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SERIES Q: SWITCHING AND SIGNALLING

Specifications of Signalling System No. 7 – Signalling connection control part

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Definition and function of signalling connection control part messages

ITU-T Recommendation Q.712

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION Q.712

DEFINITION AND FUNCTION OF SIGNALLING CONNECTION CONTROL PART MESSAGES

Summary

The Signalling Connection Control Part (SCCP) messages are used by the peer-to-peer protocol. All messages are uniquely identified by means of a message type code, which is to be found in all the messages. The meaning and definition of the various parameter fields contained in these messages are specified in clause 2. The actual inclusion of these parameter fields in a given message depends on the class of protocol and is specified in clause 3.

Source

ITU-T Recommendation Q.712 was revised by ITU-T Study Group 11 (1993-1996) and was approved under the WTSC Resolution No. 1 procedure on the 9th of July 1996.

FOREWORD

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The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 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.

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As of the date of approval of this Recommendation, the ITU had/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.

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Recommendation Q.712

DEFINITION AND FUNCTION OF SIGNALLING CONNECTION CONTROL PART MESSAGES

(revised in 1996)

1 Signalling connection control part messages

The Signalling Connection Control Part (SCCP) messages are used by the peer-to-peer protocol. All messages are uniquely identified by means of a message type code, which is to be found in all the messages. The meaning and definition of the various parameter fields contained in these messages are specified in clause 2. The actual inclusion of these parameter fields in a given message depends on the class of protocol and is specified in clause 3.

1.1 connection confirm (CC): A *Connection Confirm* message is initiated by the called SCCP to indicate to the calling SCCP that it has performed the setup of the signalling connection. On reception of a *Connection Confirm* message, the calling SCCP completes the setup of the signalling connection, if possible.

It is used during connection establishment phase by connection-oriented protocol class 2 or 3.

1.2 connection request (CR): A *Connection Request* message is initiated by a calling SCCP to a called SCCP to request the setting up of a signalling connection between the two entities. The required characteristics of the signalling connection are carried in various parameter fields. On reception of a *Connection Request* message, the called SCCP initiates the setup of the signalling connection, if possible.

It is used during connection establishment phase by connection-oriented protocol class 2 or 3.

1.3 connection refused (CREF): A *Connection Refused* message is initiated by the called SCCP or an intermediate node SCCP to indicate to the calling SCCP that the setup of the signalling connection has been refused.

It is used during connection establishment phase by connection-oriented protocol class 2 or 3.

1.4 data acknowledgement (AK): A *Data Acknowledgement* message is used to control the window flow control mechanism, which has been selected for the data transfer phase.

It is used during the data transfer phase in protocol class 3.

1.5 data form 1 (DT1): A *Data Form 1* message is sent by either end of a signalling connection to pass transparently SCCP user data between two SCCP nodes.

It is used during the data transfer phase in protocol class 2 only.

1.6 data form 2 (DT2): A *Data Form 2* message is sent by either end of a signalling connection to pass transparently SCCP user data between two SCCP nodes and to acknowledge messages flowing in the other direction.

It is used during the data transfer phase in protocol class 3 only.

1.7 expedited data (ED): An *Expedited Data* message functions as a *Data Form 2* message but includes the ability to bypass the flow control mechanism which has been selected for the data transfer phase. It may be sent by either end of the signalling connection.

It is used during the data transfer phase in protocol class 3 only.

1.8 expedited data acknowledgement (EA): An *Expedited Data Acknowledgement* message is used to acknowledge an *Expedited Data* message. Every ED message has to be acknowledged by an EA message before another ED message may be sent.

It is used during the data transfer phase in protocol class 3 only.

1.9 inactivity test (IT): An *Inactivity Test* message may be sent periodically by either end of a signalling connection section to check if this signalling connection is active at both ends, and to audit the consistency of connection data at both ends.

It is used in protocol classes 2 and 3.

1.10 protocol data unit error (ERR): A *Protocol Data Unit Error* message is sent on detection of any protocol errors.

It is used during the data transfer phase in protocol classes 2 and 3.

1.11 released (RLSD): A *Released* message is sent, in the forward or backward direction, to indicate that the sending SCCP wants to release a signalling connection and the associated resources at the sending SCCP have been brought into the disconnect pending condition. It also indicates that the receiving node should release the connection and any other associated resources as well.

It is used during connection release phase in protocol classes 2 and 3.

1.12 release complete (RLC): A *Release Complete* message is sent in response to the *Released* message indicating that the *Released* message has been received, and the appropriate procedures have been completed.

It is used during connection release phase in protocol classes 2 and 3.

1.13 reset confirm (RSC): A *Reset Confirm* message is sent in response to a *Reset Request* message to indicate that *Reset Request* has been received and the appropriate procedure has been completed.

It is used during the data transfer phase in protocol class 3.

1.14 reset request (RSR): A *Reset Request* message is sent to indicate that the sending SCCP wants to initiate a reset procedure (re-initialization of sequence numbers) with the receiving SCCP.

It is used during the data transfer phase in protocol class 3.

1.15 subsystem-allowed (SSA): A *Subsystem-Allowed* message is sent to concerned destinations to inform those destinations that a subsystem which was formerly prohibited is now allowed or that a SCCP which was formerly unavailable is now available.

It is used for SCCP management.

1.16 subsystem-out-of-service-grant (SOG): *A Subsystem-Out-of-Service-Grant* message is sent, in response to a *Subsystem-Out-of-Service-Request* message, to the requesting SCCP if both the requested SCCP and the backup of the affected subsystem agree to the request.

It is used for SCCP subsystem management.

1.17 subsystem-out-of-service-request (SOR): A *Subsystem-Out-of-Service-Request* message is used to allow subsystems to go out-of-service without degrading performance of the network. When a subsystem wishes to go out-of-service, the request is transferred by means of a Subsystem-Out-of-Service-Request message between the SCCP at the subsystem's node and the SCCP at the duplicate subsystems, node.

It is used for SCCP subsystem management.

1.18 subsystem-prohibited (SSP): A *Subsystem-Prohibited* message is sent to concerned destinations to inform SCCP Management (SCMG) at those destinations of the failure of a subsystem.

It is used for SCCP subsystem management.

1.19 subsystem-status-test (SST): A *Subsystem-Status-Test* message is sent to verify the status of a subsystem marked prohibited or the status of an SCCP marked unavailable.

It is used for SCCP management.

1.20 unitdata (UDT): A *Unitdata* message can be used by an SCCP wanting to send data in a connectionless mode.

It is used in connectionless protocol classes 0 and 1.

1.21 unitdata service (UDTS): A *Unitdata Service* message is used to indicate to the originating SCCP that a UDT sent cannot be delivered to its destination. Exceptionally and subject to protocol interworking considerations, a UDTS might equally be used in response to an XUDT or LUDT message. A UDTS message is sent only when the option field in that UDT is set to "return on error".

It is used in connectionless protocol classes 0 and 1.

1.22 extended unitdata (XUDT): An *Extended Unitdata* message is used by the SCCP wanting to send data (along with optional parameters) in a connectionless mode.

It is used in connectionless protocol classes 0 and 1.

1.23 extended unitdata service (XUDTS): An *Extended Unitdata Service* message is used to indicate to the originating SCCP that an XUDT cannot be delivered to its destination. Exceptionally and subject to protocol interworking considerations, an XUDTS might equally be used in response to a UDT or LUDT message. An XUDTS message is sent only when the return message on error option in the XUDT (or possibly LUDT) is set.

It is used in connectionless protocol classes 0 and 1.

1.24 subsystem congested (SSC): A *Subsystem Congested* message is sent by an SCCP node when it experiences congestion.

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 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.

1.26 long unitdata service (LUDTS): A *Long Unitdata Service* message is used to indicate to the originating SCCP that an LUDT cannot be delivered to its destination. An LUDTS message is sent only when the return message on error option in the LUDT is set.

It is used in connectionless protocol classes 0 and 1.

2 SCCP message parameters

2.1 affected point code: The "affected point code" identifies a signalling point where the affected subsystem or SCCP is located.

2.2 affected subsystem number: The "affected subsystem number" parameter field identifies the SCCP or a subsystem which is failed, withdrawn, congested or allowed. In the case of SST messages, it also identifies the subsystem being audited. In the case of SOR or SOG messages, it

identifies a subsystem requesting to go out-of-service. The SSN for SCMG is used to denote the SCCP as a whole in the SSA, SSC and SST messages.

2.3 calling/called party address: The "calling/called party address" parameter field, together with additional information given by the MTP, contains enough information to uniquely identify the origination/destination signalling point and/or the SCCP service access point.

It can be any combination of a global title (dialled digits, for example), a signalling point code, and a subsystem number. The subsystem number (SSN) identifies an SCCP user when provided.

In order to allow the interpretation of this address, it begins with an address indicator indicating which information elements are present. The address indicator also includes a routing indicator specifying if translation is required, and a global title indicator specifying global title format.

The "calling/called party address" parameter field has two different meanings depending on whether it is included in a connection-oriented or connectionless message.

For a connection-oriented message, the significance of these fields is related to the direction of the connection set-up (i.e. independent of the direction the message is going).

For a connectionless message, the significance of these fields is dependent on the direction the message is going (just as for OPC and DPC).

2.4 credit: The "credit" parameter field is used in the acknowledgements to indicate to the sender how many messages it may send, i.e. window size. It is also used in the CR and CC message to indicate the proposed and selected credit, and in the IT message to audit the consistency of this connection data at both ends of a connection section.

2.5 data: The "data" parameter field contains information coming from upper layers or from SCCP management.

In connectionless and connection-oriented messages the "data" parameter field contains information coming from upper layers.

Information coming from SCCP management can be contained in the "data" parameter field of a UDT or XUDT message. In this case the "data" parameter field of the UDT/XUDT message will only contain the SCCP management message.

2.6 diagnostic: The "diagnostic" parameter field has been deleted.

2.7 error cause: The "error cause" parameter field is used in the *Protocol Data Unit Error* message in order to indicate what is the exact protocol error.

2.8 end of optional parameters: The "end of optional parameters" parameter field is used in any message containing optional parameters to indicate where the part allocated to these optional parameters ends.

2.9 local reference number (source/destination): The "local reference number (source/destination)" parameter field uniquely identifies a signalling connection in a node. It is an internal working number chosen by each node independently from the destination node. At least one local reference number is to be found in any message exchanged on a signalling connection section.

NOTE – Remote reference number is used to reflect the local reference number at the remote end of a connection section.

2.10 protocol class: For connection-oriented protocol classes, the "protocol class" parameter field is used during the connection establishment phase; it is negotiated between the two end SCCP. It is also used during data transfer phase to audit the consistency of this connection data at both ends of a connection section.

For connectionless protocol classes, the "protocol class" parameter field is used to indicate whether or not a message should be returned on error occurrence, and to indicate whether or not in-sequence delivery of message is required.

2.11 receive sequence number: The "receive sequence number" parameter field P(R) is used in the data acknowledgement message to indicate the lower edge of the receiving window.

It also indicates that at least all messages numbered up to and including P(R) – 1 are accepted.

2.12 refusal cause: The "refusal cause" parameter field is used in a *Connection Refused* message to indicate the reason why the connection set-up request was refused.

2.13 release cause: The "release cause" parameter field is used in a *Released* message to indicate the reason of the connection release.

2.14 reset cause: The "reset cause" parameter field is used in a *Reset Request* message to indicate the reason why a reset procedure is invoked.

2.15 return cause: For connectionless protocol classes, the "return cause" parameter field is used to indicate the reason why a message was returned.

2.16 segmenting/reassembling: The "segmenting/reassembling" parameter field is used in the data message for the segmenting and reassembling function. It is the more data indicator (M-bit). This is used only in connection-oriented messages.

It is set to one in a data message to indicate that more data will follow in a subsequent message.

It is set to zero in a data message to indicate that the data in this message forms the end of a complete data sequence.

2.17 sequencing/segmenting: The "sequencing/segmenting" parameter field contains the information necessary for the following functions: sequence numbering, flow control, segmenting and reassembling.

2.18 subsystem multiplicity indicator: The "subsystem multiplicity indicator" is used in SCCP management messages to indicate the number of associated replicated subsystems. This parameter is reserved for national use.

2.19 hop counter: The "hop counter" parameter field is used in the CR, XUDT, XUDTS, LUDT and LUDTS messages to detect excessively long routes at the SCCP layer.

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. The parameter also contains all the information necessary to allow the correct reassembly of the message.

2.21 importance: The "importance" parameter is an optional parameter transported in CR, CC, RLSD, CREF, LUDT, LUDTS, XUDT and XUDTS messages. It gives SCCP the ability to restrict messages based on their importance.

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.

2.23 long data: The "long data" parameter is a "data" parameter with a two octet length indicator. It allows sending of up to 3952 octets in a single LUDT or LUDTS message when MTP-3b capabilities are present.

The information coming from SCCP management can be contained in the "long data" parameter field of an LUDT message. In this case, the "long data" parameter of the LUDT message will only contain the SCCP management message.

3 Inclusion of fields in the messages

The inclusion of the message parameters specified in clause 2 in the various messages specified in clause 1 according to their type depends on the protocol class. SCCP messages are specified in Table 1 and SCCP management messages are specified in Table 2. All SCCP management messages are embedded in the "data" parameter of the *Unitdata* message or *Extended Unitdata* message or the "long data" parameter of the *Long Unitdata* message.

The following applies to Tables 1 and 2:

m mandatory field;

o optional field (which is included in a message when needed).

Table 1/Q.712 – Inclusion of parameters in messages

Messages / Parameter field	CR	CC	CREF	RLSD	RLC	DT1	DT2	AK	ED	EA	RSR	RSC	ERR	IT	UDT	UDTS	XUDT	XUDTS	LUDT	LUDTS
Destination local reference number		m	m	m	m	m	m	m	m	m	m	m	m	m						
Source local reference number	m	m		m	m						m	m		m						
Called party address	m	o	o												m	m	m	m	m	m
Calling party address	o														m	m	m	m	m	m
Protocol class	m	m												m	m		m		m	
Segmenting/ reassembling						m														
Receive sequence number								m												
Sequencing/segmenting							m							m[a)]						
Credit	o	o						m						m[a)]						
Release cause				m																
Return cause																m		m		m
Reset cause											m									
Error cause													m							
User data	o	o	o	o		m	m		m						m	m	m	m		
Refusal cause			m																	
End of optional parameters	o	o	o	o													o	o	o	o
Hop counter	o																m	m	m	m
Segmentation																	o	o	o[b)]	o
Importance	o	o	o	o													o	o	o	o
Long data																			m	m

[a)] Information in these parameter fields are ignored if the protocol class parameter indicates class 2.

[b)] The segmentation parameter must be included by the originating node, if MTP/MTP-3b interworking is expected.

Table 2/Q.712 –B SCCP management messages

Parameter fields \ Messages	SSA	SSP	SST	SOR	SOG	SSC
SCMG format ID	m	m	m	m	m	m
Affected SSN[a)]	m	m	m	m	m	m
Affected PC	m	m	m	m	m	m
Subsystem multiplicity indicator[b)]	m	m	m	m	m	m
Congestion level						m

a) The affected SSN is equal to one if the message pertains to the SCCP itself or to the SCCP node.

b) Reserved for national use.

4 References

The following 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; all 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.

4.1 Normative references

– CCITT *Blue Book*, Fascicle VI.7 (1988), *Glossary of terms used in Signalling System No. 7*.

– ITU-T Recommendation Q.701 (1993*), Functional description of the Message Transfer Part (MTP) of Signalling System No. 7.*

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

– ITU-T Recommendation Q.711 (1996), *Functional description of the signalling connection control part*.

– ITU-T Recommendation Q.713 (1996), *Signalling connection control part formats and codes*.

– ITU-T Recommendation Q.714 (1996), *Signalling connection control part procedures.*

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

– ITU-T Recommendation X.210 (1993), *Information technology – Open Systems Interconnection – Basic Reference Model: Conventions for the definition of OSI services.*

4.2 Informative references

– ITU-T Recommendation Q.700 (1993), *Introduction to CCITT Signalling System No. 7*.

– ITU-T Recommendation Q.706 (1993), *Message transfer part signalling performance*.

– ITU-T Recommendation Q.715 (1996), *Signalling connection control part user guide*.

– ITU-T Recommendation Q.716 (1996), *Signalling connection control part (SCCP) performance*.

– ITU-T Recommendation Q.1400 (1995), *Architecture framework for the development of signalling and OA&M protocols using OSI concepts.*

– ITU-T Recommendation Q.2110 (1994), *B-ISDN ATM adaptation layer – Service Specific Connection Oriented Protocol (SSCOP).*

– ITU-T Recommendation Q.2140 (1995*), B-ISDN signalling ATM adaptation layer – Service specific coordination function for signalling at the network node interface (SSCF at NNI).*

– ITU-T Recommendation X.200 (1994), *Information technology – Open Systems Interconnection – Basic reference model: The basic model.*

– ITU-T Recommendation X.213 (1995), *Information technology – Open Systems Interconnection – Network service definition.*

NOTE – Further study is required to see which new parts of SCCP can use this Recommendation normatively.

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