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SERIES Q: SWITCHING AND SIGNALLING

Specifications of Signalling System No. 7 – Signalling
connection control part (SCCP)

Signalling connection control part user guide

ITU-T Recommendation Q.715

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
General	Q.700
Message transfer part (MTP)	Q.701–Q.709
Signalling connection control part (SCCP)	Q.711–Q.719
Telephone user part (TUP)	Q.720–Q.729
ISDN supplementary services	Q.730–Q.739
Data user part	Q.740–Q.749
Signalling System No. 7 management	Q.750–Q.759
ISDN user part	Q.760–Q.769
Transaction capabilities application part	Q.770–Q.779
Test specification	Q.780–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

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

ITU-T Recommendation Q.715

Signalling connection control part user guide

Summary

This Recommendation gives guidance to Administrations, specifiers of SCCP applications and implementors on a number of specific issues related to the incorporation of SCCP in actual networks. These guidelines aim to provide a common understanding and hence to enhance the interoperability between networks and implementations. The aim is to give guidance only, it is not intended to extend, change, nor restrict the normative clauses in ITU-T Recs. Q.711 to Q.714. The following topics are covered in this Recommendation:

- **Compatibility issues:** This Recommendation identifies changes between the different revisions of the SCCP Recommendations and discusses the effect on the interaction between implementations according to the different revisions. Where incompatibilities are unavoidable, engineering measures and evolution strategies are considered.
- **Addressing issues:** The meaning of the different addressing parameters and options is explained. A procedure is provided so that an application specifier can derive the needs and requirements on the addressing in the underlying SCCP layer.
- **Networking issues:** The possibilities of SCCP routing and management are explored to create particular network structures. Also networking issues pertaining to connectionless or connection oriented services are discussed. **Architecture and interworking issues related to broadband SCCP enhancements are also covered.**

Source

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Keywords

Addressing, congestion, routing, SCCP, Signalling System No. 7, user guide.

FOREWORD

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CONTENTS

Page

1	Scope	1
2	References.....	1
3	Definitions	2
3.1	Terms defined by this Recommendation.....	2
3.2	Terms defined in other Recommendations.....	3
4	Abbreviations.....	4
5	Conventions	5
6	Compatibility issues	5
6.1	Overview of differences between editions	5
6.1.1	Differences between <i>Red Book</i> and <i>Blue Book</i>	5
6.1.2	Differences between <i>Blue Book</i> and the <i>1993 edition</i>	7
6.1.3	Differences between the <i>1993 edition</i> and <i>1996 edition</i>	8
6.1.4	Differences between the <i>1996 edition</i> and <i>2001 edition</i>	10
6.2	Interworking problems	11
6.2.1	<i>Red Book</i> to <i>Blue Book</i> interworking	11
6.2.2	<i>Blue Book</i> to <i>1993 edition</i> interworking.....	14
6.2.3	<i>1993 edition</i> to <i>1996 edition</i> interworking.....	16
6.2.4	<i>1996 edition</i> to <i>2001 edition</i> interworking.....	21
6.3	Compatibility test and message change procedures	21
7	Use of addressing parameters	22
7.1	Description of addressing parameters in primitives	22
7.1.1	Subsystem numbers (3.4.2.2/Q.713)	23
7.1.2	The global title.....	24
7.1.3	Use of non-standardized TT and SSN in the international network.....	28
7.2	Procedure to derive SCCP-addressing requirements.....	29
7.3	Global title conversion operations.....	30
7.4	The generic numbering plan.....	31
7.4.1	Example	32
7.4.2	Considerations for introduction of the generic numbering plan.....	33
7.5	Considerations for the SCCP users on the inputs for global title	33
8	SCCP networking aspects.....	33
8.1	Network structures in view of SCCP management capabilities.....	33
8.1.1	Configurations of subsystems.....	34
8.1.2	Unambiguous addresses.....	37
8.1.3	Load distribution	38

	Page
8.1.4 Configurations of relay/gateway nodes	40
8.2 Application of connection-oriented services	40
8.2.1 Coupling of connection sections (clause 3/Q.714).....	40
8.3 Application of connectionless services	41
8.3.1 The return on error procedure (4.2/Q.714).....	41
8.3.2 Maximal length supported by SCCP connectionless procedures	44
8.4 Support of MTP-3b.....	45
8.4.1 Protocol architecture.....	45
8.4.2 Interworking	47
9 SCCP congestion handling	49
9.1 Assigning importance values to application messages.....	49
9.2 Responsibilities for the application	50
9.3 Application of MTP congestion procedures.....	51
9.4 Application of SCCP and node congestion procedures.....	51
9.5 Coordination of congestion control measures between SCCP and other MTP users.....	51
10 SCCP support for Number Portability	52

Introduction

This Recommendation gives guidance to Administrations, protocol specifiers and implementors on a number of issues related to the application of the SCCP protocol in actual networks.

Background

The SCCP Recommendations have gone through a number of revisions from the 1984 edition (*Red Book*), 1988 edition (*Blue Book*), 1993 edition, 1996 edition up to this edition (2002). During these revisions, incompatibilities were introduced that require extra attention both for the implementation as for the engineering of the networks. These compatibility issues prior to the 1996 edition were not described in the Recommendations.

During the revisions of the Recommendations, flexibility in the addressing mechanisms was introduced. Unfortunately, this flexibility leads to some lack of clarity: it is not clear how these mechanisms can be used in a standardized way to guarantee interworking or future extendibility. This has lead to different philosophies being applied in different regions of the world. This user guide does not intend to make any of these historic approaches obsolete, it merely tries to document what is sensible to do and what is not.

SCCP management is another area that is open for interpretation. In this user guide a number of possible network structures and their addressing-requirements are discussed. In practice, not all of these possibilities may be supported by particular implementations.

SCCP congestion was a topic that has long remained for further study. This user guide gives guidelines on how to use the SCCP congestion control measures, specified in the 1996 edition, and further guidelines on how to handle congestion occurring in CCS7 networks.

In order to support B-ISDN services via ATM links, the MTP was upgraded to provide for larger message sizes and higher signalling data rates. The SCCP was enhanced (1996 edition) in order to exploit those new capabilities of the "MTP-3b".

ITU-T Recommendation Q.715

Signalling connection control part user guide

1 Scope

This Recommendation belongs to a set of Recommendations specifying the SCCP protocol (ITU-T Recs. Q.711 [1], Q.712 [2], Q.713 [3], Q.714 [4] and Q.716 [5]). In addition to the protocol aspects in these Recommendations, this additional Recommendation gives guidance to Administrations, specifiers of SCCP-applications and implementors on a number of specific issues related to incorporating SCCP in actual networks. These guidelines aim to provide a common understanding and hence enhance interoperability between network and implementations. Specifically, the following areas are currently included:

- a) Compatibility issues: This Recommendation identifies changes between the several revisions to the SCCP Recommendations, discusses their effect on the cooperation between implementations of different versions and, where incompatibilities are unavoidable, identifies engineering measures and the need for evolutionary strategies to cope with the problems.
- b) Use of addressing parameters: This Recommendation discusses the meaning of the addressing parameters and options that have been introduced over the years. It provides a procedure that an application specifier can apply to derive the needs and requirements on the addressing mechanisms in the underlying SCCP layer.
- c) Network structures: This Recommendation explores the possibilities of SCCP routing and SCCP management procedures to create particular network structures. It discusses the network issues in case of the use of connection oriented services (e.g. coupling of connection sections) and connectionless services (e.g. the return on error procedure).
Interworking issues between (a part of) an MTP network providing the MTP-3b capabilities (Higher SDU-size and data rate, see ITU-T Rec. Q.2210 [16]) and one that does not are described.
- d) Congestion handling: Guidance is given to application specifiers/implementors on how to handle congestion situations reported from the underlying network layers and how to use the capabilities described in SCCP Recommendations.
- e) A brief statement regarding SCCP's ability to support Number Portability.

The aim of this Recommendation is to give guidance only, it is not intended to extend, change nor restrict the normative clauses in Recommendations protocol (ITU-T Recs. Q.711 [1], Q.712 [2], Q.713 [3], Q.714 [4] and Q.716 [5]). In case of conflict, the latter take precedence, e.g. normative aspects of compatibility are described in ITU-T Rec. Q.714.

2 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 editions of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

- [1] ITU-T Recommendation Q.711 (2001), *Functional description of 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.716 (1993), *Signalling System No. 7 – Signalling Connection Control Part (SCCP) performance*.
- [6] ITU-T Recommendation Q.775 (1997), *Guidelines for using transaction capabilities*.
- [7] ITU-T Recommendation Q.1400 (1993), *Architecture framework for the development of signalling and OA&M protocols using OSI concepts*.
- [8] ITU-T Recommendation X.650 (1996), *Information technology – Open Systems Interconnection – Basic Reference Model: Naming and addressing*.
- [9] ITU-T Recommendation X.200 (1994), *Information technology – Open Systems Interconnection – Basic Reference Model: The basic model*.
- [10] ITU-T Recommendation X.213 (2001), *Information technology – Open Systems Interconnection – Network service definition*.
- [11] ITU-T Recommendation Q.752 (1997), *Monitoring and measurements for Signalling System No. 7 networks*.
- [12] ITU-T Recommendation Q.708 (1999), *Assignment procedures for international signalling point codes*.
- [13] ITU-T Recommendation E.164 (1997), *The international public telecommunication numbering plan*.
- [14] ITU-T Recommendation Q.703 (1996), *Signalling link*.
- [15] ITU-T Recommendation Q.704 (1996), *Signalling network functions and messages*.
- [16] ITU-T Recommendation Q.2210 (1996), *Message transfer part level 3 functions and messages using the services of ITU-T Recommendation Q.2140*.
- [17] ITU-T Recommendation Q.1290 (1998), *Glossary of terms used in the definition of intelligent networks*.

3 Definitions

3.1 Terms defined by this Recommendation

3.1.1 solitary: A node/subsystem is called solitary for a certain portion of traffic, if it is the only node/subsystem capable of handling that traffic.

3.1.2 relay: A node that performs SCCP message transfer without any reference to an application.

3.1.3 replicated: A set of nodes/subsystems is called replicated (e.g. duplicated, triplicated, quadruplicated) for a certain portion of the traffic, if each member of the set is capable of handling that portion of the traffic.

3.1.4 primary: A node/subsystem is said to be the "primary" node/subsystem for a certain portion of traffic, if, in the absence of any failures or administrative blockings, it handles that portion of the traffic.

3.1.5 backup: A node/subsystem is said to be a "backup" node/subsystem for a certain portion of traffic, if, in the presence of failures or administrative blockings that prevents the "primary" from handling the traffic, it assumes the handling of that portion of traffic.

3.1.6 loadsharing: Loadsharing is a mechanism that makes sure that when several nodes/subsystems are capable of handling a certain portion of traffic, each of these nodes/subsystems gets a fair share of that traffic to handle, corresponding to its capacity for handling traffic.

3.1.7 active: A piece of equipment (e.g. a switch) is active when it is performing the functions for which it has been designed.

3.1.8 standby: A piece of equipment is standby when it is in a state where it is able to perform the functions for which it has been designed, but it is currently not used.

3.2 Terms defined in other Recommendations

- a) This Recommendation makes use of the following SCCP terms defined in ITU-T Rec. Q.712 [2]:
 - i) definition of SCCP messages (CR, CC, CREF, DT1, DT2, IT, EA, ED, UDT, RSR, RSC, AK, UDTS, RLSD, RLC, ERR, XU DT, XUDTS, SOG, SOR, SSP, SSA, SST, SSC, LUDT, LUDTS);
 - ii) definition of SCCP parameters.
- b) This Recommendation makes use of the following term defined in ITU-T Rec. Q.1400 [7]:
 - Subsystem number
- c) This Recommendation makes use of the following terms defined in ITU-T Rec. Q.713 [3] and 2.4/Q.714 [4]:
 - Global title indicator
 - Routing indicator
 - Encoding scheme
 - Translation type
 - Numbering plan
 - Odd/even indicator
- d) This Recommendation makes use of the following term defined in ITU-T Rec. X.650 [8]:
 - Unambiguous
- e) This Recommendation makes use of the following terms defined in ITU-T Rec. X.200:
 - Single association control function
 - Application entity
- f) This Recommendation makes use of the following terms defined in ITU-T Rec. Q.1290:
 - Service Switching Point (SSP)
 - Service Control Point (SCP)
 - Service subscriber

4 Abbreviations

This Recommendation uses the following abbreviations.

AC	Authentication Centre
AE	Application Entity
ASE	Application Service Element
ATM	Asynchronous Transfer Mode
DPC	Destination Point Code
EOP	End of Optional Parameters
ES	Encoding Scheme
FE	Functional Entity
GT	Global Title
GTI	Global Title Indicator
HLR	Home Location Register
IMSI	International Mobile Subscriber Identity
IN	Intelligent Network
ISDN	Integrated Services Digital Network
ISUP	ISDN User Part
ITCC	International Telecommunication Charge Card
LUDT	Long Unitdata Message
LUDTS	Long Unitdata Service Message
MAP	Mobile Application Part
MSC	Mobile Switching Centre
MTP-3b	Message Transfer Part, level 3 with broadband enhancements
NAI	Nature of Address Indicator
NP	Numbering Plan
NSDU	Network Service Data Unit
OMAP	Operation, Maintenance and Administration Part
OPC	Originating Point Code
OSI	Open System Interconnection
RI	Routing Indicator
RSC	Reset Confirm
RSC	Restart Confirm
RSR	Reset Request
RSR	Restart Request
SAAL	Signalling ATM Adaptation Layer
SACF	Single Association Control Function
SAP	Service Access Point

SCCP	Signalling Connection Control Part
SCMG	SCCP Management
SCP	Service Control Point
SDL	Specification and Description Language
SIB	Service Independent Building Block
SPC	Signalling Point Code
SSC	SCCP/Subsystem Congested
SSN	SubSystem Number
SSP	Service Switching Point
TC	Transaction Capabilities
TCAP	Transaction Capabilities Application Part
T-fr	Freeze Timer
TMN	Telecommunication Management Network
TT	Translation Type
VLR	Visitor Location Register

5 Conventions

This Recommendation was drafted according to the guidelines in ITU-T Rec. A.1500 (Appendix I/A.3).

6 Compatibility issues

Several changes were made to the SCCP Recommendations during the study period leading to the 2001 edition. The purpose of this clause is to record these changes, to mention any interworking problems that might arise and to suggest possible solutions to any such interworking problems. For completeness, the changes made during the study periods leading to the previous editions are also covered.

6.1 Overview of differences between editions

6.1.1 Differences between *Red Book* and *Blue Book*

6.1.1.1 Protocol class 4

Protocol class 4 was deleted, there having been no proposals for the procedures to differentiate it from protocol class 3. Therefore protocol class 4 can only have been implemented in either a network or implementation-specific way.

6.1.1.2 RSR and RSC messages

Two message types were deleted, the restart request and the restart confirm. The *Red Book* did not define their use, thus they can only be implemented in either a network or implementation specific way, although a *Red Book* node would not report them to SCCP management as undefined.

6.1.1.3 SSA, SSP, SST, SOR and SOG messages and management procedures

A functional block was added containing SCCP management procedures, and five message types were defined for SCCP management: subsystem allowed, subsystem prohibited, subsystem status test, subsystem out-of-service request and subsystem out-of-service grant.

6.1.1.4 SSC message

The subsystem congested message type, suggested for SCCP management was deleted. The *Red Book* did not define its use, thus it can only be specified in either a network or implementation specific way.

6.1.1.5 Diagnostic parameter

The diagnostic parameter was re-named as "return cause" for the connectionless protocol classes and was deleted from the connection oriented protocol classes.

6.1.1.6 Global title formats and global title indicator parameters

Three new global title formats were defined: GT-type 2, GT-type 3 and GT-type 4. In addition, the "GT-included" field was extended from one bit to four bits and re-named to "global title indicator" field to distinguish the different types of GT formats.

6.1.1.7 Routing indicator

A spare field in the address indicator field was defined as the routing indicator.

6.1.1.8 Translation type, encoding scheme and numbering plan indicator

These three new parameters were added. Their inclusion in an address depends on the GT-format type. The GT-type 1 introduced in the 1984 edition (*Red Book*) consisted only of the nature of the address field.

6.1.1.9 Release causes

Many release causes were re-named and new causes were allocated. The "unqualified" cause was reassigned from "0000 1001" to "0000 1111".

6.1.1.10 Reset causes, error causes and refusal causes

Reset, error and refusal causes were assigned for the first time.

6.1.1.11 Inactivity test

Some mandatory parameters were added to the inactivity test message and used to check for consistency of the connection data.

6.1.1.12 Restart procedure and T-guard timer

The restart procedure was defined for the connection oriented protocol classes. The restart procedure incorporates a new timer T-guard.

6.1.1.13 T-fr freeze timer

The timer for frozen connection references was replaced by an implementation-dependent mechanism.

6.1.1.14 Annex A/Q.713

Annex A was added to ITU-T Rec. Q.713, showing how the release, reset and error causes should be mapped onto the X.213 primitives.

6.1.1.15 SDLs corrected

The SDLs were changed to make them match the text of ITU-T Recs. Q.711 and Q.714.

6.1.2 Differences between *Blue Book* and the 1993 edition

6.1.2.1 XUDT and XUDTS messages

Two new messages were defined, known as "extended unitdata (XUDT)" and "extended unitdata service (XUDTS)". See 1.22/Q.712 and 1.23/Q.712. These two new message types carry two new parameter types, known as "hop counter" and "segmentation"; see 6.1.2.2, 6.1.2.3.

6.1.2.2 Hop counter

A new parameter was defined, known as the "hop counter", see 2.19/Q.712.

6.1.2.3 Segmentation

A new parameter was defined, known as "segmentation", see 2.20/Q.712. Procedures were specified for the segmenting and reassembly of connectionless protocol class messages, see 4.1.1/Q.714. Additional code points were assigned for return causes representing errors encountered during the reassembly process.

6.1.2.4 Timer values

A specific range of values was assigned to each of the timers defined in C.4/Q.714.

6.1.2.5 Subsystem number allocation

Subsystem numbers have been allocated to new applications. For example, Mobile Service Switching Centre (MSC), Visitor Location Register (VLR), see 3.4.2.2/Q.713.

6.1.2.6 Quality of service parameter

The quality of service parameter was clarified to be a "provider option" in the N-UNITDATA indication primitive and as a "user-option" in the N-UNITDATA request primitive. See 2.2.2.3.1/Q.711.

6.1.2.7 Connection oriented abnormal release procedures

Some modifications were made to the connection oriented procedures concerning release due to abnormal circumstances (e.g. routing failure).

6.1.2.8 Sequence control at relay nodes

The requirement to maintain the sequence of protocol class 1 messages with the same sequence control parameter value was made explicit. This is especially important for relay-nodes.

6.1.2.9 Guidelines for addressing

A set of guidelines was agreed for the use of the address information elements in the international network. See Annex E/Q.714, 1993 edition.

6.1.2.10 Routing procedures

The routing procedures were clarified and presented in a revised way to cover all possibilities, see 2.3/Q.714.

6.1.2.11 Restart procedures

Procedures were specified to cover SCCP restart and the SCCP handling of local MTP availability at the end of MTP-Restart, see 5.2.5/Q.714 and 5.4/Q.714. This includes the broadcast of "subsystem allowed" messages referring to SSN = 1 to all "concerned" nodes, see 5.3.7.3/Q.714.

6.1.2.12 Signalling node status management

The procedures for handling the MTP-RESUME indication primitive were modified which also incorporated the handling of an unavailable remote SCCP becoming available again.

6.1.2.13 Accessibility test of remote SCCP

The use of Subsystem Status Test (SST) and Subsystem Allowed (SSA) messages was extended to enable them to refer to SSN = 1, corresponding to the complete SCCP function at a node. See 5.3.4.2/Q.714 and 5.3.4.3/Q.714.

6.1.2.14 Release procedures

The release procedures were clarified. A new repeat-release timer was introduced. The "interval timer" is now only started after the time-out of the release timer, the repeat-release timer then takes over the process of repeating the RLSD message. This procedure is different from that indicated in the *Blue Book* SDLs.

6.1.2.15 SDL corrections

Some SDL corrections were undertaken.

6.1.3 Differences between the 1993 edition and 1996 edition

6.1.3.1 Message formatting

In the message formats, the possibility of leaving gaps between parameters was excluded. This was not explicitly stated in the past, so that implementations may exist that actually have gaps in messages.

The possibility that the block of optional parameters occurs before or between the mandatory variable parameters was explicitly stated, whereas this was not apparent from earlier versions of SCCP Recommendations.

6.1.3.2 Deletion of replacement mode

The replacement mode was left for further study in previous editions of the Recommendations. Since no user for the replacement was identified, it was deleted.

6.1.3.3 Introduction of congestion handling procedures

A new congestion handling procedure was introduced. This caused:

- changes to the N-CONNECT, N-DATA, N-DISCONNECT, N-UNITDATA req. and N-NOTICE primitives to introduce the importance parameter;
- changes to the N-PCSTATE ind. primitive to introduce the restricted importance level;
- the reinstatement of the SCCP management message SSC (removed from *Blue Book*, see 6.1.1.4);
- additional checks in the SCCP routing control.

6.1.3.4 Explicit inclusion of message compatibility rules

The application of the compatibility rules in ITU-T Rec. Q.1400 [7] to the particular case of SCCP were now explicitly covered in ITU-T Rec. Q.714.

6.1.3.5 Values of inactivity timers

The values of the inactivity send, inactivity receive and guard timers, left as provisional values in the 1993 edition, were specified.

6.1.3.6 Inactivity control procedure

The inactivity control procedure was made mandatory on all connection sections. The "option" to leave connection supervision to the SCCP-user itself was found not to be feasible.

6.1.3.7 Calling party address treatment

The treatment of the calling party address in relay nodes (with and without coupling) was clarified. As a result, the option to have no coupling of connection sections in a relay node is no longer marked for further study.

Modifications of calling party addresses were now allowed.

6.1.3.8 Screening

Screening of calling party addresses was introduced as an optional procedure. The aim being to prevent illegal messages from entering a network through a gateway.

6.1.3.9 Loadsharing

The text describing the different modes of operation of SCCP management was clarified. It now explicitly identifies methods of loadsharing over SCCP nodes (based on the SLS value in case of protocol class 1).

6.1.3.10 Routing failures

The description of routing failures was clarified. The "hop counter violation" was added as an extra routing failure. Further, the refusal causes were brought in line with the return causes, by the addition of several new refusal causes. The refusal, release and return cause "not-obtainable" was deleted.

6.1.3.11 Assignment of TT values

TT values (different from zero), applicable to the international interface, were for the first time standardized.

These values were standardized for use with GTI = 4 (see Annex B/Q.713). The same values may have a different meaning if used with another GTI.

6.1.3.12 New values for NP, TT, SSN

A number of new values for NP (private numbering plan, ITU-T Rec. E.118; generic numbering plan), TT (ISDN end-to-end supplementary services, ITCC), and SSN (ISDN-supplementary services, broadband ISDN edge-to-edge services and the TC-test responder) have standardized. The use of the different combinations of NP, TT and SSN was described in a new Annex B/Q.713 (also replacing Annex E/Q.714, *1993 edition*).

6.1.3.13 New generic numbering plan

A "generic numbering plan" was introduced to unambiguously identify a SCCP node or user entity.

6.1.3.14 Changes to the SDLs

The SDLs were aligned with the texts of the *1993 edition* and extended with new procedures for congestion control and support of broadband signalling.

6.1.3.15 Deletion of receipt confirmation service

The receipt confirmation service, which was always left for further study, was deleted. This caused the deletion of the receipt confirmation service selection parameter, N-DATA ACKNOWLEDGE primitive and confirmation request parameter.

6.1.3.16 Handling of ERR messages

The handling of the ERR message in states other than the data transfer state of a connection is specified in Tables B.2/Q.714 and B.3/Q.714.

6.1.3.17 Clarification of address formats

It was agreed that:

- a) Bit 8 of the address indicator must always be set to 0 in the international network.
- b) In octet 3 of the address format for GTI = 4, bit 8 will always be set to 0.

6.1.3.18 Omission of subsystem multiplicity indicator

The subsystem multiplicity indicator in the subsystem management messages was marked as a national option. Within the international network, it shall always be set to zero.

6.1.3.19 Support of MTP-3b capabilities

To support signalling for B-ISDN, an extension of the MTP level 3 (called "MTP-3b", see ITU-T Rec. Q.2210 [16]) has been defined that allows the transportation of higher capacity signalling messages via SAAL links, with potentially higher data rates than MTP level 2 according to ITU-T Rec. Q.703. To exploit these new capabilities of MTP-3b within SCCP, two new message types were defined (LUDT and LUDTS) that allow the transportation of up to 3968 octets of user data without invoking the segmentation procedures.

6.1.3.20 Removal of maintenance information

All instances, where in previous version "maintenance information" was issued, were removed. In the SDLs they were replaced by "inform OMAP". All these instances are now handled by first and interval measurements defined in ITU-T Rec. Q.752.

6.1.3.21 Message changes

Changes between different message types (for LUDT, LUDTS, XUDT, XUDTS, UDT, UDS) were allowed (see 4.1.2/Q.714). Such changes may be needed:

- if a network supporting broadband SCCP additions is interworked with a network not supporting them;
- to allow a priority level carried in the SIO (national option for congestion control) to be transported in the importance parameter;
- if a network operator has some interest in adding certain parameters (e.g. hop counter).

In some cases, parameters may be added without message type changes.

6.1.3.22 Model of the global title translation process

A model for the global title translation process was introduced in ITU-T Rec. Q.714.

6.1.4 Differences between the 1996 edition and 2001 edition

6.1.4.1 New translator selectors

Translator selectors (TT, NP and NAI combination) with their corresponding address format for international roaming were specified in Annex B/Q.713.

6.1.4.2 Additional application for existing translator selectors

INAP is added as application which might use the address formats B.4.3/Q.713 and B.4.4/Q.713 in both calling – and called party address.

6.1.4.3 MTP/SCCP restart

Clarifications for MTP/SCCP restart are made (5.2.5, 5.2.6 and 5.4/Q.714).

6.1.4.4 Non-standardized SSN transport in the international network

Code points for SSNs which are bilaterally agreed between the end SCCP user entities are allowed to be transported in the international network (Annex B/Q.713 and 2.7.2/Q.714).

6.1.4.5 Additional message change

An additional, optional, message change is added to 4.1.2/Q.714 : UDT(S)↔LUDT(S).

6.1.4.6 OSI alignment

Opportunity was taken to align some of the text in ITU-T Recs. Q.711 and Q.714 with OSI terminology.

6.1.4.7 IT procedures

An ERR message must be sent in reply to a received IT message with unassigned destination local reference.

6.1.4.8 SCCP parameter values

Some of the SCCP parameter value ranges were agreed to be "reserved for national use", with the highest value marked as "reserved" instead of "spare".

These parameters are:

- NAI;
- Release cause;
- Reset cause;
- Error cause;
- Refusal cause.

6.1.4.9 SCCP GT translation function

Text in 2.1, item 1)/Q.714 is changed, the possibility to access an external database during GT translation has been clarified.

6.2 Interworking problems

A number of changes have been introduced into the SCCP Recommendations throughout the different study periods. The major changes have been identified in 6.1 above. Although in many cases there will be no interworking problems, some instances have been identified where problems will arise. This subclause gives guidance on the appropriate action that should be taken in the SCCP to overcome such interworking problems.

6.2.1 Red Book to Blue Book interworking

There were fifteen areas where changes from the *Red Book* to the *Blue Book* might have introduced interworking problems:

- i) Protocol class 4 was deleted;
- ii) the restart request and the restart confirm message types were deleted;
- iii) the five message types for SCCP management were defined and SCCP management procedures introduced;
- iv) the subsystem congested message was deleted;
- v) the diagnostic parameter was renamed as "return cause" for the connectionless protocol classes and was no longer applicable to the connection-oriented protocol classes;
- vi) three new GT formats were specified: GT-type 2, GT-type 3 and GT-type 4 and the "GT Indicator" field was changed;