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Information technology — Open Systems Interconnection — Basic Reference Model — Conventions for the definition of OSI services

Technologies de l'information — Interconnexion de systèmes ouverts — Modèle de Référence de Base — Conventions pour la définition des services OSI

Contents

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.

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.

International Standard ISO/IEC 10731 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology,* Subcommittee SC 21, *Open Systems interconnection, data management and open distributed processing,* in collaboration with ITU-T. The identical text is published as ITU-T Recommendation X.210.

Annexes A, B, C, D, E and F of this International Standard are for information only.

Introduction

The service conventions prescribed in this International Standard ensure that the services of OSI standards are defined in a uniform way, which is consistent with the OSI Reference Model and the application layer structure standard. The text was developed jointly with ITU-T. The main intent of this International Standard is to provide extended capabilities, which are useful in specifying services within the application layer and also to allow greater flexibility to accommodate new services among the layers in the future.

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INTERNATIONAL STANDARD

ITU-T RECOMMENDATION

INFORMATION TECHNOLOGY —
OPEN SYSTEMS INTERCONNECTION —
BASIC REFERENCE MODEL —
CONVENTIONS FOR THE DEFINITION OF OSI SERVICES

1   Scope

This Recommendation | International Standard

—   establishes definitions of terms and conventions for use by Recommendations | International Standards defining OSI-services within the scope of the Basic Reference Model of Open Systems Interconnection;

—   specifies the application of these terms and conventions to the Recommendations | International Standards defining OSI-services within the Application Layer of the Basic Reference Model of Open Systems Interconnection;

—   specifies the application of these terms and conventions to Recommendations | International Standards defining (N)-services for Layers 1 - 6 of the Basic Reference Model of Open Systems Interconnection.

2   Normative references

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

2.1   Identical Recommendations and International Standards

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

2.2   Paired Recommendations | International Standards equivalent in technical content

—   CCITT Recommendation X.200 (1988), *Reference model of open systems for CCITT applications.*

—   ISO/IEC 7498:1984, Information technology – *Open Systems Interconnection – Basic Reference Model.*

3   Definitions

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

3.1   Terms defined in the OSI Basic Reference Model

This Recommendation | International Standard builds on the concepts developed in CCITT Rec. X.200 | ISO 7498 and makes use of the following terms defined in that Recommendation | International Standard:

a)   (N)-connection;

b)   (N)-connection-endpoint;

c)   (N)-entity;

d)   (N)-layer;

e) open system;

f) (N)-service;

g) (N)-service-access-point;

h) (N)-subsystem.

3.2 Terms defined in the Application Layer Structure

This Recommendation I International Standard makes use of the following terms defined in ITU-T Rec. X.207 (1993) I ISO/IEC 9545:

a) application-entity-invocation;

b) application-service-element;

c) application-service-object;

d) control function.

3.3 Terms defined in this Recommendation I International Standard

NOTE – Several terms in the following list are structured with the prefix "OSI-". The terms thus prefixed are intended to have a consistent meaning across all layers of OSI, including the Application Layer.

In the case of the OSI-services provided by the six lower layers, the prefix "OSI-" can be replaced by the equivalent prefix "(N)-" which particularises the concept to the generic (N)-layer.

Further particularisation is needed in other OSI standards, such as replacing "OSI-" with the abbreviation for one of the six lower layers, or replacing "OSI-" with the abbreviation for a particular application-service-element or group of application-service-elements which provide an OSI-service within the Application Layer.

3.3.1   OSI-service: The capability of an OSI-service-provider which is provided to OSI-service-users at the boundary between the OSI-service-provider and the OSI-service-users.

NOTE – The OSI-service defines the external behaviour of the OSI-service-provider independent of the mechanisms used to provide that behaviour. (N)-layers, (N)-entities, application-service-elements, etc. are components of an OSI-service-provider.

3.3.2   OSI-service-provider: An abstract representation of the totality of those entities which provide an OSI-service to OSI-service-users.

3.3.3   OSI-service-user: An entity in a single open system that makes use of an OSI-service.

NOTE – The OSI-service-user makes use of the OSI-service through a collection of OSI-service primitives defined for the OSI-service.

3.3.4   OSI-service primitive; primitive: An abstract, atomic, implementation-independent representation of an interaction between an OSI-service-user and its OSI-service-provider.

NOTE – The term "primitive" is used in some documents in place of the preferred form "OSI-service primitive".

3.3.5   submit (primitive): An OSI-service primitive initiated by an OSI-service-user.

3.3.6   deliver (primitive): An OSI-service primitive initiated by an OSI-service-provider.

3.3.7   requestor: In a particular exchange of OSI-service-primitives, an OSI-service-user that issues a submit primitive and as a result may receive one or more deliver primitives.

3.3.8   acceptor: In a particular exchange of OSI-service-primitives, an OSI-service-user that receives a deliver primitive and as a result may issue one or more submit primitives.

3.3.9   request (primitive); requestor.submit (primitive): A submit primitive issued by a requestor.

3.3.10   indication (primitive); acceptor.deliver (primitive): A deliver primitive received by an acceptor.

3.3.11   response (primitive); acceptor.submit (primitive): A submit primitive issued by an acceptor.

3.3.12   confirm (primitive); requestor.deliver (primitive): A deliver primitive received by a requestor.

3.3.13   OSI-facility: A part of an OSI-service designated within a Recommendation I International Standard.

NOTES

1   There are existing Recommendations I International Standards for OSI-service definitions which use the form "...-service" for terms relating to such a designated part of the total OSI-service. The form "...-facility" is to be strongly preferred for all such usages.

2   The term "OSI-facility" defined here is distinguished from the term "facility" (without the qualification "OSI-") used, for example, in CCITT Rec. X.25 and ISO/IEC 8208.

3.3.14   OSI-mandatory-facility: An OSI-facility which is always provided.

3.3.15   OSI-provider-optional-facility: An OSI-facility which may or may not be provided.

3.3.16   OSI-user-optional-facility: An OSI-facility which is only used if all peer OSI-service-users agree.

3.3.17   OSI-confirmed-facility: An OSI-facility in the operation of which an explicit confirmation is given from the OSI-service-provider to the initiating OSI-service-user.

3.3.18   OSI-non-confirmed-facility: An OSI-facility in the operation of which no explicit confirmation is given from the OSI-service-provider to the initiating OSI-service-user.

3.3.19   OSI-provider-initiated-facility: An OSI-facility the operation of which is initiated by the OSI-service-provider.

3.3.20   OSI-local view: The shared behaviour of an OSI-service-user and an OSI-service-provider in terms of their interactions at an OSI-service boundary.

NOTE – In the case of (N)-services, the OSI-service boundary is to be understood as the set of (N)-service-access-points for the (N)-subsystem.

3.3.21   symmetrical service: An OSI-service for which the definitions of all OSI-local views are the same (i.e. there is only one type of OSI-local view).

3.3.22   asymmetrical service: An OSI-service for which the definitions of all OSI-local views are not all the same (i.e. there are several types of OSI-local view).

3.3.23   multi-peer: A mode of operation of an OSI-service which supports exchanges between more than two OSI-service-users.

4   Abbreviations

ASE application-service-element

ASO   application-service-object

OSI Open Systems Interconnection

SECTION 1 – GENERAL MODEL AND CONVENTIONS

5   Model of service

5.1   The concept of OSI-service definition

5.1.1   An OSI-service is that capability of an OSI-service-provider which is offered to OSI-service-users at the boundary between the OSI-service-provider and the OSI-service-users.

5.1.2   An OSI-service definition is the complete expression of the behaviour of an OSI-service-provider as seen by its OSI-service-users. An OSI-service definition does not describe the internal behaviour of an OSI-service-provider. There are many mechanisms that may be specified to provide an OSI-service. It is thus fundamental that the conventions used to define an OSI-service allow an OSI-service definition to be expressed totally independently from any subsequent specification of the protocol or protocols which support that OSI-service.

5.1.3   To make proper use of an OSI-service, it is necessary for an OSI-service-user to reference the OSI-service definition. As a result, an OSI-service definition constrains the behaviour of the OSI-service-users. Nevertheless, it is not the purpose of an OSI-service definition to express the complete behaviour of OSI-service-users.

5.2 The general model of an OSI-service definition

5.2.1 This clause describes a general model for the definition of an OSI-service which is applicable to all modes of communication (connectionless-mode, connection-mode, multi-peer, etc.) in all seven layers.

5.2.2 An OSI-service-user and an OSI-service-provider interact at a OSI-service boundary in an open system. The interactions between the OSI-service-user and the OSI-service-provider constitute an abstract interface at the OSI-service boundary. This abstract interface is the OSI-local view. The OSI-local view is defined in terms of the set of OSI-service primitives which the OSI-service user and the OSI-service-provider are allowed to exchange, together with the sequencing rules which apply to these exchanges.

5.2.3 An OSI-service primitive issued by an OSI-service-user to its OSI-service-provider is a definition of:

a) the semantics of the information conveyed by the OSI-service primitive;

b) the constraints imposed on the OSI-service-user in order to issue the OSI-service primitive; and

c) the requirements for action that the OSI-service-provider shall meet as a result of receiving the OSI-service primitive.

5.2.4 An OSI-service primitive issued by an OSI-service-provider to one of its OSI-service-users is a definition of:

a) the semantics of the information conveyed by the OSI-service primitive;

b) the conditions to be fulfilled by the OSI-service-provider in order to issue the OSI-service primitive; and

c) the possible expectations of the OSI-service-provider regarding the reactions of the OSI-service-user resulting from its receipt of the OSI-service primitive.

5.2.5 The semantics of these OSI-service primitives and the complete set of relationships among OSI-local views are described in a model which defines the virtual environment in which the OSI-service applies. A relationship exists among OSI-local views when there is a correlation among OSI-service primitives at each of these several OSI-local views.

NOTES

1 In some cases, the model is explicitly described in a standard, in other cases (e.g. (N)-layer-services) the model may be implicitly known.

2 The semantics of the OSI-service primitives may be described, for example, in terms of abstract actions on abstract objects.

3 In a simple case, the model of a peer-to-peer OSI-service establishes a one to one correspondence between the two OSI-local views; in a more complex case, the model of an OSI-service may establish a one to many correspondence among some of the OSI-local views participating in the OSI-service.

5.2.6 An OSI-service definition comprises:

a) the definition of, or reference to, the model introduced in 5.2.5;

b) the definition of the OSI-local views of relevance to the OSI-service (these definitions may all be the same: symmetrical service, or they may not: asymmetrical service);

c) the definition of the correlation among OSI-service primitives for this set of OSI-local views.

5.2.7 The definition of the correlation among OSI-service primitives is itself formed by the following three components:

a) the definition of, or reference to, the model introduced in 5.2.5

b) the definition of the relationships among OSI-service primitives within the scope of each OSI-local view;

c) based on the relationships among OSI-local views, the definition of the correlations among OSI-service primitives that pertain to separate (but related) OSI-local views.

NOTES

1 Aspects of such a definition of the correlations among OSI-service primitives seen by different OSI-service-users include

– the definition of the relationships among submit primitives originated at one OSI-local view and deliver primitives issued at other related OSI-local views;

      – the definition of the effects of possible collisions among submit primitives originated at one OSI-local view with submit primitives originated at other, related OSI-local views, etc.

    2   Only the OSI-local view is visible to the OSI-service-user. A specific OSI-service-user is only concerned with the exchange of OSI-service primitives at the OSI-service boundary for this OSI-local view. The possible correlation between the OSI-service primitives seen by different OSI-service-users does not need to be known by them and, consequently, is expressed in the correlation definition and not in the definitions of the separate OSI-local views.

    3   The definition of the correlations among OSI-service primitives seen by different OSI-service users is a high-level definition. For example, although in a particular case a correlation definition might specify that an information request primitive from one OSI-service-user results in the receipt of information request primitives by a number of OSI-service-users holding the information to be accessed, it would not specify how the OSI-service-users are located nor how the requests are routed to them.

5.2.8   There are two basic types of OSI-service primitive: the submit primitive invoked by the OSI-service-user to exchange information with the OSI-service-provider, and the deliver primitive invoked by the OSI-service-provider to exchange information with the OSI-service-user.

5.2.9   Figure 1 illustrates an idealized view of a complete composite OSI-service. This composite OSI-service consists of several OSI-service primitives which, when executed successfully in the correct sequence, result in the objective of the initiating OSI-service-user.

NOTES

    1   Figure 1 illustrates four OSI-service-users, of which three are participating in an exchange of OSI-service primitives with the OSI-service-provider. Only the corresponding OSI-local view is apparent to an OSI-service-user.

    2   While it is convenient to view the OSI-service-provider as one unit for the purposes of illustration, it must not be overlooked that it is a distributed system. This means that the OSI-service-provider cannot be considered a single state machine; that there are time delays between service actions, and that there exists the possibility of loss, error, and misordering associated with real communication.

    3   If Figure 1 is reproduced in an actual OSI-service standard, it should be accompanied by explanatory text similar to 5.2.9 and Note 2.
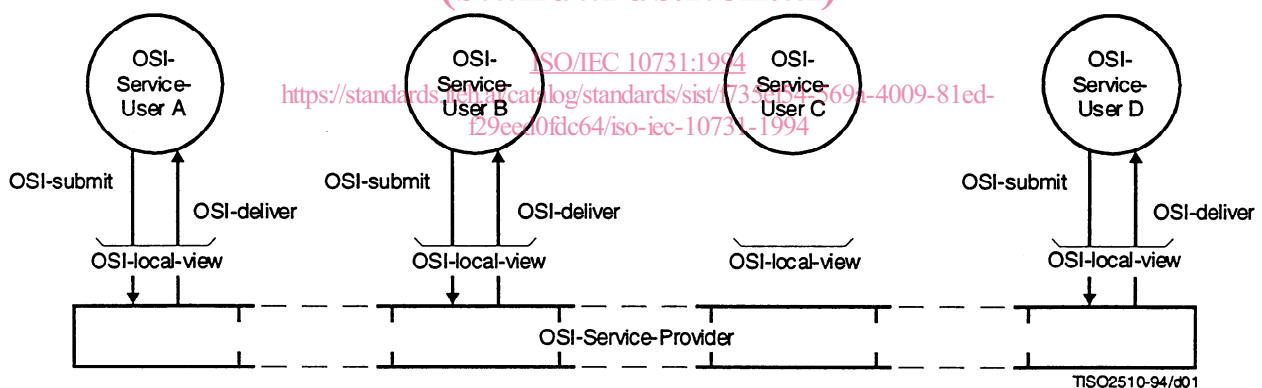

Figure 1 – OSI-service model

5.2.10   At a given point in time, the state of the OSI-local view of an OSI-service is completely determined by the preceding sequence of OSI-service primitives that has been observed at the OSI-service boundary.

5.2.11   Deliver primitives issued at an OSI-local view are usually correlated to submit primitives invoked by OSI-service-users at other OSI-local views. In some specific cases (e.g. provider initiated) a deliver primitive may be issued without any submit primitive having been invoked at any other OSI-local view.

5.2.12   An OSI-service definition contains one or more definitions of OSI-local views. Where there is only one definition of OSI-local views, the OSI-service is said to be symmetrical and needs no additional identification. Correspondingly, when an OSI-service is asymmetrical, it requires names to distinguish OSI-local views having different definitions. These names need only be unique within the OSI-service definition, but should be chosen to facilitate understanding (e.g. CLIENT and SERVER in Annex E).

5.3 The concepts of requestor and acceptor

5.3.1 An OSI-service-user that issues a submit primitive and as a result may receive one or more deliver primitives is, for that exchange of OSI-service primitives, called a requestor.

5.3.2 An OSI-service-user that receives a deliver primitive and as a result may issue one or more submit primitives is, for that exchange of OSI-service primitives, called an acceptor.

5.3.3 An OSI-service-user can have the requestor role for some of the interactions and the acceptor role for others.

NOTE – The constraints on the behaviour of the OSI-service-user or OSI-service-provider are entirely determined by the specific OSI-service primitives issued or invoked and the state of the OSI-service-user or OSI-service-provider as appropriate.

5.4 Categories of facilities within an OSI-service

Parts of an OSI-service can be categorized as

- a) OSI-mandatory-facilities;

- b) OSI-provider-optional-facilities;

- c) OSI-user-optional-facilities.

An OSI-user-optional-facility may be either an OSI-provider-optional-facility or an OSI-mandatory-facility, i.e. an OSI-facility mandatory for the provider but optional for the user.

5.5 Application of the model to various types of communication

5.5.1 The connectionless-mode service

For the basic operation of a connectionless-mode service:

- a) a submit primitive is always issued by a requestor OSI-service-user and is called a request primitive;

- b) a deliver primitive is always issued to an acceptor OSI-service-user and is called an indication primitive; and

- c) the relationship is specified between a submit primitive issued by a requestor and a deliver primitive issued to one or more acceptors.

NOTE – This description does not preclude the definition of OSI-service primitives for additional operations in some connectionless-mode services.

5.5.2 The connection-mode service

In a connection-mode service

- a) a submit primitive may be issued either by a requestor or by an acceptor OSI-service-user;

  1) a requestor.submit primitive is called a request primitive;

  2) an acceptor.submit primitive is called a response primitive;

- b) a deliver primitive may be issued either to a requestor or to an acceptor OSI-service-user;

  1) a requestor.deliver primitive is called a confirm primitive;

  2) an acceptor.deliver primitive is called an indication primitive;

- c) the relationship is specified between submit primitives issued by a requestor or by an acceptor, and deliver primitives issued to a requestor or to one or more acceptors. Figure 2 illustrates a multi-peer connection-mode service; Figure 3 illustrates a peer-to-peer connection-mode service. The relationships of the terms request, confirm, indication, and response to the requestor/acceptor, submit/deliver terms are shown.