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Information technology — Open Systems Interconnection — Service definition for the Application Service Object Association Control Service Element

Technologies de l'information — Interconnexion des systèmes ouverts — Définition du service pour l'élément de service de contrôle d'association des objets de service d'application

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 15953 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in collaboration with ITU-T. The identical text is published as ITU-T Recommendation X.217 bis.

This first edition of ISO/IEC 15953 cancels and replaces ISO/IEC 8649:1996 and its Amendment 1:1997 and Amendment 2:1998, of which it constitutes a technical revision.

Introduction

This Recommendation | International Standard is one of a set of Recommendations | International Standards produced to facilitate the interconnection of information processing systems. It is related to other ITU-T Recommendations | International Standards in the set as defined by the Reference Model for Open Systems Interconnection (see ITU-T Rec. X.200 | ISO/IEC 7498-1). The reference model subdivides the areas of standardization for interconnection into a series of layers of specification, each of manageable size.

The goal of Open Systems Interconnection is to allow, with a minimum of technical agreement outside the Interconnection standards, the interconnection of information processing systems:

- from different manufacturers;
- under different managements;
- of different levels of complexity; and
- of different technologies.

This Recommendation | International Standard recognizes that application-processes may wish to communicate with each other for a wide variety of reasons. However, any communication will require the performance of certain services independent of the reasons for communication. The application-service-element defined herein provides such services.

This Service definition defines services provided by the application-service-element for ASO-association control: the Association Control Service Element (ACSE). The ACSE provides basic facilities for the control of an ASO-association among communicating application-service-objects (ASOs). The ACSE includes four optional functional units. One functional unit provides additional facilities for exchanging information in support of authentication during association establishment without adding services. The optional ASO-context negotiation functional unit allows multiple ASO-contexts to be offered during association establishment. The optional higher level association functional unit provides for the facility to identify ASO-associations and transparently pass data to child ASOs and allows the ASO-context or the presentation context on an ASO-association to be modified during the lifetime of the association. The optional nested-association functional unit provides for the facility to instantiate multiple associations nested over supporting upper layers. The X.410 compatibility mode is not provided by this Service definition, since the optional functional units defined in this Recommendation | International Standard are not used in this mode. The service definition herein is backwards compatible with ITU-T Rec. X.217 | ISO/IEC 8649.

The fast-associate mechanism allows a session connection, including its embedded presentation connection and application association, to be established using a compressed form of the information that would otherwise be sent on the S-CONNECT exchange. The compressed form, called the upper layer context identifier, is a reference to an upper-layer context specification, which is a definition of the fields of the application, ACSE, presentation and session protocols that would be sent on the full-form connect messages. The upper layer context identifier may be parameterized to include values for the variable fields allowed by the full form protocols for the upper layers.

Within the ACSE service, the only addition is the presence of a conceptual parameter which summarizes the contents of the User-information of the A-ASSOCIATE primitives.

It is recognized that, with respect to ACSE Quality of services (QoS), described in clause 8, work is still in progress to provide an integrated treatment of QoS across all layers of the OSI Reference Model, and to ensure that the individual treatments in each layer service satisfy overall QoS objectives in a consistent manner. As a consequence, an addendum may be added to this Service definition at a later time which reflects further QoS developments and integration.

INTERNATIONAL STANDARD

ITU-T RECOMMENDATION

INFORMATION TECHNOLOGY – OPEN SYSTEMS INTERCONNECTION – SERVICE DEFINITION FOR THE APPLICATION SERVICE OBJECT ASSOCIATION CONTROL SERVICE ELEMENT

1 Scope

This Recommendation | International Standard defines ACSE services for ASO-association control in an open systems interconnection environment. ACSE supports two modes of communication service: connection-mode and connectionless-mode.

The ACSE connection-mode service is provided by the use of the connection-mode ACSE protocol (see ITU-T Rec. X.227 *bis* | ISO/IEC 15954).

The ACSE connectionless-mode service (A-UNIT-DATA) is provided by the use of the connectionless-mode ACSE protocol (see ITU-T Rec. X.237 *bis* | ISO/IEC 15955).

Five functional units are defined in the ACSE. The mandatory Kernel functional unit is used to establish and release ASO-associations. The optional Authentication functional unit provides additional facilities for exchanging information in support of authentication during association establishment without adding services. The ACSE authentication facilities may be used to support a limited class of authentication methods. The optional ASO-context negotiation functional unit allows multiple ASO-contexts to be offered during association establishment. The optional higher level association functional unit provides for the facility to identify ASO-associations and transparently pass data to child ASOs and allows the ASO-context or the presentation context on an ASO-association to be modified during the lifetime of the association.

This Recommendation | International Standard does not specify individual implementations or products, nor does it constrain the implementation of entities and interfaces within a computer system.

No requirement is made for conformance to this Service definition.

2 Normative references

The following Recommendations and International Standards contain provisions which, through reference in this text, constitute provisions of this Recommendation | International Standard. At this time of publication, the editions indicated were valid. All Recommendations and Standards are subject to revision, and parties to agreements based on this Recommendation | International Standard are encouraged to investigate the possibility of applying the most recent edition of the Recommendations and Standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards. The Telecommunication Standardization Bureau of the ITU maintains a list of currently valid ITU-T Recommendations.

2.1 Identical Recommendations | International Standards

– ITU-T Recommendation X.200 (1994) | ISO/IEC 7498-1:1994, *Information technology – Open Systems Interconnection – Basic Reference Model: The Basic Model.*

– ITU-T Recommendation X.207 (1993) | ISO/IEC 9545:1994, *Information technology – Open Systems Interconnection – Application layer structure.*

– ITU-T Recommendation X.210 (1993) | ISO/IEC 10731:1994, *Information technology – Open Systems Interconnection – Basic Reference Model: Conventions for the definition of OSI services.*

- ITU-T Recommendation X.215 (1995) | ISO/IEC 8326:1996, *Information technology – Open Systems Interconnection – Session service definition.*
- ITU-T Recommendation X.215 (1995)/Amd.1 (1997) | ISO/IEC 8326:1996/Amd.1:1998, *Information technology – Open Systems Interconnection – Session service definition – Amendment 1: Efficiency enhancements.*
- ITU-T Recommendation X.215 (1995)/Amd.2 (1997) | ISO/IEC 8326:1996/Amd.2:1998, *Information technology – Open Systems Interconnection – Session service definition – Amendment 2: Nested connections functional unit.*
- ITU-T Recommendation X.216 (1994) | ISO/IEC 8822:1994, *Information technology – Open Systems Interconnection – Presentation service definition.*
- ITU-T Recommendation X.216 (1994)/Amd.1 (1997) | ISO/IEC 8822:1994/Amd.1:1998, *Information technology – Open Systems Interconnection – Presentation service definition – Amendment 1: Efficiency enhancements.*
- ITU-T Recommendation X.216 (1994)/Amd.2 (1997) | ISO/IEC 8822:1994/Amd.2:1998, *Information technology – Open Systems Interconnection – Presentation service definition – Amendment 2: Nested connections functional unit.*
- ITU-T Recommendation X.217 (1995) | ISO/IEC 8649:1996, *Information technology – Open Systems Interconnection –Service definition for the association control service element.*
- ITU-T Recommendation X.225 (1995) | ISO/IEC 8327-1:1996, *Information technology – Open Systems Interconnection – Connection-oriented session protocol: Protocol specification.*
- ITU-T Recommendation X.225 (1995)/Amd.1 (1997) | ISO/IEC 8327-1:1996/Amd.1:1998, *Information technology – Open Systems Interconnection – Connection-oriented session protocol: Protocol specification – Amendment 1: Efficiency enhancements.*
- ITU-T Recommendation X.225 (1995)/Amd.2 (1997) | ISO/IEC 8327-1:1996/Amd.2:1998, *Information technology – Open Systems Interconnection – Connection-oriented session protocol: Protocol specification – Amendment 2: Nested connections functional unit.*
- ITU-T Recommendation X.226 (1994) | ISO/IEC 8823-1:1994, *Information technology – Open Systems Interconnection – Connection-oriented presentation protocol: Protocol specification.*
- ITU-T Recommendation X.226 (1994)/Amd.1 (1997) | ISO/IEC 8823-1:1994/Amd.1:1998, *Information technology – Open Systems Interconnection – Connection-oriented presentation protocol: Protocol specification – Amendment 1: Efficiency enhancements.*
- ITU-T Recommendation X.226 (1994)/Amd.2 (1997) | ISO/IEC 8823-1:1994/Amd.2:1998, *Information technology – Open Systems Interconnection – Connection-oriented presentation protocol: Protocol specification – Amendment 2: Nested connections functional unit.*
- ITU-T Recommendation X.227 *bis* (1998) | ISO/IEC 15954:1999, *Information technology – Open Systems Interconnection – Connection-mode protocol for the Application Service Object Association Control Service Element.*
- ITU-T Recommendation X.237 *bis* (1998) | ISO/IEC 15955:1999, *Information technology – Open Systems Interconnection – Connectionless protocol for the Application Service Object Association Control Service Element.*
- ITU-T Recommendation X.650 (1996) | ISO/IEC 7498-3:1997, *Information technology – Open Systems Interconnection – Basic Reference Model: Naming and addressing.*
- CCITT Recommendation X.660 (1992) | ISO/IEC 9834-1:1993, *Information technology – Open Systems Interconnection – Procedures for the operation of OSI Registration Authorities: General procedures.*

2.2 Paired Recommendations | International Standards equivalent in technical content

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

  ISO 7498-2:1989, *Information processing systems – Open Systems Interconnection – Basic Reference Model – Part 2: Security Architecture.*

3 Definitions

3.1 Reference model definitions

3.1.1 Basic Reference Model definitions

This Recommendation | International Standard is based on the concepts developed in ITU-T Rec. X.200 | ISO/IEC 7498-1. It makes use of the following terms defined in them:

a) application-entity;
b) application-function;
c) Application Layer;
d) application-process;
e) application-protocol-control-information;
f) application-protocol-data-unit;
g) application-service-element;
h) connectionless-mode presentation-service;
i) (N)-connectionless-mode transmission;
j) (N)-function;
k) presentation-connection;
l) presentation-service;
m) concrete syntax;
n) session-connection;
o) session-protocol; and
p) session-service.

3.1.2 Security architecture definitions

This Recommendation | International Standard makes use of the following terms defined in CCITT Rec. X.800 | ISO 7498-2:

a) credentials;
b) password; and
c) peer-entity authentication.

3.1.3 Naming and addressing definitions

This Recommendation | International Standard makes use of the following terms defined in ITU-T Rec. X.650 | ISO/IEC 7498-3:

a) application-process title;
b) application-entity qualifier;
c) application-entity title;
d) application-process invocation-identifier;
e) application-entity invocation-identifier; and
f) presentation address.

3.2 Service conventions definitions

This Recommendation | International Standard makes use of the following terms defined in ITU-T Rec. X.210 | ISO/IEC 10731:

a) service-provider;
b) service-user;
c) confirmed service;

d) non-confirmed service;

e) provider-initiated service;

f) primitive;

g) request (primitive);

h) indication (primitive);

i) response (primitive); and

j) confirm (primitive).

3.3 Presentation service definitions

This Recommendation | International Standard makes use of the following terms defined in ITU-T Rec. X.216 | ISO/IEC 8822:

a) abstract syntax;

b) abstract syntax name;

c) connectionless-mode [presentation];

d) default context;

e) defined context set;

f) functional unit [presentation];

g) normal mode [presentation];

h) presentation context;

i) presentation data value.

3.4 Application Layer Structure definitions

This Recommendation | International Standard makes use of the following terms defined in ITU-T Rec. X.207 | ISO/IEC 9545:

a) ASO-context;

b) ASO-invocation;

c) control function;

d) application-service-object (ASO);

e) ASO-association;

f) ASO-association-identifier;

g) ASOI-identifier;

h) ASOI-tag;

i) ASO-name;

j) ASO-qualifier;

k) child ASO;

l) parent ASO; and

m) ASO-title.

3.5 ACSE service definitions

For the purposes of this Recommendation | International Standard, the following definitions apply:

3.5.1 Association Control Service Element: The particular application-service-element defined in this Recommendation | International Standard.

3.5.2 ACSE service-user: The part of the ASO that makes use of ACSE services.

3.5.3 ACSE service-provider: An abstraction of the totality of those entities which provide ACSE services to peer ACSE service-users.

3.5.4 **requestor**: The ACSE service-user that issues the request primitive for a particular ACSE service. For a confirmed service, it also receives the confirm primitive.

3.5.5 **acceptor**: The ACSE service-user that receives the indication primitive for a particular ACSE service. For a confirmed service, it also issues the response primitive.

3.5.6 **association-initiator**: The ACSE service-user that initiates a particular association, i.e. the requestor of the A-ASSOCIATE service that establishes the association.

3.5.7 **association-responder**: The ACSE service-user that is not the initiator of a particular association, i.e. the acceptor of the A-ASSOCIATE service that establishes the association.

3.5.8 **authentication**: The corroboration of the identity of objects relevant to the establishment of an association. For example, these can include the AEs, APs, and the human users of applications.

NOTE – This term has been defined to make it clear that a wider scope of authentication is being addressed than is covered by peer-entity authentication in CCITT Rec. X.800 | ISO 7498-2.

3.5.9 **authentication-function**: An application-function within an application-entity invocation that processes and exchanges authentication-values with a peer authentication-function.

3.5.10 **authentication-value**: The output from an authentication-function to be transferred to a peer ACSE service-user for input to the peer's authentication-function.

3.5.11 **authentication-mechanism**: The specification of a specific set of authentication-function rules for defining, processing, and transferring authentication-values.

3.5.12 **normal mode**: The mode of ACSE operation that results in the transfer of ACSE semantics, using the presentation-service.

3.5.13 **disrupt**: A service procedure is disrupted by another service procedure if the second service results in service primitives not being used as specified for the procedure of the first service.

4 Abbreviations

For the purposes of this Recommendation | International Standard, the following abbreviations apply:

ACSE	Association Control Service Element
AE	application-entity
AEI	application-entity invocation
Amd.	Amendment to an ITU-T Recommendation or an ISO/IEC International Standard
AP	application-process
ASE	application-service-element
ASO	application-service-object
ASOI	ASO-invocation
CF	control function
cnf	confirm primitive
ind	indication primitive
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
ITU-T	International Telecommunication Union – Telecommunication Standardization Sector
OSI	Open Systems Interconnection
QoS	Quality of service
Rec.	Recommendation [ITU-T]
req	request primitive
resp	response primitive

5 Conventions

This Recommendation | International Standard defines services for the ACSE following the descriptive conventions defined in ITU-T Rec. X.210 (1993) | ISO/IEC 10731 (1994). In clause 8, the definition of each ACSE service includes a table that lists the parameters of its primitives. For a given primitive, the presence of each parameter is described by one of the following values:

blank	Not applicable
C	Conditional
M	Mandatory
P	Subject to conditions defined in ITU-T Rec. X.216 | ISO/IEC 8822
U	User option

In addition, the notation (=) indicates that a parameter value is semantically equal to the value to its left in the table.

6 Basic concepts

6.1 General

The reference model (ITU-T Rec. X.200 | ISO/IEC 7498-1) as extended by the Application Layer Structure (see ITU-T Rec. X.207 | ISO/IEC 9545) represents communication among application-processes (APs) in terms of communication among their application-service-objects (ASOs). The functionality of an ASO is factored into a number of ASOs and application-service-elements (ASEs). The interaction among ASOs in the same AE is described in terms of the use of the ASO's or the ASE's services. Interactions among ASOs in peer AEs in the same or different systems is described in terms of application-protocols.

This Service definition supports the modeling concepts of ASO-association, ASO-naming, and ASO-context.

An ASO-association is a cooperative relationship among ASOs. It provides the necessary frame of reference among the ASOs in order that they may interwork effectively. ACSE forms this relationship by the communication of application-protocol-control-information among the ASOIs. (Other means of establishing ASO-associations are outside the scope of this Recommendation | International Standard.)

ASO-naming provides the ability for an ASO to establish an ASO-association directly with another ASO in the recursive structure allowed by the Application Layer Structure. ASO-naming allows establishment to either the entity or to an invocation of the entity. The structure of ASO-names and ASOI-names is consistent with the structure of AE-titles and AEI-qualifiers, see ITU-T Rec. X.207 | ISO/IEC 9545.

An ASO-context is specified by identifying the role of the ASO-association and the control functions (CF) of the ASOs communicating over the ASO-association.

The ACSE is modeled as an ASE. The primary purpose of ACSE is to establish and release an ASO-association among ASOIs and to specify the ASO-context of that association, i.e. create explicit shared state among the communicating ASOIs. The ACSE supports two modes of communication: connection-mode and connectionless-mode. For the connection-mode, the ASO-association is established and released by the reference of ACSE connection-mode services (see 7.1). For the connectionless-mode, the ASO-association exists during the invocation of the single ACSE connectionless-mode service, A-UNIT-DATA (see 7.2).

The ACSE service-user is that part of an ASO that makes use of ACSE services. It may be the control function (CF), an ASO, or an ASE or some combination of the three.

A referencing specification does not need to specify the use of ACSE service primitive parameters that are not relevant to its operation. Such parameters may be passed by the CF between the ACSE service-provider and that part of the ASOI to which the parameters are relevant.

As an example, consider the authentication parameters of the Authentication functional unit discussed below in 6.2. The CF may be used to model the passing of authentication-values between the authentication function and the ACSE-provider. An ASE that references ACSE need not be concerned with these parameters.

The ACSE communicates with its service user by means of service primitives defined in this Service definition. Although not referenced by ACSE to send and receive its semantics, other supporting service primitives may affect the sequencing of ACSE primitives (see 9.2.4) on application-associations or higher level associations.

6.2 Authentication

This Service definition includes the Authentication functional unit. The functional unit allows AP invocations, AEIs and their related objects to exchange authentication information during the establishment of an association.

6.2.1 Authentication concepts

This Service definition includes the modeling concepts of authentication-function, authentication-mechanism, authentication-mechanism Name and authentication-value. Each is discussed below.

6.2.1.1 Authentication-function

For this Service definition, authentication is supported by a pair of authentication-functions. An authentication-function is modeled as an application-function [i.e. as an (N)-function as defined in ITU-T Rec. X.200 | ISO/IEC 7498-1] that is available to the ACSE service-user. Each is contained within the associated ASOIs.

Modeling the authentication-function in this way allows ACSE to deal with authentication communication requirements without having to understand the semantics of the security information exchanged or how it is used.

6.2.1.2 Authentication-mechanism

An authentication-mechanism is a particular specification of the processing to be performed by a pair of application-functions for authentication. A specification contains the rules for creating, sending, receiving and processing information needed for authentication.

Annex B in ITU-T Rec. X.227 *bis* | ISO/IEC 15954 is an example of an authentication-mechanism. It defines the authentication of the sending ASOI based on its ASO-title and its password. The password is contained in the Authentication-value parameter.

6.2.1.3 Authentication-mechanism Name

An authentication-mechanism Name is used to specify a particular authentication-mechanism. For example, the name of the authentication-mechanism specified in ITU-T Rec. X.227 *bis* | ISO/IEC 15954, Annex B is assigned (i.e. registered) in that annex. The value has the data type of an OBJECT IDENTIFIER.

An authentication-mechanism Name may also be used to specify a more general security mechanism that includes an authentication-mechanism. An example of a general security mechanism is an ASE that provides security facilities to its service-user.

Authentication-mechanism Names and general security mechanism names are subject to registration within OSI (see clause 12 in ITU-T Rec. X.227 *bis* | ISO/IEC 15954).

6.2.1.4 Authentication-value

An authentication-value consists of information used by a pair of authentication-functions to perform authentication. It can consist of information such as credentials, a time-stamp, a digital signature, etc. It can also identify the type and/or name of the object to be authenticated, such as the ASO, a human user, etc.

The semantic structure of an authentication-value is specified by the authentication-mechanism involved.

An initiating ASOI's authentication-function provides an authentication-value to its ASOI to be sent to the peer ASOI. The peer ASOI's authentication-function receives and processes this authentication-value. For example, it may use the value to authenticate objects at the sending ASOI.

An authentication-mechanism may be part of an ASO that provides security facilities to its service-user. In this situation, the authentication-mechanism Name identifies the ASO; the authentication-value is an APDU of the ASE.

6.2.2 ACSE authentication facilities

The ACSE Kernel functional unit does not support authentication.

The ACSE Authentication functional unit supports the transfer of authentication-values as part of the A-ASSOCIATE service. An authentication-value is treated as an atomic item by ACSE. Its semantics are transparent to the ACSE service-provider.

The facilities of the Authentication functional unit may be used to convey other security-related information. This may be done with the transfer of authentication information during association establishment.

7 Service overview

ACSE supports both a connection-mode and connectionless-mode of operation. Each mode is discussed below. Table 1 lists all of the ACSE services. It indicates the communication mode and type of service.

7.1 Connection-mode

Table 1 – ACSE Services

Communication mode	Service	Type
Connection-mode	A-ASSOCIATE	Confirmed
	A-RELEASE	Confirmed
	A-ABORT	Non-Confirmed
	A-P-ABORT	Non-Confirmed
	A-DATA	Non-Confirmed
	A-ALTER-CONTEXT	Confirmed
Connectionless-mode	A-UNIT-DATA	Non-Confirmed

7.1.1 ACSE services

This Recommendation | International Standard defines the following services for the control of a single association:

a) A-ASSOCIATE;

b) A-RELEASE;

c) A-ABORT;

d) A-P-ABORT

e) A-DATA; and

f) A-ALTER-CONTEXT.

The A-ASSOCIATE service establishes an association among ASOs with the policies associated with the value of ASO-context-name parameter.

The A-RELEASE service, if successful, terminates an association. However, the success of the A-RELEASE service may be negotiated.

The A-ABORT service causes the abnormal release of the association with the possible loss of information in transit.

The A-P-ABORT service indicates the abnormal release of the ASO-association as a result of action by the supporting service with the possible loss of information in transit.

The A-ALTER-CONTEXT service allows the service user to change the ASO-context or the presentation-context on the ASO-association during the lifetime of the association.

The A-DATA service allows an ASO to distinguish multiple ASO-associations and to transparently pass data to child ASOs.

For a particular association, the ACSE services operate in the following mode:

– normal mode.

The normal mode of operation allows the ACSE service-user to take full advantage of the functionality provided by ACSE and the supporting service.

7.1.2 Functional units

Functional units are used by this Recommendation | International Standard to identify ACSE user requirements during association establishment. Five functional units are defined:

a) Kernel functional unit;

b) Authentication functional unit;

c) ASO-context negotiation functional unit;

d) Higher Level Association functional unit; and

e) Nested Association functional unit.

The Kernel functional unit is always available, and includes the basic services identified in 7.1.1.

The Authentication functional unit supports authentication during association establishment. The availability of this functional unit is negotiated during association establishment. This functional unit does not include additional services. It adds parameters to the A-ASSOCIATE and A-ABORT services.

The ASO-context negotiation functional unit supports the negotiation of ASO-context during association establishment. The ASO-context negotiation functional unit allows the association-initiator to propose a list of ASO-context names to the association-acceptor during association establishment. The association-acceptor selects one name. This functional unit does not add additional services. It adds a single parameter to the A-ASSOCIATE primitive.

The Higher Level Association functional unit provides support for higher level associations. This functional unit is supported by the A-DATA APDU to pass data transparently to Child ASOs and the A-ALTER-CONTEXT APDU to modify the ASO-context or the presentation context on an ASO-association during the lifetime of an association. Note that some higher level associations may have a scope that precludes the use of Session Functional Units.

The Nested Association functional unit provides support for nested ASO-Associations within another ASO-association within nested supporting upper layers. A nested association identifier allows support by full presentation and session layer state machines for nested ASO-associations.

For details on the use of the Higher Level Association and the Nested Association functional units, see Annexes C, D, and E of ITU-T Rec. X.227 *bis* | ISO/IEC 15954.

Table 2 shows the services and parameters associated with the ACSE functional units for the connection-mode of communication. The services and their parameters are discussed in clause 8.

Table 2 – Functional unit services and their parameters (connection-mode)

Functional unit	Service	Parameter
Kernel	A-ASSOCIATE	ASO-context-name Calling AP-title Calling AP-invocation-identifier Calling ASOI-tag Called AP-title Called AP-invocation-identifier Called ASOI-tag Responding AP-title Responding AP-invocation-identifier Responding ASOI-tag User-information User Summary Result Result source Diagnostic Calling-presentation-address Called-presentation-address Responding-presentation-address Presentation context definition list Presentation context definition result list Default presentation context name Default presentation context result Quality of service Session requirements Initial synchronization point serial number Initial Assignment of tokens Session connection identifier

Table 2 *(concluded)*

Functional unit	Service	Parameter
	A-RELEASE	Reason User-information Result
	A-ABORT	Abort source User-information
	A-P-ABORT	Provider reason
Authentication	A-ASSOCIATE	Authentication-mechanism Name Authentication-value ACSE requirements
	A-ABORT	Diagnostic
ASO-context-negotiation	A-ASSOCIATE	ASO-context-name-list ACSE requirements
Higher Level Association	A-DATA	User data
	A-ALTER-CONTEXT	ASO-context-name ASO-context-name-list Presentation context definition list Presentation context definition result list User-information
Nested Association	None	None

7.2 Connectionless-mode

This Recommendation | International Standard defines a single service (A-UNIT-DATA) for the connectionless-mode of ACSE. The A-UNIT-DATA service assumes a transient ASO-association. That is, the ASO-association exists during the invocation of the A-UNIT-DATA service.

7.2.1 Functional units

Functional units are used by this Recommendation | International Standard to identify ACSE user requirements. Two functional units are defined:

a) Kernel functional unit; and

b) Authentication functional unit.

The Kernel functional unit is always available.

The Authentication functional unit supports peer entity authentication. This functional unit does not include additional services. It adds parameters to the A-UNIT-DATA service.

Table 2 *bis* shows the services and parameters associated with the ACSE functional units for the connectionless mode of communication. The services and their parameters are discussed in clause 8.

Table 2 *bis* – Functional unit services and their parameters (connectionless mode)

Functional unit	Service	Parameter
Kernel	A-UNIT-DATA	ASO-context-name Calling AP-title Calling AP-invocation-identifier Calling ASOI-tag Called AP-title Called AP-invocation-identifier Called ASOI-tag User-information Calling-presentation-address Called-presentation-address Presentation context definition list Quality of service
Authentication	A-UNIT-DATA	Authentication-mechanism Name Authentication-value ACSE requirements

8 Service definition

Each of the ACSE services for both the connection-mode and connectionless-modes of communication is discussed below.

8.1 A-ASSOCIATE service

The A-ASSOCIATE service establishes an association; it is a confirmed service.

8.1.1 A-ASSOCIATE parameters

Table 3 lists the A-ASSOCIATE service parameters. In addition, groups of parameters are defined for reference by other ASEs as follows:

a) Calling ASO-title is the composite of the Calling AP-title and the Calling ASO-name parameters;

b) Called ASO-title is the composite of the Called AP-title and the Called ASO-name parameters; and

c) Responding ASO-title is the composite of the Responding AP-title and the Responding ASO-name parameters.

The two components of the ASO-title (AP-title and ASO-name) are defined in ITU-T Rec. X.650 | ISO/IEC 7498-3 and ITU-T Rec. X.207 | ISO/IEC 9545.

Table 3 – A-ASSOCIATE parameters

Parameter name	Req	Ind	Rsp	Cnf
ASO-context-name	C	C(=)	C	C
ASO-context-name-list	C	C(=)	C	C(=)
Calling AP-title	C(=)			
Calling AP-invocation-identifier	U	C(=)		
Calling ASOI-tag	U	C(=)		
Called AP-title	U	C(=)		
Called ASO-name	U	C(=)		
Called AP-invocation-identifier	U	C(=)		
Called ASOI-tag	U	C(=)		

Table 3 *(concluded)*

Parameter name	Req	Ind	Rsp	Cnf
Responding AP-title			U	C(=)
Responding AP-invocation-identifier			U	C(=)
Responding ASOI-tag			U	C(=)
ACSE requirements	U	C	U	C(=)
Authentication-mechanism Name	U	C(=)	U	C(=)
Authentication-value	U	C(=)	U	C(=)
User-information	U	C	U	C(=)
Result			U	U
Result source				U
Diagnostic			U	C(=)
Calling-presentation-address	P	P		
Called-presentation-address	P	P	P	P
Responding-presentation-address				
Presentation-context definition list	P	P		
Presentation context definition result list	P	P	P	P
Default presentation context name	P	P		
Default presentation context result	P	P	P	P
Quality of service	P	P	P	P
Presentation requirements	P	P	P	P
Session requirements	P	P	P	P
Initial synchronization point serial number	P	P	P	P
Initial assignment of tokens	P	P	P	P
Session connection identifier	P	P	P	P
User summary	U	C(=)	U	C(=)

8.1.1.1 ASO-context-name

The requestor, i.e. the association-initiator, uses the ASO-context-name parameter to identify a single ASO-context-name that it proposes for the association.

NOTE 1 – If the requestor proposes the ASO-context negotiation functional unit for this association, the requestor may also propose ASO-context-names by using the ASO-Context-Name List parameter (see 8.1.1.2).

NOTE 2 – The value of the ASO-context-name parameter may be different from any of the names in the ASO-Context-Name List parameter or it may be equal to one of the names in the list.

The acceptor, i.e. the association-responder, uses the ASO-context-name parameter to select the ASO-context-name for this association.

If the ASO-context negotiation functional unit is not selected for this association, the acceptor may return any value on the response primitive.

NOTE 3 – In this case, the offer of an alternate ASO-context-name by the acceptor provides a possible mechanism for limited negotiation. However, the semantics and rules for this exchange are entirely user-specific. If the requestor cannot operate in the acceptor's ASO-context, it may issue an A-ABORT request primitive.

If the ASO-context negotiation functional unit is selected for this association, the acceptor is limited on the values that it returns on the response primitive. It shall return a value from either the ASO-context-name parameter or from the ASO-context-name-list parameter (if any) on the indication primitive.

If the ACSE service-provider is not capable of supporting the requested association, the indication primitive is not issued by the ACSE service-provider. Therefore, the response primitive is not issued by the ACSE service-user. In this situation, when the confirm primitive is issued, it does not include the ASO-context-name parameter.

NOTE 4 – This field is optional. If backward compatibility with earlier implementations of ACSE is desired, it must be present.

8.1.1.2 ASO-context-name-list

The requestor, i.e. the association-initiator, may use the ASO-context-name-list parameter to identify a list of ASO-context-names that it is capable of supporting on the association.

If the association is accepted, the parameter shall not be included on the response primitive. If the association is rejected, the acceptor may use this parameter on the response primitive to express a list of ASO-context-names that it could have supported on the association. The ASO-context-name-list parameter may only be used if the ASO-context negotiation functional unit is selected for this association.

8.1.1.3 Calling AP-title

This parameter identifies the AP that contains the requestor of the A-ASSOCIATE service.

8.1.1.4 Calling AP-invocation-identifier

This parameter identifies the AP-invocation that contains the requestor of the A-ASSOCIATE service.

8.1.1.5 Calling ASOI-tag

This parameter identifies the ASO-invocation that contains the requestor of the A-ASSOCIATE service. The ASOI-tag consists of a sequence of pairs of (ASO-qualifier, ASOI-identifier), either or both of which may be absent in a particular element of the sequence. The ASOI-tag shall include sufficient fields to disambiguate the ASOI within the context of the ASO structure in which it is invoked, to the level required.

8.1.1.6 Called AP-title

This parameter identifies the AP that contains the intended acceptor of the A-ASSOCIATE service.

8.1.1.7 Called AP-invocation-identifier

This parameter identifies the AP-invocation that contains the intended acceptor of the A-ASSOCIATE service.

8.1.1.8 Called ASOI-tag

This parameter identifies the ASO-invocation that contains the acceptor of the A-ASSOCIATE service. The ASOI-tag consists of a sequence of pairs of (ASO-qualifier, ASOI-identifier), either or both of which may be absent in a particular element of the sequence. The ASOI-tag shall include sufficient fields to disambiguate the ASOI within the context of the ASO structure in which it is invoked, to the level required.

8.1.1.9 Responding AP-title

This parameter identifies the AP that contains the actual acceptor of the A-ASSOCIATE service.

8.1.1.10 Responding AP-invocation-identifier

This parameter identifies the AP-invocation that contains the actual acceptor of the A-ASSOCIATE service.

8.1.1.11 Responding ASOI-tag

This parameter identifies the ASO-invocation that contains the actual acceptor of the A-ASSOCIATE service. The ASOI-identifier consists of a sequence of pairs of (ASO-qualifier, ASOI-identifier), either or both of which may be absent in a particular element of the sequence. The ASOI-tag shall include sufficient fields to disambiguate the ASOI within the context of the ASO structure in which it is invoked, to the level required.

8.1.1.12 ACSE requirements

This parameter is used by the requestor to indicate the functional units requested for the association. If not present, only the Kernel functional unit is available for the association. In supporting this negotiation mechanism, the ACSE service-provider removes values for unsupported functional units before issuing the indication primitive to the acceptor.

This parameter is used by the acceptor to indicate which of the requested functional units the acceptor selects. The acceptor shall not select a functional unit in the response primitive which was not requested in the indication primitive. If the Higher Level Association functional unit is refused, the association is not established.

The value of the parameter in the response primitive is delivered unchanged in the confirm primitive.

This parameter takes on one or more of the following symbolic values:

- Kernel;
- Authentication;
- ASO-context negotiation;
- Higher Level Association.

8.1.1.13 Authentication-mechanism Name

This parameter is only used if the ACSE requirements parameter includes the Authentication functional unit. If present, the value of this parameter identifies the authentication-mechanism in use. If not present, the communicating ASOIs must implicitly know the mechanism in use, e.g. by prior understanding.

NOTE 1 – Some authentication-mechanisms may require this parameter, and if so, will state this in their specification.

NOTE 2 – This parameter may specify a more general authentication-mechanism. For example, it may specify an ASE that provides security facilities to its service-user.

8.1.1.14 Authentication-value

This parameter shall only be used if the ACSE requirements parameter includes the Authentication functional unit.

The authentication-value parameter is used as defined below:

a) If present on the request or the response primitive, it contains an authentication-value generated by the authentication-function in the ASOI that issued the service primitive. It is intended for the peer's authentication-function and is not interpreted by the ACPM.

b) If present on the indication or the confirm primitive, it contains an authentication-value generated by the authentication-function in the ASOI that issued the corresponding request or response primitive. It is intended for the peer's authentication-function.

8.1.1.15 User-information

Either the requestor or the acceptor may optionally include User-information. Its meaning depends on the ASO-context that accompanies the primitive. This parameter contains an SDU of the protocol using ACSE. The contents of this field are carried transparently without interpretation and delivered to the CF in the peer ASO which is participating in this ASO-association.

The User-information parameter in the A-ASSOCIATE service may contain several pieces of information, each corresponding to the initialization information of the other ASEs for one (or several) of the ASO-context being proposed in the list.

NOTE – For example, this parameter may be used to carry the initialization information of other ASEs included in the ASO-context specified by the value of the accompanying ASO-context-name parameter.

8.1.1.16 Result

The value of this parameter is provided by either the acceptor, by the ACSE service-provider, or by the supporting service-provider. It indicates whether the request to establish the association is accepted or rejected. It takes one of the following symbolic values:

- accepted;
- rejected (permanent); or
- rejected (transient).

If the parameter has the value "accepted", the association is established. Otherwise, the association is not established.

8.1.1.17 Result source

The value of the parameter is supplied by the ACSE service-provider. It identifies the creating source of the Result parameter and the Diagnostic parameter, if present. It takes one of the following symbolic values:

- ACSE service-user;
- ACSE service-provider; or
- supporting service-provider.

NOTE – If the Result parameter has the value "accepted", the value of this parameter is "ACSE service-user".

8.1.1.18 Diagnostic

This parameter may be used by the acceptor to provide diagnostic information about the establishment of the association.

NOTE – The use of this parameter is independent of the value of the Result parameter.

If the Result source parameter has the value "ACSE service-provider", it takes one of the following symbolic values:

- no reason given; or
- no common ACSE version.

If the Result source parameter has the value "ACSE service-user", it takes one of the following symbolic values:

- no reason given;
- ASO-context-name not supported;
- calling AP-title not recognized;
- calling ASO-qualifier not recognized;
- calling AP-invocation-identifier not recognized;
- calling ASO-invocation-identifier not recognized;
- called AP-title not recognized;
- called ASO-name not recognized;
- called AP invocation-identifier not recognized;
- called ASO-invocation-identifier not recognized;
- authentication-mechanism Name not recognized;
- authentication-mechanism Name required;
- authentication failure; or
- authentication required.

8.1.1.19 Calling-presentation-address

This parameter is as defined in ITU-T Rec. X.216 | ISO/IEC 8822.

8.1.1.20 Called-presentation-address

This parameter is as defined in ITU-T Rec. X.216 | ISO/IEC 8822.

8.1.1.21 Responding-presentation-address

This parameter is as defined in ITU-T Rec. X.216 | ISO/IEC 8822.

NOTE – In general this parameter will be derived from the ASO-naming parameters by doing a directory lookup.

8.1.1.22 Presentation context definition list

This parameter is as defined in ITU-T Rec. X.216 | ISO/IEC 8822 and in this Recommendation | International Standard.

8.1.1.23 Presentation context definition result list

This parameter is as defined in ITU-T Rec. X.216 | ISO/IEC 8822 and in this Recommendation | International Standard.

8.1.1.24 Default presentation context name

This parameter corresponds to the Default context name parameter defined in ITU-T Rec. X.216 | ISO/IEC 8822. This is limited to a single Presentation context Name.

8.1.1.25 Default presentation context result

This parameter corresponds to the Default context result parameter defined in ITU-T Rec. X.216 | ISO/IEC 8822.

8.1.1.26 Quality of service

This parameter is as defined in ITU-T Rec. X.216 | ISO/IEC 8822.

8.1.1.27 Presentation requirements

This parameter is as defined in ITU-T Rec. X.216 | ISO/IEC 8822.

8.1.1.28 Session requirements

This parameter is as defined in ITU-T Rec. X.216 | ISO/IEC 8822.

8.1.1.29 Initial synchronization point serial number

This parameter is as defined in ITU-T Rec. X.216 | ISO/IEC 8822.

8.1.1.30 Initial assignment of tokens

This parameter is as defined in ITU-T Rec. X.216 | ISO/IEC 8822.

8.1.1.31 Session connection identifier

This parameter is as defined in ITU-T Rec. X.216 | ISO/IEC 8822.

8.1.1.32 User summary

User summary is a parameter that summarizes the semantic content of the User-information, by reference to an upper-layer context specification.

8.1.2 A-ASSOCIATE service procedure

An ACSE service-user that desires to establish an association issues an A-ASSOCIATE request primitive. The called ASO can be identified by parameters of the request primitive. The requestor can issue any primitives except the A-RELEASE request primitive.

The ACSE service-provider issues an A-ASSOCIATE indication primitive to the acceptor.

The acceptor accepts or rejects the association by sending an A-ASSOCIATE response primitive with an appropriate Result parameter. ACSE service-provider issues an A-ASSOCIATE confirm primitive having the same Result parameter. The Result source parameter is assigned the symbolic value of "ACSE service-user".

If the acceptor accepts the association, the association is available for use. Requestors in both ASOs may now use any service provided by the ASOs and ASEs included in the ASO-context that is in effect (with the exception of the A-ASSOCIATE).

To establish a nested association, an ACSE service-user issues an A-ASSOCIATE request primitive in the context of another association (the nesting association) which has previously been established or is in the process of establishment. The Nested Association functional unit shall be selected on the nesting association. The ACSE service-provider issues the A-ASSOCIATE indication for the new nested association in the context of the same nesting association.

NOTE – An A-ASSOCIATE to create a higher level association is a new invocation of the ACSE service and does not involve the instantiation of any supporting ACSE service.

The ACSE service-provider may not be capable of supporting the requested association. In this situation, it returns an A-ASSOCIATE confirm primitive to the requestor with an appropriate Result parameter. The Result source parameter is appropriately assigned either the symbolic value of "ACSE service-provider" or "supporting service-provider". The indication primitive is not issued. The association is not established.

If the acceptor rejects the association by invoking an A-ABORT request or an A-ASSOCIATE response with a negative indication, the association is not established.

A requestor in the peer ASO may disrupt the A-ASSOCIATE service procedure by issuing an A-ABORT request primitive. The acceptor receives an A-ABORT indication primitive. The association is not established.

8.2 A-RELEASE service

The A-RELEASE service is used by a requestor in either ASO to cause the completion of the use of an association; it is a confirmed service. If the acceptor responds negatively, the A-RELEASE service completes unsuccessfully and the association continues without loss of information in transit. If the acceptor responds positively, the A-RELEASE service completes successfully and the association is terminated.

8.2.1 A-RELEASE parameters

Table 4 lists the A-RELEASE parameters.

Table 4 – A-RELEASE parameters

Parameter name	Req	Ind	Rsp	Cnf
Reason	U	C(=)	U	C(=)
User-information	U	C(=)	U	C(=)
Result			M	M(=)

8.2.1.1 Reason

When used on the request primitive, this parameter identifies the general level of urgency of the request. It takes one of the following symbolic values:

- normal;
- urgent; or
- user-defined.

When used on the response primitive, this parameter identifies information about why the acceptor accepted or rejected the release request. It takes one of the following symbolic values:

- normal;
- not finished; or
- user defined.

8.2.1.2 User-information

Either the requestor or acceptor may optionally include user information on the request or response primitive. Its meaning depends on the ASO-context that is in effect.

8.2.1.3 Result

This parameter is used by the acceptor to indicate if the request to release the association normally is acceptable. It takes one of the following symbolic values:

- affirmative; or
- negative.

8.2.2 A-RELEASE service procedure

An ACSE service-user that desires to release the association issues an A-RELEASE request primitive. This requestor cannot issue any further primitives other than an A-ABORT request primitive until it receives an A-RELEASE confirm primitive.

The ACSE service-provider issues an A-RELEASE indication primitive to the acceptor. The acceptor then cannot issue any ACSE primitives other than an A-RELEASE response primitive or an A-ABORT request primitive.

The acceptor replies to the A-RELEASE indication primitive by issuing an A-RELEASE response primitive with a Result parameter that has a value of "affirmative" or "negative".

If the acceptor gives a negative response, it may once again use any service provided by the ASEs included in the ASO-context that is in effect (with the exception of an A-ASSOCIATE). If it gave a positive response, it cannot issue any further primitives for the association.

The ACSE service-provider issues an A-RELEASE confirm primitive with an "affirmative" or "negative" value for the Result parameter. If the value is "negative", the requestor may once again use any of the services provided by the ASEs of the application context that is in effect (with the exception of the A-ASSOCIATE).

If the value of the Result parameter is "affirmative", the association has been released.

When an ASO-association is released, the effect on supported associations is determined by the definition of the CF.

A requestor in a peer ASO may disrupt the A-RELEASE service procedure by issuing an A-ABORT request. The acceptor receives an A-ABORT indication. The association is released with the possible loss of information in transit.

An A-RELEASE service procedure collision results when requestors in both ASOs simultaneously issue an A-RELEASE request primitive. In this situation, both ACSE service-users receive A-RELEASE indication primitives; both ACSE service-users invoke the A-RELEASE response primitive; and both are delivered A-RELEASE confirm primitives, such that the service user sees no collision (see in 7.2.3.5) ITU-T Rec. X.227 *bis* | ISO/IEC 15954. The association is released when both ACSE service-users have received an A-RELEASE confirm primitive.

8.3 A-ABORT service

The A-ABORT service is used by a requestor in either ASO to cause the abnormal release of the association. It is a non-confirmed service. However, because of the possibility of an A-ABORT service procedure collision (see 9.3.5), the delivery of the indication primitive is not guaranteed. However, both ASOs are aware that the association has been released.

8.3.1 A-ABORT parameters

Table 5 lists the A-ABORT parameters.

Table 5 – A-ABORT parameters

Parameter name	Req	Ind
Abort source		M
Diagnostic	U	C(=)
User-information	U	C(=)

8.3.1.1 Abort source

This parameter indicates the initiating source of this abort. It takes one of the following symbolic values:

- ACSE service-user; or
- ACSE service-provider.

8.3.1.2 Diagnostic

The requestor may optionally include diagnostic information on the request primitive. It takes one of the following symbolic values:

- no reason given;
- protocol error;
- authentication-mechanism Name not recognized;
- authentication-mechanism Name required;
- authentication failure;
- authentication required.

8.3.1.3 User-information

The requestor may optionally include user information on the request primitive. Its meaning depends on the ASO-context that is in effect.

NOTE – When ACSE is supported with version 1 of the session-protocol, this parameter is subject to length restrictions mentioned in Annex D of ITU-T Rec. X.227 *bis* | ISO/IEC 15954. For use with version 1, the A-ABORT service procedure does not transfer any of its own semantics, thus allowing the maximum possible length for presentation data value(s) of the User information parameter. In this situation, the Abort source parameter of the A-ABORT indication primitive always indicates "ACSE service-user".

8.3.2 A-ABORT service procedure

An ACSE service-user that desires to abnormally release the association issues the A-ABORT request primitive. This requestor cannot issue any further primitives for the association.

The ACSE service-provider issues an A-ABORT indication primitive to the acceptor. The ACSE service-provider assigns the value of "ACSE service-user" for the Abort source parameter. The association has been released. When the ASO is the AE, the underlying connection is also released.

The ACSE service-provider may itself cause the abnormal release of the association because of internal errors detected by it. In this case, the ACSE service-provider issues A-ABORT indication primitives to both the communicating ASOs. The ACSE service-provider assigns the value of "ACSE service-provider" to the Abort source parameter. The User-information parameter is not used.

8.4 A-P-ABORT service

The A-P-ABORT service is used by the ACSE service-provider to signal the abnormal release of the association due to problems in services below the Application Layer. This occurrence indicates the possible loss of information in transit. A-P-ABORT is a provider-initiated service.

8.4.1 A-P-ABORT parameter

Table 6 lists the A-P-ABORT parameter.

Table 6 – A-P-ABORT parameters

Parameter name	Ind
Provider reason	P

8.4.1.1 Provider reason

This parameter is as defined in ITU-T Rec. X.216 | ISO/IEC 8822.

8.4.2 A-P-ABORT service procedure

When the supporting association is aborted, a corresponding A-P-ABORT indication primitive is issued to the ACSE service-user. The association is abnormally released. A-P-ABORT does not necessarily abort higher level associations. Such effects will be determined by the CF.

8.5 A-DATA service

The A-DATA service is used to transfer data among ASOIs once an ASO-association has been established. It is an unconfirmed service.

8.5.1 A-DATA parameters

See Table 7.

Table 7 – A-DATA parameters

Parameter name	Req	Ind
A-User-data	M	M(=)

8.5.1.1 A-User-data

The A-User-data parameter is mandatory. This parameter has meaning only to the ASO on which the ASO-association terminates.