Telenor Networks

Technical requirement specification for

Signalling System No. 7 national interconnect

with

Telenor

national interconnect ISUP version 1

CONTENTS

1. Technical signalling issues

1.1 Message Transfer Part (MTP)

MTP shall be implemented in accordance with ETSI specifications. Both ITU-T "White Book" and "Blue Book" based versions can be used.

When the signalling network is to be used for national interconnect, the network indicator value 11 (binary) "reserved for national use" (NI=3 decimally) is used, see chapter 2. If an agreement on transit of international signalling traffic is implemented, then links can be established with the network indictor value 00 (binary) "international network" (NI=0) for this purpose.

A 64 kbit/s transparent time slot (TS16 unless otherwise agreed) in a G.704 2,048 kbit/s frame shall be used as the transmission medium.

MTP priority is not supported, and the MTP message priority indication shall be coded 00 (binary).

1.2 Signalling Connection Control Part (SCCP)

SCCP is not used for Telenor national interconnect ISUP version 1.

Handling of SCCP (connectionless) will be required if an agreement is implemented for Global Title translation for GSM roaming.

ETSI specifications for SCCP shall be used. Both ITU-T "White Book" and "Blue Book" based versions can be used.

1.3 ISDN User Part (ISUP)

The signalling protocol ISUP shall be used for termination in TELENOR's PSTN/ISDN switches of the relevant 2 Mbit/s primary system accesses for carrying PSTN/ISDN traffic and services. ISDN User Part (ISUP) shall be used in accordance with the specifications in Chapter 2. Coding of the B number in the called party number in ISUP over the interconnect point shall be in accordance with Chapter 3.

Comment: The processing capacity of TELENOR's terminations in the interconnect point has been dimensioned to handle 1.3 calls per second per primary system access.

1.4 "Compliance statement"

Before an interconnect agreement is entered into the TELECOM OPERATOR shall submit a "compliance statement" to TELENOR that describes characteristics of the TELECOM OPERATOR's protocol implementation. A compliance statement shall be

written as a delta document for TELENOR's interface specifications. The purpose is to identify potential problems or exceptions that may be of significance to the interface protocol or the signalling tests that are to be executed, in addition to preventing misunderstandings associated with these issues.

The form provided by TELENOR shall be used and additional descriptions shall be given when appropriate.

When significantly new or additional functionality within the platform of TELECOM OPERATOR is implemented, a new compliance statement shall be provided.

2. TELENOR NATIONAL INTERCONNECT ISUP VERSION 1 PROTOCOL SPECIFICATION

2.1 Introduction

2.1.1 Foreword

This PSTN/ISDN/GSM national interconnect ISUP interface is specified by TELENOR.

This national interconnect interface ISUP version 1 protocol is provided from 1998-01-01 and until further notice.

This national interconnect interface ISUP protocol version is based on the ETSI standard ETS 300 303 (1994).

2.1.2 General requirements

The national interconnect ISUP version 1 protocol on the interface shall be implemented such that it is protocol compatible with the national interconnect ETSI ISUP version 2, see ETS 300 646-1. This means that when received, messages and optional parameters defined in version 2, but not in version 1, are discarded on the version 1 interface according to Q.767 rules for handling unrecognised information, without interrupting the call.

However, in order to maintain a high operational quality it is required that the messages, parameters and parameter values sent on the interface are restricted to those specified for the national interconnect ISUP version 1 protocol when this version is agreed.

For transit national calls and transit ISUP calls to the international network, transparent signalling support of services according to this specification shall be provided, taking into account the exceptions listed in this specification and existing limitations in the international network. In case the call is routed on another signalling system, appropriate interworking shall be provided, based on ETS 300 343.

In case it is found by TELENOR that the interconnect ISUP protocol agreement has been violated by the other party concerning handling of number information, protection of Closed user group or coding of priority calls, some immediate reaction could be initiated by TELENOR.

2.2 Application of ETS 300 303

2.2.1 Application of section 1 Scope

Applies, with the following clarification.

ETS 300 303 is an application of ETSI ISUP version 1 (ETS 300 121) for the international interface, modified to support the national interconnect ISUP interface. In addition to interconnect between fixed networks, ETS 300 303 also describes the effect as seen on the interface when one or both of the networks include mobility, i.e. with GSM accesses.

2.2.2 Application of section 2 Normative references

Applies, with the following additions.

ETS 300 303 (1994): “Integrated Services Digital Network (ISDN); ISDN - Global System for Mobile communications (GSM) Public Land Mobile Network (PLMN) signalling interface”.

ETS 300 482 (1996): “Integrated Services Digital Network (ISDN); ISDN - Global System for Mobile communications (GSM) Public Land Mobile Network (PLMN) signalling interface; Test specification”.

ETS 300 646-1 (1997): “Integrated Services Digital Network (ISDN); Signalling System No. 7; Digital cellular telecommunications system (Phase 2); Application of the ISDN User Part (ISUP) version 2 for the ISDN- Public Land Mobile Network (PLMN) signalling interface; Part 1: Protocol specification; (GSM 09.12)”.

"Technical specification for Number Portability for geographical and non geographical numbers in Norway", dated 1998-06-17, ref. www.npt.no from Norwegian Post- and Telecommunications authority.

2.2.3 Application of section 3 Symbols and abbreviations

Applies.

2.2.4 Application of section 4 Modifications to ETS 300 121

Applies, with the exceptions and clarifications in following sections.

2.2.5 Application of section 4.1 Formats and codes

Applies, with the indicated exceptions to annex B.

2.2.6 Application of section 4.2 Basic call

Applies, with the following exceptions and clarifications.

Table V.4-2.1

Bearer services (identified by the TMR value in ISUP)	**Comments**
Speech	Applies. Support of the speech bearer service is required, with the exceptions and clarifications indicated in the text.
3.1 kHz audio	Applies. Support of the 3.1 kHz audio bearer service is required, with the exceptions and clarifications indicated in the text.
64 kbit/s unrestricted	Applies. Support of the 64 kbit/s unrestricted bearer service is required, with the exceptions and clarifications indicated in the text.

Signalling requirements as indicated by the ISUP preference indicator (IPI) apply, i.e. the values “ISDN user part preferred all the way”, “ISDN user part not required all the way” and “ISDN user part required all the way” shall be supported. Separate traffic routing of different traffic types (i.e. different combinations of TMR/IPI values) within the TELENOR national network or on the national interconnect interface is not provided.

Echo cancellers shall be provided when necessary by each network operator for “speech” and “3.1 kHz audio” calls in certain cases:

- for calls to or from networks with large internal delay (e.g. GSM) by the network operator owning the network with large internal delay. A network internal one way propagation delay of more than 20 ms (excluding additional delay caused by user initiated call diversion or internal delay in private user terminals) is considered to be large. In case of transit networks, it is the responsibility of the network operator operating the interconnect gateway that echo cancellers are provided when the combined internal delay of the network with the gateway and other transit or local networks cascaded behind it is large in sum. It is the responsibility of the network operator providing the echo cancellers, that the echo cancellers have sufficient two way end delay capability to provide sufficient echo cancellation taking into account the combined two way end delay of both network and user terminals.

- for international calls the network operator owning the international gateway exchange shall provide echo cancellers (depending on agreement with the correspondent foreign network operator). Note: This does not free a national network operator with a network with large internal propagation delay from the

obligation to provide echo cancellers according to the first bullet above, even for international calls.

The echo control device indicator in the Nature of connection indicators parameter and the Backward call indicators parameter shall only be coded “included” when echo cancellers actually are included.

Continuity check procedures shall not apply on the national interconnect interface, except when bilaterally agreed between two network operators.

CIC code numbering on the national interconnect interface shall start from 33 (decimal), i.e. 21 hexadecimal for TS1 of the first circuit group.

The procedures of Q.767 section D.2.10.1 for circuit selection apply. The hunting "method 2" shall be used.

Recorded announcements can be applied by the destination network instead of immediate Release message in case of call failure. In this case an Address Complete message shall be sent before application of the recorded announcements. In case a recorded announcement is sent to support a commercial service, Answer or Connect message shall be sent from the destination side before the announcement is provided. Answer or Connect message shall be sent by the destination exchange before throughconnect to an ISDN destination user.

An appropriate announcement instead of immediate Release in the backwards direction to support cause #20 shall be provided by the mobile network, except if it has been explicitly agreed with TELENOR to use immediate REL(cause 20).

Calling party’s category = “data call (voice band data)” can be mapped to “ordinary calling subscriber” by the TELENOR incoming gateway.

The national/international call indicator can be modified to “call to be treated as an international call” by the incoming TELENOR national interconnect gateway.

The charge indicator in the Backward call indicators parameter can be modified to “charge” by the outgoing TELENOR gateway.

Timers T1, T5, T12, T13, T14, T15, T16, T17, T18, T19, T20, T21, T22 and T23 with timer values either according to ETS 300 121 or ETS 300 356-1 shall both be considered to be compliant to this specification.

2.2.7 Application of section 5 Message Transfer Part (MTP) protocol requirements

Applicable, with the following exception and clarifications

MTP according to CCITT Blue Book or ITU-T “White Book” recommendations apply (ref. ETS 300 548).

For the national interconnect interface, network indicator NI = 11 (binary) “reserved for national use” (i.e. NI=3 decimal) shall be used. Signalling addresses (point codes) for NI=3 are allocated to the network operators by the Norwegian regulatory authorities.

SLC numbering shall start with SLC=1.

Time slot 16 in the 2.048 kbit/s G.704 transmission frame shall preferably be used for support of the Signalling system No.7 links on the national interconnect interface with network indicator 11 (binary) “reserved for national use” (NI=3). When time slot 16 is used for control of echo cancellers, time slot 1 or 17 could be used instead for the signalling link according to specific agreement.

2.2.8 Application of Annex A (normative): Considerations on supplementary services

Applies, with the following exceptions and clarifications

Table V.4-2.2

Supplementary services	**Comments**
Supplementary services offered on the access, but not visible on the ISUP interconnect interface.	Apply, with the following clarifications: Service interactions for network specific services shall preserve the service integrity of the ETSI standardised services identified on the ISUP interconnect interface according to the rules of ITU-T rec. Q.1600.
Supplementary services which are only identified on the ISUP interconnect interface by the called party number.	Apply, with the following clarifications: Interconnect for such services are expressed by traffic routing and accounting agreements for specific number series. See separate documents. Service interactions for network specific services shall preserve the service integrity of the ETSI standardised services identified on the ISUP interconnect interface according to the rules of ITU-T rec. Q.1600. Note: See also sections in this table on transit network selection and number portability.
The TELENOR supplementary service Priority (PRI)	Not required. However, the following restrictions apply for coding of the Calling party's category: In order not to disrupt traffic routing mechanisms in the network, Calling party's category = "calling subscriber with priority" shall be reserved only for calls with considerable public importance. Examples of such calls would be emergency calls (i.e. calls to 110, 112, 113), calls originating from fire department, hospital, police, military commands, airport control centre, etc. In case regulations for application of priority calls are available from the Norwegian regulatory authorities, those shall be followed. It is assumed that calls e.g. could be given priority by a routing algorithm for certain routes which only permits the last free circuit at any moment to be seized by a call with Calling party's category = "calling subscriber with priority".

Table V.4-2.2 (continued)

Supplementary services	**Comments**
Call diversion	Applies, with the following exceptions and clarifications: The Redirecting number parameter and the Original called number parameter shall be supported according to ETS 300 646-1. The number contained in the Redirecting number parameter sent on the ISUP interconnect interface shall be true and network provided/verified from the charging point of view. It is recognised, however, that it may not be possible to verify numbers passed in transit. When the Redirecting number parameter or the Original called number parameters are coded “presentation restricted”, the same restrictions for presenting or passing them to a third party apply as for the Calling party number parameter. The Redirection number parameter, the Redirection number restriction parameter, the Call diversion information parameter, the Generic notification parameter and the Event information parameter (containing diversion information) could be present on the interconnect interface. These parameters could be discarded by the national interconnect outgoing gateway receiving those parameters, or handled according to ETS 300 646-1. If the Redirection number parameter is present it shall only be passed in the backwards direction with the same agreement on restrictions as for Calling party number. It shall be assumed by default that the Redirection number parameter is coded “presentation restricted”, unless the Redirection number restriction parameter coded “presentation allowed” has been received by the originating exchange.

Table V.4-2.2 (continued)

Supplementary services	**Comments**
Calling Line Identification Presentation (CLIP)	Applies, with the following exceptions and clarifications: A-numbers in the Calling party number parameter shall be provided both from ISDN or non ISDN originating access. A-numbers coded "network provided" or "user provided, verified and passed" to be passed in the Calling party number ISUP parameter between network operators, shall be only true network provided/verified E.164 numbers identifying the originating physical access of the call (or the mobile telephone/SIM card in case of NMT/GSM). Notes: In case of A-numbers received from another operator, it is not always possible to verify the contents of the received A-number. In case of call diversion within TUP or private networks, the A-number in the Calling party number parameter could be indicating the forwarding access.
Calling Line Identification Restriction (CLIR)	Applies, with the following exceptions and clarifications: A-numbers in the Calling party number parameter and coded "presentation restricted" shall not be passed out of Norway. A-numbers in the Calling party number parameter coded "presentation restricted" shall never be passed to a third party, except to: --- specific authorities according to legal requirements, i.e. emergency calls to hospital/ fire station/police, and to police in case of criminal investigations (e.g. MCID). --- other PSTN/ISDN/GSM/NMT network operators within Norway, which agree to the same restrictions and are authorised to handle classified and confidential number information.
Connected Line Identification Presentation (COLP)	Applies, with the following exceptions and clarifications: Requirements on the authenticity of the Connected number apply as for the Calling party number.
Connected Line Identification Restriction (COLR)	Applies, with the following exceptions and clarifications: Restrictions on the passing of the Connected number apply as for the Calling party number.

Table V.4-2.2 (continued)

Supplementary services	**Comments**
Terminal portability (TP)	Applies.
User-to-User Signalling service 1 implicit (UUS1 implicit)	Applies, with the following exceptions and clarifications: It is recognised that in some cases User-to-User information may be discarded without notification in the User-to-user indicators in the backward direction.
Closed User Group (CUG)	Applies, with the following exceptions and clarifications: Each network operator has the following obligation: In all cases of interconnect (also to a third network operator) it shall be verified that CUG calls are handled properly, see table E-1/Q.767 or E-2/Q.767, such that service requirements on security for the end users are taken care of. Network identities (NI) to be used in the Closed user group interlock codes are allocated to the network operators by the Norwegian regulatory authority. The Network identity 0470 is used by TELENOR. In order to provide a closed user group service for the same customer on several accesses across different networks, an agreement between the network operators for common administration of CUG interlock codes is necessary.
Subaddressing (SUB)	Applies.

Table V.4-2.2 (continued)

Supplementary services	**Comments**
The Norwegian transit network selection service (carrier selection and carrier pre-selection)	Applies according to requirements from the Norwegian Post- and Telecommunications authority. See www.npt.no. The Norwegian transit network selection service includes carrier selection and carrier pre-selection. Transit network selection is indicated with the operator prefix 15xx in the Called party number parameter in ISUP. The ISUP coding is identical for carrier selection and carrier pre-selection. See also section 3 "TELENOR national interconnect ISUP protocol specification for coding of called party number", which shows some examples of coding for carrier selection. Note that the Transit network selection parameter is not used. Identification of the access which has invoked transit network selection shall be based on the Redirecting number parameter in ISUP when the call has been diverted from the access invoking transit network selection, and the Calling party number parameter in ISUP in other cases.

Table V.4-2.2 (continued)

Supplementary services	**Comments**
The Norwegian number portability service	Applies according to requirements from the Norwegian Post- and Telecommunications authority. See document "Technical specification for Number Portability for geographical and non geographical numbers in Norway", date 1998-06-17, ref. www.npt.no. Number portability is indicated in IAM for ported numbers by the nature of address indicator = 0001000 ported number in the Called party number parameter in ISUP. The address signal in the Called party number parameter contains the prefix for number portability (PFXNP=XYZ) preceding the directory number. According to optional agreement on QoR, number portability can be indicated in REL with the national cause indicator value 12 "number ported out".

2.2.9 Application of Annex B (normative): Formats and codes

Applies, with the following exceptions and clarifications.

B.1 General functions of messages and signals:

Applies, with the following exceptions and clarifications.

The Continuity message only applies in case of bilateral agreement.

The Continuity indicators only applies in case of bilateral agreement.

The Redirecting number parameter and the Original Called number parameter apply according to ETS 300 646-1.

B.2 Formats and codes:

Applies, with the following exceptions and clarifications.

In the Called party number parameter the nature of address= "national(significant)number" is used when the digits start with the prefixes for transit network selection (15xx).

In the Called party number parameter the nature of address = 0001000 "ported out number" is used when the digits start with the prefix for number portability (xyz).

In the Cause parameter the national cause value 12 "number ported out" is used to support the optional QoR procedure for "long term solution" number portability.

In the Range and status parameter only ranges within the same 2.048 Mbit/s frame shall be indicated.

It shall be possible to receive the Redirection information parameter coded with both one or two octets when the value of the redirection counter is equal to 1.

The value 0000 “unknown” shall be considered as default for the original redirection reason in the Redirection information parameter. When other values are received, the parameter shall not be discarded for this reason.

The Redirecting number parameter and the Original Called number parameter apply according to ETS 300 646-1.

2.2.10 Application of Annex C (informative): Examples of echo control procedure

Applies (informative), with the published corrigenda, in case of GSM calls.

2.2.11 Application of Annex D (informative): Bibliography

Applies (informative).

3. TELENOR national interconnect ISUP protocol specification for coding of called party number

3.1 General coding rules

This coding for the Called party number on the PSTN/ISDN/GSM national interconnect ISUP interface is specified by TELENOR.

The Called party number parameter shall be coded according to ETS 300 646-1, except that the carrier selection prefix (possibly followed by other prefixes) or the operator portability prefix can be included in the address digits when the nature of address is coded “national(significant)number”. The value "ported out number" for nature of address can also be used for ported numbers.

When the number to be transferred is longer than what is allowed in the Called party number parameter (i.e. 16 digits), over-lap signalling shall be used. With over-lap signalling the maximum number length is 22 digits (23 digits including ST) with over-lap signalling.

Interpretation of the coding is shown by some examples in the following table.

Abbreviations: TON= Type of number, NTADDR= Nature of address, CC= Country code, IP= International prefix (= 00), PC= Prefix for carrier selection (indirect access).

Table V.4-3.1

Type of call	**Dialled by the customer**	**Coding on the interconnect interface**
Call to the national network (prefix not included)	Analog line: Digits= abc..... ISDN access: TON= unknown, Digits= abc..... TON= national, Digits= abc..... TON= international, Digits= 47-abc.....	NTADDR= national (significant) number, Digits= abc.....
Transit call to the international network (prefix not included)	Analog line: Digits= IP-CC-uuu... ISDN access: TON= unknown, Digits= IP-CC-uuu... TON= international, Digits= CC-uuu...	NTADDR= international number, Digits= CC-uuu...
Call to the national network (prefix included)	Analog line: Digits= PC-xxx..... ISDN access: TON= unknown, Digits= PC-xxx..... TON= national, Digits= PC-xxx.....	NTADDR= national (significant) number, Digits= PC-xxx.....
Call to the international network (prefix included)	Analog line: Digits= PC-IP-CC-uuu... ISDN access: TON= unknown, Digits= PC-IP-CC-uuu... TON= national, Digits= PC-IP-CC-uuu...	NTADDR= national (significant) number, Digits= PC-IP-CC-uuu...

3.2 Digit length formatting of Called party numbers with prefix 15xx (informative)

Currently the following formatting is expected for various number series with prefix 15xx.

Table V.4-3.2

Digits from access line	Number format in ISUP	Comments
15xx 00 CCxxxx....	IAM sent after 12 digits, (open number length = 12--, i.e. over lap).	International call
15xx 01 x.....	IAM sent after 7 digits, (open number length = 7--, i.e. over lap).	Not currently used
15xx 0Y xxx Y= 2,....,9	IAM sent after 9 digits, (fixed number length = 9, i.e.. en bloc).	5 digit national number series which cannot be reached from the international network
15xx 1 xx.....	IAM sent after 7 digits, (open number length = 7--, i.e. over lap).	Various special numbers Calls to emergency numbers (15xx110, 15xx112, 15xx113) shall be converted to appropriate 8 digit national number.
15xx a bcdefgh a= 2,.....,9	IAM sent after 12 digits, (fixed number length = 12, i.e.. en bloc).	National 8 digit geographical or non geographical number

The shown formatting is for information only. The digit length formatting for various number series can be modified at any time according to new regulatory or network requirements.

IAM will be sent from a TELENOR local exchange when the indicated minimum number of digits have been received. Digits received later will be sent in SAMs. Note however, that a SETUP from an ISDN access can contain more than the minimum number of digits. This means that IAM may contain more than the indicated minimum number of digits (up to 16). A SAM can contain one or more digits.