



Handläggande organ/Standardizing body	Fastställt/Approved	Utgåva/Edition	Sida/Page
ITS Information Technology Standardization	1999-03-12	1	1 (29)

© Copyright SIS. Reproduction in any form without permission is prohibited.

Number Portability in Sweden – Network solutions for Service Provider Portability for fixed public telecommunications services

Nummerportabilitet i Sverige – Nätlösningar för teleoperatörsportabilitet för fasta allmänt tillgängliga teletjänster

A Swedish National Standard for handling number portability for fixed public telecommunications services between public telecommunications networks

ICS 33.020.00

Standarder kan beställas hos SIS som även lämnar allmänna upplysningar om svensk och utländsk standard.
Postadress: SIS, Box 6455, 113 82 STOCKHOLM
Telefon: 08 - 610 30 00. Telefax: 08 - 30 77 57

Upplysningar om **sakinnehållet** i standarden lämnas av ITS.
Telefon: 08 - 793 90 00. Telefax: 08 - 751 53 63
E-post: info@its.se
Prisgrupp P

Tryckt i april 1999

Contents

Preface	3
Introduction	4
1 Scope	4
2 References	4
3 Terms and definitions	6
4 Abbreviations	10
5 Methods and Procedures of Number Portability	11
6 Normal call cases	13
7 Abnormal cases	13
8 Supplementary Services	14
9 Service numbers	15
10 Cancellation of subscriptions	15
11 The Network Interface	15
12 Information from the Administrative Interface	17
Annex A – Call cases (Informative)	18
Annex B – Considerations (Informative)	27

Preface

This standard is structured in the following way:

Introduction gives a general introduction to the document.

Clause 1 describes the scope.

Clause 2 lists reference documents.

Clause 3 gives terms and definitions used in the document.

Clause 4 explains abbreviations used in the document.

Clause 5 describes the methods and procedures used for realisation of number portability.

Clause 6 describes the normal call cases which may be subject to number portability.

Clause 7 describes the abnormal call cases which may be subject to number portability.

Clause 8 describes how the supplementary services are treated.

Clause 9 describes how the service numbers are treated

Clause 10 describes how cancellation of subscriptions are treated.

Clause 11 describes the network interface.

Clause 12 describes the relation to the Administrative Interface.

Annex A provides examples of call cases to help the reader to understand how to apply the rules and procedures.

Annex B explains the considerations and assumptions of the special team under working group AG15 in the development of this standard.

The administrative interface and reference database for the support of number portability is described in the Swedish Standard: **SS 63 63 91**, *Number portability in Sweden – Administrative process for number portability, including the administrative interface and the central reference database* [8].

This standard is produced by a working group of Information Technology Standardization, ITS, Working Group 15, AG15. Interested parties from the telecommunications operators and industry have manned this group.

Introduction

This standard describes the requirements imposed on the public telecommunications network, the network interface and the information which has to be exchanged over the Administrative Interfaces between public telecommunications operators in Sweden, for the support of Service Provider Portability for fixed public telecommunications services.

The introduction of Service Provider Portability will change routing and charging principles. The identification of the public telecommunications network, to which a Directory Number belongs, requires analysis of the complete number.

The considerations made concerning the introduction of Service Provider Portability for fixed public telecommunications services in Sweden are explained in Annex B.

1 Scope

This standard addresses network interconnection rules and procedures of Service Provider Portability for fixed public telecommunications services between public telecommunications operators in Sweden. In this standard, Number Portability is used in the sense of Service Provider Portability.

It describes the number portability Network Interface defined between public telecommunications operators, and the different methods compatible with the number portability Network Interface. Routing rules and the necessary changes of ISDN User Part (ISUP) parameters are also defined.

Number portability for mobile public telecommunications services between Public Land Mobile Networks (PLMN) is outside the scope of this standard.

Administrative process and interfaces between databases (administrative and reference) are outside the scope of this standard, but necessary information identified for the technical solutions is listed. The correct accounting of calls from ported numbers passing through a transit network is also outside the scope of this standard.

Numbers which are portable in the sense of this standard are subscriber numbers for the telephone service and service numbers in the public telecommunications network according to regulations published by the National Post & Telecom Agency.

The number portability methods described in this standard do not support portability for mass call numbers. (Services like e.g. televoting are planned and designed for handling extremely high instant call attempt volumes.)

This standard does not settle the commercial commitments between public telecommunications operators.

2 References

2.1 Normative References

- | | |
|-----------------------------------|--|
| ETSI TR 101 118 | Network Aspects (NA) – High level network architectures and solutions to support number portability. V1.1.1 (1997-11) [1] |
| ETSI TR 101 122 | Network Aspects (NA) – Numbering and addressing for number portability, V1.1.1 (1997-11) [2] |
| ITU-T Recommendation Q.850 | Usage of Cause and Location in the Digital Subscriber Signalling System No. 1 and the Signalling System No. 7 ISDN User Part (03/93) [3] |

TVT 8211 – A335 rev B	Telia specification, ISDN-ISDN Signalling interface for Sweden (1995-05-31) [4]
SS-ISO 8601:1991	Data elements and interchange formats – Information interchange – Representation of dates and times [5]
Report ITS 9	Application guide – Transfer of subscriber number information in national interconnection (1998-05-28 – Edition 1) [6]
Svensk nummerplan för telefoni (E.164)	NPTA decision Hk 94-4621 and additional decisions Hk 95-137 (1995-02-07), Hk 95-9700 (1995-10-26), Hk 96-4052 (1996-04-29), Hk 96-5461 (1996-12-20), Hk 96-11545 (1996-12-20), Hk 96-3500 (1997-07-09), Hk 96-18439 (1997-07-09), Hk 97-10861 (1997-07-25), Hk 97-10861 (1998-02-26), Hk 97-10861 (1998-04-08), Dnr 98-9535 (1998-06-26), Dnr 98-15011 (1998-10-01), Dnr 98-15012 (1998-10-01), Dnr 98-4773 (1998-12-21), Dnr 98-14209 (1999-02-04) [7]
SS 63 63 91:1999	Number Portability in Sweden – Administrative process for number portability, including the administrative interface and the central reference database [8]

2.2 Informative References

Regeringens proposition 1997/1998:126	Nummerfrågor [9]
ETSI TR 101 119	Network Aspects (NA) – High level description of number portability. V1.1.1 (1997-11) [10]
EN 300 356-1	Integrated Services Digital Network (ISDN) – Signalling System No.7 – ISDN User Part (ISUP) version 3 for the international interface – Part 1: Basic services – [ITU-T Recommendations Q.761 to Q.764 (1997), modified][11]
ITU-T Recommendations Q.761 – 764	Integrated Services Digital Network User Part (ISUP), Blue Book 1988 [12]
ITU-T Recommendation Q.767	Application of the ISDN User Part of CCITT Signalling System No. 7 for International ISDN Interconnections Geneva, 1991 [13]
OVUM - Number Portability in Sweden	Ovum's study (report and annexes) on the possible introduction of Number Portability (February 1997) [14]
Överflyttning av 1000- och 10000-nummerserier mellan teleoperatörer inom riktnummerområden	NPTA decision Hk 96-3500 (1997-07-09) and additional decision Dnr 98-14209 (1999-02-04) [15]

3 Terms and definitions

For the purpose of this standard the following terms and definitions apply.

3.1 Entities

3.1.1 donor service provider

The Service Provider from whom the number was ported.

3.1.2 initial donor service provider

The Service Provider from whom the number was initially ported.

3.1.3 network operator

An entity operating a public telecommunications network in order to route calls.

NOTE: A network operator can also be the service provider.

3.1.4 numbering plan administration (NPA)

An entity responsible for the administration and assignment of numbers, or number blocks, within a national numbering plan.

NOTE: In Sweden this is the National Post & Telecom Agency.

3.1.5 number range holder

An entity responsible for the administration and allocation of numbers within a particular range.

3.1.6 public telecommunications operator (PTO)

A telecommunications operator in Sweden offering public telecommunications services.

NOTE: This term includes both Service Provider and Network Operator.

3.1.7 recipient service provider

The Service Provider to whom the number is ported

3.1.8 service provider

An entity offering public telecommunication services to subscribers and users involving the use of network resources.

NOTE: "Service Provider" is, in this standard, used in a generic sense, and may have a different status according to the service provided.

3.2 Numbers

3.2.1 directory number (DN)

An E.164 number in the national numbering plan assigned to a subscriber for a public telecommunications service.

NOTE: The Directory Number is assigned directly to subscribers by the public telecommunication operators from number ranges assigned by the NPA. The Directory Number consists of the national (trunk) prefix + NDC + SN.

3.2.2 geographic number (GN)

A Directory Number with geographical significance.

3.2.3 national (significant) number (N(S)N)

The portion of the number that follows the national (trunk) prefix. The National (Significant) Number consists of the National Destination Code (NDC) followed by the Subscriber Number (SN).

3.2.4 non-geographic number (NGN)

A Directory Number which is not a Geographic Number.

NOTE: A Non-Geographic Number does not indicate the location of the subscriber. An example of Non-Geographic Numbers is Service Numbers.

3.2.5 ported number

A Directory Number subject to number portability.

3.2.6 redirecting number

If a Call Forwarding or Call Deflection supplementary service has been activated, the Directory Number for which the services are activated represents a Redirecting Number for incoming calls.

3.2.7 routing number

A specific number which is added and used by the networks to route the call.

NOTE: The Routing Number conveys information for use by the network. If the digits dialled by the user matches the digits of a Routing Number, the dialled digits shall not be interpreted as a Routing Number.

3.2.8 service number

A Directory Number from a specific range of the national numbering plan, reserved for a specific category of telecommunications services, e.g. premium rate or freephone services.

3.3 Networks

3.3.1 carrier network

The network selected by the carrier selection procedure for routing a call.

3.3.2 donor network

The network from which a number is ported.

3.3.3 initial donor network

The initial network to which a number range was allocated by the NPA.

3.3.4 originating network

The network where the calling party is located.

NOTE 1: For incoming calls to the routing domain, the originating network is effectively the first network receiving the call within the routing domain. For example, for incoming international calls, the originating network is effectively the network containing the international switching centre (ISC).

NOTE 2: For carrier selection, the network containing the first exchange of the selected carrier, becomes effectively the originating network for routing purposes as regards number portability.

3.3.5 recipient network

The network where a number is located after being ported.

3.3.6 serving network

The network that determines whether a number has been ported, and, if so, provides an appropriate routing number.

3.3.7 terminating network

The network where the called party is located.

3.3.8 transit network

A network between the originating network and the terminating network.

3.4 Exchanges

3.4.1 donor exchange

The exchange from which a number is ported.

3.4.2 gateway exchange (GW)

An exchange with Point(s) of Interconnection to exchanges in other national or international networks.

NOTE: The latter may be called International Switching Centre (ISC).

3.4.3 initial donor exchange

The exchange where a number was located before ever being ported.

3.4.4 originating exchange

The first exchange in the Originating Network.

3.4.5 recipient exchange

The new exchange to which a number belongs after being ported. For service numbers, this is the network where the service is provided.

3.4.6 serving exchange

The exchange performing the check if a Directory Number is ported.

3.4.7 terminating exchange

The exchange where the called party is located.

3.4.8 transit exchange (TE)

An exchange between two exchanges, e.g. the originating and the terminating exchange.

3.5 Other definitions

3.5.1 administrative database (AdmDB)

The Service Provider's not call related database or similar function in charge of the storage and updating of the Operational Database of ported Directory Numbers necessary for the Service Provider's correct routing of calls.

3.5.2 administrative interface

The interface between Service Providers' Administrative Databases and between the Service Providers' Administrative Databases and the Reference Database, if implemented.

NOTE: See Figure 3:1.

3.5.3 area code area

The geographical area to which an area code is assigned.

3.5.4 location portability

A function which allows the subscribers to retain their Directory Numbers when they move to a new location within a certain area, e.g. an area code area.

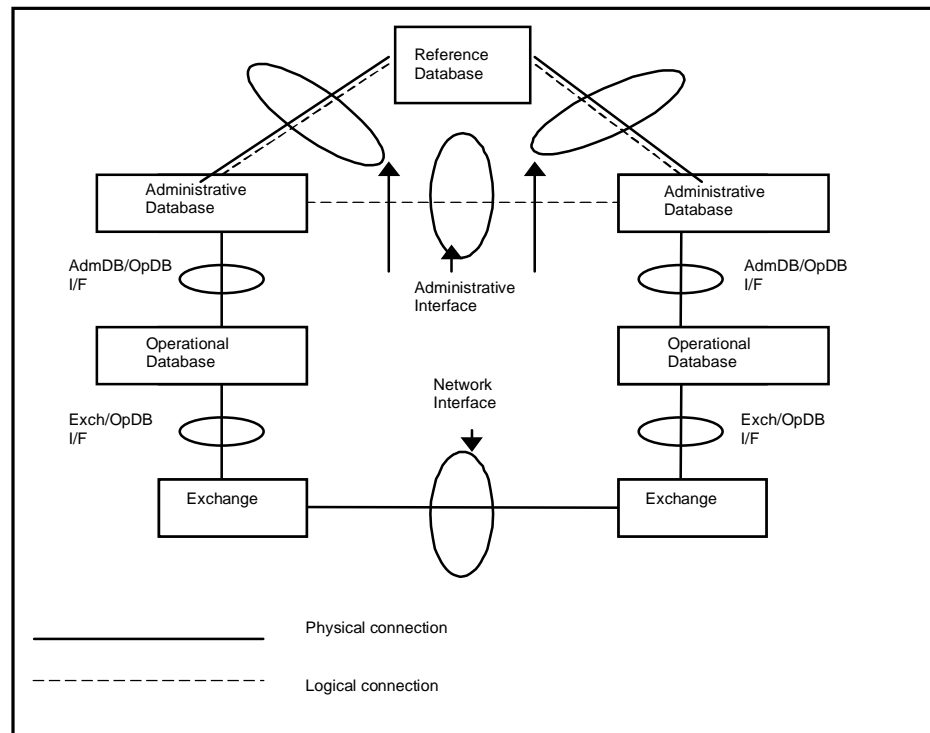


Figure 3:1

3.5.5 national numbering plan

A national numbering plan provides a structure for the numbers used and the number space available in a country.

NOTE: See ref. [7] for the structure of the Swedish numbering plan for telephony.

3.5.6 network interface

The interface between public telecommunications operators supporting Number Portability.

NOTE: See Figure 3:1.

3.5.7 operational database (OpDB)

A database used in real-time by the network operator or service provider for the correct routing of calls to ported Directory Numbers.

NOTE: The Operational Database could form part of an IN implementation, could be embedded within the exchange or could be some other type of on-line database.

3.5.8 operator identity

Identity of a Public Telecommunications Operator.

3.5.9 point of interconnection (POI)

A connection point between public telecommunications networks.

3.5.10 portability check

The function whereby a network, e.g. the serving network, performs a check of whether a Directory Number is ported.

3.5.11 portability domain

The part of the number ranges of the national numbering plan, where number portability is supported for a certain type of public telecommunications service.

NOTE: One Portability Domain may represent e.g. specified fixed subscriber number ranges, another freephone number ranges.

3.5.12 reference database (RefDB)

The database in charge of the storage and updating of the Administrative Databases of the Service Providers' ported Directory Numbers.

NOTE: The data stored is necessary for correct routing of calls by all PTOs in the Routing Domain using the All Call Query method. The Reference Database can be centralised (CRefDB) or distributed (DRefDB). If no network has implemented All Call Query, there is no need for a Reference Database.

3.5.13 routing domain

The part of the national public telecommunications network obliged to perform portability check and to route the call accordingly.

NOTE: The Routing Domain includes the Portability Domain.

3.5.14 service provider portability, number portability

A function enabling the subscribers to cancel their subscriptions with a Service Provider and to contract another subscription with another Service Provider, without changing their Directory Numbers and the nature of the service offered.

4 Abbreviations

ACQ	All Call Query method
AdmDB	Administrative Database
CC	Country Code
CdPN	Called Party Number
CRefDB	Centralised Reference Database
DDI	Direct Dialling In
DN	Directory Number
DRefDB	Distributed Reference Database
GN	Geographic Number
GW	Gateway Exchange
IAM	Initial Address Message. The message sent to set up a speech path through the network.
IN	Intelligent Network
ITS	Information Technology Standardisation.
ISC	International Switching Centre
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
LE	Local Exchange
MSN	Multiple Subscriber Number
NDC	National Destination Code
NGN	Non-Geographic Number
N(S)N	National (Significant) Number
NoA	Nature of Address indicator
NPA	Numbering Plan Administration
NPTA	National Post & Telecom Agency, the national regulatory authority for the telecommunications sector
OpDB	Operational Database
OLE	Originating Local Exchange
OR	Onward Routing method
PLMN	Public Land Mobile Network
POI	Point of Interconnection

PTO	Public Telecommunications Operator
RefDB	Reference Database
REL	Release Message. The message sent to release a speech path in the network.
SN	Subscriber Number
TE	Transit Exchange
TLE	Terminating Local Exchange

5 Methods and Procedures of Number Portability

5.1 General

The methods of realising number portability in Sweden in connection with change of Service Provider are All Call Query and Onward Routing.

All Call Query, as defined in this standard, is the preferred technical method of realising number portability, as it offers the most efficient routing of calls from the originating network.

Onward Routing, as defined in this standard, is intended for Service Providers without an Operational and/or Administrative Database for all ported numbers in the Portability Domain. The Onward Routing method leads to less efficient routing of calls compared to the All Call Query method.

The originating network, when using the All Call Query method, may use any information supplied over the Administrative Interface to handle (e.g. route and charge) calls to ported numbers in accordance with its own rules or rules agreed to by the terminating network (e.g. the recipient).

In a situation where all the public telecommunications networks use the Onward Routing method, there is no need for a Reference Database. If at least one network uses All Call Query, a Reference Database will be necessary.

The Service Provider portability for Directory Numbers as it is defined in Sweden allows porting within an area code area. Since Service Providers may offer Location Portability within area code areas, the routing of calls in such cases may be more efficient if information on Special Points of Interconnection is available. This information is defined as optional in section 12.2.

To ensure correct identification for e.g. public emergency services, calls from ported Directory Numbers shall be treated as ordinary calls as regards Calling Line Identification Presentation.

In Sweden two-step routing is applied. This means that the routing information given to a call to a ported number only points out the terminating network (e.g. the recipient network). The terminating network may need to add routing information to be able to terminate the call.

If Service Provider Portability will initially be introduced in some area code areas, the obligation to route calls correctly will still apply to all Public Telecommunications Operators in the Routing Domain.

All call cases and the specific number portability signalling information are explained in Annex A.

5.2 All Call Query method

All Call Query is the preferred and long-term technical method supporting the number portability Network Interface.

If the originating network in the Routing Domain supports the All Call Query method, it is obliged **to route calls to all ported Directory Numbers in the Portability Domain** towards the Recipient Network. The number shall be indicated as a ported number.

Before a call is routed to another network, a portability check of the called Directory Number shall be performed, in order to clarify whether the called Directory Number is or is not ported out from any network within the Portability Domain.

If the check indicates that the called Directory Number is ported, the call is routed towards the recipient network on the basis of information received over the Administrative Interface. At the Point of Interconnection, a call to a ported number is identified as described in Clause 11. Charging and accounting is performed on the basis of information received over the Administrative Interface.

If the check indicates that the called Directory Number is not ported, ordinary routing procedures will be followed.

5.3 Onward Routing method

Onward Routing is the alternative method of supporting the number portability Network Interface. This method requires bilateral agreements between the public telecommunications operators.

If the originating network in the Routing Domain supports the Onward Routing method, it is obliged **to route calls to ported Directory Numbers from its own number ranges** towards the Recipient Network. The number shall be indicated as a ported number.

Before a call is routed to another network, a portability check of the called Directory Number must be performed in order to clarify whether the called Directory Number is ported out from the network's own number ranges.

If the check indicates that the called Directory Number is ported to another network, the call is routed towards that other network on the basis of the information received over the Administrative Interface¹⁾. At the Point of Interconnection, a call to a ported number is identified as described in Clause 11. Charging and accounting is performed on the basis of information received over the Administrative Interface.

If the check indicates that the called Directory Number is not ported, or does not originate from the network's own number ranges, ordinary routing procedures will be followed.

5.4 Agreements and information on implemented methods and interworking

In order to achieve effective routing through the networks, all Public Telecommunications Operators within the Routing Domain shall inform all other directly interconnected Public Telecommunications Operators about which method they support.

The Onward Routing method requires bilateral agreements between the Public Telecommunications Operators concerned.

A network acting as an All Call Query network receiving a call from an Onward Routing network, shall perform a portability check for calls to all numbers within the Portability Domain, except for calls already marked as calls to ported numbers.

A network receiving a call from a network acting as an All Call Query network within the Routing Domain need not perform any portability check.

An Onward Routing network receiving a call from an Onward Routing network shall perform a portability check for all numbers where the second Onward Routing network is the number range holder.

1) The Administrative Interface for the Onward Routing method is the interface over which relevant routing information has been received. This interface may be the AdmDB/OpDB I/F or the Exch/OpDB I/F according to Figure 3:1.

6 Normal call cases

6.1 Calls coming into the Routing Domain

The first network within the Routing Domain receiving incoming calls from outside the Routing Domain is, in terms of number portability, considered as the originating network.

An example is incoming international calls.

6.2 Carrier selection

When a subscriber dials a carrier selection code for routing to a Carrier Network or for invoking carrier selection by preselection, the selected carrier is responsible for handling the call also with respect to number portability.

In terms of number portability, the selected Carrier Network shall be considered as the originating network. Carrier selection has priority over number portability in the routing context.

6.3 Requirements on calling subscriber identification for public emergency services

The Calling Party Number shall remain unchanged for calls to ported Directory Numbers.

The Calling Party Number for calls from ported subscribers shall be the ported Directory Number.

6.4 Calls from ported numbers

Calls from ported Directory Numbers are treated as ordinary calls. Correct accounting of calls from ported numbers passing through a transit network is outside the scope of this standard.

7 Abnormal cases

With abnormal cases, the general principle is to release the call as soon as possible to minimise the risk of looping or other network problems.

The following cases are identified:

7.1 Case 1

A terminating network within the Portability Domain receives a call with the indication of ported number from an originating All Call Query network or Initial Donor Onward Routing network. The terminating network does not recognise the called Directory Number as belonging to the network, or as unallocated. Then the terminating network shall release the call with the Cause value #112, (Ported Number not found)²⁾.

When the Cause Value #112 is received in the originating network, the call shall be released and appropriate action shall be taken.

7.2 Case 2

A terminating network within the Portability Domain receives a call without the indication of ported number from an originating or serving All Call Query network. The terminating network does not recognise the called Directory Number as belonging to the network (i.e. being ported), or as unallocated. Then the terminating network shall release the call with the Cause Value #112, (Ported Number not found) or Cause Value #1, (Unallocated Number).

2) See Clause 11.4.

The Cause value #112 can be used if the terminating network has the possibility of checking and verifying that the Directory Number is allocated to another network.

The Cause Value #1 shall be used if the Directory Number is not allocated to the terminating network and the network does not have the possibility of checking whether the Directory Number is allocated to another network, or if the result of the check is that the number is unallocated.

When the Cause Value #1 or #112 is received in the originating network, the call shall be released and appropriate action shall be taken.

7.3 Other abnormal cases

If an attempt is made to terminate a call to a ported Directory Number outside the Portability Domain, the terminating network (in this case not the recipient network) is incapable of sending number portability specific Cause Codes. In such a case, normal release codes are returned and appropriate action is taken.

If a call coming in from outside the Routing Domain results in release, the following shall apply. If the Cause Code generated is #1, it is transferred transparently to the originating network. If the Cause Code generated is #112, the first incoming network in the Routing Domain is in charge of converting Cause Code #112 into Cause Code #1.

8 Supplementary Services

As a general rule, the supplementary services supported in the donor network are not portable to the recipient network as regards Service Provider Portability. This does not exclude the same type of supplementary services from being supported in the Recipient Network and also being provided at interconnection with the Donor Network.

8.1 Direct Dialling In (DDI)

Complete DDI number ranges can be ported by the same method as single subscriber numbers with an unaffected DDI function at call set-up when the DDI service is provided by the recipient operator. Portability for individual numbers in a DDI range is outside the scope of number portability.

8.2 Multiple Subscriber Numbers (MSN)

Single numbers within an MSN can be ported.

8.3 Call Forwarding Services

If the C-number of a forwarded call is a ported number, the originating network is, from a portability aspect, the network of the Redirecting Number

8.4 Presentation Services

The Calling Party Number shall be unchanged for calls to ported Directory Numbers.

The Calling Party Number of calls from ported subscribers shall be the ported Directory Number.

8.5 Services using Transaction Capabilities

For the time being, services using Transaction Capabilities/Signalling Connection Control Part, e.g. Message Waiting and Completion of Calls to Busy Subscriber, are not supported in combination with Service Provider Portability.

9 Service numbers

Service numbers are treated in the same way as ordinary subscriber numbers at the network interface.

10 Cancellation of subscriptions

If the subscription to a ported number is cancelled, the recipient network will generate the appropriate tone or voice announcements during the vacancy period. When the vacancy period is over, the Recipient Network shall notify the Initial Donor network³⁾ and the Reference Database⁴⁾. This enables the Initial Donor of the Directory Number to take appropriate action in order to activate the relevant tone or voice announcements for calls to the Directory Number, and the Reference Database to inform all other networks.

11 The Network Interface

The Network Interface is based on Telia ISUP, see ref. [4], with the following clarifications and modifications.

11.1 General

The following modifications are introduced for the support of Service Provider Portability in the network interface between two Public Telecommunications Operators. Two main pieces of information is transferred: first an indication that a Directory Number is ported, and second, routing information on the ported number.

The indication that the number is ported can be transferred either in terms of a new value of the Nature of Address indicator, which is the preferred method, or as leading digits prior to the Routing Number. This is an available method with the present structure of area codes in the Swedish numbering plan for telephony.

The routing information is conveyed as part of the Address Signal of the Called Party Number.

11.2 Called Party Number

Information about a ported number is provided to another network by the ISDN User Part, Initial Address Message, (IAM) in the Called Party Number parameter.

This parameter is coded in the following way:

Preferred method

Nature of Address Indicator

000 1000 value 8

(Network) Routing Number concatenated with Called Directory Number (for national use)

Numbering Plan Indicator

01

The international public telecommunication numbering plan (ITU-T Recommendation E.164, (05/97))

Address signal

ZXY+N(S)N

ZXY

N(S)N

Routing Information

Routing Number

National (Significant) Number

3) Only applicable if the Directory Number shall be returned to the Initial Donor, see SS 63 63 91, Clauses 6.7.1 and 6.7.2.

4) If no network has implemented All Call Query, there is no need for a Reference Database.

Alternative method**Nature of Address Indicator**

000 0011 value 3 National (Significant) Number

Numbering Plan Indicator

01 The international public telecommunication numbering plan (ITU-T Recommendation E.164, (05/97))

Address signal

ABC+ZXY+N(S)N	Routing Information ⁵⁾
ABC	Ported Prefix (set to 394)
ZXY	Routing Prefix
N(S)N	National (Significant) Number

Structure of Routing Number

000	Reserved
001 – 499	For identification of public telecommunications operator terminating network. Allocated by independent entity.
500 – 599	Reserved for the Reference Database
600 – 899	Spare, allocated by independent entity
9	For network internal use (The number of digits used is decided by each public telecommunications operator)

11.3 Calling Party Number, Original Called Number and Redirecting number

The ISDN User Part parameters Calling Party Number, Original Called Number, Redirecting Number and corresponding generic numbers are handled according to the Report ITS 9 Application Guide, ref. [6], as regards each supplementary service and with respect to interconnect agreements in force.

11.4 Cause Indicators

One new cause value is introduced. The coding of the Cause Indicator to be used in relation to number portability is described below.

The Cause Indicator parameter is coded according to ITU-T Recommendation Q.850, ref. [3]; the affected subfields for this Cause Value are coded in the following way.

Coding standard

1 0 National Standard

Cause value

<u>Class</u>	<u>Value</u>	<u>No.</u>	<u>Definition</u>
111	0000	112	Ported Number not found

This cause indicates that the call is cleared because the ported number is not allocated to the network indicated by the Called Party Number parameter. This may be due to e.g. a mismatch between the Called Party Number parameter information and the information in the Operational Database and/or the Administrative Database of the terminating network.

5) The Routing Number consists of the Ported Prefix and the Routing Prefix.

12 Information from the Administrative Interface

In this standard, the Administrative Interface is seen as an interface between the Public Telecommunications Operators' Administrative Databases and the Reference Database where information needed to handle number portability is exchanged. The information received over the Administrative Interface is interpreted and used in each operator's network according to the routing and charging rules of this network and agreements between the terminating and originating or donor networks.

The following mandatory and optional information is identified for the technical solutions. The operators concerned must supply the mandatory information; the optional information may be supplied by agreement between the operators.

In a situation where all the public telecommunications networks use the Onward Routing method, there is no need for a Reference Database. If at least one network uses All Call Query, a Reference Database will be necessary.

12.1 Mandatory information

Directory Number

The ported Directory Number.

Date and time for porting

The Year, Month, Day, Hour, Minute and Second of switchover. (see ref. [5], ISO 8601: 1991)

Donor network/Operator identity

The identity of the operator from which the Directory Number is ported. For a public telecommunications operator with more than one logical network, there may be one identity for each network. (E.g. one for PSTN/ISDN)

Recipient network/Operator identity

The identity of the operator to which the Directory Number is ported. For a public telecommunications operator with more than one logical network, there may be one identity for each network. (E.g. one for PSTN/ISDN)

12.2 Optional information

Geographical information

The area to which the Directory Number is assigned.

Service information

Description of e.g. a service category.

Additional charging information

Charging information for the Directory Number defining other charging criteria than geographical data, e.g. subscriber class.

Information for a special Point of Interconnection

The information is the Network Indicator (NI=3) + Signalling Point Code of a Special Point of Interconnection of the Recipient Exchange, e.g. the exchange to which the Directory Number is connected.

Annex A – Call cases (Informative)

A.1 General

This annex provides information to help the reader understand the rules and procedures of number portability solutions for public telecommunications networks in Sweden. The annex presents different examples of call cases illustrating the rules stated in Clauses 5, 6 and 7.

The call cases are limited to the information exchanged over the Network Interface. Information used internally in a network is shown only for reasons of understanding. The Operational Database in originating Onward Routing networks is normally not illustrated in the figures. Functionally, the Local Exchange might be combined with a Transit Exchange.

Calls to ported numbers can be set up through Transit Networks. This is only illustrated in Figure A1, but the situation applies to all call cases.

A.2 Normal Call Cases

A.2.1 Originating network uses All Call Query

Subscriber B is ported from a Donor Network to a Recipient Network within the Portability Domain. Subscriber A in an All Call Query network in the Routing Domain calls subscriber B. See Figure A1.

Routing:

Before the call is routed to another network, a portability check of the Directory Number is performed in the originating network. The number is marked as ported in the operational database. Information received over the Administrative Interface is used for routing the call from the Originating Network towards the Terminating Network.

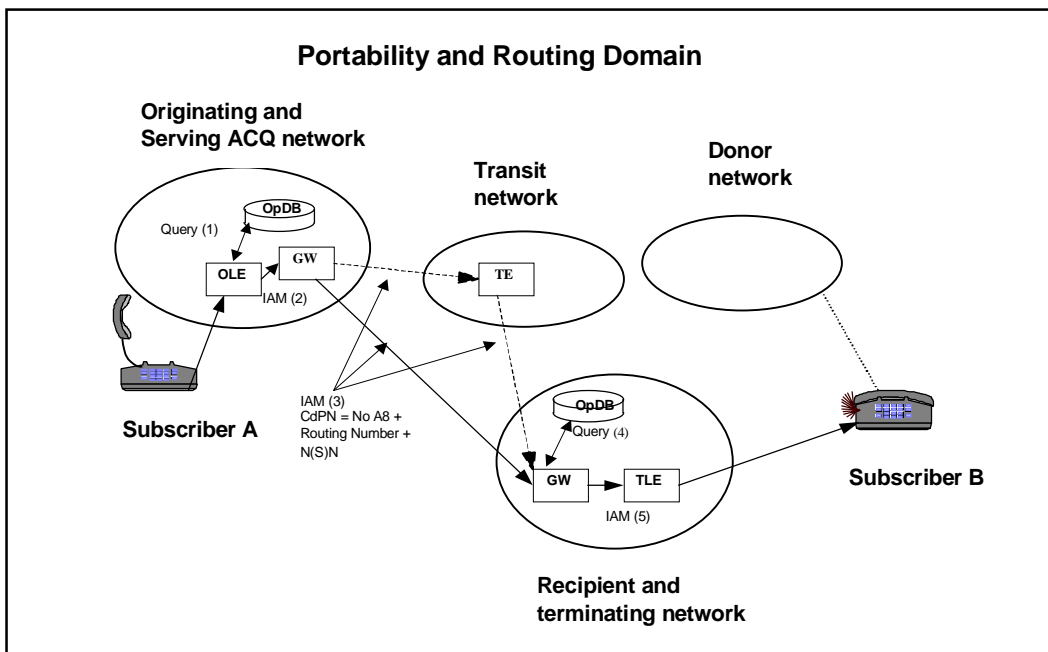


Figure A1

When the call is presented at the Point of Interconnection to the Terminating or Transit Network, the Called Party Number parameter indicates the Directory Number as ported by NoA=8. The call is routed towards the Terminating Network using the Routing Number in the Address Signals of the Called Party Number.

In the Terminating Network a routing analysis of the received Directory Number is performed. This provides new information used for routing the call to the Terminating Local Exchange where the Directory Number is allocated.

Charging and Accounting:

Charging of the calling subscriber is performed in the Originating Network on the basis of information received over the Administrative Interface. Accounting of the call is performed at each network interface according to agreed accounting procedures.

A.2.2 Originating network uses Onward Routing and Serving Initial Donor Network uses All Call Query

Subscriber B is ported from the Serving All Call Query network to a Recipient Network but not to the originating Onward Routing network. Subscriber A in the Onward Routing network calls Subscriber B. See Figure A2.

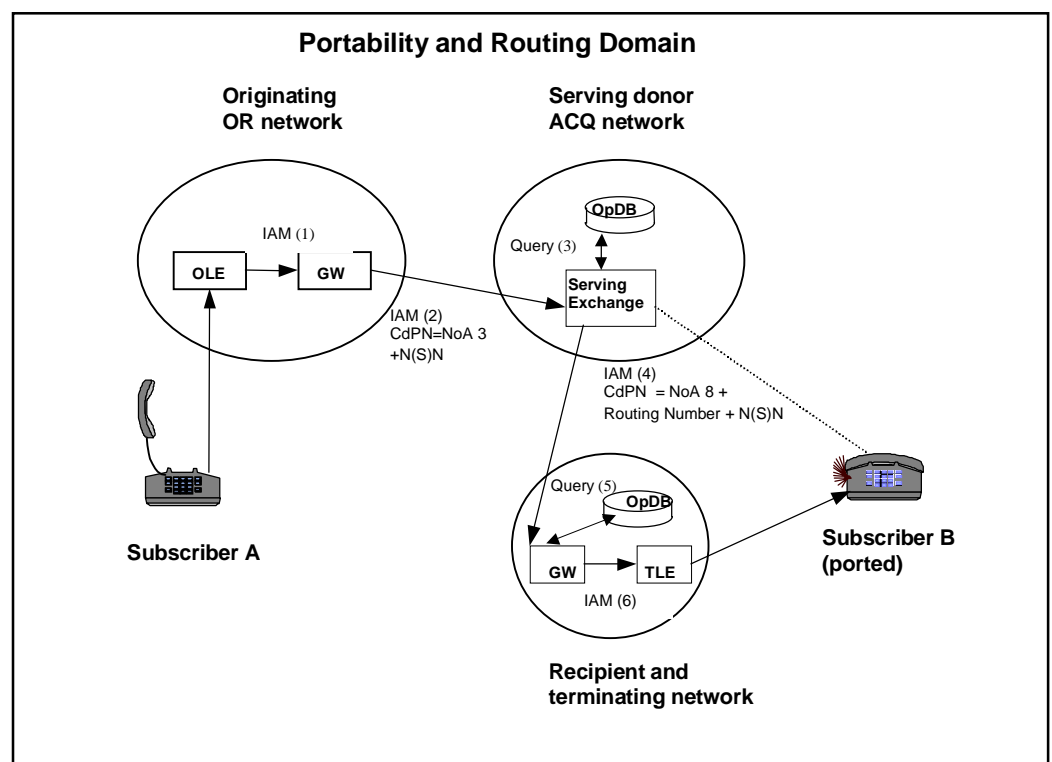


Figure A2

Routing:

The called Directory Number does not belong to the number ranges of the Originating Network. Thus the call is routed from the originating Onward Routing network towards the network which is the Number Range Holder, without any portability check of whether the number is ported. In the All Call Query network, a portability check of the Directory Number is performed and the result is that the number is marked as ported in the Operational Database. Information received over the Administrative Interface is used for routing the call from the donor All Call Query network towards the Terminating Network.

When the call is presented at the Point of Interconnection to the Terminating or Transit network, the Called Party Number parameter identifies the Directory Number as ported by NoA=8. The call is routed towards the Terminating Network using the Routing Number in the Address Signals in the Called Party Number.

In the Terminating Network a routing analysis of the received Directory Number is performed. This provides information used for routing the call to the Terminating Local Exchange where the Directory Number is allocated.

Charging and Accounting:

Charging of the calling subscriber is performed in the Originating Network on the basis of information received over the Administrative Interface⁶. Accounting of the call is performed at each network interface according to agreed accounting procedures.

A.2.3 Originating and Serving networks use Onward Routing

Subscriber B is ported from an Initial Donor Onward Routing network to a Recipient Network, but not the originating Onward Routing network. Subscriber A in the originating Onward Routing network calls Subscriber B. See Figure A3.

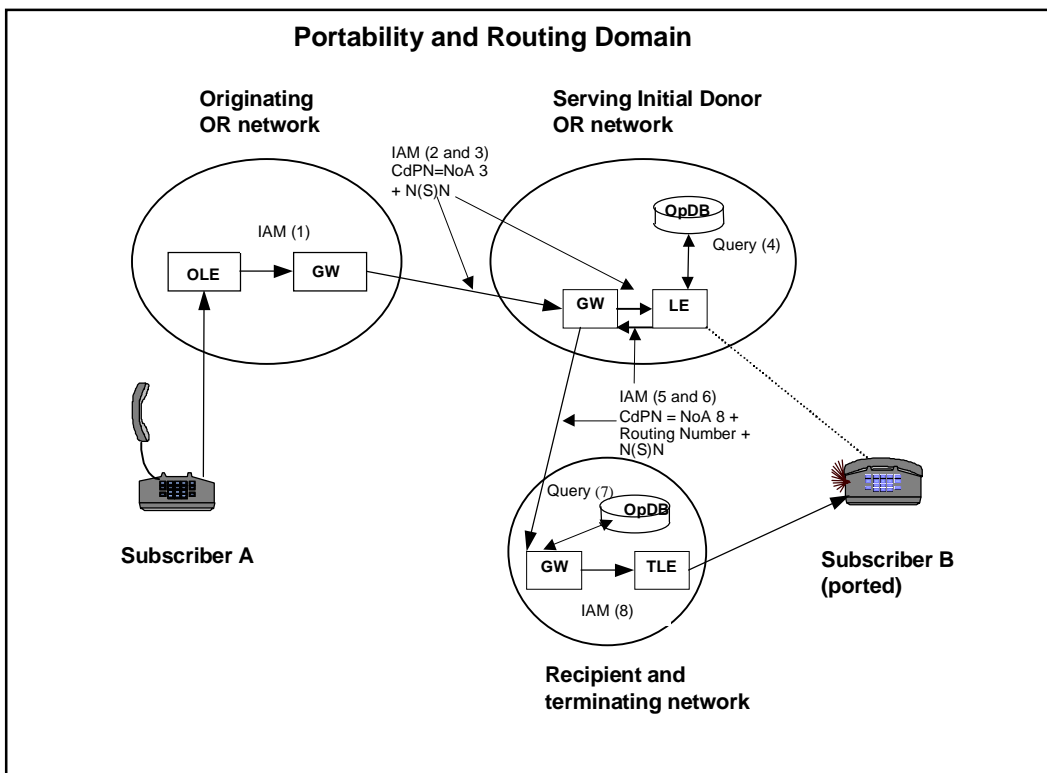


Figure A3

Routing:

Since the number range of the Called Directory Number is not allocated to the originating Onward Routing network, no portability check is performed. Thus the call is routed towards the network which is the Number Range Holder. In this network, which is an Onward Routing network, a portability check of the Directory Number is performed. The number is marked as ported in the Operational Database. Information received over the Administrative Interface is used for routing the call from the second Onward Routing network towards the Terminating Network.

When the call is presented at the Point of Interconnection to the Terminating or Transit Network, the Called Party Number parameter identifies the Directory Number as ported by NoA=8. The call is routed towards the Terminating Network using the Routing Number in the Address Signals in the Called Party Number.

6) The Administrative Interface for the Onward Routing method is the interface over which relevant routing information has been received. This interface may be the AdmDB/OpDB I/F or the Exch/OpDB I/F according to Figure 3:1.

In the Terminating Network, a routing analysis of the received Directory Number is performed. This provides new information used for routing the call to the Terminating Local Exchange where the Directory Number is allocated.

Charging and Accounting:

Charging of the calling subscriber is performed in the Originating Network on the basis of information received over the Administrative Interface⁷⁾. Accounting of the call is performed at each network interface according to the agreed accounting procedures.

A.2.4 The called number is ported from a number range belonging to the originating Onward Routing network

Subscriber B is ported from the originating Onward Routing network. Subscriber A in this network calls Subscriber B. See Figure A4.

Routing:

Before the call is routed, a portability check of the Directory Number is performed in the originating network as it is Number Range Holder. The result of the portability check is that the number is marked as ported in the Operational Database. Information received over the Administrative Interface is used for routing the call from the Originating Network towards the Terminating Network.

When the call is presented at the Point of Interconnection to the Terminating or Transit Network, the Called Party Number parameter identifies the Directory Number as ported by NoA=8. The call is routed towards the Terminating Network using the Routing Number in the Address Signals in the Called Party Number.

In the Terminating Network, a routing analysis of the received Directory Number is performed. This provides information used for routing the call to the Terminating Local Exchange to which the Directory Number is allocated.

7) The Administrative Interface for the Onward Routing method is the interface over which relevant routing information has been received. This interface may be the AdmDB/OpDB I/F or the Exch/OpDB I/F according to Figure 3:1.

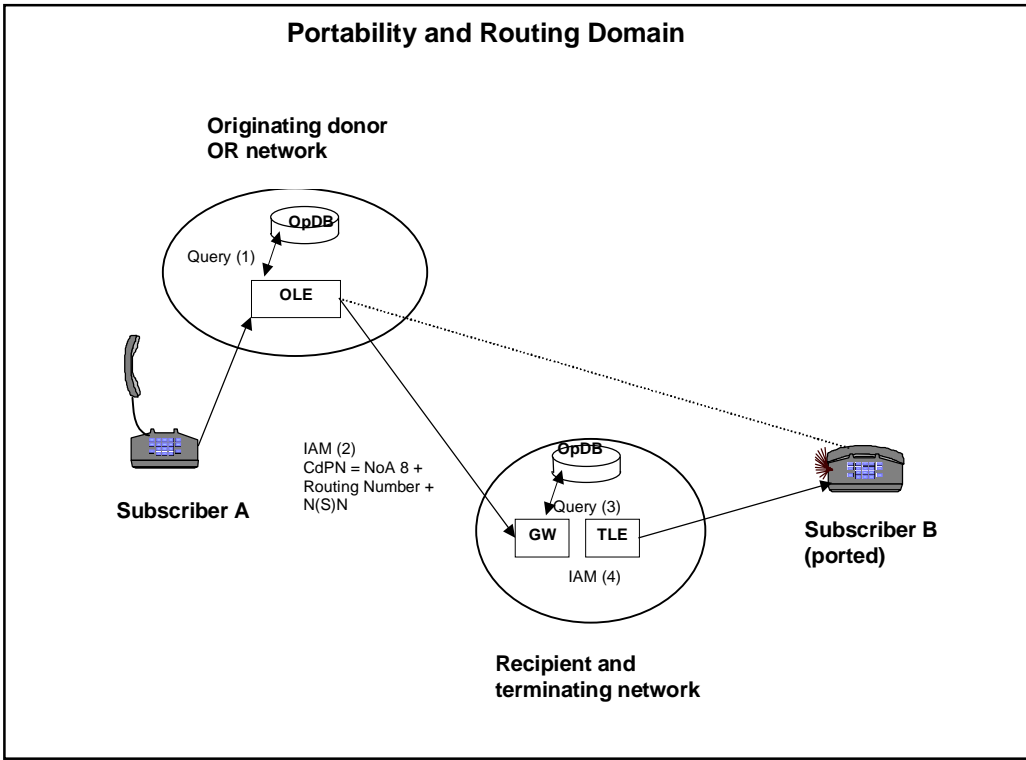


Figure A4

Charging and Accounting:

Charging of the calling subscriber is performed in the Originating Network on the basis of information received over the Administrative Interface⁸⁾. Accounting of the call is performed at each network interface according to the agreed accounting procedures.

A.2.5 Incoming call from outside the Routing Domain

Subscriber B is ported from a network in the Portability Domain. A call comes in from outside the Routing Domain. See Figure A5.

Routing:

When the call enters the first network in the Routing Domain, the following alternatives are possible.

If the first network is of the All Call Query type, this network effectively becomes originating, and applicable procedures are those according to Section A.2.1.

If the first network is of the Onward routing type, this network effectively becomes originating, and applicable procedures are those according to Section A.2.2, A.2.3 or A.2.4.

8) The Administrative Interface for the Onward Routing method is the interface over which relevant routing information has been received. This interface may be the AdmDB/OpDB I/F or the Exch/OpDB I/F according to Figure 3:1.

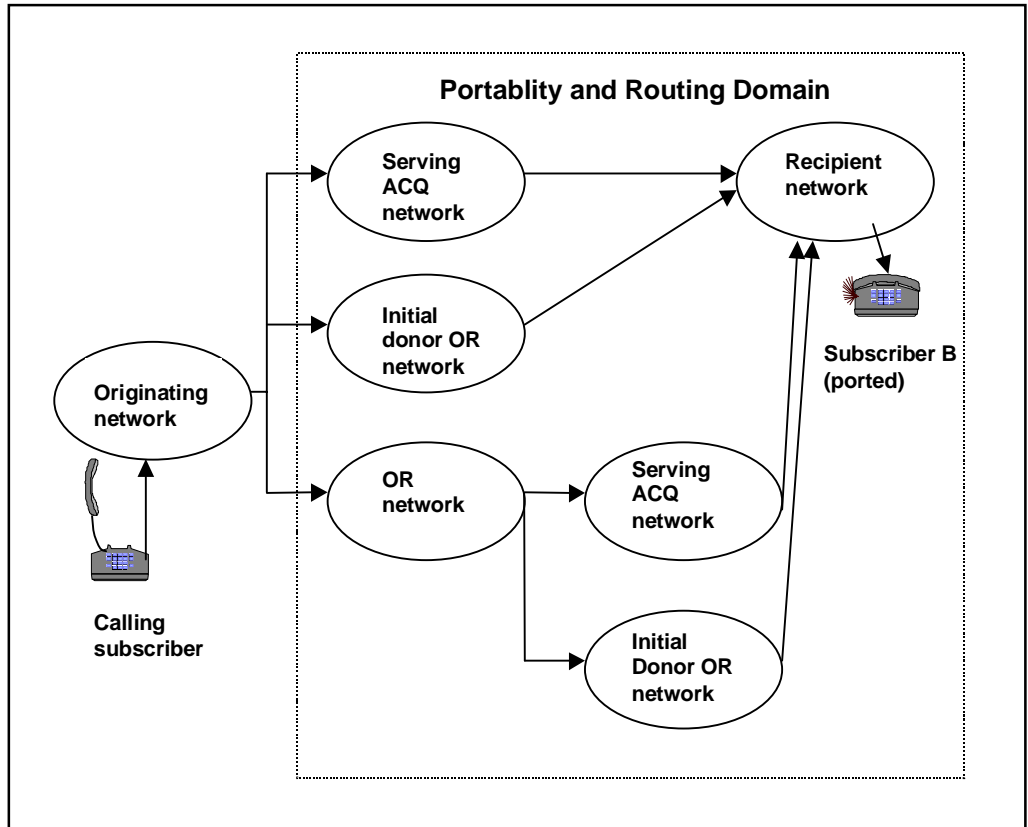


Figure A5

Charging and Accounting:

Charging is performed by the Network Operator of the calling subscriber. Accounting of the call is performed at each network interface according to agreed accounting procedures.

A.2.6 Calling Subscriber using Carrier Selection

Subscriber B is ported from one network to another within the Portability Domain. Subscriber A in an Originating access Network Operator, not the Carrier Network, calls subscriber B using carrier selection. See Figure A6.

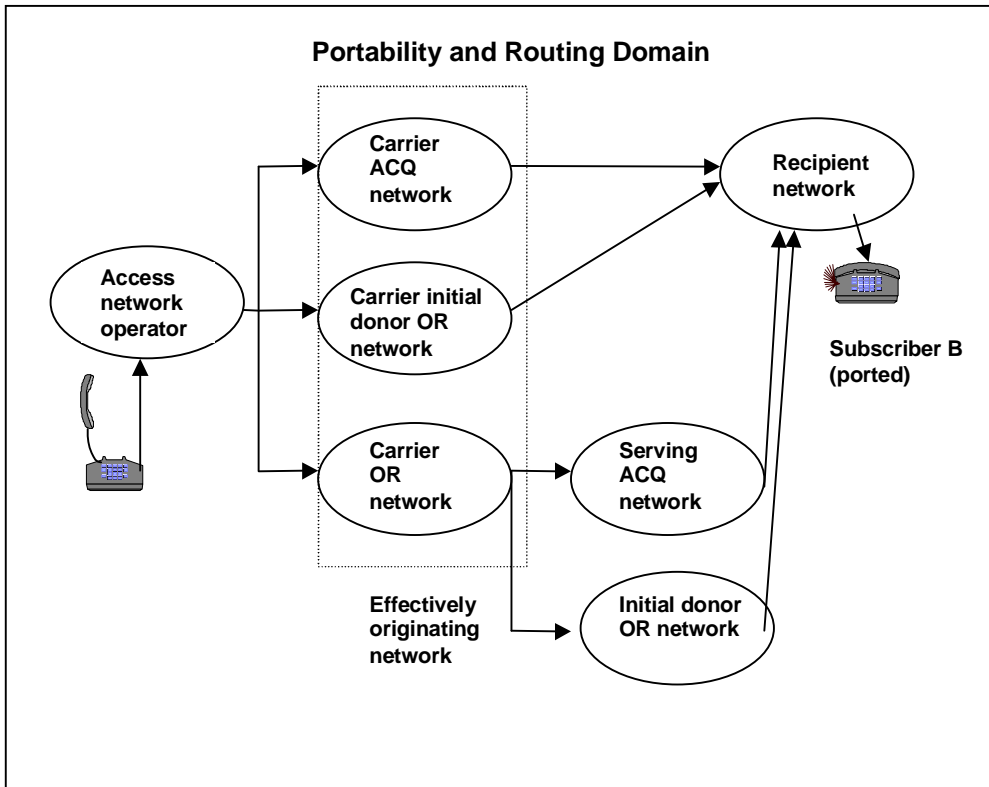


Figure A6

Routing:

The originating network routes the call towards the Carrier Network. The call is presented at the Point of Interconnection as an ordinary call but with carrier selection information. Subscriber B is ported and either of the following procedures applies, depending on which number portability method is implemented.

1. If the Carrier Network supports All Call Query, applicable procedures are those according to Section A.2.1.
2. If the Carrier Network supports Onward Routing, applicable procedures are those according to Section A.2.2, A.2.3 or A.2.4.

Charging and accounting:

Charging is performed in the Carrier Network. Accounting of the call is performed at each network interface according to agreed procedures.

A.3 Abnormal Call Cases**A.3.1 Abnormal Case 1**

The originating All Call Query or Initial Donor Onward Routing network routes a call to the Terminating Network **with** indications of a call to a ported number. The Called Directory Number is ported from the Terminating Network or unallocated. The information in the Operational Database of the Originating Network is in conflict with the information in the Operational Database of the Terminating Network. See Figure A7.

Routing:

As the Directory Number is indicated as ported, the call is routed according to the routing information fetched from the Operational Database of the Originating Network.

In the Terminating Network a check of the received Directory Number is performed. The result of the check is that the number does not belong to the network or that it is un-allocated. Therefore the network releases the call and returns a Release Message with the Cause Value #112, **Ported Number not found**.

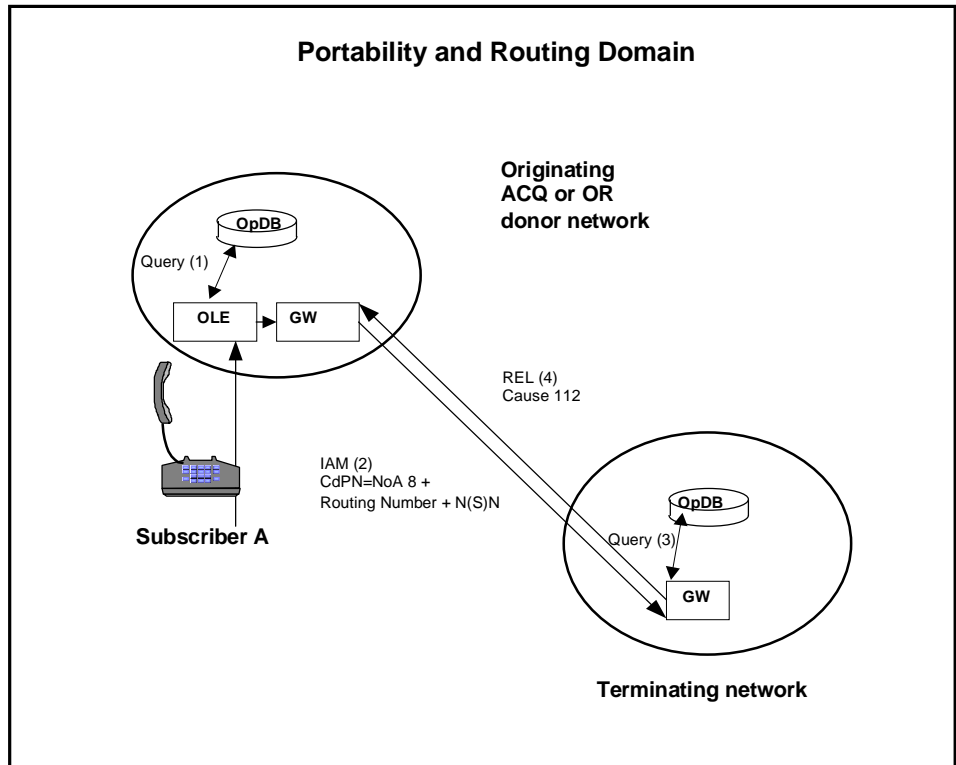


Figure A7

A.3.2 Abnormal Case 2

The originating All Call Query network routes a call to the terminating network **without** indications of call to a ported number. The Called Directory Number is ported from the Terminating Network, but the information is not present in the Operational Database of the Originating Network. No database queries are expected in the terminating local exchange. See Figure A8.

Routing:

Since the Directory Number is not marked as ported in the originating network, ordinary routing from the Originating to the Terminating Network is performed. The Terminating Network does not recognize the number and as the network has the possibility of checking whether the number is ported, a check of the received Directory Number is performed. As the check verifies that the number has been ported to another network, the Terminating network releases the call and returns a Release message with the Cause Value #112, **Ported Number not found**.

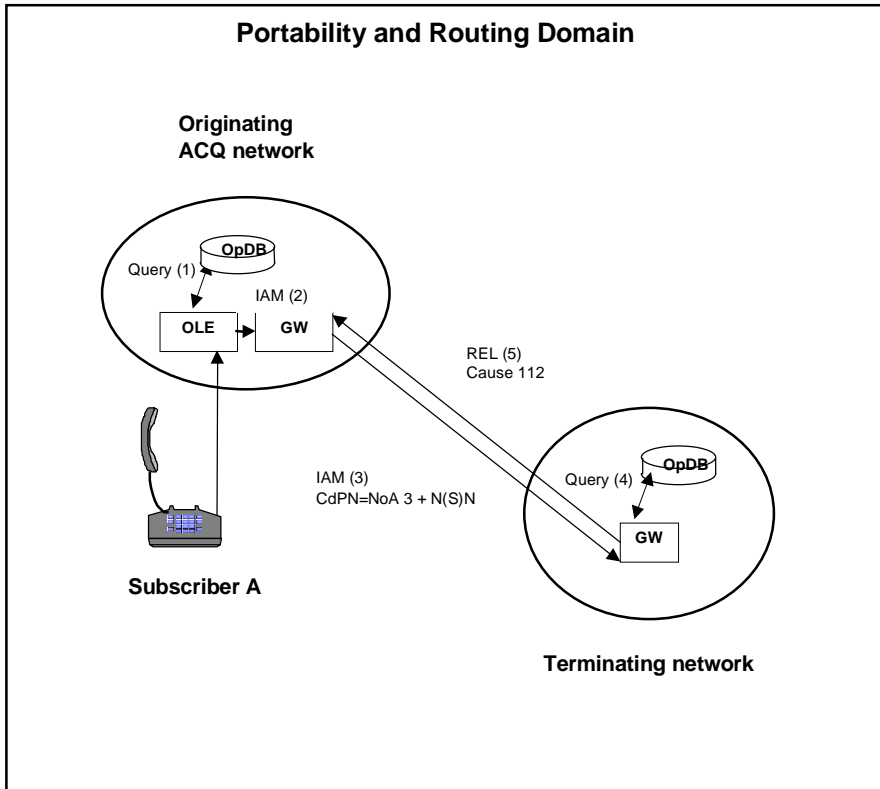


Figure A8

Annex B – Considerations (Informative)

B.1 General

This standard has been produced by a special team under working group AG15, Telecommunications Network Interoperability, which is one of the working groups of ITS, Information Technology Standardization.

Members of the special team:

HiQ Data	Nils Weidstam, Chairman and editor
Ericsson	Björn Olsson
Europolitan	Monica Hellman
Global One	Thomas Persson
Nokia	Peter Persson
Facicom International	Jan Perdén
Sonera Sverige	Esko Airas
SOS Alarm	Lennart Sundberg
Tele2	Leif Sunnegårdh
Telenordia	Lars Byström
Telia	Magnus Johansson
Telia Prosoft	Torbjörn Klasa
Telia Mobile	Anita Olsson
Telitel	Björn Arkad
WorldCom	Tomas Hellberg

Minutes of meetings and other working material may be obtained from ITS.

B.2 Considerations

The main objectives of the team have been to:

1. Follow the work plan ITS 21/15-NP
2. Reach an agreement without the intervention of authorities.
3. Meet the time limits set by authorities and EU directives.
4. Present a solution in Sweden meeting the following requirements:
 - One long-term solution
 - Alternative solution to the long term solution to avoid barriers of entry and to meet the time limits set by the Government and authorities, ref. [9].
 - Focus on Interconnect
 - Solutions supporting Network Integrity
 - Co-existing and phased solutions
 - Adaptation to International Recommendations and European Standards.

With this in mind, the following considerations have been made.

B.3 Portability methods

The following methods have been discussed or mentioned⁹⁾:

1. Call Forwarding
2. Onward Routing¹⁰⁾
3. Call Dropback
4. Query on Release
5. All Call Query
6. Look Ahead
7. Transfer of number blocks

As regards a long-term solution in Sweden, Call Forwarding and Onward Routing have been excluded since they cause inefficient routing in the network and are generally not looked upon as long-term solutions. Look Ahead has been excluded since the method is not technically possible to implement within the required implementation dates for number portability in Sweden. Transfer of Number Blocks, ref. [15], already exists and is no solution for porting of individual Directory Numbers. Though Query on Release might be a good solution with relatively low numbers of ported Directory Numbers, it has been excluded as a long-term solution since it imposes new backward signals in the ISUP. The same argument applies to Call Dropback. All Call Query has thus been chosen as the long-term solution in Sweden.

The requirements imposed on an alternative solution are as follows.

- It must be a method that can be introduced quicker than the long-term solution if the latter cannot meet the required implementation dates.
- The method must be compatible with the network interface supported by the long-term solution
- The method must make it possible for public telecommunications operators to be part of the Portability and Routing Domains with reasonable technical and financial efforts, i.e. it must be possible to implement without major investments in new technology.

The only method meeting these requirements is Onward Routing.

The choice of portability methods between public telecommunications operators in Sweden does not exclude the use of other methods internally in an operator's network as long as the network interface and procedures are not affected and network integrity is respected between public telecommunications operators.

B.4 Network interface

The number portability team early agreed that the chosen methods should all support the same 'generic' signalling interface. The discussion lead to the conclusion that the signalling interface should not require new backward signals. Thus the methods Call Forwarding, Onward Routing and All Call Query were favoured.

As regards the Indication, it could not be guaranteed that all public telecommunications operators can use the Nature of Address indicator in the Called Party Number parameter. For this reason, a ported prefix has been added in the Address Signals field in the Called Party Number parameter. The ported indicator used is a spare area code, 394, which can be used if the NoA identifier is not supported by the network. With this compromise, two methods are supported over the network interface used in Sweden.

9) For definitions, see reference [1].

10) Call Forwarding is one type of Onward Routing.

Two-step routing is applied for calls to ported numbers. This means that the Routing Number used points to the Recipient Network. Thus the Recipient Network must implement internal methods of routing the call to the correct Terminating Exchange.

The format of the Address Signals of the routing information to a ported number is for the preferred method according to Concatenated Address, Case 1 and for the alternative method, according to Concatenated Address, Case 2, ETSI TR 101 122, ref. [2].

B.5 Portability and Routing Domains

When the work in the team started, it was not clear what type of public telecommunications networks should be included in the Routing Domain. In the interpretation of the team, all public telecommunications operators offering fixed public telecommunications services in Sweden must be members of the Portability Domain. It was also agreed by the team that the extent of the Routing Domain for fixed public telecommunications services was outside the scope of this standard. If Service Provider Portability will initially be introduced in some area code areas, the obligation to route calls correctly anyhow applies to all public telecommunications operators in the Routing Domain providing fixed public telephone services in Sweden.

Public telecommunications operators in the Routing Domain using the All Call Query method must arrange for access to the Reference Database in order to support correct routing of calls. This access to the Reference Database¹¹⁾ could either be solved in the operator's own network or by another network operator according to bilateral agreements.

B.6 Administrative interface

The standard does not concern the Reference Database, the Administrative Interface, nor the Administrative Database. For that reason only information necessary for porting a Directory Number is listed.

The methods and protocols for sending information between public telecommunications operators' Administrative Databases and to the Reference Database and how to organise the Reference Database are described in other documents, ref. [8]

B.7 Interworking between Public Telecommunications networks

The team set out from the requirement of establishing a standardised network interface for Service Provider Portability. Since two number portability methods are allowed, the impact of the chosen method in a preceding network on the procedures in a succeeding network had to be clarified.

In principle, calls from All Call Query networks need not be checked with respect to portability, whereas calls from Onward Routing networks or networks using no method at all must be checked with respect to portability. This principle also applies to networks belonging to the Routing Domain but which are not part of the Portability Domain. I.e. if All Call Query is implemented in such a network, the succeeding network need not perform any portability check, but if no portability check is done, the succeeding network must perform a portability check.

This leads to the conclusion that there must be an obligation to check all directly interconnected networks as regards the number portability method implemented. This may constitute a new section in Interconnect Agreements.

11) The Reference Database could be centralised or distributed.