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Transfer of number information in national interconnections based on SIP and SIP-I

An Application Guide for handling number information between public communications networks

Reference

ITS WG NI

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Foreword

This Application Guide has been produced by ITS Working Group Network Interworking (WG NI).

Introduction

This Application Guide is released in its first edition which describes the information elements to be used in the transfer of subscriber number information across the interfaces between public communications networks for national interconnection via SIP and SIP-I in Sweden. It also describes the functional contents of the SIP headers and SIP-I ISUP information elements. It does not deal with the corresponding internal information in each operator's network.

The document is concerned with technical issues. It is assumed that the public communications operators concerned sign mutual commercial agreements on interconnection, traffic cases, routing, services, traffic volumes, accounting procedures, prices, etc. The extent to which this guide shall be applied will be settled in those agreements. The public communications operators can agree on deviations from the present document.

Public communications networks are interconnected to enable the subscribers in the different networks to call each other (see Figure 1).

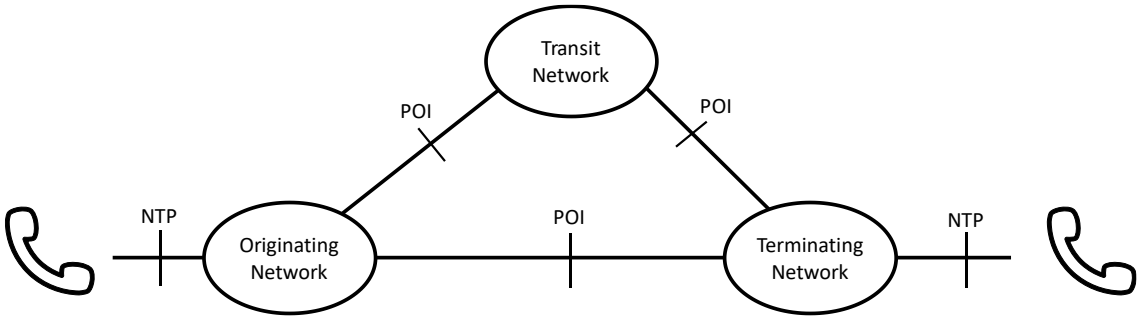

Figure 1: Interconnected public communication networks

A subscriber connected to one public communications network shall be able to use services in other public communications networks (see Figure 2).

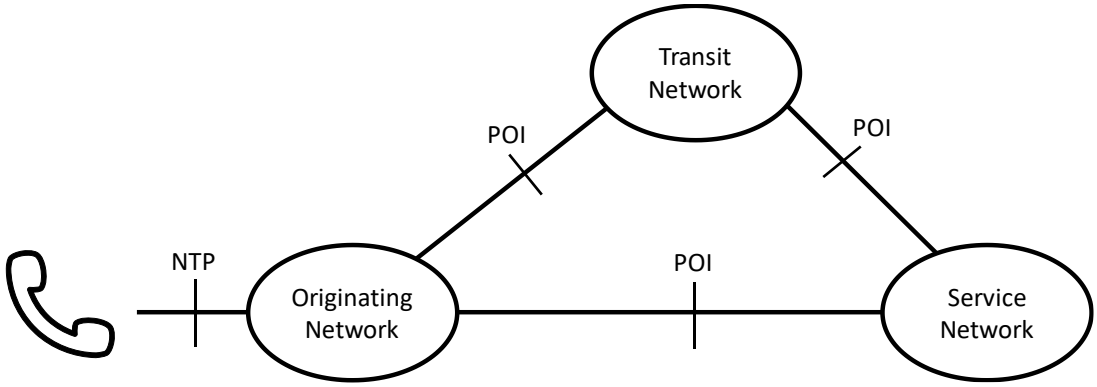

Figure 2: Use of services over networks

Services offered by public communications networks shall be capable of terminating in other public communications networks (see Figure 3).

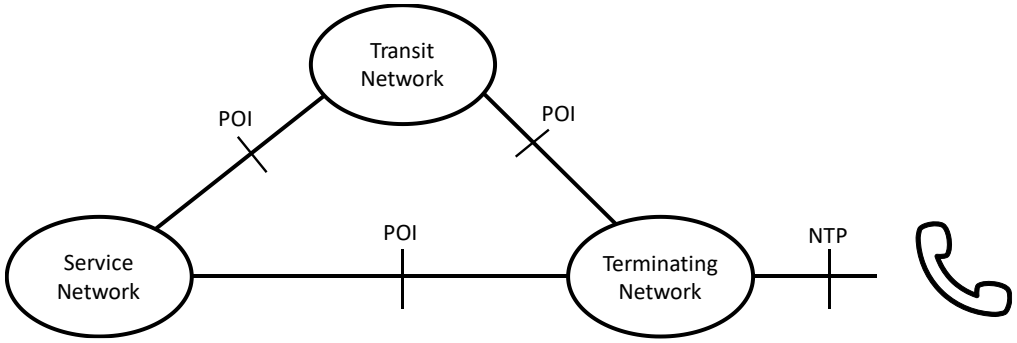

Figure 3: Termination of services

1 Scope

In order to ensure that:

- Calls can be set up between subscribers connected to different public communications networks,
- Calls can pass through a public communications network,
- Calls can reach the relay service provider for Automatic Invocation of Relay Services [15], and
- Confidential information is not disclosed, information on numbers must be transferred in a uniform manner.

This Application Guide provides format control of number information and any possible restrictions in the

presentation of subscriber numbers transferred across the interfaces between public communications networks and is applicable for national interconnection using SIP [6] and SIP-I [7] between public communications networks.

Furthermore, this Application Guide:

- Supports SIP calls by specifying the information transferred within the different SIP headers;
- Supports SIP-I calls by specifying the information transferred within the different information elements in the ISUP part;
- Supports Call Diversion by specifying the information transferred within the SIP headers
- Supports Call Diversion by specifying the information transferred within the SIP-I ISUP information element Redirecting Number;
- Describes routing cases related to calls to short code services beginning with 11, including emergency communication (112), National corporate numbers (90xxx) and Carrier Selection Codes (95xx);
- Supports transit of calls to international destinations;

Supported interconnections shall be determined through separate agreements between the operators (together with the parameters that must be sent across the POI).

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ITS cannot guarantee their long-term validity.

[1] ETSI EN 300 356-15 v 4.2.1 (07/2001): "Integrated Services Digital Network (ISDN); Signalling System No. 7: ISDN User Part (ISUP) version 2 for the international interface. Part 15: Diversion supplementary services.

[2] ITU-T Rec. Q.732.2-5 (12/1999): "Stages 3 description for call offering supplementary services using signalling system No. 7". Clause 2 – Call diversion services

[3] ITU-T Rec. Q.763 (12/1999): "Signalling System No. 7 – ISDN user part formats and codes".

[4] ITU-T Rec. Q.767 (1991): "Application of the ISDN user part of CCITT signalling system No. 7 for international ISDN interconnection

[5] ITU-T Rec. E.164 (11/2010): "The international public telecommunication numbering plan".

[6] IETF RFC 3261: "SIP: Session Initiation Protocol"

[7] ITU-T Rec. Q.1912.5: Interworking between session initiation protocol (SIP) and BICC or ISUP

[8] Post- och telestyrelsen: "Sammanställning - Svenska telefoninummerplanen" (in Swedish only)

[9] ITS ApG 21: "Guidelines for calls to emergency numbers 112 and 90 000 in Sweden."

[10] SIS SS 63 63 90: "Number portability in Sweden – Network solutions for Service Provider Portability for fixed public telecommunications services."

[11] SIS SS 63 63 92: "Mobile Number Portability in Sweden – Network solutions for Service Provider Portability for public digital mobile telephony services."

[12] ITU-T Rec. E.101 (11/2009): "Definitions of terms used for identifiers (names, numbers, addresses and other identifiers) for public telecommunication services and networks in the E-series Recommendations".

[13] ITS ApG 28: "Transfer of inter-operator Premium rate services and Mass call services termination numbers"

[14] ITS ApG 9: Transfer of number information in national interconnections based on ISUP

[15] ITS ApG 30: "Automatic network invocation of Relay services".

[16] IETF RFC 3323: "Privacy Mechanism for SIP"

[17] ITU-T Rec. Q.3401: "NGN NNI signalling profile"

[18] RFC 7044: "An Extension to the Session Initiation Protocol (SIP) for Request History Information"

[19] RFC 7544: "Mapping and Interworking of Diversion Information between Diversion and History-Info Header Fields in the Session Initiation Protocol (SIP)"

3 Terms and definitions

All call query (ACQ) operator: an operator that have access to the reference database for ported numbers and does a lookup for every call. The resulting RNP is prepended to the called number. A non-ACQ operator does not have the ability to prepend the RNP.

Carrier call-by-call selection: the calling party has an opportunity to select carrier network for each call. The calling party dials a Carrier Selection Code prior to the normal dialling information to be connected with the desired party or terminal using the selected carrier.

Carrier preselection: a fixed set-up procedure to reach a carrier network without any additional action by the calling party for each call. The normal dialling procedure is sufficient for the calling party to be connected with the desired party or terminal using a preselected carrier.

Directory number (DN): the number, derived from the E.164 numbering plan, used by the calling party to establish a call to an end user or a service. The number may also be used for presentation services like Calling Line Identification Presentation (CLIP) and Connected Line Identification Presentation (COLP) and may also be published in different directories and/or directory enquiry services [12].

eCall: a manually or automatically initiated emergency call from a vehicle, supplemented with a minimum set of emergency related data (MSD).

Emergency call taker: the term "emergency call taker" or "call taker" refers to a person at any PSAP that accepts the emergency session.

Public Safety Answering Point (PSAP): a physical location where emergency calls are handled by emergency call takers.[1]

Number Portability Dip Indicator: The npdi request URI parameter is included to indicate that number portability lookup was made for the called party number and there is no need to perform another lookup. If no lookup was made, npdi parameter must not be included.

Originating network: The network where the calling party is located.

Ported number: a directory number subject to number portability

[1] SOS Alarm is acting as the PSAP provider according to an agreement with the Swedish government.

Ported indication prefix: digits indicating that the following digits constitute a Routing number for portability (RNP), i.e. NDC 394.

Relay service: Electronic Communications Service that enables users of different modes of communication (e.g. text, sign and speech), to interact by providing conversion between the modes of communication, normally through an interpreter or a communication assistant (e.g. human operator) [15].

Routing number (RN): an address/number, only used for routing purposes and not known by end users, that is derived and used by the public telecommunications networks to route the call/session towards the network termination point.

Routing number for portability (RNP): A specific RN used to route calls towards a ported number [12]. This was commonly referred to as ZXY in earlier Application Guides.

Service network: a network of an operator offering public communication services to subscribers

Short code: string of digits in the national numbering plan (NNP), as defined by the national Numbering Plan Administrator, which can be used as a complete dialling sequence on public networks to access a specific type of service/network. The length of a short code is normally shorter than a subscriber number. In some countries, or in countries in an integrated numbering plan, the short code could be a national-only number [12].

Terminating network: A network of an operator responsible for incoming calls being terminated by the operator's services or subscribers connected to the operator's network

Transit network: a network of an operator switching calls between two other operators' networks

4 Symbols and abbreviations

ACQ	All Call Query
CC	Country Code, as defined by ITU-T (E.101)
CAC	Carrier Access Code is a digit sequence indicating that the following digits constitute a Carrier Identification Code
CIC	Carrier Identification Code is a digit sequence containing the carrier network identity
CSC	Carrier Selection Code is a digit sequence which indicates selection and provides information about the required carrier network provider. CAC + CIC = CSC.
ISUP	ISDN User Part
MIC	Municipality ID Code (Kommunkod) according to ITS ApG 21 [9].
N(S)N	National (Significant) Number, as defined by ITU-T (E.101). A number transferred as a N(S)N across an interface must belong to the Swedish numbering plan for telephony.
NDC	National Destination Code, as defined by ITU-T (E.101)
NPA	Numbering Plan Administrator
NPDI	Number Portability Dip Indicator
NTP	Network Termination Point
OIR	Originating Identification Restriction
POI	Point of Interconnection
PSAP	Public Safety Answering Point
RN	Routing Number
RNP	Routing Number for Number Portability (PTS plan for Routing numbers for number portability (dirigeringsprefix) according to Swedish standard SS 63 63 90/SS 63 63 928

SIP	Session Initiation Protocol
SIP-I	Session Initiation Protocol with encapsulated ISUP
SN	Subscriber number, as defined by ITU-T (E.101)

5 Calling party number

5.1 General

The Calling Party Number shall be provided in International E.164 Number Format. The "+" character is used to indicate international number format. The number information shall be provided in:

SIP Header	*Content*
P-Asserted-Identity	Calling Party Number
From	Calling Party Number
From	anonymous@anonymous.invalid
Privacy	id

The following SIP format shall be used:

```
P-asserted-identity: <sip:+[CC] [NSN]@operator;user=phone>
From: <sip:+[CC] [NSN]@operator;user=phone>
```

The Calling Party Number included in P-Asserted-Identity header is regarded as validated in the originated network.

There is no requirement on the CONTACT header.

Identification of the Calling Party, for the purpose of charging and accounting, shall be found in the following priority:

- History-Info
- Diversion
- P-Asserted-Identity

5.2 Number presentation

Identification of the Calling party, for the purpose of number presentation, shall be found in the From header.

When privacy for the Calling Party is requested (CLIR/OIR), this is done by setting the Privacy header to "id" according to RFC 3325 (preferred) and anonymising the From header ("anonymous@anonymous.invalid") according to IETF RFC 3323. It's the responsibility of the terminating operator to enforce the requested privacy policy as indicated by the Privacy header.

6 Called party number

6.1 General

The Called Party Number shall be provided in International E.164 Number Format. The "+" character is used to indicate international number format. The number information shall be provided in:

SIP element	*Number information*
Request-Line (INVITE)	Called Party Number

SIP URIs as well as tel URIs are supported. No examples are given for tel URIs.

The following format shall be used by non-AcQ operators:

```
INVITE sip:+46 [NSN]@operator;user=phone
```

One of the following formats shall be used for non-ported national numbers for AcQ operators (order by preference):

```
INVITE sip:+46 [NSN];npdi@operator;user=phone
INVITE sip:+46 [NSN]@operator;user=phone
```

One of the following formats shall be used for ported national numbers (order by preference):

```
INVITE
sip:+46 [NSN];npdi;rn=+46 394 [RNP] [NSN]@operator;user=phone
INVITE sip:+46 394 [RNP] [NSN]@operator;user=phone
```

Note: 394 is used as a ported indication prefix.

The following format shall be used for International destination numbers:

```
INVITE sip:+[CC] [NSN]@operator;user=phone
```

6.2 Short code information in 11- and 90-series

6.2.1 General

According to the Swedish numbering plan [8], numbers that begins with 11 and 90, which cannot be represented in national E.164 number format, shall use routing number 379 to convert the number to international E.164 number format.

116xxx and 90xxx (except 90 000) shall use formats for Number portability if the originating or Transit Network use ACQ.
Below the number format examples only contain the address that shall be used in the Request-URI (INVITE). tel URI is allowed in addition to SIP URI.

6.2.2 Emergency number 112 / 90 000

In case where customer has dialled 90 000 the originating operator shall translate the number to 112.

The address format for Emergency calls shall be:

```
sip:+46 379 112 [MIC]@operator;user=phone
```

The address format for eCall emergency calls shall be:

```
sip:+46 379 112 [AB] [MIC]@operator;user=phone
```

Note: [AB] is the eCall discriminator according to ITS ApG 21 [9].

6.2.3 National information number for non-emergent events 113 13

The address format for National information number for non-emergent events shall be:

```
sip:+46 379 11313 [MIC]@operator;user=phone
```

6.2.4 Police number 11414

The address format for Police calls shall be:

```
sip:+46 379 11414 [MIC]@operator;user=phone
```

6.2.5 Medical help-line number 117 7

The address format for Medical help-line calls shall be:

```
sip:+46 379 1177 [MIC]@operator;user=phone
```

6.2.6 Harmonized numbers for harmonized services of social value 116 xxx

116 xxx numbers are always treated by ACQ-operators as ported number.

From ACQ operators one of the following format shall be used (order by preference):

```
sip:+46 379 116xxx;npdi;rn=+46 394 [RNP]
     379 116xxx@operator;user=phone
sip:+46 394 [RNP] 379 116xxx@operator;user=phone
```

From non-ACQ operators the following format shall be used:

```
sip:+46 379 116xxx@operator;user=phone
```

6.2.7 Directory enquiry service numbers 118 xxx

The address format for Directory enquiry service calls shall be:

```
sip:+46 379 118xxx@operator;user=phone
```

6.2.8 National corporate numbers 90 xxx

90 xxx numbers,, except 90 000, are always treated by ACQ-operators as ported number.

From ACQ operators one of the following formats shall be used (order by preference):

```
sip:+46 379 90xxx;npdi;rn=+46 394 [RNP]
379 90xxx@operator;user=phone
sip:+46 394 [RNP] 379 90xxx@operator;user=phone
```

From non-ACQ operators the following format shall be used:

```
sip:+46 379 90xxx@operator;user=phone
```

6.3 Carrier Selection Code information 95xx

Carrier Preselect/Indirect Access cannot be directly represented in E.164 format. Routing number 379 may be used to convert the number to international number format. In SIP addresses the number format must be in international format, hence following formats shall be used:

```
sip:+46 379 95XY [SN]@operator;user=phone
sip:+46 379 95XY 0 [NSN]@operator;user=phone
sip:+46 379 95XY 00 [CC] [NSN]@operator;user=phone
```

6.4 Premium rate and Mass call services

The Premium rate and Mass call services can be used across operators in Sweden. This is specified in ITS ApG 28 [13] which defines the following number format:

- 389, 3 digits routing number for Correlation numbers allocated by PTS.
- XXX= Correlation number (for Premium rate services and Mass call services [13]) as decided by the terminating operator. 3 to 13 digits.

This type of address format is used to send calls from a service operator (where the charging platform is hosted) to the terminating operator (where the content platform is hosted), when different operator networks are used.

The services to use this address format are:

- Premium rate numbers NDC 900, 939 and 944
- Mass call numbers NDC 99

The following address format shall be used:

```
sip:+46 394 [RNP] 389 XXX@operator;user=phone
```

7 Redirecting number

7.1 Diversion

Diversion header may be included in addition to History-Info according to RFC 7544 [19].

SIP Header	*Number information*
Diversion	Redirecting Number

A tel or SIP URI format will be used in Diversion Header:

```
Diversion: sip:+[CC] [NSN]
```

7.2 History-Info

History-Info header is mandatory to be supported and shall be included in INVITE if call is forwarded according to RFC 7044 [18].

SIP Header	*Number information*
Supported	histinfo
History-Info	Redirecting Number

A SIP URI format will be used in History-Info Header:

```
History-Info: <sip:+[CC]
[NSN_B]@operator;user=phone?privacy=none>;index=1

History-Info: <sip:+[CC]
[NSN_C]@operator;user=phone;cause=302>;index=1.1;mp=1
```

8 Transfer of number information using SIP-I

The ISUP part is coded as a MIME attachment and the different information elements shall have the same content as the SIP information described above.

Only en bloc operation is allowed. Subsequent address messages are not used.

8.1 Calling party number

The Calling Party Number shall be provided in international E.164 Number Format.

The number information shall be provided in:

ISUP parameter	*Number information*
Calling Party Number	Calling Party Number

The following ISUP format shall be used:

[CC] [NSN] with Nature of Address=4

Caller validation is based on ISUP parameter Calling Party Number.

8.2 Called party number

The Called Party Number shall be provided in international E.164.

The number information shall be provided in:

ISUP parameter	*Number information*
Called Party Number	Called Party Number

The following ISUP format shall be used for Not Ported national numbers:

46 [NSN] with Nature of Address=4

The following ISUP format must be used for Ported national numbers:

46 394 [RN] [NSN] with Nature of Address=4

The following ISUP format shall be used for International destination numbers:

[CC] [NSN] with Nature of Address=4

8.2.1 Short code information in 11- and 90-series

In ISUP part of SIP-I the number format must be in international E.164 format, hence following ISUP formats shall be used:

46 379 11x... with Nature of Address=4

46 379 90xxx with Nature of Address=4

46 394 [RN] 379 11x... with Nature of Address=4

46 394 [RN] 379 90xxx with Nature of Address=4

The SIP part in SIP-I conforms to clause 6.

8.2.2 Emergency number 112 / 90 000

In case where customer has dialled 90 000 the originating operator shall translate the number to 112.

The ISUP address format for emergency calls shall be:

46 379 112 [MIC] with Nature of Address=4

The ISUP address format for eCall Emergency calls shall be:

46 379 112 [AB] [MIC] with Nature of Address=4

Note: [AB] is the eCall discriminator according to ITS ApG 21 [9].

8.2.3 National information number for non-emergent events

The ISUP address format for National information number for non-emergent events shall be:

46 379 11313 [MIC] with Nature of Address=4

8.2.4 Police number 114 14

The ISUP address format for Police calls shall be:

46 379 11414 [MIC] with Nature of Address=4

8.2.5 Medical help-line number 117 7

The ISUP address format for Medical help-line calls shall be:

46 379 1177 [MIC] with Nature of Address=4

8.2.6 Harmonized numbers for harmonized services of social value 116 xxx

116 xxx numbers are always treated by ACQ-operators as ported number.

From ACQ operators the following ISUP address format shall be used:

46 394 [RN] 379 116xxx with Nature of Address=4

From non-ACQ operators the following ISUP address format shall be used:

46 379 116xxx with Nature of Address=4

8.2.6.1 Directory enquiry service numbers 118 xxx

The ISUP address format for Directory enquiry service calls shall be:

46 379 118xxx with Nature of Address=4

8.2.6.2 National corporate numbers 90 xxx

90xxx numbers are always treated by ACQ-operators as ported number.

From ACQ operators the following ISUP address format shall be used:

46 394 [RN] 379 90xxx with Nature of Address=4

From non-ACQ operators the following ISUP address format shall be used:

46 379 90xxx with Nature of Address=4

8.2.6.3 Carrier Selection Code information 95xx

Carrier Preselect/Indirect Access cannot be directly represented in E.164 format. Routing number 379 may be used to convert the number to international number format.

In ISUP part of SIP-I the number format will be in international E.164 format, hence following ISUP formats shall be used:

46 379 95XY [SN] with Nature of Address=4

46 379 95XY 0 [NSN] with Nature of Address=4

46 379 95XY 00 [CC] [NSN] with Nature of Address=4

8.2.6.4 Premium rate and Mass call services

The Premium rate and Mass call services can be exchanged between operators in Sweden. This is specified in ITS ApG 28 [13] which defines the following number format:

- 389= 3 digits routing number for Correlation numbers allocated by PTS.
- XXX= Correlation number (for Premium rate services and Mass call services [13]) as decided by the terminating operator - 3 to 13 digits.

This type of address format is used to send calls from a service operator (where the charging platform is hosted) to the terminating operator (where the content platform is hosted), when different operator networks are used.

The services to use this address format are:

- Premium rate numbers NDC 900, 939 and 944
- Mass call numbers NDC 99

In ISUP part of SIP-I the number format must be in international E.164 format, hence following ISUP formats shall be used:

46 394 [RN] 389 XXX with Nature of Address=4

8.3 Generic Number - Additional Calling Party Number

ISUP parameter	*Number information*
Generic Number	Additional Calling Party Number

The following ISUP format shall be used:

[CC] [NSN] with Nature of Address=4

8.4 Redirecting Number

ISUP parameter	*Number information*
Redirecting Number	Redirecting Number

The following ISUP format shall be used:

[CC] [NSN] with Nature of Address=4

Document history

Edition	Date of publication	Changes
1	September 2024	First edition