ECC Report 213

Impact of Number Portability between Fixed and Mobile Services (Service Portability)

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0 EXECUTIVE SUMMARY

The term "service portability" describes a scenario where end-users can retain their telephone number when changing services (i.e. from a fixed service to a mobile service or vice-versa). This differs from operator portability where end-users can retain their telephone number when changing operators (i.e. from one mobile operator to another mobile operator or from one fixed operator to another fixed operator).

The scope of service portability in this report is limited to number portability between fixed and mobile services using geographic and mobile E.164 numbers in the context of fixed mobile convergence (FMC) and fixed mobile substitution (FMS).

The report examines technical issues that may impact on numbering plan management as a result of the introduction of service portability in open dialling plans, uniform number length and the geographical significance of numbers.

In recent years fixed and mobile wholesale termination rates have been declining. The corresponding impact of this trend on retail tariffs is very positive for consumers. As retail charges continue to decline the difference in cost between fixed and mobile calls may become negligible in the coming years. This trend, along with a consumer preference for mobile services over fixed services is likely to drive demand for service portability as the importance of tariff transparency in numbering ranges is diminished.

The report examines the legislative provisions and policy objectives of the regulatory framework and formulates several options for introducing service portability. The timeframe for introduction of service portability is crucial and some of the analysed options that introduce more flexibility in number portability are expected to have broadly positive benefits.

In the future number ranges will be generic and subscribers should be able to port their numbers between fixed and mobile services. The report concludes that, on balance, this is a positive regulatory outcome for consumers and the proposed timeframe for implementation (i.e. by 2020) will help to minimise any disruptive impacts on operators and calling end-users while introducing positive effects for competition, consumer choice and service innovation.

This report concludes that:

- It is expected that the distinction between geographic and mobile numbers will diminish over time.

- Subscribers should eventually have the option to port their number between a fixed service and a mobile service if they desire and the end-user can be assigned a number from a geographic or mobile number range from the start of any new service. It is expected that the tariff transparency required to implement service portability will be fulfilled by 2020 at latest.

- Retail tariffs, wholesale termination rates and market developments must be monitored so that the implementation timeframe can be adjusted according to national circumstances.

- Operators/service providers, CRDB operators and PSAP operators will need to make the necessary adjustments to their systems to accommodate these developments.

- Before 2020, different hybrid fixed-mobile/FMC solutions are expected to continue to emerge on the market. NRAs should support the introduction of these types of solutions, as long as the relevant policy objectives continue to be met.

- NRAs could consider, as a first step towards service portability, the removal of the geographical significance of area codes and the closing of dialling plans. However, the costs and benefits of such a regulatory measure should be carefully evaluated. It might well be that such a regulatory measure does not fit well to every country.

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

Abbreviation	Explanation
BEREC	Body of European Regulators of Electronic Communications
CBI	Capacity Based Interconnection
CLI	Calling Line Identification
CPP	Calling Party Pays
CRDB	Central Reference Database
DDI	Direct Dial In
EU	European Union
FMC	Fixed Mobile Convergence
FMS	Fixed Mobile Substitution
FTR	Fixed Termination Rate
IA	Impact Assessment
IVR	Interactive Voice Response
LRIC	Long Run Incremental Cost
MMS	Multimedia Messaging Service
NP	Number Portability
NRA	National Regulatory Authority
OTT	Over The Top
OECD	Organisation for Economic Co-operation and Development
PSAP	Public Safety Answering Point
RPP	Receiving Party Pays
SMS	Short Message Service
VoIP	Voice over IP
Wi-Fi	Wireless Fidelity

1   INTRODUCTION

The term "service portability" describes a scenario where end-users can retain their telephone number when changing services (i.e. from a fixed service to a mobile service or vice-versa). This is different from operator portability where end-users can retain their telephone number when changing operators (i.e. from one mobile operator to another mobile operator for a mobile service or from one fixed operator to another fixed operator for a fixed service).

In this report the term "geographic number" means numbers used to provide fixed-line (non-mobile) services[1], except special rate numbers (e.g. premium rate numbers, Freephone numbers) and short codes.

It should also be noted that the term *service portability* is in other contexts used to describe the switching of bundled services (e.g. triple-play, quad-play services) between service providers. A major challenge with this kind of service portability is often to have a synchronous switching process of all services including the porting of the number[2]. In this report the scope of service portability is limited to number portability between fixed and mobile services using geographic and mobile E.164 numbers respectively in the context of fixed mobile convergence (FMC) and fixed mobile substitution (FMS).

As the availability and uptake of FMC and FMS services increases, policy makers and industry players must re-examine NP systems, policies and procedures to ensure that they are still fit for purpose. In order to preserve the principle of competition, limitations in NP systems must not act as a barrier to switching.

This report is aimed at stimulating debate on two key issues:

- Is it still necessary to keep a strict separation between using different number ranges for fixed and mobile services?

- If not, under what conditions should end-users be able to keep their existing telephone numbers if they switch between fixed and mobile services?

This report provides an Impact Assessment (IA) on number portability between fixed and mobile services.

The IA process involves systematically weighing up the benefits, costs and other impacts of policy options within a given area of interest.

The report uses a methodology described in ECC Report 125[3] which provides guidelines for the implementation of IA in relation to radio frequency spectrum matters. The IA is based on the following steps:

    i.   Identifying the issues/problems
    ii.   Describing the policy/measure and identifying the objectives
    iii.   Identifying and describing the regulatory options
    iv.   Determining the impacts on stakeholders
    v.   Determining the impact on competition (if relevant)
    vi.   Assessing the impacts and choosing the best option
    vii.   Monitoring and evaluating

The motivation for conducting an IA is to inform and improve regulatory decision-making. IA covers a range of methodologies including multi-criteria analysis, cost-effectiveness analysis and cost-benefit analysis.

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[1] In many CEPT countries numbers used to provide services at a fixed location have geographical significance. The term *geographic number* is therefore widely used in this report and indeed is defined in European legislation. As this report deals with porting numbers between fixed and mobile services any mention of the term "geographic number" also applies to numbers used to provide services at a fixed location in those countries where such numbers may not have geographical significance. Still, in countries where it is possible to be reached at a geographic number even though the call is terminated on a mobile network (e.g. Germany, cf. section 4.4), not all of the conclusions of this report may fit well.

[2] ECC Recommendation 12(02) - Number Portability – Best Practices – 11 May 2012

[3] ECC Report 125 available at - http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCREP125.pdf

2 TECHNICAL ISSUES RELATING TO SERVICE PORTABILITY

2.1 Supporting local level dialling in an open dialling plan environment

In an open-dialling plan environment fixed line subscribers can make calls to geographic numbers within the same numbering area without having to dial the area code. For example, if a subscriber in the (21) area code dials another subscriber with the number "21 7654321", the 7-digit subscriber number need only be dialled and the "21" can be dropped. This is because, traditionally, call routing is handled by the local switch and it is configured to be able to route calls on the subscriber number only. Callers to "21 7654321" from outside of the "21" area code must dial the "21" prefix digits as the same "7654321" subscriber number could be active in several different area codes and the originating switch needs to be able to distinguish between these numbers. Where numbers have been ported, a unique routing number/prefix is used to determine the destination network. Therefore the originating switch will prefix locally dialled numbers with a unique routing number and the area code before routing the call. Local dialling is not applicable in the mobile environment and callers must always use the full number when making mobile-to-mobile or mobile-to-fixed calls.

If geographic numbers are to be hosted on mobile networks in the future, then consideration should be given to the continued support of local dialling when the call originates from a geographic number hosted on a mobile network or where a call is dialled locally on a fixed network and terminated on a mobile network. This provokes the question whether it is necessary to close the dialling plan and drop support for local dialling completely. From a technical perspective, closing the dialling plan is not mandatory but could significantly simplify the routing process and digit analysis.

2.2 Removing the geographical significance of geographic numbers

In many countries numbers used to provide services at a fixed location have geographical significance where the area code (or the first few digits of the subscriber number) identify a particular geographic area. Historically, geographical significance was important to consumers as it provided a gauge for call costs where distance was a factor, i.e. local versus national level charges.

As operator charging models continue to evolve, the need for geographical significance continues to diminish. For example, with bundled offerings, a standard monthly fee covers calls to all area codes in a country regardless of any distance dependent element. However, consumers in some countries still value the identity of local numbers for other reasons (e. g. geographic information about the subscriber, local awareness, and availability of local dialling). Also some location-based services (using non-geographic numbers – e.g. 800 numbers) rely on the CLI. These types of services use the CLI to route the call to the appropriate Interactive Voice Response (IVR) announcement or to the appropriate customer service agent relevant to that geographic area.

To the extent geographical significance becomes less relevant, location portability might become possible and further facilitate number portability between fixed and mobile services. Therefore introducing service portability will de facto imply introducing location portability[4] at a national level. On the other hand, a possible alternative development could be that subscribers continue to appreciate the geographical significance of numbers and will prefer to maintain this regardless of reducing call costs even where service portability is possible. Service portability can still be implemented but with restrictions on where the geographic number can be used or to whom the number can be assigned (e.g. the requirement of an address or residential status within the geographic area).

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[4] Limited location portability is possible within limited geographical areas (e.g. area codes) in most countries although it is not mandated by the EU regulatory framework.

2.3   Variable number length

In a few countries (e.g. Germany, Austria, Finland and Sweden), geographic numbers are configured in variable number lengths within a single area code. This characteristic is due to the evolutionary nature of national numbering plans where digits were increased in areas where there was a higher demand for numbers. Variable number lengths may also have been introduced to support Direct Dial in (DDI) for business customers with multiple internal extensions. Extending number portability to DDI number ranges in Germany and Austria is more difficult since the operator in most cases does not know the exact configuration and length of the number inside the private network of a customer. For that reason it is an issue that may need further attention, especially if partial porting of DDI ranges is permitted.

3   GENERAL TRENDS WHICH HAVE AN IMPACT ON SERVICE PORTABILITY

3.1   Termination rates

Since the introduction of mobile phone services in Europe[5], separate numbering ranges have been used in order to distinguish mobile telephony services from fixed telephony services. This distinction was beneficial to consumers given the large difference in retail prices for calling those numbers. When the telecommunications market was liberalised there was a requirement for competing networks to interconnect in order to terminate calls and this development saw the introduction of wholesale billing arrangements. Operators have an obligation to charge cost-oriented wholesale prices to other operators who wish to terminate calls on their networks. Mobile Termination Rates (MTRs) are substantially higher than Fixed Termination Rates (FTRs) although the gap between the two is narrowing. Higher retail rates are therefore a direct consequence of higher wholesale termination rates.

There are still large differences in retail tariffs between fixed-to-mobile calls and fixed-to-fixed calls in many countries. Typically, fixed-to-mobile calls are between 2 and 5 times more expensive than fixed-to-fixed calls. This difference is to some extent still due to the difference between MTRs and FTRs. In Europe[6], the average MTR is 2.58 eurocents. This is between 3 and 5 times higher than the average FTR which is €0.005, €0.006 and €0.0082 for Layers 1, 2 and 3 respectively[7].

One of the immediate risks of introducing service portability is that mobile operators could have an inherent advantage over fixed line operators in the provision of equivalent fixed line services. If a mobile operator was to charge MTRs for terminating geographic numbers at a rate that significantly exceeded FTRs then the originating operator could incur a loss which could then result in the principle of retail tariff transparency being undermined and retail prices ultimately rising. On the other hand, if the mobile operator terminated traffic at a charge that was the same or less than the FTR then the question could arise as to whether the termination rate applied is cost-oriented at all, i.e. the mobile operator could terminate traffic at a loss in order to gain market share. It would be more logical to associate termination rates with the actual physical infrastructure used to terminate calls rather than relying on numbering ranges.

However, as time goes on these risks will diminish. In many European countries MTRs will reduce to approximately 1 eurocent per minute somewhere in the period to 2016. Even at 1 eurocent, this would still represent an MTR approximately 100% higher than the FTR. After 2016, this downward trend is expected to continue as traffic on mobile networks increases and traffic on fixed networks decreases.

As a consequence we can expect that in a normal competitive market both MTRs and FTRs will continue to decrease. To illustrate the developments in MTRs and FTRs the Belgian experience is provided in Figure 1.

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[5] NMT 1G was introduced in the Nordic countries 1981 and GSM 2G was introduced in Europe (Finland) in 1991.
[6] BEREC, "Termination Rates Benchmark Snapshot (as of January 2013) - Integrated Report on Mobile Termination Rates, Fixed Termination Rates & SMS Termination Rates"
http://berec.europa.eu/eng/document_register/subject_matter/berec/reports/1279-termination-rates-benchmark-snapshot-as-of-july-2012-integrated-report-on-mobile-termination-rates-amp-sms-termination-rates
[7] Layer 1 - Peak / off- peak rates for interconnection rates based on time (per minute charges)
Layer 2 - Set- up charge, distributed over a 3 minutes /average duration) call, for the time based interconnection model
Layer 3 - Capacity based (CBI) and time based (TBI) interconnection charges, where the per circuit price has been translated into an average per minute price taking into account the price of the 2 Mbps circuit, on the one side, and the effective volume of minutes used by an average 2 Mbps circuit over the year.

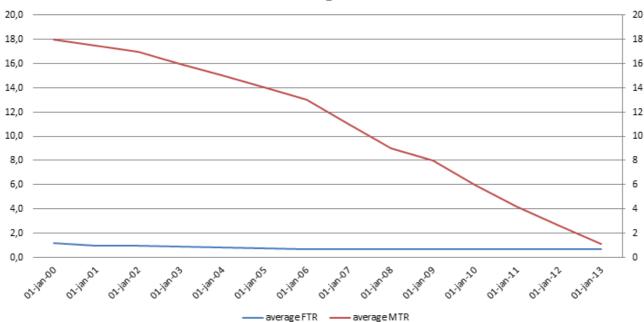## Evolution of average MTR and FTR in eurocents/minute in Belgium

Figure 1: Evolution of mobile and fixed wholesale termination rates in Belgium (source: BIPT)

If the economic model for calculating MTRs changes to pure LRIC[8], then it can be expected that FTRs will always be lower than MTRs in the future. However, once termination rates reach a certain threshold, then the absolute difference between MTRs and FTRs will no longer represent a significant barrier to offering flat fees for fixed-to-mobile calls. It will certainly take some extra time before the reduction of MTRs will be reflected in retail prices.

Over a longer timeframe (by 2020), we can assume that there will not be any significant difference between the retail prices charged by fixed and mobile operators for voice services (probably less than 0,5 Euro cent per minute). Also and as already mentioned, flat rate subscriptions will be much more prevalent in the future and this will further reduce the difference between per-minute charges for fixed and mobile calls.

3.2 Bill and Keep

The current wholesale pricing regime in Europe is based on the principle of Calling Party Pays (CPP) at the retail level (in the USA the retail pricing model for mobile services is based on a mixed approach of CPP/RPP (Receiving Party Pays). In order to facilitate this pricing model at the retail level, origination interconnection fees are necessary at the wholesale level. The alternative to this approach is "Bill and Keep".

Bill and Keep is a pricing arrangement without a call-based interconnection fee. The operators keep what they bill at the retail level and they don't bill each other at the wholesale level. The wholesale termination rate is essentially zero. This regime is essentially based on a reciprocal arrangement where operators agree to terminate calls free of charge on each other's networks. In this way; operators recover their costs only from their own customers and not from their competitors' customers.

This model may gain momentum when the lowering of MTRs and FTRs evolves further. And it is especially relevant for operators terminating broadly similar amounts of traffic on each other's networks. If this model

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[8] Long Run Incremental Cost (LRIC) is the cost to a company of producing one more unit of a product. In the communications sector this calculation model allows operators to make predictions on changes to the inputs required to providing a service, such as the cost of maintaining or rolling out networks. While there is no guarantee that the long run incremental cost will change by the exact amount projected, the exercise helps operators to inform decision making on future investments. The LRIC model is used by many countries to set regulated termination rates.

becomes a reality, it may lead to lower prices (as there is no price floor that the originating operator/service provider has to pay) and this may stimulate further innovation and flexibility in retail pricing. Service portability is presumably easier to implement, at the wholesale accounting level, in an environment where the termination rates are less relevant.

3.3 An increasing preference for mobile services

There is an increasing trend of using mobile voice services as a substitute for fixed voice services. Attitudes of end-users have changed. People tend to prefer to be reachable anywhere at any time and flexibility is a key factor. It is also notable that a large percentage of calls from mobile phones originate from within the home environment. Statistics from the OECD[9] demonstrate that many younger people are not opting for fixed-line connections at all. However, compelling offers, such as triple play services offering fixed-line voice as a free (or very cheap) add-on could have the effect of reversing the trend of a decline in the uptake of fixed-line services in the future.

We also observe in the market some examples of the implementation of FMC services. These types of services rely on the ability of the handset to make a wireless connection via a WLAN network and to make and receive calls via the fixed-line infrastructure using the same telephone number. Other types of converged services are also appearing. VoIP applications or "apps" are now available where it is possible to establish voice communications using a wireless connection such as Wi-Fi or mobile internet.

3.4 Hybrid solutions

Subscribers (both originating and terminating) can access the public telephone network in several ways using:

1. a dedicated fixed line;

2. a dedicated radio channel (during a call) on a land mobile radio access network; or

3. a broadband internet connection hosting a telephone service or application (fixed or mobile).

Some telephone service providers offer services where the subscriber has the possibility to use more than one type of access method under the same contract (i.e. where the different combinations of access options are selected by the subscriber).

Some telephone service providers offer additional add-on features like fixed line SMS, internet mailboxes, voicemail and email. Mobile telephone service providers usually offer additionally an SMS and an MMS Service.

Depending on the regulatory situation in a country, a telephone service provider can assign to the subscriber for access to the public network a:

- geographic number

- mobile number

- specific type of service number or

- different types of numbers for one and the same contract concerning the network access.

Traditionally regulators required a specific type of number for each type of network. In recent years, due to technical and market developments, they tend to allow for more flexibility.

In some countries (e.g. in the Netherlands and Portugal) it is permitted, under certain conditions (e.g. limited to one or two cells), to be reached at a geographic number even though the call is terminated on a mobile network or it is permitted (e.g. in the UK) to be reached on a mobile number, under certain conditions, even

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[9] http://www.oecd.org/sti/broadband/newoecdreportreleasedondevelopmentsinmobileterminationrates.htm.

when the call is terminated on a fixed network. The use of mobiles numbers for services with limited mobility (e.g. using Wi-Fi) is also allowed in some countries.

In Germany the situation is as follows:

- Since 2006, service providers are allowed to assign a geographic number for all types of network access, provided that the geographic information in the number remains valid. By definition this is the case if the subscriber has a dedicated fixed telephone line or a residence in the relevant local area. It is not necessary that he is located in that area while calling or receiving a call.

- Mobile numbers can be assigned if the subscriber can in principle be reached via a mobile network. Since 2011, it is not required that every call must reach the subscriber via a radio network. So the subscriber can ask the service provider to reroute calls to a fixed or internet-based mailbox or a fixed telephone line or an internet access based telephone application.

- Still, tariff transparency is ensured for the calling party. The tariffs for the calling party correspond to the type of number called, i.e. tariffs for geographic numbers apply if calls are made to a geographic number and tariffs for mobile numbers apply if calls are made to a mobile number, irrespective of the actual type of termination. Whether or not the subscriber pays for incoming calls depends on the contract entered into with the service provider.

- A subscriber is allowed to transmit, as CLI, any number which is assigned to that subscriber (except for expensive service numbers).

With the emergence of hybrid services, the barriers between fixed services and mobile services and their respective numbering ranges are diminishing. For end users it is not possible anymore with certainty to identify by the number on what kind of technology the call is originated or terminated. The calling party cannot be certain whether a call to a geographic number will be terminated in a fixed network, on a VoIP gateway or on a mobile network or a combination of these. Likewise, by the CLI the called party cannot assess which service is used to originating the call.

3.5   Transparency in retail tariffs

Previously, the difference in retail tariffs between fixed and mobile services was largely driven by the difference in fixed and mobile wholesale termination rates. As the gap between MTRs and FTRs narrows it is logical to assume that over time retail tariffs will become broadly similar, thus removing one of the barriers to fixed and mobile services using the same types of numbers.

When retail tariffs for fixed and mobile services fall below a certain level, then the need for tariff transparency will no longer have the same importance. However, as long as significant retail tariff differences remain above a certain level, it is important that consumers are informed by the number type used for a service and protected from unexpectedly high call costs.

From an end-user perspective pricing transparency for retail tariffs between fixed and mobile services was very important in the past. This is less relevant today. Flat rate fees and bundled offerings have contributed to reducing the relevance of tariff transparency. On the other hand, pricing transparency to certain non-geographic number ranges has become increasingly important (e.g. numbers used for Premium Rate Services).

4 LEGISLATIVE BACKGROUND AND POLICY OBJECTIVES

4.1 Efficient management of numbering resources

The European Framework Directive for Electronic Communications Networks & Services[10] contains provisions for the efficient management of national numbering resources and the granting of rights of use to those numbers for the provision of communications services. To this end, the national regulatory authorities must establish objective, transparent and non-discriminatory procedures for granting rights of use of numbers.

4.2 Number Portability Requirements

Article 30 of the Universal Services Directive[11] states that *"Member States shall ensure that all subscribers with numbers from the national telephone numbering plan who so request can retain their number(s) independently of the undertaking providing the service"*.

The policy objective regarding number portability is to makes it easier for consumers to change service providers by allowing them to retain their telephone number (geographic or mobile) when they change operator. Any pricing between operators and service providers to facilitate number portability at the wholesale level should not dissuade a subscriber from changing service provider.

Number portability is a competition enabler and efforts taken by NRAs to date to implement the requirements of the legislation have contributed to the development of a competitive and vibrant communications market right across Europe. Facilitating service portability, as defined in this report, has the potential to further enhance competition.

Part C Annex 1 of the Universal Services Directive describes the implementation of the number portability provisions referred to in Article 30 as follows:

The requirement that all subscribers with numbers from the national numbering plan, who so request can retain number(s) independently of the undertaking providing the service shall apply:

(a) in the case of geographic numbers, at a specific location; and

(b) in the case of non-geographic numbers, at any location

This Part does not apply to the porting of numbers between networks providing services at a fixed location and mobile networks. **(emphasis added)**

On the other hand, the preamble[12] of the Directive explicitly states that "Member States may apply provisions for porting numbers between networks providing services at a fixed location and mobile networks".

Therefore, the EU legislation does not forbid that countries, on a national basis, impose service portability between fixed and mobile telephone services.

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[10] Directive 2002/21/EC as amended by Regulation (EC) No 717/2007, Regulation (EC) No 544/2009 and Directive 2009/140/EC.
[11] Directive 2002/22/EC as amended by Directive 2009/136/EC.
[12] Preamble No. 40 of the Universal Services Directive.

5   REGULATORY OPTIONS

This section describes the various options that regulators have in order to make service portability a reality. The introduction of service portability may be disruptive both on operator business models and on the management of national numbering resources but with closer alignment of MTRs and FTRs, technological developments and service innovation, regulators could anticipate market developments and act quickly and proactively to promote earlier introduction of service portability (by 2016). Alternatively, regulators could adopt a more cautious or reactionary approach which would reflect market developments and consumer trends where service portability could become a reality across Europe by 2020.

The various options are described below. Chapter 7 will then analyse the impact of each option on stakeholders and competition. Chapter 8 will then assess the impact of each option and determine the best option.

A   Do nothing: maintain the current rules of strictly separated number ranges for fixed and mobile services. This could include introducing new separate number ranges for mobile VoIP, fixed VoIP, nomadic VoIP etc.

B1   Partial flexibility: A subscriber is assigned either a geographic or a mobile number depending on the initial service selected[13] but the number may be ported to another service (fixed or mobile) if the user decides to switch in the future. Implementation proactive: 2016.

B2   Partial flexibility: A subscriber is assigned either a geographic or a mobile number depending on the initial service selected, but the number may be ported to another service (fixed or mobile) if the user decides to switch in the future. Implementation reactive: 2020.

C1   Full flexibility: A subscriber can select a number from the geographic or mobile range from the start of any new service. The number can then be ported between services (fixed or mobile) if the user decides to switch in the future. Implementation proactive: 2016.

C2   Full flexibility: A subscriber can select a number from the traditional geographic or mobile range from the start of any new service. The number can then be ported between services (fixed or mobile) if the user decides to switch in the future. Implementation reactive: 2020.

D   Sequenced approach: Start with option B1 in 2016 and move to option C2 in 2020.

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[13] This means that, initially, the service domain as defined in the numbering plan has to be respected, e.g. only mobile numbers are used for mobile services.

6 IMPACT ON STAKEHOLDERS AND COMPETITION

6.1 Impact on stakeholders and the market

The various stakeholders include:

- subscribers who wants to switch services or to take a new service;
- calling end-users;
- PSAPs - emergency and security services;
- Operators/Service providers (fixed, mobile and VoIP);
- NRAs;
- CRDB operators.

Beside this, there is an impact on the market.

6.2 Impact on subscribers

The different options have in most cases different impacts on the different stakeholders. The subscriber who has rights of use to the number has the biggest advantage with the most flexible options. The most important concern for the subscriber is that the rights of use can be retained even when switching between different service domains. The fact that most people (particularly younger people) prefer to be reachable anywhere at any time suggests that they no longer have a preference for using a fixed line service.

Therefore options C1 and C2 are the most preferable for the holder of the number. But if we take into account that most people already have a number it means in practice options B1 and B2 are also, from a pragmatic point of view, very close to options C1 and C2.

Of course, subscribers could be adversely impacted if retail prices begin to rise because of the cost to operators of introducing service portability.

6.3 Impact on calling end-users (the calling party)

The calling party has a different perspective. As long as there is a significant difference in retail tariffs for calling fixed and mobile services the cost of the call will remain an important factor and the calling party will want to be aware of the associated charge. At present the respective "service domains" are respected and there is at least some level of transparency in the distinction between geographic and mobile number ranges.

Therefore all the options can only be envisaged when retail tariffs for calling fixed and mobile services converge to a sufficient level that the calling party is not concerned about the call cost. It is expected that by 2016 this will be the case for less price sensitive end-users. By 2020 it is expected that the difference between the cost of calling fixed and mobile services will be negligible suggesting that the need for distinct number ranges to gauge call costs will no longer be needed. Of course there can be other reasons why a calling party considers it important to know where the call terminates geographically.

Also some location-based services using non-geographic numbers (e.g. 800 numbers) have traditionally relied on the Calling Line Identification (CLI) to direct the call to the most appropriate answering point for a particular geographic area. If the originating number is hosted on a mobile network, then the CLI can no longer be relied upon to determine the geographic area and consequently this has an impact for the calling party. Another means of determining the geographic area would need to be used instead. (e.g. Cell-ID, GPS co-ordinates etc.).

In general we can conclude that from the calling party's perspective the options B2, C2 and D will be better than B1 and C1 mainly because the current situation would be maintained for as long as possible.

6.4   Impact on public safety answering points (PSAPs) – emergency Services

PSAP operators can currently make an immediate distinction between fixed and mobile calls based on the format of the number. This is extremely important because the procedures to retrieve the location (and identification) of the calling end-user are different depending on the service domain of the number. If number ranges were to converge because of service portability, the PSAPs would no longer be able to make this distinction. Other additional (and probably more complex) procedures would be needed to retrieve caller location information. This would initially suggest that PSAPs would prefer the status quo to prevail (option A) as it is less complex and less expensive than all the other options. The preferred solution from the PSAP's perspective is probably to delay as much as possible the evolution towards more flexibility. For law enforcement services the issue is less problematic because a number is only used as a "key" for intercepting a call. For the PSAP operators the reactive options appear to be better than the proactive options. Options B2, C2 and D are better than options B1 and C1 as they guarantee that the "flexibility" will be introduced at a slower pace. This would allow PSAPs to adapt their systems and invest in new technologies on a gradual basis.

6.5   Impact on operators

Established fixed line operators with a strong foothold in the market are likely to consider service portability as a threat. All options (besides option A) have an operational impact and do not present many opportunities for creating additional traffic and income. Legacy operational and support systems depend to a large extent on the structure of E.164 numbers. Also the interconnect architecture, the call routing and billing depend on the numbering areas in legacy networks. If termination rates for fixed and mobile call termination are broadly the same no distinction has to be made for billing purposes between fixed and mobile. However, there will still be a need for distinguishing between fixed and mobile termination and the impact on accounting systems could be complex. The migration to NGN could offer an opportunity to review the whole interconnect architecture e.g. a move to Bill and Keep.

Mobile operators and new market entrants such as (OTT) players are likely to have a more positive attitude in moving to full service portability. This is not only because of the opportunities for new services and increased market share but also because these market players have less legacy infrastructure to manage which is a big consideration for fixed-line operators. On the other hand roaming could become more complex as new numbering ranges are introduced on existing roaming agreements.

The majority of operators will therefore prefer the status quo for as long as possible suggesting that the worst option for them is the most aggressive one, namely options B1 and C1.

6.6   Impact on NRAs

The impact on NRAs managing these resources is minimal. The utilisation efficiency of managing available numbering resources should improve and this is an important consideration for countries facing scarcity in existing geographic or mobile numbering ranges. There will be some impact on the work of NRAs as, in most countries, laws and numbering conventions will have to be changed in order to allow NP between fixed and mobile services. Also, NRAs that have a role in managing the CRDB may be impacted if separate mobile and fixed NP databases need to be merged. However, any efforts made by NRAs to facilitate service portability should be broadly positive in helping them to achieve their competition goals as it is envisaged that service portability will intensify competition in the market place.

6.7   Impact on central reference database (CRDB) operators

The CRDB operator (for countries which use such a CRDB) will also prefer the status quo as procedures to port numbers will need to be reviewed and changes are probably necessary to the database structure particularly if separate systems exist for geographic and mobile numbering. There may be less cost and less risk for CRDB operators to implement the necessary changes gradually. This would suggest a preference from CRDB operators for the reactive options (options B2 and C2) over the proactive options (options B1 and C1). As the adaptions to be made are independent of options B, C and D they receive the same negative rating. As it is expected that the costs are low the rating is close to 0. It is also important to keep in mind that for all the different options which introduce more flexibility the impact will only be slowly visible as it is expected that users only will gradually make use of this facility.

6.8   Impact on the market

Greater flexibility in service portability can only be positive for market development as it would provide market players with an incentive to develop new and innovative fixed and mobile services. Bundled service offerings (triple play, quad play) would become more popular as the boundaries between the respective service domains disappear. Numbers would no longer act as a barrier for switching between fixed and mobile services and this would further enhance competition between service providers in the market. This would suggest that option C1 would be optimal for continued market development followed by options B1 and D.

7 ASSESSMENT OF THE IMPACT AND SELECTION OF THE BEST OPTION

This chapter provides an Impact Assessment and gives guidance on how the recommended option was selected. As a general remark, determining the recommended option should support the policy objectives as described in Chapter 5. Any option that hinders efficient numbering plan management, competition or innovation would obviously not be favourable from a regulatory perspective.

7.1 Impact assessment methodology

The methodology of the assessment below involves systematically investigating the impact of different options of fixed-mobile number portability. The impacts may be different for the various stakeholders and stakeholder groups involved.

In order to assist in assessing the different impacts, the WG NaN has developed and analysed several possible options already described in Chapter 6.

Option A, namely doing nothing is considered as the baseline option which we will use to assess options B1 (pro-active), B2 (reactive), C1 (pro-active), C2 (reactive) and D.

The scale of impact is measured from -5, the most negative impact, to +5, the most positive impact.

Note: The impact assessment table in Figure 2 is based on discussions in the WG NaN. The results are based on subjective evaluations by NP experts. The analysis, scoring and conclusions reached are based on the personal opinions, considerations and predictions of NP experts and should not therefore be regarded as provable scientific answers.

7.2 Impact assessment scoring table

Table 1: Impact Assessment

Impact/ Option	A	B		C		D
Explanation	Do Nothing	Partial flexibility: An end-user is assigned either a geographic or a mobile number depending on his initial service, but he is able to port it to another service		Full flexibility: end-user can just pick out a number from the geographic or mobile range from the start of any new service. The number can be ported between services		Start with option B1 in 2016 and move to option C2 in 2020
		B1 Proactive	B2 Reactive	C1 Proactive	C2 Reactive	D
Calling end-users	0	-3	-1	-4	-1	-2
PSAPS – Emergency Services	0	-4	-1	-5	-1	-2
Market (more competition)	0	4	3	5	3	4
Operators	0	-2	-1	-2	-1	-1
NRA	0	0	0	0	0	0
CRDB operator	0	-2	-1	-2	-1	-1
TOTAL	**0**	**-5**	**0**	**-3**	**3**	**1**

From the analysis in Chapter 7 and the Impact Assessment Table above, we can conclude that option B1 and C1 – i.e. the proactive options - have negative results. A proactive approach (i.e. by 2016) to a partially flexible or a fully flexible service portability solution may cause difficulties for the emergency services and law enforcement agencies in the provision of accurate caller location information. There may not be enough time for these stakeholders to adequately adapt their systems. From a regulatory perspective, the emergency sector is of great importance. Since options B1 and C1 are negative compared with the status quo they should be excluded as a policy option.

The two options with the highest points are option C2 (full flexibility by 2020) and option D (the sequenced approach - part flexibility by 2016 migrating to full flexibility by 2020). The difference between these two may be explained by the fact that option D involves a two-step process. There is a more positive result for going straight to full flexibility by 2020. One reason behind this is because the holder of the number might find it more transparent to go to full flexibility, rather than having an intermediate solution of 5 years of partial flexibility.

Option C2 involves maintaining the separation between geographic and mobile numbering ranges until 2020 and from that date the introduction of full flexibility where the end-user can select a number from the geographic or mobile range from the start of any new service and the number can then be ported between services from then on.

WG NaN therefore concludes in this table that option C2 is the best option as it minimises any disruptive impacts on operators and calling end-users while introducing positive effects for the subscriber, for competition and for service innovation.

However, the evolution of numbering plans is a gradual process that does not follow predefined time schedules. So even though C2 reaches a higher rating in the table, a two- or more-step process may prove to be the most probable path to service portability.

It is also important to stress that even though a clean cut implementation is the most preferable solution in the table, it does not imply that any hybrid solution or gradual approaches should be discouraged. On the contrary; NRAs should support the introduction of these types of intermediate solutions, as long as relevant policy objectives continue to be met.

8 CONCLUSIONS

This report concludes that:

- It is expected that the distinction between geographic and mobile numbers will diminish over time.

- Subscribers should eventually have the option to port their number between a fixed service and a mobile service if they desire and the end-user can be assigned a number from a geographic or mobile number range from the start of any new service. It is expected that the tariff transparency required to implement service portability will be fulfilled by 2020 at latest.

- Retail tariffs, wholesale termination rates and market developments must be monitored so that the implementation timeframe can be adjusted according to national circumstances.

- Operators/service providers, CRDB operators and PSAP operators will need to make the necessary adjustments to their systems to accommodate these developments.

- Before 2020, different hybrid fixed-mobile/FMC solutions are expected to continue to emerge on the market. NRAs should support the introduction of these types of solutions, as long as the relevant policy objectives continue to be met.

- NRAs could consider, as a first step towards service portability, the removal of the geographical significance of area codes and the closing of dialling plans. However, the costs and benefits of such a regulatory measure should be carefully evaluated. It might well be that such a regulatory measure does not fit well to every country.