INTERNATIONAL TELECOMMUNICATION UNION

ITU-T Q.2220

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

(12/2002)

SERIES Q: SWITCHING AND SIGNALLING

Broadband ISDN – Signalling network protocols

Transport-Independent Signalling Connection Control Part (TI-SCCP)

ITU-T Recommendation Q.2220

ITU-T Q-SERIES RECOMMENDATIONS

SWITCHING AND SIGNALLING

SIGNALLING IN THE INTERNATIONAL MANUAL SERVICE	Q.1–Q.3
INTERNATIONAL AUTOMATIC AND SEMI-AUTOMATIC WORKING	Q.4–Q.59
FUNCTIONS AND INFORMATION FLOWS FOR SERVICES IN THE ISDN	Q.60–Q.99
CLAUSES APPLICABLE TO ITU-T STANDARD SYSTEMS	Q.100–Q.119
SPECIFICATIONS OF SIGNALLING SYSTEM No. 4	Q.120–Q.139
SPECIFICATIONS OF SIGNALLING SYSTEM No. 5	Q.140–Q.199
SPECIFICATIONS OF SIGNALLING SYSTEM No. 6	Q.250–Q.309
SPECIFICATIONS OF SIGNALLING SYSTEM R1	Q.310–Q.399
SPECIFICATIONS OF SIGNALLING SYSTEM R2	Q.400–Q.499
DIGITAL EXCHANGES	Q.500–Q.599
INTERWORKING OF SIGNALLING SYSTEMS	Q.600–Q.699
SPECIFICATIONS OF SIGNALLING SYSTEM No. 7	Q.700–Q.799
Q3 INTERFACE	Q.800–Q.849
DIGITAL SUBSCRIBER SIGNALLING SYSTEM No. 1	Q.850–Q.999
PUBLIC LAND MOBILE NETWORK	Q.1000–Q.1099
INTERWORKING WITH SATELLITE MOBILE SYSTEMS	Q.1100–Q.1199
INTELLIGENT NETWORK	Q.1200–Q.1699
SIGNALLING REQUIREMENTS AND PROTOCOLS FOR IMT-2000	Q.1700–Q.1799
SPECIFICATIONS OF SIGNALLING RELATED TO BEARER INDEPENDENT CALL CONTROL (BICC)	Q.1900–Q.1999
BROADBAND ISDN	Q.2000–Q.2999
General aspects	Q.2000–Q.2099
Signalling ATM adaptation layer (SAAL)	Q.2100–Q.2199
Signalling network protocols	**Q.2200–Q.2299**
Common aspects of B-ISDN application protocols for access signalling and network signalling and interworking	Q.2600–Q.2699
B-ISDN application protocols for the network signalling	Q.2700–Q.2899
B-ISDN application protocols for access signalling	Q.2900–Q.2999

For further details, please refer to the list of ITU-T Recommendations.

ITU-T Recommendation Q.2220

Transport-Independent Signalling Connection Control Part (TI-SCCP)

Summary

ITU-T Recs Q.711, Q.712, Q.713, Q.714, Q.715 and Q.716 define the services of the Signalling Connection Control Part (SCCP). The SCCP provides, above the signalling transport network (or networks) connection-oriented, connectionless, routing, and management services. ITU-T Rec. Q.711 defines the services provided; ITU-T Rec. Q.714 describes the procedures performed by the SCCP. These procedures make use of the messages and information elements defined in ITU-T Rec. Q.712, whose formatting and coding aspects are specified in ITU-T Rec. Q.713. ITU-T Rec. Q.715 is a guide for the SCCP and ITU-T Rec. Q.716 defines SCCP performance.

This Recommendation defines the Transport-Independent Signalling Connection Control Part (TI-SCCP), which consists of a modification to SCCP that allows it to operate on various signalling transport networks. In addition to the MTP3 and MTP3b networks, TI-SCCP can operate on SSCOP and SSCOPMCE based networks as well as on IP-networks by utilizing the transport protocol defined in RFCs 2960 and 3309.

The independence of the particular signalling transport technology is achieved by basing the TI-SCCP on the Generic Signalling Transport Service (ITU-T Rec. Q.2150.0) and deploying one of the Signalling Transport Converters specified in ITU-T Recs Q.2150.1, Q.2150.2, or Q.2150.3.

Source

ITU-T Recommendation Q.2220 was approved on 29 December 2002 by ITU-T Study Group 11 (2001-2004) under the ITU-T Resolution A.8 procedure.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure e.g. interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

CONTENTS

ITU-T Recommendation Q.2220

Transport-Independent Signalling Connection Control Part (TI-SCCP)

1 Scope

This Recommendation describes the adaptation of the narrow-band Signalling System No. 7 Signalling Connection Control Part (SCCP) for the capability to deploy the Generic Signalling Transport Service defined in ITU-T Rec. Q.2150.0.

This Recommendation is written as a set of exceptions to ITU-T Recs Q.711, Q.712, Q.713, Q.714 and Q.715 defining the SCCP. The exceptions to certain clauses of text from the SCCP Recommendations are indicated by using revision marks. (Deleted text is shown using strikeouts, and added text is shown underlined.)

The protocol defined by this Recommendation is the Signalling Connection Control Part (SCCP) protocol to be used between "Serving Nodes". This protocol is called the "Transport-Independent Signalling Connection Control Part" (TI-SCCP).

The scope of this Recommendation is shown in Figure 1-1.

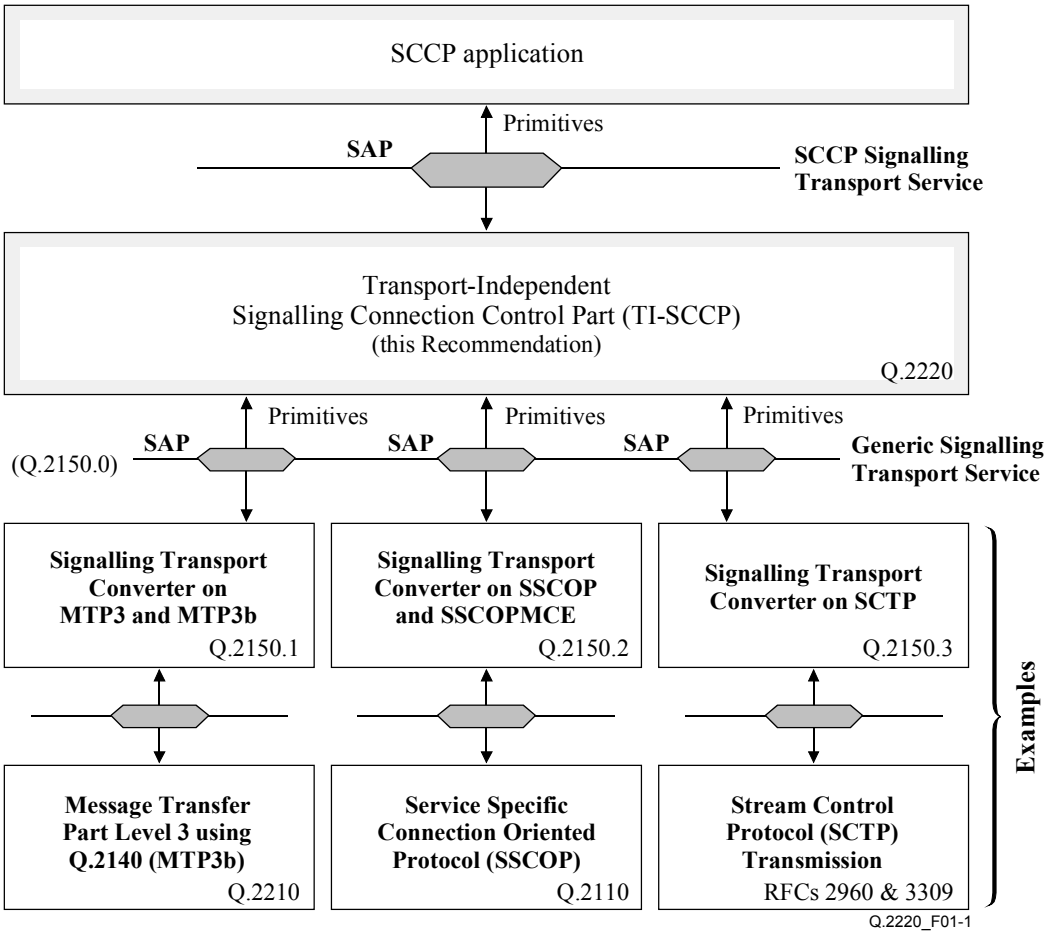

Figure 1-1/Q.2220 – Scope of this Recommendation

2 References

2.1 Normative references

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[1] ITU-T Recommendation Q.711 (2001), *Functional description of the signalling connection control part.*

[2] ITU-T Recommendation Q.712 (1996), *Definition and function of signalling connection control part messages.*

[3] ITU-T Recommendation Q.713 (2001), *Signalling connection control part formats and codes.*

[4] ITU-T Recommendation Q.714 (2001), *Signalling connection control part procedures.*

[5] ITU-T Recommendation Q.715 (2002), *Signalling connection control part user guide.*

[6] ITU-T Recommendation Q.2150.0 (2001), *Generic signalling transport service.*

2.2 Informative references

The following ITU-T Recommendations and other documents contain information that may be useful to understanding the usage of this Recommendation. There are no additional provisions of this Recommendation derived from these documents.

[B1] ITU-T Recommendation Q.2150.1 (2001), *Signalling transport converter on MTP3 and MTP3b.*

[B2] ITU-T Recommendation Q.2150.2 (2001), *Signalling transport converter on SSCOP and SSCOPMCE.*

[B3] ITU-T Recommendation Q.2150.3 (2002), *Signalling transport converter on SCTP.*

[B4] ITU-T Recommendation Q.2210 (1996), *Message transfer part level 3 functions and messages using the services of ITU-T Recommendation Q.2140.*

[B5] ITU-T Recommendation Q.2110 (1994), *B-ISDN ATM adaptation layer – Service specific connection oriented protocol (SSCOP).*

[B6] ITU-T Recommendation Q.2111 (1999), *B-ISDN ATM adaptation layer – Service specific connection oriented protocol in a multi-link and connectionless environment (SSCOPMCE).*

[B7] ITU-T Recommendation Q.701 (1993), *Functional description of the message transfer part (MTP) of Signalling System No. 7.*

[B8] ITU-T Recommendation Q.704 (1996), *Signalling network functions and messages.*

[B9] ITU-T Recommendation Q.707 (1988), *Testing and maintenance.*

[B10] IETF RFC 2960 (2000), *Stream Control Transmission Protocol.*

3 Definitions

There are no further definitions required other than those contained in the normative references (see 2.1).

4 Abbreviations

This Recommendation uses the following abbreviations:

AAL	ATM Adaptation Layer
AK	Data acknowledgement
ATM	Asynchronous Transfer Mode
BICC	Bearer Independent Call Control
B-ISDN	Broadband-Integrated Services Digital Network
B-ISUP	Broadband ISDN User Part (of SS No. 7)
CC	Connection Confirm
CIC	Call Instance Code
CL	Congestion Level
CL_{CL}	CL for connectionless services
CL_{CO}	CL for connection-oriented services
CLmc	Congestion Level "maximum congestion"
CLnc	Congestion Level "no congestion"
CLst	Congestion Level "step"
CR	Connection Request
CREF	Connection Refused
DPC	Destination Point Code
DT1	Data Form 1
DT2	Data Form 2
EA	Expedited Data Acknowledgement
ED	Expedited Data
ERR	Protocol Data Unit Error
ES	Encoding Scheme
F	Fixed Length
GST	Generic Signalling Transport
GSTS	Generic Signalling Transport Service
GST-SAP	Service Access Point to the Generic Signalling Transport Service
GT	Global Title
GTAI	Global Title Address Information
GTI	Global Title Indicator
GTT	Global Title Translation

ISDN	Integrated Services Digital Network
ISUP	Integrated Services User Part (of SS No. 7)
IT	Inactivity Test
IWF	Interworking Function
L3	Level 3
LSB	Least Significant Bit
LUDT	Long Unitdata
LUDTS	Long Unitdata Service
M	Mandatory
MSB	Most Significant Bit
MSG	Message
MTP	Message Transfer Part
MTP3	Message Transfer Part level 3 (Narrow-band)
MTP3b	Message Transfer Part level 3 (Broadband)
MTP-SAP	SAP to access the services provided by MTP
NAI	Nature of Address Indicator
NI	Network Indicator
NNI	Network Node Interface
NP	Numbering Plan
NPCI	Network Protocol Control Information
NPDU	Network Protocol Data Unit
NSDU	Network Service Data Unit
NSP	Network Service Part
O	Optional
OPC	Originating Point Code
PC	Point Code
PDU	Protocol Data Unit
RI	Routing Indicator
RIL	Restricted Importance Level
RL	Restriction Level
RLC	Release Complete
RL_{CL}	RL for connectionless services
RL_{CO}	RL for connection-oriented services
RLSD	Released
RSC	Reset Confirm
RSL	Restriction Sublevel
RSL_{CL}	RSL for connectionless services

RSL_{CO}	RSL for connection-oriented services
RSR	Reset Request
SAAL	Signalling ATM Adaptation Layer
SAP	Service Access Point
SCCP	Signalling Connection Control Part
SCCP-SAP	SAP to access the SCCP services
SCLC	SCCP Connectionless Control
SCMG	SCCP Management+
SCOC	SCCP Connection-Oriented Control
SCRC	SCCP Routing Control
SCTP	Stream Control Transmission Protocol
SDU	Service Data Unit
SI	Service Indicator
SIO	Service Information Octet
SLC	Signalling Link Code
SLS	Signalling Link Selection
SOG	Subsystem-Out-Of-Service-Grant
SOR	Subsystem-Out-Of-Service-Request
SS	SubSystem
SS No. 7	ITU-T Signalling System No. 7
SSA	Subsystem-Allowed
SSC	Subsystem Congested
SSCF	Service Specific Coordination Function
SSCOP	Service Specific Connection-Oriented Protocol
SSCOPMCE	SSCOP in a multi-link or Connectionless Environment
SSN	SubSystem Number
SSP	Subsystem-Prohibited
SSPC	SubSystem-Prohibited Control
SST	Subsystem-Status-Test
STC	Signalling Transport Converter
STP	Signalling Transfer Point
TI-SCCP	Transport-Independent SCCP
TT	Translation Type
UDT	Unitdata
UDTS	Unitdata Service
UP	User Part (of SS No. 7)
V	Variable Length

XUDT Extended Unitdata

XUDTS Extended Unitdata Service

5 Signalling network architecture

5.1 General architecture

The general principle of the architecture of TI-SCCP is shown in Figure 5-1. It depicts a TI-SCCP with ten signalling relations, each accessed via a GST-SAP and a Signalling Transport Converter instance. Three different Signalling Transport Technologies are used with three different types of Signalling Transport Converters.

NOTE 1 – Currently, three different types of Signalling Transport Converters are defined:

- Signalling Transport Converter on MTP3 and MTP3b (see ITU-T Rec. Q.2150.1 [B1]);
- Signalling Transport Converter on SSCOP and SSCOPMCE (see ITU-T Rec. Q.2150.2 [B2]); and
- Signalling Transport Converter on SCTP (see ITU-T Rec. Q.2150.3 [B3]).

A message to be transmitted is passed with a TRANSFER.request primitive (see 6.7) via a particular GST-SAP to a Signalling Transport Converter (STC) instance. The GST-SAP is associated with a particular signalling relation. The STC entity forwards the message to its peer.

The STC instance of a certain type operates over a specific Signalling Transport Technology and is configured to transport data to a single destination STC.

Upon receipt of a message, the STC entity at the destination passes the message with a TRANSFER.indication primitive via a particular GST-SAP to the TI-SCCP. This SAP identifies to the TI-SCCP the signalling relation to the TI-SCCP and, thus, identifies also the origin of the message.

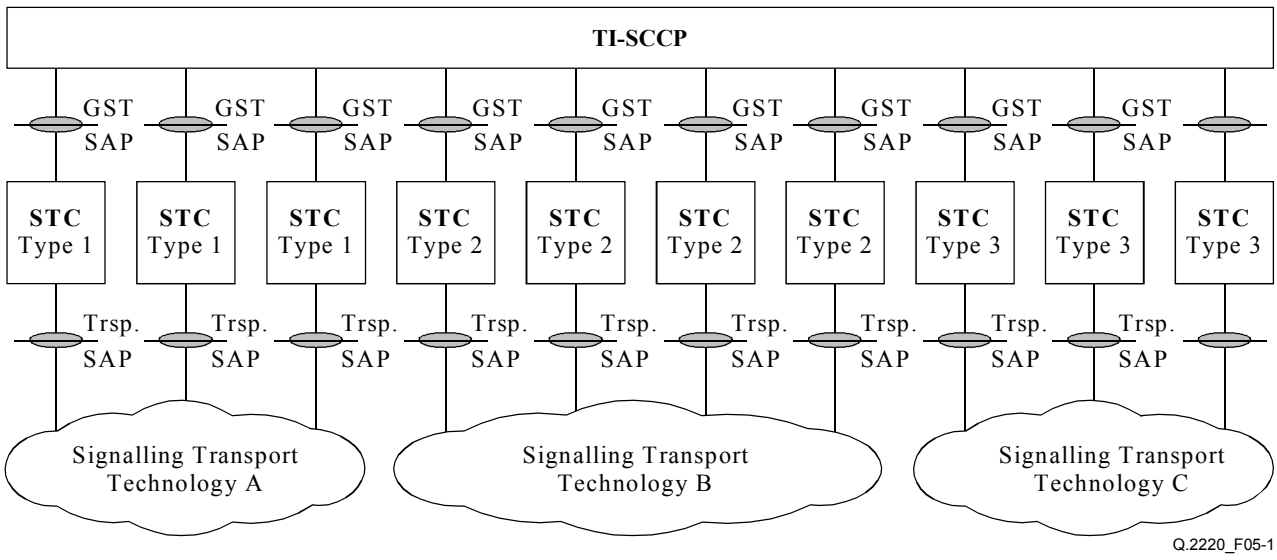

Figure 5-1/Q.2220 – Selecting a SAP to a Signalling Transport Converter entity to reach a destination independent of the Signalling Transport Technology

The status primitives, i.e., START-INFO.indication, IN-SERVICE.indication, OUT-OF-SERVICE.indication, and CONGESTION.indication, are also passed via a specific GST-SAP and, thus, by that indicate which signalling relation indicated its status.

The signalling transport network from the point of view of a TI-SCCP is a fully meshed network (see Appendix I).

NOTE 2 – Traditional SCCP networks are fully meshed via the relaying mechanism at the MTP3 layer.

Figure 5-2 shows an application of this principle by depicting a signalling network that deploys two Signalling Transport Technologies. This signalling network is fully meshed, i.e., 10 signalling relations are used. TI-SCCP "E" is attached to STCs of a single type, i.e., this TI-SCCP can be reached only by utilizing a particular Signalling Transport Technology; the other TI-SCCPs can be reached by either Signalling Transport Technology.

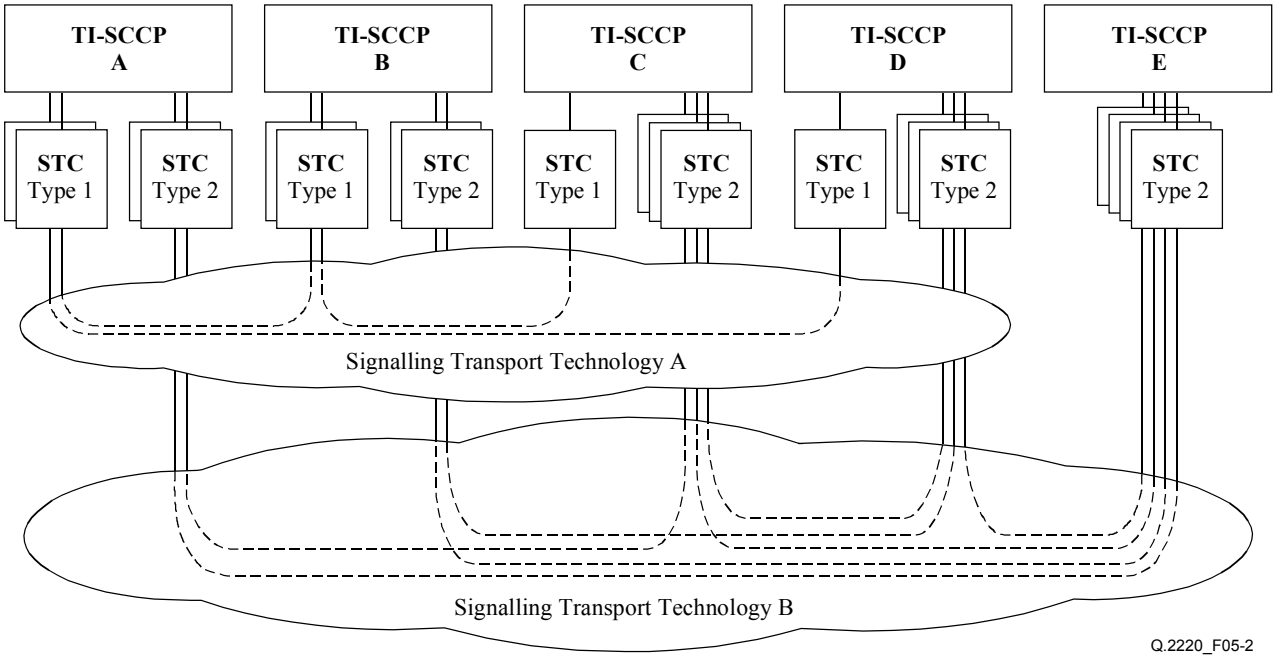

Figure 5-2/Q.2220 – Selecting a SAP to a Signalling Transport Converter entity to reach a destination independent of the Signalling Transport Technology

5.2 Interworking of TI-SCCP with SCCP

Figure 5-3 shows the interworking scenario.

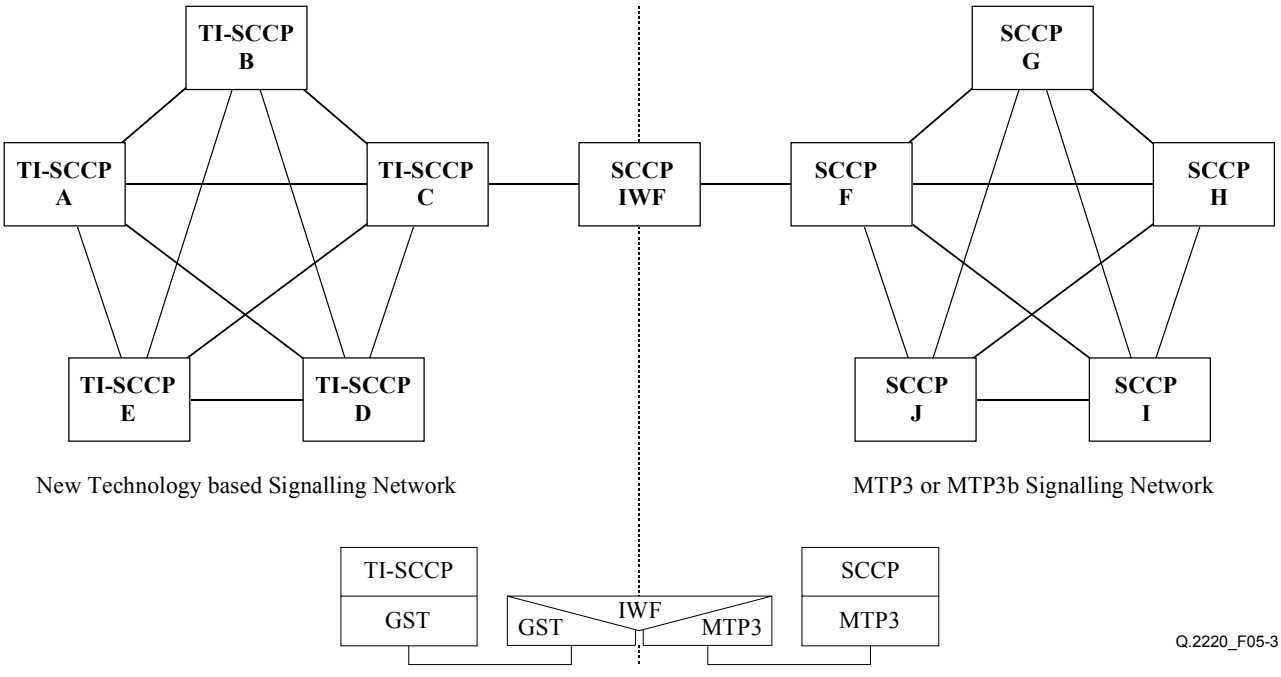

Figure 5-3/Q.2220 – Scenario for interworking between TI-SCCP and SCCP

NOTE – The interworking function ("SCCP IWF") may be collocated with TI-SCCP "C", or SCCP "F", or both.

5.2.1 Messages travelling from an SCCP network towards a TI-SCCP network

Messages arriving from an SCCP node get delivered to the SCCP IWF by an MTP-TRANSFER.indication primitive. The parameter quadruple "OPC, DCP, SI, NI" indicates the signalling relation. In addition, an SLS value is indicated.

At the SCCP IWF the following actions are performed:

1) A UDT message is converted into an XUDT or LUDT message;

   NOTE – A UDTS message is never received.

2) A sequence control parameter is appended to XUDT, XUDTS, LUDT, and LUDTS messages;

3) A regular Global Translation (see 2.4/Q.714 in 9.3/Q.2220) is required as the message enters another signalling network with its own SPC domain;

4) The SLS value is put into the sequence control parameter of the XUDT, XUDTS, LUDT, and LUDTS messages (see 3/Q.713 and 4/Q.713 in 8.3/Q.2220 and 8.4/Q.2220); and

5) The message is transmitted with the TRANSMIT.request primitive via the appropriate GST-SAP.

5.2.2 Messages travelling from a TI-SCCP network towards an SCCP network

A TRANSFER.indication primitive via a GST-SAP delivers messages arriving from a TI-SCCP node to the SCCP IWF. The identity of the GST-SAP indicates the signalling relation.

At the SCCP IWF the following actions are performed:

1) A regular Global Translation (see 2.4/Q.714 in 9.3) is required as the message enters another signalling network with its own SPC domain; and

2) The message is transmitted with the MTP-TRANSMIT.request primitive together with the parameters taken from the result of the Global Translation and the SLS value removed.

6 Exceptions to ITU-T Rec. Q.711

The specifications in ITU-T Rec. Q.711 apply with the following exceptions:

6.1 General

The SCCP defined in ITU-T Recs Q.711 to Q.716 are based on the MTP3 signalling transport service whereas the Transport-Independent SCCP defined in this Recommendation is based on the Generic Signalling Transport Service (GSTS) defined in ITU-T Rec. Q.2150.0; hence:

a) Any reference – in the text of the whole Recommendation – to the service or lower boundary conditions including references to ITU-T Recs Q.701 to Q.707, and/or in ITU-T Rec. Q.2210 shall be replaced with a reference to ITU-T Rec. Q.2150.0.

b) Any reference to "MTP" is replaced by a reference to "GST", the Generic Signalling Transport.

   NOTE – This includes figures such as Figures 1/Q.711 and 2/Q.711.

c) Any reference to "MTP-SAP" is replaced by a reference to "GST-SAP", the Service Access Point to the Generic Signalling Transport Service.

Further specific exceptions are specified in the following subclauses.

6.2 Scope and field of application

Replace the 5th paragraph in clause 1/Q.711 with:

<<<<<<<----------

The SCCP making use of the services of the GST ~~MTP~~, as specified in ITU-T Rec. Q.2150.0 ~~Q.2210~~, provides the connectionless network service as specified in this Recommendation. A connection-oriented network service can only use the services which are common to ITU-T Recs Q.2150.0 ~~Q.2210~~ and Q.704 for the MTP. In particular, the connection-oriented network service shall use a maximum PDU length that does not exceed 272 octets minus the size of the MTP label.

---------->>>>>>>

After the last paragraph and Figure 1/Q.711 in clause 1/Q.711 add the following paragraph and Note:

<<<<<<----------

The Bearer Independent Call Control (BICC) signalling is independent of the underlying transport protocols by utilizing the Generic Signalling Transport Service (GSTS). Functions of the SCCP are however used for the transfer of ISUP Supplementary Services for BICC that are based on the Transaction Capability of Signalling System No. 7.

NOTE – The Transaction Capability of SS No. 7 itself is based on the services of SCCP.

---------->>>>>>>

6.3 Primitives

Replace Figure 3/Q.711 with the following figure:

<<<<<<<----------

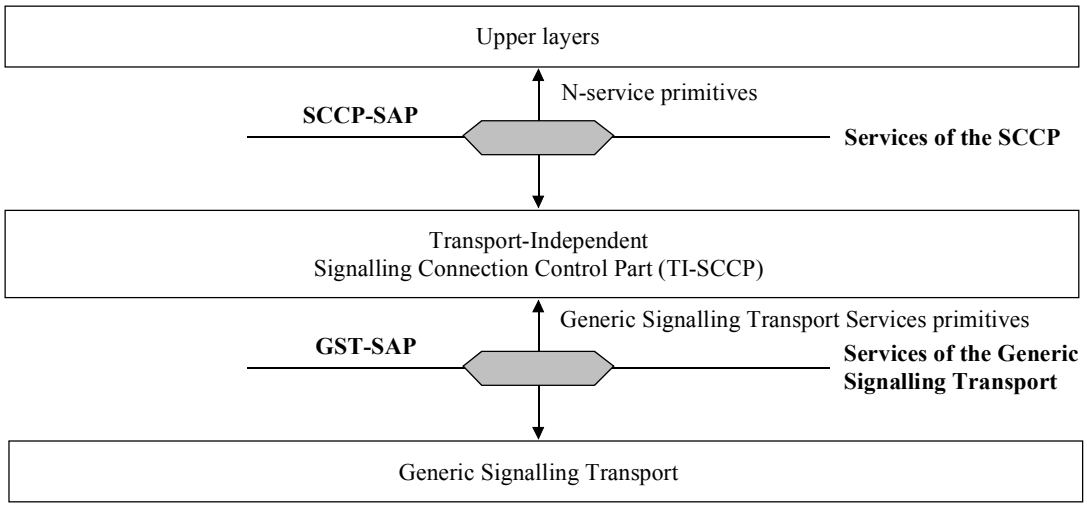

Figure 6-1/Q.2220 – Service primitives

---------->>>>>>>

6.4 Removal of the embedded service

In 6.1.1.1.1/Q.711, replace the 5th paragraph with the two bullet items and the 6th paragraph with the following:

<<<<<<<----------

For connection establishment there exists an ~~are two alternative boundaries between SCCP and SCCP user with different procedures:~~

– ~~the "X.213-like" boundary that is described further in 6.1.1.2,~~

– ~~the "ISUP-embedded" boundary that is described further in 6.1.1.3.~~

~~The~~ "X.213-like" boundary that requires that establishment procedures are performed by SCCP ~~while in the case of "ISUP-embedded" boundary the ISUP provides the routing of the request for the set-up of a connection section~~.

NOTE – The "ISUP-embedded" boundary is not supported.

---------->>>>>>>

Remove 6.1.1.3/Q.711 completely, including Tables 7/Q.711, 8/Q.711, and 9/Q.711.

6.5 Reason for return

Replace the 6th bullet item in the second paragraph of 6.2.2.2.4/Q.711 with:

<<<<<<<----------

- GST out of service ~~MTP failure~~;

---------->>>>>>>

6.6 SCCP management

In Table 14/Q.711, replace the last row with the following:

<<<<<<<----------

N-PCSTATE	Indication	Affected signalling point (together with the GST~~MTP~~-SAP instance) Signalling point status Restricted importance level Remote SCCP status Affected SCCP service

---------->>>>>>>

Add the following new subclause:

<<<<<<<----------

6.3.2.2.8 Affected SCCP service

The optional parameter "Affected SCCP service" indicates which of the SCCP services are affected by the restriction of traffic indicated in the "Restricted importance level" parameter.

"Affected SCCP service" may assume the following values:

- SCCP connectionless and connection-oriented services;
- SCCP connectionless service;
- SCCP connection-oriented service.

When this parameter is not provided, it is assumed that both connectionless and connection-oriented services are affected.

----------->>>>>>>

In Table 17/Q.711, add as a new penultimate row (before the Notes) the following:

<<<<<<<----------

Affected SCCP service	O

----------->>>>>>>

In Table 17/Q.711, replace the last row (notes) with the following:

<<<<<<<----------

c5)	Present if this is the result of ~~an MTP-STATUS reporting user part unavailability or~~ the reception of an SSC message reporting a change of restricted importance level, or a time-out (T_{con}) to detect the abatement of SCCP congestion.
c6)	Present if this is the result of a change in the restricted importance level of the affected signalling point or remote SCCP.

----------->>>>>>>

6.7 Definition of the lower boundary of the SCCP

Replace clause 7/Q.711 with:

<<<<<<<----------

7 Definition of the lower boundary of the SCCP

The Generic Signalling Transport Service is specified in ITU-T Rec. Q.2150.0. For convenience, a summary of the primitives for accessing the service is reproduced in Table 7-1/Q.2220. In the event of any difference between this table and the definitions in ITU-T Rec. Q.2150.0, the definitions in ITU-T Rec. Q.2150.0 take precedence.

Table 7-1/Q.2220 – Primitives and parameters of the Generic Signalling Transport Sublayer

Primitive generic name	Type			
	Request	**Indication**	**Response**	**Confirm**
START-INFO	–	Max_Length CIC_Control	–	–
IN-SERVICE	–	Level	–	–
OUT-OF-SERVICE	–	(Note 1)	–	–
CONGESTION	–	Level	–	–
TRANSFER	Sequence Control STC User Data Priority (Note 2)	STC User Data Priority (Note 2)	–	–

– This primitive is not defined.

NOTE 1 – This primitive has no parameters.

NOTE 2 – This parameter is a national option.

On the establishment of a Signalling Transport Converter entity and the associated Signalling Transport Converter user entity, for example at power up, the initial conditions are the same as if an OUT-OF-SERVICE.indication primitive had been conveyed across the SAP. Also at this time the START-INFO.indication is sent to the TI-SCCP.

NOTE – The procedures for the primitives IN-SERVICE.indication, OUT-OF-SERVICE.indication, and CONGESTION.indication are specified for traffic limitations (see 2.6/Q.714 in 9.3/Q.2220), for connectionless data transfer (see 4.1/Q.714 in 9.5/Q.2220), and for SCCP management (see clause 5/Q.714 in 9.6/Q.2220). The procedures for the primitives TRANSFER.request and TRANSFER.indication are specified for the data transfer between peer TI-SCCP entities (in 1.5/Q.714 in 9.2/Q.2220). The "STC User Data" parameter in these primitives carry a complete message (message formats are specified in clauses 4 and 5/Q.713 in 8/Q.2220); the "sequence control" parameter conveys the SLS value to allow the lower layers to perform signalling link selection (in 1.5/Q.714 in 9.2/Q.2220).

----------->>>>>>>

7 Exceptions to ITU-T Rec. Q.712

The specifications in ITU-T Rec. Q.712 apply with the following exceptions:

7.1 Signalling connection control part messages

Replace the specification labelled "1.25" with:

<<<<<<<----------

1.25 long unitdata (LUDT): A *Long Unitdata* message is used by the SCCP to send data (along with optional parameters) in a connectionless mode. When the maximum length indication from the Generic Signalling Transport permits, ~~MTP capabilities according to Recommendation Q.2210 are present,~~ it allows sending of NSDU sizes up to 3952 octets without segmentation.

It is used in Connectionless protocol classes 0 and 1.

----------->>>>>>>

7.2 SCCP message parameters

Replace the specification labelled "2.20" with:

<<<<<<<----------

2.20 segmentation: The "segmentation" parameter field is used in the XUDT, XUDTS, LUDT and LUDTS messages to indicate that a SCCP message has been segmented, or, in case of the LUDT(S), that it may undergo segmenting at an ~~MTP/MTP-3b~~ interworking node between the Generic Signalling Transport and an MTP3-based signalling transport. The parameter also contains all the information necessary to allow the correct reassembly of the message.

---------->>>>>>>

Replace the specification labelled "2.22" with:

<<<<<<<----------

2.22 congestion level: The "SCCP congestion level" parameter is included in the *Subsystem Congested* message (SSC) to report the severity of the congestion referring to either the whole SCCP node or to the local SCCP. When local SCCP congestion is reported, the "Affected SCCP service" field in the congestion level parameter indicates whether the reported congestion level affects SCCP connectionless, connection-oriented or both services.

---------->>>>>>>

Replace the specification labelled "2.23" with:

<<<<<<<----------

2.23 long data: The "long data" parameter is a "data" parameter with a two octet length indicator. It allows sending of up to 3968 ~~3952~~ octets in a single LUDT or LUDTS message when the maximum length indication from the Generic Signalling Transport permits sending of NSDU sizes up to 3968 octets ~~MTP-3b capabilities are present~~.

---------->>>>>>>

7.3 Inclusion of fields in the messages

In Table 1/Q.712, replace note b) at the bottom of the table with:

<<<<<<<----------

b) The segmentation parameter must be included by the originating node, if interworking between the Generic Signalling Transport and an MTP3-based signalling transport ~~MTP/MTP-3b interworking~~ is expected.

---------->>>>>>>

8 Exceptions to ITU-T Rec. Q.713

The specifications in ITU-T Rec. Q.713 apply with the following exceptions:

8.1 Introduction

Replace the text in clause 1/Q.713 "General" with:

<<<<<<<----------

This Recommendation specifies the SCCP messages formats and codes for the support of connection-oriented services, connectionless services and the management of SCCP.

The SCCP messages are passed between SCCP and GSTMTP across the GSTMTP-SAP by means of the STC user data parameter of the MTP-TRANSFER request or indication primitives as appropriate (see Table 6-1/Q.2150.0 1/Q.701).

NOTE – The MTP-TRANSFER primitive, in addition to the user data parameter, contains four parameters with the contents as follows (see Table 1/Q.701):

- the contents of the OPC consisting of information equivalent to 14 bits, to be conveyed in the standard routing label of the MTP;
- the contents of the DPC consisting of information equivalent to 14 bits, to be conveyed in the standard routing label of the MTP;
- the contents of the SLS consisting of information equivalent to 4 bits. If the MTP service "in-sequence delivery" of SDUs is a requirement, SCCP shall use the same SLS value for all SDUs with the same sequence control and called address parameters;
- information equivalent to the contents of the SIO. For SCCP, the encoding for the service indicator is 0011 binary (see Q.704 § 14.2.1)

A SCCP message consists of the following parts (see Figure 1/Q.713):

- the message type code;
- the mandatory fixed part;
- the mandatory variable part;
- the optional part, which may contain fixed length and variable length fields.

The description of the various parts is contained in the following clauses. SCCP management messages and codes are provided in clause 5.

----------->>>>>>>

Replace Figure 1/Q.713 with the following figure:

<<<<<<<----------

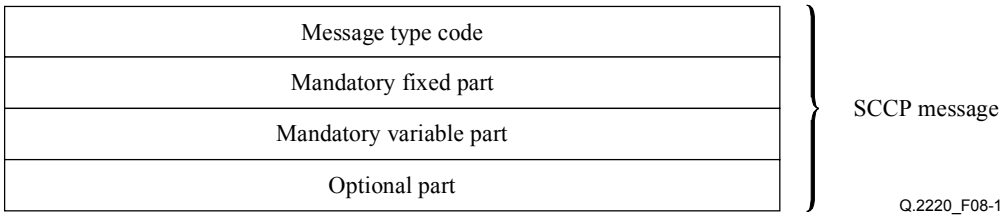

Figure 8-1/Q.2220 – General layout

----------->>>>>>>

Replace Figure 2/Q.713 with the following figure:

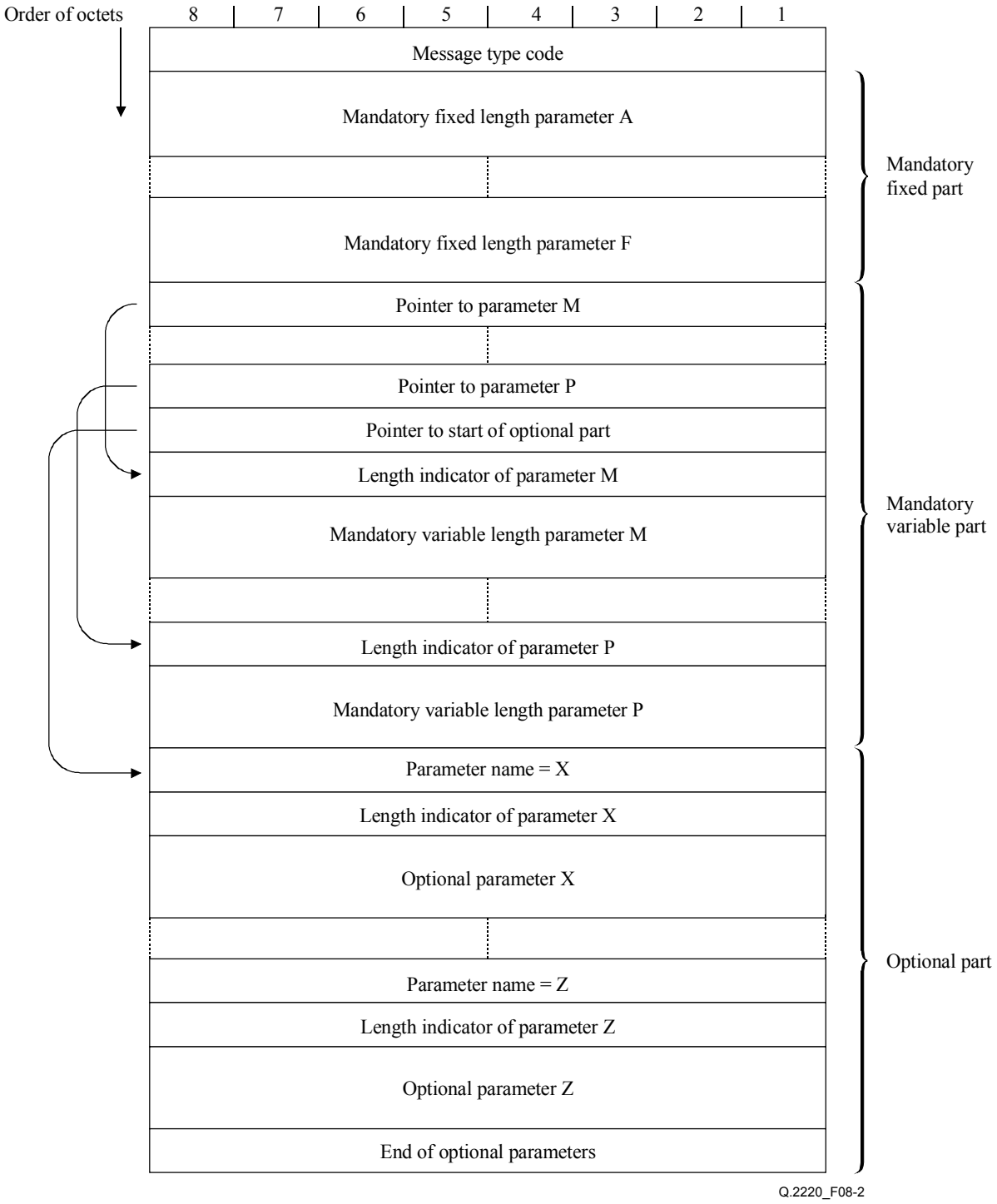

Figure 8-2/Q.2220 – General SCCP message format

Remove footnote 1 from the 2nd paragraph of 1.4/Q.713 and insert the Note in the mainline text as follows:

<<<<<<<----------

A pointer is also included to indicate the beginning of the optional part. If the message type indicates that no optional part is allowed, then this pointer will not be present. If the message type indicates that an optional part is possible, but there is no optional part included in this particular message, then a pointer field containing all zeros will be used[1].

NOTE – There are currently messages (RSR and ERR) containing one pointer to the beginning of the optional part although no optional parameters are currently defined for them.

---------->>>>>>>

8.2 Coding of the general parts

Modify Table 2/Q.713 as follows:

<<<<<<<----------

Table 2/Q.713 – SCCP parameter name codes

Parameter name	Clauses	Parameter name code 8765 4321
End of optional parameters	3.1	0000 0000
Importance	3.19	0001 0010
Long data	3.20	0001 0011
Sequence control	3.21	0001 0100
Reserved for International Use		~~0001 0100~~ 0001 0101 to 1111 0011
Reserved for National Networks		1111 0100 to 1111 1110
Reserved		1111 1111

---------->>>>>>>

Remove footnote 2 from the first paragraph of 2.3/Q.713 and insert the Note in the mainline text as follows:

<<<<<<<----------

The pointer value (in binary) gives the number of octets between the most significant octet of the pointer itself (included) and the first octet (not included) of the parameter associated with that pointer[2] as shown in the following diagram.

NOTE – For example, a pointer value of "00000001" indicates that the associated parameter begins in the octet immediately following the most significant octet of the pointer. A pointer value of "00001010" indicates that ten octets of information exist between the most significant octet of the pointer octet (included) and the first octet of the parameter associated with that pointer (not included). A two-octet pointer value of "00000000 00001010" indicates that ten octets of information exist between the most significant octet of the pointer (included) and the first octet of the parameter associated with that pointer (not included).

---------->>>>>>>

8.3 SCCP parameters

Remove footnote 3 from the entry of bit coding "00000010" of 3.14/Q.713 and insert the Note in the mainline text as follows:

<<<<<<<----------

Bits

8 7 6 5 4 3 2 1

• • •

0 0 0 0 0 0 1 0 point code mismatch[3] (see Note)

• • •

NOTE – National option (see Table B.2/Q.714).

---------->>>>>>>

Add the following new clause after 3.20/Q.713:

<<<<<<<----------

3.21 Sequence control

The "sequence control" parameter field is a one-octet field containing the signalling link selection value.

---------->>>>>>>

8.4 SCCP messages and codes

Replace 4.18/Q.713 and 4.20/Q.713 with the following:

<<<<<<<----------

4.18 Extended unitdata (XUDT)

The XUDT message contains:

– four pointers;

– the parameters indicated in Table 19.

Table 19/Q.713 – Message type: Extended unitdata

Parameter	Clause	Type (F V O)	Length (octets)
Message type	2.1	F	1
Protocol class	3.6	F	1
Hop counter	3.18	F	1
Called party address	3.4	V	3 minimum
Calling party address	3.5	V	3 minimum ~~(Note 3)~~[a]
Data	3.16	V	2 to Y+1~~(Note 1)~~[b]
Segmentation	3.17	O	6 ~~(Note 2)~~[c]
Importance	3.19	O	3
Sequence control	3.21	O	3
End of optional parameters	3.1	O	1

~~NOTE 3~~[a] The minimum length = 2 might apply in the special case of AI = X0000000 described in 3.5.

~~NOTE 1~~[b] The maximum length of this parameter depends on the length of the called party address, calling party address parameters, and the presence of optional parameters. Y is between 160 and 254 inclusive. Y can be 254 when called party address and calling party address parameters do not include the GT, and the importance and segmentation parameters are absent. Y can be at most 247 if the segmentation parameter is included and the importance parameter is absent. See 8.3.2/Q.715.

~~NOTE 2~~[c] Should not be present in case of a single XUDT message.

4.20 Long unitdata (LUDT)

The LUDT message contains:

– four two-octet pointers;

– the parameters indicated in Table 21.

Table 21/Q.713 – Message type: Long unitdata

Parameter	Clause	Type (F V O)	Length (octets)
Message type	2.1	F	1
Protocol class	3.6	F	1
Hop counter	3.18	F	1
Called party address	3.4	V	3 minimum
Calling party address	3.5	V	3 minimum
Long data	3.20	V	3-3954 ~~(Note 2)~~[a]
Segmentation	3.17	O	6 ~~(Note 1)~~[b]
Importance	3.19	O	3
Sequence control	3.21	O	3
End of optional parameters	3.1	O	1

~~NOTE 2~~[a] See 8.3.2/Q.715.

~~NOTE 1~~[b] Originating SCCP node must include this parameter if segmentation at relay node may be encountered in certain network configuration.

----------->>>>>>>

8.5 SCCP management messages and codes

Replace Figure 13/Q.713 with the following figure:

<<<<<<<----------

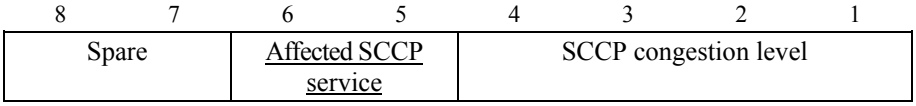

Figure 13/Q.713 – SCCP congestion level format

---------->>>>>>>

At the end of 5.2.4/Q.713, add the following paragraph:

<<<<<<<----------

Bits 6-5 indicate which SCCP services are affected by the congestion level, and is coded as follows:

Bits 6 5	
0 0	SCCP connectionless and connection-oriented services
0 1	SCCP connectionless service
1 0	SCCP connection-oriented service
1 1	Reserved

---------->>>>>>>

8.6 Mapping for cause parameter values

In Table A.2/Q.713, replace the entry with code "00001010" with the following row:

<<<<<<<----------

RLSD Message		N-DISCONNECT primitive	
Code	**Release cause**	**Reason**	**Originator**
00001010	GST out of service ~~MTP failure~~	disconnection – abnormal condition of non-transient nature	NSP

---------->>>>>>>

9 Exceptions to ITU-T Rec. Q.714

The specifications in ITU-T Rec. Q.714 apply with the following exceptions:

9.1 General

The SCCP defined in ITU-T Recs Q.711 to Q.716 are based on the MTP3 signalling transport service whereas the Transport-Independent SCCP defined in this Recommendation is based on the Generic Signalling Transport Service (GSTS) defined in ITU-T Rec. Q.2150.0; hence:

a) Any reference – in the text of the whole Recommendation – to the service or lower boundary conditions including references to ITU-T Recs Q.701 to Q.707, and/or in ITU-T Rec. Q.2210 shall be replaced with a reference to ITU-T Rec. Q.2150.0.

b) Any reference to "MTP" is replaced by a reference to "GST", the Generic Signalling Transport.

c) Any reference to "MTP-SAP" is replaced by a reference to "GST-SAP", the Service Access Point to the Generic Signalling Transport Service.

Further specific exceptions are specified in the following subclauses.

9.2 General characteristics of signalling connection control procedures

In 1.1.2/Q.714, replace the 2nd and 3rd paragraph after the bullet list with the following:

<<<<<<<----------

When one connectionless message is not sufficient to convey the user data contained in one NSDU making use of GST ~~MTP~~ services provided by an GST~~MTP~~-SAP that supports a maximum ~~MTP~~ SDU size of 272 octets (including the MTP routing label), a segmenting/reassembly function for protocol classes 0 and 1 is provided. In this case, the TI-SCCP at the originating node or in a relay node provides segmentation of the information into multiple segments prior to transfer in the "data" field of XUDT (or as a network option LUDT) messages. At the destination node, the NSDU is reassembled.

If it is certain that only GST ~~MTP~~ services that support maximum PDU length of 4096 or longer ~~according to ITU-T Recommendation Q.2210~~ are used in the network, then no segmentation information is needed.

---------->>>>>>>

In 1.1.2.2/Q.714, replace the single paragraph with the following:

<<<<<<<----------

In protocol class 1, the features of class 0 are complemented by an additional feature (i.e. the sequence control parameter contained in the N-UNITDATA request primitive) which allows the higher layer to indicate to the SCCP that a given stream of NSDUs shall be delivered in-sequence. The Sequence Control ~~Signalling Link Selection (SLS)~~ parameter in the ~~MTP~~ TRANSFER request primitive is chosen by the originating SCCP based on the value of the sequence control parameter. The Sequence Control parameter ~~SLS~~ shall be identical for a stream of NSDUs with the same sequence control parameter.

NOTE – If the GST supports only a single signalling link, e.g., when based on SSCOP (see ITU-T Rec. Q.2150.2), the sequence of NSDUs is always maintained. On the other hand, if the GST supports multiple signalling links (or streams), e.g., when based on MTP (see ITU-T Rec. Q.2150.1) or SCTP (see ITU-T Rec. Q.2150.3), the ~~MTP then encodes the Signalling Link Selection (SLS) field in the routing label of MTP messages relating to such NSDUs, so that their~~ sequence of NSDUs is, under normal conditions, maintained by the GST ~~MTP~~ and SCCP.

With the above constraints, the SCCP and GST ~~MTP~~ together ensure in-sequence delivery to the user. Thus, this protocol class corresponds to an enhanced connectionless service, where an additional in-sequence delivery feature is included.

---------->>>>>>>

In 1.2.1/Q.714, replace the 1st paragraph with the following:

<<<<<<<----------

When the SCCP functions at the originating node receive a request to establish a signalling connection, the "called address" is analysed to identify the node towards which a signalling connection section should be established. If the node is not the same, the SCCP forwards a CR message to that node using the appropriate GST-SAP instance ~~MTP routing functions~~.

---------->>>>>>>

In 1.2.1/Q.714, replace the 2nd bullet item in numbered list item b) with the following:

<<<<<<<----------

– If a coupling of connection sections is not required in this node, then no incoming or outgoing connection section is established. A CR message is forwarded towards the next node using the appropriate GST-SAP instance ~~MTP routing functions~~.

----------->>>>>>>

In 1.3.1/Q.714, replace the single paragraph with the following:

<<<<<<<----------

When the SCCP functions at the originating node receive from an SCCP user an NSDU to be transferred by the protocol class 0 or 1 connectionless service, the "called address" and other relevant parameters, if required, are analysed to identify the node towards which the message should be sent. The NSDU is then included as the "data" parameter in an XUDT, LUDT or UDT message, which is sent towards that node using appropriate GST-SAP instance ~~the MTP routing functions~~. If the network structure is such that both LUDT(S) and (X)UDT(S) messages may apply, then the routing may transmit a message other than LUDT(S) (see 2.5). Upon receipt of the XUDT, LUDT or UDT message, the SCCP functions at that node perform the routing analysis as described in clause 2 and, if the destination of the XUDT, LUDT or UDT message is a local user, deliver the NSDU to the local higher layer functions. If the destination of the XUDT, LUDT or UDT message is not at that node, then the XUDT, LUDT or UDT message is forwarded to the next node after a possible change of the type of message (see 2.5). This process continues until the destination is reached.

----------->>>>>>>

Replace Figure 1/Q.714 with the following figure:

<<<<<<<----------

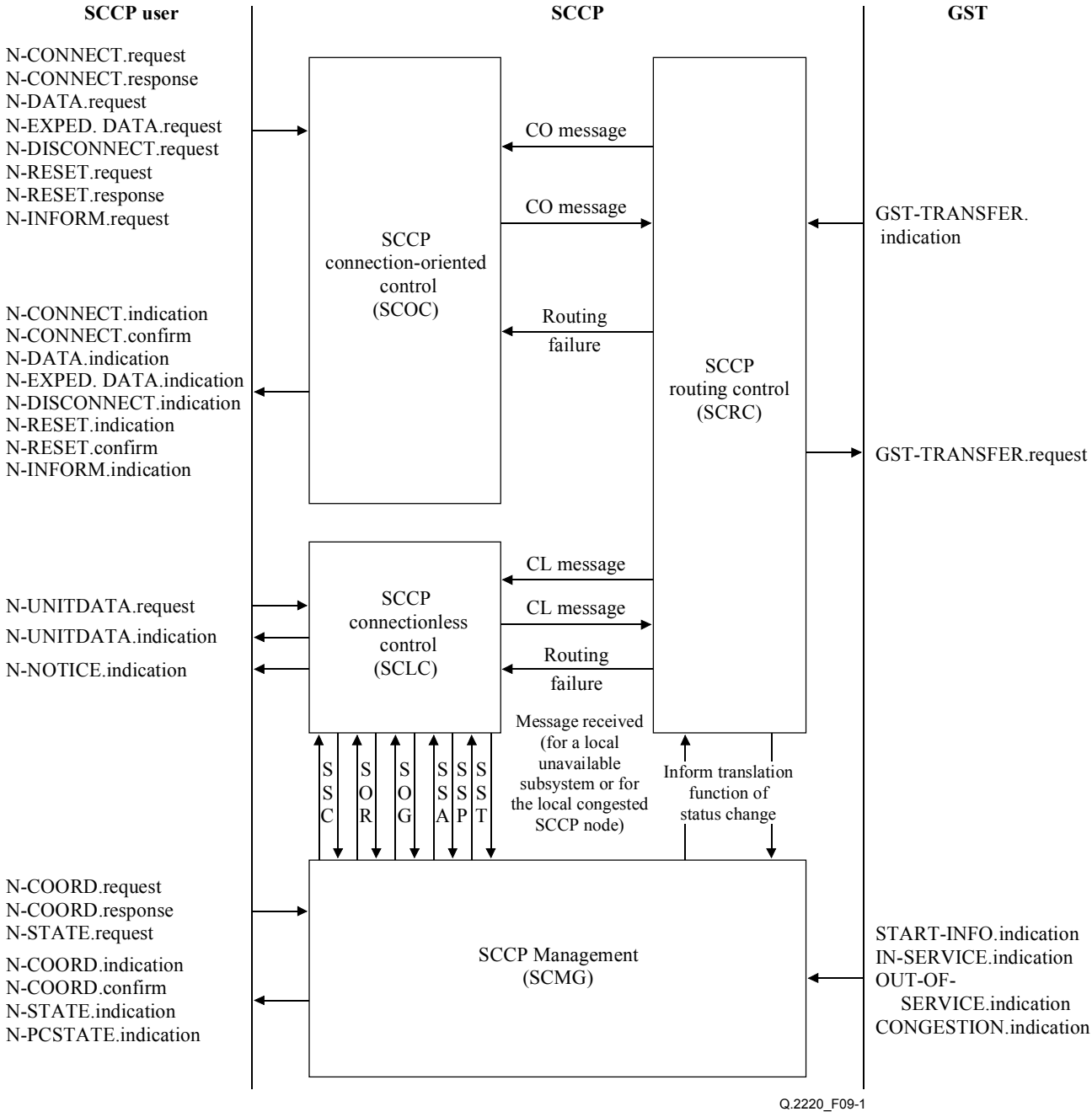

Figure 9-1/Q.2220 – SCCP overview

---------->>>>>>>

Add a new clause after Figure 1/Q.714 as follows:

<<<<<<<----------

1.5 Procedures for the use of the TRANSFER primitives

1.5.1 TRANSFER.request primitive

The TRANSFER.request primitive is used by the SCRC to transfer messages to peer SCCP entities. The particular GST-SAP via which the primitive is issued determines the destination SCCP (DPC).

NOTE 1 – The quadruplet "DPC OPC SI NI" characterizes each GST entity.

The parameters are used as follows:

a) The "STC User Data" parameter shall contain the message to be transferred.

b) The "Sequence Control" parameter shall contain the SLS value.

NOTE 2 – The SLS value is also transferred within the XUDT and LUDT messages to the peer (see clauses 1, 4, and clause 5/Q.713 in clause 8/Q.2220).

1.5.2 TRANSFER.indication primitive

The TRANSFER.indication primitive is used by the SCRC to receive messages from peer SCCP entities. The particular GST-SAP via which the primitive is received determines the originating SCCP (OPC).

NOTE – The quadruplet "DPC OPC SI NI" characterizes each GST entity.

The parameter is used as follows: The "STC User Data" parameter contains the message received.

----------->>>>>>>

9.3 Addressing and routing

Replace clause 2/Q.714 with the following:

<<<<<<<----------

2 Addressing and routing

2.1 SCCP addressing principles

The "called and calling addresses" and the "called and calling party addresses" normally contain the information necessary, but not always sufficient, for the SCCP to determine an originating and destination node.

In the case of the connectionless procedures, the addresses are normally the originating and destination nodes of the message.

In the case of the connection-oriented procedures, the addresses are normally the originating and destination nodes of the signalling connection section. However, the called party address of a CR message identifies the destination node and the calling party address of the CR message may identify the originating node of the signalling connection (see 2.7 for more detail on calling party addresses).

For the transfer of the CR message or connectionless messages, two basic categories of addresses are distinguished by the SCCP, addresses requiring translation and addresses requiring no translation:

1) When a translation is required, then a Global Title shall be present. A global title is an address, such as dialled-digits, which does not explicitly contain information that would allow routing in the signalling network, that is, the translation function of the SCCP is required. This translation function and its associated data are assumed to be part of the SCCP node. Access to an external database during invocation of this function is not specified and is for further study.

2) When a translation is not required, then the DPC + SSN shall be present. A Destination Point Code and Subsystem Number allows direct routing by the SCCP ~~and MTP~~, that is, the translation function of the SCCP is not required.

If a reply, a message return, or segmentation in connectionless mode is required, then the "calling party address" ~~plus the OPC in the MTP routing label~~ shall contain sufficient information (together with the identity of the incoming GST~~MTP~~-SAP instance) to uniquely identify the originator of the message.

2.2 SCCP routing principles

The SCCP routing control (SCRC) receives messages from an GSTMTP-SAP instance for routing, after they have been received by the GSTMTP from another node in the signalling network. SCRC also receives internal messages from SCCP connection-oriented control (SCOC) or from SCCP connectionless control (SCLC) and performs any necessary routing functions (e.g., address translation) before passing them to the selected GSTMTP-SAP instance for transport in the signalling network or back to the SCCP connection-oriented, or SCCP connectionless control.

The routing functions consist of:

1) determining a SCCP node towards which the message is allowed to be sent;
2) performing the compatibility test;
3) providing a traffic limitation mechanism.

2.2.1 Receipt of SCCP message transferred by the GSTMTP

A message transferred by the GSTMTP that requires routing will include the "called party address" parameter giving information for routing the message. The messages which require to invoke a routing function are the CR message and all types of connectionless messages. All connection-oriented messages except the CR message are passed directly to SCOC.

NOTE – Only the SPC in tThe called party address in the CREF or CC messages shall not be used for routing.

If the "called party address" parameter is used for routing, then the routing indicator determines whether routing is based on:

1) Subsystem Number (SSN) – This indicates that the receiving SCCP is the destination node of the message. The SSN is used to determine the local subsystem.
2) Global Title (GT) – This indicates that translation is required. Translation of the Global Title results normally in a Destination Point Code (DPC) and an internal identification of the GSTMTP-SAP instance to which the GSTMTP-TRANSFER primitive shall be issued for routing the message, the routing indicator and possibly a new SSN or GT or both. The SCCP routing function also provides additional information needed for the GSTMTP-TRANSFER primitive (e.g., Sequence Control OPC, SLS and SIO; this information is passed to the MTP in the form of parameters in the MTP-TRANSFER request primitive).

The Even if an SPC is present in the "called party address" parameter it shall not be used by SCRC.

2.2.2 Messages passed from connection-oriented or connectionless control to SCCP routing control

Addressing information, indicating the destination of the message, is provided in every internal message the SCCP routing control receives from connection-oriented or connectionless control.

For XUDT, LUDT or UDT messages, this addressing information is obtained from the "called address" parameter contained in the N-UNITDATA.request primitive.

For CR messages received by SCCP routing, the addressing information is obtained from the "Called address" parameter contained in the N-CONNECT.request primitive or from the addressing information contained in the received CR message and made available to SCOC (the latter case refers to relay node with coupling).

For connection-oriented messages other than a CR message, the addressing information is that associated with the connection section over which the message is to be sent.

The addressing information can take the following forms:

1) DPC + GSTMTP-SAP instance;
2) DPC + GSTMTP-SAP instance + one of the following cases:

a) SSN different from zero;

b) GT or GT + SSN equal to zero;

c) GT + SSN different from zero;

d) SSN equal to zero.

3) GT with or without SSN.

The first form applies to connection-oriented messages except the CR message. The last two forms apply to connectionless messages and to the CR message.

2.2.2.1 DPC present

If ~~the DPC is present in the addressing information and~~ the DPC is not the node itself, then the message is passed to the selected GST~~MTP~~-SAP instance using the GST~~MTP~~-TRANSFER.request primitive with addressing information as follows:

1) if no other addressing information is available (case 1 of 2.2.2), the ~~no~~ "called party address" shall contain only the DPC ~~is provided in the message~~;

2) if a non-zero SSN is present but not the GT (case 2 a) of 2.2.2), then the called party address provided shall contain this SSN together with the DPC and the routing indicator shall be set to "Route on SSN";

3) if the GT is present but no SSN or a zero SSN is present (case 2 b) of 2.2.2), then the DPC identifies where the global title translation occurs. The called party address provided shall contain this GT together with the DPC and the routing indicator shall be set to "Route on GT";

4) if a non-zero SSN and the GT are both present (case 2 c) of 2.2.2), then the called party provided shall contain both the SSN and the GT as well as the DPC. The Routing Indicator could be set to either "Route on GT" or "Route on SSN". The mechanism for the selection of the Routing Indicator is outside the scope of this Recommendation;

5) if an SSN equal to zero is present but not a GT (case 2 d) of 2.2.2), then the address information is incomplete and the message shall be discarded. This abnormality is similar to the one described in 3.8.3.3, item 1) b6.

If the DPC is the node itself, and:

1) if a non-zero SSN is present but not the GT (case 2 a) of 2.2.2), then the message is passed based on the message type to either connection-oriented control or connectionless control and based on the availability of the subsystem;

2) if the GT is present but no SSN or a zero SSN is present (case 2 b) of 2.2.2), then the message is passed to the translation function;

3) if a non-zero SSN and the GT are both present (case 2 c) of 2.2.2) then it is an implementation-dependent matter whether or not the message is passed to the translation function;

4) if an SSN equal to zero is present but not a GT (case 2 d) of 2.2.2), then the address information is incomplete and the message shall be discarded. This abnormality is similar to the one described in 3.8.3.3, item 1) b6.

2.2.2.2 DPC not present

If the DPC is not present, (case 3 of 2.2.2), then a global title translation is required before the message can be sent out. Translation results in a DPC and possibly a new SSN or new GT or both. If the GT and/or SSN resulting from a global title translation is different from the GT and/or SSN previously included in the called address or called party address, the newly produced GT and/or SSN replaces the existing one. The translation function of the SCRC will also set the RI, select the

appropriate GST~~MTP~~-SAP instance and provide information needed for the GST~~MTP~~ transfer (e.g., Sequence Control ~~OPC, SLS and SIO~~). The routing procedures then continue as per 2.2.2.1.

2.3 SCCP routing procedures

The SCCP routing functions are based on information contained in the "called party address" or "called address".

2.3.1 Receipt of SCCP messages transferred by the GST~~MTP~~

When a message is received in SCRC from the GST~~MTP~~, and if the local SCCP or node is in an overload condition, SCRC shall inform SCMG.

One of the following actions shall be taken by SCRC upon receipt of a message from the GST~~MTP~~. The message is received by the SCCP when the GST~~MTP~~ invokes an GST~~MTP~~-TRANSFER.indication primitive.

1) If the message is a connection-oriented message other than a CR message, then SCRC passes the message to SCOC.
2) If it is a CR message or a connectionless message and the routing indicator in the "called party address" indicates "Route on SSN", then SCRC checks the status of the local subsystem:
   a) if the subsystem is available, the message is passed, based on the message type, to either SCOC or SCLC;
   b) if the subsystem is unavailable, and:
      – the message is a connectionless message, then the message return procedure is initiated;
      – the message is a CR message, then the connection refusal procedure is initiated.

In addition, SCCP management is notified that a message was received for an unavailable subsystem.

3) If it is a CR message or a connectionless message and the routing indicator in the "called party address" indicates "Route on GT", then a translation of the global title must be performed.

The SCCP Hop Counter (if present) is decremented and if a Hop Counter violation is encountered (i.e., the value zero is reached), then:

– if the message is a connectionless message, then the message return procedure is initiated;
– if the message is a CR message, then the connection refusal procedure is initiated.

In addition, maintenance functions are alerted.

a) If the translation of the global title is successful (see 2.4.4), then:
   i) if the DPC is the node itself, then the message is passed, based on the message type, to either SCOC or SCLC;
   ii) if the DPC is not the node itself and the message is a connectionless message, then the GST~~MTP~~-TRANSFER.request primitive is invoked unless the compatibility test sends the message to SCLC or unless the message is discarded by the traffic limitation mechanism;
   iii) if the DPC is not the node itself and the message is a CR message, then:
      – if a coupling of connection sections is required, the message is passed to SCOC;
      – if no coupling of connection sections is required, the GST~~MTP~~-TRANSFER.request primitive is invoked unless the message is discarded by the traffic limitation mechanism.

b) In all other cases:

- if the message is a connectionless message, then the message return procedure is initiated;
- if the message is a CR message, then the connection refusal procedure is initiated.

2.3.2 Messages from connectionless or connection-oriented control to SCCP routing control

One of the following actions is taken by SCCP routing upon receipt of a message from connectionless control or connection-oriented control.

1) If the message is a CR message at a relay node with coupling (where connection sections are being associated), then the GST~~MTP~~-TRANSFER.request primitive is invoked taking into account the result of the global title translation already done.

2) If the message is a connection-oriented message other than a CR message, and:

- the DPC and remote SCCP are available, then the GST~~MTP~~-TRANSFER.request primitive is invoked unless the message is discarded by the traffic limitation mechanism;
- the DPC and/or remote SCCP are not available, then the connection release procedure is initiated.

3) If the "called address" in the primitive associated with a CR message or connectionless message includes one of the following combinations from Table 1, then one of the four actions described below is taken.

Table 1/Q.714 – Actions upon receipt of a message from connectionless control or a CR from connection-oriented control

	No GT No SSN or SSN = 0	**GT No SSN or SSN = 0**	**No GT SSN**	**GT SSN**
No DPC	(4)	(2)	(4)	(2)
DPC = own node	(4)	(2)	(1)	(1), (2) (Note)
DPC = remote node	(4)	(3)	(1)	(1), (3) (Note)
NOTE – The choice of the appropriate action is outside the scope of this Recommendation.				

Action (1)

a) If the DPC is not the node itself and the remote DPC, SCCP and SSN are available, then the GST~~MTP~~-TRANSFER.request primitive is invoked unless the compatibility test returns the message to SCLC or unless the message is discarded by the traffic limitation mechanism;

b) If the DPC is not the node itself and the remote DPC, SCCP and/or SSN are not available, then:

- for connectionless messages, the message return procedure is initiated;
- for CR messages, the connection refusal procedure is initiated.

c) If the DPC is the node itself, then the procedures in 2.3.1, item 2) above are followed[1].

NOTE – The function of routing between local subsystems is implementation dependent.

Action (2)

a) If the translation of the global title is successful (see 2.4.4), then:

- if the DPC is the node itself, then the message is passed, based on the message type, to either SCOC or SCLC;
- if the DPC is not the node itself, the compatibility may return the message to SCLC or the message may be discarded by the traffic limitation mechanism. The DPC shall be placed in the "called party address" before ~~then~~ the GST~~MTP~~-TRANSFER.request primitive is invoked~~ unless the compatibility test returns the message to SCLC or unless the message is discarded by the traffic limitation mechanism~~.

b) If the translation of the global title is unsuccessful (see 2.4.4), and:

- the message is a connectionless message, then the message return procedure is initiated;
- the message is a CR message, then the connection refusal procedure is initiated.

Action (3)

The same actions as Action (1) apply, without checking the SSN.

Action (4)

The "called address" contains insufficient information. If:

- the message is a connectionless message, then the message return procedure is initiated;
- the message is a CR message, then the connection refusal procedure is initiated.

2.4 Global title translation

2.4.1 General characteristics of the GTT

The Global Title Translation (GTT) function shall be invoked within the SCCP routing control (SCRC) under the routing procedures described in 2.3.

If the GTT function results in a "routing indicator" (see 3.4.1/Q.713) equal to "Route on GT", then the GTT function must provide a global title and the DPC of the SCCP node where that global title will be translated. This process shall be repeated until the GTT function results in a "routing indicator" equal to "Route on SSN", which means that the final destination has been determined.

The global title addressing capability and the GTT function allow diverse groups of the SCCP addressable entities associated with different applications to establish their own addressing schemes. All the application-specific addressing schemes requiring the GTT shall be specified within the GTT procedural framework stated in this subclause.

2.4.2 Terminology definitions

2.4.2.1 GT information

The GT information is made up of the Global Title Indicator (GTI) and the Global Title (GT).

1) **Global Title Indicator (GTI)**

Refer to 3.4.1/Q.713 and 3.4.2.3/Q.713 for the list of global title indicators recognized by the SCCP. The global title indicator is used to determine the content and format of the global title.

2) **Global Title (GT)**

The global title consists of the mandatory Global Title Address Information (GTAI) and one or more of the following information elements depending on the GTI:

a) **Encoding Scheme (ES)**

Refer to 3.4.2.3/Q.713 for the list of encoding schemes recognized by the SCCP. The encoding scheme indicates how the global title address information is encoded. If the encoding scheme is included, then the global title address information shall be decoded accordingly. If the encoding scheme is not included but translation type is included, then the translation rules associated with the translation type should specify the encoding scheme. Refer to d) and 3) for the description of the translation type and translation rules. The meaning of each encoding scheme value is identical for all the GTI values indicating that the encoding scheme is included.

b) **Numbering Plan (NP)**

Refer to 3.4.2.3.3/Q.713 for the list of numbering plans recognized by the SCCP. The numbering plan indicates how the global title address information is constructed from different parts (e.g. country codes, subscriber number or national significant number) according to the syntax and semantic defined for that particular numbering plan. The semantic of each numbering plan value is identical for all the GTI values indicating that the numbering plan is included.

c) **Nature of Address Indicator (NAI)**

Refer to 3.4.2.3.1/Q.713 for the list of nature of address indicator values recognized by the SCCP. The nature of address indicator defines the "scope" of the global title address information for a specific numbering plan. The semantic of the nature of address indicator value depends only on the numbering plan. In particular, it does not depend on GTI values.

d) **Translation Type (TT)**

Refer to 3.4.2.3.2/Q.713 for the list of translation types recognized by the SCCP, and refer to Annex B/Q.713 for the TT values recognized by SCCP when GTI is set to 4. The translation type together with the numbering plan and the nature of address indicator determines a specific translator which defines a specific set of translation rules.

A particular TT value shall implicitly specify the encoding scheme of the GTAI value if the encoding scheme is not included for a particular GTI.

A TT value is unique only within the context of a GTI.

3) **Translation rules**

A set of rules specifies which type of SCCP addressable entities, associated with some service/application must be unambiguously addressed with the global title address information, and how the global title address information should be interpreted by the GTT function.

The translation rules should specify which portion of the GTAI is required to unambiguously identify or distinguish one SCCP addressable entity from another pertaining to the applications. However, the rules should not specify which GTAI portion is to be translated to which DPC or DPC + SSN. The determination of the DPC and SSN is implementation-specific and requires local information (see 2.4.3.1) specific to the destination network. The translation rules may specify if the SSN is to be determined from the translation.

4) **Identification of translation rules**

The translation rules shall be uniquely identified by the GTI and its associated TT, NP and NAI values.

2.4.2.2 Other definitions used in the GTT function

1) **SCCP Entity**

An SCCP Entity is a local GST~~MTP~~-SAP + ~~a DPC +~~ possibly an SSN.

NOTE – An SCCP Entity with an SSN equal to zero (SSN not known or not used) is different from an SCCP Entity without an SSN value.

2) **SCCP Entity Set**

An SCCP Entity Set is made of one SCCP Entity or is made of two SCCP Entities of the same type (if an SSN is present in one SCCP Entity, then an SSN shall also be present in the other). In the latter case the two SCCP Entities may be considered either as a "primary" SCCP Entity and a "backup" SCCP Entity or may be interpreted as two equal SCCP Entities that can be used for a loadsharing purpose.

3) **DPC**

A DPC is significant only in a given signalling transport ~~MTP~~ network. Because an SCCP gateway manages several GST~~MTP~~ networks, a DPC, as a result of the global title translation, could be accompanied by an identification of the concerned signalling transport ~~MTP~~ network, i.e., ~~that is~~ the GST~~MTP~~-SAP instance.

2.4.3 Input of the GTT function

The following types of information can be an input for the GTT function.

2.4.3.1 Local information (mandatory input)

The local information contains firstly the routing information and secondly the management information.

- The routing information is specific to the implementation network and is administratively input to the GTT function. They are static data implementing the "translation rules" required to translate the global title address information for the applications.
- The management information is specific to the state of the network in terms of availability. They are dynamic data reflecting the accessibility of the SCCP nodes ~~(accessibility at the MTP and SCCP level)~~ and the accessibility of the subsystems handled by the different SCCP nodes.

2.4.3.2 GT information (mandatory input)

The GT information is a required input for the GTT function. It contains:

- the GTI value;
- the TT, NP, NAI and ES values depending on the GTI;
- the GTAI value.

2.4.3.3 SSN (mandatory input if present)

Even if SSN equals zero, the SSN is a mandatory input of the GTT function.

2.4.3.4 Loadsharing information

If the GTT function is able to handle a loadsharing mechanism, then the value of the Sequence Control parameter ~~SLS~~ may be an input for the GTT function.

2.4.4 Output of the GTT function

Three types of output are possible for the GTT function:

– A "successful" output which contains the required parameters to route the message forward in the network or to distribute the message.

– An "unsuccessful" output where no translation exists for the given input (see steps 1, 2 and 4 described in 2.4.5). The failure causes are "no translation for an address of such nature" or "no translation for this specific address".

– An "unsuccessful" output where the translation exists but no available destination can be found (see step 4 described in 2.4.5). The failure causes may be "GST~~MTP~~ failure", "SCCP failure" or "subsystem failure".

Refer to 2.6 for the causes used in RLSD, CREF, XUDTS, LUDTS or UDTS messages.

The two key outputs for the "normal" output of the GTT function are the DPC and the routing indicator.

If the routing indicator is set to "Route on SSN", then the SSN is a required output of GTT function. The subsystem defined by DPC + SSN is expected to be accessible from SCRC. The DPC may be a local DPC in the case of a GT translation in the destination node. The GT information as an output is optional.

If the routing indicator is set to "Route on GT", then the GT information is a required output of the GTT function and the DPC provided is expected to be accessible. The GT information is made up of the GTAI and TT, NP, NAI, ES with the corresponding GTI. The SSN is an optional output.

2.4.5 Global title translation function

When the GTT function is invoked by the SCRC, the GTT function shall perform the following steps:

1) Step 1: the GTI and the three optional parameters TT, NP and NAI should be unambiguously associated to a translator which defines a set of translation rules. If this translator cannot be determined, the GTT function shall be aborted with the cause "no translation for an address of such nature".

2) Step 2: the set of translation rules determined by step 1 is used to analyse the GTAI possibly accompanied by the encoding scheme. If no output exists for this GTAI, then the GTT function shall be aborted with the cause "no translation for this specific address". Otherwise the output of this step 2 is at least the Routing Indicator (RI) and an SCCP Entity Set. In addition, if the routing indicator is set to "Route on GT", then a GT information is a mandatory output otherwise the GT information as an output is optional.

3) Step 3: if an SSN is available as a GTT function input, then the step 3 consists of using this input SSN as a default value if some SSN are missing in the SCCP Entity Set. It may happen that the value zero appears as an SSN value in the SCCP Entity Set: this is a correct value which overwrites the SSN given as input of the GTT function.

4) Step 4: this is where the management information is taken into account and where a loadsharing mechanism can be implemented.

By definition an SCCP entity is declared accessible when the two following conditions are fulfilled:

– The DPC concerned is accessible ~~(at MTP and SCCP level)~~ or the DPC corresponds to the local node.

– If the routing indicator is set on "Route on SSN", then an SSN is present and different from zero and this subsystem is accessible in the node defined by the DPC:

  a) If the SCCP Entity Set contains only one SCCP Entity and this SCCP Entity is inaccessible, then the result of the GTT function is "GST~~MTP~~ failure", "SCCP failure"

or "subsystem failure". When the routing indicator is set to "Route on SSN" and if the inaccessibility is due to the absence of SSN in the SCCP Entity or due to an SSN value equal to zero, then the result of the GTT function shall be "no translation for this specific address".

b) If the SCCP Entity Set contains only one SCCP Entity and this SCCP Entity is accessible, then:
   - If the routing indicator is set to "Route on GT", then the outputs of the GTT function are the RI and the GT information as an output of step 2, the DPC found in the SCCP Entity and possibly the associated SSN as an output of step 3;
   - If the routing indicator is set to "Route on SSN", then the outputs of the GTT function are the RI and possibly the GT information as an output of step 2, and the DPC and SSN found in the SCCP Entity as an output of step 3.

c) If the SCCP Entity Set contains two SCCP Entities and if there is no loadsharing mechanism, then the accessibility of the "primary" SCCP Entity is checked. If this "primary" SCCP Entity is accessible, then this "primary" SCCP Entity is selected as part of the GTT function result. If the "primary" SCCP Entity is inaccessible, then the accessibility of the "backup" SCCP Entity is checked. If this "backup" SCCP Entity is accessible, then this "backup" SCCP Entity is selected as part of the GTT function result. If the "backup" SCCP Entity is inaccessible, then the result of the GTT function is "GST~~MTP~~ failure", "SCCP failure" or "Subsystem failure" (if the refusal or return causes are different for both SCCP Entities it is an implementation-dependent matter which one is selected). If the inaccessibility is due to the absence of SSN in the two SCCP Entities or due to SSN values equal to zero when the routing indicator is set to "Route on SSN", then the result of the GTT function shall be "no translation for this specific address".

d) If the SCCP Entity Set contains two SCCP Entities and if there is a loadsharing mechanism implemented, then one of the two SCCP Entities is chosen depending on the loadsharing information and on the accessibility of the SCCP Entities. If one SCCP Entity can be chosen, then this SCCP Entity is selected as part of the GTT function result. If the SCCP Entities are both inaccessible, then the result of the GTT function is "GST~~MTP~~ failure", "SCCP failure" or "Subsystem failure" (if the refusal or return causes are different for both SCCP Entities it is an implementation-dependent matter which one is selected). If the inaccessibility is due to the absence of SSN in the two SCCP Entities or due to SSN values equal to zero when the routing indicator is set to "Route on SSN", then the result of the GTT function shall be "no translation for this specific address".

Figure 2 shows the different steps of the global title translation function as well as the parameters used in this global title translation function.

In Figure 2:

– an in-bracket parameter means an optional parameter;

– the dashed line with the SLS parameter means that the loadsharing functionality itself is not required in a given implementation. If this functionality is present, then the SLS parameter may be an input parameter.

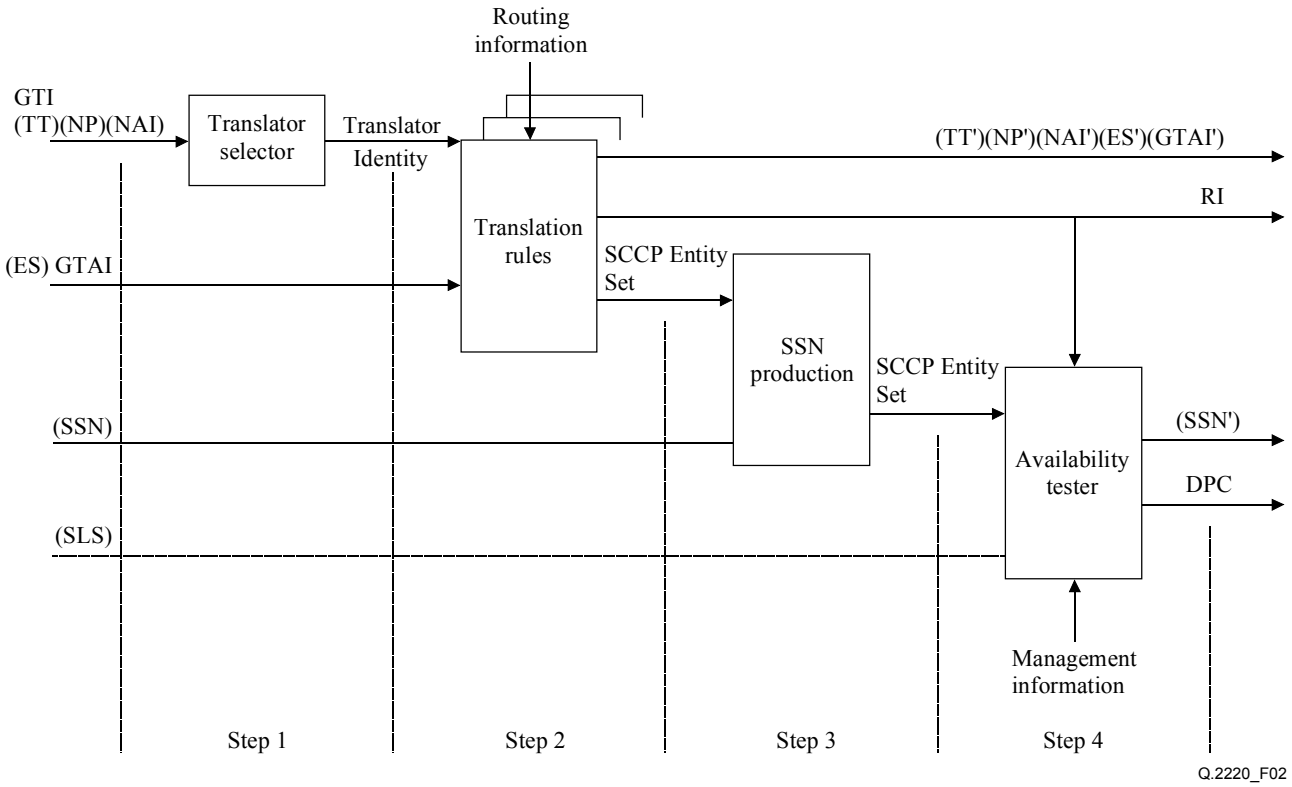

Figure 2/Q.714 – Steps and parameters of the global title translation function

2.5 Compatibility test

The compatibility test defined in this subclause applies to connectionless procedures only.

If the network structure is such that incompatibilities requiring segmentation, truncation or message type change are never present, then the compatibility test is not required.

Based on the available knowledge at the local node, the compatibility test ensures that:

1) the SCRC never attempts to send a message that cannot be understood by the recipient SCCP node;

2) the outgoing messages are of the appropriate length to be carried by the underlying GST~~MTP~~.

The compatibility test in SCRC determines whether:

1) An LUDT message needs to be segmented.

2) An LUDTS message needs to be truncated.

3) The message type needs to be changed. In some cases, a message may be changed to a type preferred by the recipient node (see 4.1.2).

If no segmentation, truncation or message type change is required, then the GST~~MTP~~-TRANSFER primitive is invoked unless the message is discarded by the traffic limitation mechanism (see 2.6). Otherwise, the message is passed to SCLC for the necessary changes.

2.6 Traffic limitation mechanism

The SCCP congestion control procedures may be subject to improvement pending further analysis of the impact of these procedures in different network scenarios and based on the results of operational experience.

2.6.1 General

The GSTMTP notifies the SCCP of unavailable or congested remote signalling points or remote SCCP unavailability using the appropriate OUT-OF-SERVICEMTP-PAUSE.indication or CONGESTIONMTP-STATUS.indication primitive. The SCCP then informs its users.

Each destination (GSTDPC + MTP-SAP instance) is associated with a Restriction Levels for connectionless (RL_{CL}) and for connection-oriented (RL_{CO}) services, and a RestrictionSubLevels for connectionless (RSL_{CL}) and connection-oriented (RSL_{CO}) which are reported by SCMG (see 5.2.4).

These levels, together with the importance of the message to be sent, allow the reduction of the traffic towards a congested node by discarding a portion of the concerned traffic.

2.6.2 Importance of a message

Whenever a message is to be sent, its importance is the minimum of the permitted maximum importance value for the message type (See Table 2), and:

a) at the originating node the importance value (if provided) in the request or response primitive (otherwise the default value from Table 2 applies);

b) at a relay node:
   - the importance value received in the incoming message contained in the optional parameter "importance" (CR, CC, CREF, RLSD, XUDT, XUDTS, LUDT or LUDTS); or
   - a value derived from the national option of the priority parameter in the TRANSFER.indication primitive field in the SIO in the MTP field; otherwise
   - a default value assigned from Table 2.

If there is a conflict between the importance parameter and a value derived from the SIO in a received message, then the importance value used is a network choice.

Table 2/Q.714 – Default and maximum importance value

Message type	Default importance	Max importance	Message type	Default importance	Max importance
CR	2	4	RSC	6	–
CC	3	4	ERR	7	–
CREF	2	4	RLC	4	–
DT1	4	6	RLSD	6	6
DT2	4	6	UDT	4	6
AK	6	–	UDTS	3	–
IT	6	–	XUDT	4	6
ED	7	–	XUDTS	3	–
EA	7	–	LUDT	4	6
RSR	6	–	LUDTS	3	–
The "–" means that the message type is not generated as a result of a primitive from the SCCP user therefore the default importance value always applies.					

NOTE – The values in Table 2 might be revised as operational experiences are gained. How these default and maximum values should be administered is implementation dependent.

When in a national network the importance information is carried in the priority parameter ~~level in the SIO~~, then it is the task of the gateway between a national network and the international network to provide the mapping between the importance parameter in the SCCP message and the priority parameter ~~in the SIO~~.

2.6.3 Handling of messages to a congested node

When a message has to be sent towards a remote SCCP node, the importance of the message is compared to the restriction level of that remote SCCP node for the service corresponding to the message to be sent (connectionless or connection-oriented):

- If the importance of the message is greater than RL, then the GST~~MTP~~-TRANSFER primitive is invoked.
- If the importance of the message is lower than RL, then the message is discarded.
- If the importance of a message is equal to RL, then the message shall be discarded proportionately as determined by the RSL value. The portion of traffic reduction is considered to be network-specific. For the international network, the following values are provisionally assigned:
  - RSL = 0 $\Rightarrow$ 0% of traffic discarded.
  - RSL = 1 $\Rightarrow$ 25% of traffic discarded.
  - RSL = 2 $\Rightarrow$ 50% of traffic discarded.
  - RSL = 3 $\Rightarrow$ 75% of traffic discarded.

When a message has to be discarded, then:

- for connectionless messages, the message return procedure is initiated;
- for CR messages, the connection refusal procedure is initiated;
- for CO messages other than the CR message, no additional actions are taken. If the message was locally originated, the SCCP may inform the user of the discard by issuing an N-INFORM primitive.

2.7 Calling party address treatment

2.7.1 Address indicator

The segmenting/reassembly process of connectionless messages requires that an unambiguous calling party address is passed in each segment. The practice of "deleting" the calling party address from an XUDT or LUDT or UDT message by coding its "Address Indicator" bit 1...7 to zero shall not be used for evolving applications, because at some time their messages may grow beyond the limit supported by one (X)UDT message.

2.7.2 Calling party address in the international network

It is the task of the outgoing international gateway~~2~~ (or originating international node) to make sure that the calling party address or responding address (i.e. called party address parameter in a CC or CREF message) satisfies the ~~following~~ rules below:

NOTE – An international gateway is an SCCP node having an GST-SAP instance for the international network and at least one GST-SAP instance for a national network.

- If routing is based on SSN, the DPC, if present, is one as defined in ITU-T Rec. Q.708, the SSN must be present and should be internationally standardized.
- If routing is based on GT, the GTI must be equal to 4, the SSN is either:
  - one of the internationally standardized numbers; or
  - national SSN value, if no internationally standardized SSN is specified and it is appropriate to use the national value (see Annex B.2/Q.713); or

- coded as "0" (i.e., "unknown").

– The Global Title must have international significance. Within a national network, it is a national option to decide on the scope ("significance") of the calling/responding party addresses. However, when the address is only locally or nationally significant, it may be necessary to change the address in relay or gateway nodes by adding a trunk code or country code to the Global Title address information. This is the case whenever the message is routed outside the domain where the address is valid.

The incoming international gateway (or possibly any other node) may, as part of its optional screening procedures, provide tests to verify the principles specified above. The screening procedures are further specified in 2.7.4.

2.7.3 Routing indicator

When the called party address in an XUDT or LUDT or UDT message has the routing indicator set on "Route on GT", the routing indicator in the calling party address shall also be set to "Route on GT", unless the destination is in the same GST~~MTP~~ network and that its GST~~MTP~~ routing tables allows the message to be routed back.

For a CR message, the calling party address may be of the form "Route on SSN" because the subsequent messages will be routed section by section.

2.7.4 Screening

Screening is an optional network-specific function.

Further screening of the received calling party address may be performed in a node to check, for example, whether a valid translator for NP/TT/NAI is available and/or whether the calling party digits are allowable.

2.7.5 Inclusion of OPC in the calling party address

The rules described in the following subclauses apply.

2.7.5.1 LUDT or XUDT or UDT message

a) *Originating node*

When the routing indicator of the called party address is set on "Route on GT" and the routing indicator of the calling party address is set on "Route on SSN", the SCCP routing function should include the OPC in the calling party address. In all other cases the inclusion of the OPC in the calling party address is irrelevant.

b) *Relay node*

When the routing indicator of the calling party address is set on "Route on SSN", and no SPC is present in it, then the OPC shall be derived from the GST-SAP via which the message has been received ~~MTP routing label shall be taken~~ and inserted into the calling party address before sending the message to the next node. When crossing signalling transport network ~~MTP~~ boundaries the value "Route on SSN" is however not allowed (refer to 2.7.2).

c) *Terminating node*

When the routing indicator of the calling party address is set on "Route on SSN" and an SPC is present in the calling party address, then this SPC identifies the originating SCCP node.

When the routing indicator of the calling party address is set on "Route on SSN" and no SPC is present in the calling party address, then the OPC derived from the GST-SAP via which the message has been received ~~in the MTP routing label~~ identifies the originating SCCP node.

2.7.5.2 CR message

a) *Originating node*

If the routing indicator of the called party address is set on "Route on GT" and it is known that no coupling will take place in the next relay node, then the SCCP routing function should include a calling party address (also when not given by the local SCCP subsystem), and in the calling party address the OPC is included.

In this case Routing indicator = Route on SSN
SPC = OPC of the originating node
SSN = SSN of local subsystem

b) *Relay node without coupling*

The SCCP routing function shall check the calling party address parameters in the received CR message:

– When a calling party address parameter is included and an SPC is present, then the calling party address parameter to be sent to the next SCCP node shall be identical to the calling party address parameter of the received CR message.

– When a calling party address parameter is included and the SPC is absent, then the OPC derived from the GST-SAP via which the CR message has been received ~~of the MTP routing label of the received CR message~~ shall be inserted in the calling party address parameter of the CR message to be sent to the next SCCP node. If no SSN is present it may be added with value "unknown".

In this case Routing indicator is unchanged
SPC = OPC derived from the GST-SAP via which the message has been received ~~of the received MTP routing label~~
SSN and GT are unchanged

– When the calling party address parameter is absent, then a calling party address parameter containing the OPC derived from the GST-SAP via which the CR message has been received ~~of the MTP routing label of the received CR message~~ shall be inserted in the CR message to be sent to the next SCCP node. An SSN may be added with value "unknown".

In this case Routing indicator = "Route on SSN"
SPC = OPC derived from the GST-SAP via which the message has been received ~~of the received MTP routing label~~
SSN = unknown
no GT

c) *Relay node with coupling*

The OPC of the calling party address of the received CR message identifies the originating SCCP node of the incoming connection section. If the calling party address is absent or if no OPC is available in the calling party address, then the OPC derived from the GST-SAP via which the CR message has been received ~~of the MTP routing label of the received CR message~~ is taken for identifying the originating SCCP node of the incoming connection section.

The SCCP routing function shall check the calling party address parameter in the received CR message:

– When a calling party address parameter is included and an SPC is present, then the SCCP routing function shall replace the SPC of the received CR message by the OPC of its own node and corresponding to the outgoing signalling transport ~~MTP~~ network, or shall delete the SPC field from the received calling party address parameter. Deleting the SPC is not advisable, because it means reformatting the message, and it

may have to be re-included in the next relay node if no coupling is done there. If no SSN is present it may be added with value "unknown".

In this case Routing indicator is unchanged
SPC = OPC of relay node with coupling
SSN and GT are not changed

– When a calling party address parameter is included and the SPC is absent, then the calling party address parameter of the CR message to be sent to the next SCCP node may be identical to the calling party address parameter of the CR message received.

  However, if it is known that no coupling will take place in the next relay node, then the SCCP routing function should include an SPC in the calling party address parameter. The SPC is the OPC of its own node and corresponding to the outgoing signalling transport ~~MTP~~ network.

– When the calling party address parameter is absent no special actions are necessary.

  However, if it is known that no coupling will take place in the next relay node, the SCCP routing function should include a calling party address parameter containing an SPC. The SPC is the OPC of its own node and corresponding to the outgoing signalling transport ~~MTP~~ network.

d) *Terminating node*

The SPC of the calling party address of the received CR message identifies the originating SCCP node of the incoming connection section. If the calling party address is absent or if no SPC is available in the calling party address, then the OPC derived from the GST-SAP via which the CR message has been received ~~of the MTP routing label of the received CR message~~ is taken for identifying the originating SCCP node of the incoming connection section.

2.8 Routing failures

When SCCP routing is unable to transfer a message, one of the causes described in 2.8.1 to 2.8.6 is indicated in the RLSD message (refer to 3.11/Q.713, Release cause), the CREF message (refer to 3.15/Q.713, Refusal cause), the XUDTS, the LUDTS or the UDTS message (refer to 3.12/Q.713, Return cause).

When an end node is informed of a routing failure, this information is forwarded towards the SCCP user by using the N-DISCONNECT primitive (refer to reason for release in 2.1.1.2.4/Q.711) or the N-NOTICE primitive (refer to reason for return in 2.2.2.2.4/Q.711). Annex A/Q.713 describes the mapping between the causes found in the messages (RLSD, CREF, XUDTS, LUDTS or UDTS) and the reasons found in primitives (N-DISCONNECT, N-NOTICE).

2.8.1 No translation for an address of such nature

The translation was invoked for a combination of translation type, numbering plan and nature of address for which no translation exists in this exchange (refer to 2.4.5, Step 1).

The following causes apply:

– Release cause: not applicable.

– Refusal cause: no translation for an address of such nature.

– Return cause: no translation for an address of such nature.

2.8.2 No translation for this specific address

The translation was invoked for a sequence of digits for which no matching (sub)sequence can be found in the translation table, hence translation is inconclusive (refer to 2.4.5, Step 2). The same

reason applies also when the RI determined by the GTT is set to "Route on SSN" and an SSN is present neither in the SCCP Entity Set, nor as input of the GTT (refer to 2.4.5, Step 4).

The following causes apply:

– Release cause: not applicable.

– Refusal cause: destination address unknown.

– Return cause: no translation for this specific address.

2.8.3 GST~~MTP~~/SCCP/subsystem failure

The translation fails because no available route could be found for the concerned destination address (refer to 2.4.5, Step 4). This may be due to failures in:

1) GST~~MTP~~ (destination point inaccessible);

2) SCCP (SCCP user part unavailable in relay node or end node);

3) SCCP subsystem (subsystem prohibited or unavailable);

4) a combination of two of the three above reasons when an alternative route exists and both the normal and the backup routes are unavailable.

The following causes apply:

– for 1):
  – Release cause: GST~~MTP~~ failure.
  – Refusal cause: destination inaccessible.
  – Return cause: GST~~MTP~~ failure.

– for 2):
  – Release cause: SCCP failure.
  – Refusal cause: SCCP failure.
  – Return cause: SCCP failure.

– for 3):
  – Release cause: subsystem failure.
  – Refusal cause: subsystem failure.
  – Return cause: subsystem failure.

– for 4):
  – Release cause: GST~~MTP~~ failure, SCCP failure or subsystem failure.
  – Refusal cause: GST~~MTP~~ failure, SCCP failure or subsystem failure.
  – Return cause: GST~~MTP~~ failure, SCCP failure or subsystem failure.

2.8.4 GST~~MTP~~/SCCP/subsystem congestion

Routing failures due to subsystem congestion are for further study.

When a routing failure due to GST~~MTP~~/SCCP/nodal congestion is detected the following causes apply:

– In the N-DISCONNECT primitive: QoS not available, transient condition.

– In the N-NOTICE primitive: network congestion.

– In the N-INFORM primitive: network service congestion.

– In the CREF message: QoS unavailable/transient.

– In the XUDTS or LUDTS or UDTS message: network congestion.

2.8.5 Unequipped user

A local unequipped user is determined by SCRC.

The following causes apply:

– Release cause: not relevant.

– Refusal cause: unequipped user.

– Return cause: unequipped user.

2.8.6 Hop counter violation

The hop counter reaches zero. It is an indication that an excessive routing could be present.

The following causes apply:

– Release cause: irrelevant.

– Refusal cause: hop counter violation.

– Return cause: hop counter violation.

---------->>>>>>>

9.4 Connection-oriented procedures

In 3.1.1/Q.714, remove the 3rd paragraph.

In 3.1.4.1/Q.714, remove all material after the first bullet item 4).

In 3.1.4.2/Q.714, replace list item 3) with the following:

<<<<<<<----------

3) The node sending the CC message (identified by ~~the parameter OPC contained in the MTP TRANSFER.indication primitive which conveyed the CC message~~ ~~plus~~ the GST~~MTP~~-SAP instance) is associated with the connection section.

---------->>>>>>>

In 3.1.5.1/Q.714. remove all material after the first bullet item 4).

In 3.1.5.1/Q.714, replace list item 2) with the following:

<<<<<<<----------

2) The node sending the CR message (identified by the OPC in the calling party address or by default by ~~the OPC in the MTP label, and~~ the GST~~MTP~~-SAP instance) is associated with the incoming connection section.

---------->>>>>>>

In 3.1.5.2/Q.714, replace list item 3) with the following:

<<<<<<<----------

3) The originating node of the CC message (identified by ~~the OPC in the MTP label plus~~ the GST~~MTP~~-SAP instance) is associated with the outgoing connection section.

---------->>>>>>>

In 3.1.5.2/Q.714, remove all material after the first bullet item 4).

In 3.1.6.1/Q.714, replace list item 2) with the following:

<<<<<<<----------

2) The originating node of the CR message (identified by the OPC in the calling party address or by default by ~~the OPC in the MTP label, and~~ the GST~~MTP~~-SAP instance) is associated with the incoming connection section.

---------->>>>>>>

In 3.1.6.1/Q.714, remove all material after the first bullet item 4).

In 3.2.1/Q.714, remove under item 1) the bullet item b).

In 3.2.1.1/Q.714, remove the following text at the end of the paragraph "if the refusal procedure has been initiated by using the refusal indicator in the REQUEST Type 2 interface element, then the refusal cause contains "SCCP user originated" ".

In 3.2.1.2/Q.714, remove the 3rd paragraph.

In 3.2.2/Q.714, remove the bullet item 2).

9.5 Connectionless procedures

In the introduction to clause 4/Q.714, replace list items a) to c) with the following:

<<<<<<<----------

a) an environment with only signalling ~~MTP~~ network(s) supporting a maximum length of 272 octets ~~according to Recommendation Q.704~~ (pure Q.704);

b) an environment with only signalling ~~MTP~~ network(s) supporting a maximum length of 4096 octets (or more) ~~according to Recommendation Q.2210~~ (pure Q.2210);

c) an environment where interworking occurs between signalling ~~MTP~~ networks that support in parts only maximum length of 272 octets and in other parts a maximum length of 4096 octets (or more) ~~according to Recommendations Q.704 and Q.2210~~.

---------->>>>>>>

Replace the 2nd paragraph after the list items a) to c) with the following:

<<<<<<<----------

An implementation shall support the XUDT, XUDTS, LUDT, and LUDTS ~~all~~ message types, parameters, and parameter values (see ITU-T Rec. Q.713) applicable to the connectionless protocol classes and capabilities of this Recommendation. But the network may allow lesser functionality according to the place of the network(s) in which the implementation is required to operate.

UDT and UDTS messages are deprecated. In particular, a UDT message shall not be used to transmit user data in protocol class 0 when the destination lies within another signalling network.

---------->>>>>>>

Remove footnote 5 in the 3rd paragraph after the list items a) to c) and insert the note in the mainline text as follows:

<<<<<<<----------

The onnectionless procedures allow a user of the SCCP to request transfer of up to 2560-3952 octets[~~5~~] of user data without first requesting establishment of a signalling connection.

NOTE – The maximum number of octets depends on the length of the called and calling party addresses, and on whether or not segmentation may occur.

---------->>>>>>>

Replace the 5th paragraph after the list items a) to c) with the following:

<<<<<<<----------

Transfer of the user data is accomplished by including the user data in XUDT or LUDT ~~or UDT~~ messages.

---------->>>>>>>

Replace the last paragraph before 4.1/Q.714 with the following:

<<<<<<<----------

The SCCP relies on the services of the GST ~~MTP~~ for transfer of SCCP messages. Based on the characteristics of the GST~~MTP~~, the protocol class 1 service may be used in such a way that it provides a quality of service that has a lower probability of out-of-sequence messages than that provided by protocol class 0.

---------->>>>>>>

Replace the 2nd and 3rd paragraphs of 4.1/Q.714 with the following:

<<<<<<<----------

The user data is then transferred in XUDT or LUDT ~~or UDT~~ message(s), using SCCP ~~and MTP~~ routing functions and the appropriate GST-SAP instance, to the "Called address" indicated in the N-UNITDATA request primitive. If protocol class 1 is used, the sequence control parameter shall be included and contain the SLS value.

The connectionless data transfer service is also used to transport SCCP management messages, which are transferred in the "data" field of XUDT or LUDT ~~or UDT~~ messages. If protocol class 1 is used, the sequence control parameter shall be included and contain the SLS value.

---------->>>>>>>

In 4.1/Q.714, replace the note and the two paragraphs after it with the following:

<<<<<<<----------

NOTE – The SCCP uses the services of the GST ~~MTP~~ and the GST ~~MTP~~ may, under severe network conditions, discard messages (see for example 2.3.5.1/Q.704). Therefore, the user of the SCCP may not always be informed of non-delivery of user data.

The GST ~~MTP~~ notifies the SCCP of available, unavailable or congested remote signalling points ~~or remote SCCP unavailability~~ using the IN-SERVICE.indication, the OUT-OF-SERVICE.indication, and the CONGESTION.indication ~~MTP-PAUSE indication or MTP-STATUS indication~~ primitives. Layer management notifies the SCCP of remote SCCP User Part availability or unavailability. The SCCP then informs its users.

When an ~~UDT or~~ XUDT or LUDT message is received at the destination node, an N-UNITDATA indication primitive is invoked, after possible reassembly of all segments, except for the SCCP management messages. The SCCP management (SCMG) messages are passed to the SCMG entity instead.

---------->>>>>>>

In 4.1.1.1.2/Q.714, replace the first two bullet items with the following 3 items:

<<<<<<<----------

– The SCCP shall place each segment of user data into separate XUDT messages, each with the same Called Party Address ~~and identical MTP routing information (DPC, SLS)~~.

– The Calling Party Address ~~and the OPC~~ in each XUDT message shall be coded identically, in the manner described in 2.1, SCCP Addressing.

– Every XUDT message shall be submitted to the same appropriate GST-SAP instance with the same value in the "Sequence Control" of the TRANSFER.request primitive.

----------->>>>>>>

In 4.1.1.2.1/Q.714, replace the first paragraph (introduction to bullet items) with the following:

<<<<<<<----------

Upon receipt of an LUDT or XUDT message with the F-bit set to one and the "remaining segment" field different from zero in the segmentation parameter, the destination SCCP shall initiate a new reassembly process, using the Calling Party Address, the GST-SAP instance through which the LUDT or XUDT was received, ~~MTP routing information~~ and the Segmentation Local Reference to uniquely identify the reassembly process. Initiating a reassembly process involves the following steps:

----------->>>>>>>

In 4.1.1.2.2/Q.714, replace the first bullet item with the following:

<<<<<<<----------

– The SCCP shall associate the received XUDT or LUDT message with a particular reassembly process, using the unique combination of the Calling Party Address, the GST-SAP instance through which the LUDT or XUDT was received, ~~MTP routing information,~~ and the Segmentation Local Reference field of the segmentation parameter. If no association is possible, the SCCP shall discard the message.

----------->>>>>>>

9.6 SCCP management procedures

Replace clause 5/Q.714 with the following:

<<<<<<<----------

5 SCCP management procedures

5.1 General

The purpose of SCCP management is to provide procedures to maintain network performance by rerouting or throttling traffic in the event of failure in the network.

Although SCCP management has its own subsystem number, the procedures in this clause do not apply to the SCCP management as an SCCP user. For the cases where the SCCP management's SSN is used to indicate the availability/unavailability of the SCCP, the applicable procedures are explicitly stated as applying to SSN = 1. ~~SSN~~ = "1" is assigned to SCCP management, whereas the remaining SSNs are assigned to SCCP users, except SSN = 0. The status of SSN = 1 is assumed to reflect the status of the entire SCCP at a node.

SCCP management is organized into two sub-functions: signalling point status management and subsystem status management. Signalling point status management and subsystem status management allow SCCP management to use information concerning the accessibility of remote signalling points and subsystems, respectively, to permit the network to adjust to failure, and recovery.

SCCP management procedures rely on:

1) out-of-service, in-service, ~~failure, recovery,~~ and congestion information provided in the OUT-OF-SERVICE.indication, IN-SERVICE.indication, and CONGESTION.indication ~~MTP-PAUSE indication, MTP-RESUME indication and MTP-STATUS indication~~ primitives; ~~and~~

2) subsystem failure and recovery information, and SCCP (SSN = 1) congestion received in SCCP management messages; and

3) indications from layer management about remote SCCP User Part availability or unavailability.

SCCP management information is currently defined to be transferred using the SCCP connectionless service with no return on error requested. The formats of these messages appear in clause 8~~ITU-T Recommendation Q.713~~.

SCCP management maintains the status of remote SCCP nodes; and the status of remote or local subsystems. It cooperates with the SCCP routing control (including translation function) to stop traffic to inaccessible destinations and to provide rerouting of traffic through alternate routing or through selection of alternate remote subsystems.

From the perspective of SCCP routing control, the remote SCCP nodes addressed by certain ranges of Global Titles can be operated in several modes; and the SCCP routing control (translation function) are supported by the signalling point status management procedures (see 5.2):

1) *Solitary mode*: The destination subsystem or next translation node is chosen from the one single SCCP node. When that node or its SCCP fails, the SCCP management will notify the SCCP routing control; and the traffic towards the solitary nodes will be discarded or returned if return-option is set. In the case of connection-oriented procedures, the connection section will be refused or released.

2) *Replicated service in dominant mode*: The next translation node or destination subsystem can be chosen from two SCCP nodes. Traffic towards a specific subdomain (characterized by ranges of Global Titles) is normally sent to the SCCP of a "primary" node. When the "primary" node is inaccessible, the SCCP management will notify the routing control and this traffic is routed to the SCCP of a "backup" node. As soon as the "primary" node becomes accessible again, the traffic is again routed to it.

3) *Replicated service in dynamically loadshared mode*: The next translation node or destination subsystem is chosen from two SCCP nodes. The traffic is dynamically distributed to the next two nodes by the traffic-sending node. The next pair of SCCP nodes receiving the traffic will back-up each other. If one of the nodes becomes inaccessible, the SCCP management will notify the routing control and the traffic will be routed to the other one. As soon as the previously inaccessible node becomes accessible again, the traffic is dynamically distributed to those two nodes again.

Remote SCCP-subsystems capable of providing the same application service for, as an example, the same subset of service subscribers can be grouped in "subsystem services". Several modes of operation for such a "subsystem service" can be distinguished and are supported by the subsystem status management procedures (see 5.3); when final translation results in "route on SSN".

1) *Solitary subsystems*: When the solitary subsystem fails, the SCCP management will notify the SCCP routing control; and the traffic towards the solitary subsystem will be discarded or returned if the return-option is set. In the case of connection-oriented procedure, the connection section will be refused or released.

2) *Replicated subsystems in dominant mode*: the destination subsystem is chosen from two replicated subsystems. The traffic is normally sent to the "primary" subsystem. When the "primary" subsystem is inaccessible, the SCCP management will notify the routing control and this traffic is sent to the "backup" subsystem. As soon as the "primary" subsystem becomes accessible again, the traffic is again routed to it.

3) *Replicated subsystem in dynamically loadshared mode*: The destination subsystem is chosen from two replicated subsystems. The traffic is dynamically distributed to the two replicated subsystems. The replicated subsystems receiving the traffic will back up each other. If one of the subsystems becomes inaccessible, the SCCP management will notify the

routing control and the traffic will be distributed to the other subsystem. As soon as the previously inaccessible subsystem becomes accessible again, the traffic is dynamically sent to those two subsystems again.

In cases 2) and 3) above, sequences of messages that must go to the same replicated subsystem (e.g., all messages of a TCAP transaction after initial transaction set-up) should use an unambiguous address, so only the initial set-up message (e.g., TCAP:BEGIN) can use the modes 2 and 3.

SCCP management procedures utilize the concept of a "concerned" subsystem or signalling point. In this context, a "concerned" entity means an entity with an immediate need to be informed of a particular signalling point/subsystem status change, independently of whether SCCP communication is in progress between the "concerned" entity and the affected entity with the status change[8].

NOTE – The definition of "concerned" subsystems or signalling points is network/architecture/application dependent.

In some situations, the number of concerned subsystem or signalling points for a given subsystem may be zero. In this case, when the subsystem fails, or becomes unavailable, no broadcast of the subsystem prohibited message is performed. Similarly, no broadcast of the subsystem allowed message is performed for that given subsystem when it recovers.

For nodes/subsystems that are not explicitly notified of status changes, i.e., they are not marked as "concerned", the SSA (subsystem-allowed) /SSP (subsystem-prohibited) messages directed to them is lost or no broadcast will take place after recovering from a GST ~~MTP~~ or SCCP failure, the response method is used. The response method ensures that an SSP (subsystem-prohibited) message is returned for a message to an unavailable subsystem, or an SSA (subsystem-allowed) message is returned as a result of the SST (subsystem-status-test) when the subsystem is available again.

The signalling point prohibited, signalling point allowed and signalling point congested procedures, specified in 5.2.2, 5.2.3 and 5.2.4 respectively, deal with the accessibility of a signalling point.

~~The local MTP network availability and unavailability procedures are described in 5.2.5 and 5.2.6, respectively.~~

The SCCP reports of SCCP and nodal congestion procedure is specified in 5.2.7

The inter- and intra-SCCP Management congestions reporting procedure is specified in 5.2.8.

The subsystem prohibited and subsystem allowed procedures, detailed in 5.3.2 and 5.3.3 respectively, deal with the accessibility of a subsystem or the SCCP.

An audit procedure to ensure that necessary subsystem management information is always available is specified in the subsystem status test procedure in 5.3.4.

A subsystem may request to go out of service, using the coordinated state change control procedure specified in 5.3.5.

Local subsystems are informed of any related subsystem status by the local broadcast procedure specified in 5.3.6.

Concerned signalling points are informed of any related subsystem status by the broadcast procedure specified in 5.3.7.

5.2 Signalling point status management

NOTE – The SCCP congestion control procedures may be subject to improvement pending further analysis of the impact of these procedures in different network scenarios and based on the results of operational experience.

5.2.1 General

Signalling point status management updates translation and status based on the information of signalling network out-of-service, in-service, ~~failure, recovery,~~ or congestion provided by the OUT-OF-SERVICE.indication, IN-SERVICE.indication, and CONGESTION.indication ~~MTP-PAUSE indication, MTP-RESUME indication, or MTP-STATUS indication~~ primitives. This allows alternative routing to backup signalling points and/or backup subsystems.

5.2.2 Signalling point prohibited

When SCCP management receives an OUT-OF-SERVICE.indication ~~MTP-PAUSE indication~~ primitive relating to a destination that becomes inaccessible, ~~or an MTP-STATUS indication primitive relating to an SCCP that becomes unavailable,~~ SCCP management performs the following actions.

1) Informs the translation function to update the translation tables.

2) In the case where the SCCP has received an OUT-OF-SERVICE.indication ~~MTP-PAUSE indication~~ primitive, SCCP management marks as "prohibited" the status of the remote signalling point, the remote SCCP and each subsystem at the remote signalling point.

   In the case where the SCCP has received an ~~MTP-STATUS~~ indication from layer management ~~primitive~~ relating to an unavailable SCCP, the SCCP marks the status of the SCCP and each SSN for the relevant destination to "prohibited" ~~and initiates a subsystem status test with SSN=1. If the cause in the MTP-STATUS indication primitive indicates "unequipped user", then no subsystem status test is initiated~~.

~~3) Discontinues all subsystem status tests (including SSN=1) if an MTP-PAUSE or MTP-STATUS indication primitive is received with a cause of "unequipped SCCP". The SCCP discontinues all subsystem status tests, except for SSN=1, if an MTP-STATUS indication primitive is received with a cause of either "unknown" or "inaccessible".~~

~~4~~ 3) Initiates a local broadcast (see 5.3.6.2) of "User-out-of-service" information for each subsystem at that destination.

~~5~~ 4) Initiates a local broadcast (see 5.3.6.4) of "signalling point inaccessible" information for that destination if an ~~MTP-PAUSE~~ OUT-OF-SERVICE.indication primitive is received.

~~6~~ 5) Initiates a local broadcast of "remote SCCP unavailable", if either an ~~MTP-PAUSE~~ OUT-OF-SERVICE.indication primitive or an ~~MTP-STATUS~~ indication from layer management about the SCCP User Part unavailability ~~primitive~~ is received.

5.2.3 Signalling point allowed

When SCCP management receives an IN-SERVICE.indication ~~MTP-RESUME indication~~ primitive relating to a destination that becomes accessible, or when it receives a subsystem allowed message relating to SSN = 1 at a remote destination which had been considered "prohibited", or when timer T(stat info) expires, SCCP management performs the following actions:

1) Sets the congestion state of that signalling point if an IN-SERVICE.indication ~~MTP-RESUME indication~~ primitive is received.

2) Instructs the translation function to update the translation tables.

3) Marks as "allowed" the status of that destination, and the SCCP, if an IN-SERVICE.indication ~~MTP-RESUME indication~~ primitive is received.

4) Marks as "allowed" the status of the SCCP if a subsystem allowed message is received for SSN = 1, or if timer T(stat info) expires, or if an indication is received from layer management that the peer SCCP User Part is available again. ~~The subsystem status test for SSN=1, if running, is stopped.~~

5) Marks as "allowed" the status of remote subsystems. As a national network provider option, the subsystem status can be marked as "prohibited" for a list of selected subsystems. For such subsystems, the subsystem status test procedure is initiated[9].

NOTE – This may under certain circumstances be used to solve the problem of message loss when switching back from a backup to a primary node (in case of replicated subsystems in dominant mode), where the status of the subsystem in the primary node is still unknown.

6) Initiates a local broadcast (see 5.3.6.5) of "signalling point accessible" information for that destination if an IN-SERVICE.indication ~~MTP-RESUME indication~~ primitive is received.

7) Initiates a local broadcast of "remote SCCP accessible" if either an IN-SERVICE.indication ~~MTP-RESUME indication~~ primitive or a subsystem status allowed message is received for SSN = 1 or if timer T(stat info) expires, or if an indication is received from layer management that the peer SCCP User Part is available again.

8) Initiates a local broadcast of "User-in-service" information for a subsystem associated with the IN-SERVICE.indication ~~MTP-RESUME indication~~ primitive.

5.2.4 Signalling point congested

When SCCP management receives a CONGESTION.indication or an IN-SERVICE.indication ~~MTP-STATUS indication~~ primitive relating to signalling network congestion to a signalling point, SCCP management:

1) Determines the severity of the congestion in the remote signalling point and updates that signalling point status to reflect the congestion as follows:

- The GST ~~MTP~~ provides a ~~single~~ congestion level (CL) ~~congestion~~ indication ~~(international method)~~[10].

  The severity is reflected by a local internal status variable referred to as "restriction level" RL_M. Each of the N + 1 restriction levels except the highest level is further divided into M "restriction sublevels", RSL_M, where:

  N = 8

  M = 4

  The method to compute these levels is as follows:

  CL is divided by N;

  RL_M is set to the quotient of the division above; and

  RSL_M is set to the remainder of the division above.

  NOTE – In the STCs, the value of congestion level "no congestion" (CLnc) must be set to "0", the value of congestion level "maximum congestion" (CLmc) must be set to "N × M", and the value "step" for Congestion Levels (CLst) must be set to "1".

  ~~The method to compute these levels uses an attack timer T_a and a decay timer T_d.~~

  ~~a) When timer T_a is not running, then:~~

  ~~Timer T_a is started and T_d is (re)started.~~

  ~~if RL_M is equal to N, then no further action is taken.~~

  ~~RSL_M is incremented.~~

  ~~If RSL_M reaches M, then RSL_M is set to zero and RL_M is incremented.~~

  ~~b) When timer T_a is running, the MTP-STATUS indication primitive is ignored.~~

2) Initiates the procedures of 5.2.8.

~~When congestion abates, the traffic is gradually resumed. SCCP management:~~

~~1) Decreases the restriction level (RL_M) in a time-controlled manner as follows:~~

~~When timer T_d expires, then RSL_M is decremented and:~~

~~a) if RSL_M reaches -1 and RL_M is not zero, then RSL_M is reset to M-1 and RL_M is decreased by one;~~

~~b) if either RSL_M or RL_M is not zero, then timer T_d is restarted again.~~

~~2) Initiates the procedure of 5.2.8.~~

~~When an indication of the end of MTP-RESTART is received, the associated RLM and RSLM are set to zero.~~

The values of M~~,~~ and N~~, T_a and T_d~~ parameters are administrable and provisional.

~~*5.2.5 Local MTP network availability*~~

~~The SCCP will receive an indication of the end of MTP restart from each restarting local MTP SAP instance (there may be one or more MTP SAP instances in a given node). This indication is implementation dependent, see 9.2/Q.704.~~

~~The occurrence of the end of MTP restart for a given local MTP SAP instance means that the local MTP network corresponding to that MTP SAP instance has become available to its local users, including SCCP. When SCCP management receives an indication reporting the end of a MTP Restard, then it:~~

~~1) resets the congestion level of the associated signalling points;~~

~~2) instructs the translation function to update the translation tables, taking into account the accessibility given by the MTP indicating the end of MTP Restart;~~

~~3) marks as allowed the status of the SCCP and all subsystems for each accessible signalling point;~~

~~4) initiates a local broadcast (see 5.3.6) of "signalling point accessible" information for the signalling points becoming accessible;~~

~~5) initiates a local broadcast of "remote SCCP accessible" for the remote SCCPs becoming accessible; and~~

~~6) initiates a local broadcast of "User in-service" (see 5.3.6.3) information for a subsystem associated with the end of the MTP-RESTART.~~

~~*5.2.6 Local MTP network unavailability*~~

~~Prior to the end of MTP restart for a given local MTP SAP instance, the local MTP network corresponding to that MTP SAP instance is unavailable to its local users, including SCCP. Any action taken is implementation dependent.~~

5.2.7 SCCP reports of SCCP and nodal congestion

This subclause describes procedures related to congestion conditions that are experienced by the SCCP or node and reported by the SCCP. The SCCP notifies the originating/relay nodes sending/relaying traffic towards a congested node of the congestion. A time-controlled procedure is run at the originating/relaying node using two ~~a~~-status variables, CL_{SCL} and CL_{CO}, which indicate~~s~~ the level of congestion for the connectionless and connection-oriented services at the remote node.

If the congestion is due to a general congestion state of the node, the application of this procedure should be synchronized with equivalent measures of other affected GST~~MTP~~-Users (e.g., BICC~~ISUP, B-ISUP~~). Any procedure to synchronize or coordinate these equivalent measures is outside the scope of this Recommendation.

5.2.7.1 Actions in the congested SCCP node

When a message arrives at a congested SCCP node, SCCP Routing Control informs SCCP management (see 2.3.1). SCMG shall return an SSC (*SCCP/Subsystem-Congested*) message ~~(SSC)~~ to the signalling point identified by the OPC in the GST-SAP instance ~~MTP routing label of the MTP-TRANSFER indication primitive and the MTP-SAP~~ from which the message is received. The *SCCP/Subsystem-Congested* message shall indicate the SPC of this congested SCCP node in the "affected PC" parameter, SSN of the SCMG ("1") in the "affected SSN" parameter, and a value in the "congestion level" parameter to indicate the severity of the congestion. Optionally, the affected SCCP service field may indicate whether the connectionless or connection-oriented service is affected or both. Any reaction towards a local originator is implementation dependent. The detection of SCCP or nodal congestion is implementation dependent.

After reception of the first message by the congested SCCP node, the SSC (SCCP/subsystem-congested) message will be repeated only on the reception of every P-th message regardless of the OPC.

P is provisionally set to 8.

5.2.7.2 Action in a relay or originating node

When a *SCCP/Subsystem-Congested* message is received from the congested SCCP, and the affected signalling point has been marked as "prohibited", no further action is taken. When a *SCCP/Subsystem-Congested* message is received from the congested SCCP, and the affected point code has not been marked as "prohibited", SCCP management shall compare the values of $CL_{~~s~~CL}$ and/or CL_{CO} associated with the congested SCCP node with the value in the congestion level parameter indicated in the *SCCP/Subsystem-Congested* message, depending on the affected SCCP service indicated. If the $CL_{~~s~~CL}$ and/or CL_{CO} has been marked with a higher congestion level, the value shall remain unchanged, or else the $CL_{~~s~~CL}$ and/or CL_{CO} shall be updated with the value of the congestion level parameter of the received *SCCP/Subsystem-Congested*. If the $CL_{~~s~~CL}$ has been marked with a higher or same level, the timer for connectionless T_{conCL} shall be restarted. If the CL_{CO} has been marked with a higher or same level, the timer for connection-oriented T_{conCO} shall be restarted.

If the T_{conCL} timer expires and the $CL_{~~s~~CL}$ has not yet reached zero, the $CL_{~~s~~CL}$ shall be decremented by one and timer T_{conCL} shall be restarted. If the $CL_{~~s~~CL}$ is reduced to zero, the timer T_{conCL} is stopped.

If the T_{conCO} timer expires and the CL_{CO} has not yet reached zero, the CL_{CO} shall be decremented by one and timer T_{conCO} shall be restarted. If the CL_{CO} is reduced to zero, the timer T_{conCO} is stopped.

Whenever a remote SCCP is marked as accessible (IN-SERVICE.indication, ~~MTP-RESUME,~~ SSA (subsystem-allowed) message, indication from layer management that the peer SCCP is available~~of the end of MTP-restart received~~), the congestion levels $CL_{~~s~~CL}$ and CL_{CO} stored by SCCP may be changed (network dependent).

The SCMG shall initiate the procedure of 5.2.8 when the values of $CL_{~~s~~CL}$ or CL_{CO} change~~s~~.

The congestion levels $CL_{~~s~~CL}$ and CL_{CO} are~~is~~ within the range 0 through 8, with 0 indicating that no congestion is present.

5.2.8 Inter- and intra-SCMG congestion reports procedure

This SCMG procedure uses the values of the following internal status variables:

1) RL_M, restriction level due to receipt of the IN-SERVICE.indication, or CONGESTION.indication primitive ~~MTP-STATUS indication of congestion~~ for each affected SP (see 5.2.4).

2) RSL_M, restriction sublevel per RL_M due to receipt of the IN-SERVICE.indication, or CONGESTION.indication primitive ~~MTP-STATUS indication of congestion~~ for each affected SP (see 5.2.4).

3) $CL_{~~SCL~~}$ and CL_{CO}, SCCP congestion levels due to receipt of the congestion level parameter of an SSC (SCCP/subsystem-congested) message for each affected SP and SSN = 1 (see 5.2.7).

The above values are used as inputs to compute the values of the following variables:

a) RL_{CL} and RL_{CO}, SCRC traffic restriction levels for each affected SP.

b) RSL_{CL} and RSL_{CO}, restriction sublevels per RL for each affected SP.

c) RIL, restricted importance level parameter reported to SCCP users for each affected SP. As an implementation option, SCCP users subscribed to the connectionless service can be informed of a RIL related to RL_{CL}. The same applies for SCCP connection-oriented users and RL_{CO}.

If there is any change in RL_{CL}, RL_{CO}, RSL_{CL} or RSL_{CO}, SCRC is informed of the new values ~~of RL and RSL~~.

If there is any change in restricted importance level, the local broadcast procedure (see 5.3.6.6) is initiated to report the new value of restricted importance level.

NOTE – The computation is left for further study.

5.3 Subsystem status management

NOTE – The SCCP congestion control procedures may be subject to improvement pending further analysis of the impact of these procedures in different network scenarios and based on the results of operational experience.

5.3.1 General

Subsystem status management updates the subsystem status based on the information of failure, withdrawal, and recovery of subsystems. This allows alternative routing to backup subsystems, if appropriate. Concerned local users are informed of the status changes of other backup subsystems. Subsystem status management procedures are also used to convey the status of the SCCP as a whole.

5.3.2 Subsystem prohibited

A subsystem prohibited message with SSN = 1 is not allowed.

5.3.2.1 Receipt of messages for a prohibited subsystem (response method)

If SCCP routing control receives a message, whether originated locally or not, for a prohibited local system, then SCCP routing control invokes subsystem prohibited control. A *Subsystem-Prohibited* message is sent to the signalling point identified by the OPC in the ~~MTP-TRANSFER indication primitive, and the~~ GST~~MTP~~-SAP instance if the originating subsystem is not local. If the originating subsystem is local, any action taken is implementation dependent. When many indications "message for a prohibited subsystem" are received, the number of SSP (*subsystem-prohibited*) messages sent out per time-interval may be reduced by implementation-dependent mechanisms.

5.3.2.2 Receipt of Subsystem-Prohibited message or N-STATE request primitive or local user failed

Under one of the following conditions:

a) SCCP management receives an SSP (*Subsystem-Prohibited*) message about a subsystem marked allowed; or

b) an N-STATE request primitive with "User-out-of-service" information is invoked by a subsystem marked allowed; or

c) SCCP management detects that a local subsystem has failed,

then SCCP management does the following:

1) instructs the translation function to update the translation tables;

2) marks as "prohibited" the status of that subsystem;

3) initiates a local broadcast (see 5.3.6.2) of "User-out-of-service" information for the prohibited subsystem;

4) initiates the subsystem status test procedure (see 5.3.4) if the prohibited subsystem is not local;

5) initiates a broadcast (see 5.3.7) of SSP (*Subsystem-Prohibited*) messages to concerned signalling points;

6) cancels "ignore subsystem status test" and the associated timer if they are in progress and if the newly prohibited subsystem resides at the local node.

5.3.3 Subsystem allowed

Under one of the following conditions:

a) SCCP management receives an SSA (*Subsystem-Allowed*) message about a subsystem other than SSN = 1, marked prohibited; or

b) an N-STATE request primitive with "User-in-Service" information is invoked by a subsystem marked prohibited,

then SCCP management does the following:

1) instructs the translation function to update the translation tables;

2) marks as "allowed" the status of that subsystem;

3) initiates as a local broadcast (see 5.3.6) of "User-in-service" information for the allowed subsystem;

4) discontinues the subsystem status test relating to that subsystem if such a test was in progress;

5) initiates a broadcast (see 5.3.7) of SSA (*Subsystem-Allowed*) messages to concerned signalling points.

If the remote SCCP, at which the subsystem reported in the SSA (*Subsystem-Allowed*) message resides, is marked inaccessible, then the message is treated as an implicit indication of SCCP restart, and the procedures in 5.2.3 are executed.

5.3.4 Subsystem status test

5.3.4.1 General

The subsystem status test procedure is an audit procedure to verify the status of a SCCP or subsystem marked as prohibited.

5.3.4.2 Actions at the initiating node

a) A subsystem status test is initiated when an SSP (*Subsystem-Prohibited*) message is received (see 5.3.2.2). For a list of selected subsystems, the subsystems status test may also be initiated on receipt of an IN-SERVICE.indication ~~MTP_RESUME indication~~ primitive, a subsystem allowed message with SSN = 1 or the time-out of timer T(stat_~~-~~info), or if an indication is received from layer management that the peer SCCP User Part is available again (see also 5.2.3 list item 5).

A subsystem status test associated with a prohibited subsystem is commenced by starting a timer T(stat_~~-~~info) and marking a test in progress. No further actions are taken until the timer expires.

Upon expiration of the timer, an SST (*Subsystem-Status-Test*) message is sent to SCCP management at the node of the prohibited subsystem and the timer is reset.

The cycle continues until the test is terminated by another SCCP management function at that node. Termination of the test causes the timer and the "test progress mark" to be cancelled.

b) A subsystem status test for SSN = 1 is initiated by layer management as necessary ~~when an MTP-STATUS indication primitive is received with "remote user inaccessibility" or "unknown" information for the SCCP at a remote signalling point~~.

~~After sending an SST(SSN = 1), the node should receive either an SSA(SSN = 1) from the restarting node or it should receive an MTP-STATUS indication primitive stating User Part Unavailable. In the case where the SST receiving node has the User Part availability control and its SCCP has not yet recovered, MTP sends a User Part Unavailable (UPU) message to the SST sending node. If neither a SSA(SSN = 1) nor a MTP-STATUS indication primitive (User Part Unavailable) is received by the SST sending SCCP during the duration of the T(stat info) timer, then the node should assume that the previously unavailable SCCP has recovered. (This ensures backward compatibility with previous versions of this Recommendation.) If the MTP-STATUS indication primitive stating User Part Unavailable is received before timer T(stat info) expires, then an SST(SSN = 1) is sent to the unavailable node when timer T(stat info) expires. A subsystem status test associated with an inaccessible SCCP is done in the same way as for the one associated with a prohibited subsystem, the only difference being that it refers to SSN = 1.~~

5.3.4.3 Actions at the receiving node

When SCCP management receives an SST (*Subsystem-Status-Test*) message and there is no "ignore subsystem status test" in progress, it checks the status of the named subsystem. If the subsystem is allowed, then an SSA (*Subsystem-Allowed*) message is sent to the SCCP management at the node conducting the test. If the subsystem is prohibited, no reply is sent.

In the case where the SST (*Subsystem-Status-Test*) message is testing the status of SCCP management (SSN = 1), if the SCCP at the destination node is functioning, then an SSA (*Subsystem-Allowed*) message with SSN = 1 is sent to SCCP management at the node conducting the test. If the SCCP is not functioning, then the GST ~~MTP~~ cannot deliver the SST (*Subsystem-Status-Test*) message to the SCCP. ~~A UPU message is returned to the SST initiating node by the MTP.~~

As soon as its SCCP has recovered, the restarting SCCP should broadcast an SSA (*Subsystem-Allowed*) message for SSN = 1 to all concerned nodes. The restarting SCCP should set the status to "allowed" for the SCCP and all subsystems of remote signalling points that it considers available, based on the GST-SAP instance ~~MTP~~ information at the node.

5.3.5 Coordinated state change

5.3.5.1 General

A duplicated subsystem may be withdrawn from service without degrading the performance of the network by using the coordinated state change procedure described below when its backup is not local. The procedure, in the case that the primary and the backup subsystems are co-located, is implementation dependent.

5.3.5.2 Actions at the requesting node

When a duplicated subsystem wishes to go out of service, it invokes a N-COORD request primitive. SCCP management at that node sends a SOR (*Subsystem-Out-of-Service-Request*) message to the backup system, sets a timer T(coord.chg) and marks the subsystem as "waiting for grant".

Arrival of a SOG (*Subsystem-Out-of-Service-Grant*) message at the requesting SCCP management causes the timer T(coord.chg) to be cancelled, the "waiting for grant" state to be cancelled, and a N-COORD confirm primitive to be invoked to the requesting subsystem. SSP (*Subsystem-Prohibited*) messages are broadcast (see 5.3.7) to concerned signalling points.

In addition, an "ignore subsystem status test" timer is started and the requesting subsystem is marked as "ignore subsystem status test". Subsystem status tests are ignored until the "ignore subsystem status test" timer expires or the marked subsystem invokes a N-STATE request primitive with "User-out-of-service" information.

If no "waiting for grant" is associated with the subsystem named in the SOG (*Subsystem-Out-of-Service-Grant*) message, then the SOG (*Subsystem-Out-of-Service-Grant*) message is discarded and no further action is taken.

If the timer associated with the subsystem waiting for the grant expires before a SOG (*Subsystem-Out-of-Service-Grant*) message is received, then the "waiting for grant" is cancelled and the request is implicitly denied.

5.3.5.3 Actions at the requested node

When the SCCP management at the node at which the backup subsystem is located receives the SOR (*Subsystem-Out-of-Service-Request*) message, it checks the status of local resources~~[1]~~. If the SCCP has sufficient resources to assume the increased load, then it invokes a N-COORD indication primitive to the backup subsystem. If the SCCP does not have sufficient resources, no further action is taken.

If the backup system has sufficient resources to allow its duplicate to go out of service, then it informs SCCP management by invoking a N-COORD response primitive. A SOG (*Subsystem-Out-of-Service-Grant*) message is sent to SCCP management at the requesting node. If the backup subsystem does not have sufficient resources, no reply is returned~~[1]~~.

NOTE – Local resources critical to this particular node are implementation dependent.

5.3.6 Local broadcast

5.3.6.1 General

The local broadcast procedure provides a mechanism to inform local allowed concerned subsystems of any related SCCP/subsystem/signalling point status information received.

5.3.6.2 User-out-of-service

A local broadcast of "User-out-of-service" information is initiated when:

a) an SSP (*Subsystem-Prohibited*) message is received about a subsystem marked allowed (see 5.3.2.2);

b) an N-STATE request primitive with "User-out-of-service" information is invoked by a subsystem marked allowed (see 5.3.2.2)~~12~~ (see Note);

c) a local subsystem failure is detected by SCCP management (see 5.3.2.2)~~12~~ (see Note);

d) an OUT-OF-SERVICE.indication ~~MTP-PAUSE indication~~ primitive is received (see 5.2.2); or

e) an ~~MTP-STATUS~~ indication from layer management that the peer SCCP User Part is unavailable ~~primitive with cause "inaccessible" is received~~ (see 5.2.2).

NOTE – These cases are applicable when the SCCP is used for routing between local subsystems. This function is implementation dependent.

SCCP management then informs local allowed concerned SCCP subsystems about the subsystem status by invoking N-STATE indication primitive with "User-out-of-service" information.

5.3.6.3 User-in-service

A local broadcast of "subsystem-in-service" information is initiated when:

a) an SSA (*Subsystem-Allowed*) message is received about a subsystem marked prohibited (see 5.3.3);

b) an N-STATE request primitive where "User-in-service" information is invoked by a subsystem marked prohibited (see 5.3.3);

c) an IN-SERVICE.indication ~~MTP-RESUME indication~~ primitive is received (see 5.2.3, SCMG action 8));

d) an SSA (*Subsystem-Allowed*) message is received with SSN = 1; about a remote SCCP marked prohibited (see 5.2.3, SCMG action 4));

e) timer T(stat info) expires, or; (see 5.2.3, SCMG action 4));

f) an indication from layer management that the peer SCCP User Part is available ~~of the end of MTP Restart is received~~ (see 5.2.5, SCMG action 6)).

SCCP management then informs local allowed concerned SCCP subsystems, except the newly allowed one in case d) above, about the subsystem status by invoking an N-STATE indication primitive with "User-in-service" information.

5.3.6.4 Signalling point inaccessible

A local broadcast of "signalling point inaccessible" or "remote SCCP inaccessible" information is initiated when an OUT-OF-SERVICE.indication ~~MTP-PAUSE~~ primitive or an indication from layer management that the peer SCCP User Part is unavailable ~~MTP-STATUS primitive (with "user part unavailable" information for a SCCP)~~ is received. SCCP management then informs local allowed concerned SCCP subsystems about the signalling point status by invoking an N-PCSTATE indication primitive with "signalling point inaccessible" or "remote SCCP inaccessible" information.

5.3.6.5 Signalling point or remote SCCP accessible

A local broadcast of "signalling point accessible" or "remote SCCP accessible" information is initiated when an IN-SERVICE.indication ~~MTP-RESUME~~ primitive, an SSA (*Subsystem-Allowed*) message (with SSN = 1) ~~message or an indication of the end of the MTP restart is received~~ or when timer T(stat info) expires or an indication from layer management that the peer SCCP User Part is available. SCCP management then informs local allowed concerned SCCP subsystems about the signalling point status by invoking an N-PCSTATE indication primitive with "signalling point accessible" or "SCCP accessible information".

5.3.6.6 Restricted importance level reporting

A local broadcast of "signalling point congested" information is initiated when there is any change in the "restricted importance level" (see 5.2.8). SCCP management then informs local allowed concerned SCCP subsystems about the signalling point status by invoking an N-PCSTATE indication primitive with "restricted importance level" and the new value of the restricted importance level.

5.3.7 Broadcast

5.3.7.1 General

The broadcast procedure provides a mechanism that may be used to inform concerned signalling points of any related SCCP/subsystem status change at local or adjacent signalling points. It is a procedure supplementary to that defined in 5.3.2.1.

The procedure to inform nodes that are not "concerned" of status change is described in 5.3.2.1 and 5.3.4.

5.3.7.2 Subsystem prohibited

A broadcast of SSP (*Subsystem-Prohibited*) messages is initiated when:

a) an SSP (*Subsystem-Prohibited*) message is received about a subsystem presently marked allowed (see 5.3.2.2), and the affected point code identified in the SSP (*Subsystem-Prohibited*) message is the same as that of the informer signalling point;

b) an N-STATE request primitive where "User-out-of-service" information is invoked by a subsystem marked allowed (see 5.3.2.2); or

c) a local subsystem failure is detected by SCCP management (see 5.3.2.2).

This broadcast permits SCCP management to inform all concerned signalling points, except the informer signalling point, about the subsystem status by SSP (*Subsystem-Prohibited*) messages. SCCP management does not broadcast if the point code of the prohibited subsystem is different from that of the informer signalling point which originates the SSP (*Subsystem-Prohibited*) message.

5.3.7.3 Subsystem allowed

A broadcast of SSA (*Subsystem-Allowed*) messages is initiated when:

a) an SSA (*Subsystem-Allowed*) message is received about a subsystem presently marked prohibited and not equal to one (SCMG) (see 5.3.3), and the affected point code identified in the SSA (*Subsystem-Allowed*) message is the same as that of the informer signalling point; or

b) an N-STATE request primitive where "User-in-service" information is invoked by a subsystem marked prohibited (see 5.3.3).

At the end of the SCCP restarting process, the restarting SCCP should broadcast an SSA (*Subsystem-Allowed*) message for SSN = 1 to all concerned nodes. The restarting SCCP should set the status to "allowed" for the SCCP and all subsystems of the remote signalling points that it considers available based on ~~MTP~~ layer management information at the node.

Broadcast of SSA (*Subsystem-Allowed*) messages permits SCCP management to inform all concerned signalling points, except the informer signalling point, about the subsystem status. SCCP management does not broadcast if the point code of the allowed subsystem is different from that of the informer signalling point which originates the SSA (*Subsystem-Allowed*) message.

5.4 Local SCCP restart

On a signalling point where SCCP restarts, an indication is given to the SCCP by layer management ~~the MTP~~ about the signalling points, which are accessible during the SCCP restart actions. The response method is used to determine the status of the SCCP and the SCCP subsystems in those signalling points, in the absence of subsystem prohibited messages.

At the end of the SCCP restart, the status of its own subsystems is not broadcast to concerned signalling points. In this case, the response method is used to inform other nodes attempting to access prohibited subsystems at the restarted signalling points.

At the completion of SCCP restart, the following actions shall have been taken:

1) SCOC Restart (see 3.8).
2) Freezing the Segmentation Local Reference of the segmentation process in SCLC.
3) Releasing all the resources, if any used for the reassembly process in SCLC.
4) Local broadcast (see 5.3.6.4) of "signalling point accessible" status about the accessible signalling points.
5) Local broadcast of "remote SCCP accessible" status about the accessible remote SCCP.
6) Reset of the availability statuses related to its local sub-systems as appropriate based on implementation-dependent reporting procedures.
7) Updating the translation tables taking into account of the accessibility of remote signalling points reported by the ~~ATP~~ layer management.
8) Marking as "allowed" the status of the SCCP and sub-systems at remote signalling points that are reported to be available.
9) Computing the traffic restriction parameters RL_M and RSL_M associated with remote signalling points that are reported to be available.
10) Broadcast of SSA messages for SSN = 1 for concerned signalling points. The local SCMG shall not broadcast the statuses of its local sub-systems.
11) Informing the local allowed concerned sub-systems of the sub-system now available.

On completion of the above procedures, the SCCP should be considered fully operational.

----------->>>>>>>

9.7 Annex C – State Transition Diagrams (STD) for the signalling connection control part of Signalling Systems No. 7

Annex C does not apply.

NOTE – This annex may still be consulted; however, the terminology should be adapted to the Generic Signalling Transport Service being used by this Recommendation. This concerns the names of the primitives being used, the non-visibility of OPC, DPC, etc. In addition, the ISUP embedded procedures are not supported.

9.8 Annex D – State Transition Diagrams (STD) for SCCP management control

Annex D does not apply.

NOTE –This annex may still be consulted; however, the terminology should be adapted to the Generic Signalling Transport Service being used by this Recommendation. This concerns the names of the primitives being used, the non-visibility of OPC, DPC, etc.

10 Exceptions to ITU-T Rec. Q.715

ITU-T Rec. Q.715 does not apply.

Appendix I

Aspects of the fully meshed Signalling Transport Network

I.1 GST supported by the Signalling Transport Converter on MTP and MTP3b

1) *MTP3*

The fully meshed signalling transport network is realized by the relay functionality of the MTP3 layer. The assured data transport is assured by the link-by-link MTP2 connection.

2) *MTP3b*

The fully meshed signalling transport network is realized by the relay functionality of the MTP3b layer. The assured data transport is assured by the link-by-link SSCOP connection (MTP3b).

I.2 GST supported by the Signalling Transport Converter on SSCOP and SSCOPMCE

1) *SSCOP*

The fully meshed signalling transport network is realized by n × n SSCOP connections. The assured data transport is assured by these end-to-end SSCOP connections.

These connections use the relay functionality of the underlying ATM transport network.

2) *SSCOPMCE*

The fully meshed signalling transport network is realized by n × n SSCOPMCE connections. The assured data transport is assured by these end-to-end SSCOPMCE connections.

These connections use the relay functionality of:

a) the underlying ATM transport network;

b) the underlying connectionless network.

I.3 GST supported by the Signalling Transport Converter on SCTP

The fully meshed signalling transport network is realized by n × n SCTP connections. The assured data transport is assured by these end-to-end SCTP connections.

These connections use the relay functionality of the underlying connectionless IP network.

Appendix II

Differences between the SCCP and TI-SCCP operating over ITU-T Rec. Q.2150.1

Observing that:

a) When transmitting a message, the definitions in TI-SCCP require the TI-SCCP entity to pass a message to be transmitted with a TRANSFER.request primitive (see 6.7) via a particular GST-SAP to a Signalling Transport Converter (STC) instance. The STC for MTP3 or MTP3b is configured with the OPC, DPC, SI, and NI to enable completion of the MTP3 type PDUs. In SCCP, the OPC, DPC, SI, and NI values are selected properly and passed to MTP3 via an MTP-TRANSFER.request primitive.

b) When receiving a message, the MTP3 selects a Signalling Transport Converter based on the OPC, DPC, SI, and NI values. The STC then passes the message with a TRANSFER.indication primitive via a particular GST-SAP to the TI-SCCP. This SAP identifies to the TI-SCCP the signalling relation to the TI-SCCP and, thus, identifies also the origin of the message. In SCCP, MTP3 passes the message with an MTP-TRANSFER.indication primitive to the SCCP entity.

In both cases, this amounts to the same operation where the particulars are not visible from outside the system, i.e., the operation of TI-SCCP and SCCP when transferring messages are identical.

On the management side, PAUSE.indication and RESUME.indication of SCCP are replaced by OUT-OF-SERVICE.indication and IN-SERVICE.indication in TI-SCCP. In TI-SCCP, congestion increase and decrease computations are performed in the STC where in SCCP this calculation takes place in the SCCP. Again, such a difference is not visible from outside the system, i.e., the operation of TI-SCCP and SCCP considering the status indications of the signalling relation are the same.

Considering the management of neighbouring SCCPs, the only detail needing attention is the User Part Unavailable (UPU) messages that, when received by the STC are discarded, layer management is informed about this. SCCPs receive this message and react by starting a subsystem test (SST). In TI-SCCP, such an SST can be initiated by system management (see 9.6, the exceptions to 5.3.4.2/Recommendation Q.714). Such differences are again not visible from outside the system.

In conclusion, the operation of SCCP over MTP3 or MTP3b are identical to the operations of TI-SCCP and the Signalling Transport Converter on MTP3 and MTP3b.

The only difference remaining is the specification that the "sequence control parameter" needs to be included in XUDT and LUDT TI-SCCP messages.

SERIES OF ITU-T RECOMMENDATIONS

Series A	Organization of the work of ITU-T
Series B	Means of expression: definitions, symbols, classification
Series C	General telecommunication statistics
Series D	General tariff principles
Series E	Overall network operation, telephone service, service operation and human factors
Series F	Non-telephone telecommunication services
Series G	Transmission systems and media, digital systems and networks
Series H	Audiovisual and multimedia systems
Series I	Integrated services digital network
Series J	Cable networks and transmission of television, sound programme and other multimedia signals
Series K	Protection against interference
Series L	Construction, installation and protection of cables and other elements of outside plant
Series M	TMN and network maintenance: international transmission systems, telephone circuits, telegraphy, facsimile and leased circuits
Series N	Maintenance: international sound programme and television transmission circuits
Series O	Specifications of measuring equipment
Series P	Telephone transmission quality, telephone installations, local line networks
Series Q	**Switching and signalling**
Series R	Telegraph transmission
Series S	Telegraph services terminal equipment
Series T	Terminals for telematic services
Series U	Telegraph switching
Series V	Data communication over the telephone network
Series X	Data networks and open system communications
Series Y	Global information infrastructure and Internet protocol aspects
Series Z	Languages and general software aspects for telecommunication systems

Geneva, 2004