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Contents

Foreword

This Technical Specification (TS) has been produced by the 3rd Generation Partnership Project (3GPP).

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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 UMTS or GSM mobile subscribers using IN technology.

Normative Annex C of the present document describes the technical realisation of the handling of calls to ported UMTS or 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 UMTS or 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. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TS 21.905: "3G Vocabulary".

[2] 3GPP TS 22.066: "Support of Mobile Number Portability (MNP); Service description. Stage 1".

[3] 3GPP TS 23.018: "Basic call handling; Technical realisation".

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

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

[6] ITU-T Recommendation Q.769.1; ISDN User Part (ISUP); Enhancements for the support of Number Portability".

[7] ETSI EN 300 356-2 V4.1: "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP) version 4 for the international interface; Part 2: ISDN supplementary services [ITU-T Recommendation Q.730 modified]".

[8} CTIA report on Wireless Number Portability, Version 2.0.0.

[9] ANSI T1.660 – 1998, American National Standards for Telecommunications – Signaling System Number 7 – NumberPortability Call Completion to a Portable Number.

[10] ANSI T1.111-1996, American National Standards for Telecommunication – Signalling System No. 7 (SS7) Message Transfer Part (MTP).

[11] ANSI T1.112-1996, American National Standards for Telecommunication – Signalling System No. 7 (SS7) Signalling Connection Control Part (SCCP).

Note: Translation Types 10 and 14 will be published in the next revision of ANSI T1.112.

[12] American National Standard for Telecommunications – Signalling System Number 7 (SS7) - ISDN User Part (ISUP) - ANSI T1.113-1995.

[13] American National Standard for Telecommunications - Signalling System Number 7 (SS7) – Transaction Capabilities Application Part (TCAP) - ANSI T1.114-1996.

[14] ETSI EN 302 097 V1.2: "Integrated Services Digital Network (ISDN); Signalling System No.7; ISDN User Part (ISUP); Enhancements for support of Number Portability (NP)".

[15] TI - Technical Requirements No. 3, April 1999, Number Portability Database and Global Title Translation.

[16] 3GPP TS 23.096: "Mobile Name Identification Supplementary Service – Stage 2".

[17] North American Numbering Council (NANC) Functional Requirement Specification, Number Portability Administration Center- Service Management System (NPAC-SMS), Version 1.0, May 25, 1995; Version 2.0, June 2, 1997.

[18] 3GPP TS 23.078: "Customised Applications for Mobile network Enhanced Logic (CAMEL) Phase 4 – Stage 2".

3 Definitions and abbreviations

3.1 Definitions

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

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

interrogating network: network in which the interrogating network entity resides

mobile number portability: ability for a mobile subscriber to change mobile network subscription within the same country whilst retaining his/her original MSISDN(s). Additional regulatory constraints apply in North America.

mobile number portability information: an information set relevant to Mobile Number Portability for a mobile subscriber. It may contain one or more of Routeing Number, generic IMSI MSISDN,and Number Portability Status.

network operator: 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)

North American GSM Number portability: the ability for a subscriber to change subscription between North American GSM networks and other subscription networks within a regulated geographical area within North America.

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

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

number portability status: information indicating the status of number portability for a mobile subscriber. It may be one of: own number ported out, own number not ported out, foreign number ported in, foreign number ported to a foreign network, foreign number not known to be ported

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

originating network: network where the calling party is located

portability domain: set of GSM PLMNs in a country between which MSISDNs may be ported or a set of North American GSM Mobile networks and other subscription networks within a regulated geographical area within North America

portability network: a PLMN or ,in North America, a PSTN or an ISDN network

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

ported number: portable number that has undergone the porting process

ported subscriber: subscriber of a ported number

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

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

routeing number: routeing number is the data stored against the ported number or the non-ported number in the Number Portability Database. The routeing number points to Subscription Network or Recipient Network

service key: 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: entity that 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: transfer of numbers between two unique Service Providers

subscription network: 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 the completion of the porting process.

3.2 Abbreviations

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

CCBS	Call Completion on Busy Subscriber
CCF	Call Completion Function
CdPA	Called Party Address
CgPA	Calling Party Address
CNAP	Calling Name Presentation
CNDB	Calling Name Database
CRMNP	Call Related Mobile Number Portability
FCI	Forward Call Indicator
GAP	Generic Address Parameter
GMSC	Gateway MSC
GMSCB	The GMSC in HPLMNB
GTT	Global Title Translation
HLR	Home Location Register
HPLMNB	The subscription network of the B subscriber
IAM	Initial Address Message
IDP	Initial Detection Point
IE	Information Element

INE	Interrogating Network Entity
IF	Information Flow
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-services Switching Centre
MSISDN	Mobile Station International ISDN Number
MSRN	Mobile Station Roaming Number
NANP	North American Numbering Plan
NAGNP	North American GSM Number Portability
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	Routeing Number
SMS	Short Message Service
SOR	Support of Optimal Routeing
SRI	Send Routeing Information
STP	Signalling Transfer Point
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 3GPP TS 21.905: "3G Vocabulary".

4 General

4.1 Overview

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

North American GSM Number Portability (NAGNP) is the ability for a subscriber to change subscription between North American GSM networks and other subscription networks within a regulated geographical area within North America.

As part of the porting process administrative actions have to be performed by the network operators of the number range holder network, donor network, recipient network and, as an option, by operators of other national UMTS or 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 holder 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 that 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 including the functionality needed to query an NPDB for MNP information (in order to be able to charge correctly for CAMEL pre-paid calls and SMS) (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 two portability networks shall be agreed upon by the two network operators involved (for an ITU-T ISUP solution see [6] and for an ANSI ISUP solution see [8] and [9]).

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 portability networks 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 that 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 portability network (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 that 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, non-call-related or MNP information request) 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. See [7] for the description of the access of the MNP-SRF (node with relay capability) to the NPDB (external 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 non segmented SCCP XUDT messages as defined in ITU-T 1996 SCCP recommendations or in the ANSI T1.112-1996 SCCP recommendations for North America, reference [11].

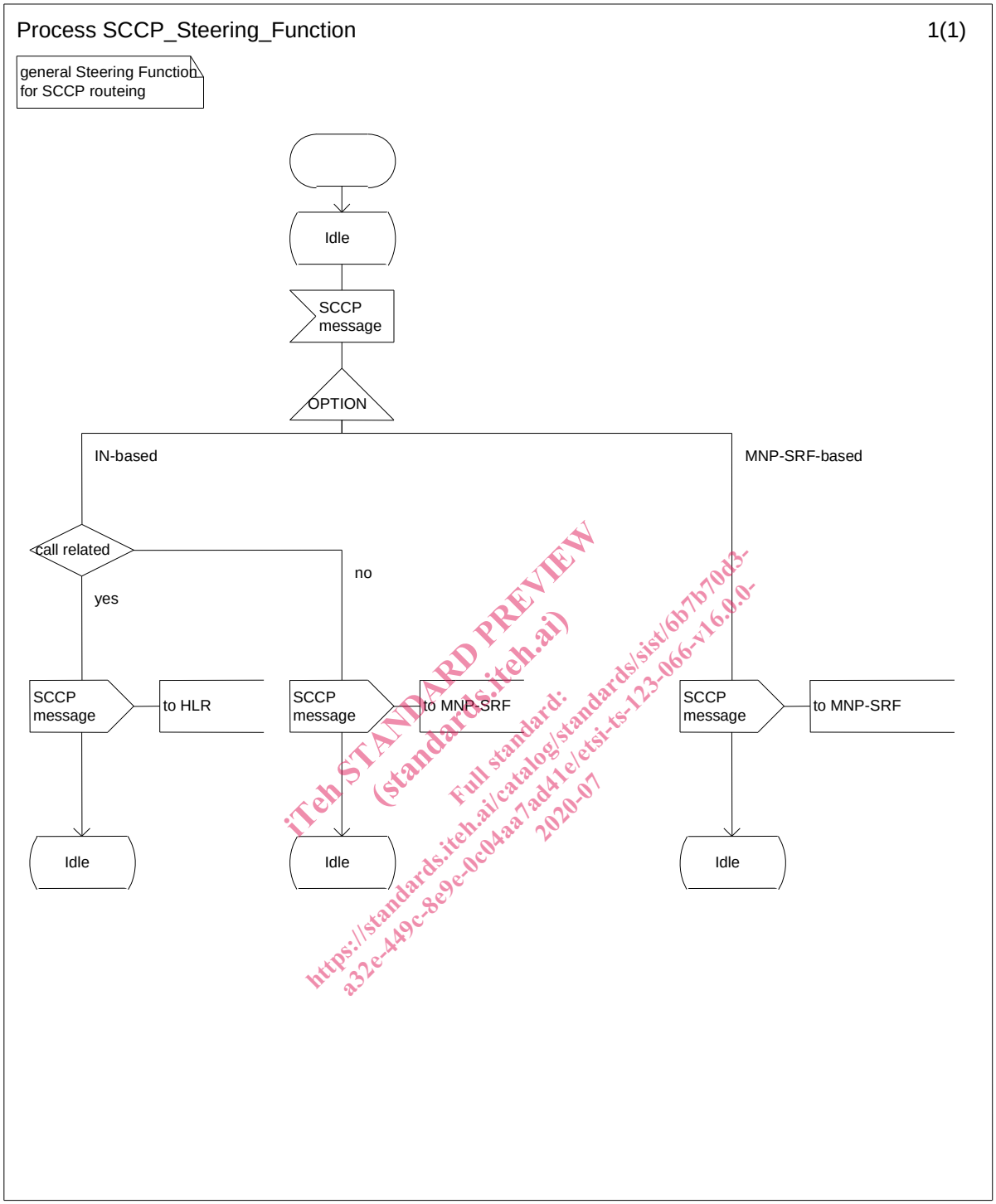

Figure 1: Steering Function for SCCP Message routeing

Figure 2 shows the process MNP_SRF in the MNP-SRF. The procedures MNP_SRF_MATF_Call_Related, MNP_SRF_Non_Call_Related and MNP_SRF_MATF_Info_Request 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 MATF's since call related messages and MNP information request messages are not terminated at the MNP-SRF.

The test "MNP info-request" is a test on the SCCP Translation Type if a dedicated Translation Type value for MNP information request 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 MNP information request messages is for further study.