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SERIES Q: SWITCHING AND SIGNALLING

Specifications of Signalling System No. 7 – Q3 interface

Upper layer protocol profiles for the Q3 and X interfaces

ITU-T Recommendation Q.812

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION Q.812

UPPER LAYER PROTOCOL PROFILES FOR THE Q3 AND X INTERFACES

Summary

This Recommendation provides the upper layer (5-7) protocol profiles for the Q3 and X interfaces as defined in the M.3000-Series of Recommendations

Source

ITU-T Recommendation Q.812 was revised by ITU-T Study Group 11 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on the 5th of June 1997.

Keywords

ACSE, ASN.1, CMISE, FTAM, Protocol Profiles, Q3 Interface, TMN, X Interface.

FOREWORD

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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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UPPER LAYER PROTOCOL PROFILES FOR THE Q3 AND X INTERFACES

(revised in 1997)

1 Introduction

1.1 Scope

This Recommendation defines the characteristics of protocol profiles for the Q3 and X interfaces, as defined in the M.3000-Series of Recommendations. The interface will support bidirectional data transfer for the management of telecommunications systems.

The need for security functionality is recognized, but is not fully addressed in this Recommendation and is for further study. Users may need to use mechanisms outside this Recommendation in order to address their specific security needs. Security mechanisms chosen may depend on the network configuration being used.

This Recommendation defines:

– the layer services profiles;

– the layer protocols profiles;

– the application service and protocols profiles;

– the conformance requirements to be met by an implementation of this interface.

This Recommendation does not define:

– the structure or meaning of the management information that is transmitted by means of the protocol suite;

– the manner in which management is accomplished as a result of the application protocol exchanges;

– the interactions which result in the use of the application layer protocols.

The profiles in this Recommendation align with equivalent ISPs.

1.2 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, all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendation and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

[1] ISO/IEC/TR 10000-1:1995, *Information technology – Framework and taxonomy of International Standardized Profiles – Part 1: General principles and documentation framework.*

[2] ITU-T Recommendation X.200 (1994) | ISO/IEC 7498-1:1994, *Information technology – Open Systems Interconnection – Basic reference model: The basic model.*

[3] ITU-T Recommendation M.3010 (1996), *Principles for a telecommunications management network.*

[4] ISO/IEC 8073:1997, *Information technology – Open Systems Interconnection – Protocol for providing the connection-mode transport service.*

[5] ITU-T Recommendation X.225 (1995) | ISO/IEC 8327-1:1996, and Amd.1 (1997), *Information technology – Open Systems Interconnection – Connection-oriented session protocol: Protocol specification.*

[6] ISO/IEC ISP 11183-1:1992, *Information technology – International Standardized Profiles AOM1n OSI Management – Management Communications – Part 1: Specification of ACSE, presentation and session protocols for the use by ROSE and CMISE.*

[7] ITU-T Recommendation X.216 (1994) | ISO/IEC 8822:1994, *Presentation service definition.*

[8] ITU-T Recommendation X.226 (1994) | ISO/IEC 8823-1:1994, *Information technology – Open Systems Interconnection – Connection-oriented presentation protocol: Protocol specification.*

[9] CCITT Recommendation X.209 (1988), *Specification of basic encoding rules for Abstract Syntax Notation One (ASN.1).*

ISO/IEC 8825:1990, *Information technology – Open Systems Interconnection – Specification of basic encoding rules for Abstract Syntax Notation One (ASN.1).*

[10] ITU-T Recommendation X.680 (1994) | ISO/IEC 8824-1:1995, *Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation.*

[11] ITU-T Recommendation X.681 (1994) | ISO/IEC 8824-2:1995, *Information technology – Abstract Syntax Notation One (ASN.1): Information object specification.*

[12] ITU-T Recommendation X.682 (1994) | ISO/IEC 8824-3:1995, *Information technology – Abstract Syntax Notation One (ASN.1): Constraint specification.*

[13] ITU-T Recommendation X.683 (1994) | ISO/IEC 8824-4:1995, *Information technology – Abstract Syntax Notation One (ASN.1): Parametrization of ASN.1 specifications.*

[14] CCITT Recommendation X.208 (1988) | ISO/IEC 8824:1990, *Specification of Abstract Syntax Notation One (ASN.1).*

[15] ISO/IEC 9545:1994, *Information technology – Open Systems Interconnection – Application Layer structure.*

[16] ITU-T Recommendation X.217 (1995) | ISO/IEC 8649:1996, *Information technology – Open Systems Interconnection – Service definition for the association control service element.*

[17] ITU-T Recommendation X.227 (1995) | ISO/IEC 8650-1:1996, *Information technology – Open Systems Interconnection – Connection-oriented protocol for the association control service element: Protocol specification.*

[18] CCITT Recommendation X.219 (1988), *Remote operations: Model, notation and service definition.*

ISO/IEC 9072-1:1989, *Information processing systems – Text communication – Remote operations – Part 1: Model, notation and service definition.*

[19] CCITT Recommendation X.229 (1988), *Remote operations: Protocol specification.*

ISO/IEC 9072-2:1989, *Information processing systems – Text communication – Remote operations – Part 2: Protocol specification.*

[20] CCITT Recommendation X.710 (1991), *Common management information service definition for CCITT applications*.

ISO/IEC 9595:1991, *Information technology – Open Systems Interconnection – Common management information service definition*.

[21] CCITT Recommendation X.711 (1991), *Common management information protocol specification for CCITT applications*.

ISO/IEC 9596-1:1991, *Information technology – Open Systems Interconnection – Common management information protocol – Part 1: Specification*.

[22] ISO/IEC ISP 11183-3:1992, *Information technology – International Standardized Profiles AOM1n OSI management – Management Communications – Part 3: CMISE/ROSE for AOM11 – Basic Management Communications.*

[23] ISO/IEC ISP 11183-2:1992, *Information technology – International Standardized Profiles AOM1n OSI management – Management Communications – Part 2: CMISE/ROSE for AOM12 – Enhanced Management Communications.*

[24] ISO/IEC ISP 10607-1:1995, *Information technology – International Standardized Profiles AFTnn – File Transfer, Access and Management – Part 1: Specification of ACSE, Presentation and Session protocols for the use of FTAM*.

[25] ISO 8571-1:1988, *Information processing systems – Open Systems Interconnection – File Transfer, Access and Management – Part 1: General Introduction.*

[26] ISO 8571-2:1988, *Information processing systems – Open Systems Interconnection – File Transfer, Access and Management – Part 2: Virtual Filestore Definition*.

[27] ISO 8571-3:1988, *Information processing systems – Open Systems Interconnection – File Transfer, Access and Management – Part 3: File Service Definition.*

[28] ISO 8571-4:1988, *Information processing systems – Open Systems Interconnection – File Transfer, Access and Management – Part 4: File Protocol Specification.*

[29] ITU-T Recommendation X.500 (1997) | ISO/IEC 9594-1:1997, *Information technology – Open Systems Interconnection – The Directory: Overview of concepts, models and services.*

[30] ITU-T Recommendation X.501 (1997) | ISO/IEC 9594-2:1997, *Information technology – Open Systems Interconnection – The Directory: Models.*

[31] ITU-T Recommendation X.511 (1997) | ISO/IEC 9594-3:1997, *Information technology – Open Systems Interconnection – The Directory: Abstract service definition.*

[32] ITU-T Recommendation X.518 (1997) | ISO/IEC 9594-4:1997, *Information technology – Open Systems Interconnection – The Directory: Procedures for distributed operation.*

[33] ITU-T Recommendation X.519 (1997) | ISO/IEC 9594-5:1997, *Information Technology – Open Systems Interconnection – The Directory: Protocol specifications.*

[34] ITU-T Recommendation X.520 (1997) | ISO/IEC 9594-6:1997, *Information technology – Open Systems Interconnection – The Directory: Selected attribute types.*

[35] ITU-T Recommendation X.521 (1997) | ISO/IEC 9594-7:1997, *Information technology – Open Systems Interconnection – The Directory: Selected object classes.*

[36] ITU-T Recommendation X.509 (1997) | ISO/IEC 9594-8:1997, *Information technology – Open Systems Interconnection – The Directory: Authentication framework.*

[37] ITU-T Recommendation X.880 (1994) | ISO/IEC 13712-1:1995, *Information technology – Remote Operations: Concepts, model and notation.*

[38] ITU-T Recommendation X.881 (1994) | ISO/IEC 13712-2:1995, *Information technology – Remote Operations: OSI realizations – Remote Operations Service Element (ROSE) service definition*.

[39] ITU-T Recommendation X.830 (1995), *Information technology – Open Systems Interconnection – Generic upper layers security: Overview, models and notation.*

[40] ISO/IEC ISP 10607-3:1995, *Information technology – International Standardized Profiles AFTnn – File Transfer, Access and Management – Part 3: AFT11 – Simple File Transfer Service (unstructured).*

[41] ITU-T Recommendation X.214 (1995) | ISO/IEC 8072:1996, *Information technology – Open Systems Interconnection – Transport service definition*.

[42] ITU-T Recommendation X.882 (1994) | ISO/IEC 13712-3:1995, *Information technology – Remote Operations: OSI realizations – Remote Operations Service Element (ROSE) protocol specification.*

[43] CCITT Recommendation X.800 (1991), *Security architecture for Open Systems Interconnection for CCITT applications*.

[44] ITU-T Recommendation X.803 (1994), *Information technology – Open Systems Interconnection – Upper layers security model*.

[45] ITU-T Recommendation Q.811 (1997), *Lower layer protocol profiles for the Q3 and X interfaces*.

1.3 Abbreviations

This Recommendation uses the following abbreviations.

ACSE Association Control Service Element

AE Application Entity

APDU Application Protocol Data Unit

ASE Application Service Element

ASN.1 Abstract Syntax Notation One

ASO Application Service Object

CCITT International Telegraph and Telephone Consultative Committee

CF Control Function

CMIP Common Management Information Protocol

CMISE Common Management Information Service Element

DAP Directory Access Protocol

DCN Data Communication Network

DSA Directory System Agent

DUA Directory User Agent

EDI Electronic Data Interchange

FTAM File Transfer, Access and Management

GULS Generic Upper Layer Security

IEC International Electrotechnical Commission

ISO International Organization for Standardization

ISP International Standardized Profile

ITU International Telecommunication Union

ITU-T International Telecommunication Union – Telecommunication Standardization Sector

NBS National Bureau of Standards

NE Network Element

OS Operations System

OSI Open Systems Interconnection

PDU Protocol Data Unit

ROS Remote Operations Service

ROSE Remote Operations Service Element

SACF Single Association Control Function

SMASE Systems Management Application Service Element

SPDU Session Protcol Data Unit

TMN Telecommunications Management Network

1.4 Terms

1.4.1 international standardized profile (ISP): An internationally agreed-to, harmonized document which identifies a standard or group of standards, together with options and parameters, necessary to accomplish a function or a set of functions [1].

2 Upper layer protocol specifications

2.1 Introduction

The communication services and protocols referred to in this Recommendation are in accordance with the Open Systems Interconnection (OSI) Reference Model [2].

The protocols for the different layers are based on ITU-T Recommendations and/or ISO Standards.

Three types of protocol profiles are defined in this Recommendation:

– upper layer protocol profile for Interactive Class services;

– upper layer protocol profile for File-oriented Class services;

– upper layer protocol specification for Directory services.

The three protocol profiles can be applied to applications using DCN, as defined by Recommendation M.3010 [3].

Interface Q3 is defined to intend to connect Mediation Devices to Operations Systems (OSs), Q Adapters to OSs, NEs to OSs, and OSs to OSs via a DCN. The X Interface is defined to connect the TMNs of two Administrations.

Other ASEs will be added in the identified protocol profiles as new requirements develop.

2.2 Upper layer protocol specification for Interactive Class services

Figure 1 illustrates the protocol stack of the upper layer protocol profile for Interactive Class services. The profile for TMN function sets corresponding to the SMASE for Interactive Class of services may be specified as part of Recommendations defining the information models and services.

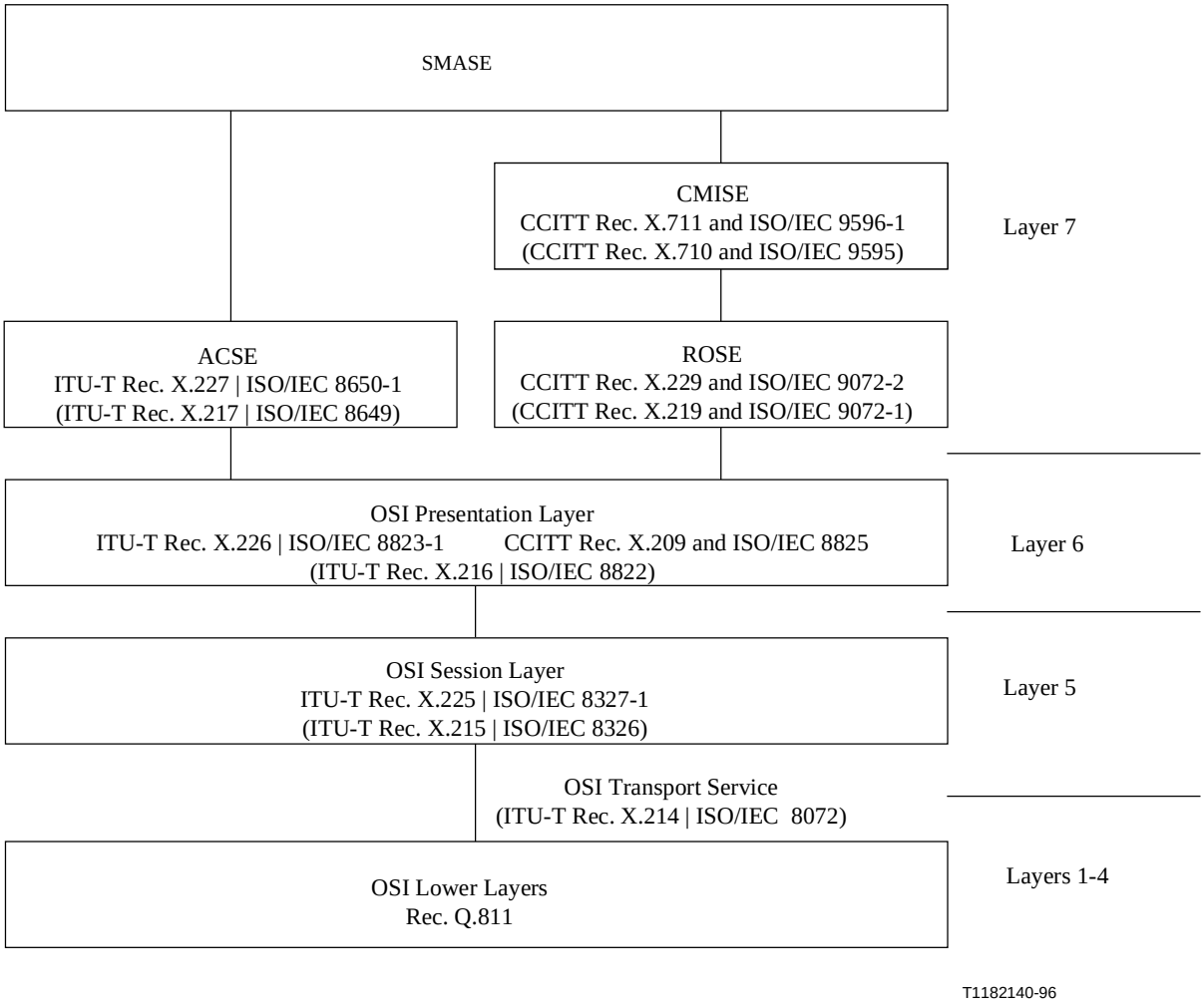

Figure 1/Q.812 – Protocol stack of the upper layer protocol profile for Interactive Class services

2.3 Upper layer protocol specification for File-oriented Class services

Figure 2 illustrates the protocol stack of the upper layer protocol profile for File-oriented Class services.

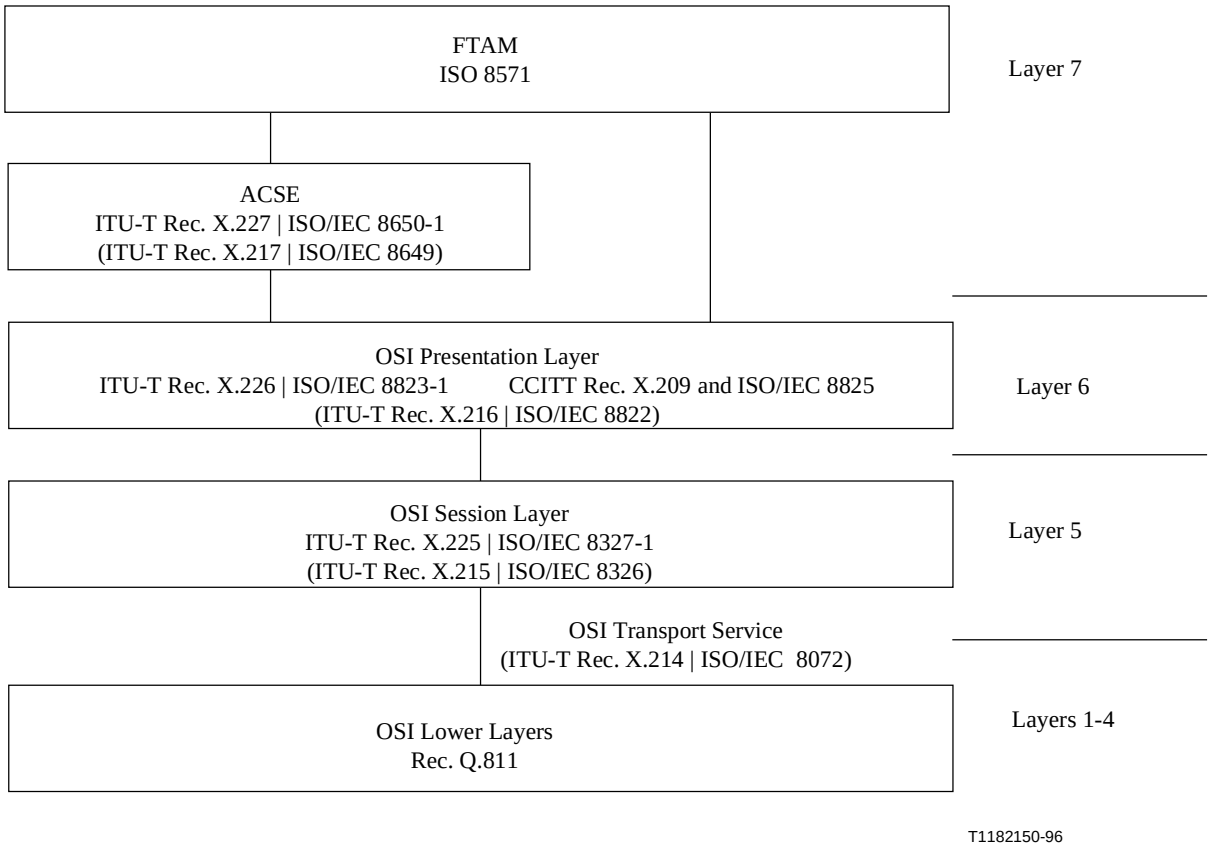

Figure 2/Q.812 – Protocol stack of the upper layer protocol profile for File-oriented Class services

2.4 Upper layer protocol specification for Directory services

Figure 3 illustrates the protocol stack of the upper layer protocol profile for Directory services.

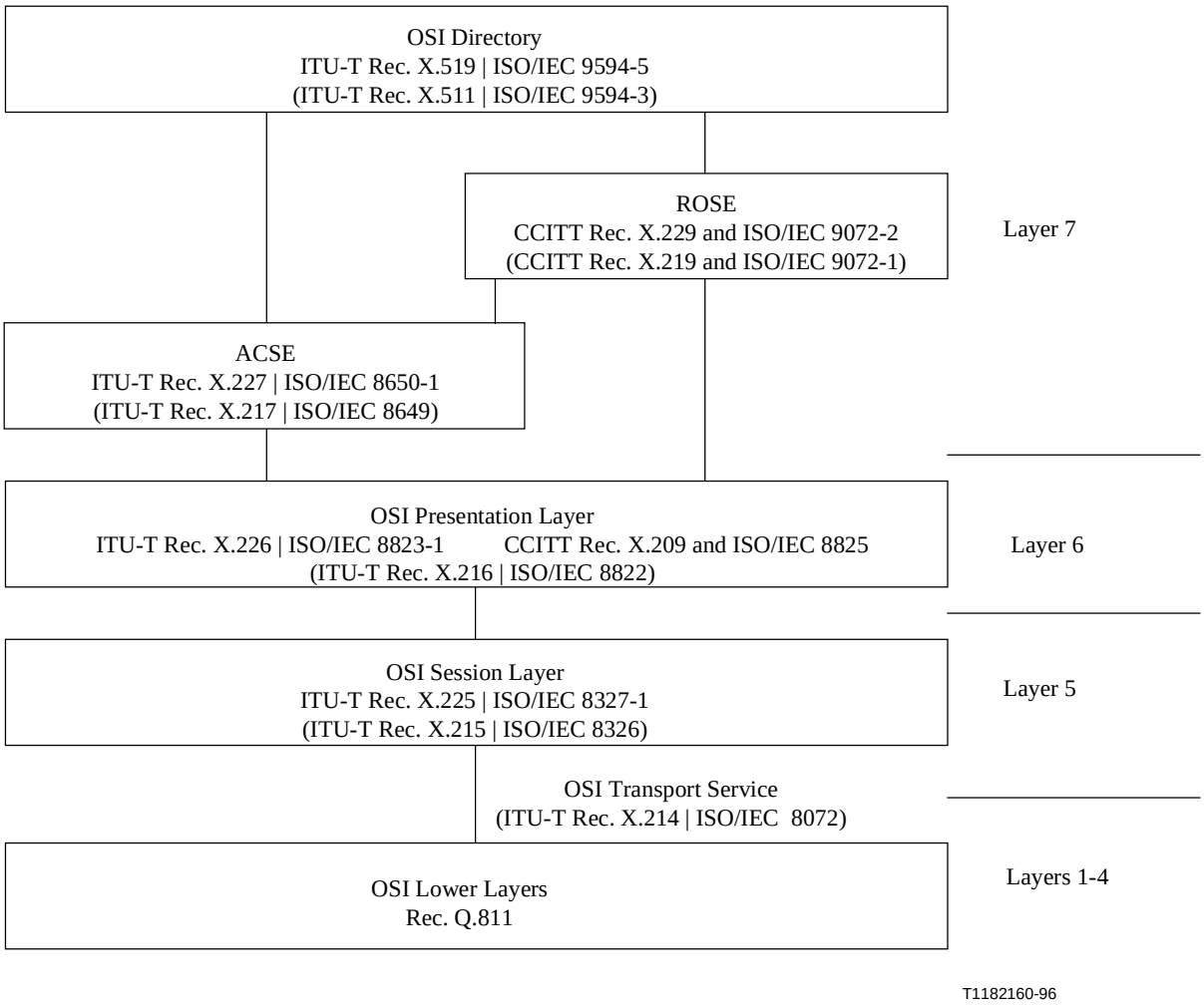

Figure 3/Q.812 – Protocol stack of the upper layer protocol profile for Directory services

2.5 Upper layer protocol specification for store and forward services

The upper layer protocols to be used for store and forward services (e.g. for exchange of EDI formatted information) is for further study.

3 Upper layer protocol specification for Interactive Class services

3.1 Session layer

3.1.1 Service definition

The session layer conforms to the service definition in ITU-T Rec. X.215 | ISO/IEC 8326.

The default values shall be part of a vendor's offering. That is, unless otherwise specified by the user, the default parameters shall be the initial values supplied. They can be subsequently changed by the user within the specified range.

A conflict in the code values for subsequent number and flow control confirmation exists between ISO and ITU-T. The conflict is expected to be resolved as specified in ISO/IEC 8073 [4].

3.1.1.1 Functional units

Two session layer Functional Units (FUs) are required in this Recommendation:

1) Kernel;

2) Duplex.

3.1.2 Protocol specification

The session layer conforms to the protocol definition in ITU-T Rec. X.225 | ISO/IEC 8327-1 [5]. The specific options and parameter values that shall be supported for Telecommunications Systems Management application are specified in ISO/IEC ISP 11183-1 [6].

3.1.2.1 User data

The maximum length of the session user data shall be 10 240 octets. This restriction implies that the Overflow Accept and Connect Data Overflow SPDUs are not required to be supported. "Session-selector"parameter values shall have a maximum length of 16 octets.

3.2 Presentation layer

3.2.1 Service definition

It is mandatory that the presentation layer conform to the services specified in ITU-T Rec. X.216 | ISO/IEC 8822 [7].

3.2.1.1 Functional units

One presentation layer Functional Unit (FU) is required in this Recommendation:

– Kernel.

3.2.2 Protocol specification

It is mandatory that the presentation layer conform to the protocols specified in ITU-T Rec. X.226 | ISO/IEC 8823-1 [8] (normal mode). The specific options and parameter values that shall be supported for Telecommunications system Management application are specified in ISO/IEC ISP 11183-1 [6].

3.2.3 Encoding rules for transfer syntax

The encoding rules defined in CCITT Rec. X.209 and ISO/IEC 8825 [9] shall be applied to derive the transfer syntax for the Application Protocol Data Units (APDUs). The ASN.1 [10] to [13] OBJECT IDENTIFIER [joint-iso-itu-t asn1 (1) basic-encoding (1)] shall be used as the value for the transfer syntax name. The maximum value of an ASN.1 basic encoding tag that needs to be handled for conformance to this Recommendation is 16 383. This is the largest unsigned integer that can be represented in 14 bits. Hence the identifier octets shall consist of an initial octet and up to two more octets, thus occupying a maximum of three octets. Also, the largest number of octets in the "contents octets" component of an ASN.1 data value encoding that needs to be handled for conformance to this Recommendation is 4,294,967,295. This is the largest unsigned integer that can be represented in 32 bits. Hence in the "long form" encoding, the length octets shall consist of an initial octet and up to four more octets, thus occupying a maximum of five octets. (Note that this restriction does not apply to "indefinite length" encodings.)

3.3 Application layer

The application layer protocol data unit presentation is described by using Abstract Syntax Notation One (ASN.1), as defined in CCITT Rec. X.208 | ISO/IEC 8824 [14].

3.3.1 Application layer architecture

It is mandatory that the application layer conforms to the architecture for the application layer outlined in ISO/IEC 9545 [15].

The concepts of Application Entity (AE), Application Entity Invocation, Application Service Object (ASO), Control Function (CF) and Application Context will be used to describe the relationship between ROSE, ACSE, CMISE, SMASE.

3.3.2 Association control service element

3.3.2.1 Service definition

The ACSE service description is detailed in ITU-T Rec. X.217 | ISO/IEC 8649 [16]. All of the defined ACSE services (see Table 1) are mandatory. The value of mode parameter of A-ASSOCIATE shall be "normal".

3.3.2.2 Protocol specification

The protocol specification for ACSE shall follow ITU-T Rec. X.227 | ISO/IEC 8650-1 [17]. All five APDUs (see Table 1) specified in the standard are mandatory. The specific options and parameter values that shall be supported for Interactive Class Telecommunications Systems Management application are specified in ISO/IEC ISP 11183-1 [6].

Table 1/Q.812 – ACSE services and associated APDUs

ACSE Service	Associated APDUs	Related P-Service
A-ASSOCIATE	AARQ, AARE	P-CONNECT
A-RELEASE	RLRQ, RLRE	P-RELEASE
A-ABORT	ABRT	P-U-ABORT
A-P-ABORT	(None)	P-P-ABORT

3.3.2.3 Use of the SACF for association control

The CF is defined to control the interactions among ASEs and/or ASO within the containing ASO in ISO/IEC 9545 [15] with DAM 1.

Thus it controls the association establishment, release and abort in respect to the rules defined in the Application Context available for the association.

Then it allows the joint use of several ASEs on the same association.

3.3.2.4 Abstract Syntax Name

The ACSE abstract syntax name has the ASN.1 type OBJECT IDENTIFIER. The following value shall be used to identify the ACSE abstract-syntax-definition:

{
joint-iso-itu-t association-control (2)
abstract-syntax (1) apdu's (0) version (1)

}

3.3.3 Remote operations

3.3.3.1 Service definition

The Remote Operations Service Element (ROSE) shall be a mandatory service element. The ROSE service description is detailed in CCITT Rec. X.219 and ISO/IEC 9072-1 [18]. All of the defined ROSE services (see Table 2) are mandatory.

3.3.3.2 Protocol specification

The protocol specification for ROSE shall follow CCITT Rec. X.229 and ISO/IEC 9072-2 [19]. All four APDUs specified in the standard (see Table 2) are mandatory. In addition, the ability to support correct origination and reception of the linked-id protocol element is required.

The requirement specified in Table 2 implies association Class 3 in ROSE.

Table 2/Q.812 – ROSE services and associated APDUs

ROSE Service	Associate APDUs	Relate Underlying Service
RO-INVOKE	ROIV	P-DATA
RO-RESULT	RORS	P-DATA
RO-ERROR	RORE	P-DATA
RO-REJECT-U	RORJ	P-DATA
RO-REJECT-P	RORJ	P-DATA

3.3.4 Common management information

Network management applications shall use the Common Management Information Service Element (CMISE).

3.3.4.1 Service definition

The CMISE service description is detailed in CCITT Rec. X.710 and ISO/IEC 9595 [20]. The CMISE services are listed in Table 3.

Multiple object selection, filter, multiple reply and cancel get functional units as defined in CCITT Rec. X.710 and ISO/IEC 9595 [20] are optional. Their use is application dependent. The negotiation during association establishment to use or not use the functional units shall be supported.

Support of the extended service functional unit defined in CCITT Rec. X.710 and ISO/IEC 9595 [20] is not required for conformance to this Recommendation and negotiation shall be supported, at association establishment, for its non-use.

Table 3/Q.812 – CMISE services

Service	Type
M-EVENT-REPORT	Confirmed/non-confirmed
M-GET	Confirmed
M-SET	Confirmed/non-confirmed
M-ACTION	Confirmed/non-confirmed
M-CREATE	Confirmed
M-DELETE	Confirmed
M-CANCEL-GET	Confirmed

3.3.4.2 Protocol specification

Implementations shall support those operations defined in CCITT Rec. X.711 and ISO/IEC 9596-1 [21], that are required by specific applications. All mandatory parameters defined in CCITT Rec. X.711 and ISO/IEC 9596-1 [21] for the required operations are mandatory parameters for this Recommendation. The specific options and parameter values that shall be supported are specified in ISO ISP 11183-3 [22] for basic Telecommunications Systems Management and in ISO/IEC ISP 11183-2 [23], for enhanced Telecommunications Systems Management.

3.3.4.3 Abstract Syntax

The abstract syntax name for CMISE is {joint-iso-ccitt ms(9) cmip(1) abstract syntax(4)}.

3.4 Security support for interactive applications

For X-Interface, the support for authentication and access control security services are mandatory, For Q3, the support for these services are optional. The authentication service shall be supported using Authentication Functional Unit specified in ACSE. The actual mechanism(s) to be used for the X-Interface is for further study.

The access control service shall be supported by using the access control parameter defined in CMIP operations. The syntax for this parameter depends on the specific mechanism and is for further study. When specific mechanisms are defined, an additional abstract syntax defining the syntax of the access control shall be included in the Definition Context Set (DCS) for the Presentation Protocol.

4 Upper layer protocol specification for File-oriented Class functions

The profiles for each layer are the same as described in clause 3; this clause only documents the differences required for FTAM support.

4.1 Session layer

4.1.1 Service profile

4.1.1.1 Functional units

Four session layer Functional Units (FUs) are required in this Recommendation:

1) Kernel;
2) Duplex;
3) Minor Synchronize;
4) Resynchronize.

4.1.2 Protocol profile

The specific options and parameter values that shall be supported for file transfer service are specified in ISO/IEC ISP 10607-1 [24].

4.2 Presentation layer

4.2.1 Service definition

It is mandatory that the presentation layer conform to the services specified in ITU-T Rec. X.216 | ISO/IEC 8822 [7].

4.2.1.1 Functional units

One presentation layer Functional Unit (FU) is required in this Recommendation:

– Kernel.

4.2.2 Protocol specification

It is mandatory that the presentation layer conform to the protocols specified in ITU-T Rec. X.226 | ISO/IEC 8823-1 [8] (normal mode). The specific options and parameter values that shall be supported for Telecommunications system Management application are specified in ISO/IEC ISP 11183-1 [6].

4.2.3 Encoding rules for transfer syntax

The encoding rules defined in CCITT Rec. X.209 and ISO/IEC 8825 [9] shall be applied to derive the transfer syntax for the Application Protocol Data Units (APDUs). The ASN.1 OBJECT IDENTIFIER [joint-iso-itu-t asn1 (1) basic-encoding (1)] shall be used as the value for the transfer syntax name. The maximum value of an ASN.1 basic encoding tag that needs to be handled for conformance to this Recommendation is 16 383. This is the largest unsigned integer that can be represented in 14 bits. Hence the identifier octets shall consist of an initial octet and up to two more octets, thus occupying a maximum of three octets. Also, the largest number of octets in the "contents octets" component of an ASN.1 data value encoding that needs to be handled for conformance to this Recommendation is 4,294,967,295. This is the largest unsigned integer that can be represented in 32 bits. Hence in the "long form" encoding, the length octets shall consist of an initial octet and up to four more octets, thus occupying a maximum of five octets. (Note that this restriction does not apply to "indefinite length" encodings.)

4.3 Application layer profile

4.3.1 Application layer architecture

The description of ACSE and FTAM as part of the application layer architecture is to be provided.

4.3.2 File transfer, access and management

4.3.2.1 Service profile

The mandatory file service class is file transfer class.

In this class the following functional units are mandatory:

– the kernel functional unit;

– both the read and write functional units;

– the limited file management functional unit;

– the grouping functional unit;
– and, in the internal file service, the recovery functional unit and optionally the restart functional unit.

4.3.2.2 Protocol profile

The functional units of the file protocol are equivalent to the functional units of the supported service described above.

The functional units retained and their PDUs associated are listed in Table 4.

This file protocol assumes the session services described in 4.1.1.1 with the following details:

– the recovery or restart functional unit implicates the use of minor synchronize session service;
– the restart functional unit implicates in addition to minor synchronize session service the resynchronize session service.

Table 4/Q.812 – FTAM functional units and PDUs associated

Name	Functional units
F-INITIALIZE request	Kernel
F-INITIALIZE response	Kernel
F-TERMINATE request	Kernel
F-TERMINATE response	Kernel
F-P-ABORT request	Kernel
F-U-ABORT request	Kernel
F-SELECT request	Kernel
F-SELECT response	Kernel
F-DESELECT request	Kernel
F-DESELECT response	Kernel
F-CREATE request	Limited file management
F-CREATE response	Limited file management
F-DELETE request	Limited file management
F-DELETE response	Limited file management
F-READ-ATTRIB request	Limited file management
F-READ-ATTRIB response	Limited file management
F-OPEN request	Read, write
F-OPEN response	Read, write
F-CLOSE request	Read, write
F-CLOSE response	Read, write
F-READ request	Read
F-WRITE request	Write
F-DATA-END request	Read, write
F-TRANSFER-END request	Read, write
F-TRANSFER-END response	Read, write
F-CANCEL request	Read, write
F-CANCEL response	Read, write

Table 4/Q.812 – FTAM functional units and PDUs associated (*concluded*)

Name	Functional units
F-BEGIN-GROUP request	Grouping
F-BEGIN-GROUP response	Grouping
F-END-GROUP request	Grouping
F-END-GROUP response	Grouping
F-RECOVER request	Recovery
F-RECOVER response	Recovery
F-RESTART request	Restart
F-RESTART response	Restart

4.3.2.3 Abstract Syntax

The abstract syntax names for FTAM are:

{iso standard 8571 abstract syntax(2) ftam-fadu(2)}
{iso standard 8571 abstract syntax(2) ftam-pci(1)}
{iso standard 8571 abstract syntax(2) unstructured-text(3)}
{iso standard 8571 abstract syntax(2) unstructured-binary(4)}

4.3.2.4 Support of document types

The nature of the file structures to be transferred involves the use of the suitable document types.

Three types of file structures are retained:

– unstructured binary files;

– unstructured text files;

– sequentially ordered files (these files are made of a sequence of records without any possibility of having direct access to a given record, each record is made of fields of different types).

So three document types at least are mandatory:

– ISO FTAM unstructured text (FTAM.1);

– ISO FTAM unstructured binary (FTAM.3);

– NBS sequential file (NBS-6).

FTAM.1 and FTAM.3 are allowed by FTAM hierarchical file model defined in ISO 8571-2 [26] as constrained by the unstructured constraint set.

NBS-6 is allowed by FTAM hierarchical file model defined in ISO 8571-2 [26] as constrained by the sequential flat constraint set.

4.4 Security Support for FTAM Services

For X-Interface, the support for authentication service is mandatory. For Q3, the support for these services are optional. The authentication service shall be supported using Authentication Functional Unit specified in ACSE. The actual mechanism(s) to be used for the X-Interface is for further study.

Security support for FTAM services in TMN is for further study.

5 Upper layer protocol specification for Directory services

5.1 Session layer

5.1.1 Service definition

This layer conforms to the service definition in ITU-T Rec. X.215 | ISO/IEC 8326.

5.1.1.1 Functional units

Two session layer FUs are required in this Recommendation:

a) Kernel;

b) Duplex.

5.1.2 Protocol specification

The session layer conforms to the protocol definition in ITU-T Rec. X.225 | ISO/IEC 8327-1 [5].

5.1.3 User Data

DUAs shall be capable of sending request APDUs of any size up to 32 767 (32k-1) octets in length. DSAs shall be capable of accepting and processing operation request APDUs of any size up to 32 767 octets in length. DSAs shall be capable of sending response APDUs of any size up to 262 143 (256k-1) octets in length. DSAs shall be capable of accepting and processing response APDUs of any size up to 262 143 octets in length and shall be capable of sending request APDUs of any size up to 32 767 octets in length.

5.2 Presentation layer

5.2.1 Service definition

The presentation-service is defined in ITU-T Rec. X.216 | ISO/IEC 8822 [7].

The ACSE is the sole user of the P-CONNECT, P-RELEASE, P-U-ABORT and P-P-ABORT services of the presentation-service.

The ROSE is the sole user of the P-DATA service of the presentation service.

Presentation default context, context restoration, and context management are not used.

5.2.2 Protocol specification

It is mandatory that the presentation layer conform to the protocols specified in ITU-T Rec. X.226 | ISO/IEC 8823-1 [8] (normal mode).

5.3 Application layer

5.3.1 Application Layer architecture

It is mandatory that the application layer conforms to the architecture for the application layer outlined in ISO/IEC 9594 [29] to [36].

5.3.2 Directory protocol Abstract Syntaxes

The ASN.1 type from which the values of the abstract syntaxes are derived is specified using the parameterized types of ROS {DAP-InvokeIDSet | DAP-Invokable | DAP-Returnable | DSP-InvokeIDSet | DSP-Invokable | DSP-Returnable}, Bind { dSABind | directoryBind}, and Unbind {dSAUnbind | directoryUnbind} which are defined in ITU-T Rec. X.880 | ISO/IEC 13712-1 [37].

The DAP abstract syntax is called the directoryAccessAbstractSyntax. The DSP abstract syntax is called the directorySystemAbstractSyntax.

5.3.3 Directory application contexts

The DAP application context is called the directoryAccessAC. The DSP application context is called the directorySystemAC.

5.3.4 Association control service element

The abstract-syntax of ACSE, acse-abstract-syntax is required for DAP and DSP.

The ACSE supports the establishment, release and abort of an application-association between a pair of AEs. Associations between a DUA and a DSA may be established only by the DUA. Only the initiator of an established association can release it.

5.3.4.1 Service definition

The ACSE service description is detailed in ITU-T Rec. X.217 | ISO/IEC 8649 [16].

The RO-BIND and RO-UNBIND services are the sole users of the A-ASSOCIATE and A-RELEASE services of the ACSE. The application-process is the user of the A-ABORT and A-P-ABORT services of the ACSE.

5.3.4.2 Protocol specification

The protocol specification for ACSE shall follow ITU-T Rec. X.227 | ISO/IEC 8650-1 [17].

5.3.5 Remote operations

5.3.5.1 Service definition

ROSE shall be a mandatory service element. The ROSE service description is detailed in ITU-T Rec. X.881 | ISO/IEC 13712-2 [38].

The Directory ASEs are users of the RO-INVOKE, RO-RESULT, RO-ERROR, RO-REJECT-U, and RO-REJECT-P services of the ROSE.

5.3.5.2 Protocol specification

The DAP and DSP are the Directory protocols used to provide communications between a pair of application processes.

5.4 Security Support for Directory Services

ITU-T Rec. X.509 | ISO/IEC 9594-8 [36] defines a framework for the provision of authentication services by the Directory to its users. Security support for Directory services in TMN is for further study.

The upper layer protocols to be used for store and forward services (e.g. for exchange of EDI formatted information) is for further study.

This Recommendation specifies partial support for security requirements across the Q3 and X interfaces. To support security services such as data integrity, confidentiality and non-repudiation and management of security information (such as key management procedures and protocols), the use of Generic Upper Layer Security Recommendations (X.830-Series of Recommendations) will be required. Guidelines for using GULS in applications are specified in Annex A/X.830 [39]. Details for using GULS in both interactive and file transfer classes of TMN applications are for further study.

6 Conformance

Requirements for items not specifically referenced in this Recommendation shall be per ISPs as identified below:

– Session, Presentation and ACSE layers for Interactive Class services shall conform to ISO/IEC ISP 11183-1 [6].

– Session, Presentation and ACSE for File-oriented Class services shall conform to ISO/IEC ISP 10607-1 [24].

– CMIP utilized in Interactive Class services profile shall conform to ISO/IEC ISP 11183-3 [22] for basic services and to ISO/IEC ISP 11183-2 [23] for enhanced services. Applications may override the APDU size of 10K specified in AOM-12 if larger size is required.

– FTAM profile shall correspond to ISO/IEC ISP 10607-3 [40] "Simple File Transfer service profile".

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