

# Interkonnektion – Joining-Network Node Interface

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## 1 Summary

1. The intent of this specification is to define a part of the Narrowband Integrated Services Digital Network (N-ISDN) protocol stack and its profile at the Joining Network Node Interface (J-NNI) for interconnection with other operator's networks.
2. The protocol stack is defined by referencing to appropriate protocol entity specifications which apply at the J-NNI for specifications of the Physical Layer, the Message Transfer Part (MTP) and the connectionless Signalling Connection Control Part (SCCP) (SCCP-CL).
3. The functionality specified herein, covers the functional layers from the Physical Layer of the NNI for use in the N-ISDN up to and including MTP and SCCP.
4. It provides the services of the MTP 3 and SCCP-CL to Signalling Applications such as the Narrowband Integrated Services User Part (of S.S. No. 7) and N-ISUP.

## 2 Scope and field of application

1. This document is part of a series of specifications dealing with the Joining Network Node Interface (J-NNI) for the interconnection of the Swisscom network with the network of another operator. The intent of this document is to specify this J-NNI in terms of the requirements of:
  - a) The physical interface that is in common for the C and U plane of the ISDN
  - b) The protocol profiles of MTP 1
  - c) The protocol profiles of MTP 2 and signalling link functionality in order to provide an upper layer boundary consistent with the expectations of MTP 3 as specified in ITU-T Recommendation Q.704
  - d) The protocol profiles of MTP 3 and signalling network functionality in order to provide an upper layer boundary consistent with the expectations of N-ISUP as specified in ITU-T Recommendations Q.761, Q.762, Q.763, Q.764The protocol profiles of connectionless SCCP (SCCP-CL) and signalling network functionality in order to provide an upper layer boundary consistent with the expectations of the Transaction Capabilities (TC) as specified in ITU-T Recommendations Q.771 - Q.775.
2. The physical interface defined at the J-NNI provides services to its users at a Physical Service Access Point (SAP). These users may be functional entities of the C plane, typically MTP, or functional entities of the U plane, typically a switching fabric using Physical Layer internal services.
3. Not in the scope of this document are in particular:
  - The definition of requirements a switching fabric should meet nor such referring to performance
  - The definition of requirements of the U plane above the Physical Layer
  - The specification of interworking between the protocol profiles defined in this specification and any other protocol profiles
  - The definition of requirements for a joining network nor such referring to equipment engineering
4. The supplier of an implementation shall complete the Protocol Implementation Conformance Statement (PICS) pro forma, as specified in this document.

### 3 References

#### 3.1 General

#### 3.2 Normative references

	Title
G.703	ITU-T Recommendation G.703 (10/98) Physical/electrical characteristics of hierarchical digital interfaces
G.704	ITU-T Recommendation G.704 (July 1995) Synchronous frame structures used at 1544, 6312, 2048, 8488 and 44736 kbit/s hierarchical levels
G.706	CCITT Recommendation G.706 (1991) Frame alignment and cyclic redundancy check (CRC) procedures relating to basic frame structures defined in Recommendation G.704
G.736	ITU-T Recommendation G.736 (March 1993) Characteristics of synchronous digital multiplex equipment operation at 2048 kbit/s
G.783	ITU-T Recommendation G.783 (04/97) – Characteristics of Synchronous Digital Hierarchy (SDH) Equipment Functional Blocks
G.823	ITU-T Recommendation G.823 (March 1993) - The control of jitter and wander within digital networks which are based on the 2048 kbit/s hierarchy
G.957	ITU-T Recommendation G.957 (06/99) – Optical interfaces for equipment and systems relating to the synchronous digital hierarchy.
166	ETSI ETS 300 166 (August 1993) Physical and electrical characteristics of hierarchical digital interfaces for equipment using 2048 kbit/s based plesiochronous or synchronous digital hierarchies
008	ETSI ETS 300 008 (December 1991) Integrated Services Digital Network (ISDN); CCITT Signalling System No. 7 Message Transfer Part (MTP) to support international interconnection
008A1	ETSI ETS 300 008 (April 1993) Integrated Services Digital Network (ISDN); CCITT Signalling System No. 7 Message Transfer Part (MTP) to support international interconnection Amendment 1 to ETS 300 008 (1991)
Q.701	ITU-T Recommendation Q.701 (March 1993) FUNCTIONAL DESCRIPTION OF THE MESSAGE TRANSFER PART (MTP) OF SIGNALLING SYSTEM NO.7
Q.702	ITU-T Recommendation Q.702 (Blue Book, Fascicle VI.7) SIGNALLING SYSTEM NO.7 SIGNALLING DATA LINK
Q.703	ITU-T Recommendation Q.703 (07/96) SIGNALLING SYSTEM NO.7 SIGNALLING LINK
Q.704	ITU-T Recommendation Q.704 (07/96) SIGNALLING NETWORK FUNCTIONS AND MESSAGES.
Q.707	ITU-T Recommendation Q.707 CCITT Blue Book, Fascicle VI.7 (1988) SPECIFICATIONS OF SIGNALLING SYSTEM NO.7 TESTING AND MAINTENANCE.

009	ETSI ETS 300 009-1 (September 1996) - Integrated Services Digital Network (ISDN); CCITT Signalling System No. 7 - Signalling Connection Control Part (SCCP) (connectionless and connection-oriented) to support international interconnection
287	ETS 300 287-1 (November 1996); Integrated Services Digital Network (ISDN); Signalling System No.7; Transaction Capabilities (TC) version 2; Part 1: Protocol Specification [ITU-T Recommendations Q.771 to Q.775 (1993), modified]
Q.711	ITU-T Recommendation Q.711 (March 1993) - Signalling System No.7 - FUNCTIONAL DESCRIPTION OF THE Signalling CONNECTION CONTROL PART
Q.712	ITU-T Recommendation Q.712 (March 1993) - Signalling System No.7 - DEFINITION AND FUNCTION OF SCCP MESSAGES
Q.713	ITU-T Recommendation Q.713 (March 1993) - Signalling System No.7 - SCCP FORMATS AND CODES
Q.714	ITU-T Recommendation Q.714 (March 1993) - Signalling System No.7 - Signalling CONNECTION CONTROL PART PROCEDURES

### 3.3 Informative references

Title	
I.320	ITU-T Recommendation I.320 (November 1993) ISDN PROTOCOL REFERENCE MODEL
Q.761	ITU-T Recommendation Q.761 (09/97) Signalling System No.7 FUNCTIONAL DESCRIPTION OF THE ISDN USER PART OF Signalling SYSTEM NO. 7
Q.762	ITU-T Recommendation Q.762 (09/97) Signalling System No.7 GENERAL FUNCTION OF MESSAGES AND SIGNALS
Q.763	ITU-T Recommendation Q.763 (09/97) Signalling System No.7 FORMATS AND CODES
Q.764	ITU-T Recommendation Q.764 (09/97) Signalling System No.7 ISDN USER PART Signalling PROCEDURES
Q.771- Q.775	ITU-T Recommendation Q.771 -Q.775 (June 1997) - Signalling System No.7 - TRANSACTION CAPABILITIES

### 4 Abbreviations and acronyms

Abbreviation	Description
BIC	Bearer Identification Code
C plane	Control Plane
CBA	Changeback acknowledgement signal
CBD	Changeback declaration signal
CHM	Changeover and changeback messages
CIC	Circuit Identification Code
CNP	Connection not possible signal

CNS	Connection not successful signal
COA	Changeover Acknowledgement
COO	Changeover Order
CRC	Cyclic Redundancy Check
CSS	Connection successful signal
DLC	Signalling data link connection order signal
DLM	Signalling-Data-Link-Connection-Order Message
DPC	Destination Point Code
ECA	Emergency changeover acknowledgement signal
ECM	Emergency changeover message
ECO	Emergency changeover order signal
FCM	Signalling traffic flow control messages
ITU-T	International Telecommunication Union, Telecommunication Standardisation Sector
ISS	ISDN Supplementary Services
ISUP	Integrated Services User Part (of S.S. No. 7)
J-NNI	Joining Network Node Interface
kbit/s	kilobit per second
L3	Level 3
LFU	Link forced uninhibit signal
LIA	Link inhibit acknowledgement signal
LID	Link inhibit denied signal
LIN	Link inhibit signal
LLT	Link local inhibit test signal
LRT	Link remote inhibit test signal
LSB	Least Significant Bit
LUA	Link uninhibit acknowledgement signal
LUN	Link uninhibit signal
MIM	Management inhibit messages
MS	Management System
MSB	Most Significant Bit
MTP	Message Transfer Part
MTP-3	MTP Level 3
MTP-SAP	Service Access Point to MTP
NI	Network Indicator

N-ISDN	Narrowband Integrated Services Digital Network
N-ISUP	Narrowband Integrated Services User Part (of S.S. No. 7)
NNI	Network Node Interface
OPC	Originating Point Code
PDU	Protocol Data Unit
PHY-SAP	Physical Layer Service Access Point
PICS	Protocol Implementation Conformance Statement
POI	Point Of Interconnection
POP	Point Of Presence
POTS	Plain Old Telephone System
RAI	Remote Alarm Indication
RCT	Signalling route set congestion test signal
RSM	Signalling route set test message
RSR	Signalling route set test signal for restricted destination (national option)
RST	Signalling route set test signal for prohibited destination
SAP	Service Access Point
SCCP	Signalling Connection Control Part (of Signalling System No.7)
SCCP-CL	Signaling Connection Control Part Connectionless
SCCP-SAP	Service Access Point to SCCP
SDU	Service Data Unit
SI	Service Indicator
SIO	Service Information Octet
SIF	Signalling Information Field
SL	Signalling Link
SLC	Signalling Link Code
SLS	Signalling Link Selection
SLT	Signalling Link Test
SLTA	Signalling Link Test Message
SLTM	Signalling Link Test Acknowledgement
S.S. No. 7	ITU-T Signalling System Number 7
SSN	Sub System Number
STM-1	Synchronous Transport Module level 1 (155 Mbit/s)
STP	Signalling Transfer Point
TC	Transaction Capabilities

TFA	Transfer allowed signal
TFC	Transfer controlled signal
TFP	Transfer prohibited signal
TFR	Transfer restricted signal (national option)
TRA	Traffic restart allowed signal
TRM	Traffic restart allowed message
U plane	User Plane
UDT	Unitdata
UDTS	Unitdata Service
UFC	User part flow control messages
UPU	User part unavailable signal
XUDT	Extended Unit Data
XUDTS	Extended Unit Data Service

## 5 Protocol stacks for support of J-NNI

1. The protocol stacks for support of J-NNI are composed of protocol entities at different layers. Some of these protocol entities are specified in this specification by referencing to the publication where they are defined. This specification also defines the protocol profiles these entities shall support.
2. Figure 1 shows a reference configuration and defines the location of the Network Node Interface (NNI) at which apply the specifications for:
  - i) The physical interface(s)
  - ii) The MTP 1 protocol profiles
  - iii) The MTP 2 protocol profiles
  - iv) The MTP 3 protocol profiles and functional specification defined in this specification
  - v) The SCCP
  - vi) The N ISUP
  - vii) The U plane protocol profiles
3. The Network Elements that support the J-NNI are N-ISDN Nodes that provide switched N-ISDN and Plain Old Telephone System (POTS) capabilities.
4. This reference configuration is intended for the specification of communication protocols including layer 1 transmission aspects. It does not cover any aspects of the joining network or equipment engineering.

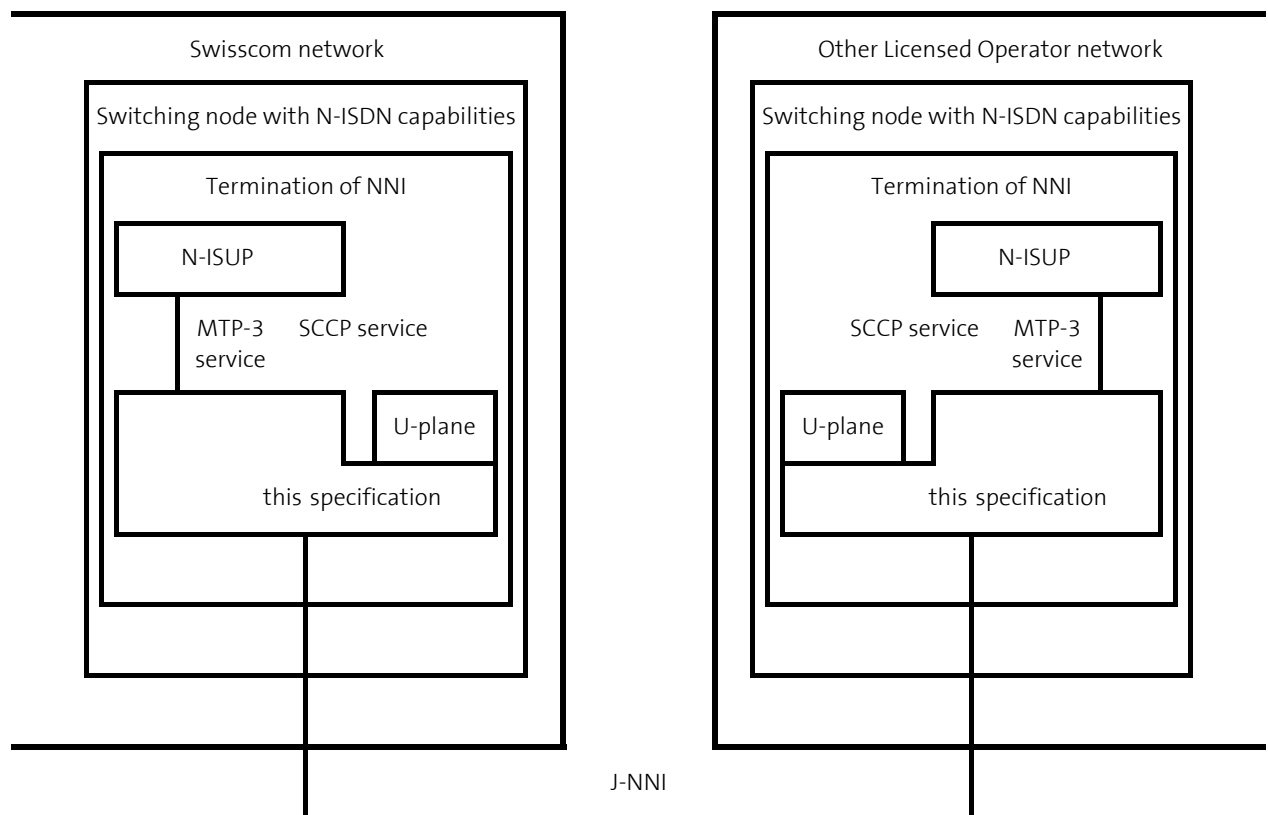


Figure 1 Reference configuration and location of J-NNI

5. The layer services and layer communication protocols comply with the open systems interconnection and the protocol reference model for N-ISDN.
6. The protocols for the different layers are based on ITU-T Recommendations for N-ISDN protocols at the NNI.
7. The physical interfaces are based on ITU-T Recommendations for interfaces at the NNI for use in the N-ISDN.
8. The model used in figure 2 to describe this protocol stack is consistent with the model defined in ITU-T Recommendation I.320 "ISDN Protocol Reference Model". ITU-T Recommendation I.320 adopts the concept of Control Plane (C plane) and User Plane (U plane).
9. The physical interface accomplishes the functions specified in ITU-T Recommendations G.703, G.704 and G.706 and therein referenced specifications.
10. The Physical Layer entity provides access for upper protocol entities to a Channel by using appropriate service primitives across the PHY-SAP. This entity also offers an internal interface to a switching fabric.
11. The MTP 1 and MTP 2 protocol entities belong to the C plane and accomplish the functions specified in ITU-T Recommendations Q.702 and Q.703.
12. The MTP 3 protocol entity accomplishes the functions specified in ITU-T Recommendation Q.704. The MTP 3 provides to its users, which may be signalling protocol entities and SCCP, signalling network

services at a MTP-SAP, which can be utilised by using appropriate service primitives across the MTP-SAP.

13. The SCCP protocol entity accomplishes the functions for the support of connectionless services classes 0 and 1 as specified in ITU-T Recommendation Q.71X-series.

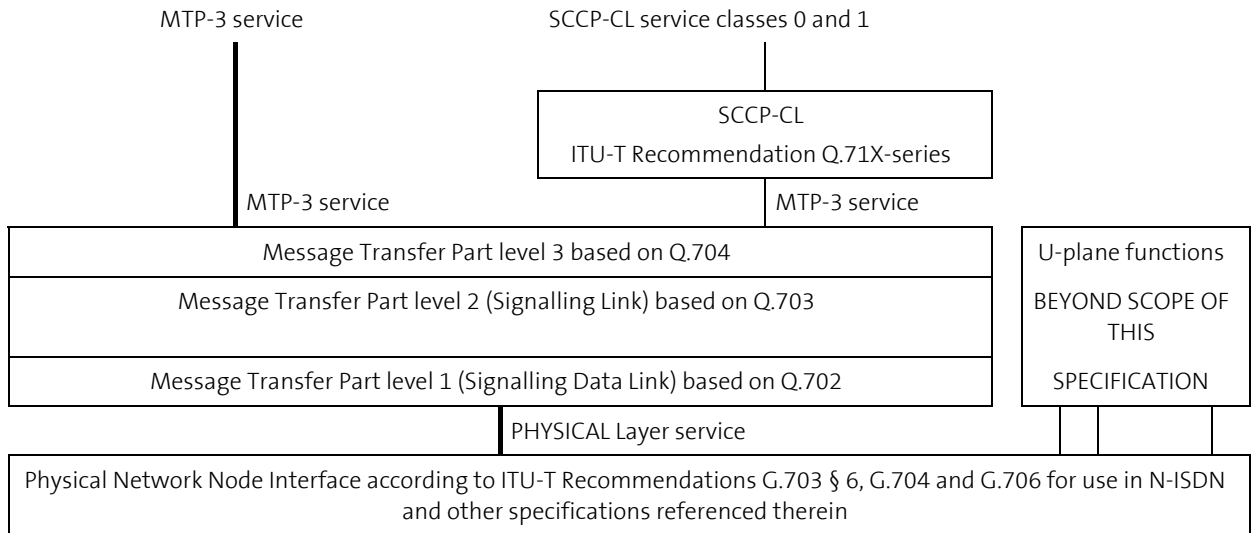


Figure 2 Protocol Stack for the support of signalling at the J-NNI

## 6 Services provided to the user at the upper boundary

### 6.1 Services provided to the user of MTP-3

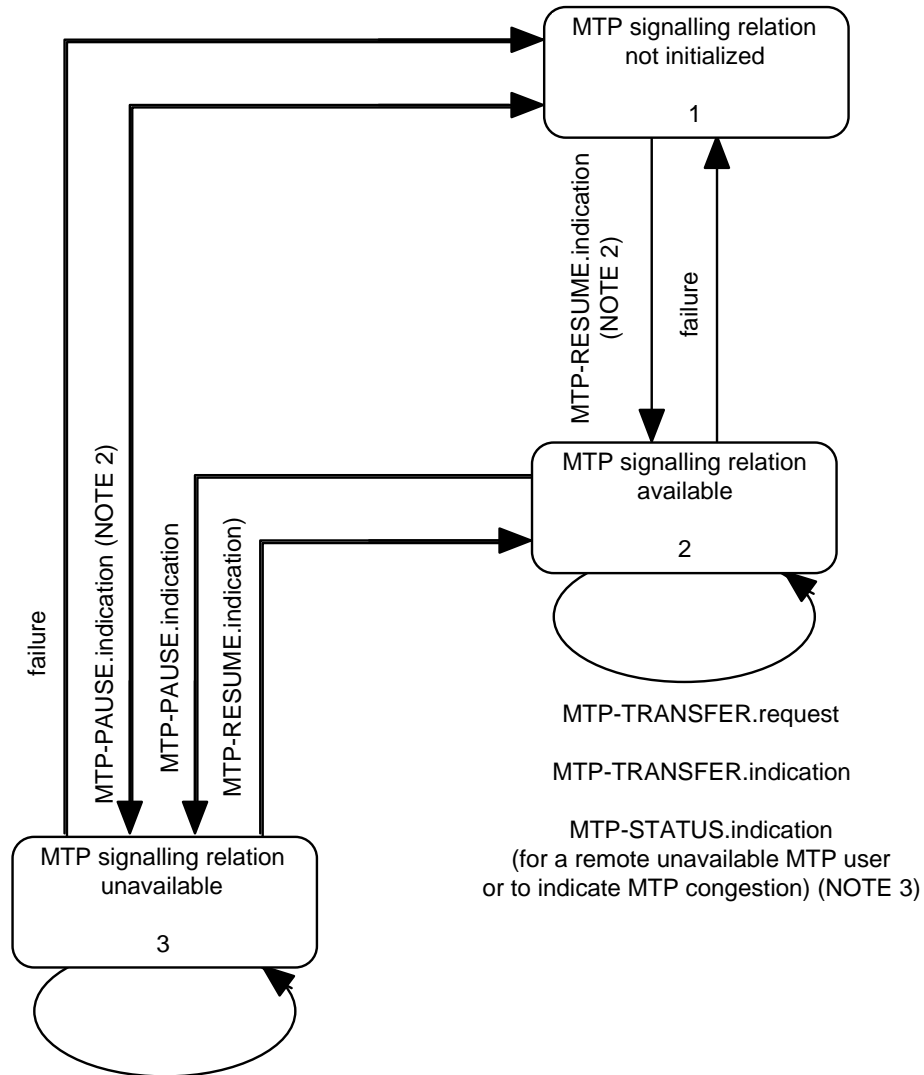
#### 6.1.1 MTP-3 services, MTP-primitives and MTP-SDU size

1. The services offered by the MTP 3 to the MTP 3 user at the NNI are specified in ITU-T Recommendation Q.701 § 1.1, § 1.2 and § 8. They are available at a signalling point to point connection endpoint within a MTP SAP. The maximum MTP Service Data Unit (SDU) size supported by MTP 3 is specified in ITU-T Recommendation Q.703 § 2.3.8 and is 272 octets.

#### 6.1.2 State transition diagram

1. The MTP 3 user which wants to use MTP 3 services shall support the abstract upper MTP 3 boundary which includes the repertoire of MTP primitives, and the layer interactions at a signalling point to point MTP connection endpoint.
2. The state transition diagram, from the MTP User's point of view, is shown in Figure 3. One individual state transition diagram exists per MTP 3 connection, which is conceptually identified by a Connection Endpoint Suffix with the identifier "OPC/DPC". Associated with each MTP 3 connection is one signalling relation.
3. The sequences are related to the states at one MTP connection endpoint and apply to the international method of congestion control.

4. The following states are defined:
- State 1 MTP signalling relation not initialized
  - State 2 MTP signalling relation available
  - State 3 MTP signalling relation unavailable



MTP-TRANSFER.indication (NOTE 1)

MTP-STATUS.indication  
(for a remote unavailable MTP user  
or to indicate MTP congestion)

NOTE 1: The MTP TRANSFER.indication in state 3 indicates the availability of the signalling relation towards the local MTP (state 2), whereas the signalling relation towards the remote MTP is unavailable.

NOTE 2: These transitions are implicitly triggered by the MTP restart procedure.

NOTE 3: The MTP itself does not keep track of the status of the remote MTP users, so that each user is responsible for detecting the availability of its remote peer.

Figure 3 State transition diagram for sequences of MTP-primitives for one MTP signalling relation for the international method of congestion reporting

## 6.2 Services provided to the user of the connectionless SCCP

### 6.2.1 SCCP-CL-services SCCP-CL-primitives

<sup>1</sup> The services offered by the connectionless SCCP to its user and the connectionless SCCP primitives are specified in ITU-T Recommendation Q.711. They are available at an SCCP-SAP.

### 6.2.2 State transition diagram

<sup>1</sup> See § 6.1.2.

## 7 Protocol profiles

### 7.1 Physical layer profile

<sup>1</sup> The physical layer shall provide a digital transmission facility with the following properties:

- Total bit rate of 2048 kbit/s
- Time division multiplex structure with 32 time slots and time slot 0 as synchronization time slot
- 31 time slots for conveyance of a transparent bit stream of 64 kbit/s each
- Capability to enable/disable the Cyclic Redundancy Check with four bit (CRC 4) procedure according to ITU-T Recommendation G.704 § 2.3.3

### 7.2 MTP-1 profile

<sup>1</sup> The MTP 1 profile is based on ITU-T Recommendation Q.702 with the following properties:

- The signalling data link shall be provided over a bidirectional digital transmission path and the signalling bit rate shall be 64 kbit/s. This path is derived from a digital multiplex signal at 2048 kbit/s having a frame structure as described in § 6.1
- The signalling data link shall be exclusively dedicated for the use of Signalling System No. 7
- The signalling data link shall provide transparent transmission of signalling information maintaining the bit sequence integrity. In particular no equipment such as echo suppressors, source encoding converters, etc. shall be inserted in the signalling data link
- Time slot 16 shall be assigned for support of the signalling data link, unless otherwise defined by a bilateral agreement

### 7.3 MTP-2 profile

<sup>1</sup> The MTP 2 profile is described in ITU-T Recommendation Q.703 from § 1.2 through § 1.8 with the

following properties:

- The signalling link bit rate shall be 64 kbit/s
- For error correction, the basic method according to ITU-T Recommendation Q.703 § 1.4.2 applies
- No operation over satellite connections is foreseen. For error correction, the preventive cyclic retransmission method according to ITU-T Recommendation Q.703 § 1.4.3 is not supported

#### 7.4 MTP-3 profile

- <sup>1</sup> The MTP 3 profile is based on ITU-T Recommendation Q.704 with the following properties :
- The MTP profiles defined in this specification apply to a signalling network identified by the Network Indicator (NI) set to binary 11. The NI is conveyed in the bits C and D of the Sub service field within Service Information Octet (SIO) (see ITU-T Recommendation Q.704, FIGURE 13/Q.704 and § 14.2.2)
  - No interworking is foreseen with a MTP 3 implementation according to the CCITT Red Book version of Q.704
  - No interworking is foreseen with a MTP 3 implementation according to the CEPT Recommendation T/S 43 01
  - No operation over satellite connections is foreseen

#### 7.5 Connectionless SCCP profile

- <sup>1</sup> The SCCP-CL profile is based on ITU-T Recommendation Q.711 with following property:
- No subsystem management functions are foreseen

### 8 Physical interface(s) at the J-NNI

#### 8.1 The J-NNI can be provided over two types of interfaces:

- <sup>1</sup>
1. 2048 kbit/s (see § 8.3):  
Originally used for interconnection.  
NB: STM -1 can be used to transport these 2048 kbit/s for the Network Joining Link. 2048 kbit/s links are however presented at the Point of Interconnection (POI), located at the Point of Presence (POP) or SAP circuit terminating unit.
  2. STM-1 (see § 8.2):  
STM-1 interfaces are used for interconnection at the POP or SAP circuit terminating unit, either as electrical or optical interface. Such STM-1 are however structured in VC 12, in order to transport the 2048 kbit/s carrying the voice channels. The POI can be located in the POP or in the SAP, or possibly at any point along the Network Joining Link (in span interconnection).

#### 8.2 Optical/electrical characteristics of the STM-1 interface

- <sup>1</sup> The STM-1 at J-NNI can be either an optical interface or an electrical interface.
1. Optical STM-1 interface:  
The optical characteristics are specified in the ITU-T Rec. G.957. In order to guarantee the transversal compatibility, the different options provided in G.957 (e.g. application code) must be

bilaterally agreed.

2. Electrical STM-1 interface:

The electrical characteristics are specified in the ITU-T Rec. G.703, § 12.

- <sup>2.</sup> The other physical characteristics for both optical and electrical STM-1 interfaces, including jitter performances (tolerance, generation and transfer), are described in ITU-T Rec. G.783, which refers to further ITU-T Recommendations.

### 8.3 Electrical characteristics of the 2048 kbit/s interface

- <sup>1.</sup> The requirements of ITU-T Recommendation G.703 § 6 for 2048 kbit/s Interface using symmetrical pairs with an impedance of 120 ohms shall apply with clarifications as follows:

1. The maximum values for jitter and wander at the output and input ports is given in ITU-T Recommendation G.823 § 2 and § 3.1.1, as referred in ITU-T Recommendation G.703.
2. Return loss at the input port shall be according to ITU-T Recommendation G.703.
3. Return loss at the output port shall be according to ETS 300 166 subclause 5.3.

### 8.4 Frame structure at the 2048 kbit/s interface

- <sup>1.</sup> For Pulse Code Modulation (PCM) 32 frame structure the requirements of ITU-T Recommendation G.704 § 5.1 shall apply.

- <sup>2.</sup> For time slot "0" within PCM 32 frame structure the requirements of ITU-T Recommendation G.704 § 2.3.2 shall apply with clarifications as follows:

1. Use of bit SI according to ITU-T Recommendation G.704 NOTE 1 to Table 5A/G.704.
2. If the CRC 4 procedure according to ITU-T Recommendation G.704 § 2.3.3 is supported, the use of bit no. 1 (that is bit SI in Table 5A/G.704) in the multiframe structure shall comply with the requirements according to ITU-T Recommendation G.704, Table 5B/G.704; otherwise bit SI shall be set to binary "1".
3. The usage of bits Sa4 through Sa8 according to ITU-T Recommendation G.704, NOTE 4 to Table 5A/G.704 does not apply. The bits Sa4 through Sa8 shall be set to binary "1".

### 8.5 Frame alignment

- <sup>1.</sup> For loss of frame alignment the requirements of ITU-T Recommendation G.706 § 4.1.1 shall apply with clarifications as follows:

1. The event "incorrect frame alignment signal" is detected during the synchronized state, if the framing bitpattern "0011011" does not appear at the expected position in the bit stream. Other positions in the bit stream are not taken into account.
2. The event "loss of frame alignment" occurs under at least one of the following conditions:
  - i) When at three consecutive expected positions (time slot 0 in frame that should contain the framing bitpattern) in the bit stream the framing bitpattern "0011011" does not appear
  - ii) When bit 2 in time slot 0, in frames not containing the frame alignment signal, has been received with an error on three consecutive occasions. (According to ITU-T Recommendation G.706 NOTE 1 to § 4.1.1 the binary value shall be "1")
  - iii) If CRC 4 procedures are in use, when the CRC 4 multiframe cannot be acquired within 8 ms

- after frame alignment has been gained (see ITU-T Recommendation G.706 NOTE 2 to § 4.1.1 and § 4.2)
- iv) If CRC 4 procedures are in use, when the defined CRC 4 block error ratio is exceeded (see ITU-T Recommendation G.706 NOTE 2 to § 4.1.1 and NOTE 2 to § 4.3.2)
- 3. The event “loss of frame alignment” shall be indicated to the peer by means of the signal Remote Alarm Indication (RAI) (see ITU-T Recommendation G.704 Table 5A/G.704).
- <sup>2.</sup> For the establishment of frame alignment the requirements of ITU-T Recommendation G.706 § 4.1.2 shall apply with the clarifications as follows:
- 1. Frame alignment is achieved when the three consecutive events occur as follows i) the framing bitpattern “0011011” is detected the first time in a bit by bit search, ii) Bit no.2 in time slot 0 of the subsequent frame is binary “1”, iii) time slot 0 of the subsequent frame contains the framing bitpattern “0011011”.
  - 2. If during the frame alignment process, an expected event does not occur, a new bit by bit search shall start at the bit position after that where the framing bitpattern “0011011” has been detected the first time in accordance with ITU-T Recommendation G.706 NOTE 1 to § 4.3.2.
  - 3. While in the frame aligned state, bit “A” (bit no. 3 in time slot 0 that contains not the framing bitpattern “0011011”) shall be set to binary “0”.

## 8.6 Cyclic Redundancy Check procedure (CRC-4)

- <sup>1.</sup> The elements of the CRC 4 procedure are described in ITU-T Recommendation G.704 § 2.3.3.
- <sup>2.</sup> The proper operation of the CRC 4 procedure requires bilateral agreement between the two ends to enable/disable the procedure in accordance with ITU-T Recommendation G.704 § 2.3.3.5.
- <sup>3.</sup> If the CRC 4 procedure is disabled, bit no. 1 in time slot 0 shall be ignored.
- <sup>4.</sup> If the CRC 4 procedure is enabled the requirements of ITU-T Recommendation G.706 § 4.2 for multiframing shall apply with the clarifications as follows:
  - 1. The search for the multiframe is to be invoked upon achieving frame alignment; this search is confined to bit no. 1 in time slot 0 of frames that do not contain the framing bitpattern “0011011”.
  - 2. The multiframe alignment is achieved when the multiframing bitpattern “001011” has been detected twice since frame alignment has been achieved; the second time latest after a time of 8ms is elapsed (that spans three possible positions in relation to the first detection of the multiframing bitpattern). Otherwise, frame alignment is lost (see § 8.5.1 item 2.iii)).
  - 3. The multiframe alignment is lost when frame alignment is lost.
  - 4. If the CRC 4 procedure is enabled the requirements of ITU-T Recommendation G.704 § 2.3.3.5 for CRC 4 generation and detection (bits C1, C2, C3, C4 according to ITU-T Recommendation G.704, Table 5B/G.704) shall apply.

## 8.7 Cyclic Redundancy Check procedure (CRC-4) error monitor and notification

- <sup>1.</sup> If the CRC 4 procedure is enabled the requirements of ITU-T Recommendations G.704 § 2.3.3 and G.706 § 4.3 for CRC 4 error monitoring and notification shall apply with clarifications as follows:
  - 1. The bit “E” shall be used to notify to the remote side detected CRC 4 errors in accordance with ITU-T Recommendation G.704 § 2.3.3.4.

2. Upon loss of frame alignment, bit “E” is set to binary “0” in accordance with ITU-T Recommendation G.704 § 2.3.3.4.
3. Error notifications received from the remote side are valid, even if the CRC 4 check of the frame conveying (in the bit “E”) the report failed (in accordance with G.704 § 2.3.3.4 NOTE 1).
4. The CRC 4 block error ratio shall be evaluated at each end for both transmission directions, in the receiving direction based on local CRC 4 processing, in the transmitting direction based on CRC 4 error notifications conveyed in bit “E”.
5. A CRC 4 block error ratio that is “too high” in at least one direction of transmission shall be indicated to the remote side by means of RAI signal (in accordance with G.736 § 4.2.2).
6. A CRC 4 block error ratio of the value of  $10^{-6}$  is defined to be “too high”.

## 9 MTP-1 functionality and applicability of procedures

- <sup>1</sup> In general those parts of ITU-T Recommendation Q.702 that refer to a “digital signalling link via switch block” using a 2048 kbit/s digital path shall apply. The equipment supporting the J-NNI shall allow to associate any signalling link with any time slot, except synchronization time slot 0, of the 2.048 Mbit/s 32 time slot channel structure of the interface.

## 10 MTP 2 functionality and applicability of procedures

- <sup>1</sup> In general ITU-T Recommendation Q.703 shall apply, except those parts of that refer to the “preventive cyclic retransmission” mechanism and/or signalling bit rates other than 64 kbit/s.

## 11 MTP 3 functionality, formats and applicability of procedures

### 11.1 MTP 3 general requirements

- <sup>1</sup> In general ITU-T Recommendation Q.704 shall apply with the selection of options and clarifications in according to the following sub sections.
- <sup>2</sup> Since MTP 3 provides the capability to support a variety of signalling network configurations, the application of MTP 3 procedures depends on the particular circumstances. For this reason, this specification of MTP 3 distinguishes between transmitter and receiver requirements for the support of a procedure:
  - The transmitter portion of the MTP 3 protocol machine is committed to support those procedures that are required to reflect the “own” network according to the expectation of the other network operator in compliance with the specification of the J-NNI
  - The receiver portion of the MTP 3 protocol machine is committed to support all procedures in compliance with the specification of the J-NNI

### 11.2 General format and coding conventions

- <sup>1</sup> ITU-T Recommendation Q.704 § 15 specifies the format of the messages, and the fields within the messages, based on bit transmission order. According to the general format and coding conventions used in Q.704, the first bit transmitted appears at the right side of each figure. For each field, the bit with the lowest number is transmitted first and a field may span a number of bits which do not

conform to an integer number of octets (e.g. the 14 bit field which contains the Originating Point Code (OPC).

2. When the MTP 3 generates a PDU, the following coding conventions shall be used:
  - When a field of the PDU is contained within a single octet, the lowest bit number associated with the field represents the least significant bit
  - When a field of the PDU spans more than one octet, the order of the bit values within each octet progressively increases as the bit number and the octet number increases. The lowest bit value associated with the field represents the least significant bit
3. Figure 4 specifies how format and coding conventions apply to signalling network management messages, and Figure 5 how they apply to messages conveying peer to peer information of user parts.
4. With respect to codings for the service indicator field (see ITU-T Recommendation Q.704 § 14.2.1 for definition), the encodings according to Figures 4, 5 and 6 shall apply. The so called “special application message routing capability” according to ITU-T Recommendation Q.704 § 14.2 and § 2.3.1 does not apply.
5. With respect to codings for sub service field (see ITU-T Recommendation Q.704 § 14.2.2 for definition), the encodings according to Figures 4, 5 and 6 shall apply.
6. The standard routing label according to ITU-T Recommendation Q.704 § 2.2.2 consisting of Destination Point Code (DPC) and Originating Point Code (OPC) of 14 bits each, and Signalling Link Selection (SLS) of 4 bits shall apply. A unique numbering scheme for the coding of the fields DPC and OPC shall be used to identify the signalling points of a signalling network.
7. No other encodings than those defined in Figures 4, 5 and 6 are allowed.
8. The SLS field is available for the support of the functions listed below. Which of these functions apply to this recommendation is specified in ITU-T Recommendation Q.701, Table 1/Q.701, and in this specification § 10.5.8 and § 10.6.1:
  - a) SLS for the purpose of load sharing when associated with SDUs of the User Parts ISUP and MTP Testing. This function ensures message sequence integrity of SDUs passed by each User Part to MTP 3 to be conveyed to a destination signalling point (see ITU-T Recommendation Q.704 § 2.2.5)
  - b) Identification of a faulty/unavailable signalling link when associated with PDU Changeover (Changeover Order (COO) or Changeover Acknowledgement (COA))
  - c) Identification of the recovered link (identified by Signalling Link Code (SLC)) to which the traffic is to be diverted when associated with PDU Changeback (Changeback declaration signal (CBD) or Changeback acknowledgement signal (CBA))
  - d) Identification of the signalling link (identified by SLC) to be connected when associated with signaling data link message group (DLM)
  - e) Identification of the signalling link (identified by SLC) on which the signalling network testing and maintenance message (SLTM, SLTA) is sent

8	7	6	5	4	3	2	1	Bit	
								Octet	
SIO								1	
Sub-service field				Service indicator					
D	C	B	A	D	C	B	A		
1	1	spare set to "0"	spare set to "0"	0	0	0	0		
DPC.1								LSB	2
OPC.1		LSB	MSB		DPC.2				3
OPC.2								4	
MSB		SLC		LSB	MSB			OPC.3	5
Heading code H1				Heading code H0				6	
D	C	B	A	D	C	B	A		
LSB								(NOTE) 7	
MSB								(NOTE) m	

NOTE : The octets numbered from 7 through m may not be present, or consist of one or more than one octet, depending on the type of signalling network management message.

Figure 4 Format and coding conventions of signalling network management messages

8	7	6	5	4	3	2	1	Bit	
								Octet	
SIO								1	
Sub-service field				Service indicator					
D	C	B	A	D	C	B	A		
1	1	spare set to "0"	spare set to "0"	0	1	0	1	ISUP	
DPC.1								LSB	2
OPC.1		LSB	MSB		DPC.2				3
OPC.2								4	
MSB		SLS		LSB	MSB			OPC.3	5
PAYLOAD								LSB	6
PAYLOAD									
MSB								PAYLOAD	n

Figure 5 Format and coding conventions of messages conveying peer to peer information of user parts

### 11.3 Formats and codes of signalling network management messages

#### 11.3.1 Applicability of PDUs defined in Q.704

- <sup>1</sup> The repertoire of PDUs with encodings as specified in ITU-T Recommendation Q.704 § 15 shall apply as indicated in Table 1, with the exceptions specified in subsequent paragraphs.
- <sup>2</sup> The PDUs received which are associated with a procedure which is not supported, are disregarded and no action is taken (NOTE).
- <sup>3</sup> This applies for example to Transfer restricted (TFR).
- <sup>4</sup> In Table 1:
  - Support = X denotes that this PDU is in the active repertoire of a transmitter which can be the initiator of a procedure. The receiver which can be the responder of a procedure shall treat this PDU in accordance with the protocol
  - Not allowed = X denotes that this PDU need not be recognized at the receiving side and shall be disregarded without any further action (in the same manner as not allocated heading code points)

PDU	Group H0	Type H1	Ref. to Q.704	Procedure associated with	H1 DCBA	H0 DCBA	support	not allowed
Signalling-data-link-connection-not-possible	DLM	CNP	15.14	Data link connecting	0100	1000		X
Signalling-data-link-connection-not-successful	DLM	CNS	15.14	Data link connecting	0011	1000		X
Signalling-data-link-connection-order (NOTE)	DLM	DLC	15.13	Data link connecting	0001	1000		X
Signalling-data-link-connections successful	DLM	CSS	15.14	Data link connecting	0010	1000		X

NOTE: The Signalling-data-link-connection-order message is able to identify a layer 1 data link (based on 12 bit field) in an arrangement which is circuit based, making use of CIC, or even a submultiplex of a 64 kbit/s data stream, making use of BIC.

Table 1 (1 of 3) Repertoire of PDUs Set A (Signalling Link management messages) of signalling network management messages

PDU	Group H0	Type H1	Ref. to Q.704	Procedure associated with	H1 DCBA	H0 DCBA	support	not allowed
Changeback acknowledgement	CHM	CBA	15.5	Changeback	0110	0001	X	
Changeback declaration	CHM	CBD	15.5	Changeback	0101	0001	X	
Changeover acknowledgement	CHM	COA	15.4	Changeover	0010	0001	X	
Changeover order	CHM	COO	15.4	Changeover	0001	0001	X	
Emergency changeover acknowledgement	ECM	ECA	15.6	Changeover	0010	0010	X	
Emergency changeover order	ECM	ECO	15.6	Changeover	0001	0010	X	
Link force uninhibit	MIM	LFU	15.11	Link uninhibiting	0110	0110	X	
Link inhibit	MIM	LIN	15.11	Link inhibiting	0001	0110	X	
Link uninhibit	MIM	LUN	15.11	Link uninhibiting	0010	0110	X	
Link inhibited acknowledgement	MIM	LIA	15.11	Link inhibiting	0011	0110	X	

Link uninhibited acknowledgement	MIM	LUA	15.11	Link uninhibiting	0100	0110	X	
Link inhibit denied	MIM	LID	15.11	Link inhibiting	0101	0110	X	
Link local inhibit test	MIM	LLT	15.11	Link inhibit test	0111	0110	X	
Link remote inhibit test	MIM	LRT	15.11	Link inhibit test	1000	0110	X	
Traffic restart allowed	TRM	TRA	15.12	MTP restart	0001	0111	X	
User part unavailable	UFC	UPU	15.17	User Part availability control	0001	1010		X

Table 2 (2 of 3) Repertoire of PDUs Set B (Signalling Traffic management messages) of signalling network management messages

PDU	Group HO	Type H1	Ref. to Q.704	Procedure associated with	H1 DCBA	H0 DCBA	support	not allowed
Signalling-route-set-test for prohibited destination	RSM	RST	15.10	Signalling route set test	0001	0101	X	
Signalling-route-set-test for restricted destination	RSM	RSR	15.10	Signalling route set test	0010	0101		X
Signalling-route-set-congestion-test	FCM	RCT	15.16	Signalling route set congestion test	0001	0011		X
Transfer-allowed	TFM	TFA	15.8	Transfer allowed AND Controlled rerouting AND Signalling route set test	0101	0100	X	
Transfer controlled	FCM	TFC	15.15	Signalling route set congestion	0010	0011	X	
Transfer-prohibited	TFM	TFP	15.7	Forced rerouting AND MTP restart AND Signalling route set test	0001	0100	X	
Transfer restricted	TFM	TFR	15.9	Controlled rerouting AND MTP restart AND Signalling route set test	0011	0100		X

Table 3 (3 of 3) Repertoire of PDUs Set C (Signalling Route management messages) of signalling network management messages

### 11.3.2 Changeback declaration message

- <sup>1</sup> ITU-T Recommendation Q.704 § 15.5 shall apply with the following clarification:  
The changeback code is generated by the entity initiating the changeback procedure. It shall be unique for a specific changeback hand shaking and allows discriminating between concurrent changebacks.

### 11.3.3 Transfer allowed message

- <sup>1</sup> ITU-T Recommendation Q.704 § 15.8 without use of SIF compatibility mechanism shall apply (see also ITU-T Recommendation Q.701 §7.2.6).

#### 11.3.4 Signalling route set test message

- <sup>1</sup> ITU-T Recommendation Q.704 § 15.10 without use of heading code H1 for restricted destination shall apply (i.e. H1 encoding DCBA = 0010 is not allowed).

#### 11.3.5 Transfer controlled message

- <sup>1</sup> ITU-T Recommendation Q.704 § 15.15 without notification of congestion status shall apply (i.e. the two spare bits shall be set to binary “00”).

#### 11.4 MTP timers and timer values

- <sup>1</sup> The timers are defined in ITU-T Recommendation Q.704 [§ 16.8. Their applicability is defined in ETS 300 008 § 4.3.2 while the timer values defined in ETS 300 008 § 4.3.2 are identical to those defined in ITU-T Recommendation Q.704 § 16.8. The Table 4 specifies the applicability of timers in general, while under certain conditions being subject to network construction, some timers may not need to be supported. The values contained in Table 4 are provisional, their applicability requires further evaluation.

Timer	Description	Value/range	Procedure associated with	Applicability
T1	Delay to avoid message mis-sequencing on changeover	500 (800) to 1200 ms	Time-controlled changeover	
T2	Waiting for changeover acknowledgement	700 (1400) to 2000 ms	Changeover	
T3	Time controlled diversion - delay to avoid message mis-sequencing on changeback	500 (800) to 1200 ms	Time-controlled changeback	
T4	Waiting for changeback acknowledgement (first attempt)	500 (800) to 1200 ms	Changeback	
T5	Waiting for changeback acknowledgement (second attempt)	500 (800) to 1200 ms	Changeback	
T6	Delay to avoid message mis-sequencing on controlled rerouting	500 (800) to 1200 ms	Controlled rerouting	
T7	Waiting for signalling data link acknowledgement	1 to 2s	Data link connecting	n.a. [008] § 4.3.2
T8	Transfer prohibited inhibition timer (transient solution)	800 to 1200 ms		
T9	NOT USED			n.a.
T10	Waiting to repeat signalling route set test message	30 to 60s		
T11	Transfer restricted timer	30 to 90s		n.a. [008] § 4.3.2
T12	Waiting for uninhibit acknowledgement	800 to 1500 ms	Managem. inhibit	
T13	Waiting force uninhibit	800 to 1500 ms	Managem. inhibit	
T14	Waiting for inhibition acknowledgement	2 to 3s	Managem. inhibit	
T15	Waiting to start signalling route set congestion test	2 to 3s		n.a. [008] § 4.3.2
T16	Waiting for route set congestion status update	1.4 to 2s		n.a. [008] § 4.3.2

T17	Delay to avoid oscillation of initial alignment failure and link restart.	800 to 1500 ms	Link activation	
T18	Supervision of link activation , link set activation and receipt of routing information	Implementation and network dependent	MTP restart	
T19	Supervision during MTP restart to avoid possible ping-pong of TFP, TFR and TRA messages	67 to 69s	MTP restart	
T20	Overall MTP restart timer at the signalling point whose MTP restarts	59 to 61s	MTP restart	
T21	Overall MTP restart timer at the signalling point adjacent to one whose MTP restarts	63 to 65s	MTP restart	
T22	Local inhibit test timer	3 to 6min	Managem. inhibit	
T23	Remote inhibit test timer	3 to 6min	Managem. inhibit	
T24	Stabilizing timer after removal of local processor outage, used in LPO to RPO	500 ms		n.a. [008] § 4.3.2

Table 4 Timers and timer values

## 11.5 Applicability of procedures

### 11.5.1 Changeover

- <sup>1</sup> The requirements of ITU-T Recommendation Q.704 § 5 shall apply in accordance with the particular structure of the interconnection signalling network.

### 11.5.2 Changeback

- <sup>1</sup> The requirements of ITU-T Recommendation Q.704 § 6 shall apply in accordance with the particular structure of the interconnection signalling network.

### 11.5.3 Forced rerouting

- <sup>1</sup> The forced rerouting procedure as specified in ITU-T Recommendation Q.704 § 7 shall be invoked upon the receipt of a transfer prohibited (TFP) message provided that an alternative route is defined and available, otherwise ITU-T Recommendation Q.704 § 7.2.3 applies. Whether or not the signalling network of the other operator or Swisscom transmits the transfer prohibited (TFP) message is subject to network construction and therefore beyond the scope of this specification.

### 11.5.4 Controlled rerouting

- <sup>1</sup> The controlled rerouting procedure as specified in ITU-T Recommendation Q.704 § 8 shall be invoked upon the receipt of a transfer allowed (TFA) message provided that an alternative route is in use to convey signalling traffic. Whether or not the signalling network of the OLO or Swisscom transmits the transfer allowed (TFA) message is subject to network construction and therefore beyond the scope of this specification.

#### 11.5.5 MTP restart

- <sup>1.</sup> The MTP restart procedure is described in ITU-T Recommendation Q.704 § 9. Whether or not the signalling point supporting the J-NNI performs signalling transfer functions is subject to network construction and therefore beyond the scope of this specification. For the transmission of messages associated with the restart function, the requirements of ITU-T Recommendation Q.704 § 9 shall apply according to the functionality (without/with Signalling Transfer Point (STP)) of the signalling point supporting the J-NNI with the following clarifications:
  1. In the restarting node the condition "sufficient Signalling Links available" is true if at least one Signalling Link with any adjacent Signalling Point is available.
  2. For the reception of messages associated with the restart function, the requirements of ITU-T Recommendation Q.704 § 9 shall apply.

#### 11.5.6 Management inhibiting of signalling link

- <sup>1.</sup> Management inhibiting of signalling link is a management mechanism which allows to make or keep a signalling link unavailable to User Part generated traffic. The required procedures are part of the signalling traffic management and the status of the connection within the provider layer is not affected.
- <sup>2.</sup> This function is making use of three procedures:
  - i) The link inhibiting procedure can be requested by management functions at either end of a signalling link. The request is granted, under the condition that the inhibiting action does not cause any previously accessible destinations to become inaccessible at either end of the signalling link. The end of the signalling link which initiated the procedure, in case of successful inhibiting, changes the status of the signalling link to "local inhibited" while the status at the other end is "remotely inhibited".
  - ii) The link uninhibiting procedure can be requested by management (functions or the signalling routing control (TSRC) is part of signalling traffic management) for a locally inhibited signalling link, or by the signalling routing control for a remotely inhibited signalling link. In the latter case, forced uninhibiting is initiated.
  - iii) The link inhibit test procedure is initiated for a signalling link which is inhibited periodically on expiry of a timer in order to guard the inhibition status at each end of the signalling link.
- <sup>3.</sup> For the link inhibiting procedure the requirements of ITU-T Recommendation Q.704 § 10.2 shall apply.
- <sup>4.</sup> For the link uninhibiting procedure the requirements of ITU-T Recommendation Q.704 § 10.3 shall apply.
- <sup>5.</sup> For the link inhibit test procedure the requirements of ITU-T Recommendation Q.704 § 10.6 shall apply.
- <sup>6.</sup> In addition the requirements of ITU-T Recommendation Q.704 § 10.4 and § 10.5 shall apply for the treatment of unexpected management inhibition messages as well as the processor recovery or receipt of messages for delivery to User Parts.

### 11.5.7 Signalling traffic flow control

- <sup>1.</sup> The requirements of ITU-T Recommendation Q.704 § 11 shall apply with the modifications from § 10.5.7.1 through §10.5.7.3.

#### 11.5.7.1 Flow control indications to the local user parts

- <sup>1.</sup> The requirements of ITU-T Recommendation Q.704 § 11.2.1 and § 11.2.2 shall apply with the following amendments:
  - In the case of unavailability, the appropriate primitive is MTP PAUSE.indication with a parameter indicating the concerned DPC
  - In the case of availability, the appropriate primitive is MTP RESUME.indication with a parameter indicating the concerned DPC

#### 11.5.7.2 Signalling rout set congestion

- <sup>1.</sup> The requirements of ITU-T Recommendation Q.704 § 11.2.3 (International signalling network) shall apply with the following amendment:
  - In 11.2.3.1 i) item b), the appropriate primitive is MTP STATUS.indication with a parameter indicating the affected DPC
  - The value for N for a particular signalling link is implementation and network provider dependent. The value N stands for the number of octets specified in § 11.2.3.1 for which, in case of a congested route, a MTP STATUS.indication with a cause "signalling network congested", or transfer controlled message shall be generated
- <sup>2.</sup> The alternative mechanisms, like the option with congestion priorities according to ITU-T Recommendation Q.704 § 11.2.4, and the option without congestion priorities according to ITU-T Recommendation Q.704 § 11.2.5 shall not be used.

### 11.5.8 User part availability control

- <sup>1.</sup> The requirements of ITU-T Recommendation Q.704 § 11.2.7 shall not apply, i.e. the UPU message is not allowed.

### 11.5.9 Signalling link management

- <sup>1.</sup> The signalling link management addresses:
  - a) The allocation of protocol entities (signalling equipment such as signalling terminals) for support of a signalling link
  - b) A connecting procedure which allows to establish, or release, an association between a signalling link and Signalling Link (SL) connection endpoints at both ends. The identity of a signalling link, referred to by the SLC, is not the SL connection identity itself to identify a signalling link within provider layers such as CIC
  - c) The activation, restoration and deactivation of a link set and individual links. A primitive procedure allows to request, or release provider layer resources which are offered in form of SL connections
- <sup>2.</sup> The allocation of protocol entities (signalling equipment such as signalling terminals) for the support of

a signalling link is a local matter; its realization is in the responsibility of implementers. The automatic allocation of signalling terminals defined in ITU-T Recommendation Q.704 § 12.3 and § 12.5 is not applicable, in accordance with ETS 300 008 § 4.4.

3. For the support of basic signalling link management an association between each signalling link and SL connection endpoints is established, or released, in a local procedure at each end of the signalling link. The number of active (associated SL connection In Service) and inactive (associated SL connection Out of Service) signalling links and the priority for signalling initialization of links in a link set shall be identical at both ends of the link set. The requirements of ITU-T Recommendation Q.704 § 12.2 shall apply. In order to invoke a SL connection, the SL START.request primitive shall be used; the SL IN\_SERVICE.indication notifies to MTP 3 the completion of the initial alignment. On receipt of the SL IN\_SERVICE.indication primitive, the signalling link test as specified in ITU-T Recommendation Q.707 § 2.2 shall be invoked (NOTE), further requirements are specified in § 10.6. In order to release a SL connection, the SL STOP.request primitive shall be used.

The coding of the service indicator for signalling network testing and maintenance messages is DCBA = 0001 (see also ITU-T Recommendation Q.704 § 14.2.1).

4. The signalling link management procedures for automatic allocation of signalling data links according to ITU-T Recommendation Q.704 § 12.4 and § 12.6, in accordance with ETS 300 008 § 4.4 are not applicable.

#### 11.5.10 Transfer controlled procedures

1. Alternative Transfer controlled procedures are described in ITU-T Recommendation Q.704 §§ 13.6 (congestion indication), 13.7 (congestion priority), and 13.8 (multiple congestion states).
2. The requirements of ITU-T Recommendation Q.704 § 13.6 shall apply.
3. The procedures according to ITU-T Recommendation Q.704 §13.7 and § 13.8 shall not apply.

#### 11.5.11 Transfer prohibited procedure

1. The invocation of the procedure specified in ITU-T Recommendation Q.704 § 13.2 is subject to network construction and therefore beyond the scope of this specification. When receiving a transfer prohibited message, the requirements of ITU-T Recommendation Q.704 § 13.2.3 and § 13.2.4 shall apply.

#### 11.5.12 Transfer allowed procedure

1. The invocation of the procedure specified in ITU-T Recommendation Q.704 § 13.3 is subject to network construction and therefore beyond the scope of this specification. When receiving a transfer allowed message, the requirements of ITU-T Recommendation Q.704 § 13.3.3 and § 13.3.4 shall apply.

#### 11.5.13 Signalling route set test procedure

1. The requirements of ITU-T Recommendation Q.704 § 13.5 shall apply with the following exceptions:
  1. This procedure is not to be invoked upon receipt of a Transfer restricted message (since this message is not allowed).
  2. The Transfer restricted message shall not be sent in response to a Signalling route set test signal message.

**11.5.14 Transfer route set congestion test procedure**

<sup>1.</sup> The procedure specified in ITU-T Recommendation Q.704 § 13.9 shall not apply.

**11.5.15 Transfer restricted procedure**

<sup>1.</sup> The procedure specified in ITU-T Recommendation Q.704 § 13.4 shall not apply.

**11.6 Testing and Maintenance**

<sup>1.</sup> This section specifies the modifications to ITU-T Recommendation Q.707.

**11.6.1 General format and coding convention**

<sup>1.</sup> ITU-T Recommendation Q.707 § 5.4 specifies the format of the messages, and the fields within the messages, based on bit transmission order. According to the general format and coding conventions used in Q.704, the first bit transmitted appears at the right side of each figure. For each field, the bit with the lowest number is transmitted first and a field may span a number of bits which do not conform to an integer number of octets (e.g. the 14 bit field which contains the OPC).

<sup>2.</sup> Figure 6 specifies how format and coding conventions apply to signalling network testing and maintenance messages.

8	7	6	5	4	3	2	1	Bit	
								Octet	
SIO								1	
Sub-service field				Service indicator					
D	C	B	A	D	C	B	A		
1	1	spare set to "0"	spare set to "0"	0	0	0	1		
DPC.1							LSB	2	
OPC.1		LSB	MSB		DPC.2			3	
OPC.2								4	
MSB		SLC		LSB	MSB			OPC.3	5
Heading code H1				Heading code H0				6	
D	C	B	A	D	C	B	A		
Length indicator				Spare set to "0000"				7	
Test pattern							LSB	(NOTE) 8	
MSB								(NOTE) m	

NOTE : The octets numbered from 8 through m contain the test pattern which consists of one up to fifteen octets.

Figure 6 Format and coding conventions of signalling network testing and maintenance messages

**11.6.2 Formats and codes of signalling network testing and maintenance messages**

- <sup>1.</sup> The repertoire of PDUs with encodings as specified in ITU-T Recommendation Q.707 § 5.3 and § 5.4 shall apply as indicated in Table 6.
- <sup>2.</sup> In Table 6:
  - Support = X denotes that this PDU is in the active repertoire of a transmitter which can be the initiator of a procedure. The receiver which can be the responder of a procedure shall treat this PDU in accordance with the protocol
  - Not allowed = X denotes that this PDU need not be recognized at the receiving side and shall be discarded without any further action (in the same manner as not allocated heading code points)

PDU	Group H0	Type H1	Ref. to Q.707	Procedure associated with	H1 DCBA	H0 DCBA	support	not allowed
Signalling link test message	SLT	SLTM	5.4	Signalling data link test	0001	0001	X	
Signalling link test acknowledgement message	SLT	SLTA	5.4	Signalling data link test	0010	0001	X	

Table 5 Repertoire of PDUs – Signalling network testing and maintenance messages

**11.6.3 Timers and timer values**

- <sup>1.</sup> The timers defined in ITU-T Recommendation Q.707 § 5.5 shall apply.

**11.6.4 Applicability of procedures**

- <sup>1.</sup> The procedures defined in ITU-T Recommendation Q.707 § 2.2 shall apply with the following exception:
  - The Signalling Link Test which is performed at regular intervals, i.e. periodically on expiry of timer T2, shall be adjustable per link set

**12 Connectionless SCCP functionality, formats and applicability of procedures**

**12.1 SCCP-CL general requirements**

- <sup>1.</sup> In general ITU-T Recommendations Q.711, Q.712, Q.713 and Q.714 shall apply with the selection of options and clarifications in subsequent subsections of section 12.
- <sup>2.</sup> For this specification all state transition diagrams have only informative character. In case of contradictions between text and STDs, the specification text, respectively the ITU-Text has priority.

**12.2 Definitions and functions**

<sup>1</sup> ITU-T Recommendation Q.712 specifies the definitions and function of SCCP messages. The whole recommendation is required except all matters concerning connection oriented SCCP.

**12.3 Formats and codes**

<sup>1</sup> In general ITU-T Recommendation Q.713 shall apply except all matters concerning connection oriented SCCP and the following restrictions, differences and supplements.

§3.4.1	ADDRESS INDICATOR	The Global Title Indicator has only the values
		Bit 6 5 4 3
		0 0 0 0 No global title included
		0 1 0 0 Global title includes translation type, numbering plan, encoding scheme and nature of address
		Bit 8 (reserved for national use) is always coded 0 and is not evaluated.
§3.4.2.2	SUBSYSTEM NUMBER	In addition the following network specific SSNs are used:
		Bits 8 7 6 5 4 3 2 1
		0 0 0 0 1 0 1 1 ISS ISDN Supplementary Services
§3.4.2.3	GLOBAL TITLE	only Global Title format 4 is required
§3.4.2.3.4	GLOBAL TITLE=0100	the following parameters are defined:
		Bits 8 7 6 5 4 3 2 1
	Translation Type	0 0 0 0 0 0 0 0 The octet is 0 when not used
		0 0 0 1 0 0 0 1 CCBS, MWI
	Numbering plan	0 0 0 1 x x x x ISDN/Telephony (E.163 and E.164)
	Encoding Scheme	0 0 0 1 BCD, odd number of digits
		0 0 1 0 BCD, even number of digits
	Nature of address	0 0 0 0 0 0 1 1 national significant number
		0 0 0 0 0 1 0 0 international number
§3.6	PROTOCOL CLASS	Bits 4 3 2 1
		0 0 0 0 class 0
		0 0 0 1 class 1

Table 6 Exceptions and clarifications to .713 [Q.713] SCCP, formats and codes

**12.4 Procedures**

<sup>1.</sup> In general ITU-T Recommendation Q.714 shall apply except all matters concerning connection oriented SCCP and the following restrictions, differences and supplements.

§1.1.2.2 PROTOCOL CLASS 1	Supplement according to [009]: The insequence delivery not only relies on the properties of the MTP-network, but also SCCP shall guarantee the sequential processing of SCCP-messages. This excludes e.g. arbitrary parallel processing of global title translations in relay nodes.
§2.4 GLOBAL TITLE TRANSLATION	
§4 CONNECTIONLESS PROCEDURES Supplement:	- fifth paragraph: The word 'may' in the sentence beginning with 'For protocol class 0...' is replaced with 'shall'
§4.1.1 SEGMENTATION/REASSEMBLY	According to [009] insert the following note: NOTE: The principle of segmenting/reassembly of connectionless message is such that actions are necessary in relay nodes, except for routing the XUDT and XUDTS messages in the same way as UDT and UDTS messages.
§4.1.1.2.3 MESSAGE RETURN PROCEDURE	Supplement according to [009]: The timeout of the reassembly timer shall be considered as one of the errors for which this procedure applies.

Table 7 Exceptions and clarifications Q.714 [Q.714] SCCP, procedures

**13 Transactions Capabilities**

<sup>1.</sup> The implementation of the Swisscom TC is based on ETS 300 287-1, which contains modifications to the ITU-T Recommendations Q.771 to Q.775.