Telekommunikationsindustrien i Danmark
Telecommunication Industries Association in Denmark

Technical Group on Number Portability

Addendum
Rules and procedures on Number Portability

Additional requirements for Mobile network to Mobile network Number Portability (MNP) and Fixed network to/from Mobile network Number Portability (FMNP)

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1. Contents

Foreword

This specification is an addendum to the technical Rules and Procedures on Number Portability, version 1.0, October 1997, Telekommunikationsindustrien i Danmark.

The numbering of clauses in this addendum is referring to the numbering in the main document.

2. Scope *(additions)*

This technical specification has been prepared by the Telekommunikationsindustrien in Denmark. It defines network interconnect rules and procedures to be followed by network operators in Denmark when Number Portability is introduced in and between Mobile networks (MNP) and between Fixed networks and Mobile networks (FMNP).

Fixed network to Fixed network Number Portability (FNP) is for the call related case described in [5]. This specification is an addendum to the FNP specification.

The rules and procedures for the call related case decribed in [5] is also applicable for MNP and FMNP.

This specification describes the additional requirements to be used for call related and non-call related signalling (SCCP messages) in a Number Portability environment. The non-call related case is mandatory for the Short Message Service when Number Portability between mobile networks is introduced.

Introduction of supplementary services between two network operators (in all combinations of Number Portability between mobile and fixed networks) is not within scope of this document. However, when a supplementary service applying non-call related signalling is introduced between two network operators, then this specification shall be followed.

This specification gives the additional requirements to the administrative interface to provide information about subscribers connected to mobile networks.

Furthermore this specification gives the additional requirements to inclusion of mobile network origin for calls from a calling party having a ported number in a mobile network.

For MNP this specification is based on ETSI EN 301 716 [7] using the direct routing method.

The call related case is based on ETSI EN 302 097 [8] by use of the all call query method, but including an optional use of a query on release method as described in an annex to [8]. However, the use of a specific Nature of Address indicator (NoA 112) and a non-concatenated addressing method in the interface between network operators is a specific Danish adoption. This choice was made before the ETSI specification was finalized and it is felt too risky in a short term to change the principles already introduced for FNP in the Danish network.

Specifications for the non-call related case is yet not finalized in ITU-T / ETSI, but the principles choocen in this specification are in line with the intention in the international organisations not to change the SCCP protocol itself, but rather to define a new functionality triggered by existing element in the SCCP (or TCAP) protocol.

3. References *(additions)*

[5]
Rules and Procedures on Number Portability, version 1.0, October 1997, Telekommunikationsindustrien i Danmark

[6] ETSI ETS 300 009
Integrated Services Digital Network (ISDN); Signalling System No. 7; Signalling Connection Control Part (SCCP) [connectionless and connection-oriented] to support international interconnection

[7] ETSI EN 301 716
Digital cellular telecommunications system (phase 2+); Support of Mobile Number Portability (MNP); Technical realization; Stage 2

[8] ETSI EN 302 097
Integrated Services Digital Network (ISDN); Signalling System No.7 (SS7); ISDN User Part ISUP); Enhancements for support of Number Portability (NP) [ITU-T Recommendation Q.769.1 (2000), modified]

[9]
Rules and Procedures for Number Portability (Administrative & IT Processes), version 1.0, 28. January 2000, Telekommunikationsindustrien i Danmark

4. Definitions *(additions)*

FMNP
Fixed network to/from Mobile network Number Portability

FNP
Fixed network to fixed network Number Portability

GT
Global Title.

Invoking SCCP user entity
The entity at the originating side where an application is invoking a service. Messages sent from the invoking SCCP user entity is called forward messages in this document. The service invoke operation is transferred in the 1st forward message.

MNP
Mobile network to mobile network Number Portability

Responding SCCP user entity
The entity at the destination side where an application is responding to a service invoke. The suscriber who the service invoke is directed to, is called the served subscriber. the Messages sent from the responding SCCP user entity is called backward messages.

SCA
Service Centre Address of the end node serving the calling user or the called user.

SRA
SCCP Routing Address used to route a SCCP message to the recipient network.

5. Routing, charging and accounting principles *(additions)*

5.7 General aspects on routing in the SCCP network (additional clause)

Some services in the fixed and/or mobile network requiring non-call related signalling make use of an addressing method, where the 1st message in a dialogue invoking the service includes the directory number of the served subscriber in the called party address at the SCCP level. In a number portability environment the directory number is not applicable any more for routing the message via the SCCP network to the rigth destination in case the number is ported. Therefore it is necessary to introduce a mechanism in the SCCP network which makes it possible to query the number data base for routing information to be used to route the messages to the final destination. In order to minimize the load on the number data base and to optimize the routing in the SCCP network, it could be desirable for some network operators if the message flow following the 1st message (backward and forward) could be handled in the SCCP network without involving the number data base. For this purpose exchanging of Service Centre addresses during the initial phase of the invoke/response process is recommended.

Design of model and methods in the SCCP network for checking whether a number is ported or not is up to the network operator. This means that the possibility of reusing retained call information for call completion services also is a network operator decision. Furthermore it is a network operator decision whether to make data base look-up for all SCCP messages or only for the 1st message in a dialogue.

5.8 Normal procedures for routing in the SCCP network (additional clause)

The normal procedure is the procedure to be followed if no agreement exists for using the optional procedures described in subclause 5.9.

When the originating network finds a number ported, then the GT in the SCCP called party address for the 1st forward message in a dialogue to be sent to the recipient network shall be modified. The modified address has the format SRA + directory number of the called subscriber as described in subclause 10.1.

When the originating network finds a number not ported, then the GT in the SCCP called party address for the 1st forward message shall not be modified.

The OLE shall include its own SCA in the SCCP calling party address. The format of the SCA is also described in subclause 10.1.

A SCCP transit network shall be able to route messages based on the SRA (different from own SRA) included in the GT in the SCCP called party address.

On receipt of a SCCP message in the recipient network the following guidance may be applied for performing an analysis on the GT in the SCCP called party address.

i. If the GT contains a SRA belonging to own network a data base look-up shall be performed in order to find the final destination.

ii. If the GT contains a SCA a data base look-up is not necessary (however not forbidden).

iii. If the GT received via a national interconnect does not contain a SRA or a SCA, then a data base look-up is not necessary.

iv. If the GT recived via an international interface does not contain a SRA or a SCA, then a data base look-up is necessary.

Detection of GT's containing a SRA can be based on the fact that such an address contains a unique 4 - 6 digit prefix (number series not used for other purposes) defined by each network operator.

Detection of GT's containing a SCA can be based on the fact that such addresses belong to unique number series defined by each network operators.

5.9 Possibility for other procedures for routing in the SCCP network (additional clause)

This specification does not exclude the possibility of using other procedures for routing messages between two network operators based on bilateral agreement, e.g. to open for the option that an originating network could route its SCCP message directly to a SCCP relay point in another network which handles the data base look-up.

5.10 Abnormal procedures for routing in the SCCP network (additional clause)

Indefinite looping shall be prevented. The preferred procedure is as follows. If the reciepient network receives a SCCP message containing a SRA in the GT in the SCCP called party address belonging to the own network and the data base look-up detects a destination outside own network, then the SCCP message shall be rejected and if *'return option'* is set a UDTS message containing a return cause *'no translation for this specific address'(1)* shall be sent back.

As an interim solution a network not supporting the above mentioned procedure may stop the signalling by discarding a message if the SRA does not match the destination.

6. Supplementary Services *(corrections)*

6.2 Services using Transaction Capabilities (corrections)

When services using Transaction Capabilities/Signalling Connection Control Part, e.g. Message Waiting Service, Call Completion to Busy Subscriber, are introduced, then the SCCP routing mechanism desribed in the subclauses 5.7 – 5.10 shall be used.

7. Service numbers

No additional requirements identified.

8. The Administrative interface *(additions and clarifications)*

The following additions and clarifications have to be taken into account for the information identified as needed for the technical solution and to be supplied by the operator in charge of the ported number. The main purpose of the following additions is to be able to exchange information to be used for charging and routing of calls depending on which type of network / subscriber class the number is ported to.

This clause is informative. The normative requirements for the Administrative interface are given in [9].

Telephone Number	The number that is being ported.
Operator Identity *(clarification)*	Identity of the operator to which the Telephone Number is ported. *Seen from a network perspective the Operator Identity shall point out the physical network the directory number is assigned to. It is however allowed to exchange another Operator Identity via the administrative interface, e.g. for a number ported to a service provider, but in this case such an Operator Identity shall be handle in the same way – e.g. by mapping – as the Operator Identity for the physical network.*
Geographical Information *(clarification)*	The district (that is "Kommune") where the Telephone Number is assigned to. This parameter is used – if instructed by the Porting Case - in relevant cases to define the charging and to route the call to an interconnect in the relevant region. *For non-geographical networks this field shall be coded with the meaning 'whole Denmark'.*
Charging Information *(clarification)*	The equivalent number range (e.g. 4347 for numbers 43470000 to 43479999) to which the Telephone Number is ported, and has to be charged as belonging to this number range. In the originating network this information is used to charge the call if instructed by the porting case.
Interconnection Point (*clarification*)	The information is the Network Indicator + Signalling Point Code of the recipient exchange.

	This parameter is used in relevant cases to route the call to a local interconnect (terminating point).
Routing Information *(addition)*	The equivalent number range (e.g. 4347 for numbers 43470000 to 43479999) to which the Telephone Number is ported, and has to be routed as belonging to this number range. In the originating network this information is used to route the call if instructed by the Porting Case.
Porting Case *(addition)*	Information defining which parameters in the administrative interface that shall be used for routing and charging. The field Porting Case can have three values: `NonPorted´, `PortedWithGeo´ and `PortedNonGeo´. *For the `PortetWithGeo´ case the routing is based on Operator Identity, Geographical Information and Interconnection Point (as used for the current porting of numbers to fixed networks). The charging is based on the same information except the Interconnection Point.* *For the `PortedNonGeo´ case the routing is based on Routing Information and the charging is based on Charging Information (used for numbers ported to GSM networks and other non geografical networks (like 70, 80, 90 and 721 numbers).*

Reminder:
The existing FNP solution does not make use of Porting Case, Charging Information and Routing Information. Seen from a network perspective, there should be made a migration plan for the conversion from the current administrative interface (phase 1) to the new environment (phase 2). One point identified is, that all the networks should be updated to phase 2 before the administrative interface (OCH) is changed. This means that an updated network shall be able to handle 'phase 1' information. In other words if the Charging Information is coded '0' and the Porting Case and Routing Information are missing, then this should be interpreted as default charging (based on operator identity and geographical information) and default routing (based on Operator Identity, Geographical Information and Interconnection Point) to the other operators fixed network.
It is recommended that all parameters used for routing and charging must be given in the NP create for validation in OCH (or alternatively to be validated by the donor). OCH must be provided with a list of valid equivalent number range values valid for the Charging Information and Routing Information respectively.

9. Clarifications of ISDN User Part parameters *(additions)*

In addition to the requirements given in [5] concerning the geographical location of the calling party, some services, e.g. service 70- and 80-, may require knowledge about whether the calling party is connected to a mobile network.

The requirements for indicating mobile origin are given in appendix A.

10. Clarifications of SCCP parameters *(additional clause)*

The requirements to the SCCP are given in the recommendation ETSI ETS 300 009 [5]. There is no additional requriments to the coding of the SCCP parameters. The following is only a clarification of the content of the address field in the GT in SCCP the calling/called party address. The content of the other fields of the parameters is only shown for information.

10.1 Format of called/calling party addresses in the 1st forward message

Called party address at SCCP level:

An unmodified (non-ported number) SCCP called party address shall in the interconnect contain the following information (the usual format for the called party address):

Address indicator:

Point code indicator:	The address does not contain a SPC (0) or the address contains a SPC (1). Inclusion of SPC is up to each network operator, but this information can under no circumstances be used for routing purposes between networks.
SSN indicator:	The address contains a SSN (1)
Global title indicator:	GT incluces TT, NP, encoding scheme and NoA (4)
Routing indicator:	Route on GT (0)

Address:

Signalling Point Code:	Optionally, but if included this field consists of the 14 bits signalling point code + 2 bits set to zero
Subsystem Number:	Mandatory and set as defined by the service, e.g. 11 for ISDN supplementary services
Global title:	Mandatory and for GT indicator 4 containing the following information: - Translation Type set as defined by the service, e.g. 0 for SMS - Encoding scheme set to 'BCD, odd number of digits' (1) or 'BCD, even number of digits' (2) - Numbering Plan set to 'ISDN/telephony NP (E.164)' (1) - Nature of Address set to 'national significant number' (3) or 'international number' (4) NOTE

- Global title address information containing the directory number of the served subscriber.

NOTE Called party addresses with NP = E.214 (e.g. used for location update in GSM) are not subject for number portability and look-up in the number data base is not required for messages containing such addresses.

A modified (ported number) SCCP Called Party Address shall in the interconnect contain the following information:

Address indicator:

Coded as for the unmodified case

Address:

Signalling Point Code: Coded as for the unmodified case

Subsystem Number: Coded as for the unmodified case

Global title: Mandatory and for GT indicator 4 containing the following information:
- Translation type coded as for the unmodified case
- Encoding scheme coded as for the unmodified case
- Numbering plan coded as for the unmodified case
- **Nature of Address set to 'national (significant) number' (3)**
- Global title address information containing the **SCCP Routing Address, SRA** and the national 8 digit directory number of the called subscriber (which means that the Country Code 45 shall be removed if received e.g. from the international network). **The SRA is a unique 5 digit prefix (a number serie not used for other purposes) defined by the (recipient) network operator, taken from the number series allocated by Telestyrelsen to this operator.**

Calling party address at SCCP level:

The calling party address at the SCCP level in the 1st forward message to be sent via the interconnect shall be coded as follows for dialogues originating i an exchange/node in the Danish network:

Address indicator:

Point code indicator: The address does not contain a SPC (0) or the address contains a SPC (1). Inclusion of SPC is up to each network operator, but

this information can under no circumstances be used for routing purposes between networks.

SSN indicator: The address contains a SSN (1)

Global title indicator: GT incluces TT, NP, encoding scheme and NoA (4)

Routing indicator: Route on GT (0)

Address:

Signalling Point Code: Optionally, but if included this field consists of the 14 bits signalling point code + 2 bits set to zero

Subsystem Number: Mandatory and set as defined by the service, e.g. 11 for ISDN supplementary services

Global title: Mandatory and for GT indicator 4 containing the following information:

- **Translation Type set to 0**
- Encoding scheme set to 'BCD, odd number of digits' (1) or 'BCD, even number of digits' (2)
- Numbering Plan set to 'ISDN/telephony NP (E.164)' (1)
- **Nature of Address set to 'international number' (4)**
- Global title address information containing the **Danish Country Code 45 followed by the Service Centre address for the invoking SCCP user entity. The Service Centre address shall belong to a unique number serie only containing such addresses (a network operator may decide to have from one to a limited number of number serie(s) containing Service Centre Addresses, taken from the number series allocated by Telestyrelsen to this operator).**

The format for a calling party address received from the international network is similar to the above coding except for the global title address information, which in this case contains a country code + n digits in accordance to the numbering scheme for the other country.

10.2 Format of the called/calling party addresses in the backward message(s)

Called party address at the SCCP level:

The calling party address received in the 1st forward message shall be used as the called party address in the 1st (and following) backward message(s) (swopped address).

Calling party address at the SCCP level:

The format of the calling party address in backward messages is the same as for the calling party address in the forward messages, but in this case the content of the Global title address information shall consists of the **Danish Country Code 45 followed by the Service Centre address for the responding SCCP user entity.**

10.3 2nd (and following) forward message(s)

Called party address at the SCCP level:

Global Title received in the calling party address in the 1st backward message shall be used in the called party address for the 2nd (and following) backward message(s).

Calling party address at the SCCP level:

The format is described in clause 10.1.

The following example shows the rules. It is seen, that the right node is receiving 487503 as Called Party Address, which could be a single telephone number on that node. The node itself, however, has got the Global Title 487599 attached to it (own GT). The requirement is, that the node is answering the message using its own Global Title as Calling Party Address, and not the received subscriber number 487503.

Appendix A

For the purpose given in clause 9 a call from a ported subscriber may as an option for bilateral agreement include information about the specific network origin (e.g. a number ported to a mobile network).

The desired solution is to use the location number for this purpose by application of the following rules:

For a number ported to a fixed network the format given in [5] for the location number is still valid.

For a number ported to a mobile network one of the following formats should be used for outgoing calls:

a) Location Number based on the E.164 numbering plan as defined in [5] by adding the following NDC:

National Destination Code:	For mobile networks the the field is structured 238xy, where xy is the Mobile Network Code as defined in 'Disponering af MNC-koder i Danmark - Nummerforhold / Disponering af nummerresourcer – nummerlister / Mobile Network Codes', Telestyrelsen (in the mobile world 238 is the Mobile Country Code for Denmark, but in the context of this document – and in order to simplify the management of codes - the whole 5 digits code 238xy should be considered as a National Destination Code). E.g the National Destination Code will be 23802 for Sonofon's mobile network. A network operator may choose only to provide this NDC for calls to relevant service numbers (11- (e.g. Directory service, 118), 70-, 80- and 90- number series).

b) Location Number based on the X.121 numbering plan (the format used internally in mobile networks). The call can then be interpreted as a mobile network originated call only on the fact that the numbering plan indicator is set to X.121.
(It is out of scope of this document to identify the needs for the location number to support national roaming).

Both for fixed network and mobile network originating calls the location number is inserted by the access network (not changed by a selected carrier).