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Information processing systems — Open Systems Interconnection — Basic Reference Model —

Part 3 : Naming and addressing

Systèmes de traitement de l'information — Interconnexion de systèmes ouverts — Modèle de référence de base —

Partie 3 : Dénomination et adressage

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Contents

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 7498-3 was prepared by Technical Committee ISO/TC 97, *Information processing systems.*

Introduction

This part of the Basic Reference Model for Open Systems Interconnection (ISO 7498) extends the basic architectural concepts of identifiers described in 5.4 of ISO 7498.

This part of ISO 7498 states the architectural principles which are followed in the production of any standard which involves the identification (naming) and location (addressing) of objects for the purpose of interconnection within the Open System Interconnection Environment (OSIE).

This part of ISO 7498 has sufficient flexibility to accommodate advances in technology and expansion in user demands. This flexibility is also intended to allow the phased transition from existing implementations to OSI standards.

NOTE - This part of ISO 7498 is expected to be subject to future expansion, in particular with regard to Multi-Peer Data Transmission (MPDT).

The architectural principles stated within this part of ISO 7498 ensure that any ISO standard that involves the identification and location of objects within the OSIE for the purpose of interconnection will:

a) avoid any restrictions on:

1) the functionality that may be made available through current or future International Standards,
2) the functionality of any real open system,
3) the internal design of any real open system;

b) preserve the principle of layer independence in the OSIE. That is, the internal functioning of one layer is not constrained by any other layer;

c) preserve the principle of implementation independence in the OSIE, as expressed in 4.2 of ISO 7498. That is, no real open system (or administrator thereof) is required to know anything about the implementation design of any other real open system (or administration thereof), nor does any real open system impose such knowledge as a condition for communication using OSI standards;

d) allow economical support for interconnection within the OSIE; in particular individual standards produced within the framework specified by this part of ISO 7498 should make it possible to provide facilities which give adequate levels of performance, reliability, and integrity and which ease the administration by humans with respect to identifying and locating objects within the OSIE for the purpose of interconnection.

The description of naming and addressing for the OSIE given in this part of ISO 7498 is developed in stages.

Clauses 1 - 4 provide basic introductory and reference information.

Clause 5 introduces concepts of naming.

Clause 6 prescribes, for the OSIE, the objects named, the operation of addressing, and the uses of addressing.

Clause 7 prescribes, for the OSIE, the objective of naming and addressing and the mechanisms to be employed to meet that objective.

Clause 8 prescribes the principles governing the nature and use of addressing information in (N)-services.

Clause 9 prescribes the principles governing the nature and use of addressing information in (N)-protocols.

Clause 10 provides a layer independent description of the layer directory-functions necessary to support the addressing structure established by clauses 7, 8, and 9, based on the general mechanisms and principles established in clauses 5 and 6.

Clause 11 prescribes the use of the directory-functions in each layer.

Clause 12 defines the nature of addressing domains and registration authorities.

Clause 13 prescribes the registration procedures required for naming in the OSIE.

Clause 14 prescribes the requirements for directory facilities in the OSIE.

NOTE - This part of ISO 7498 provides clarifications of the basic architecture defined in ISO 7498 where this is necessary for a full understanding of the naming and addressing requirements within the OSIE.

Information processing systems — Open Systems Interconnection — Basic Reference Model —

Part 3 : Naming and addressing

1 Scope

This part of ISO 7498 :

a) defines general mechanisms for the use of names and addresses to identify and locate objects in the OSIE; and

b) defines the use of these mechanisms within the layered structure of the Basic Reference Model.

This part of ISO 7498 extends the concepts and principles defined in ISO 7498. This part is not intended to be either an implementation specification or a basis for appraising the conformance of actual implementations.

The specific form of names and addresses is not within the scope of this part.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 7498. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 7498 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/Add. 1:1984, *Information processing systems - Open systems interconnection - Basic Reference Model - Addendum 1: Connectionless-mode transmission.*

ISO 7498-4:-[1], *Information processing systems - Open systems interconnection - Basic Reference Model - Part 4: OSI management framework.*

ISO 8348/Add. 2:1988, *Information processing systems - Data communication - Network service definition - Addendum 2:Network layer addressing.*

ISO/TR 8509:1987, *Information processing systems - Open systems interconnection - Service conventions.*

ISO 9545:-[1], *Information processing systems - Open systems interconnection - Application layer structure.*

3 Definitions

3.1 This part of ISO 7498 makes use of the following terms defined in ISO 9545:

a) application-process-type;
b) application-process-invocation.

3.2 This part of ISO 7498 makes use of the following terms defined in ISO/TR 8509:

a) (N)-service-request-primitive,
b) (N)-service-indication-primitive,
c) (N)-service-response-primitive,
d) (N)-service-confirm-primitive.

3.3 This part of ISO 7498 makes use of the following term defined in ISO 8348/Add. 2:

a) subnetwork point of attachment.

3.4 For the purpose of this part of ISO 7498, the following definitions apply.

3.4.1 (N)-address: A name unambiguous within the OSIE which is used to identify a set of (N)-service-access-points which are all located at a boundary between an (N)-subsystem and an (N+1)-subsystem in the same open system.

NOTES

1 This definition of (N)-address is different from that in ISO 7498. This definition is the definitive one and will be moved to ISO 7498 to replace the existing definition when ISO 7498 is revised.

2 A name is unambiguous within a given scope when it identifies one and only one object within that scope. Unambiguity of a name does not preclude the existence of synonyms.

3.4.2 (N)-address-selector; (N)-selector: An element of addressing information that identifies a set of (N)-SAPs which are all in the same (N)-subsystem; an (N)-selector value is assigned by the local administration.

1) To be published.

NOTE - The concept of (N)-address-selectors only applies above the Network Layer.

3.4.3 (N)-association: A cooperative relationship among (N)-entity-invocations.

NOTE - This may be formed by the exchange of (N)-protocol-control-information.

3.4.4 calling-(N)-address: A parameter which may appear in an (N)-service request or indication primitive and which identifies the (N)-address at the (N)-initiator.

NOTE - In the service definition of a particular layer, such a parameter may be referred to either as a "calling-(N)-address" or "source-address". Throughout this part of ISO 7498, however, only the term "calling-(N)-address" is used.

3.4.5 called-(N)-address: A parameter which may appear in an (N)-service request or indication primitive which identifies the (N)-address at the (N)-recipient.

NOTE - In the service definition of a particular layer, such a parameter may be referred to either as a "called-(N)-address" or "destination-address". Throughout this part of ISO 7498, however, only the term "called-(N)-address" is used.

3.4.6 descriptive name: A name that identifies a set of one or more objects by means of a set of assertions concerning the properties of the objects of the set.

3.4.7 (N)-directory-function: An (N)-function that processes (N)-addresses, (N-1)-addresses, (N)-entity-titles, and (N)-PAI to provide mappings among these categories of information.

3.4.8 (N)-entity: An active element within an (N)-subsystem embodying a set of capabilities defined for the (N)-layer that corresponds to a specific (N)-entity-type (without any extra capabilities being used.)

NOTE - This definition of (N)-entity is different from that in ISO 7498. This definition is the definitive one and will be moved to ISO 7498 to replace the existing definition when ISO 7498 is revised.

3.2.9 (N)-entity-invocation: a specific utilization of part or all capabilities of a given (N)-entity (without any extra capabilities being used).

NOTE - This definition will be moved to ISO 7498 to replace the existing definition when ISO 7498 is revised.

3.4.10 (N)-entity-title: A name that is used to identify unambiguously an (N)-entity.

3.4.11 (N)-entity-type: a description of a class of (N)-entities in terms of a set of capabilities defined for the (N)-layer.

NOTE - This definition will be moved to ISO 7498 to replace the existing definition when ISO 7498 is revised.

3.4.12 generic name: A name of a set of objects.

NOTE - A generic-title is a specific form of generic name.

3.4.13 (N)-initiator: An (N)-entity-invocation which issues an (N-1)-service request primitive.

3.4.14 name: A linguistic construct which corresponds to an object in some universe of discourse.

3.4.15 naming-authority: A registration authority which allocates names according to specified rules. Where the naming-authority allocates titles, it is known as a title-authority. Where the naming-authority allocates addresses, it is known as an addressing-authority.

3.4.16 naming-domain: The set of names that are assignable to objects of a particular type. Where the names are titles, the set is known as a title-domain. Where the names are addresses, the set is known as an addressing-domain.

3.4.17 naming-subdomain: A subset of a naming-domain, which is disjoint from all other naming-subdomains of that naming-domain.

3.4.18 primitive name: A name that identifies an object and which is assigned by a designated naming-authority. The internal structure of the name is not required to be understood or to have significance to users of the name.

3.4.19 (N)-recipient: An (N)-entity-invocation which receives an (N-1)-service indication primitive.

3.4.20 (N)-protocol-addressing-information; (N)-PAI: Those elements of (N)-PCI which contain addressing information.

3.4.21 responding-(N)-address: A parameter which may appear in an (N)-service response or confirm primitive and which identifies the (N)-address at the (N)-recipient.

NOTE - In the service definition of a particular layer, such a parameter may be referred to either as a "called-address" or "responding address." Throughout this part of ISO 7498, however, only the term "responding-(N)-address" is used.

3.4.22 (N)-service-access-point-address; (N)-SAP-address: An (N)-address that is used to identify a single (N)-SAP.

NOTES

1 This definition of (N)-service-access-point-address is different from that in ISO 7498. This definition is the definitive one and will be moved to ISO 7498 to replace the existing definition when ISO 7498 is revised.

2 (N)-address is the general term which applies to any set of (N)-SAPs, including sets of one and only one (N)-SAP. (N)-SAP address is only used where it is necessary to specify precisely that the address identifies one and only one (N)-SAP. Whether an (N)-address is an (N)-SAP address or not is a matter

local to the (N)-subsystem and is not known to other open systems. Nevertheless, at some layers and because of their possible use in subsequent communications, calling-(N)-addresses and responding-(N)-addresses may be constrained to identify a single (N)-SAP (see 8.4.4 and 8.5.5). The decision whether or not to apply this constraint is made on a layer-by-layer and protocol-by-protocol basis.

3.4.23 subnetwork-address: An identifier assigned to a subnetwork point of attachment by the registration authority of the subnetwork.

3.4.24 synonymous name; synonym: A name that identifies an object that is also identified by another distinct name. Synonymous generic names are distinct generic names that name the identical set.

3.4.25 system-title: A name, unique within the OSIE, which is used to identify a single real open system.

4 Abbreviations

For the purposes of this part of ISO 7498, the following abbreviations apply:

(N)-CEPI	(N)-Connection-EndPoint-Identifier
DLSAP	Data-Link-Service-Access-Point
NSAP	Network-Service-Access-Point
OSI	Open Systems Interconnection
OSIE	OSI Environment
(N)-PAI	(N)-Protocol-Addressing-Information
(N)-PCI	(N)-Protocol-Control-Information
PhSAP	Physical-Service-Access-Point
PSAP	Presentation-Service-Access-Point
(N)-SAP	(N)-Service-Access-Point
SNPA	SubNetwork Point of Attachment
SSAP	Session-Service-Access-Point
TSAP	Transport-Service-Access-Point

5 Basic concepts of naming

5.1 Names are linguistic constructs expressed in some language. They correspond to objects in some universe of discourse. The correspondence between names (in the language) and objects (in the universe of discourse) is the relation of identifying. A name identifies the object to which it is bound.

5.2 Within the context of OSI, names identify particular communications objects in the Open Systems Interconnection Environment (OSIE). There are two distinct kinds of names, primitive and descriptive.

5.3 Within any particular universe of discourse, a primitive name is a name assigned by a naming-authority to a specific object. A naming-authority is simply a source of names. The only architectural constraints imposed upon naming-authorities are that all of the names it provides:

a) are expressed in a prescribed language; and

b) are unambiguous (identify just one object).

5.4 A descriptive name consists of a set of assertions which are expressed in a formally defined language. The definition of the formal language determines those linguistic constructs which are well-formed descriptive names. A descriptive name may be incomplete, in that many objects satisfy all the assertions, or it may be complete, in that it serves to identify a single object. A complete descriptive name is equivalent to a primitive name in that it unambiguously identifies an object. Primitive names may be components of a descriptive name.

5.5 Although a primitive name is unambiguous, there may be more than one name that unambiguously identifies the same object.

5.6 A generic name is a primitive name or a descriptive name that identifies a set comprising more than one object with the intent that, when a generic name is used to denote an object, the result is that exactly one member of the set of objects will be selected. A generic name may be used to identify a set of objects of a particular type, which need not be located in the same open system.

5.7 A title is assigned to an object where the purpose of the name is to discriminate among different objects and to permit retrieval of information associated with an object from a Directory Facility. A title is assigned to an object type where the purpose of the name is to discriminate among different object types and to permit retrieval of information associated with an object type from a Directory Facility. The name may identify a system, application-process, application-process-type, (N)-entity, or (N)-entity-type.

NOTE - These objects and types are defined in either ISO 7498 or ISO 9545.

5.8 An identifier is assigned to an object where the purpose of the name is only to discriminate among occurences of this object. The name may identify an (N)-

association, an application-process-invocation, or an (N)-entity-invocation.

NOTE - These objects are defined in either ISO 7498 or ISO 9545.

6 OSI naming and addressing concepts and the correct use of addresses

6.1 The naming of real open systems

6.1.1 A system-title is a layer independent primitive name, i.e., the same identifier is used within various layers to identify the same real open system. A single real open system is named by one and only one system-title.

6.1.2 A system-title is used to identify a real open system as a whole. It may also be used:

a) in conjunction with other qualifiers to identify specific OSI resources in the relevant parts of the management information base within the real open system; or

b) as an attribute of a Directory Facility entry pertaining to an OSI resource associated with a single real open system.

6.2 The naming and addressing of elements of an (N)-layer

6.2.1 Introduction

6.2.1.1 Since an (N)-entity-type describes a class of (N)-entities, it needs to be named, but not located. Since (N)-entities and (N)-entity-invocations are active elements within an (N)-layer, they need to be unambiguously identified and located.

6.2.1.2 Within an open system, (N+1)-entities and (N)-entities are bound together at (N)-service-access-points [(N)-SAPs]. (N)-entities provide services to (N+1)-entities via the exchange of service primitives at (N)-SAPs.

6.2.1.3 An (N)-entity is identified unambiguously by an (N)-entity-title. An (N)-entity-type is identified by an (N)-entity-type-title. An (N)-entity-invocation is identified by an (N)-entity-invocation-identifier which is unambiguous within the scope of an (N)-entity.

6.2.2 (N)-addresses

6.2.2.1 An (N)-address identifies a set of (N)-SAPs which are all located at the boundary between an (N)-subsystem and an (N+1)-subsystem. An (N)-SAP-address is an (N)-address which identifies a set containing exactly one (N)-SAP.

6.2.2.2 While (N)-entities are the objects being addressed, the result of communication to an address is communication with an (N)-entity-invocation.

6.2.2.3 An (N+1)-entity is located by its binding to one or more (N)-SAPs. An (N)-SAP is identified by one or more (N)-addresses.

NOTE - A physical-address is used to access a data-link-entity;
a data-link-address is used to access a network-entity;
a network-address is used to access a transport-entity;
a transport-address is used to access a session-entity;
a session-address is used to access a presentation-entity; and
a presentation-address is used to access an application-entity.

6.2.3 (N)-selectors

An (N)-selector is that part of the addressing information which is specific to the (N)-subsystem. (N)-selectors are used to identify (N)-SAPs or sets of (N)-SAPs within an end open system, once this end open system is unambiguously identified. Since the end open system is implicitly known at the Network Layer, (N)-selectors are used above the Network Layer, along with local information, to address the desired (N+1)-entity within the open system. (N)-selector values are exchanged between open systems as part of the (N)-PAI.

6.3 The correct use of (N)-addresses

6.3.1 (N)-addresses have a limited scope. They are used to distinguish among sets of (N)-SAPs, and only (N)-SAPs. Addressing rules are not used to make the structure of a real open system visible to the OSI environment.

6.3.2 (N)-addresses are used to identify sets of (N)-SAPs in order to locate (N+1)-entities. An (N+1)-subsystem is partitioned into (N+1)-entities:

a) to support different (N+1)-protocols or sets of (N+1)-protocols;

b) to accommodate security and/or management requirements; and

c) in the case of the application-subsystem, to distinguish between different application-processes and different application-entities of the same application-process.

6.3.3 (N)-addresses are not used:

a) to distinguish among aspects of protocols that are subject to negotiation (classes, subsets,

quality of service, protocol versions) or parameter values;

b) to derive routing information above the Network Layer; or

c) to distinguish among hardware components.

NOTE - In some configurations, the use of an (N)-address as defined in 6.3.2 can lead to an (N+1)-entity being wholly contained within a single hardware component. Nevertheless, within the OSIE, the (N)-address identifies the (N+1)-entity; it does not identify the hardware component.

7 OSI addressing model

7.1 Associations between peer (N)-entities

7.1.1 An (N)-association is a cooperative relationship between two (N)-entity-invocations. Cooperation between (N)-entity-invocations requires the establishment and maintenance of related state information in each (N)-entity-invocation. This state information supports an (N)-association between the (N)-entity-invocations.

7.1.2 An (N)-entity invocation may support one or more independent (N)-associations at any one time. The communications behavior of the (N)-entity-invocation with respect to a specific (N)-association is defined by the (N)-entity and by the state information which is maintained by the (N)-entity-invocation and is specific to that (N)-association.

7.1.3 An (N)-association-identifier is associated with each (N)-association. This identifier is unique within the scope of a pair of cooperating (N)-entity-invocations. It serves to identify the related state information associated with each (N)-entity-invocation. The identifier has two components, one being determined by each (N)-entity-invocation.

NOTE - Certain (N)-protocols may not need explicit (N)-association-identifiers.

7.1.4 Two (N)-entity-invocations can establish (N-1)-connection(s), or can make use of an (N-1)-connectionless service, to support an (N)-association. The lifetime of an (N)-association may exceed the lifetime of any supporting (N-1)-connection(s). The binding of an (N)-association with (N-1)-connection(s) may change with time.

NOTE - An (N)-association could be associated with a sequence of (N-1)-connections with a one-to-one binding at any point in time; alternatively in the case of splitting, there could be a one-to-many binding at any point in time.

7.1.5 When the operation of an (N)-association requires it, (N)-entity-titles are used to identify (N)-entities independent of their locations. When the operation of an (N)-association requires it, (N-1)-addresses are used in requests for (N-1)-services to identify the locations of the (N)-entities concerned.

7.2 Attachment of (N)-entities to (N)-SAPs

An (N)-entity may provide (N)-services through one or more (N)-SAPs and may use (N-1)-services through one or more (N-1)-SAPs. In consequence an (N)-entity may have the following relationships with (N)-SAPs and (N-1)-SAPs (see Figure 1):

a) an (N)-entity may provide (N)-services through one (N)-SAP making use of (N-1)-services through one (N-1)-SAP;

b) an (N)-entity may provide (N)-services through multiple (N)-SAPs making use of (N-1)-services through one (N-1)-SAP;

c) an (N)-entity may provide (N)-services through one (N)-SAP making use of (N-1)-services through multiple (N-1)-SAPs;

d) an (N)-entity may provide (N)-services through multiple (N)-SAPs making use of (N-1)-services through multiple (N-1)-SAPs;

NOTES

1 There is no relationship between the SAP/entity correspondences identified above and multiplexing. An (N)-multiplexing function provides for the mapping of several (N)-connections onto a single (N-1)-connection. The (N)-connections may all terminate in a single (N)-SAP or they may terminate in separate (N)-SAPs. Multiplexed (N)-connections are distinguished from each other by elements of (N)-PCI at the service boundary and by elements of the (N)-PAI, e.g. an association-identifier within the (N)-protocol.

2 Logical channel numbers in X.25 (ISO 8208) and connection references in the OSI Transport Protocol (ISO 8073) are examples of information exchanged in (N)-PCI to distinguish connections when multiplexing is used.

7.3 (N)-addresses and (N)-SAPs

7.3.1 The OSI addressing structure allows:

a) (N)-addresses to identify the location of an (N+1)-entity without constraining the structure of lower layer subsystems in the open system concerned; and

b) multiple (N)-entities to be defined within an (N)-subsystem.