

JIS

JAPANESE INDUSTRIAL STANDARD

**Open Systems Interconnection
— Transport Service Definition**

JIS X 5108—1986

Translated and Published

by

Japanese Standards Association

Printed in Japan

19 S

In the event of any doubt arising,
the original Standard in Japanese is to be final authority.

JAPANESE INDUSTRIAL STANDARD

J I S

Open Systems Interconnection - Transport
Service Definition

X 5108-1986

1. Scope

This Japanese Industrial Standard specifies in an abstract way the externally visible transport layer service provided by the open systems interconnection, hereinafter referred to as the "OSI" in terms of

- (1) the primitive actions and events of the service;
- (2) the parameter data associated with each primitive action and event;
- (3) the relationship between, and the valid sequence of, the actions and events.

The service defined in this 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 Standard does not specify individual implementations or products, nor does it constrain the implementations of entities and interfaces within a computer system. There is, therefore, no conformance to this Standard.

2. Definitions

3.1 Reference Model Definitions This Standard is based on the concepts specified in JIS X 5003 and makes use of the following terms defined therein:

- (1) expedited transport-service-data-unit;
- (2) transport-connection;
- (3) transport-connection endpoint;
- (4) transport layer;
- (5) transport service;
- (6) transport-service-access-point;
- (7) transport-service-access-point address;
- (8) transport-service-data-unit;
- (9) network layer;
- (10) network service;
- (11) network-connection;
- (12) interface flow control

Applicable Standards, Corresponding Standard and Reference Standards:
See page 33.

2.1 Service Notation Definitions This Standard also makes use of the following terms defined by OSI service notation (refer to Reference).

- (1) service-user
- (2) service-provider
- (3) primitive
- (4) request (primitive)
- (5) indication (primitive)
- (6) response (primitive)
- (7) confirm (primitive)

2.3 Terms Defined in This Standard Terms defined in this Standard shall be as follows:

- (1) calling TS user A Transport Service user that initiates a transport-connection establishment request.
- (2) called TS user A Transport Service user with whom a calling TS user wishes to establish a transport-connection.

 Remark: 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 user simultaneously.
- (3) sending TS user A Transport Service user that acts as a source of data during the data transfer phase (refer to 12.) of a transport-connection.
- (4) receiving TS user A Transport Service user that acts as a sink of data during the data transfer phase of a transport connection.

Remark: A Transport Service user can be both a sending and a receiving TS user simultaneously.

3. Abbreviations

The following abbreviations are used in this Standard.

- (1) TS: Transport Service
- (2) TC: Transport-Connection
- (3) TSAP: Transport-Service-Access-Point
- (4) TSDU: Transport-Service-Data-Unit
- (5) QOS: Quality of Service

4. Notations

4.1 General Notations This Standard uses the descriptive notations defined in OSI service notations (refer to Reference).

4.2 Parameters The available parameters for each group of primitives are set out Tables 5 to 8.

The "○", "(U)" and "(=)" in the tables indicate the following:

- (1) ○ indicates that the primitive in the table shall have the parameter in the table in the cases except the following (2).
- (2) (U) indicates that the inclusion of the parameter is a choice made by the user.
- (3) (=) indicates that the value supplied in an indication or confirm primitive shall be always identical to that supplied in the previous request or response primitive issued at the peer service access point.

5. Overview and General Characteristics of Transport Service

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 the following:

- (1) Quality of Service Selection The Transport Layer is required to optimize the use of available communications resources to provide the QOS required by communicating TS users at minimum cost. QOS is specified through the selection of values for QOS parameters representing characteristics such as throughput, transit delay, residual error rate and failure probability.
- (2) Independence of Underlying Communication Resources The Transport Service hides from TS users the difference in the QOS provided by the NETWORK SERVICE. This difference in QOS arises from the use of a variety of communications media by the NETWORK LAYER to provide the NETWORK SERVICE.
- (3) End-to-end Significance The Transport Service provides for the transfer of data between two TS users in end systems.
- (4) Transparency of Transferred Information The Transport Service provides for the transparent transfer of octet⁽¹⁾-aligned TS user-data and/or control information. It does not restrict the content, format, or coding of the information, nor does it ever need to interpret its structure or meaning.

Note (1) The octet is the transfer unit consisting of 8 bit sequence in 2. (16) of JIS X 5104.

- (5) 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.

6. Features of the Transport Service

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

- (1) 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.
- (2) Associated with each TC at its time of establishment, the opportunity to request, negotiate, and have agreed by the TS provider a certain QOS as specified by means of QOS parameters.
- (3) 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.

- (4) The means by which the receiving TS user may control the rate at which the sending TS user may send octets of data.
- (5) The means of transferring separate expedited TSDUs (refer to 12.2) when agreed to by both TS users.

Expedited TSDUs transfer is subject to a different flow control from normal data (refer to 12.1) across the TSAP.

- (6) The unconditional and therefore possibly destructive release of a TC.

7. Classes of Transport Service

No distinct classes of Transport Service are defined.

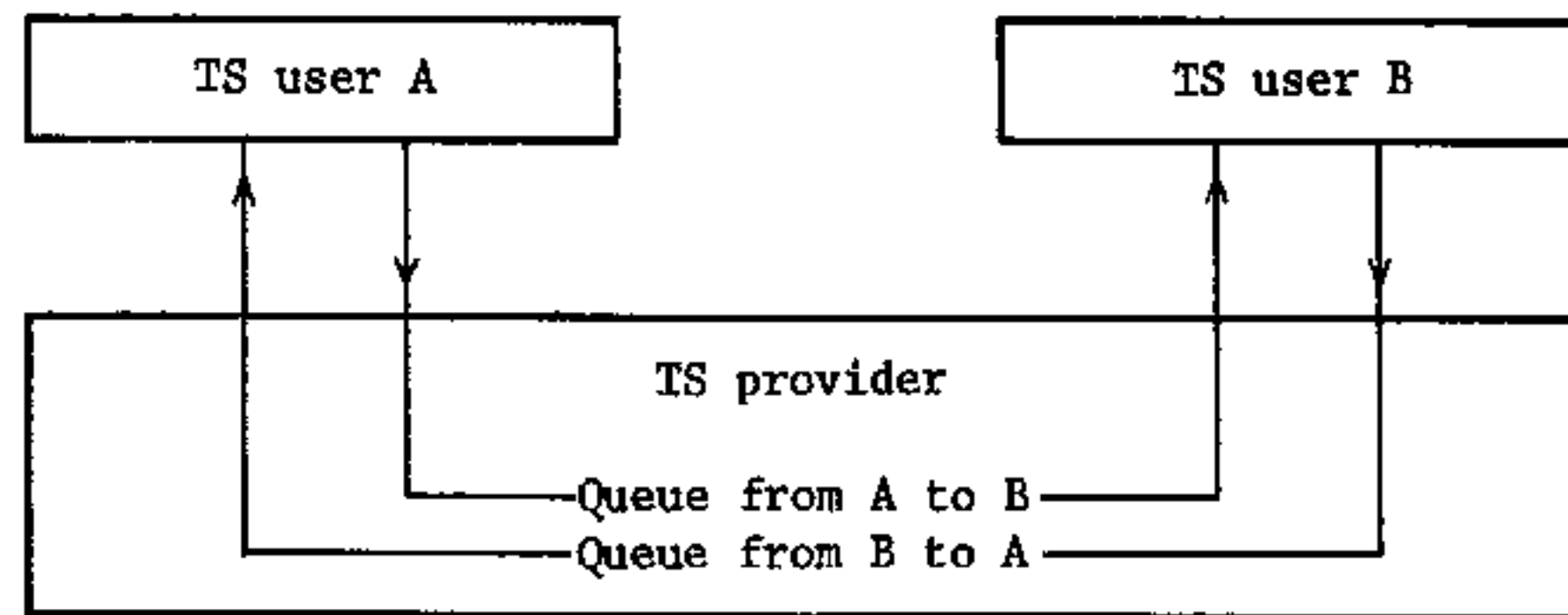
8. Model of the Transport Service and Transport Connection

8.1 Model of the Transport Service This Standard uses the abstract model for a layer service defined in OSI service notation. 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 implementation.

8.2 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 (refer to Fig. 1). Each TC is modelled by a separate pair of queues.

Fig. 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⁽²⁾ to a queue will be determined by the behaviour of the TS user removing objects from that queue and the state of queue. Objects are entered and removed from the queue as a result of interactions at the two TSAPs.

Note (2) It is each request in which the service of F 3 treater of JIS Z 8121 should be received. It corresponds to "guest" or "call" in a queue model.

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

- Remarks**
1. Remove is the operation by a TS user and delete is the operation by a TS provider.
 2. 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
 - (1) constrains one the local ability (system outside OSI environment) to invoke primitives;
 - (2) service procedures defining particular sequencing constraints on some primitives.
 3. A TS endpoint identification mechanism should be provided locally if the TS user and the TS provider need to distinguish between several TCs at a TSAP. All primitives should 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 should not be confused with the address parameter of the T-CONNECT primitives.

- (1) The objects which may be placed in a queue by a TS user (refer to 11. to 13.) 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 primitive);
 - (e) disconnect objects (each representing all parameters contained in a T-DISCONNECT primitive).

Remarks 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 10. to 13. 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.

- (2) 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 TC 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 13. and in the manner described in 10.2. The release procedure may be destructive with respect to other objects in the two queues.

- (3) A queue relates to 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 (4)(6) below;
 - (b) objects are added to the queue, subject to 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 are added [however, refer to (4)(a) and (4)(b)].
 - (e) a queue has a limited capacity (initially greater than zero), but this capacity is not necessarily either fixed or determinable, and shall meet the requirements of (f).
 - (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 their 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.
- (4) In addition the TS provider may manipulate pairs of adjacent objects in the queue to allow
- (a) 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, and disconnect objects take precedence over any other object (refer to Table 1).
 - (b) Deletion Any object may be deleted by the TS provider if, and only if, the following one is a disconnect object. 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.
- (5) Whether the TS provider performs actions of types (4)(a) and (4)(b) or not, will depend on the behaviour of the TS users and on the agreed QOS. 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 (4)(a) and (4)(b).

Table 1. Precedence Table

The queue object X The queue object Y	Connect object	Octets of normal data	End-of-TSDU indication	Expedited TSDU	Disconnect object
Connect object	—	—	—	—	○ a, b
Octet of normal data	—	×	×	○ a	○ a, b
End-of-TSDU indication	—	×	×	○ a	○ a, b
Expedited TSDU	—	×	×	×	○ a, b
Disconnect object	—	—	—	—	○ b

Remark: a: refer to (4)(a)

b: refer to (4)(b)

○: object X has precedence over object Y

×: object X has no precedence over object Y

—: not applicable

9. Quality of Transport Service

The term "Quality of Service" QOS refers to certain characteristics of a TC as observed between the TC components.

QOS is described in terms of QOS parameters. These parameters give TS users a method of specifying their needs, and give the TS provider a basis for protocol selection.

The QOS is normally negotiated between the TS users and the TS provider on a per TC basis, using the T-CONNECT request, indication, response, and confirm TS primitives defined in 10. The QOS requested by the calling TS user may be lowered either by the TS provider following the T-CONNECT request, or by the called TS user, following the T-CONNECT indication.

In applying this to some QOS parameters this may mean that

- (1) a delay becomes longer;
- (2) a throughput becomes lower;
- (3) the error rate becomes higher;
- (4) the priority becomes lower;
- (5) the failure probability becomes higher.

However, the TC protection parameter remains unchanged by the TS provider.

The negotiated QOS values then apply throughout the lifetime of the TC.

The view of QOS at each end of an established TC is always the same.

This section does not specify particular values, or classes of values, for the QOS parameters. Possible choices and default values for each parameter will normally be specified at the time of initial TS provider installation. The values for any or all parameters may be fixed for a given TS provider, in which case QOS negotiation on a per TC basis is not required. When a QOS value is specified, the TS user may also indicate whether the request is an absolute requirement or whether a degraded value is acceptable.

The QOS parameters include parameters which express TS performance and parameters which express other TS characteristics as described in 9.1 to 9.11.

A classification of the performance QOS parameters is shown in Table 2.

Table 2. Classification of Performances QOS Parameters

Phase (refer to 11. to 13.)	Performance criterion	
	Speed	Accuracy or reliability
TC establish- ment	TC establish- ment delay	TC establishment failure probability (misconnection and TC refusal)
Data transfer	Throughput Transit delay	Residual error rate (corrup- tion, duplication and loss) Resilience of the TC Transfer failure probability
TC release	TC release delay	TC release failure proba- bility

9.1 TC Establishment Delay TC establishment delay is the maximum acceptable delay between a T-CONNECT request and the corresponding T-CONNECT confirm primitive.

Remark: This delay includes TS user dependent components.

9.2 TC Establishment Failure Probability TC establishment failure probability is the ratio of total TC establishment failures to total TC establishment attempts in a measurement sample. A TC establishment failure is defined to occur when a requested TC is not established within the specified maximum acceptable TC establishment delay as a result of misconnection, TC refusal, or excessive delay on the part of the TS provider. TC establishment attempts which fail as a result of error, TC refusal, or excessive delay on the part of a TS user are excluded in calculating the TC establishment failure probability.