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Digital cellular telecommunications system (Phase 2+) (GSM); Support of Mobile Number Portability (MNP); Technical Realisation; Stage 2 (GSM 03.66 version 7.3.1 Release 1998)

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Special Mobile Group (SMG).

The present document specifies alternatives for the realisation of Mobile Number Portability within the digital cellular telecommunications system.

The contents of the present document are subject to continuing work within SMG and may change following formal SMG approval. Should SMG modify the contents of the present document it will then be republished by ETSI with an identifying change of release date and an increase in version number as follows:

Version 7.x.y

where:

7 Indicates GSM Phase 2+ Release 1998;

x the second digit is incremented for technical enhancements, corrections, updates, etc

y the third digit is incremented when editorial only changes have been incorporated in the specification.

National transposition dates	
Date of adoption of the present document:	22 September 2000
Date of latest announcement of the present document (doa):	31 December 2000
Date of latest publication of new National Standard or endorsement of the present document (dop/e):	30 June 2001
Date of withdrawal of any conflicting National Standard (dow):	30 June 2001

1   Scope

The present document describes several alternatives for the realisation of Mobile Number Portability.

The present document includes information applicable to network operators, service providers, switch and database manufacturers and national regulators.

It is left to operator and implementation decisions which option, or combination of options, is used, taking into account the regulatory and architectural constraints that may prevail. The possible implications of these options on internal node functions and on signalling performance are not covered in the present document.

Normative Annex A of the present document describes the technical realisation of the handling of calls to ported GSM mobile subscribers using IN technology.

Normative Annex C of the present document describes the technical realisation of the handling of calls to ported GSM mobile subscribers using Signalling Relay technology.

Normative Annex A and Normative Annex C describe alternative solutions. The network operator may choose the solution to be used in his network.

Normative Annex B of the present document describes the technical realisation of the handling of non-call related SCCP signalling for ported GSM mobile subscribers using Signalling Relay technology.

The present document does not specify the porting process.

2   References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies.

- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

- For this Release 1998 document, references to GSM documents are for Release 1998 versions (version 7.x.y).

[1]   GSM 01.04 (ETR 350): "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".

[2]   ETS 300 009 (December 1991): "Integrated Services Digital Network (ISDN); CCITT Signalling System No. 7 - Signalling Connection Control Part (SCCP) [connectionless services] to support international interconnection".

[3]   GSM 02.66: "Digital cellular telecommunications system (Phase 2+); Support of Mobile Number Portability (MNP); Service description. Stage 1".

[4]   GSM 03.18: "Digital cellular telecommunications system (Phase 2+); Basic call handling ; Technical realisation".

[5]   GSM 09.02 (ETS 300 974): "Digital cellular telecommunications system (Phase 2+); Mobile Application Part (MAP) specification".

[6]   ETS 300 374-1: "Intelligent Network (IN); Intelligent Network Capability Set 1 (CS1); Core Intelligent Network Application Protocol (INAP); Part 1: protocol specification".

[7]   EN 302 097 V1.1.2 (1999): "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP); Enhancements for support of Number Portability (NP)".

[8]   EN 300 356-2 (V4.0.0): "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 4 for the international interface; Part 2: ISDN supplemantary services [ITU-T Recommendation Q.730 modified]".

3   Definitions and abbreviations

3.1   Definitions

For the purposes of the present document, the following terms and definitions apply:

donor network: the subscription network from which a number is ported in the porting process. This may or may not be the number range holder network

interrogating network entity: the entity that submits a non-call related signalling message to interrogate the HLR

interrogating network: the network in which the interrogating network entity resides

mobile number portability: the ability for a mobile subscriber to change GSM subscription network within the same country whilst retaining their original MSISDN(s)

network operator: a GSM PLMN operator

non-call related signalling message: all signalling messages where the MSISDN is used to route the message on SCCP level except MAP SRI without OR parameter set (i.e. SRI_SMS, SRI for SOR, Send_IMSI, CCBS_Request etc)

number portability database: an Operational database (used in real time at call set-up) which provides portability information

number portability location register: an internal MAP application terminating function (MATF) in the MNP-SRF network entity with an (unspecified) interface with a NPDB

number range holder network: the network to which the number range containing the ported number has been allocated

originating network: the network where the calling party is located

portability domain: a set of GSM PLMNs in a country between which MSISDNs may be ported

portable number: an E.164 number that can be ported between networks in one nation

ported number: a portable number that has undergone the porting process

ported subscriber: the subscriber of a ported number

porting process: a description of the transfer of a number between network operators

recipient network: the network which receives the number in the porting process. This network becomes the subscription network when the porting process is complete

routeing number: the routeing number is the data stored against the ported number in the Number Portability Database

service key: the Service Key can identify to the entity holding the Number Portability Database that the service logic for Mobile Number Portability should apply. The Service Key value for Mobile Number Portability is administered in the MSC, and is passed transparently to the entity holding the Number Portability Database

service provider: an entity which offers service subscriptions to individual subscribers and contracts with a network operator to implement services for a specific MSISDN. A service provider may contract with more than one network operator

service provider portability: the transfer of numbers between two unique Service Providers

subscription network: the network with which the customer's Service Provider has a contract to implement the customer's services for a specific MSISDN

NOTE: The term "recipient network" is used during the porting process. The recipient network becomes the "subscription network" after completion of the porting process.

3.2 Abbreviations

Abbreviations used in the present document are listed in GSM 01.04 ([1]).

For the purposes of the present document, the following abbreviations apply:

GMSC	Gateway MSC
GMSCB	The GMSC in HPLMNB
HLR	Home Location Register
HPLMNB	The subscription network of the B subscriber
IDP	Initial Detection Point
IE	Information Element
IF	Information Flow
INE	Interrogating Network Entity
IPLMN	Interrogating PLMN
MATF	MAP application Terminating Function
MNP	Mobile Number Portability
MNP-SRF	Signalling Relay Function for support of MNP
MSA	Mobile Station of the A subscriber
MSB	Mobile Station of the B subscriber
MSC	Mobile service Switching Centre
NPDB	Number Portability Database
NPLMN	The number range holder network of the B subscriber
NPLR	Number Portability Location Register
OQoD	Originating call Query on Digit Analysis
PLMN	Public Land Mobile Network
QoHR	Query on HLR Release
RN	Routing Number
SMS	Short Message Service
SOR	Support of Optimal Routeing
SRI	Send Routeing Information
TQoD	Terminating call Query on Digit Analysis
TT	Translation Type
VMSC	The Visited MSC
VMSCB	The VMSC of the B subscriber

Further GSM related abbreviations are given in GSM 01.04.

4   General

4.1   Overview

Mobile Number Portability (MNP) is the ability for a mobile subscriber to change the GSM subscription network within a portability domain whilst retaining her original MSISDN or MSISDNs.

As part of the porting process administrative actions have to be performed by the GSM network operators of the number range holder network, donor network, recipient network and, as an option, by operators of other national GSM networks as follows:

  a) if the number range holder network is identical with the donor network:

Recipient network:	add an entry in the HLR; add an entry in the Number Portability Database.
Donor network:	add an entry in the Number Portability Database; delete the entry related to the ported MSISDNs in the HLR.

Other networks in the portability
    domain:
	add an entry in the Number Portability Database (if direct
	    routeing is used).

  b) if the number range owner network is identical with the recipient network:

Recipient network:	add an entry in the HLR;
	    delete any entry related to the ported MSISDN in the
	    Number Portability Database.

Donor network:	delete any entry related to the ported MSISDN in the Number
	    Portability Database;
	    delete the entry related to the ported MSISDNs in the HLR.

Other networks in the portability
    domain:
	delete any entry related to the ported MSISDN in the Number
	    Portability Database.

  c) if the number range holder network is different from both the recipient and the donor network:

Recipient network:	add an entry in the HLR; add an entry in the Number Portability Database.
Number range holder network:	update the Number Portability Database
Donor network:	delete (or update) the entry in the Number Portability Database; delete the entry related to the ported MSISDNs in the HLR.

Other networks in the portability
    domain:
	update the Number Portability Database (if an entry for the
	    ported MSISDN exists).

Note that the order of sequence for the administrative actions to be performed both within a network and by different network operators is significant with respect to prevention of disruption in service to the mobile subscriber and prevention of looping calls between networks during the porting process.

Termination of a subscription for a ported number results in the deletion of any entry in an HLR and NPDB of that number.

If a call fails because databases are not correctly synchronised, the network entity which detects the inconsistency will raise an MNP specific alarm to the operation and maintenance subsystem.

The present document does not specify the porting process; it specifies the functionality needed to set-up calls to both ported and non ported subscribers (normative annex A and normative annex C) and the functionality needed to relay non-call related signalling messages to the HLR in the subscription network (normative annex B).

4.2 Compatibility

The IAM sent to the subscription network may contain additional routeing information. Within a portability domain the method how to convey the Routeing Number in the IAM between 2 PLMNs shall be agreed upon by the 2 network operators involved (see also [7]).

In general, IN-based and MNP-SRF (call-related) solutions are compatible and may coexist in the same portability domain. The only restriction refers to the case where the number range holder network relays call-related MAP messages (i.e. SRI for national calls) to the subscription network. If this solution is selected by at least one network operator within a portability domain, all the PLMNs and transit networks affected must fulfil the following requirements:

1. The SCCP interfaces between networks in a portability domain must be agreed. This refers to the SCCP addressing mechanism being used (e.g. number lengths, natures of address and translation types for call-related MAP messages).
   For messages which do not cross network boundaries the SCCP addressing mechanism is a choice of the network operator.

2. The subscription network must be able to generate the SRI ack to allow the onward routeing of the call from the number range holder network to the subscription network.

In the rest of the possible architectures for MNP, no interworking problems have been identified. In these cases, network architectures used within one PLMN (e.g. IN, MNP-SRF) are regarded as operator dependent.

In order to avoid loops and incompatibility situations, all the networks within a portability domain shall use the same routeing convention either direct routeing, indirect routeing or indirect routeing with reference to the Subscription network. As an alternative, indirect routeing can interwork successfully with direct routeing if the routeing number is transferred in the IAM or if dedicated traffic connections are used.

4.3 Common Functionality of the MNP-SRF

In a PLMN which supports mobile number portability, SCCP messages sent to an HLR may be relayed by an MNP-SRF. Depending on the implemented solution (IN-based or MNP-SRF-based), on the type of message (call-related or non-call-related) and on the porting status of the called subscriber the MNP-SRF may modify the SCCP called party address and route the message to a different HLR or to the subscription network, or terminate the dialogue and response to the INE.

Figure 1 shows the general steering functionality for SCCP message routeing. It shows the SCCP routeing principle for mobile number portability within a network.

Note that call related messages in the IN-based solution are not routed to the MNP-SRF. Therefore Normative Annex A of the present document does not mention the MNP-SRF.

However, the usage of the IN-based solution for the call-related messages should allow operators to have the routeing of the non call-related messages determined in the same database.

In order to guard against the possibility that the porting data for an MSISDN is inconsistent between PLMNs in a porting domain, the SCCP hop counter may be used to prevent indefinite looping of messages between PLMNs. The MNP-SRF would then decrement the SCCP hop counter for every message that is relayed. It should be noted that the use of the SCCP hop counter requires the use of unsegmented SCCP XUDT messages as defined in ITU-T 1996 SCCP recommendations.
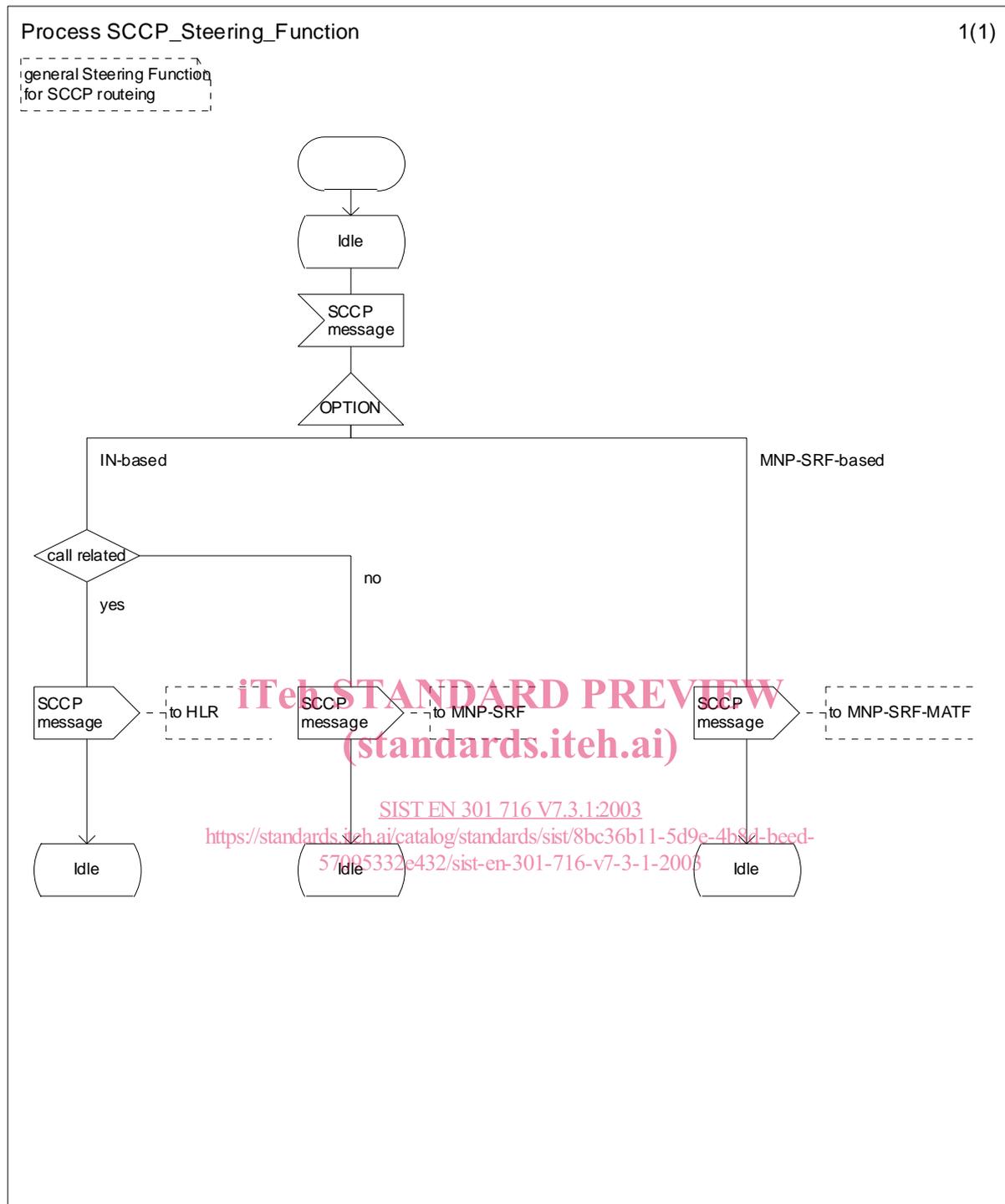
Figure 1: Steering Function for SCCP Message routeing

Figure 2 shows the process MNP_SRF in the MNP-SRF. The procedures MNP_SRF_MATF_Call_Related and MNP_SRF_Non_Call_Related are described in Normative Annex C and Normative Annex B of the present document. Note that in networks which support the IN-based solution for call related signalling, a distinction on SCCP level for call related and non-call related messages is needed and that the MNP-SRF does not require to include a MATF since call related messages are not routed to the MNP-SRF.

The test "call-related" is a test on the SCCP Translation Type if a dedicated Translation Type value for call related messages is used in the network. The handling of SCCP messages in the MNP-SRF in networks which do not make use of a dedicated Translation Type value for call related messages is for further study.

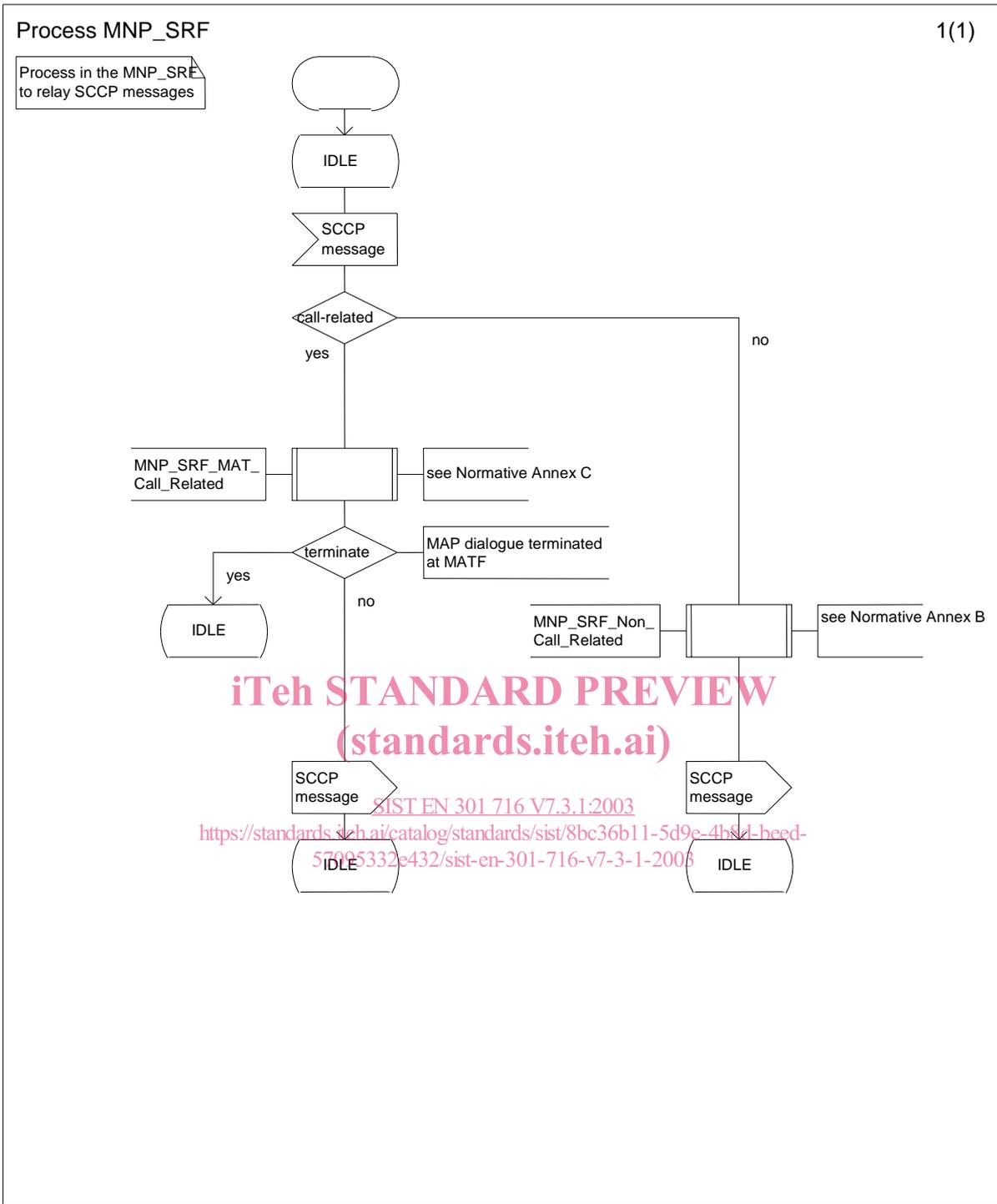Process MNP_SRF   1(1)

Process in the MNP_SRF
to relay SCCP messages

IDLE

SCCP
message

call-related

yes   no

MNP_SRF_MAT_   see Normative Annex C
Call_Related

terminate   MAP dialogue terminated
at MATF

yes

no   MNP_SRF_Non_   see Normative Annex B
Call_Related

IDLE

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SCCP
message   SCCP
message
SIST EN 301 716 V7.3.1:2003
https://standards.iteh.ai/catalog/standards/sist/8bc36b11-5d9e-4b54-beed-
57095332e432/sist-en-301-716-v7-3-1-2003
IDLE   IDLE

Figure 2: Process MNP_SRF

5   Common Architecture for call setup

Figure 3 shows the general architecture of a portability domain for routeing of calls. The more detailed architecture within the networks depends on the chosen solution (IN-based or MNP/SRF-based) and options and is described in Normative Annex A and Normative Annex C of the present document.

The architecture for non-call related signalling is described in Normative Annex B of the present document.
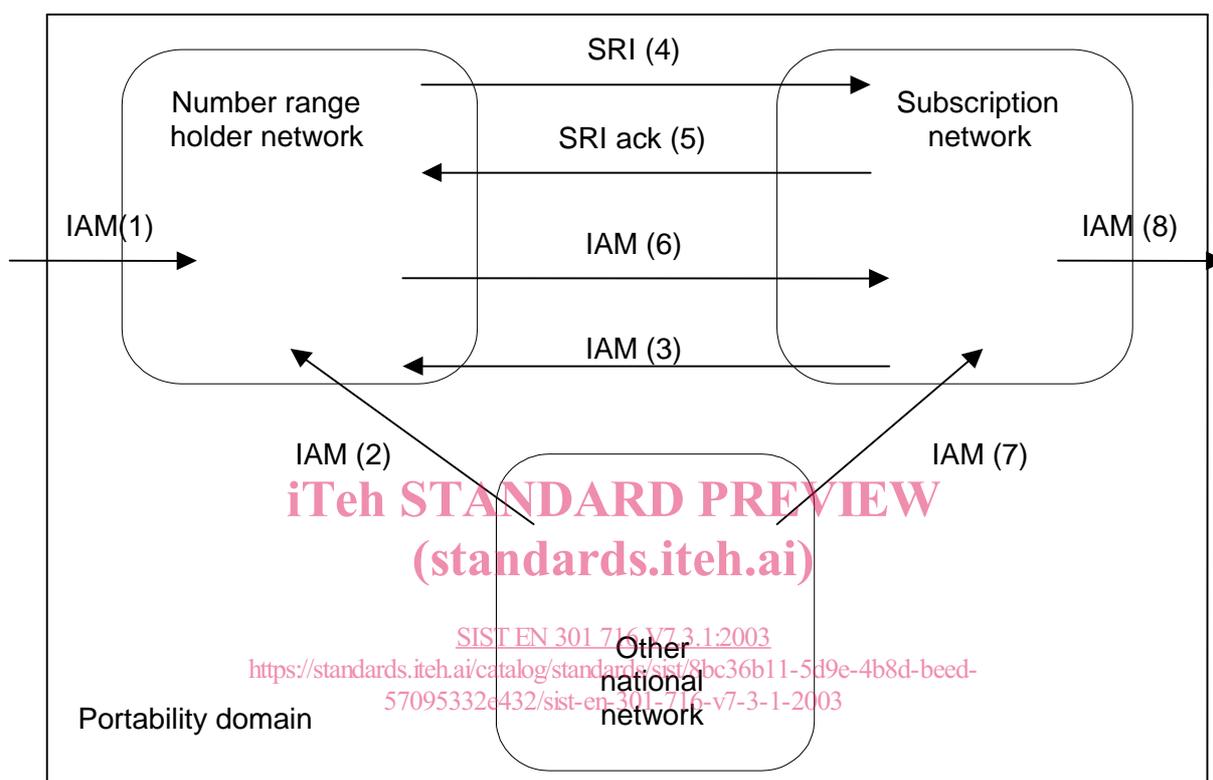

Figure 3: General architecture of a portability domain for routeing of calls

The following routeing conventions are identified:

1. Direct Routeing of calls is a PLMN option which allows to route calls directly from the PLMN supporting this option to the ported subscriber's subscription network.

2. Indirect Routeing of calls is a PLMN option which allows to route calls from the PLMN supporting this option via the number range holder network to the ported subscriber's subscription network.

3. Indirect Routeing of calls with reference to the subscription network is a PLMN option for PLMN operators having chosen the MNP-SRF solution for call related signalling described in Normative Annex C. If all PLMNs within a portability domain support this option, calls are routed from the originating network to the number range holder network. The number range holder network obtains onward routeing information from the subscription network and routes the call onward to the ported subscriber's subscription network.

The following actions in the different networks can be identified:

1.   If the call is originated outside the portability domain, the IAM(1) is received by the number range holder network.

2a. If the call is originated in another national network and the other national network does not support originating call query (i.e. Indirect Routeing of calls is applicable), the IAM(2) is received by the number range holder network.