INTERNATIONAL STANDARD

ISO/IEC 9545

Information technology — Open Systems Interconnection — Application Layer structure

Systèmes de traitement de l'information — Interconnexion de systèmes ouverts — Structure de la couche application

Contents

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) together form a system for worldwide standardization as a whole. 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.

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 approval before their acceptance as International Standards. They are approved in accordance with procedures requiring at least 75 % approval by the national bodies voting.

International Standard ISO/IEC 9545 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology.*

Annex A of this International Standard is for information only.

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Introduction

This International Standard is a refinement of the description of the OSI Application Layer contained in ISO 7498.

The purpose of this International Standard is to provide a basis for co-ordinating the development of Application Layer standards and to enable existing International Standards to be placed in perspective within the OSI reference model. It defines the internal structure of the Application Layer, providing a framework for the development of Application Layer standards. It also describes the general principles underlying the operation of application-protocols.

The following subjects are covered by this International Standard:

a) the relationship between distributed information processing and OSI communication services;

b) the structure of application-entities;

c) the OSI service and protocol structure in the Application Layer; and

d) application-context.

This International Standard only considers those aspects of distributed information processing for an application which are relevant for the derivation of generic requirements for the structuring of Application Layer communications.

The architectural framework specified in this International Standard embodies concepts that may not be fully supported by existing Application Layer International Standards. However, these concepts have been specified so as to provide a basis for the development of future Application Layer International Standards which, it is anticipated, will require their use.

NOTE — This framework may be extended to support more generalized application-entity structures including recursive use of structures defined in this International Standard.

This International Standard may be subject to future expansion, particularly with regard to connectionless mode communication, multi-peer communication, multi-party communication, security, application-context management, Application Layer relationships, recovery, and Open Distributed Processing.

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1 Scope

2 Normative references

This International Standard refines the Basic Reference Model for OSI to provide a framework for co-ordinating the development of existing and future Application Layer standards. It is provided for reference by Application Layer standards.

In particular this International Standard:

    a)   defines the nature of standards in the Application Layer and the relationships among them;

    b) defines the architectural framework in which individual OSI Application Layer protocols shall be developed.

    c)   defines the categories of identifiable objects which are necessary for the specification and operation of protocols;

    d)   relates distributed information processing activities to the standards in the Application Layer.

This International Standard does not specify services and protocols for OSI. It is neither an implementation specification for systems, nor a basis for appraising the conformance of implementations. Further, it addresses neither the requirements for, nor the form of, documentation of such services and protocols.

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 7498 : 1984, *Information processing systems - Open Systems Interconnection - Basic Reference Model.*

ISO 7498-3: 1989, *Information processing systems - Open Systems Interconnection - Part 3: Naming and Addressing.*

ISO 8649: 1988, *Information processing systems - Open Systems Interconnection - Service Definition for the Association Control Service Element.*

ISO 8822: 1988, *Information processing systems - Open Systems Interconnection - Connection - oriented presentation service definition.*

ISO/TR 9007: 1987, *Information processing systems - Concepts and terminologies for the conceptual schema and the information base.*

3 Definitions

3.1 For the purposes of this International Standard, the following terms as defined in ISO 7498 apply:

    a) application-process;

    b) application-entity;

    c) (N)-function;

    d) (N)-layer;

    e) (N)-protocol;

    f) (N)-protocol-control-information;

    g) (N)-protocol-data-unit;

    h) real open system; and

    i) transfer syntax.

3.2 For the purposes of this International Standard, the following terms as defined in ISO 7498-3 apply:

    a) (N)-association;

    b) (N)-directory-function;

    c) (N)-protocol-addressing-information; and

    d) (N)-service-access-point-address.

3.3 For the purposes of this International Standard, the following terms as defined in ISO/TR 9007 apply:

    a) Conceptual Schema;

    b) Information Base; and

    c) Universe of Discourse.

3.4 For the purposes of this International Standard, the following terms as defined in ISO 8822 apply:

    a) abstract syntax; and

    b) presentation context.

3.5 For the purposes of this International Standard, the following definitions apply.

3.5.1 application-association, association: A co-operative relationship between two application-entity-invocations for the purpose of communication of information and co-ordination of their joint operation. This relationship is formed by the exchange of application-protocol-control-information using the Presentation Service.

3.5.2 application-context: A set of rules shared in common by two application-entity-invocations in order to enable their co-operative operation (see 5.7).

NOTE 1 — An application-context is a shared conceptual schema for the universe of discourse for communication.

3.5.3 application-context-definition: The description of an application-context.

3.5.4 application context name: A name that unambiguously identifies an application-context-definition.

3.5.5 application-entity-invocation: A specific utilization of part or all of the capabilities of a given application-entity in support of the communications requirements of an application-process-invocation.

3.5.6 application-entity-type: A description of a class of application-entities in terms of a set of capabilities defined for the Application Layer.

3.5.7 application-process-invocation: A specific utilization of part or all of the capabilities of a given application-process in support of a specific occasion of information processing.

3.5.8 application-process-type: A description of a class of application-processes in terms of a set of interworking capabilities.

3.5.9 application-service-element: A set of application-functions that provides a capability for the interworking of application-entity-invocations for a specific purpose.

NOTE 2 — This definition refines the original definition of application-service-elements in ISO 7498.

3.5.10 association control service element: An application-service-element that provides the exclusive means for establishing and terminating all application-associations.

NOTE 3 — The functionality of this application-service-element is defined in ISO 8649.

3.5.11 multiple association control function: A component of the application-entity-invocation that co-ordinates the interactions among multiple associations within an application-entity-invocation in order to provide a co-ordinated service.

3.5.12 single association control function: The component of a single association object that represents the use of those rules in the application-context concerning interactions among application-service-elements within a single association object.

3.5.13 single association object: The collection of things in an application-entity-invocation related to a single application-association.

4 Abbreviations

ACSE	Application Control Service Element
AE	application-entity
AP	application-process
APDU	application-protocol-data-unit
APCI	application-protocol-control-information
ASE	application-service-element
MACF	multiple association control function
OSI	Open Systems Interconnection
SACF	single association control function
SAO	single association object

5 Application Layer Concepts

5.1 Introduction

5.1.1 International Standards for OSI are intended to support the communication requirements of applications (i.e., information processing tasks) requiring co-ordinated processing activities in two or more real open systems. In particular, standards for the OSI Application Layer define procedures for the support of distributed information processing.

5.1.2 The Application Layer is supported by the lower layers in OSI. In particular, the Presentation Layer contains facilities for representing information exchanged between application-entities (AEs), and the Session Layer contains mechanisms that may be used for controlling interactions between AEs.

5.1.3 The Application Layer differs from the other layers of OSI in several important respects. Entities in the Application Layer are made up of a collection of application-service-elements (ASEs), each of which is defined by a set of service and protocol standards. These ASEs are combined in various ways to form various types of AEs. The Application Layer, as the highest layer of OSI, does not provide connections within the Application Layer. As a result, relationships formed by the transfer of information between AE-invocations in the Application Layer have particular significance.

5.2 Fundamental concepts

5.2.1 In ISO 7498, the co-operative operation of real open systems is modelled in terms of the interactions between application-processes (APs) in these systems. An AP is an abstract representation of those elements of a real open system which perform information processing for a particular application. Depending upon the nature of an application, an AP may only need to communicate with other APs intermittently; moreover, the set of APs involved in distributed processing for an application may change with time.

5.2.2 Co-operative operation between APs requires that they share sufficient information to interact and carry out processing activities in a compatible manner.

NOTE — This shared information is referred to as a universe of discourse in the terminology of ISO/TR 9007. The description of a universe of discourse is a conceptual schema.

5.2.3 The information determining the nature of the interactions between AP-invocations is of three kinds:

    a)   Information describing the set of objects (using this term in its most general sense) which

are the subject of distributed information processing activities.

b) Information describing the procedures to be used to effect communication between the AP-invocations for the control and co-ordination of distributed information processing.

c) Information representing the net effect (i.e., state) of past interactions between the AP-invocations.

NOTE — This is a portion of the shared information base in the terminology of ISO/TR 9007.

The purpose of OSI Application Layer standards is to provide definitions of procedures for interworking which are related to these three kinds of information.

5.2.4 The structuring of the Application Layer into components described in this International Standard does not prescribe whether the information contained in any one of these components is, or is not, accessible to any other component that may be present in the AE-invocation of which it is a part.

5.3 Application-Processes

5.3.1 An AP represents a set of resources, including processing resources, within a real open system that may be used to perform a particular information processing activity (the AP concept is defined in ISO 7498). An AP may organise its interactions with other APs in whatever way is necessary to achieve a particular information processing goal: no constraints are imposed by this International Standard either on the form of these interactions or on the possible relationships that may exist between them.

NOTE — For instance, an AP could schedule its interactions with other APs to take place either sequentially or concurrently.

5.3.2 The activity of a given AP is represented by one or more AP-invocations. Co-operation between APs takes place via relationships established among AP-invocations. At a particular time, an AP may be represented by none, one or more AP-invocations. An AP-invocation is responsible for co-ordinating its interactions with other AP-invocations. Such co-

ordination is outside the scope of this International Standard.

5.4 Application-Entities

5.4.1 The aspects of an AP which need to be taken into account for the purpose of OSI are represented by one or more AEs. An AE represents a set of OSI communication capabilities of a particular AP.

5.4.2 An AE represents one, and only one, AP in the OSI environment. Different APs may be represented by AEs of the same AE-type. An AP may be represented by a set of AEs: each AE in this set is of a different AE-type.

5.4.3 An AE-invocation represents a specific use of the capabilities of an AE. It represents specific communication activities of an AP-invocation and is an integral part of that AP-invocation. The aspects of an AP-invocation that need to be taken into account for the purposes of open systems interconnection are represented by one or more AE-invocations.

5.4.4 An AE-invocation models the communication functions together with the associated state information for particular communication activities of an AP-invocation. Such activities are progressed through communication between AE-invocations related by application-associations.

5.4.5 An AE-invocation may be a partner in a number of application-associations either consecutively or concurrently. The number of these application-associations may change with time. In particular, there may be periods of time when an AE-invocation is not a party to any application-associations. The lifetime of an AE-invocation is not determined by the duration of the application-associations in which it is a participant.

5.4.6 The state information modelled by an AE-invocation reflects the net effect of its communications with other AE-invocations. The existence of this state information provides a basis for modelling the co-ordinated consecutive or concurrent use of multiple application-associations. It also provides a basis for modelling a relationship, between a pair of AE-invocations, whose duration is not bound to the lifetime of a particular application-association. For example, this provides one possible

method for modelling the continuation of an activity following the loss of an application-association.

5.4.7 The lifetime of an AE-invocation is controlled by the AP-invocation which it represents in the OSI environment. An AP-invocation may have a longer lifetime than any or all of its AE-invocations. There may be zero or more AE-invocations representing an AP-invocation at any particular time.

5.5 Application-Service-Elements

5.5.1 An ASE is a set of functions that provides OSI communication capabilities for the interworking of AE-invocations for a specific purpose.

NOTE — Different functions can be grouped into one single ASE or split into several ASEs. In order to avoid unnecessary proliferation of different ASEs, the following should be considered:

   a) grouping of functions into an ASE must contain at least all the functions and the corresponding APDUs which are required for a protocol machine which is logically complete and consistent in itself;

   b) the grouping of functions into different ASEs has to occur in such a way that the ASEs can be specified independently of each other.

5.5.2 The capabilities of an ASE shall be defined by the specification of a set of application-protocol-data-units (APDU) and the procedures governing their use. This constitutes the application-protocol between two ASEs of the same kind.

5.5.3 An AE may be composed of one or more ASEs of different kinds in order to realize a specific composite communication capability for a particular purpose.

5.6 Application-Associations

5.6.1 An application-association is a co-operative relationship between two AE-invocations for the purpose of communication of information and co-ordination of their joint operation. This relationship is formed by the exchange of application-protocol-control-information (APCI) using the Presentation Service. The properties of this relationship are characterised by a set of rules and state information

governing the mutual communication behaviour of the particular pair of AE-invocations.

NOTE _ The pair of AE-invocations in an application-association may have different roles; as a consequence they may exhibit complementary rather than similar communication behaviours.

5.6.2 When communication is required between two AEs to meet the needs of an application, one or more application-associations are established between AE-invocations of the two AEs. An AE-invocation may support a number of application-associations simultaneously, sequentially or both, with one or more other AE-invocations.

5.6.3 An application-association-identifier may be associated with an application-association. This application-association-identifier is unique within the scope of the pair of associated AE-invocations. It provides the means to identify the related state information in each AE-invocation.

5.7 Application-Context

5.7.1 A pair of AE-invocations must have shared knowledge, and follow a common set of rules that governs their communication. Such a set of rules is called an application-context.

NOTE — An application-context is a shared conceptual schema for the universe of discourse for communication.

5.7.2 An application-association has only one application-context. The set of rules that make up the application-context may contain rules for alteration of that set of rules. The set of rules may contain alternatives, together with rules for selecting among these alternatives according to the requirements of the APs.

NOTE — The use of a rule to select among alternative rules within an application-context does not constitute an alteration of the application-context. However, the use of a selection rule does change the state information maintained by AE-invocations with respect to an application-association.

5.7.3 An application-context includes the rules that describe a set of things that must be known by both AE-invocations, relationships among those things,