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DIGITAL SUBSCRIBER SIGNALLING SYSTEM No. 1 (DSS 1)

DIGITAL SUBSCRIBER SIGNALLING SYSTEM No. 1 (DSS 1) – ISDN USER-NETWORK INTERFACE PROTOCOL PROFILE FOR MANAGEMENT

ITU-T Recommendation Q.941

(Previously "CCITT Recommendation")

FOREWORD

The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the International Telecommunication Union. The 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 Conference (WTSC), which meets every four years, established the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

ITU-T Recommendation Q.941 was revised by the ITU-T Study Group XI (1988-1993) and was approved by the WTSC (Helsinki, March 1-12, 1993).

NOTES

1 As a consequence of a reform process within the International Telecommunication Union (ITU), the CCITT ceased to exist as of 28 February 1993. In its place, the ITU Telecommunication Standardization Sector (ITU-T) was created as of 1 March 1993. Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.

In order not to delay publication of this Recommendation, no change has been made in the text to references containing the acronyms "CCITT, CCIR or IFRB" or their associated entities such as Plenary Assembly, Secretariat, etc. Future editions of this Recommendation will contain the proper terminology related to the new ITU structure.

2 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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DIGITAL SUBSCRIBER SIGNALLING SYSTEM No. 1 (DSS 1) – ISDN USER-NETWORK INTERFACE PROTOCOL PROFILE FOR MANAGEMENT

(Melbourne, 1988; modified at Helsinki, 1993)

1 General

This Recommendation is one of a series of Recommendations describing the model, protocol profile and the communications capabilities in support of management and maintenance functions to be provided at the ISDN user-network interface.

This Recommendation describes the protocol profile employed in providing management information transfer capabilities at the ISDN user-network interface. The overall management architecture, communications paths and service requirements are specified in Recommendation Q.940 [1]. These protocols can be used on the D-channel of both the basic and primary rate interface structures and across both reference points S and T, and are based on the DSS 1 messages. Because these messages are transferred between a network node and the directly connected users, these protocols only have local significance at the user-network interface. If management information transfer is end-to-end between a user and a remote OS, mapping in the network node has to be provided.

Other Recommendations in this series specify the procedures and protocol associated with specific management functions that are provided at the ISDN user-network interface.

The protocols and procedures described in these Recommendations provide the means to support management functions at the ISDN user-network interface. In particular, these management functions "provided by the ISDN user-network interface" should "enable the network node or network user" to support the activities of the Telecommunications Management Network (TMN) and support specific requirements such as those expressed in the I.600-Series [2] Recommendations (Subscriber access and installation maintenance). These protocols make the local control of these management functions possible, e.g. the control of loopbacks and diagnostic tests, the initiation and termination of event reports, etc.

NOTE – The means by which file transfer capability is to be provided on the ISDN primary rate access is for further study.

1.1 Scope

This Recommendation specifies the application protocol and the use of the layer 1-3 protocols at the ISDN user-network interface in providing management capabilities. The protocols defined in this Recommendation are suitable for management interactions involving transaction type information exchanges.

NOTE – The means of providing file transfer capabilities at the local access is for further study.

Specifically, this Recommendation defines the following:

a) the layer services for layers 1-3 and the application layer;

b) the protocols for layers 1-3 and the application layer;

c) the convergence function required to allow the application layer to interface directly with layer 3; and

d) the conformance requirements to be met by a system claiming to implement the management protocol profile for the ISDN user-network interface.

This Recommendation does not:

a) define the structure or meaning of the management information that is transmitted by means of these protocols;

b) specify the manner in which management is accomplished as a result of the protocol exchanges;

c) define the nature of any interactions which result in the use of the application layer protocol; and

d) define the nature of any implementation intended to provide the ISDN management function.

1.2 Abbreviations and symbols

1.2.1 Abbreviations

ACSE	Association Control Service Element
ASN.1	Abstract Syntax Notation One
CMISE	Common Management Information Service Element
CMIP	Common Management Information Protocol
ROSE	Remote Operation Service Element
SMASE	System Management Application Service Element

1.3 Terms

To be provided.

2 ISDN user-network management profile: overview

The ISDN user-network management profile is based on CCITT ISDN Recommendations for the D-channel layers 1-3 protocols and on ISO standards and CCITT Recommendations for the management application layer. To allow the management application layer to access the network layer interface a convergence function has been defined. The architecture of the resulting profile is shown in Figure 1. The ISDN user-network interface management protocols make use of the D-channel.

3 Physical layer profile

The ISDN user-network management protocol utilizes the D-channel of either the primary or basic rate interface.

3.1 Basic rate physical layer

Management information is transmitted on the 16 kbit D-channel of the basic rate interface.

The service and protocol definition for the physical layer shall apply as defined in Recommendation I.430 [3].

The default values of all parameters shall be the values specified in Recommendation I.430.

The interface connector shall comply with ISO 8877 [4].

3.2 Primary rate physical layer

Management information is transmitted on the 64 kbit D-channel of the primary rate interface.

The service and protocol definition for the physical layer shall apply as defined in Recommendation I.431.

The default values of all parameters shall be the values specified in Recommendation I.431 [5].

The interface connector and interface wiring shall comply with 6/I.431 and 7/I.431, respectively.

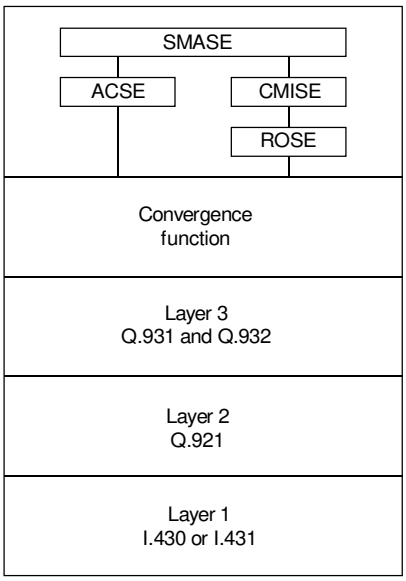

FIGURE 1/Q.941

ISDN user-network interface management profile

4 Data link layer profile

Local management information shall be transmitted on the D-channel and shall use the same SAPI as for call control procedures, i.e. SAPI 0.

The data link layer service and protocol definition shall apply as defined in Recommendation Q.921.

Default values for all parameters shall be as specified in 5.9/Q.921 [6].

5 Network layer profile

The network layer service and protocol definition shall be in accordance with Recommendations Q.931 [7] and Q.932 [8].

Default values for layer 3 parameters shall apply as defined in Table 9/Q.931.

In addition to Q.931 messages, to support the management profile the ISDN access shall also support the following Q.932 messages:

- FACILITY,
- REGISTER.

In addition the ISDN access shall also support the extended facility information element specified in Recommendation Q.932, in these Q.931 and Q.932 messages as specified in those Recommendations.

The extended facility information element may carry information with a length longer than 255 octets in its PDU field. Management services which utilize layer 3 messages with a length exceeding N201 (defined in Recommendation Q.921) shall support Annex H/Q.931, Message segmentation procedures. The default maximum number of message segments supported by Annex H/Q.931 is eight. Thus the maximum length of the application protocol data unit (APDU) which may be carried by an extended facility information element is approximately 2000 octets[1)].

5.1 Use of the extended facility information element

The extended facility information element is used to convey application protocol data units (APDUs). To indicate that a management service has been invoked the protocol profile is used with the following encoding:

Protocol profile

Bits	5	4	3	2	1	
	1	0	0	1	0	for CMIP Protocol
	1	0	0	1	1	for ACSE Protocol

5.2 Call independent management procedures

For management procedures invoked independent of an active call, once a data link connection has been established, the user or the network start the establishment of a signalling connection (and management association) by transferring a REGISTER message across the user-network interface. The signalling connection (and management association) is identified by the call reference allocated with the REGISTER message. The REGISTER message shall contain an extended facility information element which will carry the information for requesting to establish the management association.

Management service requests are conveyed in the extended facility information elements in the FACILITY messages.

The signalling connection (and management association) is released by means of a RELEASE COMPLETE message. The RELEASE COMPLETE message shall contain an extended facility information element which will carry the information for orderly release of the management association.

If the protocol profile in the extended facility information element indicates “CMIP Protocol” or “ACSE Protocol” then the information in the extended facility information element is passed to the management entity for further processing.

NOTE – The term “management entity” as used here refers to the convergence function and protocol entities that process management information.

If an extended facility information element contains more than one PDU, these PDUs are treated as separate PDUs and no assumption can be made about the order in which they will be processed.

5.3 Call associated management procedures

When management information is exchanged in association with an existing call the management information may be carried in any Q.931 or Q.932 message that contains an extended facility information element.

NOTE – Further study is required to determine the actions to be taken when either the call control process attempts to release the connection or when the management application process attempts to release the connection (e.g. due to attempted security violations or errors in the extended facility information element).

6 Convergence function

The convergence function is required to support the mapping service.

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1) The exact length is determined by N201 × 8 – layer 3 headers.

6.1 Mapping

The mapping service is required to map the P-DATA, P-CONNECT, P-RELEASE and P-U-ABORT services onto appropriate network services and Q.931/Q.932 messages.

6.1.1 Mapping of the P-DATA service

P-DATA-requests issued by the management entity shall have their user data mapped into the PDU field of the extended facility information element of a message. The protocol profile shall be set to the value indicating CMIP Protocol.

PDU received by the convergence function shall be mapped into the user data field of a P-DATA-indication.

6.1.2 Mapping of the P-CONNECT service

P-CONNECT-requests issued by the management entity shall be mapped onto the REGISTER message. Only the user data parameter of the P-CONNECT-request is required. If any other parameters are present, they shall be ignored. For information on when the P-CONNECT-request is used see 7.1.3.

The first response received shall be mapped onto the P-CONNECT-confirmation. Only the user data parameter of the P-CONNECT-confirmation is required. If any other parameters are present, they shall be ignored. A RELEASE COMPLETE message shall result in a negative indication and contain a negative AARE APDU in its user data field. A FACILITY message shall result in a positive confirmation containing a positive AARE APDU in its user data field.

The protocol profile in the extended facility information element shall be set to the value indicating ACSE Protocol.

6.1.3 Mapping of the P-RELEASE service

P-RELEASE-requests issued by the management entity shall be mapped onto a FACILITY message. For information on when the P-RELEASE-request is used see 7.1.3.

A RELEASE COMPLETE message received by the convergence function shall be mapped onto a P-RELEASE-confirmation with a RLRE APDU in the user data.

The protocol profile in the extended facility information element shall be set to the value indicating ACSE Protocol.

6.1.4 Mapping of the P-U-ABORT service

P-U-ABORT-requests issued by the management entity shall be mapped onto a RELEASE COMPLETE message. A RELEASE COMPLETE message received by the convergence function shall be mapped onto a P-U-ABORT-indication with an ABRT APDU in the user data.

The protocol profile in the extended facility information element shall be set to the value indicating ACSE Protocol.

7 Application layer

The application layer provides transaction type management across the ISDN user-network interface. To provide this capability the following application service elements are used:

ACSE Association Control Service Element

CMISE Common Management Information Service Element

ROSE Remote Operation Service Element

7.1 Association control

Version 1 of the ACSE protocol shall be used. For ISDN local management, the Q.931 call reference value is used to identify the Q.931 connection and the management association, if any. Since the management association is identified, the following optional parameters in AARQ and AARE shall not be used: calling and called AP-titles, calling and called AP-invocations, calling and called AE-qualifiers, and calling and called AE-invocations: and responding AP-title, responding AP-invocation, responding AE-qualifier, and responding AE-invocation.

7.1.1 Association control service

Association control services used shall comply with Recommendation X.217 [9]. All the A-ASSOCIATE parameters in Table 2/X.217 with a value of P with respect to request, indication, response and confirmation columns are not required in A-ASSOCIATE service primitives. If present, they shall be ignored.

7.1.2 Association control service protocol

The association control protocol shall comply with Recommendation X.227 [10].

7.1.3 Use of Associations

To establish a new non-call associated management association, the A-ASSOCIATE-request is used. The request uses the P-CONNECT-request in the presentation layer. The association is established when the positive A-ASSOCIATE-confirmation is received. The confirmation uses the P-CONNECT-confirmation in the presentation layer.

To exchange call associated management information on an existing connection, the A-ASSOCIATE-request shall not be used. Instead the appropriate CMISE operation shall be invoked. The SMISE services use the P-DATA in the presentation layer.

When management information is exchanged in conjunction with Q.931 call establishment, the A-ASSOCIATE-request shall not be used. Instead the appropriate operation shall be conveyed in an extended facility information element contained in a SETUP message.

To release a management association, the A-RELEASE-request is used if the association was established via an exchange of the A-ASSOCIATE-request and A-ASSOCIATE-confirmation. The A-RELEASE-request makes use of the P-RELEASE-request. The management association is orderly released when a positive A-RELEASE-confirmation is received. For a call associated management association, the management association will be cleared when the call reference is released.

7.2 Remote operations

7.2.1 Remote operations service

The remote operations service element shall comply with Recommendation X.219 [11] with the exception that the BIND and UNBIND operations are not used in this profile. Operation Classes 2 and 5 shall be supported. Alternatively, Operation Class 1 may be supported instead of Operation Class 2.

7.2.2 Remote operations protocol

The remote operations protocol shall comply with Recommendation X.229 [12]. In addition support of the correct origination and reception of the linked-id protocol element is required.

ROSE association class 3 shall be supported.

7.3 Common management information service

7.3.1 Common management service

For this interface a simplified subset of the CMIP protocol is used. The availability of the CMIP functional units cannot be negotiated when this profile is used and shall be statically supported as follows:

1) the support of multiple object selection and filter functional units by the network for the requests from the user is mandatory for both the basic and primary rate interfaces;

2) the support of multiple object selection and filter functional units by the user for the requests from the network is mandatory for the primary rate interface and optional for the basic rate interface;

3) the support of a multiple reply functional unit by both the network and the user for both the basic and primary rate interfaces is mandatory; and

4) the cancel-get and extended service functional units shall not be used for this profile.

The common management information service shall comply with Recommendation X.710 [13].

7.3.2 Common management protocol

The common management information protocol shall comply with Recommendation X.711 [14]. Version 2 of CMIP shall be used.

7.3.3 Object naming

The Local Distinguished Name (LDN) shall be used.

7.4 System management application service element (SMASE)

The SMASE provides services in support of specific management functions. The details are for further study.

7.5 Syntax and encoding

The application layer protocol data units is described by using ASN.1 as defined in Recommendation X.208 [15] and is encoded in accordance with the Basic Encoding Rules for ASN.1 as defined in Recommendation X.209 [16].

The procedures for encoding/decoding the EXTERNAL type shall comply with 34.5/X.208. For encoding/decoding the two ASN.1 types: CMIPUserInfo and CMIPAbortInfo, the following object identifier value is assigned. An ASN.1 object identifier value

{ ccitt(0) recommendation(0) q(17) q941(941) abstractSyntax(0) }

is assigned in this Recommendation which is the combination of

{ joint-iso-ccittms(9)cmip(1)abstractSyntax(4) }

as the abstract syntax and the Basic Encoding Rules as the transfer syntax.

The maximum value of an ASN.1 basic encoding tag shall be limited to 16,383.

8 Conformance

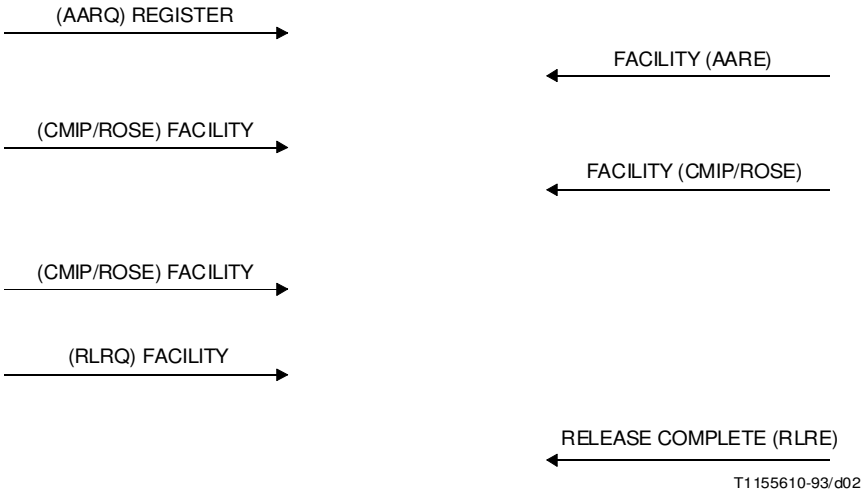
For further study.

Annex A

Example of APDU mapping to Q.931/Q.932 messages

(This annex forms an integral part of this Recommendation)

An example is given below to illustrate the mapping of the APDUs to the Q.931/Q.932 messages in a time sequence for a call independent management association.



References

[1] CCITT Recommendation Q.940 *ISDN User-Network Interface Protocol for Management – General Aspects*.

[2] CCITT Recommendations I.600 Series *ISDN – Inter network Interfaces and Maintenance Principles*.

[3] CCITT Recommendation 1.430 *Basic User-Network Interface – Layer 1 Specification*.

[4] ISO 8877 Interface Connector and Contact Assignments for ISDN Basic Interface Located at Reference Points S and T.

[5] CCITT Recommendation I.431 *Primary Rate User-Network Interface – Layer 1 Specification*.

[6] CCITT Recommendation Q.921 *ISDN User-Network Interface-Data Link Layer Specification*.

[7] CCITT Recommendation Q.931 *ISDN User-Network Interface Layer 3 Specification for Basic Call Control*.

[8] CCITT Recommendation Q.932 *Generic Procedures for the Control of ISDN Supplementary Services*.

[9] CCITT Recommendation X.217 *Open Systems Interconnection – Service Definition for Association Control Service Elements* (see also ISO 8649).

[10] CCITT Recommendation X.227 *Open Systems Interconnection – Protocol Specification for Association Control Service Element* (see also ISO 8650).

[11] CCITT Recommendation X.219 *Remote Operations: Model, Notation, and Service Definition*.

[12] CCITT Recommendation X.229 *Remote Operations: Protocol Specification*.

[13] CCITT Recommendation X.710 *Common Management Information Service Definition* (see also ISO 9595).

[14] CCITT Recommendation X.711 *Common Management Information Protocol [Part 1:] Specification* (see also ISO 9596-1).

[15] CCITT Recommendation X.208 *Specification of Abstract Syntax Notation One (ASN.1)* (see also ISO 8824).

[16] CCITT Recommendation X.209 *Specification of Basic Encoding Rules for Abstract Syntax Notation One (ASN.1)* (see also ISO 8825).