

Office of the Director of
**Telecommunications
Regulation**

Introducing Number Portability in Ireland

**A consultative document prepared by Ovum
for the ODTR**

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FOREWORD

Number portability is a key enabler for effective competition in a liberalised telecommunications environment. The European Commission Directive 98/61/EC requires that number portability should be available to consumers in January 2000. Although Ireland has the option of seeking a derogation, the Minister for Public Enterprise has stated that Ireland will not make use of this additional period.

The Director of Telecommunications Regulation is also committed to the early introduction of number portability in Ireland. In 1998, for example, the Office of the Director of Telecommunications Regulation (ODTR) undertook to commission an independent study on the technical and regulatory aspects of number portability (Numbering in Ireland in the 21st Century, Decision Notice: D2/98).

The ODTR commissioned Ovum to carry out this study which aims to analyse the key issues and develop a national strategy which addresses the major options for implementation. The strategy will determine the form of number portability to be implemented, define routing and charging rules and will propose a timetable for implementing number portability in Ireland.

The following consultative document is an important step in the study process. However, it should be noted that the analysis and proposals in this document are those of Ovum and do not imply any acceptance on the part of the ODTR.

The Director invites views from interested parties on the consultative document. Comments should be submitted in writing before 5pm on the **22nd February** to:

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All comments are welcome, but it would make the task of analysing responses easier if comments reference the relevant question numbers from this document. Unless marked confidential, the ODTR will make copies of the comments available for public inspection at its offices. The Director regrets that it will not be possible to enter into correspondence with all those supplying comments.

Following the consultation, the Director will hold a seminar to discuss the outcome and will issue a decision notice on the introduction of number portability. Details on timing and location of the seminar will be provided nearer the date.

Note: - This consultative document is not a legal document and does not constitute legal, commercial or technical advice. The Director is not bound by it. The consultation is without prejudice to the legal position of the Director or her rights and duties under the relevant legislation.

Introducing number portability in Ireland

**A consultative document by Ovum
as part of a study for the ODTR**

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CC733

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1 Introduction

1.1 Background to the consultation

Number portability (NP) is essential to maximise the benefits of a competitive telecommunications market. For example NP of the type which allows users to keep their telephone number when changing operator provides significant benefits:

- for the *porting user* it eliminates the cost of informing others of a number change
- it eliminates the need for *callers* to consult directory enquires and/or change entries in their address books or computer systems
- it increases competition, with significant benefits for *all users*, by lowering the cost to users of switching operator or service provider.

So Ireland needs to introduce NP if it is to maximise the benefits from the liberalisation of December 1998.

There is already a commitment in principle to introduce NP in Ireland:

- the Minister for Public Enterprise has stated that in accordance with European Commission Directive 98/61/EC, NP should be introduced in Ireland in January 2000.
- the Director of Telecommunications Regulation indicated in her Decision Notice on Numbering (D2/98) that she intends to initiate work to ensure the introduction of NP services in the year 2000.

The Office of the Director of Telecommunications (ODTR) now wants to establish a detailed timeframe and a set of rules for introducing NP as soon as possible. So it has commissioned Ovum to carry out a study on how best to do this.

1.2 The study objectives

The study aims to resolve four key issues which, in combination, define the national strategy for introducing NP:

- what kind of NP services should the Irish Telecommunications industry introduce over the next two years?
- should the originating network operator or the donor network operator be responsible for routing calls to ported numbers?
- what national rules should operators be required to follow:
 - when routing calls to ported numbers?
 - when porting a number from one operator to another?
 - to recover the additional costs of NP?
- what action plan should the ODTR follow in introducing NP?

1.3 Responses to the consultative document

This consultative document is an important step in the study process. It presents Ovum's analysis and proposals for the introduction of NP in Ireland. But it does not necessarily represent the views of the ODTR.

The chapters which follow consider each of the four issues of Section 1.2 in turn. They identify options for resolving the issues, recommend solutions and

seek written comments from interested parties. These comments will play a major role in shaping the final study recommendations.

The document attempts to define terms as it goes along. But there is also a glossary of key terms used in analysing the routing of ported numbers which is attached as Annex A.

The proposed timetable for the study following the publication of the consultative document is as follows. Ovum staff will:

- assist the ODTR in a presentation of the consultative document to an advisory group¹ on numbering, in early February
- hold discussions with the main operators and service providers in late January and early February to clarify points raised in this document
- analyse and, if appropriate, follow up on written comments at the end of February
- deliver and present its finding to the ODTR by mid March

Following the consultation, the Director will hold a seminar to discuss the outcome and will issue a decision notice on the introduction of number portability. Details on timing and location of the seminar will be provided nearer the date.

¹ The advisory group will include representatives from the major operators, industry watchdog groups and both business and consumer interest groups

2 What kind of number portability services are required?

2.1 The different kinds of NP services

There are three different types of NP service:

- **operator portability** - where a customer changes operator or service provider and keeps the same directory number
- **location portability** - where a customer changes location and keeps the same directory number
- **service portability** - where a customer changes service and keeps the same directory number. The extent of a change in service may be minor as in a change from PSTN to ISDN or major as in a change from a fixed to mobile service.

In the long term it may make sense to implement all three types of NP and combinations of them. But at the moment the number dialled provides valuable information to the caller, especially on the price paid for the call (e.g. the difference between freephone 1800 and part-paid 1850). It is important to preserve this information in the number until such time as alternative solutions are available. This means there is a need to limit the kind of NP services which are implemented.

With these considerations in mind we propose that initially the ODTR should:

- *limit the scope of location NP. The ODTR has already said, in its Decision Notice on numbering (D2/98) that it will initially restrict location NP for geographic numbers to portability within the minimum numbering area² for which they were issued.*
- *prohibit portability between services with fundamentally different pricing arrangements. Under this rule NP between a freephone service and a personal numbering service or premium rate service is prohibited. But this restriction does not prevent NP between PSTN and ISDN (which is more a technology than a service difference) where the user pays the same price per call.*

2.2 What kinds of operator NP are required?

Given the proposed restriction on service and location NP the study focuses on operator NP. But there are three different kinds of operator NP that the Irish telecommunications industry might implement:

- operator portability of geographic numbers which allows portability of PSTN/ISDN numbers between operators. We refer to this as **geographic NP** from now on
- operator portability of non geographic numbers which allows portability of non geographic service numbers³ between operators or service providers. We refer to this as **non geographic NP** from now on
- operator portability of mobile numbers which allows portability of cellular mobile numbers between operators. We refer to this as **mobile NP** from now on.

² There are currently 128 minimum numbering areas in Ireland. This number could be reduced in future, creating a smaller number of larger areas. The proposals on NP do not affect such changes.

³ Non geographic services include freephone, shared cost, premium rate, universal access and personal numbering services

Which of these types of operator NP should Ireland introduce first? In answering this question the Director does not have a free hand. The European Commission Directive on Operator Number Portability and Carrier Pre-selection (98/61/EC) requires that geographic NP and non-geographic NP be introduced by 1 January 2000. There is provision in the Directive for an additional transition period. However, the Minister for Public Enterprise stated in late 1997 that Ireland will not make use of this deferment. The Minister plans to introduce legislation requiring the introduction of geographic NP and non-geographic NP by 1 January 2000.

There is a further choice to make about how operator NP is introduced. It is possible to introduce each type of operator NP in one of two ways:

- **customer initiated NP.** The customer requests NP and the operators must be in a position to provide it. Customer initiated NP gives users the right to NP and operators must make their networks capable of dealing with both the export and import of numbers. The main advantage of customer initiated NP is that the customer can avail of NP regardless of which operator he wishes to move to. But there is a disadvantage to moving directly to customer initiated NP in a recently liberalised market. Such a move means that all operators must immediately provide the facility for import and export. This will involve increased costs, which may be significant for a new entrant and may be a barrier to market entry
- **operator initiated NP.** Typically this means that:
 - the incumbent operator must be capable of exporting numbers to another operator if that operator requests it
 - the requesting entrant must offer to export numbers to the incumbent in return (reciprocity)
 - an entrant can refuse NP to another requesting entrant if it is not already required to offer NP to Telecom Eireann on a reciprocal basis.

Operator initiated NP can facilitate new entrants in developing market share. It allows new entrants to judge when the additional costs of implementing NP make it worthwhile. It does not require them to do so.

Figure 2.1 illustrates the main differences between these two approaches.

The EU directive on NP requires Ireland to implement customer initiated NP by Time U⁴, and the Minister has stated that number portability should be introduced in January 2000. This may leave open the possibility of a two phased approach – with the early introduction of operator initiated NP and the later implementation of customer initiated NP. In addition, it will be difficult to introduce portability for all services by January 2000. This is discussed in subsequent sections.

The ODTR needs to establish priorities for introducing operator NP:

- which type(s) does it introduce first?
- does it require customer initiated NP from the outset?

We set out below Ovum's proposed answers to these questions for consideration in response to the consultation.

⁴ Time U needs to be clarified. However, Ovum believes it is December 2000

Figure 2.1 Customer initiated v operator initiated NP

	<i>Customer initiated</i>	<i>Operator initiated</i>
Objective	Maximises choice of operator for customers wishing to retain their number	Remove barrier to competition
Start date	Set by regulator	Chosen by requesting operator
Implementation required by Telecom Eireann	Export and import	Export only
Implementation required by new entrant	Export and import	Export to Telecom Eireann if entrant requests import from Telecom Eireann No obligation to provide export to other entrants unless it is required to offer it to Telecom Eireann on a reciprocal basis

2.3 Requirements for non geographic NP

We propose that the ODTR should make the introduction of non geographic NP its highest priority.

More specifically we propose that the ODTR should:

- *require operators and service providers to implement NP of non-geographic numbers (eg freephone, shared costs and premium rate) on the request of the customer with effect from 1 January 2000. This implies that all operators who provide these services will have to implement both an export and an import capability from the outset.*
- *require an operator or service provider which enters the market after 1 Jan 2000 to offer number portability to users at the commencement of service or within two months of the allocation of a number block to the new operator, whichever is the later.*

Our rationale for making this proposal is as follows:

- non geographic NP generates major benefits for users. Non geographic numbers (such as freephone numbers) have potentially the highest value of all numbers. They are normally used for business purposes and are frequently used in advertising and long term marketing campaigns
- several new entrants have told us that number portability for non-geographic numbers is their highest priority. They see non geographic services as high revenue services than can be competitive right from the start of liberalisation
- non-geographic NP is normally implemented centrally and the routing arrangements already use IN. These factors make the implementation easier and quicker for non geographic NP than for geographic NP.

Customers may want to use a specific non geographic number which has business significance (eg 1 800 747747 as a freephone number for a long distance airline). The existing system of block allocations means that a customer is constrained initially to take service from the operator who has been allocated the number block that contains the specific number required.

To overcome this problem we propose that the ODTR should:

- *require porting to apply to numbers after individual allocation but before, as well as after, the start of service. This would allow a customer who wishes to start service from Operator Y to use a number that is in a block allocated to*

Operator X. We see this as a relatively short term solution for use of specific numbers

- *conduct a review within two years to examine the possibility of changing to individual allocation of non geographic numbers to customers.*

2.4 Geographic NP

Implementing geographic NP may be less urgent. Competition in fixed telephony services is starting late in Ireland. Experience in Germany, Sweden and other countries has shown that competition will initially develop in the provision of long distance and international services using carrier selection. These services do not require new subscriber numbers and so do not require number portability. For direct connection to customers the first priority is large organisations that are likely to retain existing lines from the incumbent for incoming calls and are therefore unlikely to need NP in the early stages of service. So, in the first two years of competition, there is unlikely to be a large number of customers and potential customers who want geographic NP. Requiring customer initiated NP from the outset could be a disincentive to competition for terminating calls.

With these market considerations in mind we propose that the ODTR should:

- *require Telecom Eireann to provide by July 2000 the capability to export numbers to any other operator who requests portability and who is willing to offer portability in return*
- *require all operators to offer customer initiated geographic NP from Time U*
- *up until Time U allow entrants which do not want to import numbers to refuse to export numbers to other operators.*

This proposal is formulated to allow new entrants, but not Telecom Eireann, to decide when to start number portability. In the initial phase Telecom Eireann would not be entitled to require portability from new entrants who have not yet decided to start number portability. However Telecom Eireann would be able to request number portability from any operator that has itself requested portability from Telecom Eireann. Consequently although the requirement will be initiated by new entrants, the portability will be reciprocal. Giving new entrants the option on initiation is designed to allow them to set their own priorities in the critical initial phase of their operations.

These proposals also allow all operators a period in which to decide whether they want to import numbers as well as export them. (Implementing the capability to import numbers is likely to be more demanding than implementing the capability to export numbers)

We also make three further, more detailed, proposals on geographic NP:

- *where DDI numbers are allocated in blocks and a block of numbers is ported, the customer may subsequently need more numbers and prefer them to be contiguous with its existing numbers. In this situation, we propose that the requirement for porting should apply even if the numbers are not already in service, provided that these numbers are not already allocated to other customers*
- *Telecom Eireann should respond to requests from other operators for geographic NP in a minimum numbering area within two months. This period should be sufficient for Telecom Eireann to implement any of the changes needed to make NP available within that area*
- *after Time U other operators should make geographic NP available in an area either on providing service in that area or within two months of*

receiving number blocks in the relevant minimum numbering areas, whichever is the later.

2.5 Mobile NP

There is no EU requirement for Ireland to introduce mobile NP in the near future (as there is for geographic and non geographic NP). But there is an economic case for doing so. The UK and Dutch regulators have both conducted detailed economic analyses which conclude that the early introduction of mobile NP is in the national interest. For example in the UK:

“OfTel considers that the introduction of NP between mobile operators is essential to promote full competition and to ensure the consumers get a good deal in the mobile market”⁵

Moreover the economic case for mobile NP is getting stronger as:

- the size of the mobile market grows and the (largely) fixed costs of introducing NP are counter-balanced by benefits which grow quickly as the cellular mobile subscriber base expands
- the cost of implementing mobile NP falls with the introduction of signalling standards and support systems which are NP capable
- dual mode GSM handsets which operate at both 900 and 1800 MHz are introduced. For customers with such handsets the main barriers to switching between a GSM900 and a DCS1800 operator is the lack of NP.

In Ireland however there are two factors which significantly weaken the case for the early introduction of mobile NP:

- the existing mobile operators, Eircell and Digifone, have already implemented **partial NP**. Under this partial NP the subscriber switching for one operator to the other keeps subscriber number but changes national destination code (NDC)⁶. The donor network then puts a voice announcement on the old number for a 6 month period. This partial NP delivers many of the benefits of full NP and weakens the case for its early introduction
- Ireland is a small country with penetration rates for cellular mobile services which are about average for the EU. So the setup cost for mobile NP must be spread across a smaller number of subscribers than in other countries like the UK or the Netherlands. This tilts the balance between cost and benefits to give a greater weight to the costs.

With these considerations in mind we make the following proposals:

- *the ODTR should confirm its decision in principle to move to full NP between mobile operators in the long term. This will give the mobile operators an incentive to invest in NP capable systems from now on*
- *the ODTR should continue with the current system of partial NP between mobile operators in the short term*
- *the ODTR should take the necessary steps to ensure that the mobile operators make the existing system of partial NP work properly. At the moment there are problems. In particular there is some duplicate use of the same subscriber numbers by different customers.*

⁵ NP in the Mobile Telephony Market, an explanatory statement by OfTel, July 1997

⁶ So a subscriber moving from Digifone to Eircell changes number from 86 8812345 to 87 8812345)

- *the ODTR should keep the current situation under review. It should consider a move to full NP if partial NP continues to operate in an unsatisfactory way, or if requested to do so by the third mobile operator once licenced, or by 2001 at the latest. By then circumstances will have changed considerably. The mobile market will be much bigger and the cost of implementing NP will have fallen. In combination these developments should significantly strengthen the economic case for full mobile NP.*

2.6 The extent of location NP

The ODTR has already decided to initially restrict location NP to the minimum numbering area (MNA) so as to preserve location information in the numbering scheme. But should it be a requirement that location NP should be available throughout the entire MNA?

We understand that:

- the Telecom Eireann network is capable of providing location NP across all numbers on each switch
- most MNAs are served by a single Telecom Eireann switch. But here are exceptions. For example the Dublin MNA is heavily populated and is served by several switches
- all MNAs are likely to be served by a single new entrant switch.
- Telecom Eireann's support systems and processes would require significant modification to allow location NP across the entire MNA. For example Telecom Eireann currently analyses the number to locate the remote concentrator unit (RCU) to which a faulty line is attached. In most cases there is more than one RCU in an MNA.

In these circumstances we propose that the ODTR should:

- *restrict entrants to providing location NP within an MNA and not more widely*
- *allow Telecom Eireann to offer more restricted location NP if it wishes. In most cases this will mean location NP across the area served by an RCU*
- *encourage Telecom Eireann to publicise the extent of its location NP capability in areas where competition is weak or non-existent. We understand that many users are currently unaware of this capability.*

These measures are likely to have the effect of allowing users who change location within an MNA to port from Telecom Eireann to an entrant but not necessarily to port in the reverse direction. This should give Telecom Eireann a commercial incentive to implement MNA wide location NP.

We do not believe that the ODTR should require Telecom Eireann to offer MNA-wide location portability. In our view such matters are better left to market forces.

2.7 Requirement for portability across different technologies

Within a particular service category, eg geographic numbers on the fixed network, there may be a variety of different access technologies used such as:

- analogue single line
- analogue multi-line
- ISDN basic access
- ISDN primary rate access
- IP based access.

We propose that the ODTR should not distinguish between these different technologies. In principle it should require NP between any combination of technologies, with the exception of cases where the number of telephony access circuits is reduced⁷. In the interests of the user this requirement should apply both within and between networks.

In practice this requirement may cause some implementation difficulties. So the ODTR and any working group established to deal with NP will need to discuss each case on its individual merits.

2.8 Effect of NP on non-call related services

Non-call related services involve signalling interactions that are not related to a circuit switched call. Examples include:

- the ISDN supplementary service Call Completion to Busy Subscribers for fixed networks
- optimal routing for GSM based mobile services.

We expect that non-call related services will become more common in the future and we propose that they should eventually be implemented in a way that allows number portability. This requirement is likely to make it necessary for operators to use an NP implementation that includes IN.

At present few supplementary services are supported across interconnection points and we consider that it would be premature to apply this requirement from the start of NP.

So, at this stage, we simply propose that the ODTR should signal its intention to apply this requirement to all operators at an appropriate time in the future.

2.9 Questions

Q2.1 Do you agree with the proposed restrictions on location and service portability? (Section 2.1)

Q2.2 Do you agree that non-geographic NP should have the highest priority? (Section 2.3)

Q2.3 Could the introduction of non-geographic NP be achieved earlier than the target date of January 2000? If so, how can this be achieved?

Q2.4 Are there any non-geographic services which should be exempted from operator NP requirements?

Q2.5 Do you support the idea of a two phased approach to introducing geographic NP between operators? (Section 2.4)

Q2.6 Could the Telecom Eireann capability to export geographic numbers to other operators be implemented earlier than the target date of July 2000? If so, how can this be achieved?

Q2.7: Do you agree with the proposed notice period of two months for the introduction of geographic NP by new entrants?

Q2.8 Do you agree with our proposals to delay a move from partial to full mobile NP? (Section 2.5)

Q2.9 Is the existing system of partial NP between mobile operators worth preserving?

Q2.10 If so, what steps would be taken to make it work properly?

⁷ For example NP from primary rate to basic rate ISDN

Q2.11 Should the ODTR simply restrict location NP to the MNA and allow operators to offer location NP on a narrower basis or should it make MNA wide location NP mandatory on all local operators? (Section 2.6)

Q2.12 Do you agree that, in principle, NP should be implemented in a way which is independent of the access technology? (Section 2.7)

3 The responsibility for routing calls to ported numbers

3.1 Introduction

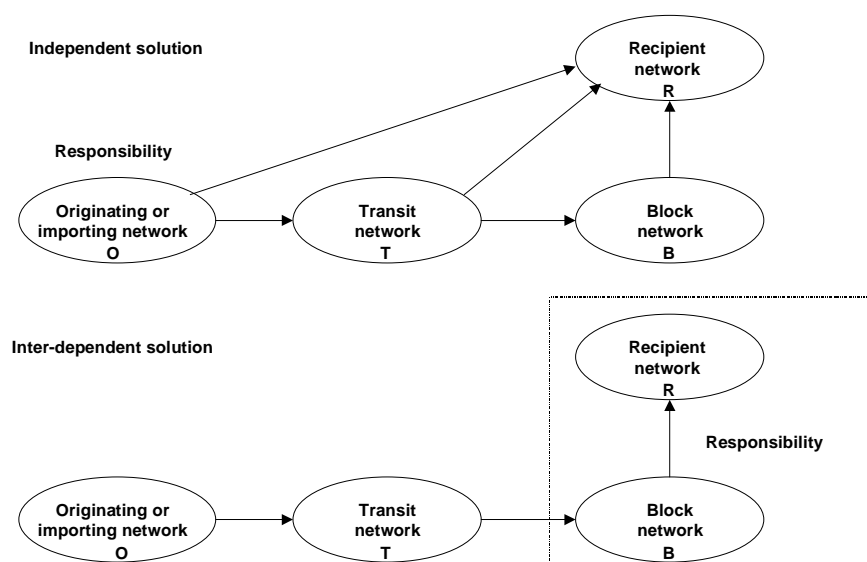
Having established the kind of NP services which are required, the next main issue to be decided in the national strategy is which operator should take responsibility for the routing of calls to ported numbers. Here we are deliberately separating responsibility for routing from implementation of routing so as to allow the responsible operator to use and pay for the services of another operator to carry out the routing functions. Responsibility does not imply an obligation to carry out the routing functions, but it does imply an obligation to pay, at least in part, for any special routing carried out by other networks.

There are two main options:

- **the independent solution**, where the originating operator has routing responsibility independently of the block network⁸. This means that all originating networks are affected by NP. For example mobile operators become responsible for the correct routing of calls to ported fixed network numbers
- **the inter-dependent solution**, where the block operator and recipient operator together have responsibility for routing. The two operators act in an interdependent way and the effects of number portability are isolated from other networks.

Figure 3.1 compares the independent solution and inter-dependent solutions for calls to ported numbers. The figure is drawn for separate originating local, transit, and destination local networks, although in practice these networks may be combined in various ways.

Figure 3.1 Independent solution versus inter-dependent solution



⁸ The block network is the network to which other operators would route calls on the basis of normal number analysis

With the independent solution the originator may fulfil its responsibility in one of two ways:

- it may route the calls correctly itself (route O-R)
- it may route the call to the transit operator T and pay that operator for applying the correct routing. The transit operator may then, in turn, route the call to the block network and rely on the block network to re-route the call to the recipient (route O-T-B-R). Alternatively it might route the call directly (route O-T-R).

In contrast the inter-dependent option places the routing responsibility on the block operator always resulting in the route (O-T-B-R).

In practice the two options, independent and inter-dependent, can use the same routing implementation although the payments for the additional routing functions are handled differently.

The choice between these alternatives is fundamental, and closely linked to the charging principles.

3.2 The independent solution

The independent solution has the following characteristics:

- it treats portability as an integral part of the telecommunications services which an operator offers to its directly connected customers and is part of the price they pay for service
- it affects all originating operators
- it fits well with the idea that portability is a user right and that users can demand NP. This idea, embodied in the EU Directive on NP, affects all operators in a similar way to the independent solution
- it requires a mechanism for making information on ported numbers available to all networks. A national reference database is one such mechanism
- it naturally leads to the additional conveyance costs being borne by customers of all access networks
- it gives the operator with responsibility for routing decisions the opportunity to decide how to implement that routing. This alignment makes it easy to ensure that operators have the correct financial incentives to take economically efficient decisions on the implementation of the routing functions as the volume of ported numbers increases
- it is compatible with the development of advanced services using non call related signalling.

3.3 The inter-dependent solution

The inter-dependent solution has the following characteristics:

- it treats portability as a way of removing a barrier to competition for entrant operators
- it affects only the donor, block and recipient networks
- it fits well with the idea of portability as an interconnect service for operators rather than a service for users and, hence, with the idea of operator initiated NP
- it normally requires information exchange only between the block and recipient exchange

- it naturally leads to the additional routing costs being borne by customers of the block and recipient network
- it does not provide incentives for operators to take economically efficient decisions on the implementation of the routing functions as the volume of ported numbers increases. This means that operators may be locked into a solution that becomes inefficient
- it leads to problems with the development of advanced services using non call related signalling.

3.4 The choice in other countries

Experience in other countries indicates that both solutions can work. Although solutions differ to some extent, in general terms:

- the independent solution is used in Germany, the Netherlands, USA
- the inter-dependent solution is used in Australia, Finland, New Zealand, the UK
- Australia and Finland plan to move to an independent solution at a later stage.

3.5 Recommendation

We recommend that the ODTR should adopt the independent solution from the start.

There are three main reasons for recommending the independent solution when compared with the inter-dependent solution:

- it provides incentives for operators to implement efficient solutions in the long term when the volume of ported numbers is high. The inter-dependent solution does not
- it gives the competing network of networks within Ireland the potential for higher functionality in the long term because it is more compatible with the development of advanced services using non call related signalling
- it fits in well with the EU Directive on NP which requires operators to implement user initiated NP and means that all fixed network operators must implement NP.

It is important to keep in mind that this recommendation does not impose restrictions on the way in which operators implement NP. In particular it allows low cost initial solutions.

3.6 Questions

Q3.1 Which solution fits best with the long term development of telecommunications in Ireland?

Q3.2: Which solution do you prefer and why?

4 What rules should operators follow when implementing NP?

4.1 The need for national rules

In the previous chapter we proposed that the responsibility for correct routing of calls to ported numbers should be placed on the originating operator rather than the block operator. Having made this fundamental choice there are still many technical options which an originating network operator can use to implement NP routing capability- either as a permanent solution or as a stepping stone to such a solution.

These include:

- using data decode solutions which might involve call drop back or tromboning
- using IN solutions which might involve query on release or all call query techniques
- using IN solutions which involve querying the database from an originating exchange (local or transit) or a terminating exchange (local or transit).

Annexes B and C provide information on the options which are available and used in other countries for geographic and non geographic NP respectively.

It is important that operators should have as much freedom as possible to implement NP using solutions which best fit their circumstances and any implementation timescales which are established. But they cannot do this independently of each other. They must all work together within a set of national rules if NP is to work effectively.

There is a requirement for three sets of such rules:

- *routing rules* which ensure correct routing of calls to ported numbers and which operators must follow when their network originates a call or receives a call from another network
- *charging rules* which specify when and how one operator can recover the additional costs of NP from another party
- *porting rules* which govern the process of transferring numbers and services from one operator to another in a user friendly and equitable way. These rules place constraints on how operators make changes to their operational and customer support systems to deal with NP.

In this chapter we make proposals for routing rules. In subsequent chapters we discuss and make proposals for cost allocation and porting process rules.

4.2 Routing rules for geographic NP

Given the choice of an independent solution within the national strategy, we propose that the ODTR should establish the following routing rules for geographic NP:

- *the responsibility for correct routing should be placed on:*
 - *the operator which originates the call, if the call originates within Ireland*
 - *the operator which imports the call, if the call originates outside Ireland*
- *this operator should be free to decide whether to implement the necessary routing capability itself or to pass the call to another operator that will perform the additional routing functions. This is of potential benefit to very*

small operators such as local communities that are served using simple technology such as a PBX as a local switch.

- *operators should be free to decide which routing technology to use. This freedom will enable the operators concerned to decide which technology best fits within their network and to change the technical solution used if synergy with other services or growth in the volume of calls to ported numbers makes a change appropriate*
- *mobile operators, as well as fixed network operators, should be responsible for routing to the correct fixed network operator. When full mobile portability is introduced the fixed networks will be responsible for routing to the correct mobile operator.*
- *Telecom Eireann should be required to provide a routing service to other operators for the correct delivery of calls to ported numbers. The Telecom Eireann network holds a special position, both as a former monopoly and in view of the current interconnection topology where many other networks do not have direct interconnections but interconnect via Telecom Eireann in a star configuration*

4.3 Routing rules for non geographic NP

We propose that the ODTR should establish the following routing rules for non geographic NP:

- *the responsibility for correct routing should be placed on:*
 - *the operator which originates the call, if the call originates within Ireland*
 - *the operator which imports the call, if the call originates outside Ireland*
- *this operator should be free to decide whether to implement the necessary routing capability itself or to pass the call to another operator*
- *mobile and fixed operators alike should be responsible for routing to the correct fixed network operator. When full mobile portability is introduced the fixed networks will be responsible for routing to the correct mobile operator*
- *new entrants should have the freedom to outsource the routing capability*
- *Telecom Eireann should be required to provide a routing service to other operators for the correct delivery of calls to ported numbers.*

In practice it is likely that operators will initially use the database platforms which deliver non geographic service⁹ to provide NP capabilities as well. Instead of returning the geographic number of the called party the database could return the called number with an added prefix that would be used for routing the call to the correct network.

4.4 Routing information passed between networks

The network that has carried out the rerouting needs to be able to direct the call to its correct destination. It therefore needs to pass on some routing information to the subsequent network, which may be a transit network. The advantage of passing on the routing information is that only one network controls the routing and so problems of synchronising changes to routing information do not occur.

Two questions arise:

⁹ like freephone

- what information should be passed between networks?
- in what form should this information be conveyed?

The content of the information sent

We propose that the routing rules should require that:

- *the rerouting network provides information which identifies the **recipient network**. This gives the recipient operator freedom for network reconfiguration without needing to change routing information. This freedom should be of benefit both to Telecom Eireann and to the new entrants*
- *Telecom Eireann should have the option of using different identifiers for each exchange in the case of areas like Dublin (which has a large minimum numbering area served in the Telecom Eireann network by more than one exchange)¹⁰.*

There are several options for the information which is passed between networks. These include:

- the identity of the recipient network
- the identity of the recipient exchange
- the identity of the recipient concentrator.

Sending the identity of the recipient network provides the most stable information since no changes need to be made if the recipient network is re-organised internally. Sending the identity of the recipient exchange is arguably the least stable option because network re-organisations frequently involve re-parenting remote concentrators that feed the subscribers lines on different processors.

Limiting the information to the identity of the recipient network will however increase the number analysis needed in a recipient network where the interconnection point does not lead directly to the recipient exchange.

In Germany and Finland the information sent identifies the recipient network. In the UK and the USA it identifies the recipient concentrator or exchange.

The form of the information sent

There are two main options for the form of the additional routing information:

- a prefix to the called party number
- the use of an additional field in the signalling system.

Prefixes are used in most European countries. The US solution replaces the called party number with a routing number that identifies the recipient switch and carries the called party number in a separate field. Once the call reaches the recipient switch the called party number is restored to its normal location in the signalling.

A prefix may need to be distinguished from a diallable number or logic may need to be added to switch processors to determine from the number length whether a prefix is present. Both Finland and Germany use prefixes which start with a non-numerical hexadecimal character for easy identification.

We propose that the routing rules should require operators to use a prefix of the form "Dxyz" to identify the recipient network.

¹⁰ This would enable Telecom Eireann to avoid rerouting when a call to an imported number in a multi-switch MNA arrives in its network.

This choice provides:

- compatibility with Call Detail Records used for billing (use of another field would not be compatible)
- easy identification through the hexadecimal character “D”
- full compatibility with the dialling plan
- compatibility with any possible future nation-wide solution for location portability which could use prefixes of the form “Cxyz”.

4.5 Illustrative functional specification of routing requirement

The following text is an example of a functional specification for routing rules based on the proposals set out above:

1. The operator of any network type operated under a general or mobile licence:

- which originates a call to a number with operator portability, if the call originates within Ireland, or
- which imports a call to a number with operator portability, if the call originates outside Ireland

shall be responsible for ensuring that the call is routed directly or indirectly to the network that currently serves the number.

2. In exercise of this responsibility the operator shall either:

- add a prefix of the form “Dxyz” to the called number, where Dxyz is the code allocated by ODTR to identify the serving (recipient) network under operator number portability, or
- route the call to another network that has agreed to undertake subsidiary responsibility for the routing of the call to its correct destination.

3. Any operator which determines that a number is the subject of operator portability and determines the identity of the network that is currently serving the number, shall add a prefix of the form “Dxyz” to the called number, where Dxyz is the code allocated by ODTR to identify the serving (recipient) network under operator number portability.

4. Any operator which receives a call with a prefix of the form “Dxyz” to the called number shall route the call towards the network identified by the prefix.

5. With effect from 1 January 2000, Telecom Eireann shall add to its Reference Interconnection Offer a service for the correct routing of calls to numbers with operator portability¹¹.

4.6 Questions

Q4.1 Do you agree with the proposed routing rules?

Q4.2 If not, how would you modify them?

Q4.3: Will prefixes using hexadecimal C and D work within existing networks? If not what are the alternatives?

¹¹ From January to July 2000 this would cover non geographical NP only under our proposals.

5 Rules for allocating the additional costs of NP

5.1 Introduction

This chapter examines the rules for allocating the additional costs generated by NP. It focuses on the rules which are appropriate with an independent solution and then looks briefly at the rules for an inter-dependent solution.

5.2 The additional costs of NP

Introducing NP increases costs for network operators and service providers. There are three additional costs to consider:

- **the set up costs of NP.** These are the costs that are incurred even before a single number is ported. They include all the capital costs of network upgrading and systems development, as well as the costs involved in creating an agreed porting procedure and determining commercial terms. For an incumbent the bulk of these costs are usually generated in modifying operational and customer support systems. For an entrant the position varies. Often entrants start operation with NP capable support systems and the costs of modifying them are low
- **the transaction costs of NP.** These are the costs that are incurred in porting a specific number before any calls are made to that number. They include the costs of following the agreed porting procedures, activating the ported number, testing the new facility, and communicating the necessary call routing information to other operators
- **the additional conveyance costs of NP.** These are the additional traffic sensitive routing and conveyance costs which arise for calls as a result of introducing NP.

Which of these costs (if any) should operators be allowed to recover from other operators or from customers?

5.3 Guiding principles for allocating the additional costs of NP

Regulators have identified a number of guiding principles on which to base the rules for NP cost allocation. There are three main guiding principles:

- **cost causation.** Those who cause the costs should bear them
- **cost minimisation.** Cost allocation rules should provide incentives for operators to minimise their additional costs of NP and, in particular, to adopt technically efficient solutions
- **capture of externalities.** This principle recognises that some of the benefits of number portability spread beyond the customer who ports a number or the user who calls a ported number. Where the generality of customers benefit (for example, from an enhancement of competition), they should pay a portion of the costs of number portability.

These guidelines are useful in assessing the merits of different cost allocation rules. But they do not lead to a single unambiguous set of rules. The guidelines conflict and are open to interpretation. Depending on the judgements made, it is possible to develop a variety of cost allocation rules. So we look below the main options for cost allocation rules and make recommendations on which rules the ODTR should adopt.

5.4 Allocating system set up costs

There is general consensus emerging around the world that each operator should pay its own system set up costs. This consensus fits both the independent and the inter-dependent solutions. It is based on the view that:

- portability is intrinsic to a fully competitive telecommunications industry
- each participant in this competitive industry must make its network NP capable as a condition of entry.

We therefore propose that the ODTR should require each operator to meet its own system set up costs when making its network and support systems NP capable.

5.5 Allocating transaction costs

With the independent solution there are three elements to the transaction costs involved in porting an individual number from one operator to another:

- the cost to the donor operator of exporting the number. We evaluate below the main options for allocating this cost
- the cost to the recipient operator of importing the number. There is general agreement that the recipient operator should bear this cost itself.
- the cost of changing routing data for all operators who carry out rerouting functions.

The first two (administrative) cost items are the biggest.

In most countries the exporting operator charges the importing operator to recover its transaction costs in full. The importing operator then chooses whether or not to pass a proportion of these costs on to the porting customers. Some do and some do not. This rule for cost recovery is clearly superior to one in which the exporting operator bears its own transaction costs. It provides an incentive for the importing operator to limit demand for NP by charging customers so as to prevent excessive churn. This is important from the perspective of economic efficiency. If porting customer and/or recipient operator can use the NP service free of charge then they will do so even though they do not value the service.

The main alternative to this rule is for the exporting operator to recover its transaction costs from the porting customer directly. But this alternative rule removes the importing operator's freedom to decide whether or not to pass on the transaction costs to the customer. In our view this freedom is important.

On the basis of this analysis we propose that, for the independent solution, the ODTR should:

- *allow the exporting operator to levy a transaction charge which recovers its administrative¹² transaction costs from the importing operator in full*
- *ensure that the transaction charge:*
 - *recovers only the costs of an efficient operator using an efficient technical solution*
 - *includes an allowance for failed attempts to port numbers. Early experience in the UK and Hong Kong indicates that less than 50% of geographic porting requests go through smoothly at the first attempt*

¹² The costs of changes in routing are excluded because correct routing is the operator's responsibility for calls originating on its own network

- *excludes any costs which the exporting operator would incur if it were to lose the customer to another operator without NP. Such costs are part of the process of losing a customer but not additional costs generated by NP.*
- *require all originating operators to bear their own costs for changes to routing data, including any changes made by other operators¹³ on their behalf*

5.6 Allocating additional conveyance costs

The elements of the additional conveyance costs

There are two elements to additional conveyance costs. The *rerouting element*¹⁴ of these costs varies with the technical solutions chosen:

- if the originating switch queries an IN database for all calls the rerouting costs are a function of the volume of calls leaving that switch. The costs are generated by a requirement for additional signalling link capacity and processing capacity at both the switch and the database
- if a data de-code solution at the block switch is used, the rerouting costs are a function of the number of calls to directory numbers exported from the switch. They are generated by additional processing capacity in the switches concerned.

The *conveyance element* is the additional conveyance cost that results where the routing is less efficient than it would be if the number were not ported. If the originating switch carries out the routing function, then the conveyance element of the additional costs will be zero. The conveyance element may occur as a result of:

- additional routing in the block network, which may be reduced by techniques such as dropback or query on release
- additional routing between networks, eg routing through the network that carries out the rerouting functions.

Proposed rules

In Chapter 3 we propose that Ireland should, from the start, adopt the independent solution and make the originating operator responsible for ensuring the correct routing of calls to ported numbers. It is important, if the independent solution is chosen, that the rules for allocating additional conveyance should reflect this fundamental choice.

We therefore propose that the ODTR should:

- *require the originating operator to bear the additional conveyance costs from the date of introduction of geographic and non-geographic NP*
- *give this operator the freedom to recover these costs from its customers¹⁵*

¹³ eg a transit operator

¹⁴ Which is essentially the cost of adding a prefix to the number

¹⁵ The effect of such freedom is likely to be small. We calculate that, for the PSTN, they might lead to a retail price increase of under 1% over the next few years, in a period when call prices are typically falling at 5 to 10% pa. This estimate assumes that less than 10% of geographic numbers are ported and additional conveyance cost are less than 0.4 pence per minute

- allow all other operators who incur additional conveyance costs to recover them through charges on the originating operator
- ensure that the conveyance element of any additional conveyance charges are set so as to recover costs (in the same way as for interconnect charges)
- ensure that the rerouting element of these charges is cost based for Telecom Eireann but allow negotiated charges from entrants.

The rationale for the last of these rules is as follows. With an independent solution, the originating operator may use a transit operator or block operator for the rerouting function or it may do the rerouting itself. So the operator has a choice and rerouting charges should not, in general, be regulated. This argument does not apply to Telecom Eireann because:

- Telecom Eireann will act as the main transit network between other networks for many years
- there is a proposed obligation on Telecom Eireann to offer a rerouting service to other operators

So we propose that all Telecom Eireann NP charges should be regulated to recover costs plus a reasonable profit.

How the rules would work in practice

Figures 5.1, 5.2 and 5.3 show how the proposed cost allocation rules work for the independent solution.

Figure 5.1 shows the arrangements for an originating network that does its own rerouting:

- if available it uses Route O-R and pays no additional conveyance charges
- otherwise it uses Route O-T-R and pays a normal transit charge (but no rerouting charge) to Network T
- otherwise it uses Route O-T-B-R. In this case both O and T pay normal transit charges.

Figure 5.1: Rerouting by the originating network

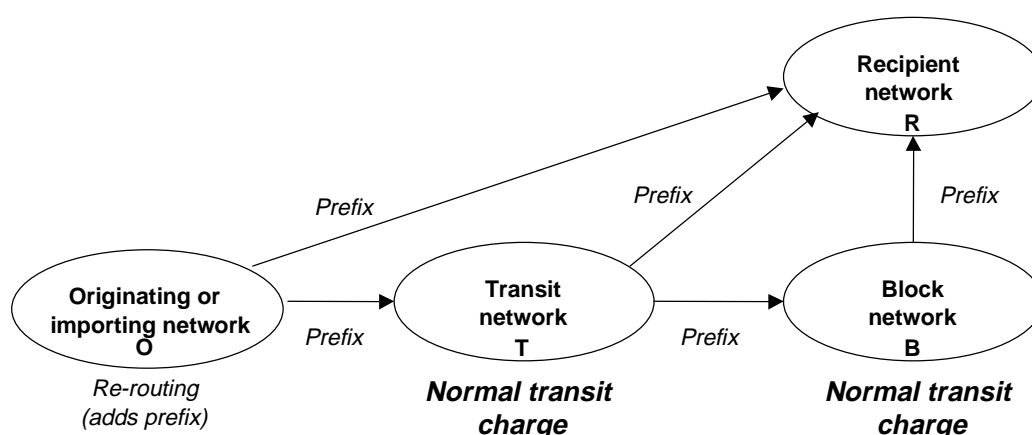


Figure 5.2 shows the situation where a transit operator carries out the rerouting for the originating network. The transit operator charges a rerouting supplement to the originating operator and normal transit charges also apply. First choice route is O-T-R if available else O-T-B-R.

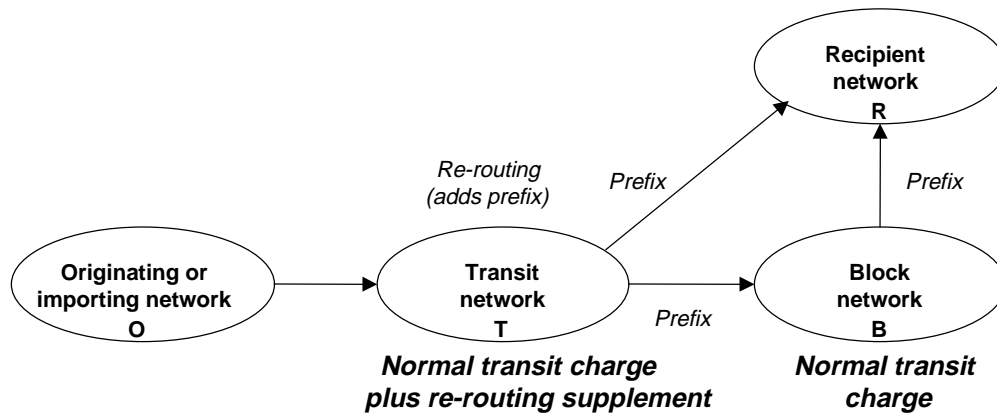
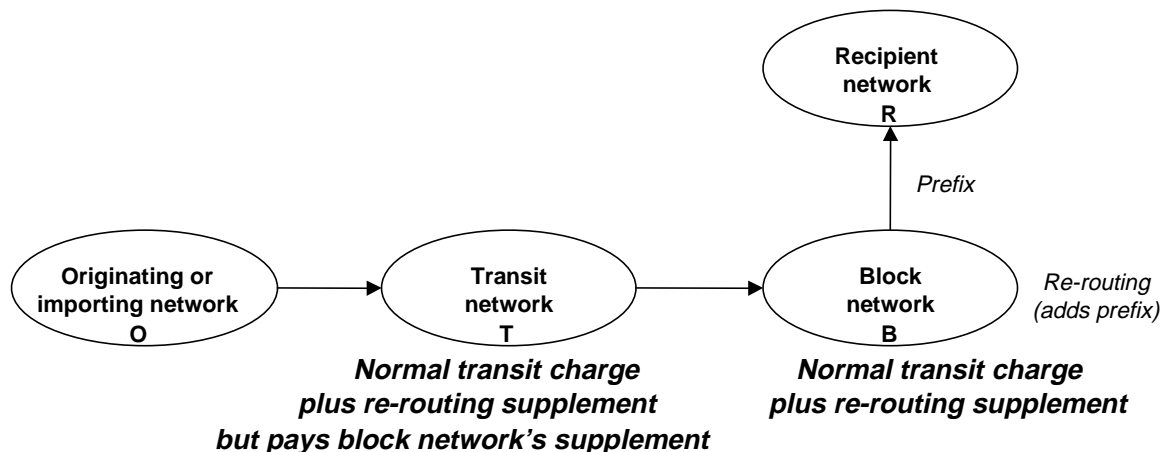
Figure 5.2: Rerouting by the transit network


Figure 5.3 shows the situation where the block operator carries out the rerouting for the originating network. The rerouting supplement is passed on through the transit operator as shown. Again normal transit charges also apply.

Figure 5.3: Rerouting by the block network


The proposed rules and the guiding principles

Such proposed rules are fully consistent with the guidelines for cost allocation:

- the rules lead to **cost minimisation**. So as to meet the proposed timescales for the introduction of NP and to keep initial cost low, initial implementations of NP will probably involve routing of calls to ported numbers from terminating block switches. Under the proposed rule the block network can charge the originating operator for any additional conveyance costs incurred. This gives the originating operator an incentive to implement an IN based solution and to route calls efficiently as these charges grow in size. In contrast a rule which allows the block operator to charge the recipient operator for these costs would not contain such an incentive. Ireland might then be stuck with the initial solution in the long term. This is the current position in the UK

- the rules are consistent with the **cost causation** guideline if we accept that the person who calls the ported number generates the additional conveyance costs. Some would argue that the additional conveyance costs are caused by the customer porting the number and that the block operator should therefore recover these costs from the recipient operator¹⁶. Whilst this line of reasoning is undoubtedly valid for transaction costs it is difficult to sustain for conveyance costs, especially if Ireland chooses the independent solution
- the rules lead to good capture of **the external benefits of NP**. The originating operators pay the additional conveyance costs roughly in proportion to the number of subscribers on their networks. So the rule leads to recovery of these costs from subscribers in proportion to market share. This, in turn, means reasonable capture of the external competitive benefits of NP.

5.7 Practical issues in allocating additional conveyance costs

There are a number of practical issues to consider in implementing the proposed rules on allocation of additional conveyance charges. We look at each of them below.

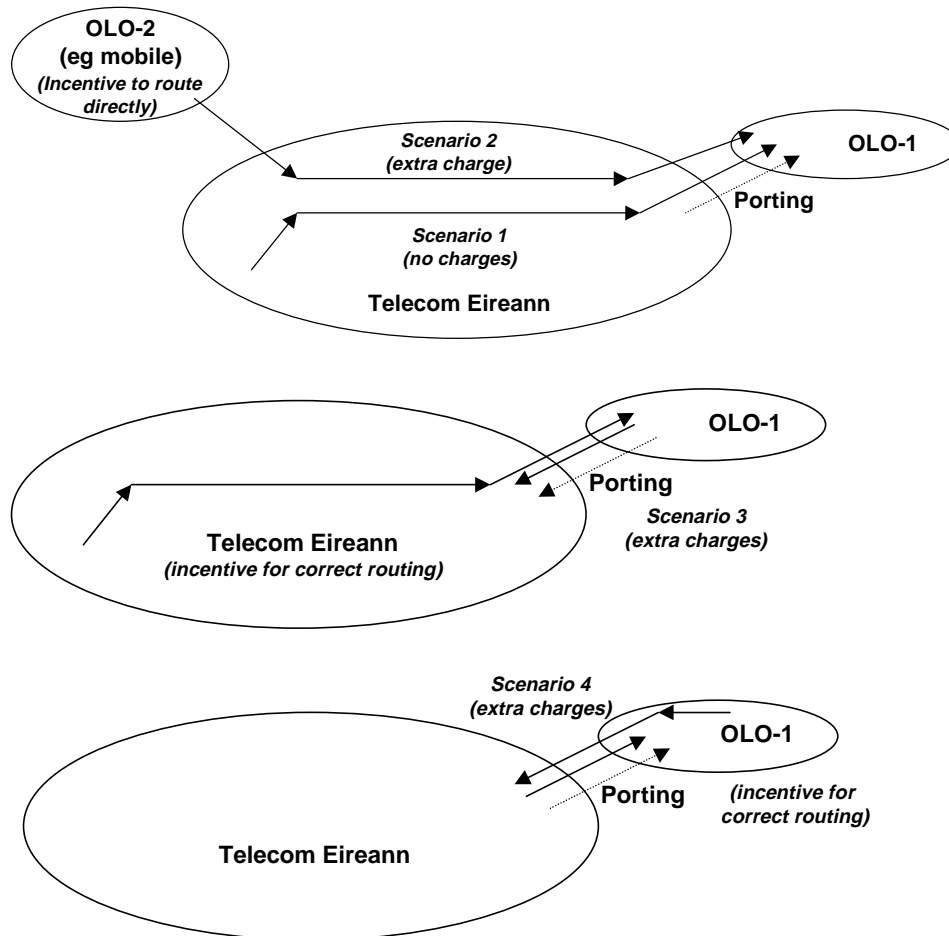
Initial implementations of NP

Operators might initially implement a data decode solution with rerouting at the terminating block switch for geographic NP. Figure 5.4 illustrates how the proposed rules would work on allocation of additional conveyance charges in this situation:

- in Scenario 1 a Telecom Eireann subscriber ports his number to OLO1. Calls originating on the Telecom Eireann network are routed to OLO1 and there is no charge for additional conveyance costs
- Scenario 2 is similar to Scenario 1 but the call originates on the network of OLO2. OLO2 passes the call to Telecom Eireann which re-routes it to OLO1 and charges OLO2 for the additional conveyance and transit costs involved. Eventually charges of this kind give OLO2 an incentive to build its own NP database and to route calls efficiently directly from its network
- in Scenario 3 a customer has ported his number from OLO1 to Telecom Eireann. The call originating on the Telecom Eireann network is routed to OLO1 on the basis of the number dialled and the OLO then routes the call back to Telecom Eireann for final delivery. OLO1 can charge Telecom Eireann, as the originating network, for the full costs of tromboning the call through its network and routing it back to Telecom Eireann. This charge is likely to be significant and give Telecom Eireann a strong incentive to prevent call tromboning of this kind
- Scenario 4 shows the situation of Scenario 3 reversed with the OLO paying Telecom Eireann these additional conveyance charges and creating the same incentives to prevent tromboning.

We conclude that the likely early implementations of NP in Ireland are consistent with the proposed charging rules for additional conveyance charges.

¹⁶ And hence, indirectly, from the porting customer

Figure 5.4 Recovering additional conveyance costs under the proposed rule


Billing of additional conveyance charges

There are two main ways in which an operator can estimate the additional conveyance charges which are due to them:

- through analysis of individual call detail records. We understand that interconnect charging systems in Ireland already use call detail records. These systems will need modifying to calculate the additional conveyance charges shown in Figures 5.1, 5.2, 5.3 and 5.4
- by estimating the charges using average call statistics applied to the number of ported numbers.

We recommend that the ODTR should leave it to operators to negotiate and agree billing methods and only intervene in the case of a dispute.

While call volumes to ported numbers are low, or where there is a balance of ported numbers between networks, operators may find that the cost of billing for the additional conveyance charges outweighs the revenues and might therefore agree to waive the charges in the short term.

Additional conveyance costs and mobile networks

We recommend that the mobile operators should, as originating networks, take responsibility for delivering mobile to fixed calls and pay for any additional conveyance costs incurred by the other operators as a result of these calls.

This recommendation has a sound theoretical basis once mobile NP is implemented. Fixed operators are then responsible for paying additional conveyance charges generated by other operators for fixed to mobile calls. But the recommendation is questionable in the meantime. In the short-term mobile operators pay towards the additional costs of geographic and non-geographic NP but neither they nor their subscribers receive any benefit from these services.

In the face of this objection the ODTR might adopt one of two approaches:

- it might take the view that the costs allocated to the mobile operators are tiny¹⁷ in comparison to the retail prices charged by the mobile operators and implement the long-term cost allocation rule anyway
- it might waive the requirement for mobile operators to pay the charges until the mobile operators implement full mobile NP. In the meantime the fixed network block operators might then bear the cost themselves or charge the recipient operators.

We seek the industry's views on the best way forward.

Freephone and shared cost services

The proposed allocation rules for additional conveyance costs are based on the premise that the originating operator can recover its additional NP costs by charging its customers. But for calls to freephone and shared cost services this freedom does not exist. For example, for a freephone call the originating operator receives nothing from the caller, only a call origination charge from the freephone service provider. So in this case who should bear the additional conveyance costs?

We propose that the originating operator should continue to bear these costs.

There are three main reasons for such a ruling:

- it keeps charging arrangements simple
- it preserves the long-term incentive for the originating operator to invest in the IN solution required to route calls efficiently
- it looks at the service package used by the caller as a whole. The originating operator cannot (by definition) recover the additional conveyance costs through an increase in the price of the freephone service. But it can fractionally increase other charges (which currently make up a much higher percentage of the customers overall spend) instead.

The obvious alternative ruling is to allow the originating network operator to increase its call origination charge to the freephone service provider to cover its additional conveyance costs. But this ruling does not give the originating operator any incentive to move to an efficient long term solution.

5.8 The proposed rules vs practice in other countries

How do the proposed rules on NP cost allocation compare with practice in other countries?

¹⁷ These costs include additional conveyance costs but not system set-up costs or transaction costs. In combination the additional conveyance costs constitute less than 10% of total NP costs over the first three years after the introduction of NP. So the major costs for existing mobile operators are incurred when they implement full mobile NP and not when they are made responsible for routing calls to ported geographic numbers.

- in almost all countries the set-up costs are borne by the operators concerned, as recommended here
- there are some differences concerning transaction and additional conveyance charges. These are shown in Figure 5.5 for geographic services and in Figure 5.6 for freephone¹⁸.

Figure 5.5 Geographic services - comparison of cost allocation rules

<i>Country</i>	<i>Transaction</i>	<i>Additional conveyance</i>
Ireland (proposal)	Cost based payment by recipient to donor	Originating operator has choice to do routing itself and bear costs or use cost based service from Telecom Eireann or any other operator who offers such service. Use of Telecom Eireann is likely initially. Payments to Telecom Eireann create correct incentives to change to own routing at appropriate time.
Germany (independent solution)	No payment by recipient to donor but donor charges porting customer 39DM	No payments between operators. Originating operator is obliged to route correctly and bears cost
UK (inter-dependent solution)	Cost based payment by recipient to donor (as proposed for Ireland), typically about £4-00	Initially half of difference between block operator's tromboning and dropback costs paid by recipient but now no payments between operators. Block operator bears all costs. No incentive for originating operators to move to more efficient routing when call volumes increase.
USA (independent solution)	No payment by recipient to donor and no charges to customer, but payments to independent database operator	No payments between operators. (n-1)th operator is obliged to route correctly, but all large local telcos (LECs) do own routing and bear costs. LECs have filed for small portability supplement for all calls to recover costs.

Analysis of Figures 5.5 and 5.6 indicates that we are proposing:

- the same solution for transaction costs as the UK
- the same theoretical solution for additional conveyance costs as Germany and almost the same as USA, but with:
 - flexibility for the operators to use the lower cost technical solution adopted in the UK when call volumes to ported numbers are low,
 - full additional conveyance charges payable by the originator to create the correct economic incentive to move to routing by the originating operator when justified by call volumes and economies of scope.
- a different approach to the UK. There the block operator now bears its own additional conveyance costs and there is no long term incentive to move to solutions which route calls efficiently.

We therefore believe that our proposals achieve a better combination of incentives than those in other countries. Opportunities for cost minimisation are better than in Germany and USA, and incentives for long term technical efficiency are better than in the UK.

¹⁸ The commonest of the non-geographic services

Figure 5.6 Freephone services - comparison of cost allocation rules

Country	Transaction	Additional conveyance
Ireland (proposal)	Cost based payment by recipient to donor	Originating operator has choice to do routing itself and bear costs or use cost based service from Telecom Eireann or any other operator in which case the originating operator would be paid slightly less for the calls to freephone numbers. Use of Telecom Eireann is likely initially. The differences in the payments by Telecom Eireann create correct incentives to change to own routing at appropriate time.
Germany (independent solution)	No payment by recipient to donor, not known if donor charges porting customer	No payments between operators. Originating operator is obliged to route correctly and bears cost
UK (inter-dependent solution)	Cost based payment by recipient to donor (as proposed for Ireland)	Initially half costs of block operator paid by recipient but now no payments between operators for calls from block network. Recipient pays block operator for transit element where calls enter block from other UK networks. No incentive for originating operators to move to more efficient routing when call volumes increase.
USA (independent solution)	No payment by recipient to donor and no charges to customer, but payments to independent database operator of 34c per month per number registered (all numbers, not just ported)	No payments between operators. (n-1)th operator is obliged to route correctly. In practice transit carriers pay LECs 0.5c per query for correct routing at origin.

5.9 Cost allocation rules for location NP

The rules proposed in Sections 5.4 to 5.7 apply to operator NP but not to location NP. Location NP is a commercial service which operators are free to provide or not as they wish. In these circumstances it would be wrong to impose any costs generated as a result of these commercial decisions on another operator.

We therefore recommend to the ODTR that the operator offering location NP should bear its own costs.

In the short-term the cost allocation rules for operator and location NP can coexist without conflict. But in the long-term issues will arise if location NP is allowed across Ireland¹⁹. It might then make sense for originating operators running IN databases to perform the location NP function for the terminating network. In this case the originating operator might want to recover its additional costs from the terminating operator. Such situations are unlikely to arise for many years. So we do not consider them further in this document.

5.10 Cost allocation rules with an inter-dependent solution

The analysis so far is based on the assumption that Ireland adopts an independent solution for NP. But how do the proposed cost allocation rules change if it chooses the inter-dependent solution instead?

Such a choice does not affect the rules for allocation of system setup costs. But it does affect the allocation of transaction and additional conveyance costs.

¹⁹ Rather than only across a minimum numbering area

For *transaction costs* the change is minor. The block operator incurs a cost in changing routing data. It makes sense for the block operator to recover this cost along with other components of the transaction costs under the inter-dependent solution.

For *additional conveyance costs* the change is more substantial. Under the inter-dependent solution the block (or donor) operator and the recipient operator are jointly responsible for the correct routing of calls. So logically they, rather than the originating operator, should bear these costs. The exact proportion of the additional conveyance costs which are borne by the recipient is a matter which operators and regulators elsewhere in the world have debated thoroughly but inconclusively. The arguments revolve around what percentage of the benefits of NP arise through externalities (eg the benefits of greater competition) and what percentage are direct benefits to the porting user. It is impossible to make this estimate with any certainty. So the proportion of additional conveyance and transits costs which the block operator receives varies, according to the judgement of the parties which decide the matter. In some countries (like New Zealand) the recipient bears 100% of these costs. In others (like the UK) the recipient bears 0% of the rerouting element of the additional conveyance costs, 0% of the conveyance element of the additional conveyance costs for calls to geographic numbers but 100% of the conveyance element of the additional conveyance costs for calls to non-geographic numbers.

If Ireland chooses an interdependent solution we recommend that the ODTR should:

- *require each operator to bear its system setup costs*
- *allow donor operators to charge recipients in full for its transaction costs*
- *allow the block operator to recover a percentage of its additional conveyance and transit costs from the recipients after considering the views of the industry. One possible solution is for the block operator to recover all of the conveyance element but none of the rerouting element of its additional conveyance costs.*

5.11 Questions

Q5.1: Do you agree that each operator should bear its own system set-up costs? (Section 5.4)

Q5.2: Do you agree that the donor operator should charge the recipient operator for the bulk of the transaction costs as specified in Section 5.5?

Q5.3: How do you think additional conveyance costs should be allocated:

- if an independent solution is chosen? (Section 5.6)
- if an inter-dependent solution is chosen? (Section 5.9)

Q5.4: What practical problems do you foresee in implementing the proposed cost allocation and charging rules? (Section 5.7)

Q5.5: In particular:

- should mobile operators pay additional conveyance charges from the start of NP?
- should originating operators bear the additional conveyance costs of calls to ported freephone and shared cost numbers?

6 The porting process

6.1 Introduction

This chapter looks at the porting rules which should govern the process of transferring numbers and services from one operator to another in a user friendly and equitable way. It considers the interaction between:

- the donor and recipient operators
- the subscriber and the donor/recipient operators
- other operators and the donor/recipient operators

The issues addressed are:

- the initial interactions with the subscriber, including the possibility of one-stop shopping
- the order of events in the transfer of service and directory number between operators
- recovery from problems that may arise in the porting process
- how operators communicate to manage the porting process
- the possible need for restrictions on activities by the donor operator to win back the subscriber.

6.2 Initial interactions with the subscriber

Operator portability is part of the transfer of service from one operator to another. The transfer involves:

- the closure of the account with the donor operator
- the opening of an account with the recipient operator.

In relation to this transfer the following need to be achieved:

- the process needs to be made simple and user-friendly for the subscriber
- the donor operator needs an authoritative request to close the account and transfer the number
- the donor needs to collect any payment for past calls and rental that may be due, either from the subscriber or the recipient operator
- the recipient operator needs to receive the service profile (exact details of the service required) for the subscriber.

There are various options for achieving these objectives. For example there are two alternatives for ordering by the subscriber:

- separate interactions with the donor and recipient to request closure of the old account and to open the new account with portability. Separate interactions provide a simpler legal framework, but require more activity by the subscriber. There is also a risk that a subscriber will order the new service but fail to request to close the old one
- a single interaction (one-stop shop) handled by the recipient operator with instructions relayed by the recipient to the donor. The one-stop shop approach offers the advantage of completing the ordering procedure in one session with the customer but requires the recipient to collect and pass on the customer's authority for the closure of the service and transfer of the number to the donor.

The subscriber's service profile could be transferred from the donor to the recipient but this would have two disadvantages:

- the recipient may not offer the same range of services or the same tariff structure for extra service features as the donor
- there would be no review of the services bought and it is in the user's interest to review these services periodically.

Ovum therefore recommends that the ODTR should establish the following rules:

1. The recipient should offer one-stop shopping to the subscriber so that the subscriber would:

- *discuss and decide the service profile to be offered on the recipient network*
- *sign a separate instruction form for the closure of the account with the donor. This form would then be relayed to the donor by the recipient²⁰.*

2. The donor should proceed with the porting unless there are significant inconsistencies between the instructions received and the information already collected about the customer²¹.

3. The donor should raise an invoice and collect any outstanding payment direct from the subscriber. But the collection of this payment should not be a pre-requisite for releasing the number because such linkage would not be possible if the customer changed operator without number portability.

6.3 The order of events in the transfer of service and number

Geographic NP

The procedure for transferring service and directory number with geographic NP depends on the way in which the local loop is provided by the recipient network. There are two main possibilities:

- the recipient operator builds its own local loop
- the recipient operator rents a local loop from Telecom Eireann (local loop unbundling).

We look at each possibility below.

Separate exchange lines

If a separate new line is installed by the recipient operator, then closure of the service on the donor network may not coincide with the start of service on the recipient network, and there may be either a gap or overlap. If something goes wrong, the subscriber or an engineer visiting the subscriber's premises may need to make an outgoing call to have the problem resolved. Ideally an outgoing call capability should always be maintained in case of an emergency.

Incoming calls may also be received during the transfer period. If these calls meet the number unobtainable tone or announcement, then the caller is likely to report a fault. If they meet a ringing tone but there is no reply then fault reporting is much less likely.

²⁰ If necessary the standard terms of contract should be altered to allow the donor to respond to instructions received in this way

²¹ eg different name, different address

Figure 6.1 provides an analysis of how incoming calls will be handled in the gap and overlap situations. The first two columns show the state of activation of the lines to the donor and recipient and the third column shows which line the telephone is connected to. Rows 3 and 4 apply only for the gap and Rows 5 and 6 apply only for the overlap situations.

Figure 6.1 Analysis of gap and overlap for calls to geographic numbers

State	Donor	Recipient	Telephone connected to	What happens
1	Active	Inactive	Donor	Normal reception of call
2	Active	Inactive	Recipient	Ring tone heard but no reply because no telephone connected
3 Gap	De-activated	Inactive	Donor	Call routed to recipient but recipient not ready and so call fails
4 Gap	De-activated	Inactive	Recipient	Call routed to recipient but recipient not ready and so call fails
5 Overlap	Active	Active	Donor	Calls may be routed to either network, calls that reach donor are received normally, calls that reach recipient receive ring tone but no reply because no telephone connected
6 Overlap	Active	Active	Recipient	Calls may be routed to either network, calls that reach donor receive ring tone but no reply because no telephone connected, calls that reach recipient are received normally
7	De-activated	Active	Donor	Calls routed to recipient, ring tone heard but no reply because no telephone connected
8	De-activated	Active	Recipient	Normal reception of call

Ovum recommends that the porting procedure rules should be organised to ensure that there is no gap where outgoing service is not available on either line and where some incoming calls are not terminated.

This procedure has two main advantages:

- an outgoing call capability is always maintained on at least one line
- incoming calls that are not answered will be terminated with a ring tone and no reply, which should not lead to fault reports.

In Ireland many customers use terminals that are rented from Telecom Eireann but are connect to the network via a plug and socket. Arrangements will be needed for customers to buy or relinquish these terminals when they change operators. This is not a number portability issue and so is not considered further in this document.

Local loop unbundling

Local loop unbundling is not required or offered at present in Ireland. But there is a possibility that it will be introduced in the foreseeable future.

Unbundling means that when the subscriber changes operator, the existing exchange line is disconnected at the donor exchange and re-connected by some means to the recipient exchange. No site visits are needed and telephones do not need to be moved from one socket to another.

With unbundling there is no choice between gap and overlap as there is an unavoidable gap in all services after the line is disconnected from the donor and before it is re-connected to the recipient.

The main challenge here is to ensure continuity of service for the customer. NP will undoubtedly make a satisfactory handover more difficult. But the main

challenge relates to the process of cross connecting the local loop to the switch of the entrant.

We therefore recommend that the ODTR should study these NP process rules further if and when local loop unbundling is introduced in Ireland and processes for customer handover are defined.

Non geographic NP

The arrangements for non geographic NP are often similar to those for geographic NP with local loop unbundling. In many cases the ported number remains associated with the same local loop and there is no need for a site visit.

In these circumstances we recommend that operators should:

- *activate the new service in the recipient network*
- *then activate the rerouting functions in the donor network. In practice this might initially mean that, instead of replacing the 800 number with a PSTN number, the donor network adds a prefix to the 800 number and then routes on this prefix.*
- *then communicate the transaction to other operators²².*

6.4 Timing and control of the transfer of service and number

The timing of the transfer of service and number needs to be adapted to the requirements of the subscriber. Some subscribers will want the transfer to take place as soon as possible, whereas others will want it to take place at a specific time. In most cases there will be a site visit when the recipient installs and tests the new line. Although site visits may be planned, difficulties in installation may occur, and subscribers may fail to be at home when an engineer calls. If a site visit is needed it may be difficult to keep to a pre-determined schedule for the transfer of service. Where site visits do take place, it will be desirable for the engineer to complete the installation of the new line and effect and test the transfer of number.

We therefore propose that the ODTR should ensure that several options are available for the transfer. These include:

- *de-activation by the donor and implementation of the new routing for operator portability at a fixed time specified by the recipient*
- *de-activation by the donor and implementation of the new routing for operator portability at any time during a window of two working weeks with the recipient able to initiate de-activation using an on-line method of control either from the customer's premises or elsewhere²³.*

Once the donor and recipient network complete the porting process, other networks, for a short while, still route calls to the donor and the donor reroutes them to the recipient. The final stage of the process is for the recipient to inform other operators that the port has occurred and for these networks to update their routing databases (if they do their own routing) and route calls directly to the recipient. This final stage might take 24 hours to complete. In the meantime calls are routed correctly but inefficiently.

²² Perhaps via a reference database – see Chapter 7 for more details

²³ This system is provided in the UK using real-time routers into which an engineer can dial and issue commands using DTMF tones with PIN security

6.5 Recovering from problems that may arise in the porting process

Problems may occur during the porting process. So there is a need to ensure that any disruption to users is minimised. With geographic numbers on single lines the probability of not being able to resolve a problem quickly is low, but with DDI blocks and high volume traffic to non-geographic numbers more complex problems may be experienced.

We therefore propose that:

- *each donor should retain the necessary information to restore the original service within 60 minutes if requested by the recipient operator*
- *this capability should be available for the first 24 hours from the time of de-activation of the service by the donor.*

6.6 Time limits for the process

There are several phases to the porting process:

- the initial ordering
- passing the order to the donor
- confirmation by the donor that porting can proceed
- waiting for completion of installation of the recipient's line
- the transfer of service and number
- distribution of information about the porting to other operators.

Where a phase is under the control of the subscriber or recipient there is no need to specify a time limit as there will be sufficient incentives to proceed in the most effective way. However where activities depend on the donor, we recommend that a time limit should be set.

We propose the following limits:

- *confirmation by the donor that porting can proceed should be returned to the recipient within one working day, unless there is a need to contact the subscriber. If there is a need to contact the subscriber, the first attempt should be made within one working day and the response should be returned to the recipient within half a working day of successful contact.*
- *the donor should be ready to effect transfers no later than three working days after it confirms that porting can go ahead.*

6.7 Restricting activities by the donor to win back the subscriber

When a subscriber closes an account, the operator concerned may contact the subscriber to find out why the account is being closed and to try to persuade the subscriber to change his or her mind. This is called "winback". Without number portability, the operator does not know:

- whether the subscriber is ceasing service, or
- if the subscriber is changing operator, to which operator the subscriber is moving.

But, in countries where operator number portability is in operation, there are stories of:

- subscribers being called several times in attempts to win them back
- subscribers being warned by the donor of poor performance by the recipient operator

- subscribers being told of the supposedly high proportion of customers who are dissatisfied with the recipient and who return to the donor.

Consequently there are requests for some control of winback activities. In the UK this is currently handled through a voluntary code of practice agreed between the operators.

The critical issue is the use of information obtained through the porting procedure rather than through the closure of the account. The retail sales part of the donor always knows that the account is closing. So actions triggered by this knowledge alone are part of normal competition. What may be anti-competitive are actions that are triggered by information that the number is being ported and that lead to special marketing to porting customers.

We think that the ODTR should control win-back. Its objective should be to ensure that the donor operator's win-back approach does not depend on information gained during the porting process²⁴. There are two main options:

- "Chinese walls" apply so that the retail staff of the donor operator do not have access to information that the customer is porting. In this case any confirmation of the request for porting must be obtained by separate staff who are running the portability service. These staff should not be allowed to discuss any sales or marketing issues, nor to pass comment on the service of the recipient operator
- there is a strict code of practice on what sales staff may do, especially during the period between the customer's request for porting and its fulfilment²⁵. Such a code of practice might, for example, forbid:
 - more than one call in a period of one month from the porting order by a salesman to ask about the reasons for closing the account and to attempt to win the customer back²⁶.
 - any reference by a salesman to the price or quality of service offered by a specific competitor.

We recommend that the ODTR should adopt one of these two options. We seek views from the operators on the most appropriate and practicable approach.

6.8 Questions

Q6.1: Should one-stop shopping be required for operator portability?
(Section 6.2) Will authorisation through the recipient work satisfactorily?

Q6.2: Should a donor be allowed to refuse portability for a specific number? If so on what grounds?

Q6.3: Are any changes or additions needed to the proposal in Section 6.2?

Q6.4: Do operators support the overlap approach described in Section 6.3? Are there any problems that have not been identified?

²⁴ And which would not have been available if the customer had not ported the number

²⁵ Some restrictions may also need to apply after the porting is completed since, in a normal competitive situation, the donor operator would not typically know the identity of the customer's new supplier.

²⁶ Where the operator needs to contact the customer to confirm authorisation for closure because of significant inconsistencies between the order and the existing customer information, a separate sales call should not be made to prevent the customer from feeling hassled.

Q6.5: Are the proposed options for timing and control of the process the most appropriate ones? (Section 6.4) Should others be considered?

Q6.6: Should there be a requirement for recovery from errors? (Section 6.5) Is the proposal appropriate and practicable? If not, what should be specified?

Q6.7: Are the time limits specified in Section 6.6 appropriate and practicable? If not, what changes should be made? Should other requirements be added?

Q6.8: What is the most appropriate approach to the control of winback? Is regulation needed?

7 A possible national number portability database

7.1 The concept of a national NP database

Several countries are developing or have established national reference databases to support number portability. They include Finland, the Netherlands, Germany, Hong Kong and the USA.

These national databases are reference databases and store information on ported numbers. Primarily they record the relationship between the ported number and the identity of the network that is currently serving that number. Such databases may be involved in the interactions between operators during the porting process, but they are not involved in the routing of calls. All operational use of information held on the national database is done using operational databases run by the operators which contain copies of the information held on the reference database. This distinction between reference and operational databases is important because:

- the reference database needs to support only a low rate of transactions
- the operational database needs to support a high volume of transactions. This is a major design factor for the operational database
- the performance of the operational database affects an operator's quality of service and so should be under that operator's control.

7.2 The need for a national database in Ireland

Whether or not a national database is needed in Ireland will depend on whether the independent or inter-dependent solution is chosen:

- with the *inter-dependent solution*, only the donor and recipient (plus the block operator if that is not the same as the donor) need to know about the porting. These requirements can be handled by bilateral procedures so a database is not needed. But it may still be useful to establish a national reference database to allow a later move to the independent solution
- with the *independent solution*, there are two phases to the procedures - the porting process between the donor and recipient followed by the procedure for informing all operators that a number has been ported. A national reference database is especially useful in the second phase. The recipient updates the reference database during the porting process and all operators obtain the updated information in periodic downloads²⁷ which are used to update their operational databases. In addition to routing, the database information may be needed for billing purposes. Operators may need to refer to the database to calculate charges for routing functions carried out as a service to other operators.

Long term it is difficult to operate the independent solution without a national reference database. Without such a database:

- the recipient needs another mechanism to inform all operators of a number porting
- there is no single national record of ported numbers and so there are difficulties if a new network starts operation and needs to establish an operational database.

²⁷ eg once per day

7.3 Opportunities for using a database for other functions

There are many opportunities for using a national number portability database to provide other functions. These include developing the database to include:

- a master reference list of numbers for directory services purposes. (This list would include not only ported numbers but all allocated numbers. Access would require appropriate controls on use of ex-directory numbers)
- a master list of all numbers for emergency services purposes
- a master list of national codes and number block allocations
- a master list of each customer's preselected long distance carrier. (There would be commercial reasons for restricting operator access to this list).

In its expanded form the master database could also be used for direct allocation of numbers to subscribers.

7.4 Functions and specifications needed for number portability

The database and its protocols should provide the following functions to support NP:

- number porting
- number disconnection
- order cancellation
- data integrity checking
- addition of new operators
- conflict resolution
- disaster recovery and backup
- audit functions
- report generation.

The database should be defined primarily by specifying:

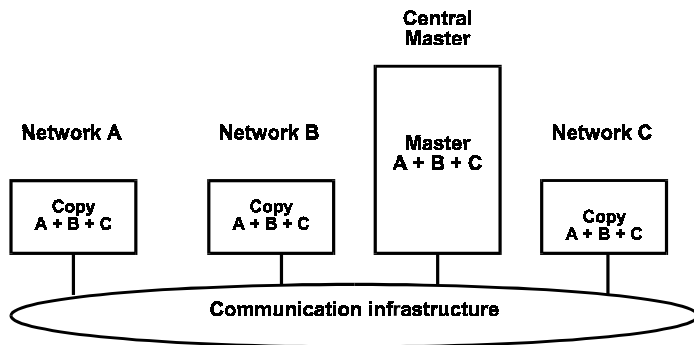
- the information in the master tables
- the functionality (operations on information)
- the interfaces and protocols for the various operations including the porting process and broadcast of information
- the response times and error handling procedures.

The protocols will need to be specified with care to ensure correct inter-operation and so formal methods such as use of the System Description Language (SDL) would be preferable.

7.5 The structure of a national database for number portability

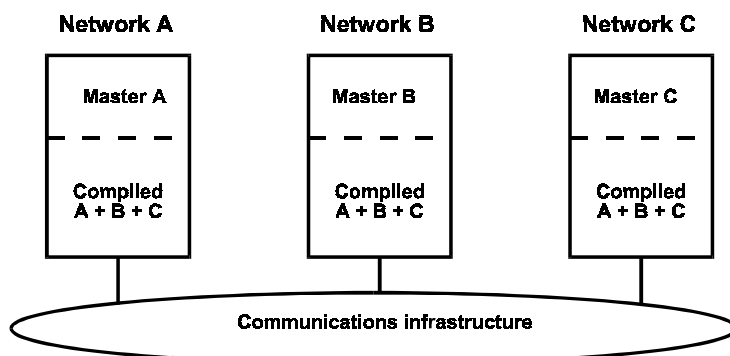
Should a national database use a centralised or distributed structure?

The structure of a *centralised database* is shown in Figure 7.1. Each operator simply copies the master database to obtain a complete set of information on ported numbers. A porting transaction is concerned with changing the master information.

Figure 7.1 Centralised database


Distributed database

Figure 7.2 shows a *distributed database*. Each operator maintains a master table of the porting transactions it is involved in and copies the master tables of other operators to compile them into a complete set of information. A porting transaction is concerned with moving master records from one master table to another. The porting transaction is then followed by broadcasting information on the transaction to all other operators.

Figure 7.2 Distributed database


A centralised or distributed database?

The choice between a centralised and distributed database is not related to the choice between the independent and inter-dependent solutions. (That choice affects the need for the database but not its structure). Instead the choice between centralised and distributed depends on who has the “contract” with the customer for the use of the number. This, in turn, depends on the method of allocation of the numbers to customers:

- at the moment the ODTR allocates blocks to each operator who then allocates individual numbers to customers. Information on the contract with customers is distributed amongst the different operators. Some contracts are with one operator and some with another. Each operator has a unique but incomplete master table and a distributed structure is needed

- in the longer term, non-geographic services may move to individual allocation of numbers²⁸ from the ODTR²⁹ to customers. In this case information on the contract with the customer for use of the numbers is centralised because all the contracts are with the ODTR. The ODTR has a complete master table and a centralised structure is appropriate.

One practicable implementation of the national database which takes account of possible future developments in Ireland is as follows:

- each operator has a physical reference database and all databases are interconnected using a TCP/IP based infrastructure
- the physical database contains separate logical databases for each service type
- the structure of the logical database depends on the allocation method for the service concerned
- the physical database and communications infrastructure support:
 - distributed databases and protocols for the initial block-allocated geographic and non-geographic numbers (ported numbers only). The two main protocols are the porting transaction between donor and recipient and the subsequent broadcasting to all operators
 - a centralised database for non-geographic number allocation if introduced in the future (This database would need to contain all non geographic numbers individually allocated and not just ported ones)
 - other services if required.
- each operator connects its reference database to its operational routing database. But the two are physically separate because the design factors are different. The routing database is designed primarily for throughput.

Other factors

Even where block allocation of numbers is universal, a central reference database structure is usually valuable to operators. In this case the functions of an independent central reference database are:

- to maintain a complete compiled master copy of the information obtained from the distributed incomplete master tables held by each operator. This compiled master provides an independent back-up in case of disaster
- to provide copies of the compiled master to new entrant operators and to operators who loose data through a disaster
- to provide any centralised database needed in the future (eg for individual number allocations)
- to provide any other database services needed
- to manage the specifications for the databases and their protocols.

The operator of the independent reference database acts, in this case, as manager and co-ordinator of the network of interconnected reference databases run by each operator, and as manager of the communications infrastructure. It also provides consultancy support to new entrants to get their own databases running.

²⁸ The case for individual allocation of geographic numbers is currently weak

²⁹ Or some other independent numbering administrator

7.6 Operating and funding an independent national reference database

If Ireland decides to implement a national reference database then it is important that:

- the operation of the database is under independent management with obligations for non-discrimination and the supply of service to all operators
- the prices charged by this independent manager are regulated to prevent monopoly profits.

There are various models that could be used to fund and operate the national database:

- a club of operators funded with annual subscriptions related to use. This would mean that new operators would need to join the club.
- a company owned by some or all operators with usage fees set to cover the costs. It would not be essential for all operators to become shareholders. This is a model used in the USA
- an independent company not owned by operators but controlled under a long term agreement with the operators. This model is also used in the USA.

In addition to the independent reference database, each operator would fund its own reference and operational databases and connection to the communications infrastructure.

7.7 Recommendations

If Ireland decides to use the independent solution (with the originating network being responsible for routing) then we propose that the ODTR should ensure that:

- *an independent national reference database is established as soon as reasonably possible. Because we expect that the number of porting transactions will be low initially, the reference database does not have to be operational before number portability can commence. It is therefore not on the critical path for introducing NP*
- *the database is connected to the reference databases of the operators using a common communications infrastructure*
- *the logical structure of the database is related to the allocation mechanism. For numbers allocated in blocks to operators, the independent national reference database should maintain a compiled master table for all ported numbers*
- *the database is used for any future central number allocation functions*
- *the communications infrastructure supports both information exchange between donor and recipient and subsequent broadcasting of changes to all operators*
- *the operator of the database manages and co-ordinates all activities related to the database and provides some support services to the operators*
- *each operator runs its own reference database connected to the infrastructure using standardised protocols*
- *a legal constitution for the operation and management of the database is developed by the operators and approved by the ODTR.*

7.8 Questions

Q7.1: Do the operators agree that a national reference database is needed? If so when is it required?

Q7.2: What functions should the reference database provide in addition to recording the ported number/serving operator relationship? Should the database be involved in the porting transaction?

Q7.3: What database structure should be used – distributed or centralised?

Q7.4: What type of organisation should establish and run the database and how should funding and prices be controlled?

8 Making number portability work in Ireland

8.1 The role of the ODTR

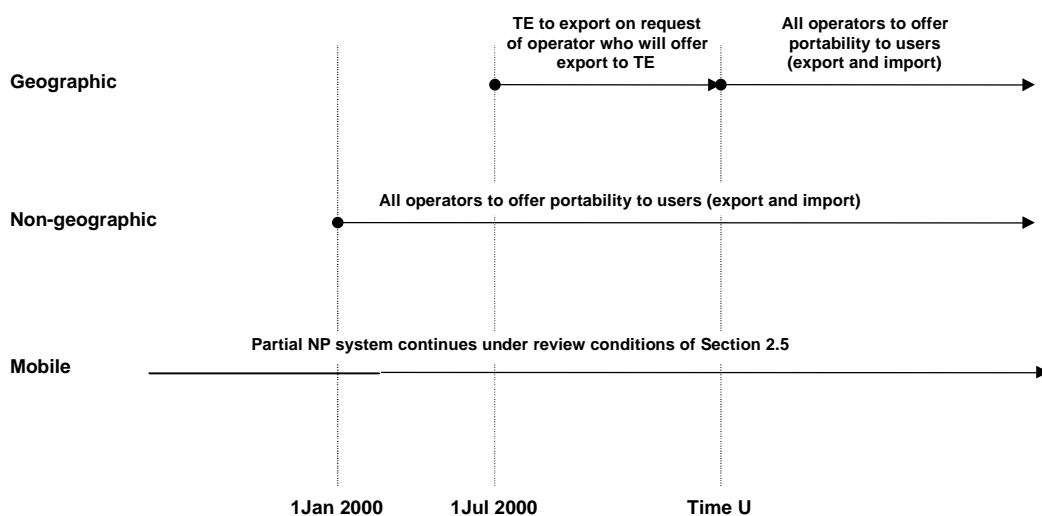
The ODTR has a key role to play in introducing NP in Ireland. In carrying out its role the ODTR will need to strike a balance between determining rules and allowing the industry to agree its own rules. In our view its main tasks are:

- to enforce an overall timetable for the introduction of NP following completion of the Ovum study
- to establish and chair a number portability committee with membership drawn from the industry. This committee will need to agree rules for call routing and the porting processes
- to establish the basic rules for cost allocation after discussion with the industry.

8.2 The timetable for introducing NP

Figure 8.1 summarises the proposed schedule for the introduction of NP in Ireland. The timetable is a challenging one, and made even more difficult by the Year 2000 problems which all organisations with major computer systems face in the run up to the new millennium.

Figure 8.1 The timetable for introducing NP



To meet this timetable the ODTR and the operators will need to move quickly at the end of the Ovum study to agree on routing and porting process rules. Figure 8.2 provides a detailed schedule of what is required to implement the proposal of Figure 8.1.

8.3 Committee arrangements

Ovum recommends the early formation of a committee to consider practical NP implementation issues. In many respects ODTR should allow the operators to develop their own solutions, but a committee offers the following advantages:

- a single multilateral forum is more efficient than many separate bi-lateral discussions

- an open forum ensures non-discrimination
- knowledge is shared and new entrants can learn from more established players
- user interests can be represented and users can have visibility of developments.

Ovum also believes that:

- the main activities of this committee should be:
 - the development of specifications, procedures and codes of practice
 - discussion and resolution of practical problems
- the main number portability committee should not address commercial issues. It is possible to achieve better working relationships between competitors if commercial issues are kept separate from technical and procedural ones. If charging principles are defined clearly, there should be relatively few commercial issues to resolve.
- the documents produced by the committee should be published on the web

In terms of the working practices of the committee, we think that individual specifications should be developed by small project teams of people who are most able to contribute to the work, with a rapporteur appointed for each specification. The rapporteur should write the specification with inputs from the project team and be responsible for its consistency. The project teams would report to the main committee.

The committee will need to produce the following specifications for number portability:

- functional specification for portability in geographic services
- functional specification for portability in non-geographic services
- porting procedure for geographic services
- porting procedure for non-geographic services
- protocol for porting (for use over database communications infrastructure)
- requirements for the independent reference database

Figure 8.2 An action plan for NP in Ireland

<i>Task</i>	<i>Responsible</i>	<i>By when?</i>
General		
Establish NP Committee	ODTR	3/1999
Define national strategy guidelines on porting and routing rules	ODTR	4/1999
Determine cost allocation rules for NP	ODTR	7/1999
Issue a Direction amending operators' licenses to include NP provisions	ODTR	8/1999
Develop specification for national reference database and associated porting protocols	NP committee ³⁰	1/2000
Non geographic NP		
Finalise routing rules for non geographic NP	NP committee ³⁰	5/1999
Finalise porting procedures for non geographic NP	NP committee ³⁰	6/1999
Modify support systems processes for non geographic NP (mostly manual)	Operators and SPs	10/1999
Add NP prefixes to routing tables for calls to non geographic numbers	Operators and SPs	10/1999
Test non geographic NP	Operators and SPs	11/1999
Modify and test charging arrangements for non geographic NP charging	Operators and SPs	11/1999
Introduce commercial non geographic NP	Operators and SPs	1/2000
Geographic NP		
Finalise routing rules for geographic NP	NP committee ³⁰	8/1999
Finalise porting procedures for geographic NP	NP committee ³⁰	8/1999
Modify support systems for export of geographic numbers	Telecom Eireann	4/2000
Install routing capability in trial area	Telecom Eireann	4/2000
Test geographic NP in trial area (export from Telecom Eireann)	Telecom Eireann and another operator	5/2000
Modify and test charging arrangements for geographic NP charging	Telecom Eireann and another operator	5/2000
Introduce geographic NP (export of numbers)	Telecom Eireann	7/2000
Introduce geographic NP (import and export of numbers)	All relevant operators	Time U

8.4 Questions

Q8.1: Do you agree with the proposed committee arrangements for the introduction of NP?

Q8.2: Do you believe that the proposed timetable of Figure 8.2 is realistic? Is it challenging enough? How, if at all, should it be modified?

³⁰ Subject to ODTR approval

Annex A Key terms

Terminology for number portability often fails to take adequate account of the possibility of more than one porting for a number. To cover this situation, we have developed and use the following terminology.

'Steady state' provision of services

Block network: the network to which a number was allocated in a block by the regulator and which was initially, and may still be, the current network.

Current network: a network that currently has a contract to provide services to a specified number. If the number has been ported, this refers to the most recent recipient of the number.

During porting

These descriptions are only valid during and close to the time of porting.

Donor network: a network that is exporting a specified number.

Recipient network: a network that is importing or has just imported a specified number, and thereby becomes the current network. (If the context of the sentence is clearly not referring to the porting process, then 'recipient' means the most recent recipient.)

In relation to a call

Originating network: the network that initiates the call (that is, the network that serves the 'A' customer).

Transit network: any network through which the call passes (that is, both enters and leaves).

Terminating network: the network where the call is terminated (that is, the network that serves the 'B' customer).

Annex B Routing for geographic services

Routing technologies and their location

There are two basic technologies for obtaining the additional information needed to route a call to a ported number:

- **number analysis based solutions.** These involve analysis of the called number by the processor of the exchange concerned and the addition of the routing information from the stored information available to the processor. This technology is called “data decode” in the UK. Number analysis is normally applied only at the block exchange where the full called subscriber number is analysed. In theory it could be applied at any exchange but it would require a large increase in the processing and stored data capability there. Data decode is used by UK operators in conjunction with the inter-dependent solution and by Deutsche Telekom in its initial implementation of the independent solution.
- **database query solutions.** These involve a query to an external database using the called number for the interrogation. This query may be made for all called numbers within blocks known to contain ported numbers (all call query or full IN) or it may be made in response to an external trigger such as a call release signal (query on release) or a prefix added by another exchange. The external triggers are used to reduce the rate of database queries when compared to the all call query solution. Database queries may be made from any exchange and the following examples show the range of solutions in different countries:
 - KPN the Dutch incumbent uses a combination of query on release and all call query in the transit exchanges
 - the US local operators use all call query in the local exchanges
 - NTT uses a query from the donor local exchange to a central database.

Where a network has two or more layers (eg transit and local) and there is rerouting from a lower layer that results in a trombone route, an additional technique called dropback may be used to detect and remove the trombone. Dropback is used in the UK by BT in conjunction with data decode. External triggers are also normally used only in networks with two or more layers. To date we are unaware of any instances of query triggers or dropback arrangements operating between networks; they are used only within networks. Figure B1.1 shows a simplified comparison of these methods (other variants are possible).

The choice of routing technology affects the organisation of the information on the location of ported numbers. With the number analysis solutions, this information has to be disseminated to the exchanges that perform the analysis, whereas with the IN database query solutions, queries can be made from any location to a central routing database. Some operators consider that the use of a central routing database facilitates the management of the routing information.

Some supplementary services such as call completion to busy subscribers (CCBS) and some mobile services such as optimal routing involve signalling interactions that are separate from the call (non-call related services). These signalling interactions may use ported numbers and the signalling messages need to be routed correctly. IN is generally considered to be more suitable for this function than number analysis within exchanges.

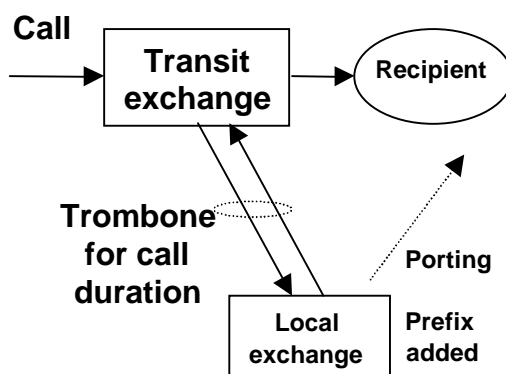
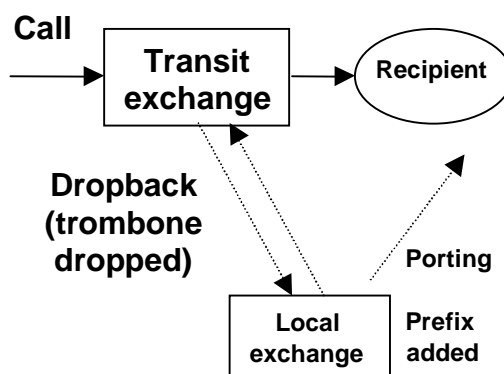
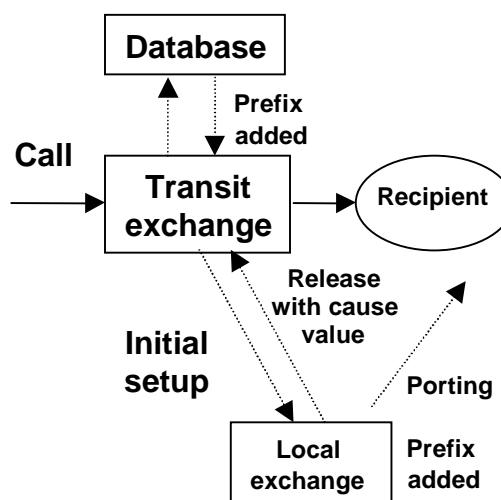
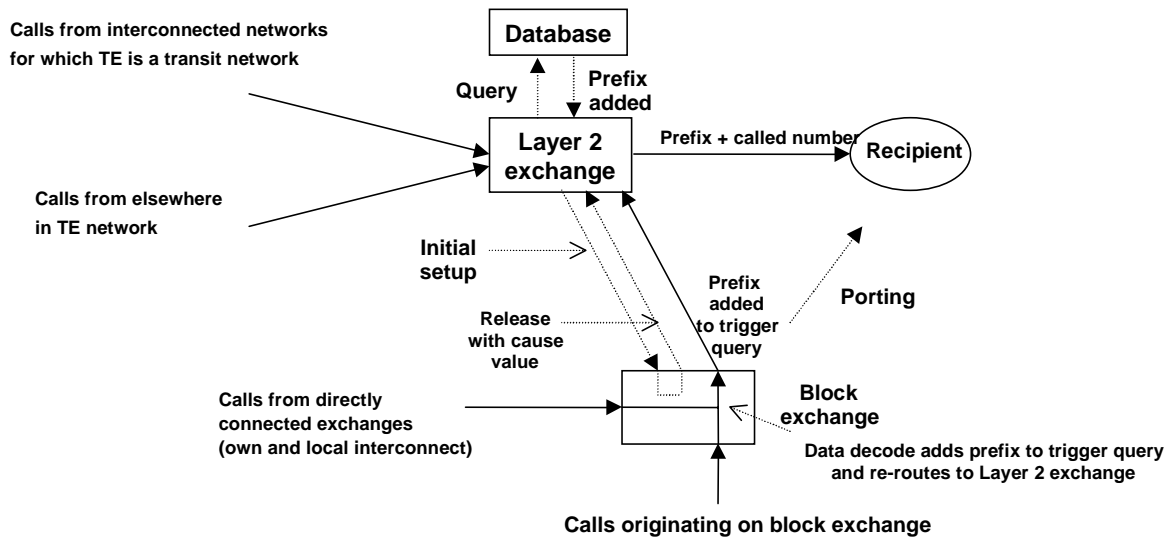
Figure B1.1 Comparison of rerouting methods
Data decode**Data decode with dropback****Query on release**

Figure B1.2 shows the sort of implementation of a triggered query solution that might be considered by Telecom Eireann.

Figure B1.2 Possible implementation for Telecom Eireann


Routing in the recipient network

A recipient exchange will need to support the imported number. Depending on the number analysis methods used, this may mean supporting a number block containing the imported number. Thus the same number blocks would be supported on both the exporting and importing networks but each containing different active numbers. Calls to imported numbers that originate on the importing exchange would then normally be retained within the exchange.

Unless an all-call-query IN solution is used, calls from other exchanges within the importing network would be routed out towards the donor network and then re-routed back. Because we propose to place responsibility for routing on the originating network we would require an originating network that is also the recipient to pay for any routing or tromboning through a transit or the donor network, but we would not prohibit such routing.

Routing in transit networks

Where a call to an imported number is received at an interconnection point that is not directly connected to the recipient exchange, another exchange will need to route the call to the recipient. This other exchange will need to analyse both the prefix and called number to determine the correct routing, since otherwise it would route calls to the block network.

Annex C Routing for non-geographic services

There are two main methods for routing calls to ported non geographic numbers:

- onward routing from the service provider with the block allocation of non geographic numbers
- routing by the originating network.

Figure C1.1 shows how calls may be routed to non-geographic numbers, where the originating network uses the block network to provide the rerouting. In some cases, X and A will be the same network.

Figure C1.1 Routing to non-geographic numbers from block allocations

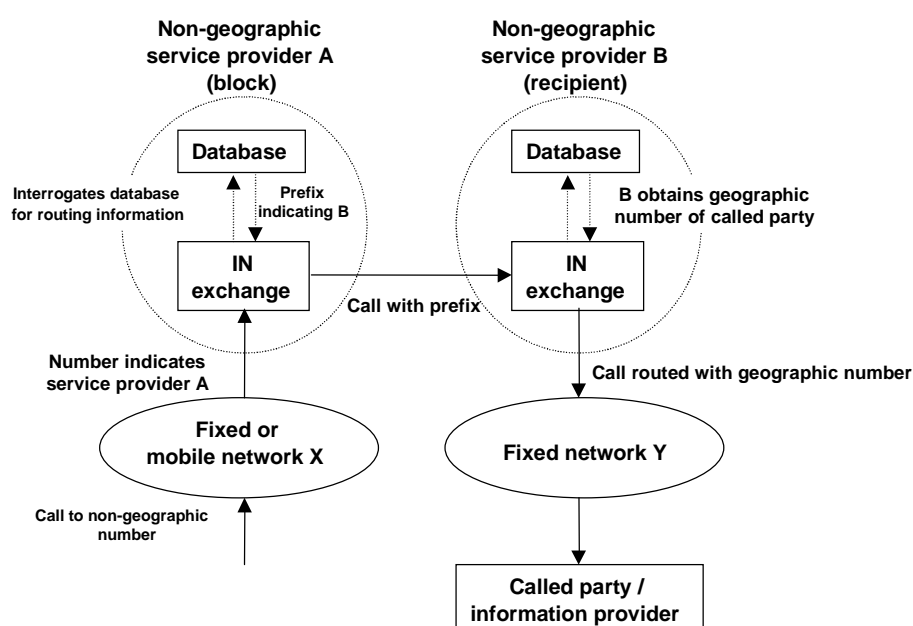


Figure C1.2 shows the routing arrangements where the originating network has IN and can do its own routing. It can then route directly from X to B and not pass through A. This arrangement would need to apply if there were to be direct allocation of numbers to customers.

Figure C1.2: Routing by originating network to non-geographic numbers