Electronic Communications Committee (ECC)

within the European Conference of Postal and Telecommunications Administrations (CEPT)

IMPLEMENTATION OF MOBILE NUMBER PORTABILITY IN CEPT COUNTRIES

March 2003

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1   INTRODUCTION

This report presents key experience of CEPT countries that have implemented mobile number portability or are planning its implementation. The main purpose of the report is to enable countries that are preparing for the introduction of mobile number portability to be aware of the predominant approaches to its implementation and to compare alternative approaches. The information provided in this report might also assist countries that have already introduced mobile number portability but wish to review aspects of its implementation.

Portability of various types of numbers is a fact in most liberalised telecommunications markets, but portability of mobile numbers is not yet widespread. This may, in part, be due to arguments that the scale of the benefits from mobile number portability is smaller than for portability of other types of numbers. If this is the case, the smaller benefits may be because, for many users, the ability to retain their mobile number when switching network is desirable but not critical, particularly when mobile phones are used only occasionally or predominately for outgoing calls. It may also be that the scope for efficiency gains through increased competition is lower in the mobile market because the rate of churn rate is generally relatively high even before portability is introduced.

If the benefits of portability of mobile numbers are relatively less substantial than for other types of numbers, then the success of mobile number portability is likely to depend on factors such as how simple and inexpensive the implementation of portability is, relative to the value users put on their numbers and the retention of them.

This report therefore also aims to provide information that points to ways in which mobile number portability can be implemented in the most cost-efficient manner.

The report draws heavily on the results of a survey across CEPT countries undertaken in the first half of 2002 regarding implementation of mobile number portability or plans for its implementation.

2   BACKGROUND

Mobile telephones are an increasingly ubiquitous form of communication. In some cases, they have entirely replaced fixed telephones as the usual method of communication for residential or business users. This reflects the mobile penetration rates in many European countries, in which the trend is for the mobile penetration rate to exceed that of the fixed network. In EU countries, the average mobile penetration rate is greater than the fixed network penetration rate.

Fixed and mobile penetration rates in 40 of the 45 CEPT countries for 2001 are shown on the next page.

For users, therefore, it may seem logical that the capability for porting fixed network numbers is extended to mobile numbers. Mobile number portability also creates for mobile users the benefit of something akin to a personal number, which enhances the concept of personal mobility that they already receive via the use of a personal terminal.

From a user's perspective, mobile number portability creates an ability to switch mobile network without the possible cost and inconvenience of a change of their telephone number. This is because, in the absence of number portability, a change of number when switching networks requires most users to notify people who contact them of the new number. In the case of business users, especially those who rely on a mobile phone as a primary method of communication, the effort and cost involved in notifying contacts of a new number may be quite substantial.

From a regulator's perspective, mobile number portability is intended to produce certain effects on the mobile market. Fundamentally, it should prevent network operators from gaining market power by charging an extra price margin that corresponds to the cost of switching networks. Consequently, mobile number portability should:
- ❑ Enhance competition among network operators, especially in relation to the installed subscriber base;
- ❑ Create downward pressure on prices; and
- ❑ Make it easier for newer entrants to gain market.

In 25 July 2003, the European Union Directive on universal service and users' rights relating to electronic communications networks and services will take effect in member states. Existing EU legislation specifies an obligation for the implementation of portability of both geographic and non-geographic numbers, but contains an exemption for mobile numbers. Article 30 of the new directive removes that exemption by requiring that:

Member States shall ensure that all subscribers of publicly available telephone services, including mobile services, who so request can retain their number(s) independently of the undertaking providing the service:

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

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

It is anticipated that, in due course, the new legislation will be implemented not only by EU countries, but also by EFTA countries and EU accession countries.

Mobile telephone subscribers per 100 inhabitants
Main telephone lines per 100 inhabitants
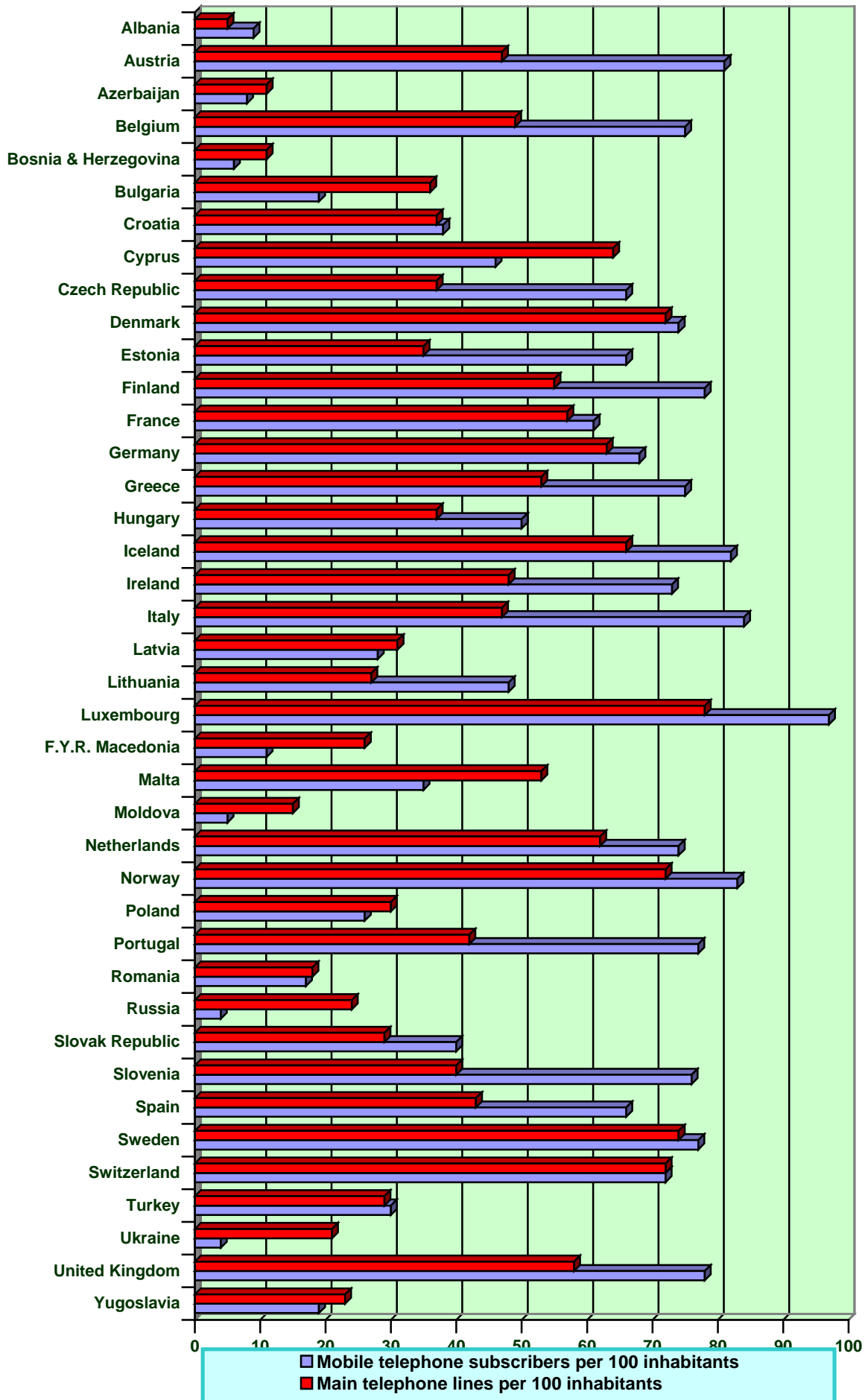
Source: ITU World Telecommunication Indicators Database (updated with information from individual countries)

3   SCOPE OF IMPLEMENTATION

Mobile number portability has, to date, been implemented
in the following CEPT countries:

- ❑   Belgium
- ❑   Denmark
- ❑   Germany
- ❑   Italy
- ❑   Netherlands
- ❑   Norway
- ❑   Portugal
- ❑   Spain
- ❑   Sweden
- ❑   Switzerland
- ❑   United Kingdom

Planning is underway in the following countries for
implementation of mobile number portability:

- ❑   Austria
- ❑   Finland
- ❑   France
- ❑   Greece
- ❑   Hungary
- ❑   Iceland
- ❑   Ireland
- ❑   Lithuania
- ❑   Luxembourg
- ❑   Romania
- ❑   Slovakia
- ❑   Slovenia

A timeline showing the dates for implementation
of mobile number portability in the above countries
(where known) is at right.
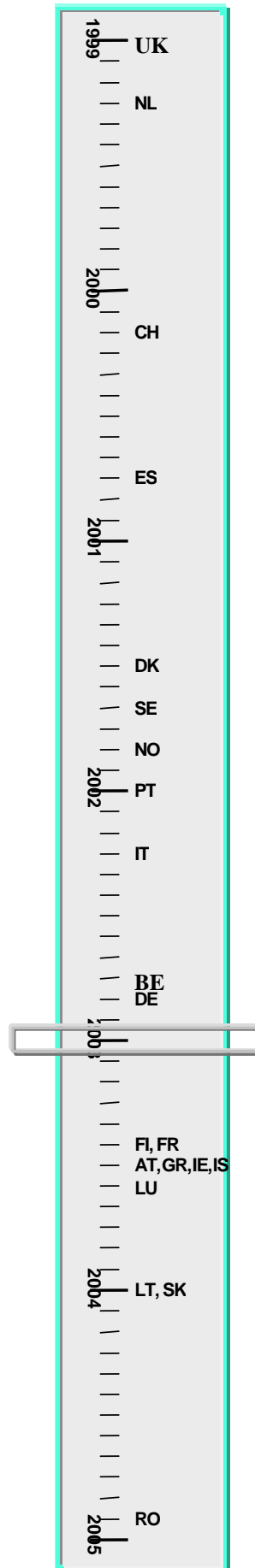
4   ROLE & INVOLVEMENT OF REGULATOR

What is the appropriate role that should be assumed by the regulator in determining the approach to implementation of mobile number portability to be adopted in each country? Arguments for and against the regulator determining the approach to implementation are:

- ❑ Without involvement by the regulator, industry players will lack the initiative, or the means of reaching agreement, to settle on a particular method of implementation;
- ❑ The most cost-effective solution to a network operations problem such as implementation of mobile number portability will be most efficiently worked out by the industry players themselves.

CEPT countries vary regarding the extent of regulator involvement in determining how mobile number portability is implemented. Arguably the most important decision (other than apportionment of costs) to be made in preparation for implementation of mobile number portability is selecting the method to be used for routing calls made to a mobile number to the correct terminating mobile operator. Out of 14 respondents, regulators in 8 CEPT countries have determined or plan to determine the call routing method, whereas regulators in the other 6 countries have made no such decision or do not plan to make such a decision.

In many CEPT countries, network operators and other relevant parties have established a forum and process for making decisions collectively about mobile number portability implementation. In the absence of involvement by the regulator in determining the method to be used for routing calls and other important parameters of mobile number portability implementation, such a forum and process becomes essential and the effectiveness of it in reaching decisions quickly becomes critical. Even in those countries where the most critical decisions are taken by the regulator, however, it is clear that the involvement of industry in developing the detailed specifications for how mobile number portability will be introduced and will operate is vital.

5   CALL ROUTING

As mentioned above, a key question to be resolved early in the preparation for mobile number portability implementation is the method used for routing of calls from an originating network to the mobile network associated with a given mobile number. As with portability of other types of numbers, there are broadly two methods available for routing of calls in a mobile number portability environment:

- ❑ Routing of a call directly from the originating network to the correct terminating mobile network, which requires the former to determine what is the appropriate network for a given number ("ALL CALL QUERY"); or
- ❑ The mobile network that was originally associated with a given number is involved in the routing of a call to the correct terminating mobile network.

The second method can be further divided into several different forms:

- ❑ The mobile network originally associated with the called number identifies the correct terminating mobile network and routes the call onward to that network ("ONWARD ROUTING");
- ❑ The mobile network originally associated with the called number checks if the number is ported and, if it is, releases the call back to the originating network together with information identifying the correct terminating network ("CALL DROP BACK"); or
- ❑ The mobile network originally associated with the called number identifies that the number is ported and returns a message to the originating network indicating that the number has moved. The originating network then queries a database to obtain information identifying the correct terminating network ("QUERY ON RELEASE").

Onward routing is often regarded as the simplest routing method to implement and the all call query method as the most complex, with the other methods lying between these two extremes. This is also reflected in the costs of establishment, with onward routing regarded as cheaper to establish than the all call query method. By contrast, the ongoing costs associated with the all call query method are usually regarded as less than those of the onward routing method. Again, the costs associated with the other two methods lie between those of all call query and onward routing.

The methods used for routing a call to a ported mobile number that originates on –

- ❑ Another mobile network (within the same country);
- ❑ A fixed network (within the same country); or

❑   A network in another country

– may be distinct. For calls to mobile numbers originating in another country, it is almost universally true that the foreign network will forward the calls initially to a correspondent network operator in the destination country, which will then route the call according to the same method it would use if the call originated on its own network.

It may not be necessary for all networks in a particular country to use the same method for routing of calls. Several countries have adopted approaches which permit network operators to choose the method of routing they will utilise.

The actual methods of routing calls to ported mobile numbers adopted in CEPT countries (or planned to be adopted) display considerable variation. Table 1 illustrates this variation across respondent countries and other CEPT countries for which information is available:

	How calls are routed from a fixed network to a mobile network	How calls are routed from a mobile network to another mobile network
BELGIUM	all call query [§]	all call query & query on release [§]
DENMARK	all call query & query on release	all call query & query on release
FINLAND	onward routing	onward routing
FRANCE	phase 1: onward routing phase 2: all call query	phase 1: onward routing phase 2: all call query
GERMANY	onward routing & all call query	all call query
HUNGARY	all call query & query on release	phase 1: onward routing & all call query phase 2: all call query
IRELAND	onward routing	all call query
ITALY	onward routing & all call query	all call query
NETHERLANDS	all call query [¶]	all call query [¶]
NORWAY	all call query	all call query
PORTUGAL	all call query & query on release	all call query
SPAIN	onward routing	onward routing
SWEDEN	onward routing & all call query	onward routing & all call query
SWITZERLAND	onward routing	onward routing
UNITED KINGDOM	onward routing	onward routing

§   The minimum legal requirement is for onward routing.
¶   Queries are outsourced by one operator to the incumbent operator.

Table 1: Methods of routing calls to ported mobile numbers

SMS messages are routed between mobile networks via signalling paths rather than over voice circuits. This has two important implications:

❑   The methods used for routing of calls to ported numbers are not applicable to handling of SMS messages forwarded to ported numbers; and

❑   SMS traffic is generally only between mobile networks — SMS traffic between fixed and mobile networks is in its infancy — so routing of SMS messages to ported numbers does not yet need to take account of non-mobile networks.

There is as yet little information available on the methods used or planned to be used in CEPT countries for routing SMS to the correct mobile network.

6   NUMBER DATABASES

All implementations of mobile number portability involve the use of databases that contain information on the network with which ported numbers are associated. This information is used in routing a call to a ported number, to determine the

correct terminating network for the call. The actual information is usually a routing number that can be used to enable a call to a ported number to be routed to the correct mobile terminating network.

Number databases are typically managed in either a centralised or a distributed manner. The centralised model involves a single reference database containing data for all mobile numbers (or for all ported numbers – it may not be considered necessary to store data for numbers that have not ported). It is usual for this reference data to be copied to operational databases in each participating network on a frequent basis. A centralised number database for mobile number portability is generally managed by a consortium of network operators, which may comprise just the mobile network operators or all network operators which may be involved in routing of calls to mobile numbers. The actual operation and maintenance of a centralised number database may be out-sourced to a third party company which has experience in database operations.

By contrast, the distributed model involves multiple databases containing subsets of the total data. Each separate database in the distributed model may, for example, comprise only the numbers assigned to a particular mobile network operator. The full set of information about all mobile numbers (or all ported mobile numbers) is only available from these separate databases when taken as a whole.

Most respondent countries (10 out of 12) have adopted or plan to adopt a centralised approach to management of a number database.

BELGIUM	centralised
DENMARK	centralised
FRANCE	centralised
GERMANY	centralised
HUNGARY	centralised
IRELAND	centralised
ITALY	distributed
NETHERLANDS	hybrid distributed & centralised
NORWAY	centralised
PORTUGAL	centralised
SWEDEN	centralised
SWITZERLAND	centralised

Table 2: Types of ported mobile number database

7 ADMINISTRATION OF PORTING

Although the technical implementation of mobile number portability involves particular challenges, more attention has started to be given to the administrative arrangements that facilitate porting of numbers. There is a growing awareness that poorly designed, complex or easily-abused procedures for porting of mobile numbers are less likely to result in a successful implementation of portability or to produce the benefits that portability is intended to deliver.

Nevertheless, designing efficient, simple and practical porting procedures for the mobile market involves special challenges not generally found in other forms of portability. These include the role of retailers, the need to change SIMCard, and the existence of contracts related to handset subsidies.

Other important factors in designing porting procedures apply as much to other forms of portability as to mobile number portability, and include the method by which the user requesting a port is verified as the holder of a number, arrangements for communication between entities involved in porting a number during the porting process, and procedures for porting large quantities of numbers at one time.

7.1 Entities handling porting Requests

Most mobile users deal exclusively with retail outlets in establishing their mobile service. Accordingly, it may seem natural for them to deal with retail outlets for porting their mobile number to a different operator, even though retailers may find it difficult to work with new and unfamiliar porting procedures. In 10 out of 12 respondent countries, it is possible or will be possible for mobile users to arrange to port their number through a retailer. In all but one of the respondent

countries, it is also possible to arrange porting of a number with the (new) mobile operator or with the (new) mobile reseller.

Unless permitting particular market players to receive requests for porting of a mobile number creates particular problems, it makes sense to allow users the flexibility to approach various market players to request a port.

	Request port from mobile dealers?	Request port from mobile resellers?	Request port from mobile operators?
BELGIUM	✓	✓	✓
DENMARK	✓	✓	✓
FRANCE	✓	✓	✓
GERMANY	✓	✓	✓
IRELAND	✓		✓
ITALY	✓	✓	✓
NETHERLANDS		✓	✓
NORWAY	✓	✓	✓
PORTUGAL			✓
NORWAY	✓	✓	✓
PORTUGAL	✓	✓	✓
SWEDEN	✓	✓	✓
SWITZERLAND	✓		✓
UNITED KINGDOM	✓	✓	✓

Table 3: Entities from which port of mobile number may be requested

7.2 Porting procedures

Authentication

An authentication procedure is usually built into porting processes to ensure that the person requesting that a number be ported is authorised to do so. The way in which this is implemented can have significant effects on the robustness of the porting process, how convenient it is to users, and how long it takes to complete. The most important variables are:

- ❑ Whether authentication is performed via reference to account records, relies on some form of documentary evidence supplied by the person requesting the port (such as a bill), or uses some other technique;
- ❑ Who performs the authentication — for example, the entity that receives the porting request, or the donor network operator or service provider;
- ❑ How communication between the various parties which are involved in authentication occurs — for example, electronically, by fax, or by letter; and
- ❑ The level of trust between the various parties involved in a porting request, which itself may influence the need for an effective reversal procedure in the event that an unauthorised porting occurs.

A range of methods are in use or planned in 12 respondent countries, including:

- The donor operator verifies that the person requesting a port is the same as the assignee of the number mentioned in the request, frequently using the customer's account number as a key — this is most common method used;
- Similar customer identification methods are employed to those used when a new mobile service is established;
- The person requesting a port is asked to produce an identity card to authenticate their identity; and
- A call is made to the number to be ported to minimise risk of fraudulent requests.

	Donor operator verifies port request (using name, account no., etc.)	Same authentication methods as for new service	Identity card supplied by person requesting port	Call made to ported number	Any method chosen by recipient operator
BELGIUM	✓ *				
DENMARK	✓				
FINLAND					
FRANCE	✓				
GERMANY	✓				
IRELAND	✓			✓	
NETHERLANDS	✓				
NORWAY	✓				
PORTUGAL			✓		
SWEDEN			✓		
SWITZERLAND		✓ *			
UNITED KINGDOM					✓

* Recipient operator must provide power of attorney from subscriber to donor operator.

Table 4: Methods of authentication

The rigour of an authentication procedure may be related to the assessed risk of fraud, or to the capability to quickly reverse a port if it is found that it has fraudulently been requested. 6 out of 12 respondent countries have implemented, or plan to implement, such a reversal procedure.

Communications during porting process

Network operators and other entities involved in porting of a number have, in most countries, established special protocols or other arrangements for exchanging information during the porting process. In almost all countries, a dedicated communications network has been established or is planned to carry the messages associated with steps in the porting process. Such arrangements may ensure that messages are carried quickly and efficiently between entities involved in the porting process, that the risk of fraud is reduced, and that the specified porting procedures are correctly followed.

Refusal of port

In the majority of respondent countries, it is or will be permissible for a donor provider to refuse a port request. Apart from grounds for refusal such as flaws related to the porting request — for example, an incomplete porting request, the requesting party cannot be authenticated, two porting requests are received for the same number, or the number is not associated with an active service provided by the donor — other grounds for refusal include:

- ❑ the term of the user's service contract is not complete – this is a very common ground for refusal;
- ❑ an outstanding debt is associated with the user's account;
- ❑ the user has a SIM-locked handset;
- ❑ the handset is recorded as stolen;
- ❑ national defence reasons; and
- ❑ technical obstacles.

The status of the refusal by a donor provider to port a number may differ according to whether the grounds for refusal are specified in regulation, or in the contract between an end user and the donor provider.

	Term of service contract not complete	Outstanding debt	SIM-locked handset	Handset recorded as stolen	National defence reasons	Technical obstacles
DENMARK	✓					
FRANCE	✓	✓				
GERMANY	✓					
IRELAND				✓		
ITALY						✓
NETHERLANDS	✓					
PORTUGAL					✓	
SWITZERLAND	✓		✓			
UNITED KINGDOM	✓					

Table 5: Reasons for refusal of port
(not including reasons related to errors in porting procedure**)**

It seems reasonable for a donor network operator or service provider to be able to refuse a request to port a number under certain circumstances. It is, however, arguable that this ability should be carefully weighed against users' legitimate rights over the use of their mobile numbers.

Time to port

A porting process that requires many days or weeks to port a number can seem very lengthy when compared with the few minutes or hours it may take for a user to initiate a new mobile service. A lengthy porting period may create extra costs for users in porting, or simply discourage them from porting at all. A short porting period, however, may allow insufficient time for proper checks at all stages of the porting process to avoid fraud and ensure proper completion of a port. It may also increase the costs of porting — for example, the costs associated with

making a porting process available on a 24×7 basis.

The majority of respondent countries have instituted target periods within which porting of a number must be completed. There is enormous variation in the length of this period, which ranges from 2 hours to 30 days; the average target period is 9 days. There is no discernible trend regarding the length of the target porting period among CEPT countries, either towards the period becoming shorter or becoming longer. In fact, both the shortest and the longest target periods are in countries in which mobile number portability is currently in the planning stages.

BELGIUM	2 days [§]
FRANCE	30 days
GERMANY	4 working days + 2 further days
IRELAND	2 hours
ITALY	10 days [¶]
NETHERLANDS	3 working days
NORWAY	6.5 days
PORTUGAL	between 5 & 20 working days
SWEDEN	5 working days
UNITED KINGDOM	2 working days + 1 calendar week [‡]

[§] Different period applies to complex ports.
[¶] To be reduced to 5 days in future.
[‡] Different period applies to bulk ports.

Table 6: Target maximum porting period

It is of note that in the first European countries to implement mobile number portability – the United Kingdom and the Netherlands – there have been efforts in the last couple of years to significantly reduce the length of the porting period.

The majority of respondent countries have restrictions on the time of day or week during which porting can occur. This may be to ensure resources can be devoted to the porting process during that time, or to avoid changes to operational systems during high-traffic periods. Such restrictions may reduce the costs of implementation — for example, allowing ports to be implemented during high-traffic periods might require more sophisticated modifications to operators' IT systems. It should, however, be recognised that such restrictions may reduce the flexibility of the porting process.

Bulk porting

There may be procedural advantages in managing the porting of large quantities of mobile numbers — for example, a "fleet" of corporate mobile telephones — via a separate procedure to that suited to porting of individual numbers. There may also be financial advantages in managing bulk ports via a special procedure as it may allow the cost of porting many numbers to be reduced significantly.

To date, only 3 respondent countries have established or planned bulk porting procedures. Such a practice may be worthy of consideration if it can readily be incorporated in existing procedures or procedures that are planned.

8   ECONOMIC ARRANGEMENTS

There are several categories of costs associated with implementing mobile number portability:
- ❏   The administrative cost each time that a number is ported;
- ❏   The establishment and operating costs associated with running a database containing details of ported numbers, whether that database is a centralised or a distributed one;
- ❏   The costs of additional conveyance of calls to ported numbers in the case that they must transit the mobile network originally associated with a ported number; and
- ❏   The costs of database dips in the case that this is required to determine the correct network to which a call must be routed.

The most critical question associated with these costs for regulators and industry players is how they are apportioned. A range of principles is taken into account in deciding how these costs will be apportioned, comprising:
- ❏   Cost causation — should the entity that generates a cost pay for it?
- ❏   Cost minimisation — how can incentives be created for all parties to minimise costs?
- ❏   Distribution of benefits — should the entities that benefit from mobile number portability pay its costs?
- ❏   Reciprocity — should cost apportionment be symmetrical?
- ❏   Effects on competition – how can any transactions or cost recovery approaches be certain of producing no adverse effects on competition (in particular, discouraging porting of numbers)?
- ❏   Efficiency — how can an outcome be achieved that creates the greatest level of efficiency in the allocation of resources?
- ❏   Practicality – how can a particular cost apportionment methodology be certain of being workable?

The practical choices available to regulators in deciding how to apportion a particular cost include:
- ❏   Imposing it entirely on the donor provider;
- ❏   Imposing it entirely on the recipient provider;
- ❏   Sharing it among the relevant market players;
- ❏   Allowing the relevant market providers to negotiate how the cost is apportioned;
- ❏   Requiring all market players to bear their own costs; or
- ❏   Imposing it on users.

Practices in CEPT countries regarding the various categories of cost associated with mobile number portability are described below.

Porting costs   The administrative process of porting a number involves various costs for the recipient network operator, the donor network operator, and potentially for mobile dealers or mobile resellers which may be involved in the porting process and for the operator of a number database.

The actual cost of a single port of a mobile number in the CEPT countries in which mobile number portability is implemented or planned and for which information is available range from €10 up to €31; the average cost is €22.

DENMARK	DKK 72 (tax excluded)
ITALY	EUR 30 (proposed)
SWEDEN	SEK 200
SWITZERLAND	CHF 29
UNITED KINGDOM	GBP 20 (estimated, 1997 figure)

Table 7: Actual administrative cost per port

In virtually all countries, the administrative costs associated with porting a number are attributed to the recipient network.

These costs are permitted to be passed on to the user requesting that a number be ported, although CEPT countries differ as to whether:

- ❑ The donor network operator is or will be permitted to charge the user for porting a number (2 countries only);
- ❑ The recipient network operator is or will be permitted to charge the user for porting a number (all countries).

In the case that **only** the recipient network operator is permitted to charge the user, it is likely that this charge will be waived for many or most ports in order not to discourage the user from switching to the recipient's network.

On the other hand, allowing the donor network operator to charge the user for the costs of a port may suggest the necessity of regulating this charge; if the charge is not regulated, it is possible for the donor network operator to inflate it in order to discourage users from switching to a competitor's network. However, the likelihood that a charge by the donor network operator will never be waived means that the charge acts as a disincentive to frequent and unnecessary switching of networks which, it may be argued, would have a destabilising effect on the mobile market.

The fee charged to users for porting a mobile number among CEPT countries for which information is available ranges from zero up to €47; the average charge is €14.

BELGIUM	maximum EUR 15
DENMARK	no fee *
NETHERLANDS	EUR 9.08
NORWAY	approximately NOK 85
SWITZERLAND	no fee
UNITED KINGDOM	up to GBP 30

∗ Some recipient service providers charge a small fee.

Table 8: Fee charged per port

Number database costs

The cost of establishing and operating a national number database to support mobile number portability is difficult to determine. This is primarily because such information is generally regarded as confidential. The cost may also be difficult to calculate if the database for mobile numbers shares some of the same management arrangements or infrastructure with databases for other types of ported numbers. Details of the costs of a database of mobile numbers were obtained from only one European country. These details were provided on an "in-confidence" basis and, as they cannot be compared with costs in other countries, it is not possible to know if the costs are representative.

The methods used to recover the establishment and operating costs associated with a number database are either:

- ❑ The company that manages and/or operates the database meets all costs itself and, in turn, recovers these by imposing fees on users of the database for the services it provides to them;

or:

- ❑ Network operators which are subject to number portability obligations contribute to meeting the costs, generally on the basis of a formula related to market share, quantities of numbers in the database for which it is responsible, or another similar method.

Call-related costs

A call to a ported mobile number may involve costs additional to those that would be incurred if the number was not ported (or, indeed, if no mobile numbers were ported). There are two principal costs of this nature:

- ❑ Additional conveyance costs, associated with carrying a call from an intermediate network (typically the network originally associated with the called number) to the terminating mobile network; and

- ❑ Database dip costs, associated with querying a ported number database.

Neither cost may be incurred under all approaches to implementation of mobile number portability. Additional conveyance costs are associated with the onward routing and call drop back implementations of mobile number portability in which a call to a ported number is initially routed to the mobile network originally associated with the number. Database dip costs are generally associated with all call query and query on release implementations which involve triggers in the call processing to query Intelligent Network databases.

Little data is currently available on additional conveyance costs in CEPT countries in which mobile number portability has been implemented, but it is generally accepted that such costs are relatively low. There is considerable variation in the approaches adopted or planned for apportioning additional conveyance costs between market players, comprising the following:

- ❑ The costs are borne by the originating network, except where the network originally associated with a ported number prescribes an inefficient method of routing calls to ported numbers;

or:

- ❑ The costs are borne by the originating network, except where these costs are negligible;

or:

- ❑ The costs are split between the originating network operator and the network originally associated with a ported number;

or:

- ❑ The costs are borne by the network originally associated with a ported number;

or:

- ❑ The costs are borne by the terminating network;

or:

- ❑ The network that undertakes additional conveyance bears its own costs.

	Costs borne by originating network	Costs split between originating network & network originally associated with number	Costs borne by network originally associated with number	Costs borne by terminating network	Costs borne by network undertaking additional conveyance
BELGIUM	✓ §				
GERMANY					
ITALY				✓	
PORTUGAL	✓ ¶				
SWEDEN		✓			
SWITZERLAND			✓		
UNITED KINGDOM					✓

§   Except if network originally associated with number prescribes less efficient method for routing of calls, in which case it pays difference between cost of method it prescribes and cost of most efficient method.
¶   Except if costs are negligible, in which case they are borne by each network that incurs costs.

Table 9: Approaches to apportioning additional conveyance costs

No data is yet available on database dip costs but, again, it is generally assumed that these costs are quite low. There is also a range of approaches adopted or planned for apportioning database dip costs between market players:

- ❑ The costs are borne by the originating network, except where the network originally associated with a ported number prescribes an inefficient method of routing calls to ported numbers;

or:

- ❑ The costs are borne by the originating network, except where these costs are negligible;

or:

- ❑ The costs are borne by the network originally associated with a ported number;

or:

- ❑ The network that performs a database dip bears its own costs.

|	Costs borne by originating network	Costs borne by network originally associated with number	Costs borne by network performing database dip
BELGIUM	✓ §		
GERMANY			✓
NORWAY	✓		
SWEDEN	✓		
SWITZERLAND		✓	

§   Except if network originally associated with number prescribes less efficient method for routing of calls, in which case it pays difference between cost of method it prescribes and cost of most efficient method.

Table 10: Approaches to apportioning database dip costs

Because of the limited extent of the experience among CEPT countries of mobile number portability, it is as yet impossible to point to any generally preferred approach to apportioning either additional conveyance costs or database dip costs, or to any trend favouring one approach over the others.

9 TARIFF TRANSPARENCY

Users find it desirable to be able to predict the price of calls to mobile numbers, and porting of mobile numbers should ideally not undermine this capability. Mobile number portability may, however, potentially reduce tariff transparency for mobile users due to the price difference that commonly exists between on-net and off-net calls from mobile networks. This is because, in a mobile number portability environment, users lose the capacity to distinguish between on-net and off-net calls on the basis of the prefix of the number.
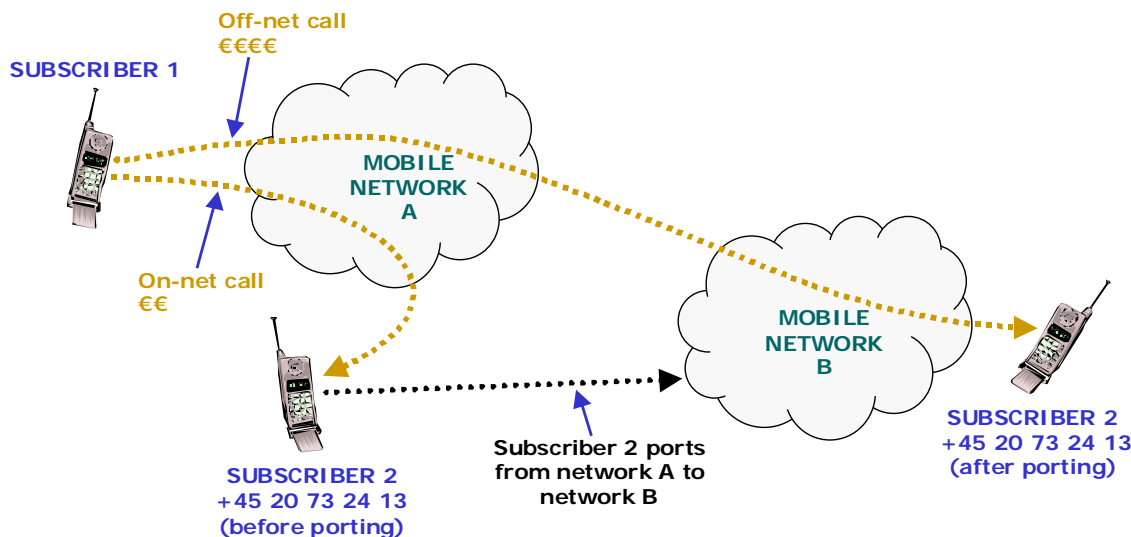
Given the substantial difference that sometimes exists between the cost of an on-net call and the cost of an off-net call, the capability to distinguish between on-net and off-net calls may be a sensitive issue. This is because the absence of such a

capability may adversely affect the usability and affordability of mobile services for users and has the potential to generate controversy. Typical differences between on-net and off-net calls can readily be seen in Table 11, which shows tariffs in November 2002 for various post-paid and pre-paid price plans offered by mobile operators in the United Kingdom.

		ON-NET (PEAK)	OFF-NET (PEAK)
O₂	Flat rate 150	25p	25p
	Flat rate 250	15p	15p
	All calls	8p	35p
	Leisure Time	35p	45p
	Leisure Time Plus	30p	45p
	O₂ 30	15p	45p
	O₂ 50	15p	45p
	O₂ 100	10p	40p
	O₂ 200	10p	40p
	O₂ 250	8p	35p
	O₂ 400	8p	35p
	Max O₂	3p	30p
	Pay & Go [PRE-PAID]	15p	50p
	Pay & Go Talkalot [PRE-PAID]	25p first 3 mins, then 5p	40p
	Pay & Go Wild [PRE-PAID]	25p first 3 mins, then 5p	40p
Vodafone	Leisure 200	20p	50p
	Leisure 500	40p	50p
	Vodafone 20	10p	50p
	Vodafone 60	10p	50p
	Vodafone 200	10p	50p
	Vodafone 400	10p	35p
	Vodafone 800	10p	35p
	Vodafone 1100	10p	35p
	Vodafone Business	10p	50p
	Vodafone Talk by Text	40p	40p
	Firststep [PRE-PAID]	40p	50p
	Smartstep [PRE-PAID]	25p	40p
	Nextstep [PRE-PAID]	10p	40p
T-Mobile	Freetime 750	40p	50p
	Anytime 20	10p	25p
	Anytime 60	10p	25p
	Anytime 200	10p	20p
	Anytime 400	10p	20p
	Anytime Max	free	free
	Daytime Max	free	20p
	Everyone 200 Off Peak	30p	30p
	Everyone 30	10p	20p
	Everyone 100	10p	20p

		ON-NET (PEAK)	OFF-NET (PEAK)
Orange	Everyone 300	10p	20p
	Everyone 500	10p	20p
	Everyone 1000	10p	20p
	Pay As You Go [PRE-PAID]	30p (call spend ≤ £10), 20p (call spend > £10 & ≤ £20), 10p (call spend > £20)	30p (call spend ≤ £10), 20p (call spend > £10 & ≤ £20), 10p (call spend > £20)
	30 Mins	10p	35p
	60 Mins	10p	35p
	120 Mins	10p	35p
	200 Mins	10p	35p
	400 Mins	10p	35p
	700 Mins	10p	35p
	1000 Mins	10p	35p
	2000 Mins	10p	35p
	Pay As You Go [PRE-PAID]	25p first 3 mins, then 5p	40p
Virgin Mobile	[PRE-PAID]	15p first 5 mins, then 5p	35p

Table 11: On-net and off-net tariffs in U.K. mobile price plans

The potential sensitivity of callers' ability to distinguish on-net from off-net calls no doubt contributed to the inclusion in the new EU Universal Service Directive of a statement urging national regulatory authorities to facilitate appropriate tariff transparency as part of the implementation of number portability.

Nevertheless, it is appropriate to recognise that the ability to distinguish between on-net and off-net calls is affected by more than just porting of mobile numbers. Pricing arrangements under the control of operators may reduce the transparency of mobile call tariffs considerably more than number portability. Operator pricing arrangements that may reduce tariff transparency include pre-payment and bundled tariff packages (for example, in which a certain amount of call minutes are free).

The problem of tariff transparency is recognised in many of the countries in which mobile number portability is implemented or planned for implementation. The problem has generally been addressed by ensuring that mobile users have access to information that enables them to predict the cost of a call to another mobile number. This information may be provided via a recorded or live telephone information service or an SMS information service, which provides the correct tariff information on input by the user of the number that will be called. An alternative approach is to provide an audible warning at the beginning of a call that indicates it will be charged at an off-net rate.

	Service indicating network to which specified number belongs (voice-based)	Service indicating network to which specified number belongs (SMS-based)	Tariff information service	Audible warning of off-net call at start of call
BELGIUM	✓	✓		✓
DENMARK			✓	
NORWAY	✓			
PORTUGAL	✓			
SWITZERLAND		✓		

Table 12: Methods of providing tariff transparency

10 SPECIAL MOBILE NUMBERS AND SERVICES

10.1 Voicemail numbers

In some CEPT countries, mobile network operators assign special mobile numbers to their subscribers for deposit and/or retrieval of voicemail, in addition to the standard mobile number associated with subscribers' mobile service.

Particular numbering arrangements have been adopted in some countries or networks for mobile voicemail numbers, such as creating a numeric relationship between a standard mobile number and a mobile voicemail number. For example, a user's standard mobile number may be in the form '0171 abcdefg' and the corresponding voicemail number in the form '0171 13 abcdefg'. Special handling may be required if this relationship is to be preserved when a mobile user ports both numbers (or, more problematically, when just one of the numbers is ported).

There is little data available indicating the extent to which CEPT countries in which mobile number portability is planned or implemented have included voicemail numbers in portability obligations. Out of 6 respondents on this issue, however, portability obligations in 4 countries do include or will include voicemail numbers.

10.2 Data and fax numbers

GSM standards specify that, for calls to mobile terminals that originate on the fixed network, the terminating mobile network may seek to identify the bearer capability that is required depending on the nature of the call. Bearer services that may be supported by mobile networks include telephony, data, facsimile, etc. Identification of the required bearer capability ensures that a call is presented to a mobile terminal in a form that is appropriate to the content.

For calls that originate on the fixed network, there is no direct means of specifying the required bearer capability. However, mobile network operators have the option of adopting a multi-numbering scheme in which several E.164 numbers are associated with a single mobile subscriber, and each number is used for a different bearer capability. Thus, a mobile subscriber may be assigned not only a standard mobile voice number, but also a mobile fax number and a mobile data number. A call originating on the fixed network should, if a mobile subscriber is assigned a mobile fax number or a mobile data number, use this number in order to specify that the call is not a voice call but a fax or data call.

In 6 out of 9 respondent countries, regulatory requirements relating to mobile number portability include or will include mobile data and mobile fax numbers.

10.3 Pre-paid services

Users with pre-paid mobile services may have as much interest in retaining their number when switching network as do users with post-paid services. In most CEPT countries in which mobile number portability is planned or implemented, mobile numbers associated with pre-paid services can be ported.

	Voicemail numbers	Data & fax numbers	Pre-paid services
AUSTRIA			✓
BELGIUM		✓	✓
DENMARK	✗	✓	✓
FRANCE	✗	✗	✓
GERMANY			✓
IRELAND	✓	✓	✓
ITALY			✓
NETHERLANDS	✓	✓	✓
NORWAY	✓	✓	✓
PORTUGAL	✓	✗	✓
SWEDEN		✓	✓
SWITZERLAND		✗	✓
UNITED KINGDOM			✓

**Table 13: Existence of requirements for porting in respect
of special types of numbers & services**

11 CONCLUSIONS

The increasing importance of mobile telephone numbers to users means that the achievement of a successful implementation of mobile number portability is critical to ensuring the benefits of a liberalised market flow through to mobile services.

Mobile number portability has now been introduced or is actively being planned in up to 23 European countries. The approach to implementation being taken across these 23 countries shows considerable variation. There are, however, a number of common themes:

❑ The *involvement of industry* in developing the detailed specifications – and in some cases the high-level specifications – for introducing mobile number portability is clearly important. The task of establishing the forums and procedures to permit this involvement in a fair, transparent and effective manner should not be under-estimated;

❑ Centralised *number databases* are evidently the most favoured approach to managing data associated with ported mobile numbers that must be shared among network operators. This approach may also facilitate cross-border access to this data should such access become desirable in order to optimise cross-border routing of calls to mobile numbers;

❑ Aspects of the implementation of mobile number portability such as selection of a method (or methods) for routing of calls, and administrative procedures for porting of numbers are clearly very important. Some lesser aspects, however, notably the handling of *mobile voicemail, data and fax numbers*, and *routing of SMS traffic*, are also important and, if ignored until late, may impede progress towards implementation;

- The *administration of the porting process* is a complex manner, involving the careful balancing of factors such as cost, convenience, simplicity, speed, reliability and robustness. Although each country reaches a different outcome in balancing these considerations, it is important that all of them are properly assessed to ensure that the administrative process that is implemented does not adversely affect the success of mobile number portability;

- Similarly, different approaches to determining the *apportionment of costs* associated with the implementation and operation of mobile number portability results in variation across CEPT countries regarding how the various entities involved in the operation of mobile number portability bear these costs. Nevertheless, it is clear that some considerations will almost always be paramount. These considerations include creating incentives to keep costs and charges low and promoting efficiency; and

- The reduced *tariff transparency* that would normally result from the introduction of mobile number portability is a problem that could seriously affect the usability and affordability of mobile services for users. Solutions are, however, available to ensure that tariff transparency is preserved when mobile number portability is introduced.

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