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Technologies de l'information — Interconnexion de systèmes ouverts (OSI) — Définition du service de transport

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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.

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 8072 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 6, *Telecommunications and information exchange between systems*, in collaboration with ITU-T. The identical text is published as ITU-T Recommendation X.214.

This third edition cancels and replaces the second edition (ISO/IEC 8072:1994), which has been technically revised.

Introduction

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

This Recommendation | International Standard defines the Service provided by the Transport Layer to the Session Layer at the boundary between the Transport and Session Layers of the Reference Model. It provides for the designers of Session Protocols a definition of the Transport Service existing to support the Session Protocol and for designers of Transport Protocols a definition of the services to be made available through the action of the Transport Protocol over the underlying service. This relationship is illustrated in Figure Intro.1.

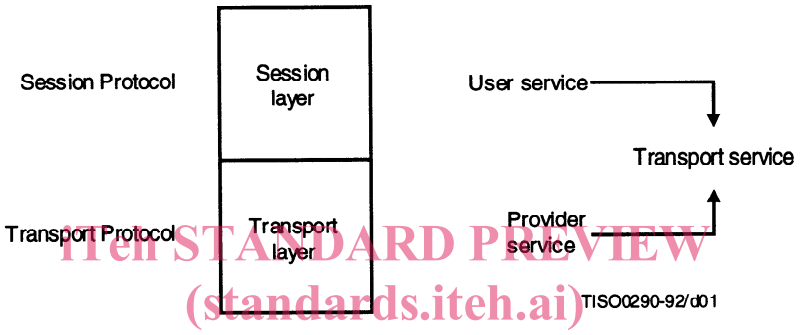

Figure Intro. 1 – Relationship of the Transport Service to OSI Transport and Session Protocols

Throughout the set of OSI Recommendations | International Standards, the term "Service" refers to the abstract capability provided by one layer of the OSI Reference Model to the layer above it. Thus, the Transport Service defined in this Recommendation | International Standard is a conceptual architectural Service, independent of administrative divisions.

NOTE – It is important to distinguish the specialized use of the term "Service" within the set of OSI Recommendations | International Standards from its use elsewhere to describe the provision of a service by an organization (such as the provision of a service, as defined in other Recommendations, by an Administration).

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INTERNATIONAL STANDARD

ITU-T RECOMMENDATION

INFORMATION TECHNOLOGY – OPEN SYSTEMS INTERCONNECTION – TRANSPORT SERVICE DEFINITION

SECTION 1 – GENERAL

1 Scope

This Recommendation | International Standard defines in an abstract way the externally visible service provided by the OSI Transport Layer in terms of:

a) the primitive actions and events of the service;

b) the parameter data associated with each primitive action and event;

c) the relationship between, and the valid sequences of, these actions and events.

The service defined in this Recommendation | International Standard is that which is provided by all OSI Transport Protocols (in conjunction with the Network Service) and which may be used by any OSI Session Protocol.

This Recommendation | International Standard does not specify individual implementations or products, nor does it constrain the implementation of entities and interfaces within a system. Conformance of equipment to this Recommendation | International Standard is achieved by conformance to the protocols specified to fulfil the Transport Service defined in this Recommendation | International Standard.

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

3 Definitions

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

3.1 Reference Model definitions

This Service Definition is based on the concepts developed in the OSI Reference Model (see ITU-T Rec. X.200 | ISO/IEC 7498-1), and makes use of the following terms defined in it:

a) expedited transport-service-data-unit;

b) transport-connection;

c) transport-connection endpoint;

d) Transport Layer;

e) Transport Service;

f) transport-service-access-point;

g) transport-service-access-point address;

h) transport-service-data-unit;

i) Network Layer;

j) Network Service;

k) network-connection;

l) interface flow control.

3.2 Service (Definition) conventions

This Service Definition also makes use of the following terms defined in ITU-T Rec. X.210 | ISO/IEC 10731, as they apply to the Transport Layer:

a) service-user;

b) service-provider;

c) primitive;

d) request;

e) indication;

f) response;

g) confirm.

3.3 Transport Service Definitions

For the purpose of this Service Definition, the following definitions also apply.

3.3.1 transport connection: An association established by a Transport Layer between two TS users for the transfer of data, which provides explicit identification of a set of transport data transmissions and agreement concerning the services to be provided for the set.

NOTE – This definition clarifies that given in ITU-T Rec. X.200 | ISO 7498-1.

3.3.2 calling TS user: A Transport Service user that initiates a transport connection establishment request.

3.3.3 called TS user: A Transport Service user with whom a calling TS user wishes to establish a transport connection.

NOTE – Calling TS users and called TS users are defined with respect to a single connection. A Transport Service user can be both a calling and a called TS user simultaneously.

3.3.4 transport connection-mode data transmission: The transfer of a TSDU from a source TSAP to a destination TSAP within the context of a TC that has previously been established.

3.3.5 transport connectionless-mode data transmission: The transmission of a TSDU from a source TSAP to one or more destination TSAPs outside the context of a TC and without any requirement to maintain any logical relationship among multiple TSDUs.

3.3.6 sending TS user: A Transport Service user that acts as a source of data during the data transfer phase of a transport-connection, or during a particular instance of transport connectionless-mode data transmission.

3.3.7 receiving TS user: A Transport Service user that acts as a sink of data during the data transfer phase of a transport-connection, or during a particular instance of transport connectionless-mode data transmission.

NOTE – A Transport Service user can be both a sending and a receiving TS user simultaneously.

3.3.8 group transport address: An address that identifies a particular group of TSAPs. A group Transport address may only be used to identify destination addresses.

4 Abbreviations

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

TS	Transport Service
TC	Transport-connection
TSAP	Transport-service-access-point
TSDU	Transport-service-data-unit
QOS	Quality of Service

5 Conventions

5.1 General conventions

This Service Definition uses the descriptive conventions given in ITU-T Rec. X.210 | ISO/IEC 10731.

5.2 Parameters

The available parameters for each group of primitives are set out in tables in clauses 12 to 14 and 19. Each "X" in the tables indicates that the primitive labelling the column in which it falls may carry the parameter labelling the row in which it falls.

Some entries are further qualified by items in brackets. These may be:

a) *Indications that the parameter is optional in some way:*

(U) indicates that the inclusion of the parameter is a choice made by the user.

b) *A parameter specific constraints:*

(=) indicating that the value supplied in an indication or confirm primitive is always identical to that supplied in the previous request or response primitive issued at the peer service access point.

6 Overview and general characteristics

The Transport Service provides transparent transfer of data between TS users. It relieves these TS users from any concern about the detailed way in which supporting communications media are utilized to achieve this transfer.

The Transport Service provides for the following:

a) *Quality of Service selection:*

The Transport Layer is required to optimize the use of available communications resources to provide the Quality of Service required by communicating TS users at minimum cost. Quality of Service is specified through the selection of values for Quality of Service parameters representing characteristics such as throughput, transit delay, residual error rate and failure probability.

b) *Independence of underlying communications resources:*

The Transport Service hides from TS users the difference in the Quality of Service provided by the Network Service. This difference in Quality of Service arises from the use of a variety of communications media by the Network Layer to provide the Network Service.

c) *End-to-end significance:*

The Transport Service provides for the transfer of data between two TS users in the case of the connection-mode Transport Service or between two or more TS users in the case of the connectionless-mode Transport Service in end systems.

d) *Transparency of transferred information:*

The Transport Service provides for the transparent transfer of octet-aligned TS user-data and/or control information. It does neither restrict the content, format, or coding of the information, nor does it ever need to interpret its structure or meaning.

e) *TS user addressing:*

The Transport Service utilizes a system of addressing which is mapped into the addressing scheme of the supporting Network Service. Transport-addresses can be used by TS users to refer unambiguously to TSAPs or a specific group of TSAPs.

7 Classes and types of Transport Service

There are two types of Transport Service:

a) a connection-mode service (defined in clauses 8 to 14); and

b) a connectionless-mode service (defined in clauses 15 to 19).

When referring to this Service Definition, a user or provider of TS shall state which type(s) of service it expects to use or provide.

There are no distinct classes of Transport Service defined.

SECTION 2 – DEFINITION OF THE CONNECTION-MODE SERVICE

8 Features of the connection-mode Transport Service

The connection-mode Transport Service offers the following features to a TS user:

a) The means to establish a TC with another TS user for the purpose of exchanging TSDUs. More than one TC may exist between the same pair of TS users.

b) Associated with each TC at its time of establishment, the opportunity to request, negotiate, and have agreed by the TS provider a certain Quality of Service as specified by means of Quality of Service parameters.

c) The means of transferring TSDUs on a TC. The transfer of TSDUs which consist of an integral number of octets is transparent, in that the boundaries of TSDUs and the contents of TSDUs are preserved unchanged by the TS provider and there are no constraints on the TSDU content imposed by the TS provider.

d) The means by which the receiving TS user may control the rate at which the sending TS user may send octets of data.

e) The means of transferring separate expedited TSDUs when agreed to by both TS users. Expedited TSDUs transfer is subject to a different flow control from normal data across the TSAP.

f) The unconditional and therefore possible destructive release of a TC.

9 Model of the connection-mode Transport Service

9.1 General

This Service Definition uses the abstract model for a layer service defined in ITU-T Rec. X.210 | ISO/IEC 10731. The model defines the interactions between the TS users and the TS provider which take place at the two TSAPs. Information is passed between a TS user and the TS provider by service primitives, which may convey parameters.

The primitives are abstract representations of TSAP interactions. They are solely descriptive and do not represent a specification for implementation.

9.2 Model of a Transport Connection

The operation of a TC is modelled in an abstract way by a pair of queues linking the two TSAPs. There is one queue for each direction of information flow (see Figure 1). Each TC is modelled by a separate pair of queues.

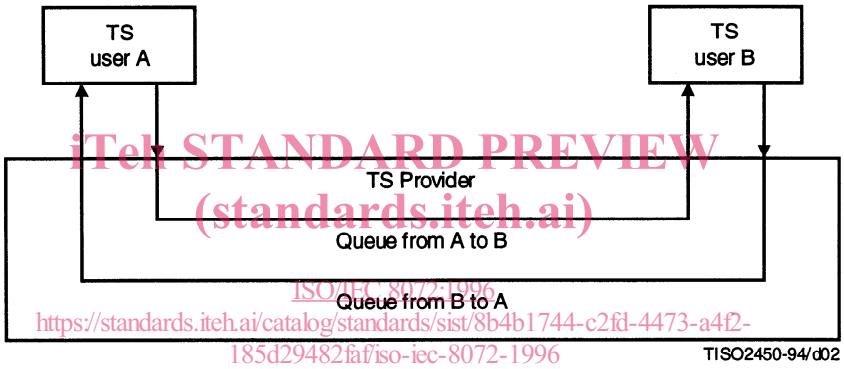

Figure 1 – Abstract model of a Transport Connection

The queue model is used to introduce the flow control feature. The ability of a TS user to add objects to a queue will be determined by the behaviour of the TS user removing objects from that queue and the state of the queue. Objects are entered and removed from the queue as a result of interactions at the two TSAPs.

The pair of queues is considered to be available for each potential TC.

The objects which may be placed in a queue by a TS user (see clauses 12 to 14) are:

a) connect objects (each representing all parameters contained in a T-CONNECT request or T-CONNECT response primitive);

b) octets of normal data;

c) indications of end-of-TSDU (completion of a T-DATA primitive);

d) expedited TSDUs (representing all parameters of a T-EXPEDITED-DATA primitive);

e) disconnect objects (each representing all parameters contained in a T-DISCONNECT primitive).

NOTES

1 Normal and expedited TSDU transfer will result in different objects being entered into the queue.

2 The description of flow control requires a less abstract description than that used for describing sequences of primitives in clauses 11 to 14. Each TSDU associated with a T-DATA primitive is here subdivided conceptually into a sequence of octets of data followed by an end-of-TSDU indication. The T-DATA request primitive occurs when the end-of-TSDU indication is entered into the queue. The T-DATA indication primitive occurs when the end-of-TSDU indication is removed from the queue. This does not imply any particular subdivision in any real interface.

The only objects which can be placed in a queue by the TS provider are disconnect objects (representing T-DISCONNECT primitives and their parameters).

TS user A, who initiates connection establishment by entering a connect object (representing a T-CONNECT request primitive) into the queue from A to B, is not allowed to enter any other object than a disconnect object into this queue until after the connect object representing the T-CONNECT confirm has been removed. In the queue from TS user B to TS user A, objects other than a disconnect object can be entered by TS user B only after TS user B has entered a connect object corresponding to a T-CONNECT response. The insertion of a disconnect object represents the initiation of the release procedure. The release procedure may be initiated at the times permitted in clause 14 and in the manner described in 11.2. The release procedure may be destructive with respect to other objects in the two queues.

A queue relates an ordered set of distinct objects in the following ways:

a) Queues are empty before a connect object has been added and can be returned to this state, with loss of their contents, by the TS provider under the circumstances as described in h) below.

b) Objects are added to the queue, subject of control by the TS provider.

c) Objects are normally removed from the queue, subject to control by the receiving TS user.

d) Objects are normally removed in the same order that they were added [but see g) and h) below].

e) A queue has a limited capacity, but this capacity is not necessarily either fixed or determinable.

f) The management of the queue capacity shall be such that normal data and end-of-TSDU indications cannot be added to the queue when its addition would prevent addition of an expedited TSDU or disconnect object. Similarly expedited TSDUs cannot be added if their addition would prevent the addition of a disconnect object.

In addition the TS provider may manipulate pairs of adjacent objects in the queue to allow:

g) *Reordering:*

The order of any pair of objects may be reversed if, and only if, the following object is of a type defined to take precedence over the preceding object. Expedited TSDUs take precedence over octets of normal data and end-of-TSDU indications (see Table 1).

h) *Deletion:*

Disconnect objects take precedence over any other object. Any object other than a disconnect object may be deleted by the TS provider if, and only if, the following one is a disconnect object (see Table 1).

If a connect object associated with a T-CONNECT request primitive is deleted in this manner, the disconnect object is also deleted. If a connect object associated with a T-CONNECT response primitive is deleted, the disconnect object is not deleted.

Whether the TS provider performs actions of types g) and h) or not, will depend on the behaviour of the TS users and on the agreed Quality of Service. In general, if the objects are not removed from the queue due to flow control expressed by the receiving TS user, the TS provider shall, after some unspecified period of time, perform all permitted actions of types g) and h).

NOTES

1 The internal mechanisms which support the operation of a queue are not visible in the Transport Service. A queue is one particular way of expressing the mutual interaction between primitives at different TSAPs. There may also be, for example:

a) constraints on the local ability to invoke primitives;

b) service proccdures defining particular sequencing constraints on some primitives.

2 A TC endpoint identification mechanism must be provided locally if the TS user and the TS provider need to distinguish between several TCs at a TSAP. All primitives must then make use of this identification mechanism to identify the TC to which they apply. This implicit identification is not shown as a parameter of the TS primitives, and must not be confused with the address parameters of the T-CONNECT primitives.