3GPP TSG CN Plenary Meeting #22 **NP-030509**
10th – 12th December 2003 Maui, USA.

Source: TSG CN WG4

Title: Corrections on Mobile Number Portability

Agenda item: 8.8

Document for: APPROVAL

Spec	CR	Rev	Doc-2nd-Level	Phase	Subject	Cat	Ver_C
23.066	027		N4-031092	Rel-5	Incorrect implementation of CR 023r1	F	5.2.0
23.066	028	1	N4-031340	Rel-5	MNP correction for prepaid charging	F	5.2.0
29.002	675	2	N4-031341	Rel-5	MNP correction for prepaid charging	F	5.7.0
29.002	676	2	N4-031342	Rel-6	MNP correction for prepaid charging	A	6.3.0

3GPP TSG CN WG4 Meeting #21 **N4-031092**
Bangkok, THAILAND, 27th – 31st October 2003

CR-Form-v7

CHANGE REQUEST

⌘ **23.066** **CR** **027** ⌘ **rev** **-** ⌘ Current version: **5.2.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Incorrect implementation of CR 023r1
Source:	⌘	CN4
Work item code:	⌘	MNP
Date:	⌘	09/10/2003
Category:	⌘	**F**
Release:	⌘	Rel-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)

Reason for change:	⌘	CR 023r1 approved at CN#20 has not been correctly implemented
Summary of change:	⌘	move the new chapter A.1.4.3 after chapter A.1.4.2
Consequences if not approved:	⌘	Confusion

Clauses affected:	⌘	A.1.1, A.1.4.3

Other specs affected: ⌘	Y	N		⌘
		X	Other core specifications	
		X	Test specifications	
		X	O&M Specifications	

Other comments: ⌘

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

Annex A (normative): IN Call-Related Technical Realisation

A.1 Architecture

A.1.1 Network Options

There are two IN-based solutions for querying the NPDB :-

i. ETSI Core INAP

ii. ANSI IN Query.

The following network operator options are defined for the MT calls in the GMSC:

- Terminating call Query on Digit Analysis (TQoD);
- Query on HLR Release (QoHR).

In a GSM network that supports the IN-based approach for call related MNP, each GMSC shall support at least one of these options.

The following network operator option is defined for MO calls in VMSCA and for forwarded calls in the GMSC and VMSCB:

- Originating call Query on Digit Analysis (OQoD).

In a GSM network which supports the IN-based approach for call related MNP, it is a network operator decision, taking into account the regulatory and architectural constraints that may prevail, whether or not VMSCs and GMSCs support this option.

The use of OQoD in transit switches in a PLMN while avoiding multiple database interrogations is for further study.

The interworking between the CCF and the SSF for MNP is for further study.

Note that for different number ranges different options may be chosen.

An IN-based solution for querying the NPDB may also be used by the gsmSCF in order to be able to apply different charging tariffs for CAMEL pre-paid subscribers' calls or short messages established/sent when roaming in their home PLMN and directed to ported and non-ported mobile subscribers, depending on whether or not the called and the calling subscriber subscribe to the same PLMN.

~~……~~

~~A.1.4.3 IN-Query for CAMEL pre-paid service~~

~~Figure A.1.4.3 shows the architecture for a call or MO Short Message originated by a CAMEL pre-paid subscriber while roaming in the Home PLMN where the gsmSCF needs to know whether or not calling and called subscriber subscribe to the same PLMN in order to apply the correct charging tariff.~~

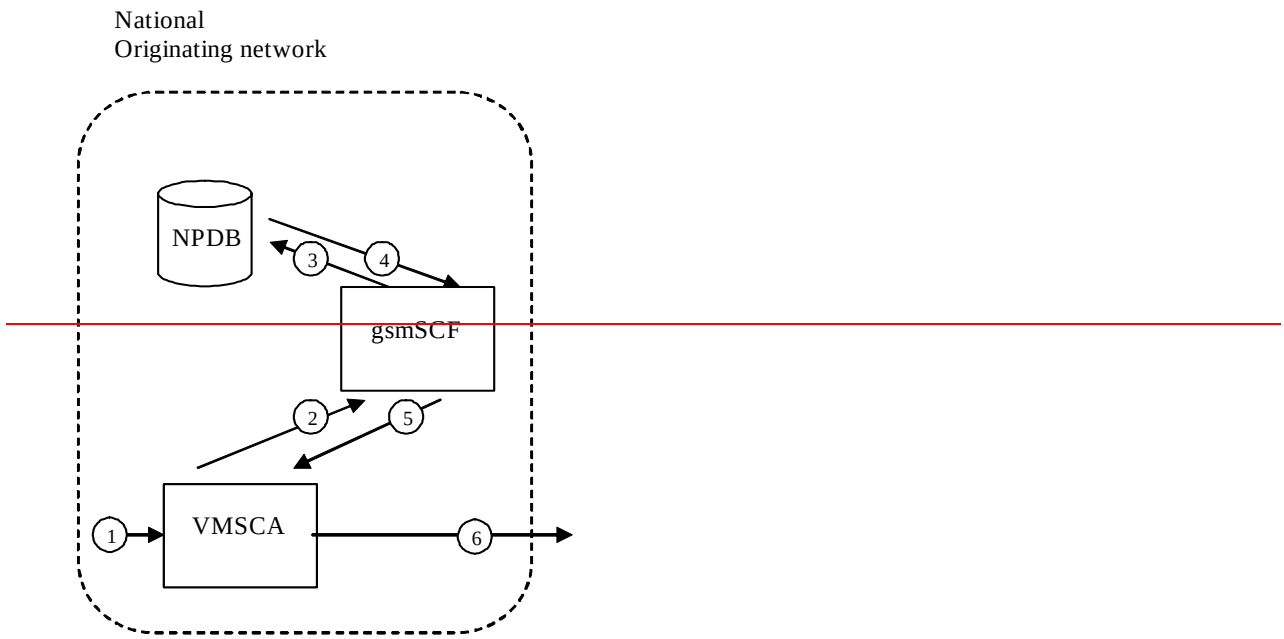

Figure A.1.4.3: IN-Query for pre-paid service

1 A call or short message is initiated by Mobile Subscriber A towards Mobile Subscriber B, using the MSISDN of the called subscriber.

2 When VMSCA receives the call setup indication, it will send a CAP IDP message to the gsmSCF. The IDP contains the called party's MSISDN.

3 If the calling subscriber roams in her Home PLMN and the called subscriber's MSISDN indicates that the called subscriber subscribes to a PLMN within the calling subscriber's Home Country, the gsmSCF queries the NPDB based on the called party's MSISDN.
Otherwise the tariff to be applied does not depend on the called subscriber's porting status and enough information to apply the correct tariff is available; go to 5.

4 The NPDB returns a routing number to the gsmSCF pointing out the called subscriber's subscription network. Based on this information the gsmSCF applies the appropriate tariff for pre-paid subscriber A.

5 The gsmSCF returns CAP AC and CAP CUE messages to the VMSCA.

6 The call or short message is set up.

Note that the NPDB and gsmSCF may be integrated within one physical entity.

A.1.2 No NP Query required – Number is not subject for portability

Figure A.1.2 shows the architecture for a call to a number that is not subject for portability. This can be for several reasons like for example:

- the national regulator has stipulated some number series as being non-portable or;
- in an initial phase only a limited amount of subscribers might port in certain number blocks and some operators might want to treat the call routeing according to traditional routeing plans without any change.

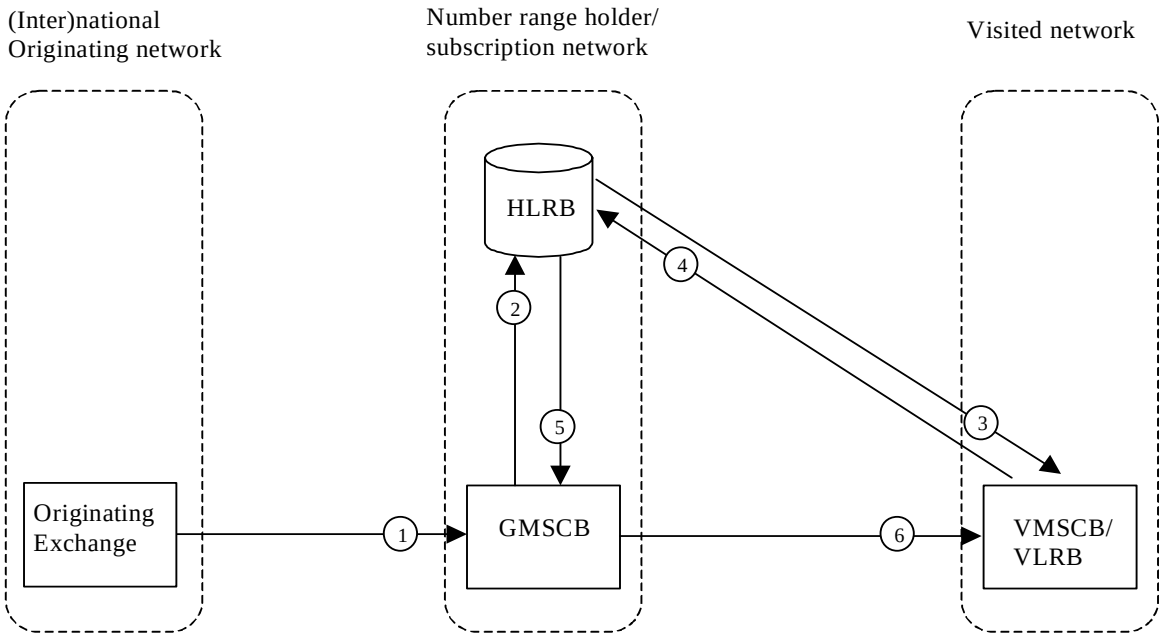

Figure A.1.2: Call to a non-ported number, no NP query required

1 From an Originating Exchange a call is set up to MSISDN. The call is routed to the Number range holder network being the Subscription network.

2 When GMSCB receives the ISUP IAM, it requests routeing information by submitting a MAP SRI to the HLRB including the MSISDN in the request.

3 The HLRB requests an MSRN from the MSC/VLRB where the mobile subscriber currently is registered;

4 The MSC/VLRB returns an MSRN back to the HLRB.

5 The HLRB responds to the GMSCB by sending an SRI ack with an MSRN.

6 GMSCB uses the MSRN to route the call to VMSCB.

A.1.3 NP Query in Number Range Holder Network

A.1.3.1 TQoD – Number is not ported

Figure A.1.3.1 shows the architecture for a call where the Originating network has no knowledge whether the MSISDN is ported or not and uses the traditional routeing plans for routeing the call to the Number range holder network for further routeing decisions.

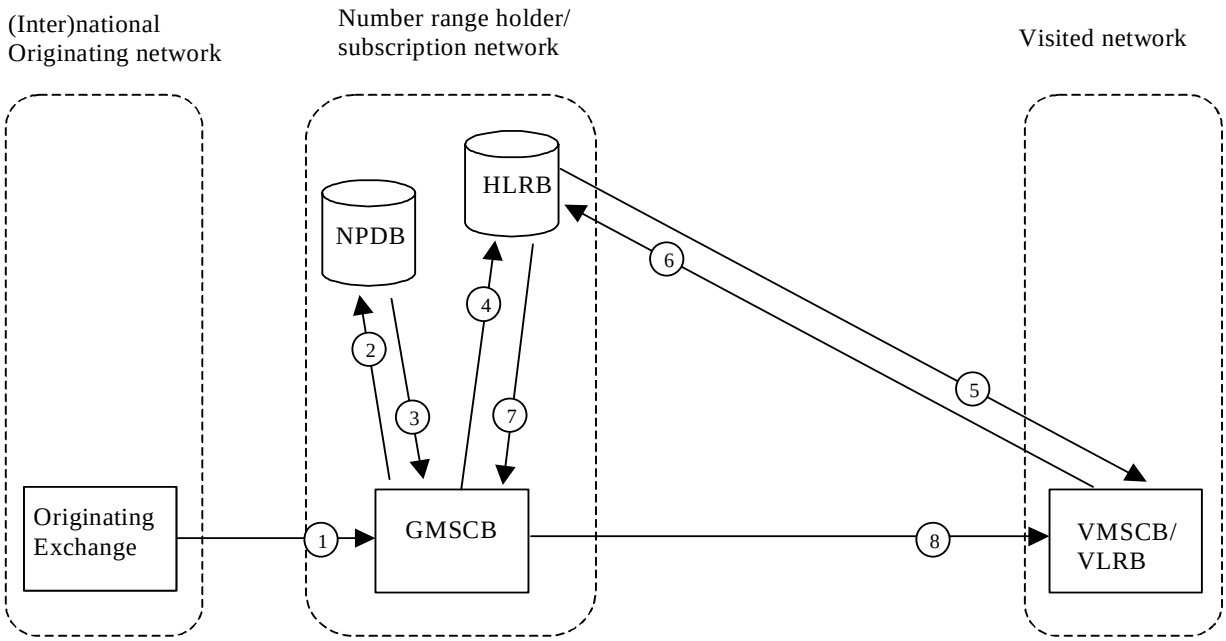

Figure A.1.3.1: Call to a non-ported number using TQoD procedure

1 From an Originating Exchange a call is set up to MSISDN. The call is routed to the Number range holder network being the Subscription network.

2 When GMSCB receives the ISUP IAM, it will send a database query to the NPDB as a result of analysis of the received MSISDN. The MSISDN is included in the query to the NPDB.

3 The NPDB detects that the MSISDN is not ported and responds back to the GMSCB to continue the normal call setup procedure for MT calls.

4 The GMSCB requests routeing information by submitting a MAP SRI to the HLRB, including the MSISDN in the request.

5 The HLRB requests an MSRN from the MSC/VLRB where the mobile subscriber owning the MSISDN currently is registered.

6 The MSC/VLRB returns an MSRN back to the HLRB.

7 The HLRB responds to the GMSCB by sending an SRI ack with an MSRN.

8 GMSCB uses the MSRN to route the call to VMSCB.

Note that the NPDB may be outside the number range holder network if a shared NPDB is used.

A.1.3.2 TQoD – Number is ported

Figure A.1.3.2 shows the architecture for a call where the Originating network has no knowledge whether the MSISDN is ported or not and uses the traditional routeing plans for routeing the call to the Number range holder network for further routeing decisions.

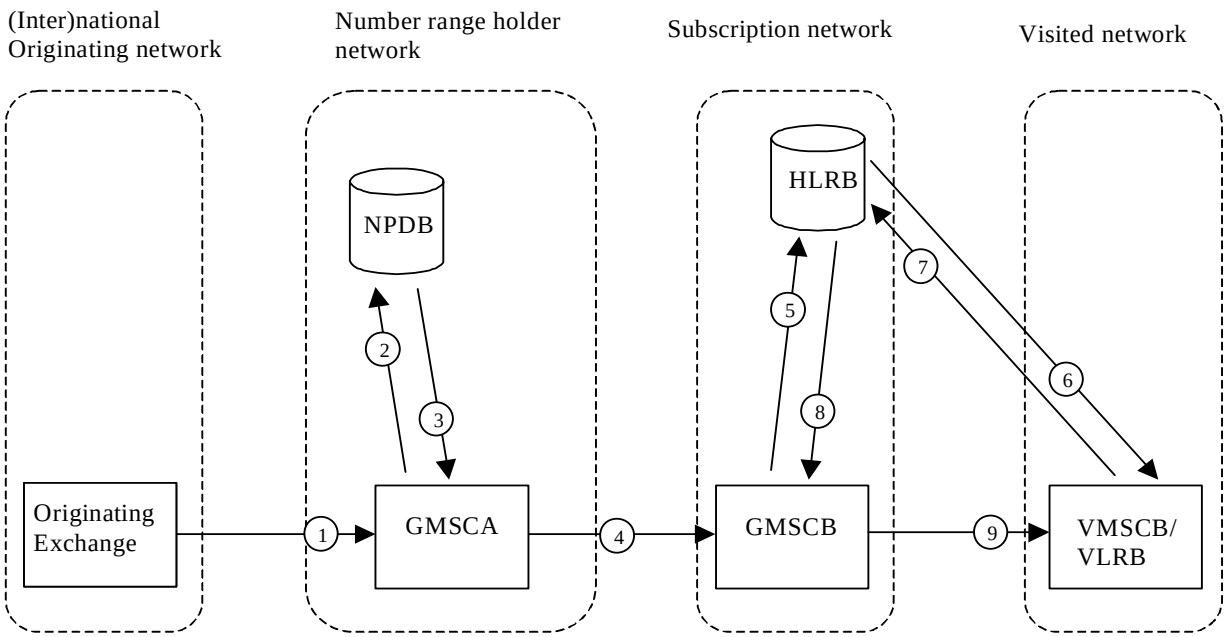

Figure A.1.3.2: Call to a ported number using TQoD procedure

1 From an Originating Exchange a call is set up to MSISDN. The call is routed to the Number range holder network.

2 When GMSCA receives the ISUP IAM, it will send a database query, including the MSISDN, to the NPDB as a result of analysis of the received MSISDN.

3 The NPDB detects that the MSISDN is ported and responds back to the GMSCA with a Routeing Number pointing out the Subscription network.

4 The call is routed to the Subscription network based on the Routeing Number carried in ISUP IAM message; also the MSISDN is included in IAM.

5 The GMSCB requests routeing information by submitting a MAP SRI to the HLRB, including the MSISDN in the request. The capability to route messages to the correct HLR is required.

6 The HLRB requests an MSRN from the MSC/VLRB where the mobile subscriber currently is registered.

7 The MSC/VLRB returns an MSRN back to the HLRB.

8 The HLRB responds to the GMSCB by sending an SRI ack with an MSRN.

9 GMSCB uses the MSRN to route the call to VMSCB.

Note that the NPDB may be outside the number range holder network if a shared NPDB is used.

A.1.3.3 QoHR – Number is ported

Figure A.1.3.3 shows the architecture for a call where the Originating network has no knowledge whether the MSISDN is ported or not and uses the traditional routeing plans for routeing the call to the Number range holder network for further routeing decisions.

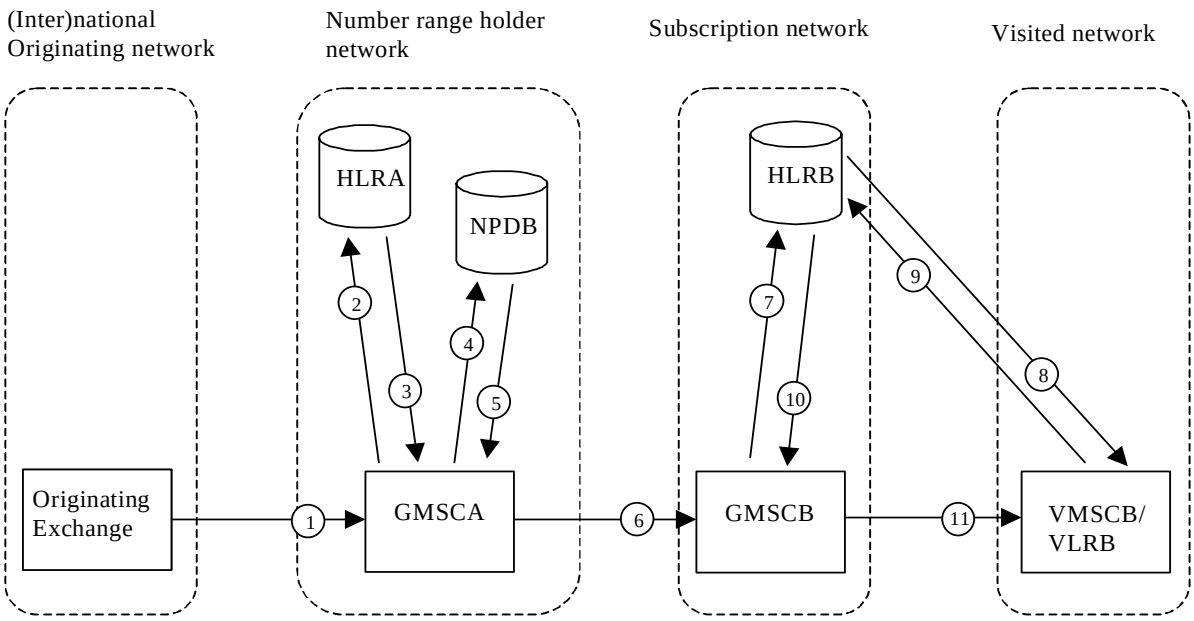

Figure A.1.3.3: Call to a ported number using QoHR procedure

1 From an Originating Exchange a call is set up to MSISDN. The call is routed to the Number range holder network.

2 When GMSCA receives the ISUP IAM, it requests routeing information by submitting a MAP SRI to the HLRA including the MSISDN in the request.

3 The HLRA returns a MAP SRI ack with an “Unknown Subscriber” error since no record was found for the subscriber in the HLRA.

4 When GMSCA receives the error indication form the HLRA, this will trigger the sending of a database query to the NPDB, including the MSISDN in the query.

5 The NPDB detects that the MSISDN is ported and responds back to the GMSCA with a Routeing Number pointing out the Subscription network.

6 The call is routed to the Subscription network based on the Routeing Number carried in ISUP IAM message; also the MSISDN is included in IAM.

7 The GMSCB requests routeing information by submitting a MAP SRI to the HLRB, including the MSISDN in the request. The capability to route messages to the correct HLR is required.

8 The HLRB requests an MSRN from the MSC/VLRB where the mobile subscriber currently is registered.

9 The MSC/VLRB returns an MSRN back to the HLRB.

10 The HLRB responds to the GMSCB by sending an SRI ack with an MSRN.

11 GMSCB uses the MSRN to route the call to VMSCB.

Note that the NPDB may be outside the number range holder network if a shared NPDB is used.

A.1.4 NP Query in Originating Network

A.1.4.1 OQoD – Number is not ported

Figure A.1.4.1 shows the architecture for a call where already the Originating network has the knowledge whether the MSISDN is ported or not and can route the call directly to the Subscription network that in this case is the same as the Number range holder network.

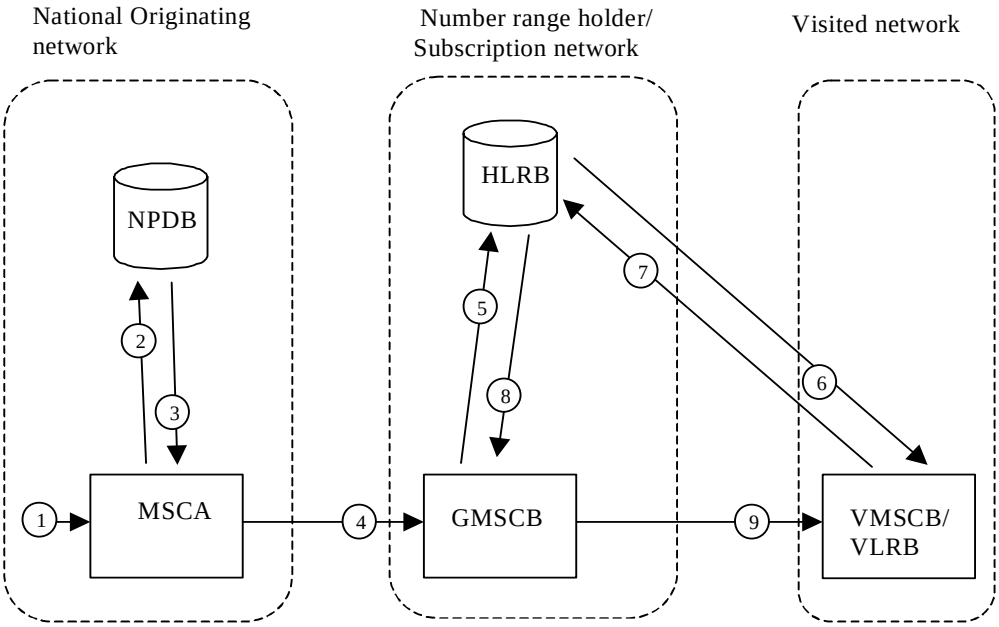

Figure A.1.4.1: Call to a non-ported number using OQoD procedure

1 A call is initiated by Mobile Subscriber A towards Mobile Subscriber B, using the MSISDN of the called subscriber.

2 When VMSCA receives the call setup indication, it will send a database query to the NPDB as a result of analysis of the received MSISDN, including the MSISDN in the query.

3 The NPDB detects that the MSISDN is not ported and responds back to the VMSCA to continue the normal call setup procedure for MO calls. Depending on database configuration option, the NPDB could either return a Routeing Number on not ported calls, as done for ported calls, or the call is further routed using the MSISDN number only towards the Number range holder network.

4 The call is routed to the Number range holder/Subscription network based on the MSISDN or Routeing Number carried in ISUP IAM message.

5 The GMSCB requests routeing information by submitting a MAP SRI to the HLRB, including the MSISDN in the request.

6 The HLRB requests an MSRN from the MSC/VLRB where the mobile subscriber currently is registered.

7 The MSC/VLRB returns an MSRN back to the HLRB.

8 The HLRB responds to the GMSCB by sending an SRI ack with an MSRN.

9 GMSCB uses the MSRN to route the call to VMSCB.

Note that the NPDB may be outside the national originating network if a shared NPDB is used.

A.1.4.2 OQoD – Number is ported

Figure A.1.4.2 shows the architecture for a call where already the Originating network has the knowledge that the MSISDN is ported and can route the call directly to the Subscription network without involving the Number range holder network.

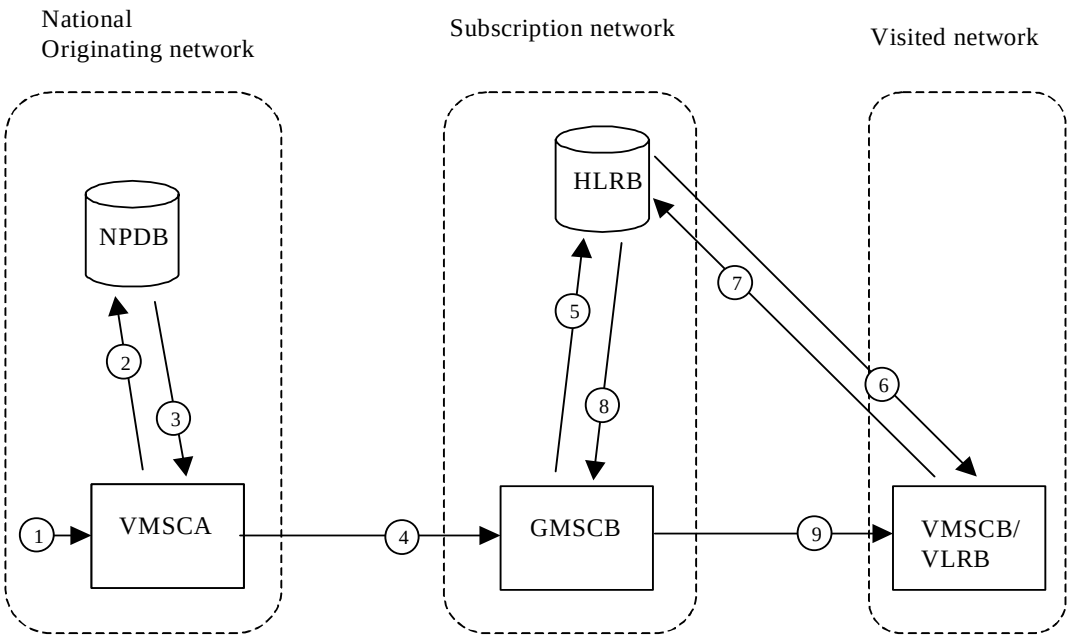

Figure A.1.4.2: Call to a ported number using OQoD procedure

1 A call is initiated by Mobile Subscriber A towards Mobile Subscriber B, using the MSISDN of the called subscriber.

2 When VMSCA receives the call setup indication, it will send a database query to the NPDB as a result of analysis of the received MSISDN including the MSISDN in the query.

3 The NPDB detects that the MSISDN is ported and responds back to the VMSCA with a Routeing Number pointing out the Subscription network.

4 The call is routed to the Subscription network based on the Routeing Number carried in ISUP IAM message; also the MSISDN is included in IAM.

5 The GMSCB requests routeing information by submitting a MAP SRI to the HLRB, including the MSISDN in the request. The capability to route messages to the correct HLR is required.

6 The HLRB requests an MSRN from the MSC/VLRB where the mobile subscriber currently is registered.

7 The MSC/VLRB returns an MSRN back to the HLRB.

8 The HLRB responds to the GMSCB by sending an SRI ack with an MSRN.

9 GMSCB uses the MSRN to route the call to VMSCB.

Note that the NPDB may be outside the national originating network if a shared NPDB is used.

A.1.4.3 IN-Query for CAMEL pre-paid service

Figure A.1.4.3 shows the architecture for a call or MO-Short-Message originated by a CAMEL pre-paid subscriber while roaming in the Home PLMN where the gsmSCF needs to know whether or not calling and called subscriber subscribe to the same PLMN in order to apply the correct charging tariff.

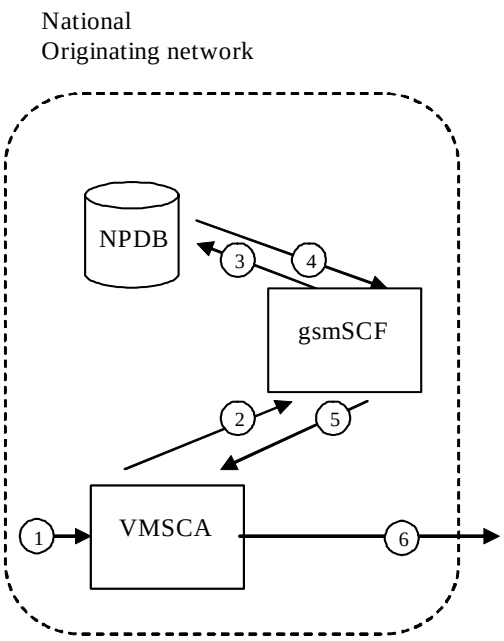

Figure A.1.4.3: IN-Query for pre-paid service

1 A call or short message is initiated by Mobile Subscriber A towards Mobile Subscriber B, using the MSISDN of the called subscriber.

2 When VMSCA receives the call setup indication, it will send a CAP IDP message to the gsmSCF. The IDP contains the called party's MSISDN.

3 If the calling subscriber roams in her Home PLMN and the called subscriber's MSISDN indicates that the called subscriber subscribes to a PLMN within the calling subscriber's Home Country, the gsmSCF queries the NPDB based on the called party's MSISDN.
Otherwise the tariff to be applied does not depend on the called subscriber's porting status and enough information to apply the correct tariff is available; go to 5.

4 The NPDB returns a routing number to the gsmSCF pointing out the called subscriber's subscription network. Based on this information the gsmSCF applies the appropriate tariff for pre-paid subscriber A.

5 The gsmSCF returns CAP AC and CAP CUE messages to the VMSCA.

6 The call or short message is set up.

Note that the NPDB and gsmSCF may be integrated within one physical entity.

A.2 Information flows

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3GPP TSG CN WG4 Meeting #21 **N4-031340**
Bangkok, THAILAND, 27th – 31st October 2003

CR-Form-v7

CHANGE REQUEST

⌘ **23.066** **CR** **028** ⌘**rev** **1** ⌘ Current version: **5.2.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	MNP correction for prepaid charging
Source:	⌘	CN4
Work item code:	⌘	MNP
Date:	⌘	07/10/2003
Category:	⌘	**F**
Release:	⌘	Rel-5

Use one of the following categories:
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R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
Rel-4 *(Release 4)*
Rel-5 *(Release 5)*
Rel-6 *(Release 6)*

Reason for change:	⌘	During the discussion on CR 29.002-615 and CR 23.066-026 in CN4#20 several modifications to those CRs have been agreed. Unfortunately when reviewing the revised versions of these CRs CN4#20 found that they did not reflect the agreed modifications. Due to lack of time and since it was believed that the missing corrections are "nearly editorial" CN4#20 approved those CRs as being technically correct but improvable. CN#21 have allowed further non critical corrections on this issue. This CR provides the modifications which were already agreed in CN4#20.
Summary of change:	⌘	Replace MNP-SRF with NPLR;
Consequences if not approved:	⌘	Misalignment of specifications

Clauses affected:	⌘	

		Y	N			
Other specs affected:	⌘	X		Other core specifications	⌘	29.002 CR 675
			X	Test specifications		
			X	O&M Specifications		

Other comments:	⌘	

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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.

~~Normative Annex D of the present document describes the technical realisation of the handling of the MNP information request for ported or non-ported UMTS or GSM mobile subscribers. Two solutions are described, one using IN technology the other using Signalling Relay technology. The network operator may choose the solution to be used in his network.~~

The present document does not specify the porting process.

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~~s~~ one or more of Routeing Number, generic IMSI~~,~~ MSISDN,and~~/or~~ 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.

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 ~~charge~~ 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) ~~and the functionality needed to query a NPDB for MNP information (in order to be able to correctly charge CAMEL pre-paid calls and SMS) (Normative Annex D)~~.

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].

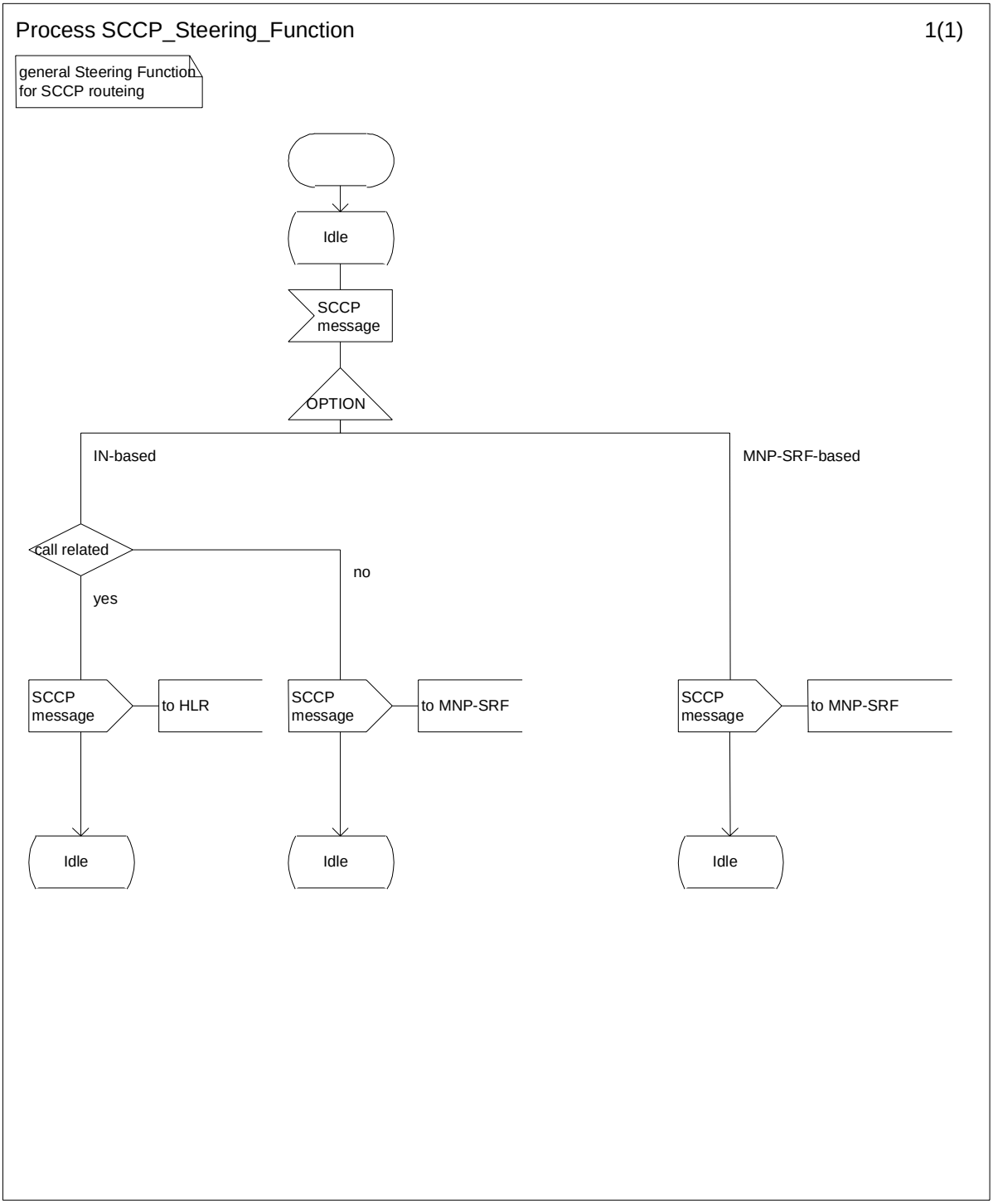


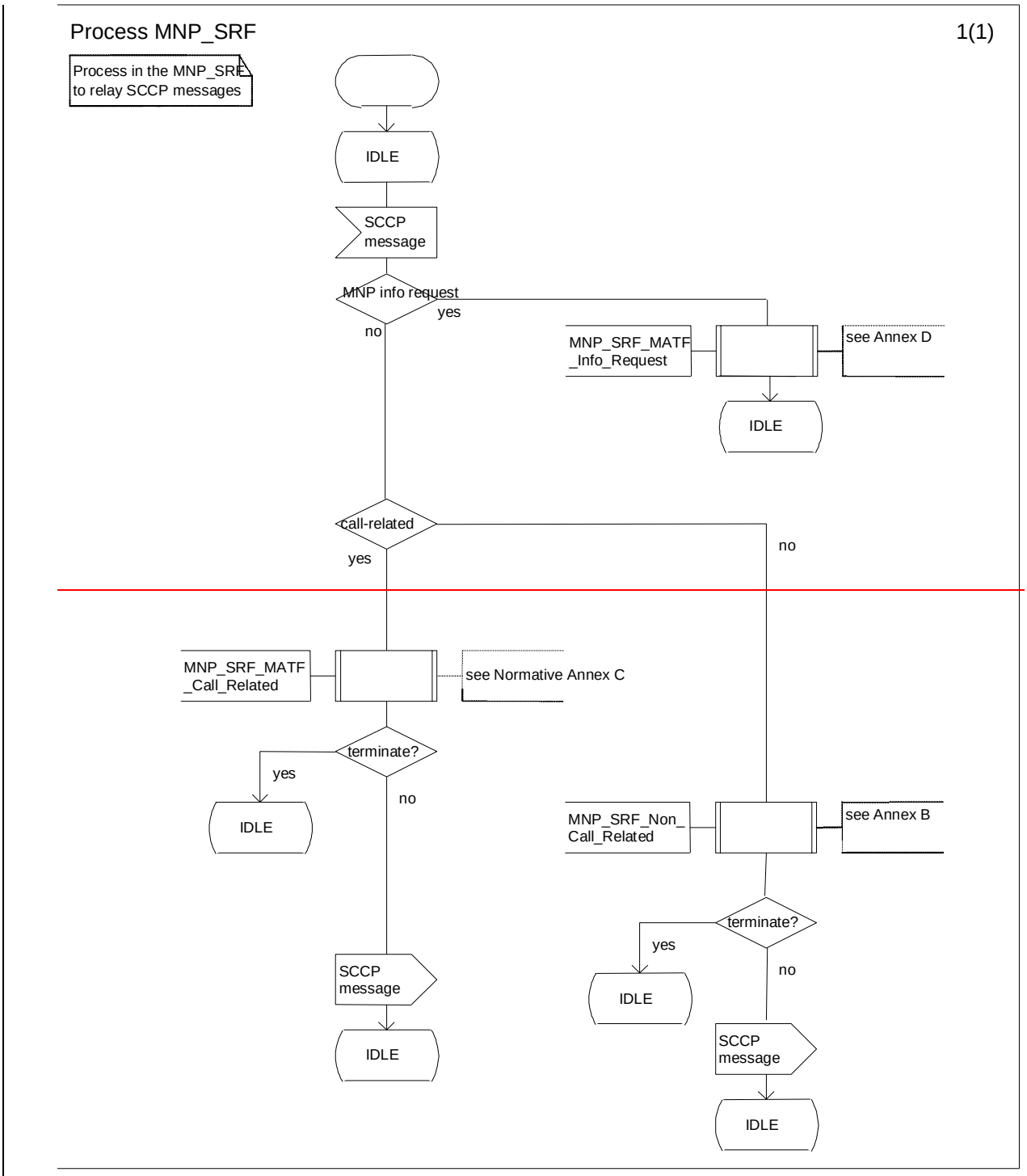
Figure 1: Steering Function for SCCP Message routeing

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 ~~and Normative Annex D~~ 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.

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.



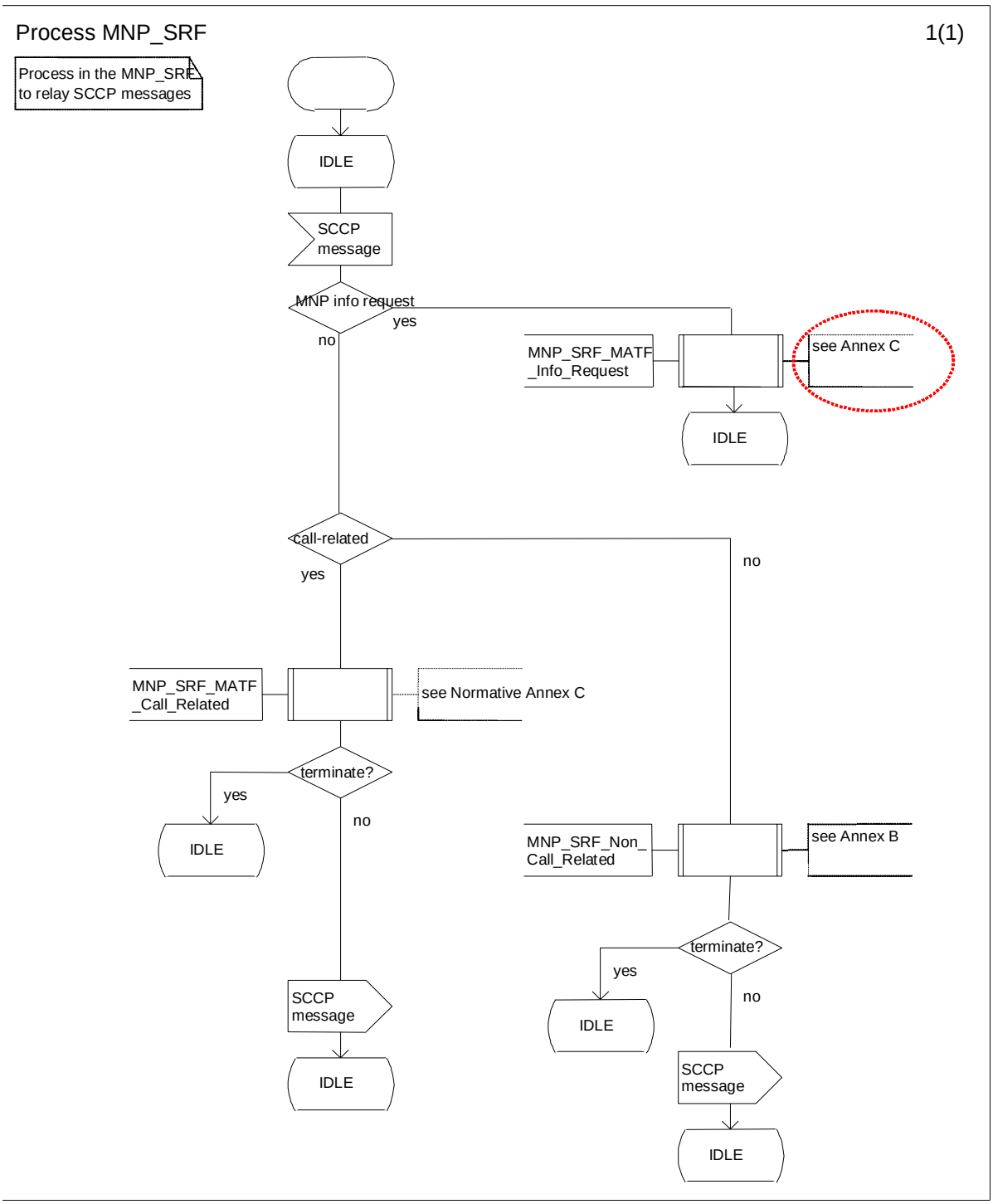


Figure 2: Process MNP_SRF

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.

~~The architecture for MNP information request is described in Normative Annex D of the present document.~~

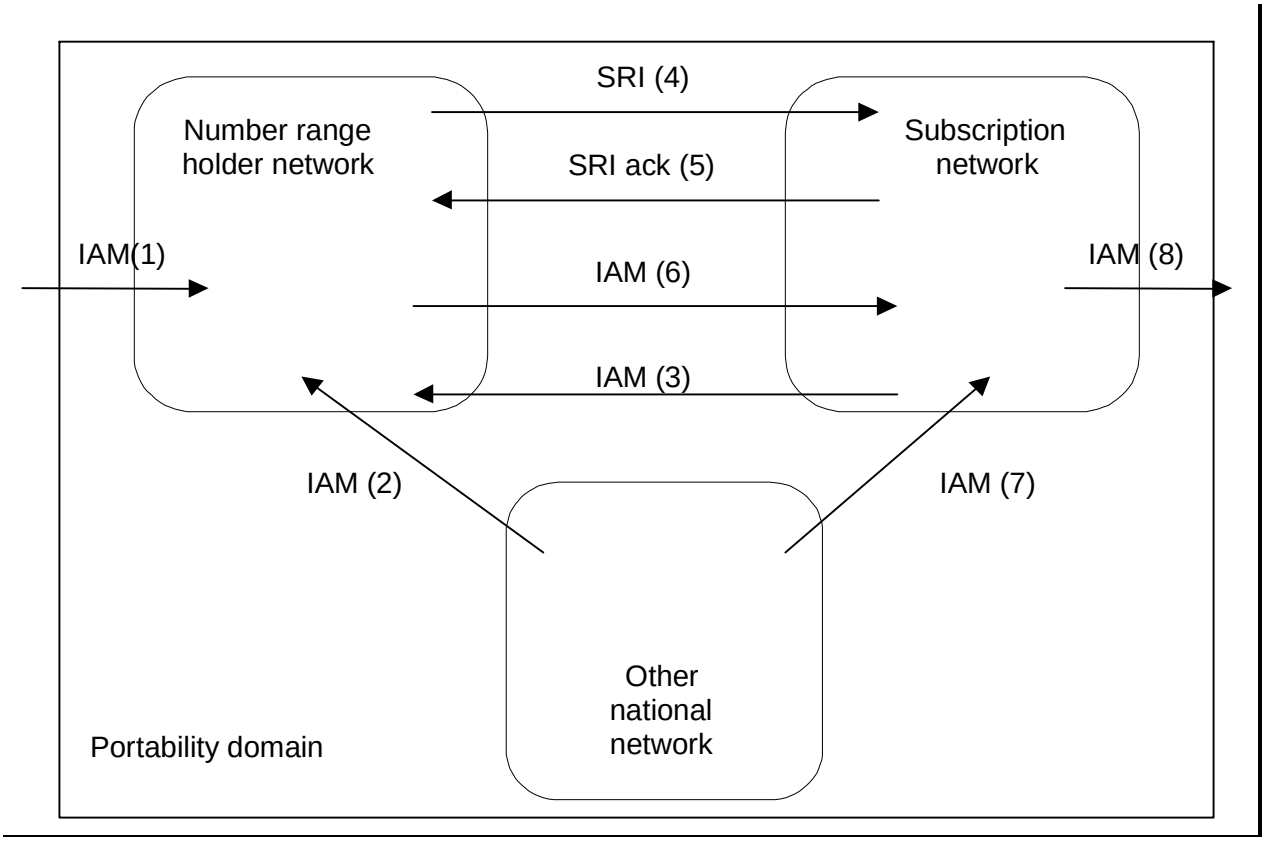


Figure 3: General architecture of a portability domain for routeing of calls

The following routeing conventions are identified:

1. Direct Routeing of calls is a PLMN option that 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 action 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.

2b. If the call is originated in another national network and the other national network supports originating call query (i.e. Direct Routeing of calls is applicable), the IAM (7) containing the routeing number is sent to the subscription network. If the routeing number is not used in the IAM sent from the national originating network to the subscription network, all transit networks involved are required to look up an NPDB in order to retrieve routeing information to route the call to the subscription network without looping.

3a. If the call is originated in the subscription network and the subscription network does not support originating call query (i.e. Indirect Routeing of calls is applicable), the IAM (3) is received by the number range holder network.

3b. If the call is originated in the subscription network and the subscription network supports originating call query (i.e. Direct Routeing of calls is applicable), it sends an IAM (8) containing the MSRN to the visited network of the called subscriber.

3c. If the subscription network receives IAM (6 or 7) containing the routeing number, it sends an IAM (8) containing the MSRN to the visited network of the called subscriber.

4a. If the call is routed via the number range holder network, and the number range holder network supports the MNP-SRF/MATF solution with the option 'MATF in subscription network' described in Normative Annex C of the present document (i.e. Indirect Routeing of calls with reference to the subscription network is applicable), the number range holder network sends SRI (4) to the subscription network. The subscription network returns SRI ack (5) containing the routeing number. The number range holder network then sends IAM (6) containing the routeing number to the subscription network. If the routeing number is not used in the IAM sent from the number range holder network to the subscription network, all transit networks involved are required to look up an NPDB in order to retrieve routeing information to route the call to the subscription network without looping.

4b. If the call is routed via the number range holder network, and the number range holder network supports the IN solution described in Normative Annex A of the present document or the MNP-SRF/MATF solution with the option 'MATF inside number range holder network' described in Normative Annex C of the present document, the number range holder network sends IAM (6) containing the routeing number to the subscription network.

Annex C (normative): MNP Signalling Relay Function - Call Related Signalling

C.1 Handling of Call Related Signalling

The ~~only call related~~ MAP messages affected by MNP are~~is~~ the MAP_-SEND_ROUTING_INFORMATION (SRI) message without OR parameter set sent to the HLR and the MAP_ANY_TIME_INTERROGATION (ATI) message with parameter MNP-requestedInfo present terminated in the MNP-SRF~~sent to the HLR~~.

In a PLMN supporting MNP with direct routeing using signalling relay, all incoming calls and calls originated in the network for which the called party number is within the ranges owned by any network in the portability domain, the gateway MSCs will send an SRI such that it will be handled by the MNP-SRF in that network.

In a PLMN supporting MNP with direct routeing, where the called party number is within the ranges owned by any network in the portability domain, the INE sends an MNP Information request (ATI) such that it will be handled by the MNP-SRF in the network.

In a PLMN supporting MNP with indirect routeing using signalling relay, all incoming calls and calls originating in the network, for which the called party number is within the range owned by the network, the gateway MSCs will send SRI such that it will be handled by the MNP-SRF in that network.

In a PLMN supporting MNP with indirect routeing, ~~where the called party number is within the ranges owned by any network in the portability domain,~~ the INE sends an MNP Information Request (ATI) such that it will be handled by the MNP-SRF in the Number Range Holder Network.

The MNP-SRF obtains routeing information from the NP database to identify the subscription network associated with a particular national MSISDN. The interface between the MNP-SRF and the NP database is considered implementation dependent and is not detailed further.

From the perspective of the PLMN in which the MNP-SRF resides, the CdPA represents one of:

1. An own number ported out.
2. An own number not ported out.
3. A foreign number ported in.
4. A foreign number ported to a foreign network.
5. A foreign number not known to be ported.

Cases 4 and 5 are applicable only for direct routeing.

For SRI:

In case 1, the MNP-SRF may perform one of the following depending on agreements within the number portability domain.

a. An SRI response is sent containing the necessary routeing information to route the call to the subscription network. This is performed by an internal MAP Application Termination Function (MATF) known as the Number Portability Location Register (NPLR).

b. If indirect routeing of calls with reference to the subscription network is used, the message is relayed to the MNP-SRF in the subscription network, whose NPLR provides the necessary routeing information in an SRI response. The use of an NPLR in the subscription network can only be by agreement within the number portability domain.

In cases 2 and 3, the MNP-SRF relays the message to the HLR. For further details of the signalling relay function, the reader is referred to [7].

In case 4, an SRI response is sent, containing the necessary routeing information to route the call to the subscription network.

In case 5, an SRI response is sent, containing the necessary routeing information to route the call to the number range holder network.

For ATI:

In all cases the MNP information request (ATI) is sent to the MNP_SRF_MATF_Info_Request procedure/ MAP Application Termination Function (MATF) for handling. A response is sent to the INE containing MNP information or an error is returned.

C.2 Functional Requirements of Network Entities

C.2.1 Procedure MNP_SRF_MATF_Call_Related

Figure C.2.2~~.2~~ shows the procedure MNP_SRF_MATF_Call_Related. This procedure handles call-related signalling messages. It is called from the process MNP_SRF (see clause 4.3).

The check “message has been relayed” identifies all call related signalling messages which are relayed from the number range holder network towards the subscription network in the case of Indirect Routeing with reference to subscription network implementation. These messages only refer to numbers ported into the network.

The check “own number not ported out” identifies all mobile numbers from number ranges allocated to the network the MNP-SRF/MATF is located in and which are not ported to other networks. In this case the call related message is relayed to the HLR in the network.

The check “foreign number ported in” identifies all mobile numbers from the number ranges not allocated to the network the MNP-SRF/MATF is located in and which are served by the network the MNP-SRF/MATF is located in. In this case the call related message is relayed to the HLR in the network.

The check “foreign number not known to be ported” identifies all mobile numbers from the number ranges not allocated to the network the MNP-SRF/MATF is located in and which are also not served by the network the MNP-SRF/MATF is located in. In this case the call is sent to the SRF_MATF procedure for handling.

The check “foreign number ported to foreign network” identifies all mobile numbers from the number ranges not allocated to the network the MNP-SRF/MATF is located in and which are not served by the network the MNP-SRF is located in and not served by the network the number range is allocated to, i.e. the number is ported between two other networks. In this case the call related message is sent to the SRF_MATF procedure for handling.

The remaining cases “own number ported out” are mobile numbers allocated to the network the MNP-SRF/MATF is located in and which are served by other networks, i.e. the number is ported out to another network. In this case the call is relayed to the MATF in the subscription network if this option is the one used by the operator, or sent to the SRF_MATF procedure for handling if not.

C.2.2 Process SRI_NPLR

Figure C.2.2.2 shows the process SRI_NPLR.

The check “unknown subscriber” identifies a subscriber without any associated available information.

If the GMSC is in the database own network then a routeing number is provided to route to the number range holder network.

If the GMSC is not in the database own network then the enquiry has been routed from the number range holder network, so the call should fail.

The database query uses the MSISDN received at the application level in the SRI, rather then the CdPA of the SCCP level.

If an error must be set as a result of the check “terminate”, the user error “unknown subscriber” shall be used. If version 3 or higher of the MAP protocol is in use, then the diagnostic “NPDB mismatch” may be used.

The check “HPLMN MSISDN Range” identifies if the MSISDN received in the SRI exists in a MSISDN Range owned by the HPLMN. This is a North American Network implementation option and allows a MAP Error “Unknown Subscriber” to be sent to the GMSC instead of the MSISDN.

The check “HPLMN RN Range” identifies if the Routeing Number assigned to the MSISDN within the SRI_NPLR is assigned to the HPLMN. This is a North American Network implementation option and allows a MAP Error “Unknown Subscriber” to be sent to the GMSC instead of the RN+MSISDN.

C.2.3 Procedure MNP_SRF_MATF_Info_Request

Figure C.2.3.1 shows the procedure MNP_SRF_MATF_Info_Request. This procedure handles an information request signalling message to provide MNP information for a subscriber. It is called from the process MNP_SRF (see clause 4.3).

C.2.4 Process ATI_NPLR

Figure C.2.3.2 shows the process ATI_NPLR.

The database query uses the MSISDN received at the application level in the ATI, rather thaen the CdPA of the SCCP level.

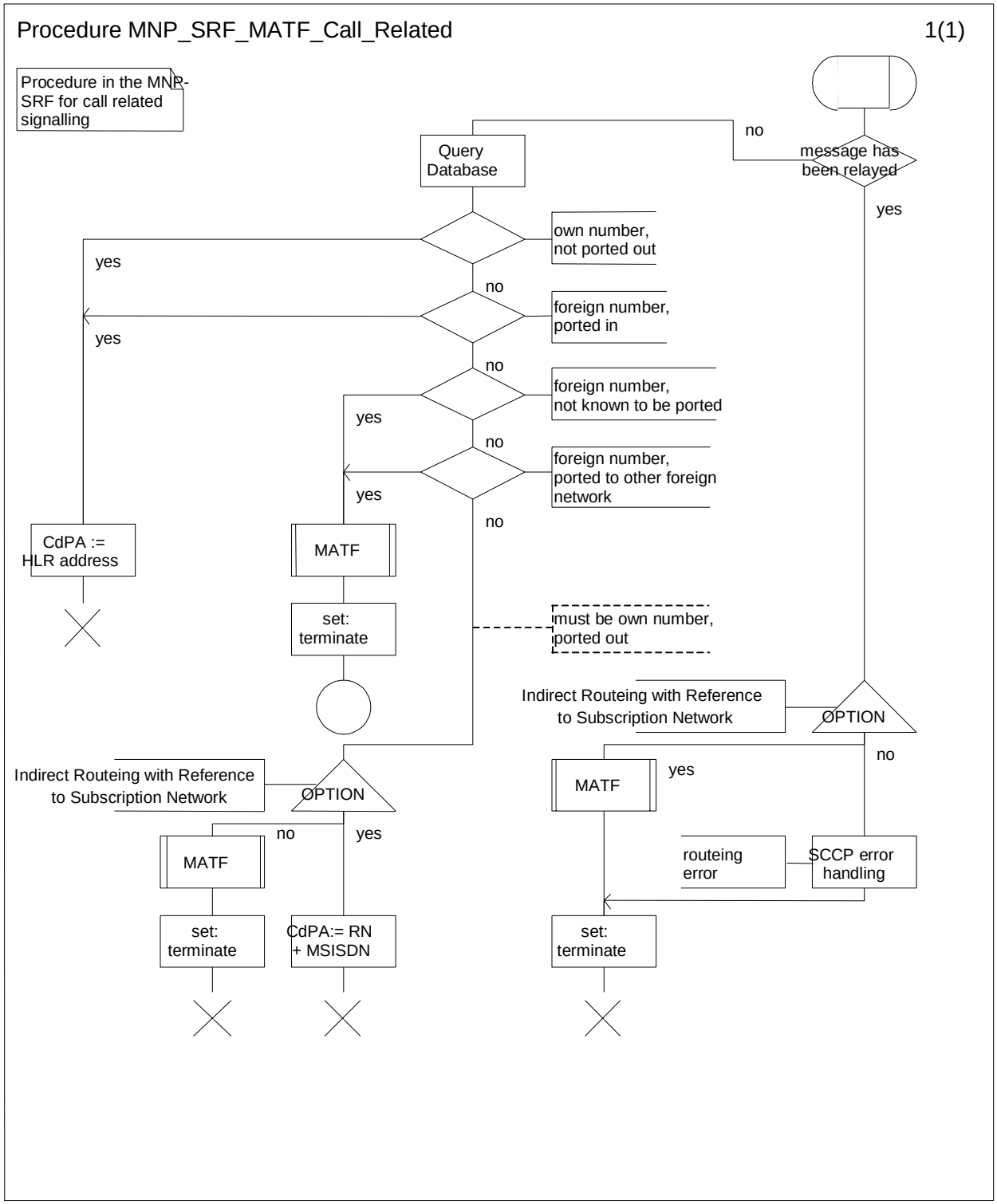


Figure C.2.2: Procedure MNP_SRF_MATF_Call_Related

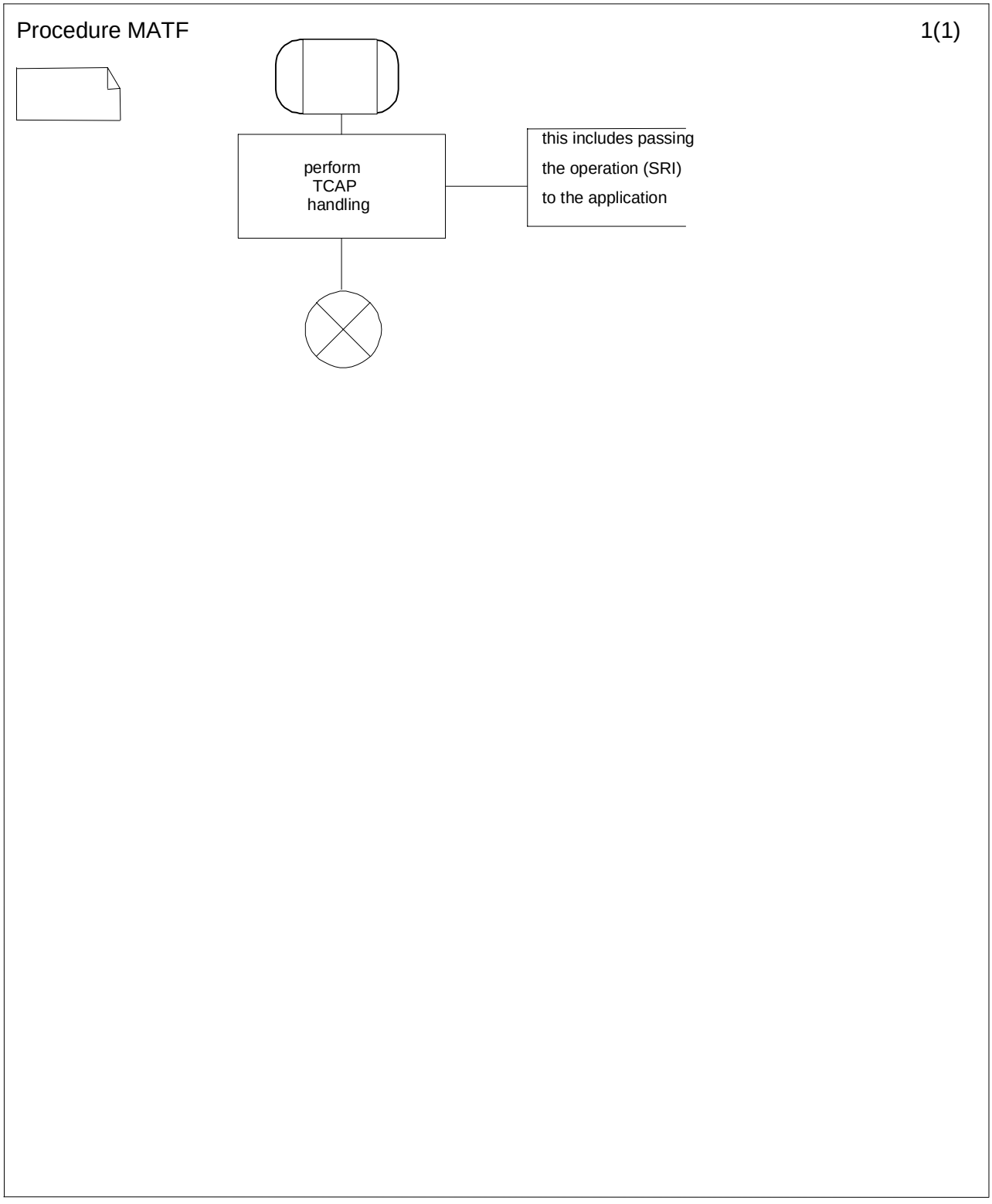


Figure C.2.2.1: Procedure MATF

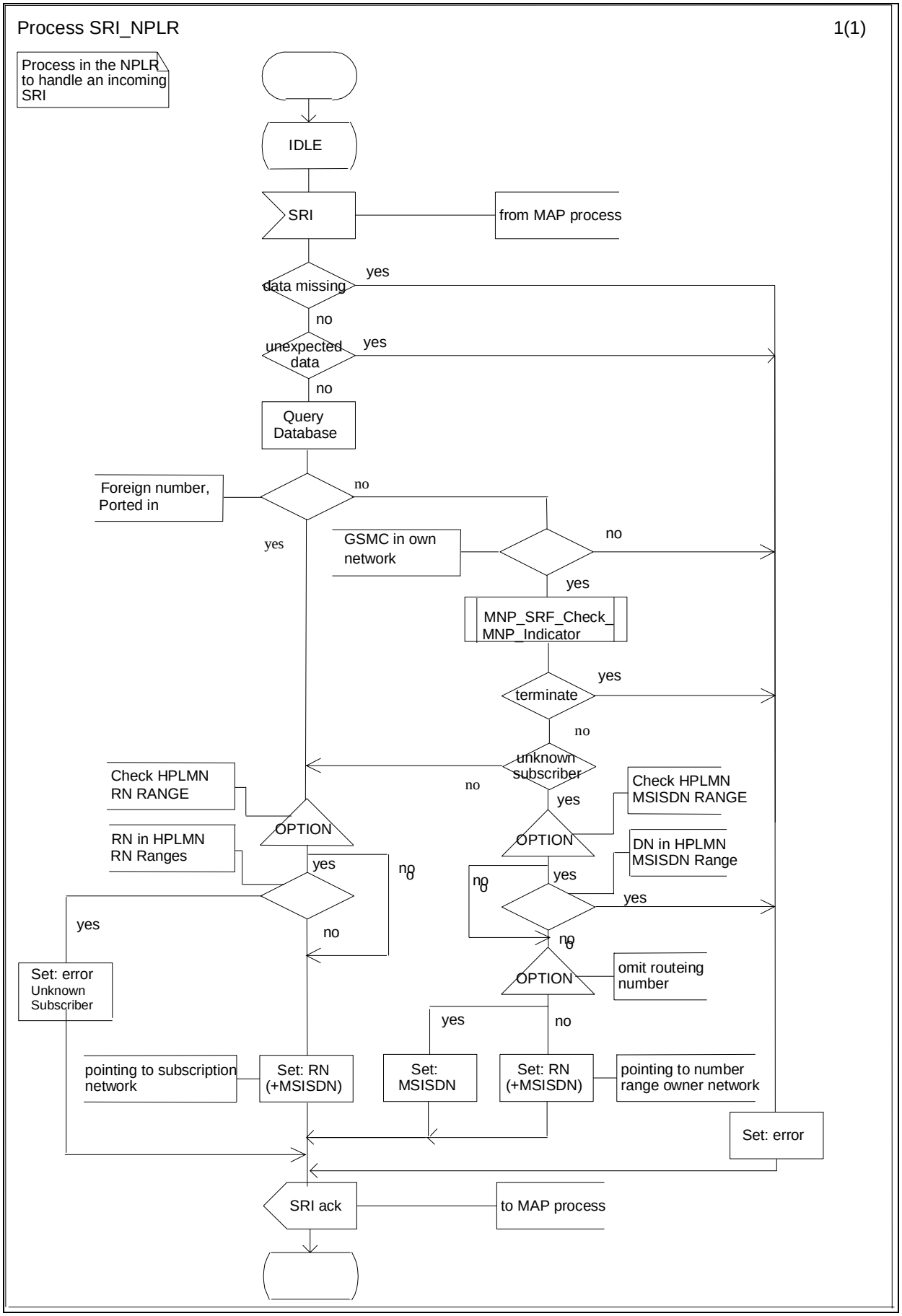


Figure C.2.2.2: Process SRI_NPLR

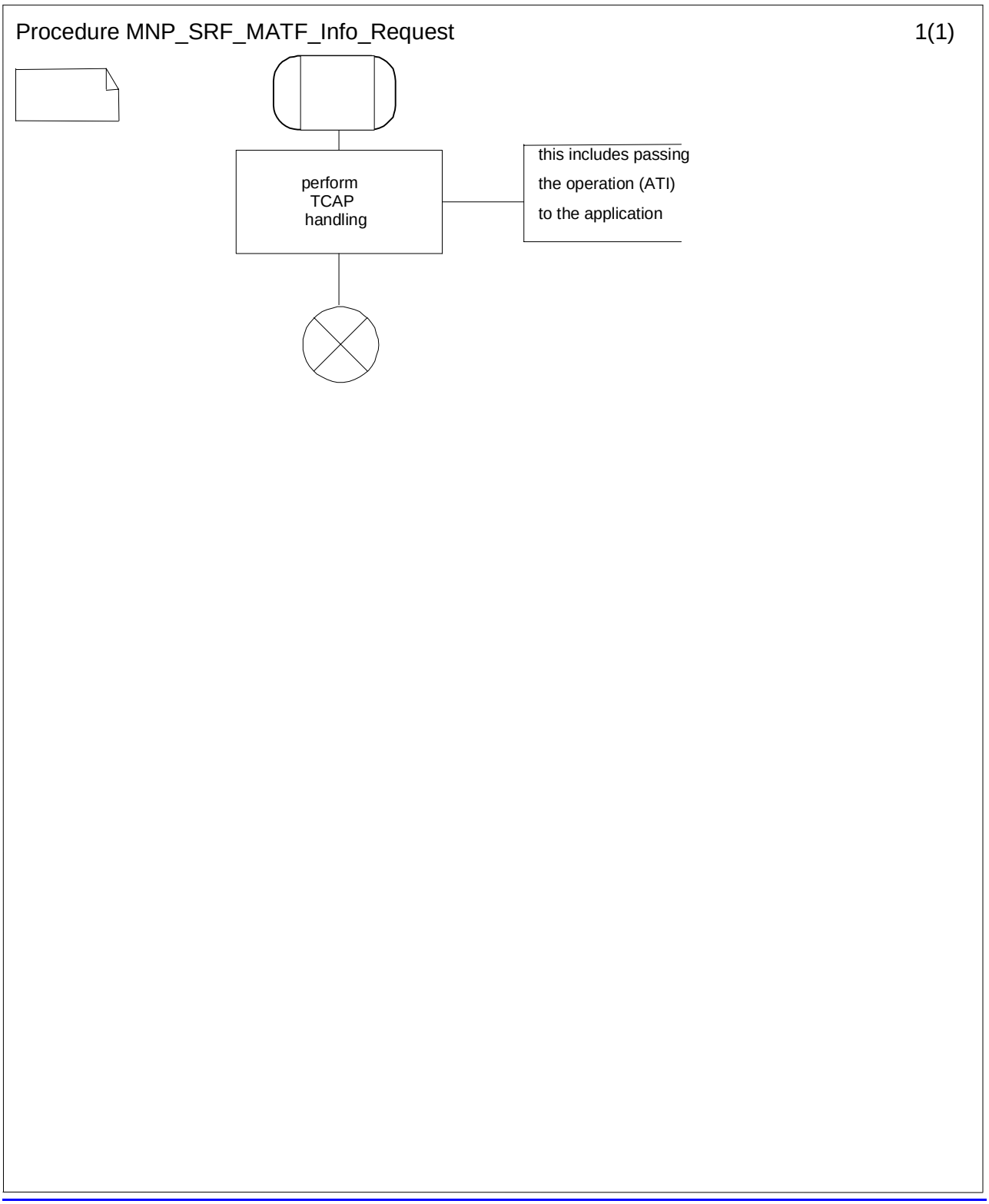


Figure C.2.3.1: Procedure MATF_Info_Request

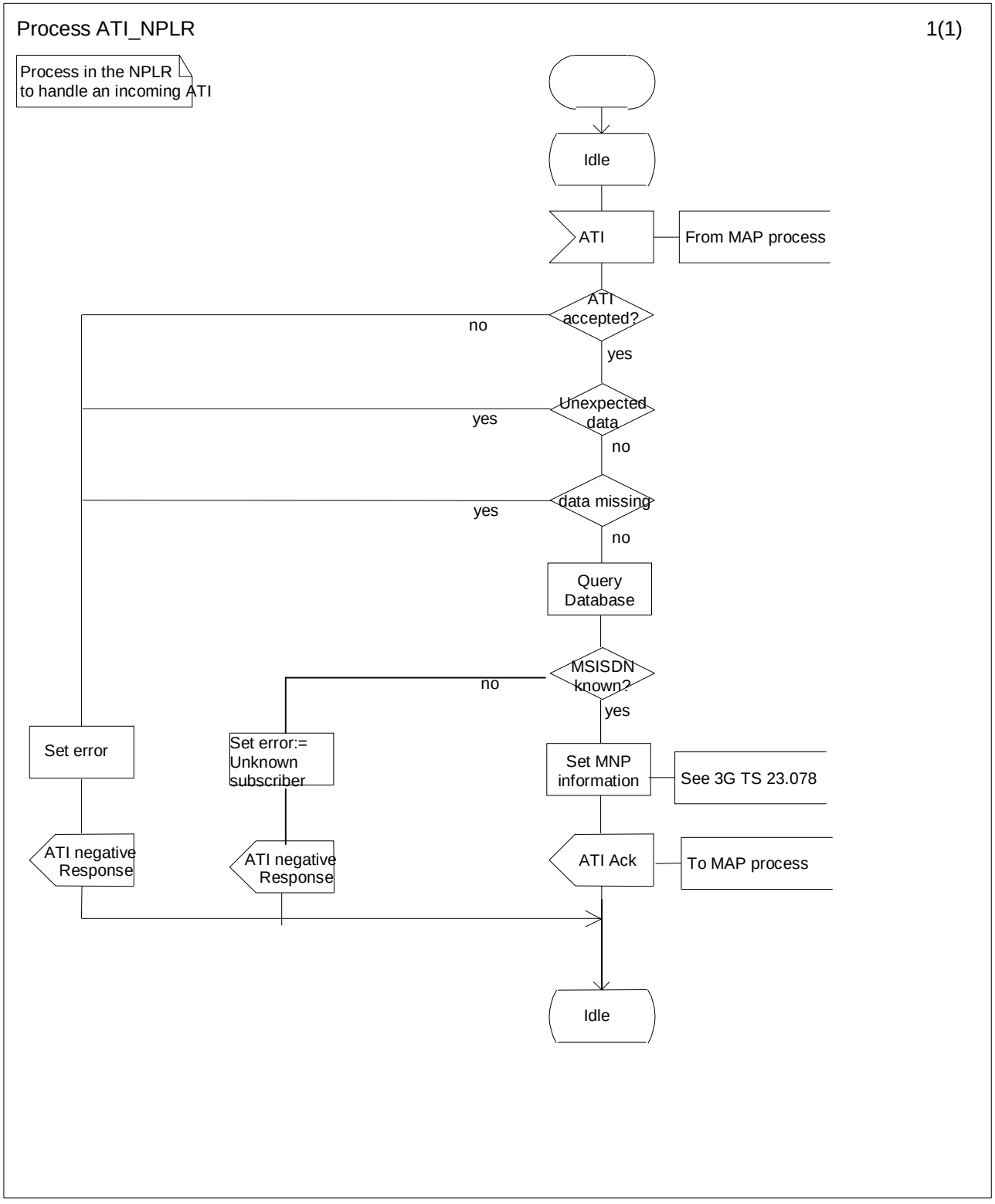


Figure C.2.3.2: Process ATI_NPLR

C.3 Call Scenarios

The notation TT=SRI in diagrams in this section assumes that SRI=CRMNP for ETSI and SRI = Translation Type 14 for ANSI. The use of other translation types is for further study. The message flows for the following scenarios are based on the use of an SCCP relay function in MNP-SRF(s). The message flows for the higher level relay function (e.g.

TC relay) in MNP-SRF are not covered here, but the principle can be found in B.4.2. For further details of the signalling relay function, the reader is referred to [7].

C.3.1 Call to a Non-Ported Number or Number Ported into the Network

Figure C.3.1 shows the signalling involved for a call to a non-ported number or number ported into the network (see 3G TS 23.018 [3]).

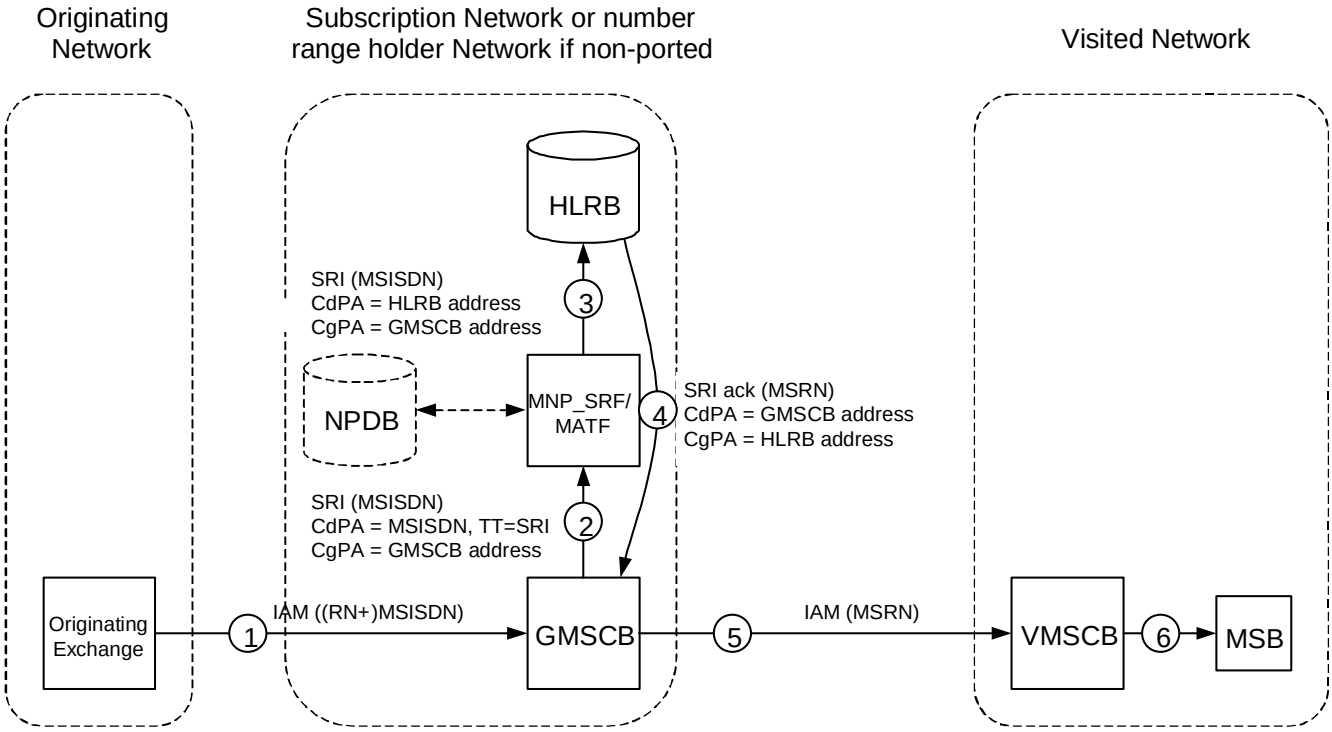


Figure C.3.1: Call to a non-ported number

1. From an Originating Exchange a call is set up to MSISDN. The call is routed to the subscription network being the number range holder network, if the number is non-ported.

2. When GMSCB receives the ISUP IAM, it requests routeing information by submitting a MAP SRI to the MNP_SRF/MATF. The TT on SCCP may be set to 'SRI'.

3. When the MNP_SRF/MATF receives the message, the MNP_SRF/MATF analyses the MSISDN in the CdPA and identifies the MSISDN as being non-ported. The MNP_SRF/MATF function then replaces the CdPA by an HLRB address. After modifying the CdPA, the message is routed to HLRB.

4. When HLRB receives the SRI, it responds to the GMSCB by sending an SRI ack with an MSRN that identifies the MSB in the VMSCB.

5. GMSCB uses the MSRN to route the call to VMSCB.

C.3.2 Call to a Ported Number – Originating Network = Subscription Network – Direct Routeing

Figure C.3.2 shows the signalling involved for a call to a ported number via direct routeing where the call is originated in the subscription network.

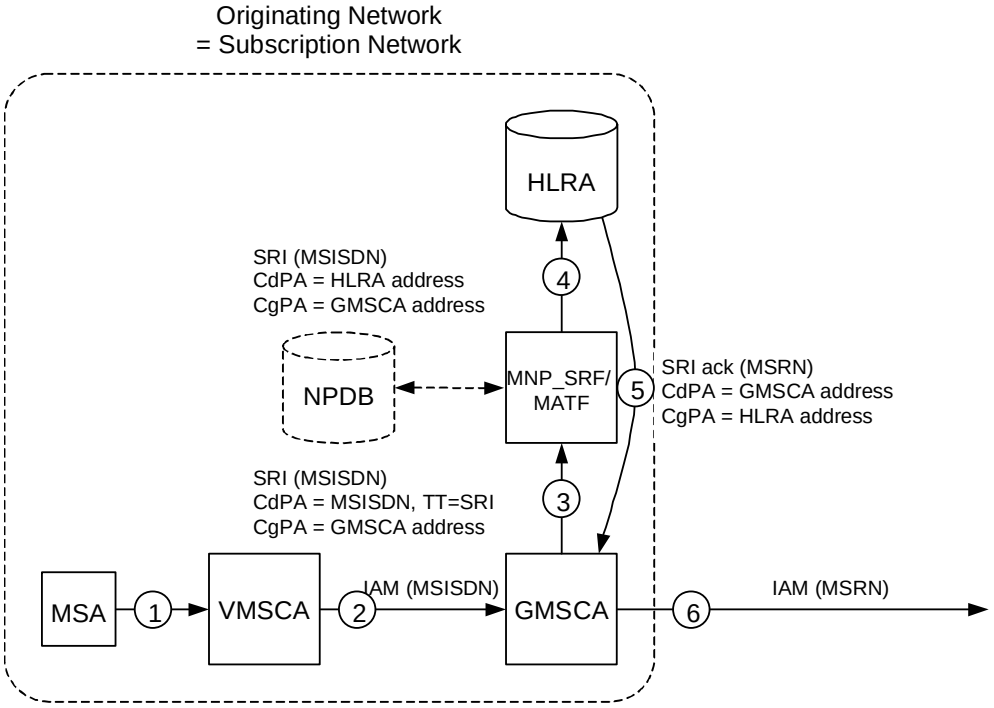


Figure C.3.2: Call to a ported number via direct routeing where the call is originated in the subscription network

1. MSA originates a call to MSISDN.
2. VMSCA routes the call to the network's GMSCA.
3. When GMSCA receives the ISUP IAM, it requests routeing information by submitting a MAP SRI to the MNP_SRF/MATF. The TT on SCCP may be set to 'SRI'.
4. When the MNP_SRF/MATF receives the message, it analyses the MSISDN in the CdPA and identifies the MSISDN as being ported into the network. The MNP_SRF/MATF function then replaces the CdPA by an HLRA address. After modifying the CdPA, the message is routed to HLRA.
5. When HLRA receives the SRI, it responds to the GMSCA by sending an SRI ack with an MSRN that identifies the MSB in the VMSCB.
6. GMSCA uses the MSRN to route the call to VMSCB.

C.3.3 Mobile Originated Call to a Ported or not known to be Ported Number – Originating Network ≠Subscription Network– Direct Routeing

Figure C.3.3 shows the signalling involved for a national mobile originated call to a number not Subscribed in the originating network via direct routeing. The scenario describes signalling in the originating network using direct routeing in the cases when an own number is ported out, a foreign number is not known to be ported or a foreign number is ported to other foreign network.

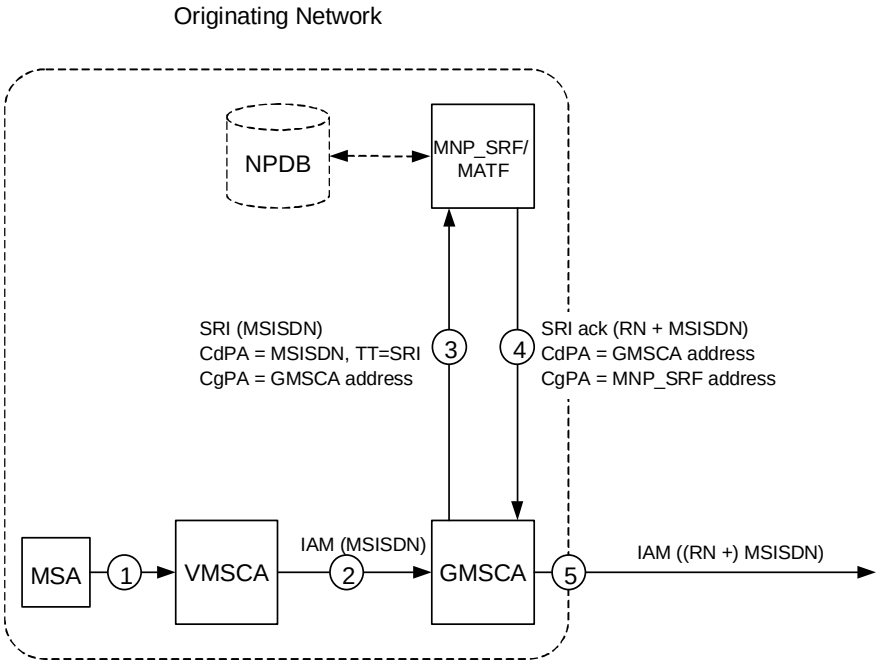


Figure C.3.3: National mobile originated call to a ported number via direct routeing

1. MSA originates a call to MSISDN.
2. VMSCA routes the call to the network's GMSCA.
3. When GMSCA receives the ISUP IAM, it requests routeing information by submitting a MAP SRI to the MNP_SRF/MATF. The TT on SCCP may be set to 'SRI'.
4. When the MNP_SRF/MATF receives the message, it analyses the MSISDN in the CdPA and identifies the MSISDN as not known to be ported or being ported to another network. As the message is a SRI message, the MNP_SRF/MATF responds to the GMSCA by sending an SRI ack with a RN + MSISDN; For the case the number is not known to be ported the routeing number may be omitted.
5. GMSCA uses the (RN +) MSISDN to route the call to GMSCB in the subscription network. Depending on the interconnect agreement, the RN will be added in the IAM or not.

C.3.4 Call to a Ported Number – Indirect Routeing

Figure C.3.4 shows the signalling involved for a call to a ported number via indirect routeing.

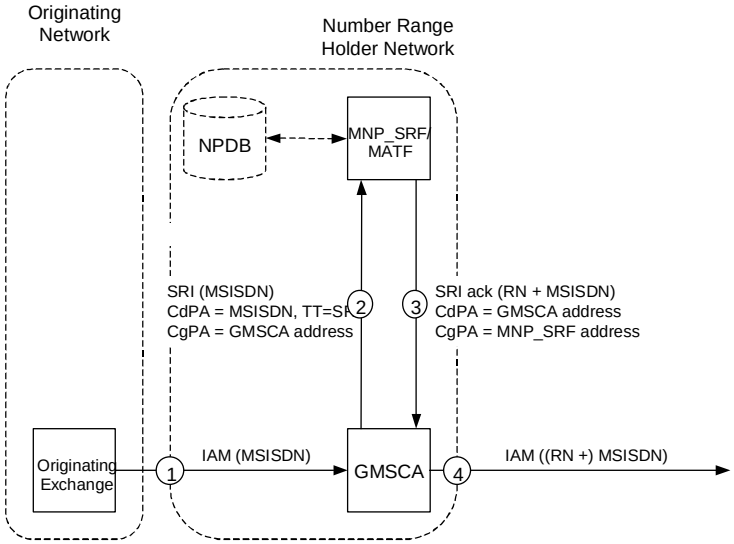


Figure C.3.4: Call to a ported number via indirect routeing

1. From an Originating Exchange a call is set up to MSISDN. The call is routed to the number range holder network.

2. When GMSCA in the number range holder network receives the ISUP IAM, it requests routeing information by submitting a MAP SRI to MNP_SRF/MATF. The TT on SCCP may be set to 'SRI'.

3. When the MNP_SRF/MATF receives the message, it analyses the MSISDN in the CdPA and identifies the MSISDN as being ported to another network. As the message is an SRI message, the MNP_SRF/MATF responds to the GMSCA by sending an SRI ack with a RN + MSISDN.

4. GMSCA uses the RN + MSISDN to route the call to GMSCB in the subscription network. Depending on the interconnect agreement, the RN will be added in the IAM or not.

C.3.5 Call to a Ported Number – Indirect Routeing with Reference to Subscription Network

Figure C.3.5 shows the signalling involved for a call to a ported number where indirect routeing with reference to the subscription network is used.

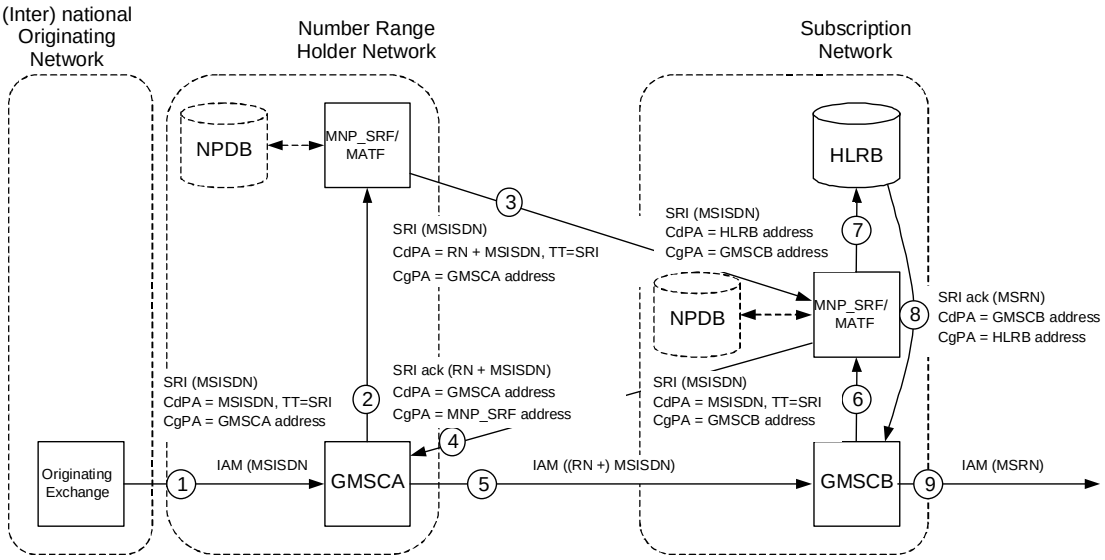


Figure C.3.5: National or international originated call to a ported number where indirect routeing with reference to the subscription network is used

1. From an Originating Exchange a call is set up to MSISDN. The call is routed to the number range holder network.

2. When GMSCA in the number range holder network receives the ISUP IAM, it requests routeing information by submitting a MAP SRI to the MNP_SRF/MATF. The TT on SCCP may be set to 'SRI'.

3. When MNP_SRF/MATF receives the message, MNP_SRF/MATF operation is triggered. The MNP_SRF/MATF functionality analyses the MSISDN in the CdPA and identifies the MSISDN as being ported to another network. As the message is a SRI message, the MNP_SRF/MATF function relays the message to the subscription network by adding a routeing number to the CdPA which information may be retrieved from a database. After modifying the CdPA, the message is routed to the subscription network.

4. When MNP_SRF/MATF in the subscription network receives the SRI, it responds to the GMSCA in the number range holder network by sending a SRI ack with a RN + MSISDN.

5. GMSCA uses the (RN +) MSISDN to route the call to GMSCB in the subscription network; Depending on the interconnect agreement, the RN will be added in the IAM or not.

6. When GMSCB in the subscription network receives the ISUP IAM, it requests routeing information by submitting a MAP SRI to MNP_SRF/MATF. The TT on SCCP may be set to 'SRI'.

7. When MNP_SRF/MATF receives the message, MNP_SRF/MATF operation is triggered. The MNP_SRF/MATF functionality analyses the MSISDN in the CdPA and identifies the MSISDN as being ported into the network. The MNP_SRF/MATF function then replaces the CdPA by an HLRB address which information may be retrieved from a database. After modifying the CdPA, the message is routed to HLRB.

8. When HLRB receives the SRI, it responds to the GMSCB by sending an SRI ack with an MSRN that identifies the MSB in the VMSCB.

9. GMSCB uses the MSRN to route the call to VMSCB.

NOTE: The MNP_SRF/MATF in this scenario has only information about all ported numbers to one subscription network, except those for which subscription information is held in the subscription networks HLR. In this scenario the routeing depends always on the number range holder and the subscription network.

C.3.6 MNP Info Query - Direct Routeing

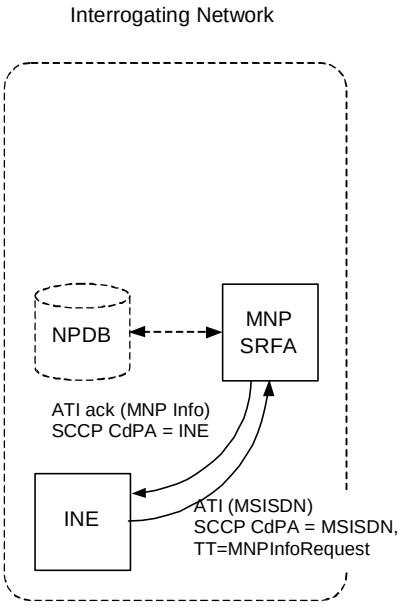


Figure C.3.6: MNP-SRF operation for providing MNP Information where direct routeing applies

In a PLMN using a MNP-SRF based MNP solution supporting direct routeing, the INE always sends the MNP information request, containing the CdPA, to the MNP-SRF in that network.

The INE may query the MNP information for the called party number or the calling party number.

The INE requesting MNP information may be a gsmSCF for prepaid services (see 3GPP TS 23.078 [18]).

~~Note:~~ In order to provide enough information for a CAMEL SCP to charge correctly for ~~charge~~ CAMEL Pre-Paid Calls and SMS to national MSISDNs originated in the HPLMN, operators should ensure that the NPDB contains, at least, MNP information for 'own numbers ported out' and 'foreign numbers ported in'.

C.3.7 MNP Info Query - Indirect Routeing

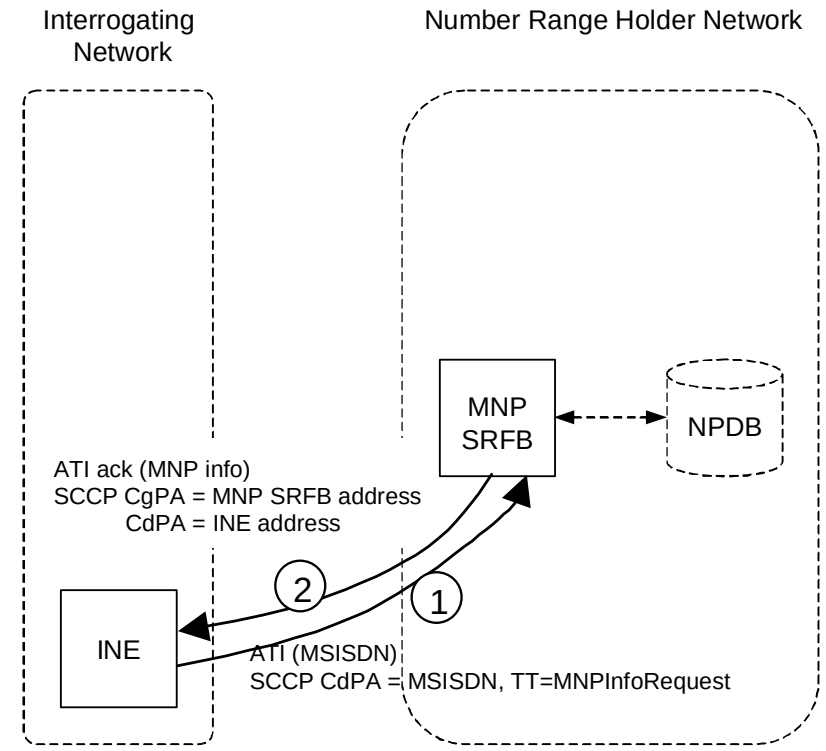


Figure C.3.7: MNP-SRF operation for Providing MNP information where indirect routeing applies

The Interrogating Network Entity (INE) submits a MNP Information request message to the MNP-SRFB, which triggers MNP-SRF operation. The MNP-SRF functionality analyses the MSISDN in the application level and queries an MNP database to get the MNP information. The INE may query the MNP information for the called party number or the calling party number.

The INE requesting MNP information may be a gsmSCF for prepaid services (see 3GPP TS 23.078 [18]).

C.4 Information Flows

Figure C.4.1 shows the information flow for a successful delivery of a call to a non-ported number or number ported into the network. The figure is related to figure C.3.1.

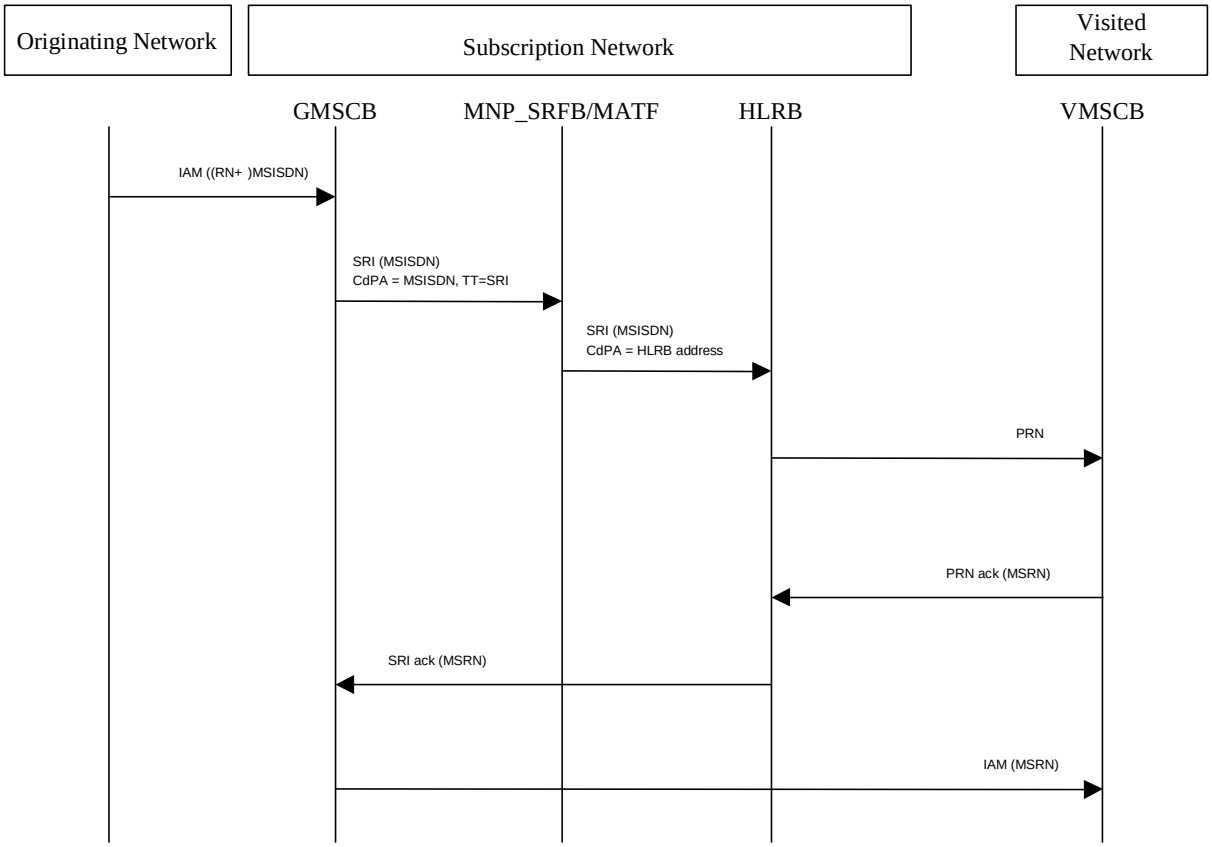


Figure C.4.1: Successful delivery of a call to a non-ported subscriber or number ported into the network

Figure C.4.2 shows the signalling involved for a call to a ported number via direct routeing where the call is originated in the subscription network. The figure is related to figure C.3.2.

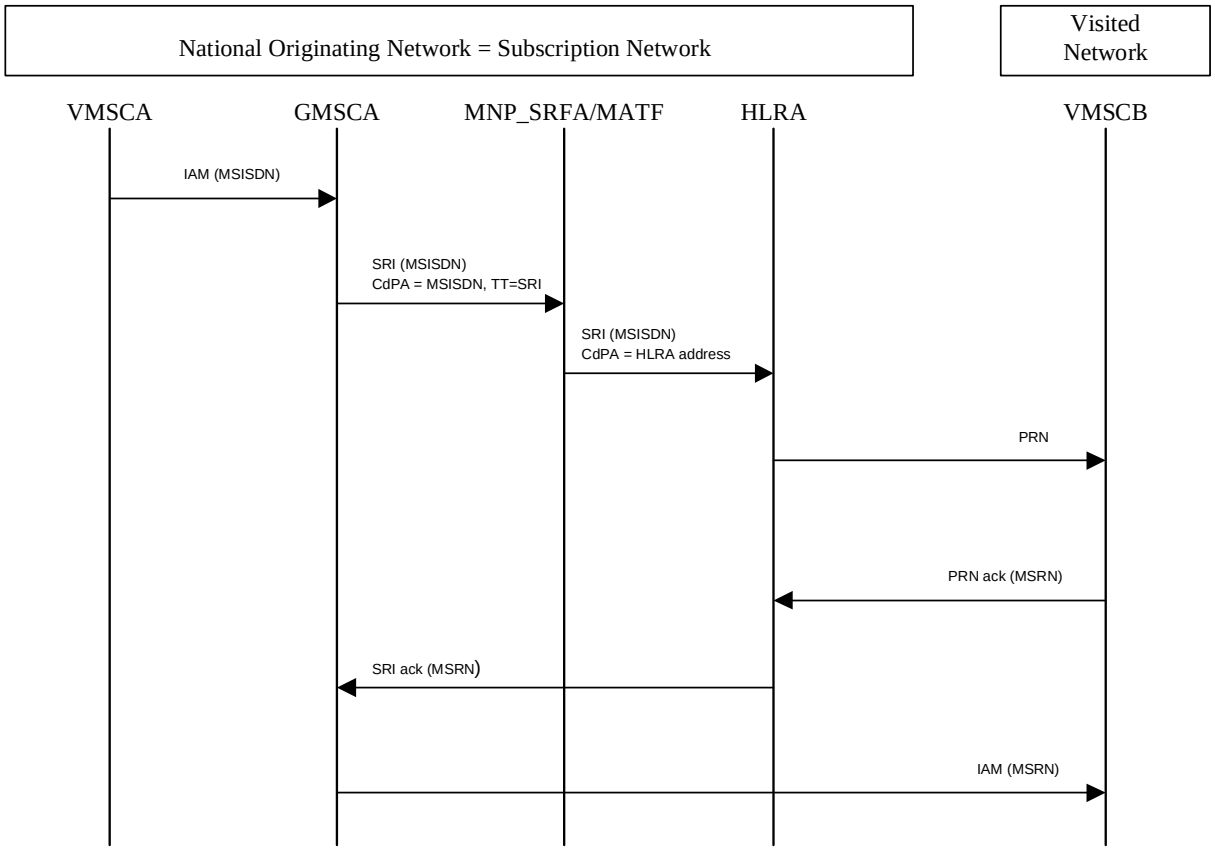


Figure C.4.2: Successful delivery of a call to a ported number via direct routeing where the call is originated in the subscription network

Figure C.4.3 shows the signalling involved for a national mobile originated call to a ported number via direct routeing. The figure is related to figure C.3.3.

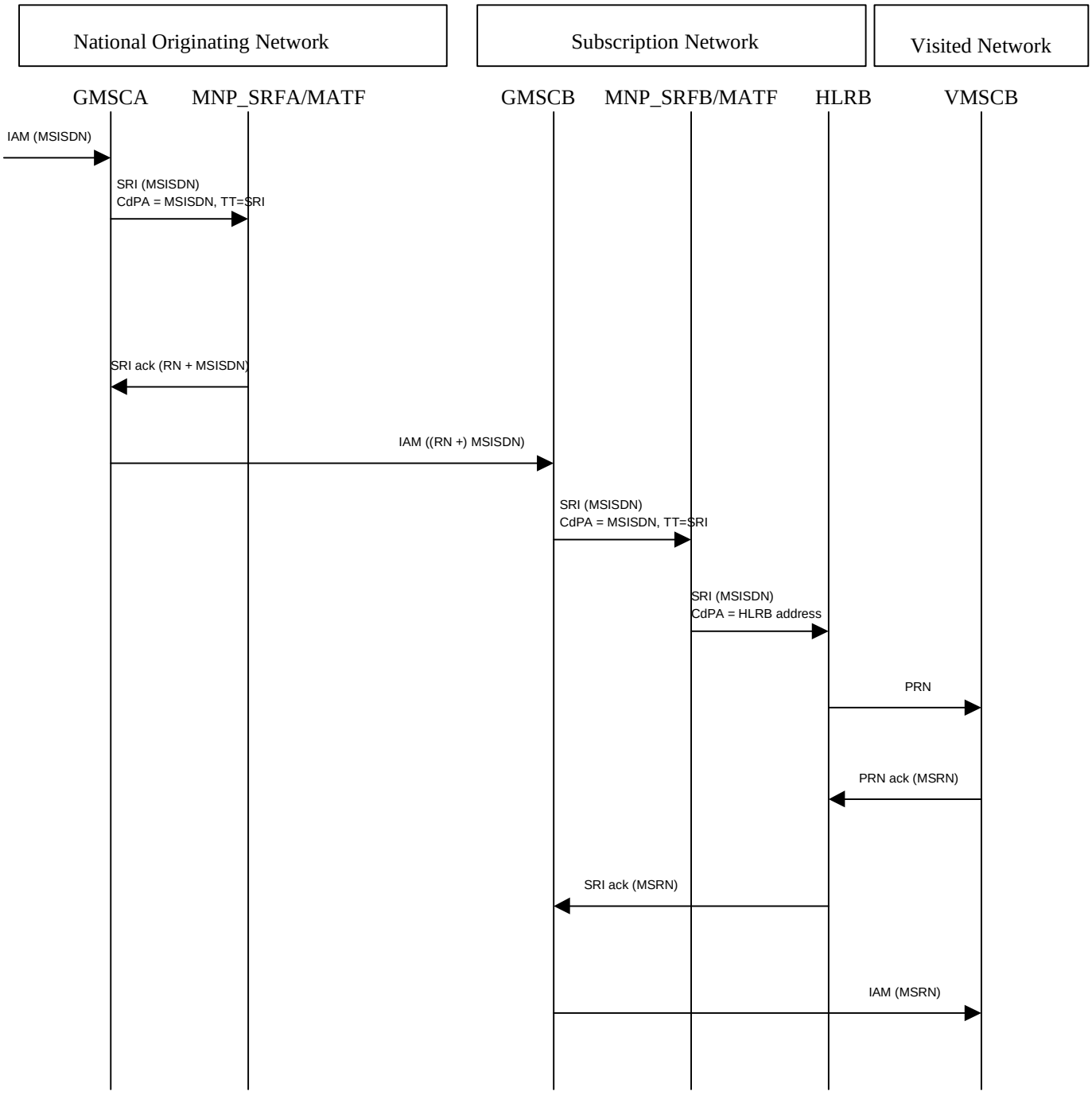


Figure C.4.3: Successful delivery of a national mobile originated call to a ported number via direct routeing

Figure C.4.4 shows the signalling involved for a national mobile originated call to a not known to be ported number via direct routeing. The figure is related to figure C.3.3.

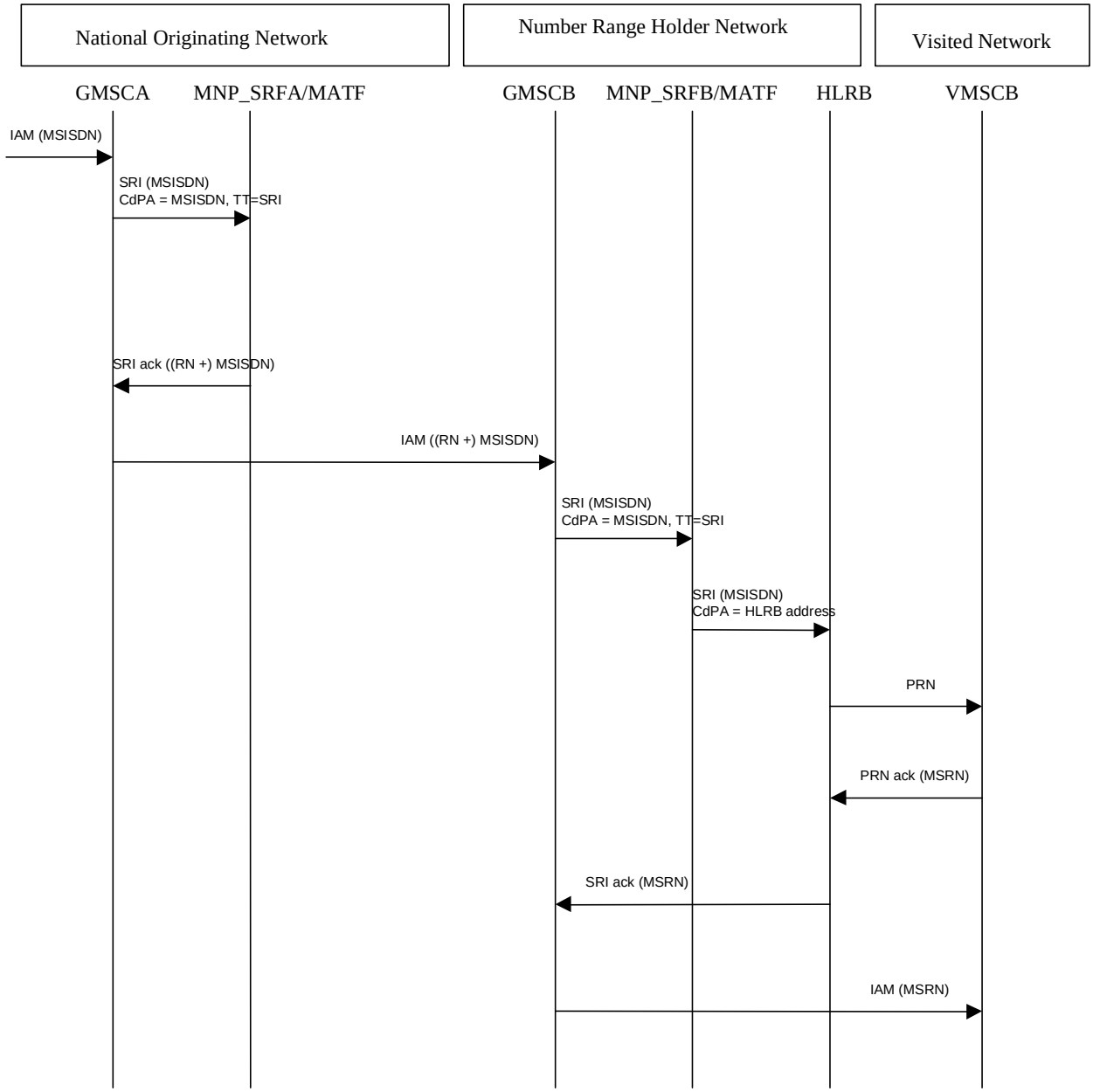


Figure C.4.4: Successful delivery of a national mobile originated call to a not known to be ported number via direct routeing

Figure C.4.5 shows the signalling involved for a call to a ported number via indirect routeing. The figure is related to figure C.3.4.

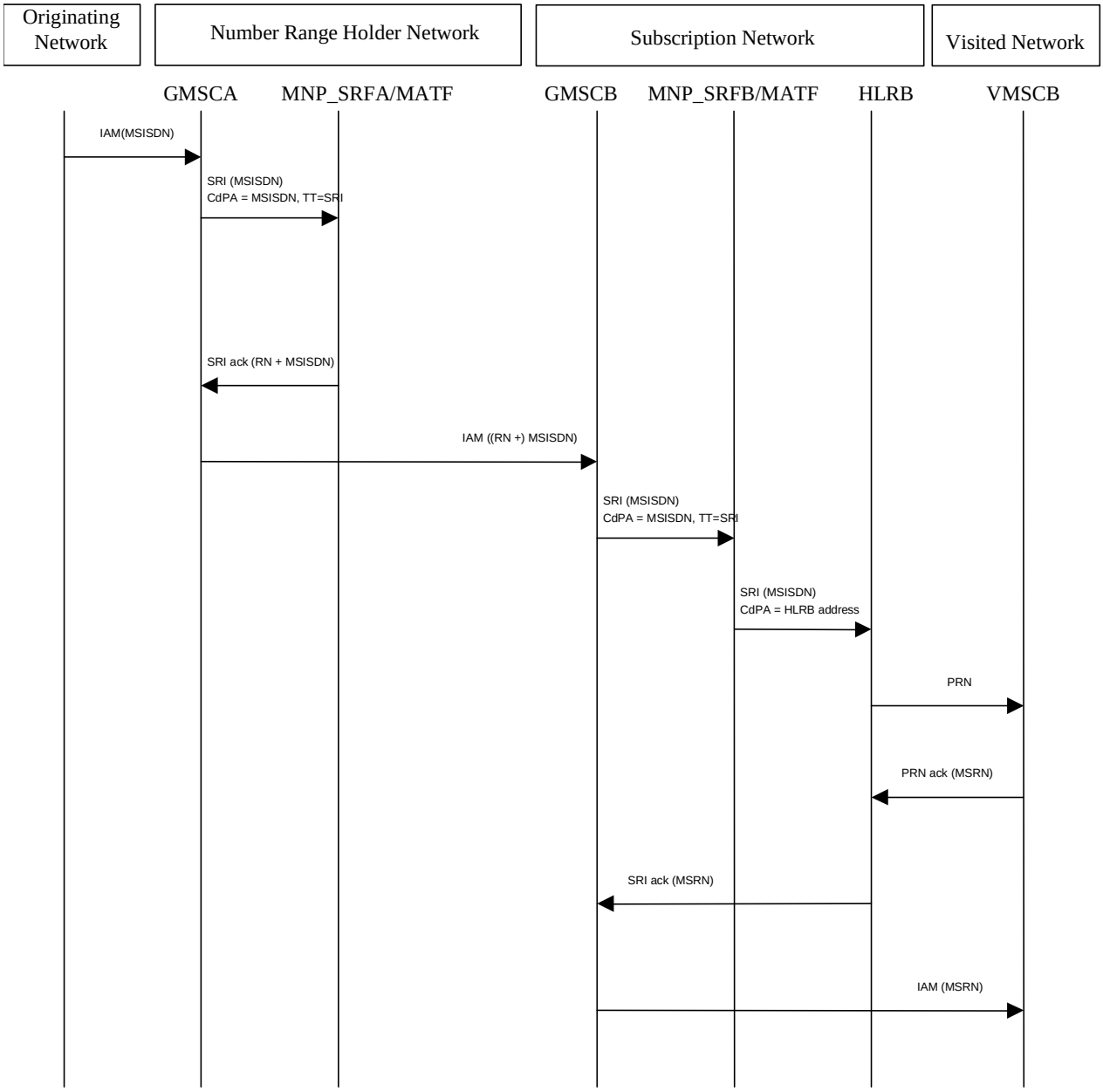


Figure C.4.5: Successful delivery of a call to a ported number via indirect routeing

Figure C.4.6 shows the signalling involved for a call to a ported number where indirect routeing with reference to the subscription network is used. The figure is related to figure C.3.5.

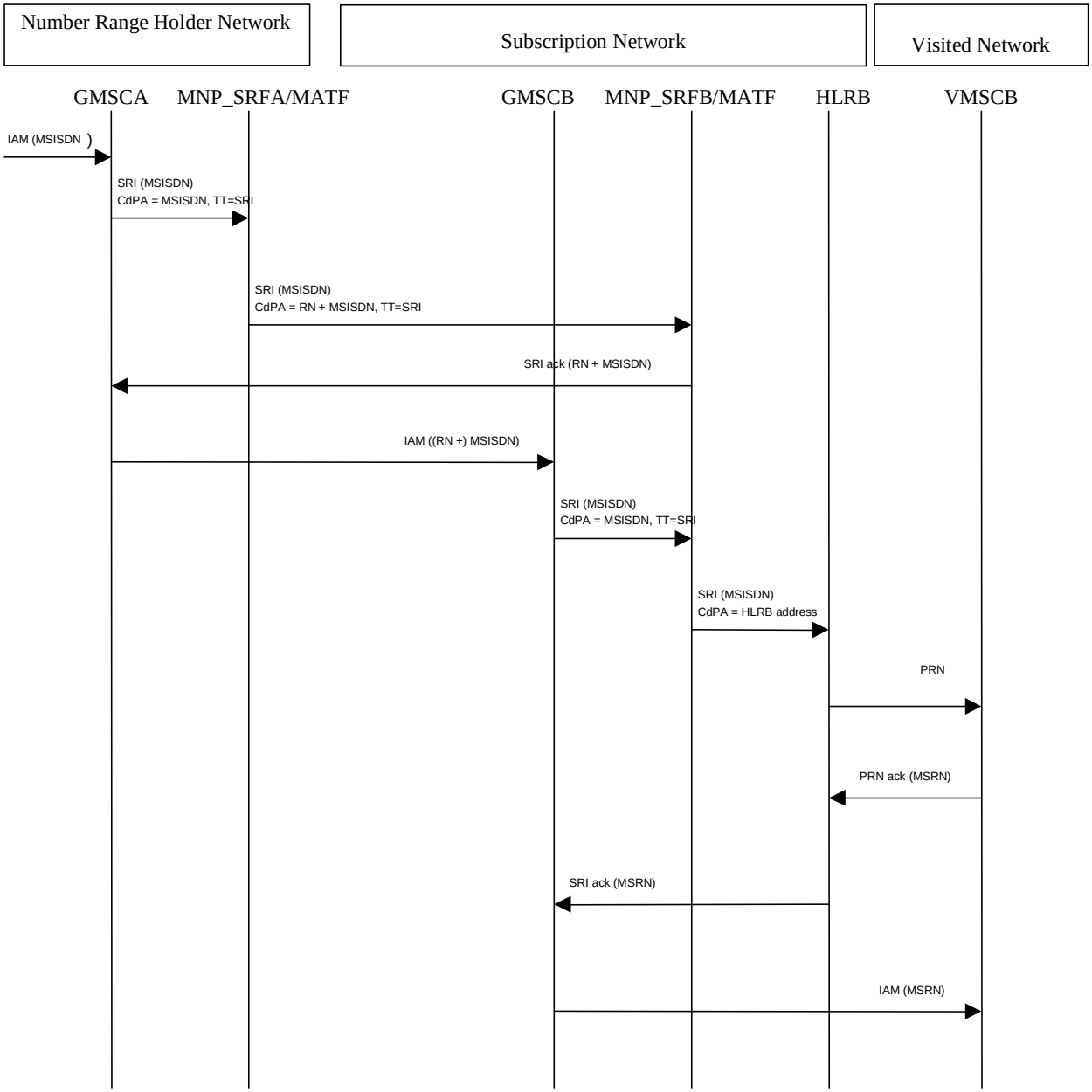


Figure C.4.6: Successful delivery for a call to a ported number where indirect routeing with reference to the subscription network is used

C.5 Contents of the messages

This clause contains detailed description of the messages shown in this part B of the specification.

The contents of the messages used on the gsmSCF – MNP-SRF interface are specified in 3G TS 23.078 [19]. When the message is sent from the NPLR to the gsmSCF, the MNP specific information are defined as in clause C.5.2. The gsmSCF may transit the information received from NPLR to the gateway MSC with the CAP Connect message in order to avoid a subsequent SRI message.

C.5.1 Send Routeing Info

The contents of this message are specified in 3G TS 23.018 [3].

C.5.2 Send Routeing Info ack

The contents of this message are specified in 3G TS 23.018 [3]. In the case that the message is sent from the NPLR to the GMSC, the following MNP specific information is defined:

Information element name	Required	Description
Imsi	M	The IMSI returned by an NPLR is a generic IMSI, i.e. it is not tied necessarily to the Subscriber. MCC and MNC values in this IMSI shall point to the Subscription Network of the B Subscriber
Msrn	C	When returned from the NPLR, this parameter contains a Routeing Number that points to Subscription Network. If concatenate addressing is used, it also contains the MSISDN in addition to the Routeing Number.In the case of a number which is not known to be ported, the Routeing Number may be omitted as an operator option. If the routeing number is omitted, this parameter contains only the MSISDN.
Msisdn	C	MSISDN of the B subscriber. This information element shall be present if MSRN contains the routeing number to reach the subscription network for B subscriber and the MSISDN is not contained in the MSRN information element.
MNP Indicator	U	Indicates the number portability status of the subscriber.

C.6 Handling of MAP to ISUP mapping (informative)

Different configurations can be possible within a portability domain depending on the versions of MAP and ISUP protocols being used. The following sections describe possible interworking scenarios.

C.6.1 ETSI Mapping direction: ISUP to MAP

The GMSC always constructs the Send Routeing Info message using the MSISDN. If the incoming IAM corresponds to a ported number the GMSC shall retrieve the MSISDN from the corresponding parameter in the IAM.

C.6.2 ETSI Mapping direction: MAP to ISUP

In MAP SRIack messages from NPLR, MAP versions 1 and 2 only support concatenate addressing for MNP. If MSISDN parameter is present in the SRIack, this means that separate addressing is used in MAP; this is only possible if MAP version 3 is used. MAP version 3 can also support concatenate addressing. In all cases, when a Routeing Number is returned, it is included in the MSRN parameter of the SRIack.

Regardless of how MAP is established, the possible mappings of the parameters in ISUP IAM message is one of these 4 options (see also [6]):

1. CdPN parameter includes only the MSISDN.
2. CdPN parameter includes both RN and MSISDN concatenated.
3. CdPN parameter includes the MSISDN and NRN parameter includes the Routeing Number.
4. CdPN parameter includes the Routeing Number and CDN parameter includes the MSISDN.

In all cases, the method to transport the routeing number in the IAM depends on the interfaces agreed by the operators in the portability domain.

C.6.3 ANSI Mapping direction: ISUP to MAP

The GMSC always constructs the Send Routeing Info message using the MSISDN. If the incoming IAM corresponds to a ported number the GMSC shall retrieve the MSISDN from the corresponding parameter in the IAM.

The IAM message is specified for ANSI ISUP implementation in [8] and [9].

C.6.4 ANSI Mapping direction: MAP to ISUP

In MAP SRIack messages from NPLR, MAP versions 1 and 2 only support concatenate addressing for MNP. If MSISDN parameter is present in the SRI Ack, this means that separate addressing is used in MAP; this is only possible if MAP version 3 is used. MAP version 3 can also support concatenate addressing. In all cases, when a Routeing Number is returned, it is included in the MSRN parameter of the SRI Ack.

Regardless of how MAP is established, the possible mappings of the parameters in ISUP IAM message is one of these 4 options (see also [8] and [9]):

MAP Parameters	SRI Ack		ISUP Parameters	IAM
IMSI	Subscriber IMSI		CdPN	MSRN
MSRN	MSRN	MAPS TO	GAP	N/A
MSISDN	Not Present		FCI Bit M Indicator	1
MNP Indicator	Not Present			

MAP Parameters	SRI Ack		ISUP Parameters	IAM
IMSI	Default IMSI		CdPN	Dialled DN
MSRN	Dialled DN	MAPS TO	GAP	N/A
MSISDN	Not Present		FCI Bit M Indicator	1
MNP Indicator	NotKnownToBePorted			

MAP Parameters	SRI Ack		ISUP Parameters	IAM
IMSI	Default IMSI		CdPN	RN
MSRN	RN	MAPS TO	GAP	Dialled DN
MSISDN	Dialled DN		FCI Bit M Indicator	1
MNP Indicator	OwnNumber PortedOut			

MAP Parameters	SRI Ack		ISUP Parameters	IAM
IMSI	Default IMSI		CdPN	RN
MSRN	RN	MAPS TO	GAP	Dialled DN
MSISDN	Dialled DN		FCI Bit M Indicator	1
MNP Indicator	Foreign Number PortedToForeign Network			

In all cases, the method to transport the routing number in the IAM depends on the interfaces agreed by the operators in the portability domain.

Annex D: Void

~~Annex D (normative):~~
~~Mobile Number Portability Information Request~~

~~MNP information can be requested by the gsmSCF to help determine the appropriate tariff to apply to a CAMEL pre-paid call or SM.~~

~~There are two solutions for MNP Information Request:~~

~~1.IN based~~

~~2.MNP SRF based~~

~~D.1 IN-based MNP Information Request~~

~~(See section A.1.4.3)~~

~~D.2 MNP-SRF-based MNP Information Request~~

~~D.2.1 Architecture~~

~~In a PLMN supporting MNP with direct routeing, where the called party number or the calling party number is within the ranges owned by any network in the portability domain, the INE sends a MNP Information request such that it will be handled by the MNP SRF in the network.~~

~~In a PLMN supporting MNP with indirect routeing, where the called party number or the calling party number is within the ranges owned by any network in the portability domain, the INE sends a MNP Information Requestsuch that it will be handled by the MNP SRF in the Number Range Holder Network.~~

~~The MNP SRF obtains the MNP information for a subscriber from the MNP database.~~

~~From the perspective of the PLMN in which the MNP SRF resides, the CdPA represents one of:~~

~~1. An own number ported out.~~

2. An own number not ported out.

3. A foreign number ported in.

4. A foreign number ported to a foreign network.

5. A number not known to be ported.

In all cases the MNP information request is sent to the MNP_SRF_MATF_Info_Request procedure/ MAP Application Termination Function (MATF) for handling. A response is sent to the INE containing MNP information or an error is returned.

D.2.1.1 Direct Routeing

In a PLMN using a MNP-SRF based MNP solution supporting direct routeing, the INE always sends the MNP information request, containing the CdPA, to the MNP-SRF in that network.

The INE may query the MNP information for the called party number or the calling party number.

The INE requesting MNP information may be gsmSCF for prepaid services (see 3GPP TS 23.078 [18]).

Note: In order to provide enough information for a CAMEL SCP to correctly charge CAMEL Pre-Paid Calls and SMS to national MSISDNs originated in the HPLMN, operators should ensure that the NPDB contains, at least, MNP information for 'own numbers ported out' and 'foreign numbers ported in'.

D.2.1.2 Indirect Routeing

The Interrogating Network Entity (INE) submits a MNP Information request message to the MNP-SRFB, which triggers MNP-SRF operation. The MNP-SRF functionality analyses the MSISDN in the application level and queries an MNP database to get the MNP information. The INE may query the MNP information for the called party number or the calling party number.

The INE requesting MNP information may be gsmSCF for prepaid services (see 3GPP TS 23.078 [18]).

D.2.3 Functional Requirements of Network Entities

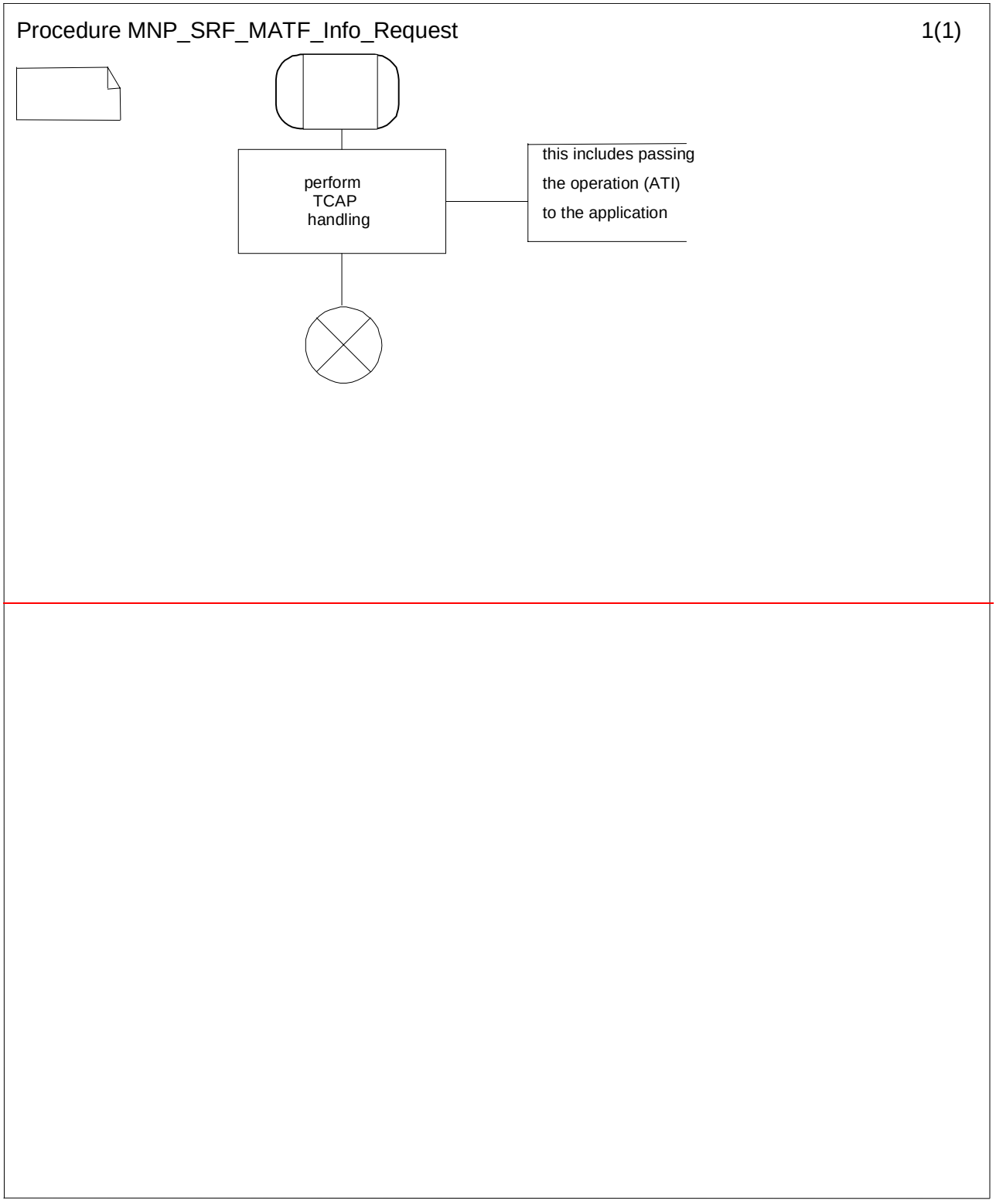
D.2.3.1 Procedure MNP_SRF_MATF_Info_Request

Figure D.2.3.1 shows the procedure MNP_SRF_MATF_Info_Request. This procedure handles an information request signalling message to provide MNP information for a subscriber. It is called from the process MNP_SRF (see clause 4.3).

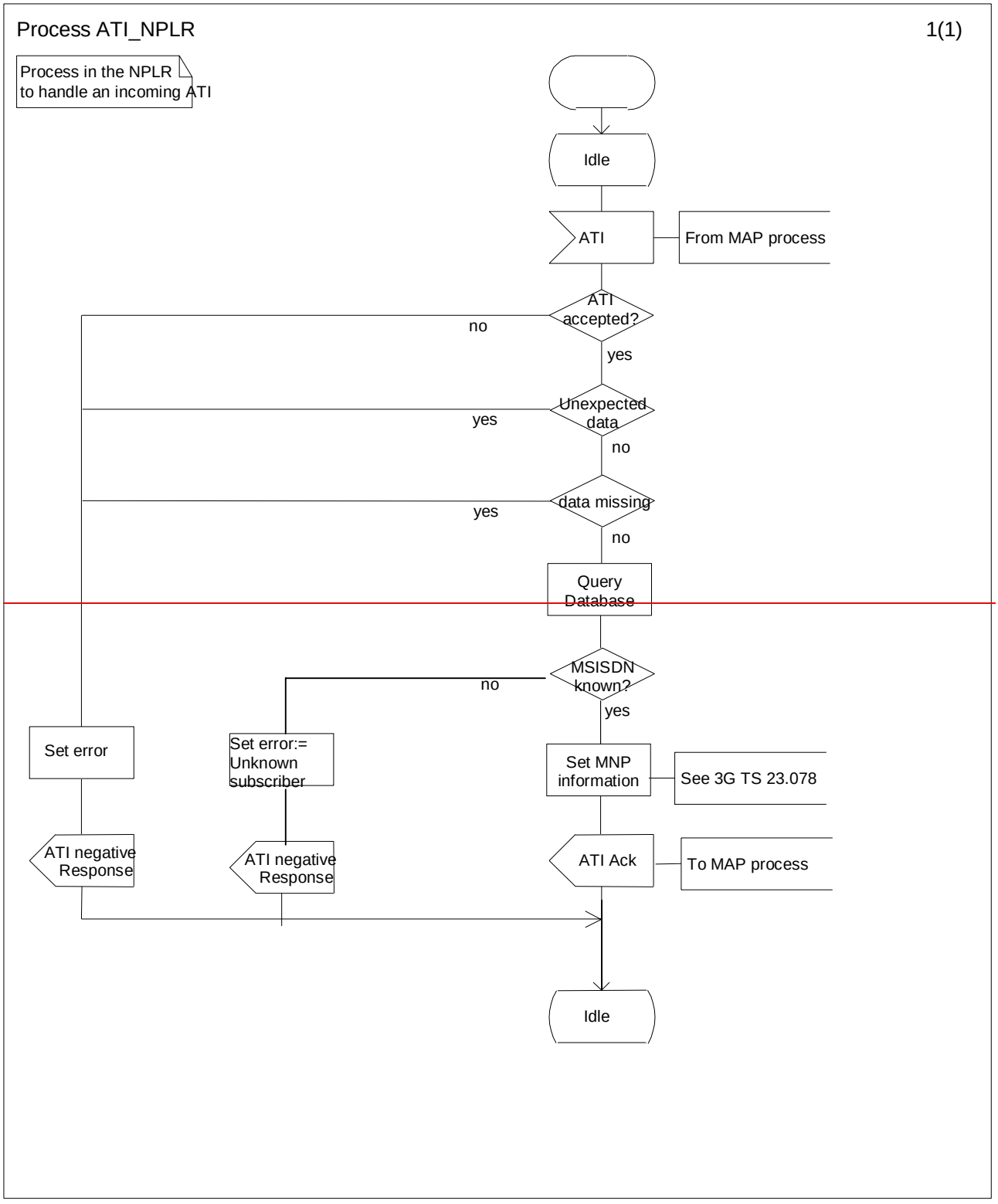
D.2.3.2 Process ATI_NPLR

Figure D.2.3.2 shows the process ATI_NPLR.

~~The database query uses the MSISDN received at the application level in the ATI, rather then the CdPA of the SCCP level.~~



~~Figure D.2.3.1: Procedure MATF_Info_Request~~



~~Figure D.2.3.2: Process ATI_NPLR~~

~~D.2.4 Contents of Messages~~

~~The contents of the messages used on the SCF – MNP-SRF interface are specified in 3G TS 23.078 [19].~~

Annex EDE (informative): Change history

3GPP TSG CN WG4 Meeting #21 **N4-031341**
Bangkok, THAILAND, 27th – 31st October 2003

CR-Form-v7

CHANGE REQUEST

⌘ **29.002** **CR** **675** ⌘ **rev** **2** ⌘ Current version: **5.7.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	MNP correction for prepaid charging
Source:	⌘	CN4
Work item code:	⌘	MNP
Date:	⌘	30/10/2003
Category:	⌘	**F**
Release:	⌘	Rel-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	During the discussion on CR 29.002-615 and CR 23.066-026 in CN4#20 several modifications to those CRs have been agreed. Unfortunately when reviewing the revised versions of these CRs CN4#20 found that they did not reflect the agreed modifications. Due to lack of time and since it was believed that the missing corrections are "nearly editorial" CN4#20 approved those CRs as being technically correct but improvable. CN#21 have allowed further non critical corrections on this issue. This CR provides the modifications which were already agreed in CN4#20.
Summary of change:	⌘	Replace MNP-SRF with NPLR, various editorials;
Consequences if not approved:	⌘	Misalignment of specifications

Clauses affected:	⌘	

Other specs affected:	⌘	Y	N		⌘	
		X		Other core specifications		23.066 CR 028
			X	Test specifications		
			X	O&M Specifications		

Other comments:	⌘	

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Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm.
Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

7.6.3.92 MNP Requested Info

This parameter indicates by its presence that~~-~~ Mobile Number Portability (MNP) information ~~are~~ is requested for the subscriber, as defined in 3GPP TS 23.078 [98].

7.6.3.93 MNP Info Result

This parameter refers to the Mobile Number Portability (MNP) information result (see 3GPP TS 23.078 [98] and 3GPP TS 23.066 [108]). This parameter may contain~~s~~ the following information:

- Routeing Number (see clause 7.6.2.59).
- IMSI (see 3GPP TS 23.078[98], see also clause 7.6.2.1).
- MSISDN (see clause 7.6.2.17).
- Number Portability Status (see clause 7.6.5.14).

.....

8.11 Subscriber Information services

8.11.1 MAP-ANY-TIME-INTERROGATION service

8.11.1.1 Definition

This service is used by the gsmSCF, to request information (e.g. subscriber state and location) from the HLR or the GMLC at any time. This service may also be~~is~~ used by the gsmSCF to request the Mobile Number Portability (MNP) information from the NPLR~~MNP Signalling Relay Function (MNP SRF) at any time whenever the Mobile Number Portability applies in the country~~.

When this service is used to the HLR, the subscriber state or location may be requested.

When this service is used to the GMLC, only the location may be requested.

When this service is used to the NPLR~~MNP SRF~~, only the MNP information may be requested.

The MAP-ANY-TIME-INTERROGATION service is a confirmed service using the service primitives defined in table 8.11/1.

8.11.1.2 Service primitives

Table 8.11/1: Any_Time_Interrogation

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
Requested Info	M	M(=)		
Requested domain	C	C(=)		

MNP Requested Info	C	C(=)		
gsmSCF-Address	M	M(=)		
IMSI	C	C(=)	C	C(=)
MSISDN	C	C(=)	C	C(=)
Location Information			C	C(=)
Location Information for GPRS			C	C(=)
Subscriber State			C	C(=)
PS Subscriber State			C	C(=)
IMEI			C	C(=)
MS Classmark 2			C	C(=)
GPRS MS Class			C	C(=)
MNP info Result			C	C(=)
User error			C	C(=)
Provider error				O

.....

17.2.2.31 Any time information enquiry

This operation package includes the operations required for any time information enquiry procedures between gsmSCF and HLR or between gsmSCF and GMLC or between gsmSCF and NPLR~~MNP SRF~~.

```
anyTimeInformationEnquiryPackage-v3  OPERATION-PACKAGE ::= {
     -- Supplier is HLR or GMLC or NPLR~~MNP SRF~~ if Consumer is gsmSCF
     CONSUMER INVOKES {
          anyTimeInterrogation} }
```

This package is v3 only.

.....

17.3.2.29 Any time information enquiry

This application context is used between gsmSCF and HLR or between gsmSCF and GMLC or between gsmSCF and NPLR~~MNP SRF~~ for any time information enquiry procedures.

```
anyTimeInfoEnquiryContext-v3 APPLICATION-CONTEXT ::= {
     -- Responder is HLR or GMLC or NPLR~~MNP SRF~~ if Initiator is gsmSCF
     INITIATOR CONSUMER OF {
          anyTimeInformationEnquiryPackage-v3}
     ID   {map-ac anyTimeInfoEnquiry(29) version3(3)} }
```

This application-context is v3 only.

.....

17.7.1 Mobile Service data types

.....

```
MNPInfoRes ::= SEQUENCE {
     routeingNumber                    [0] RouteingNumber               OPTIONAL,
     imsi                              [1] IMSI                         OPTIONAL,
     msisdn                            [2] ISDN-AddressString           OPTIONAL,
     numberPortabilityStatus           [3] NumberPortabilityStatus      OPTIONAL,
     extensionContainer                [4] ExtensionContainer           OPTIONAL,
     ... }

--   The IMSI parameter contains a generic IMSI, i.e. it is not tied necessarily to the
--   Subscriber. MCC and MNC values in this IMSI shall point to the Subscription Network of
--   the B or A Subscriber. See 3GPP TS 23.066 [108].
```

3GPP TSG CN WG4 Meeting #21 **N4-031342**
Bangkok, THAILAND, 27th – 31st October 2003

CR-Form-v7

CHANGE REQUEST

⌘ **29.002** **CR** **676** ⌘ **rev** **2** ⌘ Current version: **6.3.0** ⌘

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Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	MNP correction for prepaid charging
Source:	⌘	CN4
Work item code:	⌘	MNP
Date:	⌘	30/10/2003
Category:	⌘	**A**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
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Use one of the following releases:
2 *(GSM Phase 2)*
R96 *(Release 1996)*
R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
Rel-4 *(Release 4)*
Rel-5 *(Release 5)*
Rel-6 *(Release 6)*

Reason for change:	⌘	During the discussion on CR 29.002-615 and CR 23.066-026 in CN4#20 several modifications to those CRs have been agreed. Unfortunately when reviewing the revised versions of these CRs CN4#20 found that they did not reflect the agreed modifications. Due to lack of time and since it was believed that the missing corrections are "nearly editorial" CN4#20 approved those CRs as being technically correct but improvable. CN#21 have allowed further non critical corrections on this issue. This CR provides the modifications which were already agreed in CN4#20.
Summary of change:	⌘	Replace MNP-SRF with NPLR, various editorials;
Consequences if not approved:	⌘	Misalignment of specifications

Clauses affected:	⌘	

Other specs affected:	⌘	Y	N		⌘	
		X		Other core specifications		23.066 CR 028
			X	Test specifications		
			X	O&M Specifications		

Other comments:	⌘	

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1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

7.6.3.92 MNP Requested Info

This parameter indicates by its presence that Mobile Number Portability (MNP) information is~~are~~ requested for the subscriber, as defined in 3GPP TS 23.078 [98].

7.6.3.93 MNP Info Result

This parameter refers to the Mobile Number Portability (MNP) information result (see 3GPP TS 23.078 [98] and 3GPP TS 23.066 [108]). This parameter may contain~~s~~ the following information:

- Routeing Number (see clause 7.6.2.59).
- IMSI (see 3GPP TS 23.078[98], see also clause 7.6.2.1).
- MSISDN (see clause 7.6.2.17).
- Number Portability Status (see clause 7.6.5.14).

.....

8.11 Subscriber Information services

8.11.1 MAP-ANY-TIME-INTERROGATION service

8.11.1.1 Definition

This service is used by the gsmSCF, to request information (e.g. subscriber state and location) from the HLR or the GMLC at any time. This service may also be~~is~~ used by the gsmSCF to request the Mobile Number Portability (MNP) information from the NPLR~~MNP Signalling Relay Function (MNP SRF) at any time whenever the Mobile Number Portability applies in the country~~.

When this service is used to the HLR, the subscriber state or location may be requested.

When this service is used to the GMLC, only the location may be requested.

When this service is used to the NPLR~~MNP SRF~~, only the MNP information may be requested.

The MAP-ANY-TIME-INTERROGATION service is a confirmed service using the service primitives defined in table 8.11/1.

8.11.1.2 Service primitives

Table 8.11/1: Any_Time_Interrogation

Parameter name	Request	Indication	Response	Confirm
Invoke id	M	M(=)	M(=)	M(=)
Requested Info	M	M(=)		
Requested domain	C	C(=)		

MNP Requested Info	C	C(=)		
gsmSCF-Address	M	M(=)		
IMSI	C	C(=)	C	C(=)
MSISDN	C	C(=)	C	C(=)
Location Information			C	C(=)
Location Information for GPRS			C	C(=)
Subscriber State			C	C(=)
PS Subscriber State			C	C(=)
IMEI			C	C(=)
MS Classmark 2			C	C(=)
GPRS MS Class			C	C(=)
MNP info Result			C	C(=)
User error			C	C(=)
Provider error				O

.....

17.2.2.31 Any time information enquiry

This operation package includes the operations required for any time information enquiry procedures between gsmSCF and HLR or between gsmSCF and GMLC or between gsmSCF and NPLR~~MNP SRF~~.

```
anyTimeInformationEnquiryPackage-v3  OPERATION-PACKAGE ::= {
     -- Supplier is HLR or GMLC or NPLR~~MNP SRF~~ if Consumer is gsmSCF
     CONSUMER INVOKES {
          anyTimeInterrogation} }
```

This package is v3 only.

.....

17.3.2.29 Any time information enquiry

This application context is used between gsmSCF and HLR or between gsmSCF and GMLC or between gsmSCF and NPLR~~MNP SRF~~ for any time information enquiry procedures.

```
anyTimeInfoEnquiryContext-v3 APPLICATION-CONTEXT ::= {
     -- Responder is HLR or GMLC or NPLR~~MNP SRF~~ if Initiator is gsmSCF
     INITIATOR CONSUMER OF {
          anyTimeInformationEnquiryPackage-v3}
     ID   {map-ac anyTimeInfoEnquiry(29) version3(3)} }
```

This application-context is v3 only.

.....

17.7.1 Mobile Service data types

.....

```
MNPInfoRes ::= SEQUENCE {
     routeingNumber                    [0] RouteingNumber               OPTIONAL,
     imsi                              [1] IMSI                         OPTIONAL,
     msisdn                            [2] ISDN-AddressString           OPTIONAL,
     numberPortabilityStatus           [3] NumberPortabilityStatus      OPTIONAL,
     extensionContainer                [4] ExtensionContainer           OPTIONAL,
     ... }

--   The IMSI parameter contains a generic IMSI, i.e. it is not tied necessarily to the
--   Subscriber. MCC and MNC values in this IMSI shall point to the Subscription Network of
--   the B or A Subscriber. See 3GPP TS 23.066 [108].
```