



Information processing systems – Open Systems Interconnection – Service conventions

Systèmes de traitement de l'information – Interconnexion de systèmes ouverts – Conventions de service

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The reasons which led to the decision to publish this document in the form of a technical report type 2 are explained in the Introduction.

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0 Introduction

This Technical Report has been published as interim guidance to users and definers of service standards. The objective is to provide a common definition of terms and time sequence diagrams for reference by service standards, particularly those for the Network, Transport and Session Layers.

Although the original intention was for ISO to publish an International Standard for service conventions, it has become accepted that considerably more work is required to produce a completely satisfactory and comprehensive treatment of the subject.

The advanced state of development of the Network, Transport and Session service definitions is such that a common reference to their use of service conventions is required. This Technical Report is designed to meet that need, but not the complete needs of all service standards derived from the Basic Reference Model. Even then it has not been possible to ensure full alignment between these three standards and this Technical Report. Almost all divergences are not technically significant, insofar as they generally involve slightly different ways of presenting the same type of information.

Rather than seek perfect alignment, and hence introduce delays in the publication of those standards, a more practical but less elegant solution has been adopted. This Technical Report defines the general conventions used, but also identifies where a particular service standard uses significantly different conventions.

1 Scope and field of application

This Technical Report establishes definitions of terms and conventions for reference by standards defining the connection-oriented or connectionless-mode (N)-services provided by the Reference Model for Open Systems Interconnection (ISO 7498). In particular, it is concerned with conventions relating to a point-to-point connection, or instance of a point-to-point communication within a layer of the Reference Model.

NOTE — The scope of this Technical Report has been restricted to meet a specific urgent need for the Network, Transport and Session Layers. Where appropriate it can be applied to other layers.

Conventions for the other types of (N)-service, and wider issues of the underlying semantic model for (N)-services are the subject of further study.

2 References

ISO 7498, *Information processing systems — Open Systems Interconnection — Basic Reference Model.*

ISO 8072, *Information processing systems — Open Systems Interconnection — Transport service definition.*

ISO 8326, *Information processing systems — Open Systems Interconnection — Basic connection oriented session service definition.*

ISO 8348, *Information processing systems — Data communications — Network service definition.*

3 Definitions

3.1 This Technical Report builds on the concepts developed in ISO 7498 and makes use of the following terms defined in it :

- a) (N)-layer;
- b) (N)-service;
- c) (N)-entity;
- d) (N)-service-access-point;
- e) (N)-service-access-point-address.

NOTES

1 The use of the term "service" in both this Technical Report and the Network, Transport and Session service definitions is not always consistent with the definition in ISO 7498. In many cases it is used to indicate a distinct part or element of the total (N)-layer service. In general the particular usage is clear from either the naming convention used or the context.

2 The term "service-access-point" is used when describing the relationship between primitives associated with a single connection. Further study is required to include the concept of connection-endpoints in this description. However, reference is already made to connection-endpoints in both the existing network and transport service definitions (ISO 8348 and ISO 8072).

3.2 For the purpose of this Technical Report the following definitions also apply :

3.2.1 **service-user**: An entity in a single open system that makes use of a service through service-access-points.

3.2.2 **service-provider**: An abstract of the totality of those entities which provide a service to peer service-users.

NOTE — The behaviour of a service-provider is often described in terms of an abstract machine.

3.2.3 **service primitive; primitive**: An abstract, implementation-independent representation of an interaction between the service-user and the service-provider.

NOTE — Since a service-user is usually a (N)-entity (except at the Application Layer), and since the decomposition of a service-provider usually yields (N)-entities and a lower layer service (except at the Physical Layer), a service primitive is also an abstract, implementation-independent representation of an interaction between two adjacent (N)-entities.

3.2.4 **request (primitive)**: A representation of an interaction in which a service-user invokes some procedure.

3.2.5 **indication (primitive)**: A representation of an interaction in which a service-provider either

- a) indicates that it has, on its own initiative, invoked some procedure; or
- b) indicates that a procedure has been invoked by the service-user at the peer service-access-point.

3.2.6 **response (primitive)**: A representation of an interaction in which a service-user indicates that it has completed some procedure previously invoked by an interaction represented by an indication primitive.

3.2.7 **confirm (primitive)**: A representation of an interaction in which a service-provider indicates, at a particular service-access-point, completion of some procedure previously invoked, at that service-access-point, by an interaction represented by a request primitive.

3.2.8 **(N)-mandatory-service**: A distinct part of the total (N)-service which is always included in a realization of that (N)-service.

3.2.9 (N)-provider-optional-service: A distinct part of the total (N)-service which may or may not be included in a realization of that (N)-service.

3.2.10 (N)-user-optional-service: A distinct part of the realization of an (N)-service which is only used if both peer service-users agree during connection establishment.

3.2.11 confirmed-service: A distinct part of the total (N)-service which results in an explicit confirmation from the service-provider to the initiating service-user.

NOTE — There is not necessarily any relationship between this confirmation and the response from the peer service-user.

3.2.12 non-confirmed-service: A distinct part of the total (N)-service which does not result in an explicit confirmation from the service-provider to the initiating service-user.

3.2.13 (N)-provider-initiated-service: A distinct part of the total (N)-service which is initiated by the service-provider rather than the service-user.

4 Model for layer service

A layer service is defined in terms of an abstract model having the following elements:

- a) (N)-service-users; and
- b) (N)-service-provider.

Each service-user gains access to the service provider via a service-access-point.

For the lifetime of a particular connection two service-users at different service access-points are interrelated. (See figure 1.)

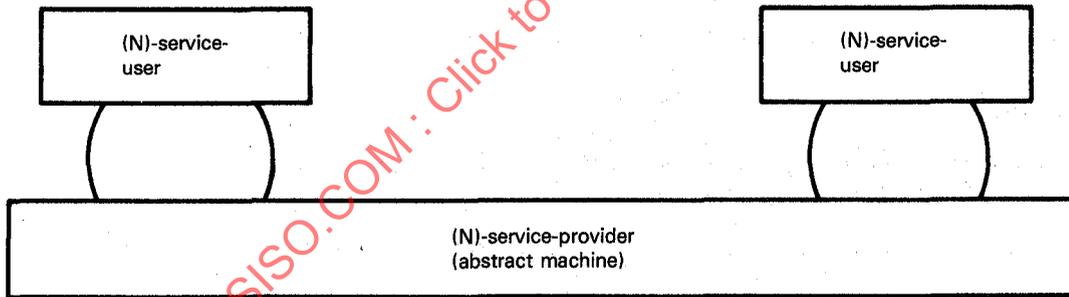


Figure 1 — Layer service model

The interactions between service-user and service-provider are described by service-primitives. The layer service defines relations between interactions at one service-access-point and consequent interactions at a peer service-access-point used by service-users in order to communicate.

The relationships between the terms service, service primitive, peer protocol, and peer entities are illustrated in figure 2.

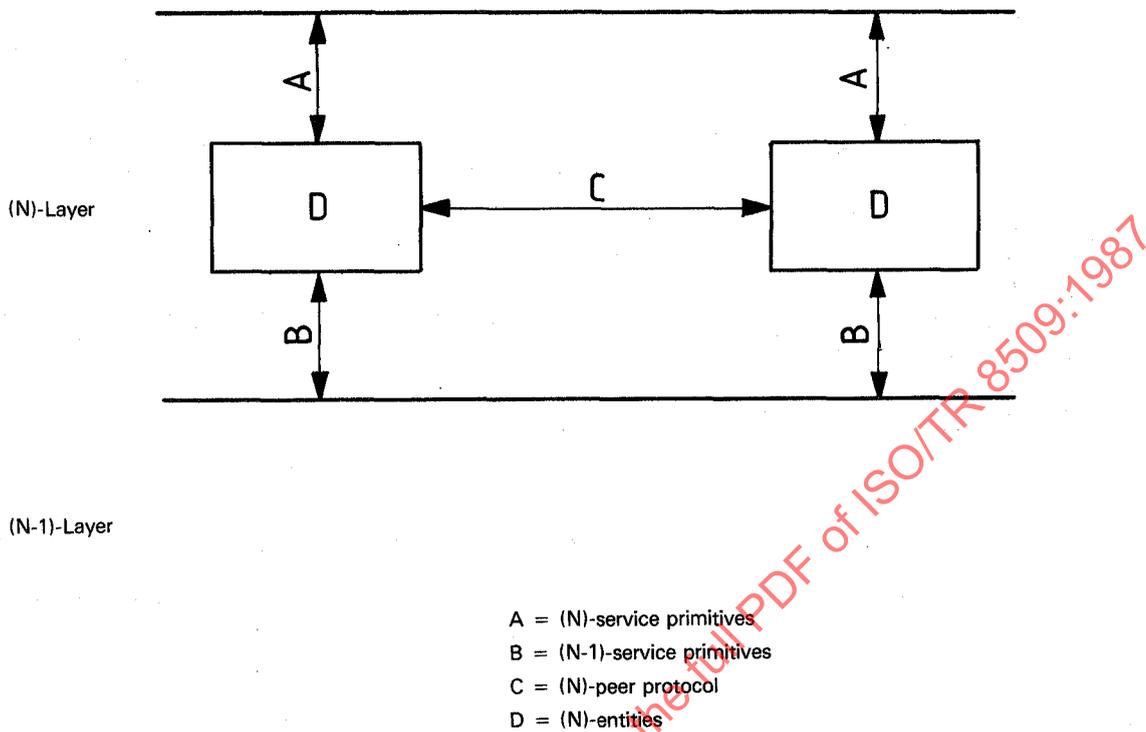


Figure 2 — Relationships between terms

5 Service primitives

5.1 General

The use of primitives does not imply any specific implementation of a service-access-point. The following comments apply to this definition technique based on service primitives :

- a) service primitives are conceptual, and need not be either directly related to protocol elements, or seen as macro calls of an access method to the layer service;
- b) it is possible to have one and the same layer service represented by other sets of primitives than those defined in this Technical Report;
- c) only service primitives which relate to some element of the layer service involving two service-users need to be considered. The interactions which are related only to local conventions between the service-user and provider do not relate to this description technique. For example, strictly local functions could be provided in some implementations. As they do not involve both users, such functions are not visible outside the local system.

5.2 Categories of service

The following types of service are identified :

- a) mandatory-service (see 3.2.8);
- b) provider-optional-service (see 3.2.9);
- c) user-optional-service (see 3.2.10).

A user-optional-service may be either a mandatory-service or a provider-optional-service.

5.3 Types of service primitives

Four types of service primitives are identified :

- a) request primitive (see 3.2.4);
- b) indication primitive (see 3.2.5);
- c) response primitive (see 3.2.6);
- d) confirm primitive (see 3.2.7).

5.4 Properties of primitives

The interaction described by a service primitive shall be regarded as taking place as an instantaneous event, which cannot be interrupted by another interaction. A primitive has associated with it

- a) a direction which may be
 - 1) from a service-user to the service-provider, or
 - 2) from the service-provider to a service-user indicating the main flow of information;
- b) one or more parameters, each having a defined range of values. The values associated with an interaction described by a primitive are passed in either direction as appropriate for a given primitive.

5.5 Names of primitives

The name of each primitive contains three elements:

- a) an initial (or initials) which specifies the layer (see annex A, clause A.1);
- b) a name which specifies a distinct part of the total layer service (see annex A, clause A.2);
- c) a name which specifies the type of primitive (see annex A, clause A.3).

NOTE — In the session service definition (ISO 8326) the clause on collision introduces a modified naming structure, which indicates a particular sub-division of a single distinct part of the session service. This sub-division is indicated in brackets after the name of the distinct part of the service.

6 Conventions for time-sequence diagrams

Time-sequence diagrams are used to illustrate how sequences of interactions are related in time.

Time-sequence diagrams (see figure 3) indicate

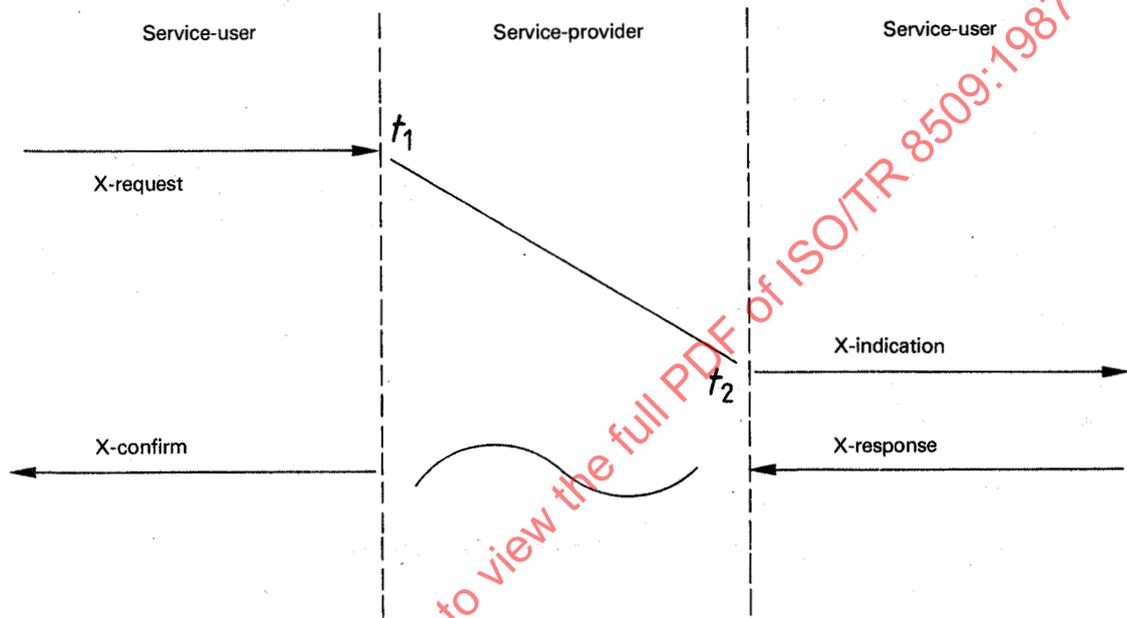
- a) the sequence of events at each user/provider interface; and
- b) where appropriate, the sequence of events between peer users.

Each diagram is partitioned by two vertical lines into three fields. The central field represents the service-provider and the two side fields represent the two service-users. The lines represent the service-access-points between the service-users and the service-provider, and, moving from top to bottom, the passage of time.

Sequence of events at each service-access-point are positioned along the appropriate vertical lines in time order down the page. Arrows, placed in the areas representing the service-user, indicate the main flow of information during the execution of an interaction described by a service-primitive (i.e. to or from the service-user). This information flow may be subject to implicit flow control between service-user and service-provider.

The sequence relationships between interactions at the two service-access-points can be shown in two ways. The logically correct presentation is shown in figure 3 a) whereas the presentation commonly used in the network, transport and session service definitions is shown in figure 3 b). Both presentations are intended to convey the same basic meaning. For example, in figures 3 a) and 3 b) the request primitive from one service-user to the service-provider at time t_1 is followed by the indication primitive to the peer service-user at time t_2 because of the line shown in the service-provider field. If there is no specific relationship between events, in that it is impossible to foresee which will occur first but both must occur within a finite period of time, then the central field is left blank, or for clarity a tilde (~) is used in this field.

a) preferred notation



b) alternative notation (used in network, transport and session service definitions)

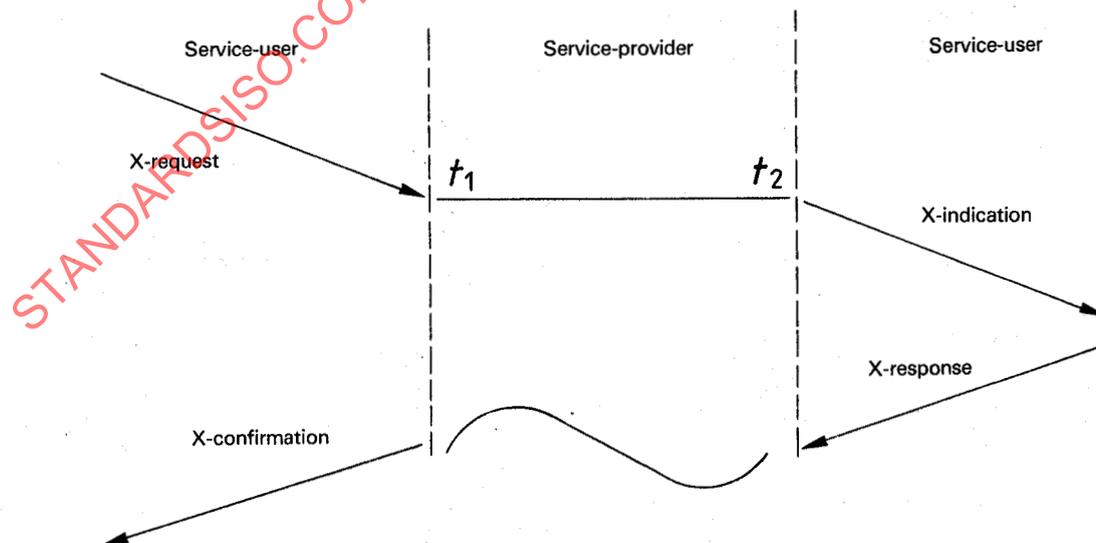


Figure 3 — Annotated time sequence diagrams

Figures 4a) and b) present alternative methods of indicating acknowledgements generated by the responding service-user. In figure 4a), the same service primitive name (for example X) is used throughout the complete sequence, whereas in figure 4b) the responding service-user employs a request with a different service primitive name (for example Y).

NOTE — In each of the network, transport and session definitions there are variations in representation of time sequence diagrams to those described here. However, the principles adopted are those above, and hence the meaning that is being conveyed is not affected by these variations.

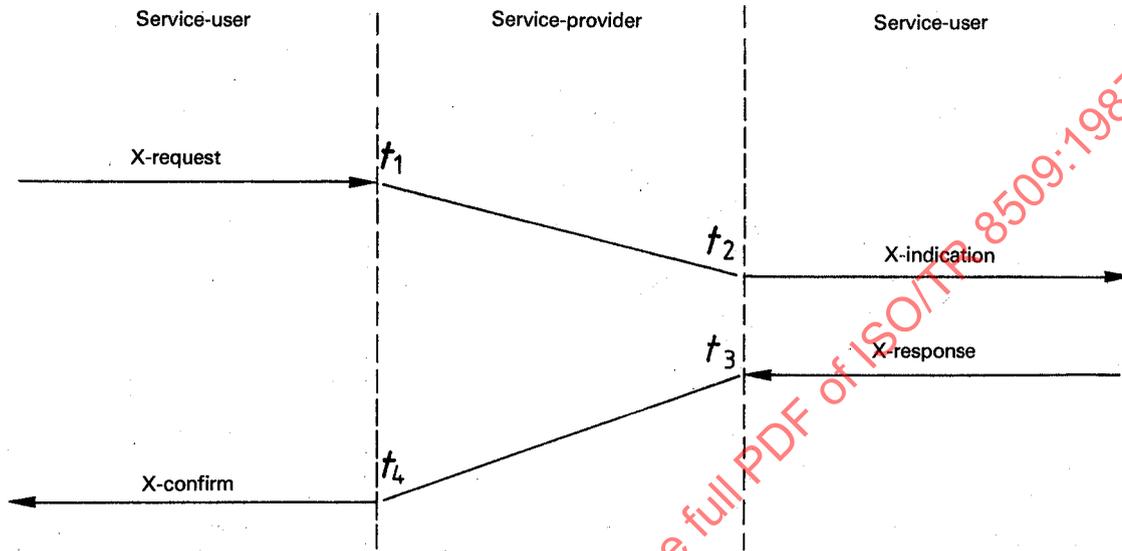


Figure 4 a) — Acknowledgements (1)

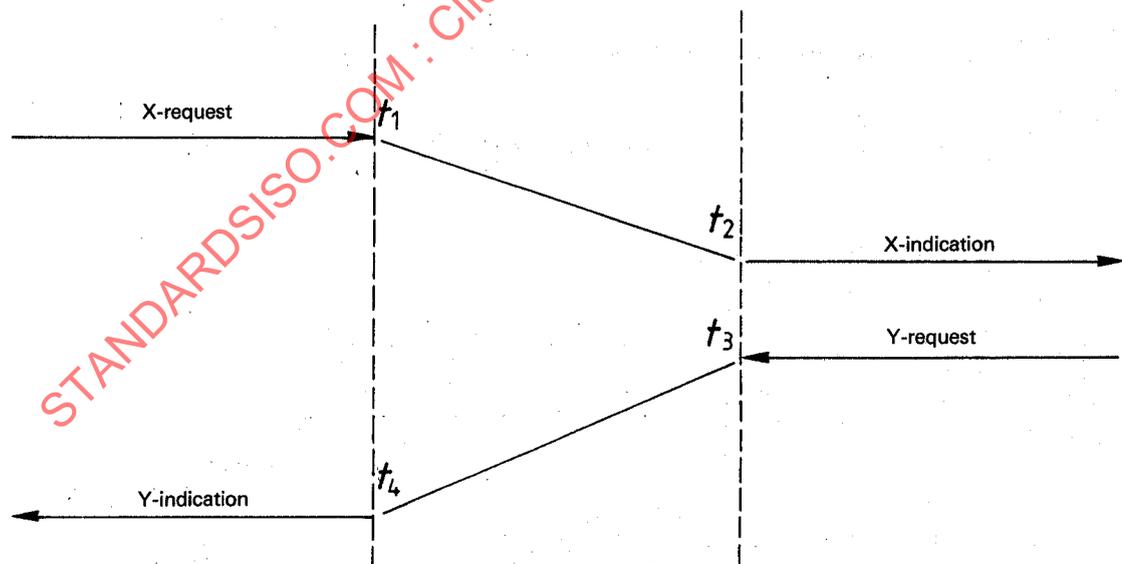


Figure 4 b) — Acknowledgements (2)