, Roger launched the North American coverage for Ovum as Vice President, Telecom. He established the company as one of the leading telecom research providers in North America. Before joining Ovum, Roger headed the wireless carrier research group at the Yankee Group from 2001 to 2004. From 2002 to 2003, he was a member of a 16-person SBIR/STTR Phase II Panel for the National Science Foundation. He helped direct federal research grants to innovative, high-risk projects with a significant potential for commercial viability.

At both the Yankee Group and Ovum, Roger focused on researching trends in the wireless world and advising clients on current and emerging business and consumer trends that affect the wireless world. Previously, Roger was Strategic Marketing Manager for LCC International, which designed and built wireless networks around the world. In that role, he assessed the trends and developments in the wireless world and developed strategies to help LCC benefit from emerging opportunities. Part of his focus was understanding and determining the demand for cell sites based on coverage and capacity requirements based on customer behavior.

Roger received a Bachelor of Arts in Business Organization, from the Heriot-Watt University in Edinburgh, United Kingdom, a Master of Business Administration from the George Washington University in Washington, DC, and an Honorary Doctorate of Science from Heriot-Watt University.