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Draft for Development

**Open Systems Interconnection:
connection-mode network service definition
(ISO/DIS 8348)**

Projet à développer. Interconnexion des systèmes ouverts: Définition du mode de connexion en service réseau

Entwurf zur weiteren Ausarbeitung. Kommunikation Offener Systeme: Definition des verbindungsorientierten Vermittlungsdienstes

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Documents

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This publication is not to be regarded as a British Standard.

It is being issued in the Draft for Development series of publications and is of a provisional nature because the subject matter is in the progress of ongoing development within the International Standards Committee (ISO/TC 97/SC 6 Telecommunications and Information Exchange between Systems).

It should be applied on this provisional basis, so that information and experience of its practical application may be obtained.

A review of this Draft for Development will be carried out not later than two years after its publication. Notification

of the start of the review period, with a request for the submission of comments from users of this Draft for Development will be made in an announcement in the appropriate issue of *BSI News*. Observations which it is felt should receive attention before the official call for comments will be welcomed.

According to the replies received, the responsible BSI Committee will judge whether the Draft for Development can be converted into a British Standard or what other action should be taken.

National foreword

This Draft for Development has been prepared under the direction of the Office and Information Standards Committee. The primary objective of this Draft for Development is to give advance guidance to product and systems designers concerned with the Network Layer of the Basic Reference Model for Open Systems Interconnection (OSI).

The text of the Draft for Development is identical with the revised text of ISO/DIS 8348 submitted to the International Organization for Standardization (ISO) for publication as ISO 8348.

For ease of reproduction the ISO text has been reproduced unchanged.

The UK has actively participated through BSI Technical Committee OIS/6 in the development of the Draft International Standard. The Technical Committee will review any agreed amendments or addenda to the ISO text and will, where appropriate, update the text of this Draft for Development via an amendment or revision. When the ISO draft reaches an appropriate level of agreement and stability, this Draft for Development may then be converted to a British Standard.

The text of the Draft International Standard is technically identical with CCITT Recommendation X.213. The CCITT text includes certain temporary notes relating to scheduling.

There are two draft addenda to DIS 8348 as follows:

DAD 1 covers connectionless-mode operation and the DIS ballot on DAD 1 terminates on 7 August 1985. The text of DAD 1 has been approved by the BSI technical committee for publication as a national appendix to DD 118 Open Systems Interconnection: protocol to provide the connectionless-mode network service (ISO/DIS 8473). This DAD does not have an equivalent CCITT recommendation.

DAD 2 covers addressing at the network layer and is applicable to both connection-mode and connectionless-mode operation. This DAD has been approved by the ISO Committee for issue for DIS ballot, and distribution of DAD 2 is currently awaited. The text of DAD 2 (reference ISO/TC 97/SC 6 N 3599) has been published as DD 134. A companion addendum to X.213 to cover addressing is currently under development in CCITT.

Other Drafts for Development specify various protocols which, used either singly or in combination, provide either the connection-mode or the connectionless-mode Network Service.

A brief summary of the Network Layer, to assist comprehension of the interrelationship between the various Network Layer publications, is attached as national appendix A.

A Department of Trade and Industry IT Standards Unit Technical Guide, TG 100/1, 'Intercept recommendations for the OSI Network Layer' is currently available from the DTI HQ Library, Room LG37, 1 Victoria Street, London SW1H 0ET.

For information, a list of published British Standards and Drafts for Development (together with those scheduled for publication at the time of publication of this Draft for Development) for OSI, data communications and computer graphics is attached as national appendix B. Press Releases for new OSI and data communications British Standards publications will be issued to the computing press, and details of all new publications will be recorded in full in *BSI News*.

Terminology and conventions. The text of the revised Draft International Standard has been approved as suitable for publication as a Draft for Development without deviation. Some terminology and certain conventions are not identical with those used in Drafts for Development.

Cross-references

International standards	Corresponding British Standards
ISO 7498-1984	BS 6568 : 1984 Description of basic reference model for open systems interconnection (Identical)
ISO/DIS 8073-1984	DD 116 : 1985 Open Systems Interconnection: transport protocol specification (ISO/DIS 8073 and DAD 1) (Identical)
ISO/DIS 8348/DAD 2 -1985	DD 134 : 1985 Open Systems Interconnection: network layer addressing (ISO/DIS 8348/DAD 2) (Identical)
ISO/DIS 8509	DD 108* Open Systems Interconnection: service conventions (ISO/DIS 8509) (Identical)

*In preparation.

0. INTRODUCTION

This Standard is one of a set of International Standards produced to facilitate the interconnection of computer systems. It is related to other Standards in the set as defined by the Open Systems Interconnection (OSI) Basic Reference Model. The OSI Reference Model subdivides the area of standardization for interconnection into a series of layers of specification, each of a manageable size.

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

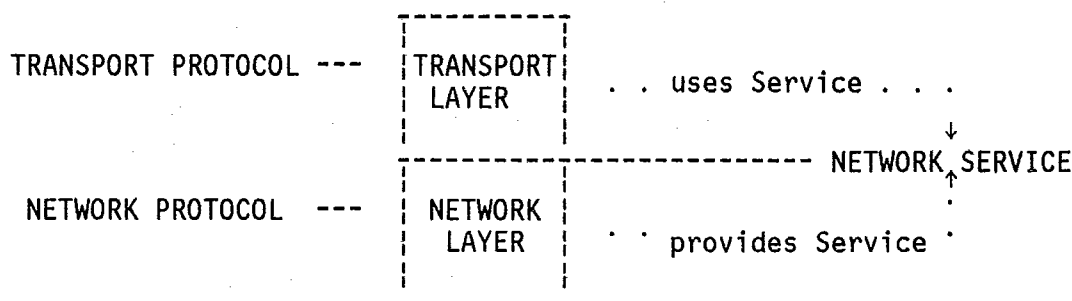


Figure 1
Relationship of the Network Service in this Standard to the
Protocols Specified in other OSI Standards

The use of the word "Network" to name the "Network" Layer of the OSI Reference Model should be distinguished from the use of the word "network" to denote a communications network as conventionally understood. To facilitate this distinction, the term "subnetwork" is used for a collection of physical equipment, commonly called a "network" (Reference IS 7498). Subnetworks may be either public networks or privately supplied networks. In the case of public networks, their properties may be determined by separate CCITT Recommendations such as X.21 for a circuit-switched network or X.25 for a packet-switched network.

Throughout the set of OSI 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 Network Service defined in this 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 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 CCITT Recommendations, by an Administration).

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Any particular subnetwork may or may not support the OSI Network Service. The OSI Network Service may be provided by a combination of one or more subnetworks and optional additional functions between or outside these subnetworks.

1. SCOPE AND FIELD OF APPLICATION

This Standard defines the OSI Network Service in terms of:

- a) the primitive actions and events of the Service;
- b) the parameters associated with each primitive action and event, and the form which they take;
- c) the interrelationship between, and the valid sequences of, these actions and events.

The principal objectives of this Standard are:

- a) to specify the characteristics of a conceptual Network Service and thus, supplement the Reference Model in guiding the development of Network Layer protocols;
- b) to encourage convergence of the capabilities offered by providers of subnetworks;
- c) to provide a basis for the individual enhancement of existing heterogeneous subnetworks to a common subnetwork-independent Network Service to enable them to be concatenated for the purpose of providing global communication. (Such concatenation may involve optional additional functions which are not defined in this Standard.) A definition of the quality of service is an important element of the Network Service Standard;
- d) to provide a basis for the development and implementation of subnetwork-independent Transport Layer protocols decoupled from the variability of underlying public and private subnetworks and their specific interface requirements.

This Standard does not specify individual implementations or products nor does it constrain the implementation of entities and interfaces within a system.

There is no conformance of equipment to this Network Service Definition Standard. Instead, conformance is achieved through implementation of conforming OSI Network protocols which fulfill the Network Service defined in this Standard.

[ISO page 3]

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2. REFERENCES

ISO 7498, Information Processing Systems - OSI - Basic Reference Model

Note: See also CCITT Recommendation X.200, Reference of Open Systems Interconnection for CCITT Applications.

ISO Technical Report 8509, OSI Service Conventions

Note: See also CCITT Recommendation X.210, OSI Layer Service Definition Conventions.

ISO 8073, Information Processing Systems - OSI - Connection-oriented Transport Protocol Specification

Note: See also CCITT Recommendation X.224, Transport Protocol Specification for Open Systems Interconnection for CCITT Applications.

CCITT Recommendation X.213, Network Service Definition for Open Systems Interconnection for CCITT Applications.

ISO 8348/DAD2, Information Processing Systems - OSI - Addendum to the Network Service Definition Covering Network Layer Addressing.

3. DEFINITIONS

Note: The definitions contained in this clause make use of abbreviations defined in clause 4.

3.1 Reference Model Definitions

This Standard is based on the concepts developed in the OSI Reference Model, IS 7498, and makes use of the following terms defined in that Standard:

- a) expedited Network-Service-data-unit
- b) Network-connection
- c) Network Layer
- d) Network Service
- e) Network-Service-access-point
- f) Network-Service-access-point-address
- g) Network-Service-data-unit
- h) subnetwork

3.2 Service Conventions Definitions

This Standard also makes use of the following terms defined by the OSI Service Conventions, TR 8509, as they apply to the Network Layer:

- a) Network Service user
- b) Network Service provider

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- c) primitive
- d) request
- e) indication
- f) response
- g) confirm

3.3 Network Service Definitions

For the purpose of this Standard, the following definitions also apply.

3.3.1 Calling NS user: An NS user that initiates an NC Establishment request.

3.3.2 Called NS user: An NS user with whom a calling NS user wishes to establish an NC.

Note: Calling NS users and called NS users are defined with respect to a single NC. An NS user can be both a calling and a called NS user simultaneously.

3.3.3 Generic address: An address which identifies a set of NSAPs rather than a single specific NSAP.

4. ABBREVIATIONS

COR	Confirmation of Receipt
ENSDU	Expedited Network-Service-data-unit
N	Network
NC	Network-connection
NL	Network Layer
NS	Network Service
NSAP	Network-Service-access-point
NSDU	Network-Service-data-unit
OSI	Open Systems Interconnection
QOS	Quality of service

5. CONVENTIONS

5.1 General Conventions

This Standard uses the descriptive conventions given by the OSI Service Conventions, TR 8509.

The layer service model, service primitives, and time-sequence diagrams taken from those conventions are entirely abstract descriptions; they do not represent a specification for implementation.

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5.2 Parameters

Service primitives, used to represent service-user/service-provider interactions (see TR 8509), convey parameters which indicate information available in the user/provider interaction.

The parameters which apply to each group of Network Service primitives are set out in tables in clauses 12 to 14. 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) an indication that the parameter is conditional in some way:
 - (C) indicates that the parameter is not present on the primitive for every NC; the parameter definition describes the conditions under which the parameter is present or absent.
- b) a parameter specific constraint:
 - (=) indicates that the value supplied in an indication or confirm primitive is always identical to that supplied in the corresponding request or response primitive occurring at the peer NSAP.
- c) indication that some note applies to the entry:
 - (Note x) indicates that the referenced note contains additional information pertaining to the parameter and its use.

In any particular interface, not all parameters need be explicitly stated. Some may be implicitly associated with the NSAP at which the primitive is issued.

5.3 NC Endpoint Identification Convention

If an NS user needs to distinguish among several NC's at the same NSAP, then a local NC endpoint identification mechanism must be provided. All primitives issued at such an NSAP would be required to use this mechanism to identify NC's. Such an implicit identification is not described as a parameter of the service primitives in this Network Service Definition.

Note: The implicit NC endpoint identification must not be confused with the address parameters of the N-CONNECT primitives (clause 12.2).

6. OVERVIEW AND GENERAL CHARACTERISTICS

The Network Service provides for the transparent transfer of data (i.e., NS-user-data) between NS users. It makes invisible to these NS users the way in which supporting communications resources are utilized to achieve this transfer.

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In particular, the Network Service provides for the following.

- a) Independence of underlying transmission media - the Network Service relieves NS users from all concerns regarding how various subnetworks are used to provide the Network Service. The Network Service hides from the NS user differences in the transfer of data over heterogeneous subnetworks, other than quality of service.
- b) End-to-end transfer - the Network Service provides for transfer of NS-user-data between NS users in end systems. All routing and relaying functions are performed by the NS provider including the case where several similar or dissimilar transmission resources are used in tandem or in parallel.
- c) Transparency of transferred information - the Network Service provides for the transparent transfer of octet-aligned NS-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.
- d) Quality of service selection - the Network Service makes available to NS users a means to request and to agree to the quality of service for the transfer of NS-user-data. Quality of service is specified by means of QOS-parameters representing characteristics such as throughput, transit delay, accuracy, and reliability.
- e) NS user addressing - the Network Service utilizes a system of addressing (NSAP addressing) which allows NS users to refer unambiguously to one another.

7. FEATURES OF THE NETWORK SERVICE

The Network Service offers the following features to an NS user.

- a) The means to establish an NC with another NS user for the purpose of transferring NS-user-data in the form of NSDUs. More than one NC may exist between the same pair of NS users.
- b) The establishment of an agreement between the two NS users and the NS provider for a certain QOS associated with each NC.
- c) The means of transferring NSDUs in sequence on an NC. The transfer of NSDUs, which consist of an integer number of octets, is transparent, in that the boundaries of NSDUs and the contents of NSDUs are preserved unchanged by the Network Service, and there are no constraints on the NSDU content imposed by the Network Service.
- d) The means by which the receiving NS user may flow control the rate at which the sending NS user may send NSDUs.
- e) In some circumstances, the means of transferring separate expedited NSDUs in sequence (see clause 8). Expedited NSDUs are limited in length and their transmission is subject to a different flow control from normal data across the NSAP.

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- f) The means by which the NC can be returned to a defined state and the activities of the two NS users synchronized by use of a Reset Service.
- g) In some circumstances, the means for the NS user to confirm the receipt of an NSDU (see clause 8).
- h) The unconditional, and therefore possibly destructive, release of an NC by either of the NS users or by the NS provider.

8. CLASSES OF NETWORK SERVICE

No distinct classes of Network Service are defined. However, two Network Layer services, Receipt Confirmation and Expedited Data Transfer, are NS provider-options.

A service which is an NS provider-option is one which an NS provider can choose either to provide or not to provide for a particular NC. In circumstances where the NS provider chooses not to provide a provider-option service, it will not be available in the Network Service. If the provider-option Receipt Confirmation or Expedited Data Transfer is provided, it shall be provided as defined in this Network Service Definition (clauses 14.1, 14.2, and 14.3).

All other Network services are mandatory in the Network Service. Mandatory services must be provided by every NS provider and are therefore always available.

9. MODEL OF THE NETWORK SERVICE

9.1 Model of the Network Layer Service

This Standard uses the abstract model for a layer service defined in clause 4 of the OSI Service Conventions (TR 8509). The model defines the interactions between the NS users and the NS provider which take place at the two NSAPs. Information is passed between the NS user and the NS provider by service primitives, which may convey parameters.

There are two types of OSI Network Service:

- a) a connection-mode Service (defined in Section Two of this Standard). The connection-mode Service is characterized by the features (a) to (h) given in clause 7 above.
- b) a connectionless-mode Service (not defined in this Standard).

When making reference to the Network Service, an NS user or NS provider shall state which types of Network Service it expects to use or provide.

9.2 Model of a Network Connection

Between the two endpoints of an NC, there exists a flow control function which relates the behavior of the NS user at one end receiving NS-user-data

[ISO page 8]

to the ability of the NS user at the other end to send NS-user-data. As a means of specifying this flow control feature and its relationship with other capabilities provided by the Network Service, the queue model of an NC, described in the following clauses, is used.

This queue model of an NC is discussed only to aid in the understanding of the end-to-end service features perceived by users of the Network Service. It is not intended to serve as a substitute for a precise, formal description of the Network Service, nor as a complete specification of all allowable sequences of NS primitives. (Allowable primitive sequences are specified in clause 11 -- also, see note below.) In addition, this model does not attempt to describe all the functions or operations of Network Layer entities (including relay entities) which are used to provide the Network Service. No attempt to specify or constrain Network Service implementations is implied.

In interpreting this Standard, statements in clauses 12-14 of the properties of individual primitives have precedence over the general statements in this clause.

Note: In addition to the interaction between service primitives described by this model, there may be constraints applied locally on the ability to invoke primitives, as well as service procedures defining particular sequencing constraints on some primitives.

9.2.1 Queue Model Concepts

The queue model represents the operation of an NC in the abstract by a pair of queues linking the two NSAPs. There is one queue for each direction of information flow (see Figure 2).

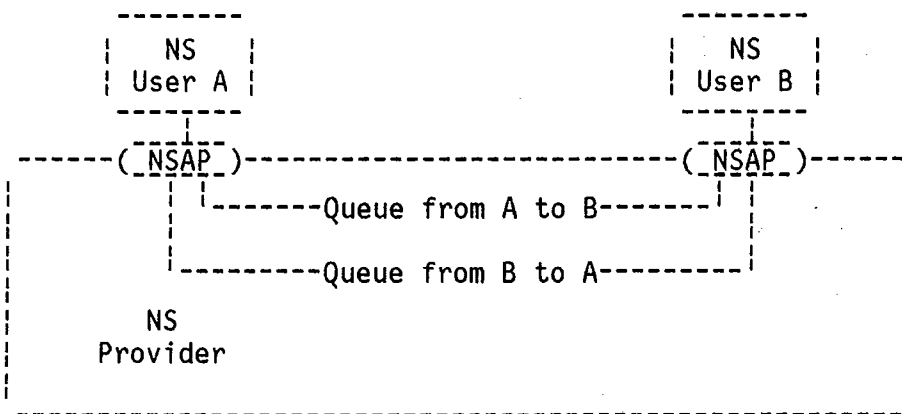


Figure 2
Queue Model of a Network Connection

Each queue represents a flow control function in one direction of transfer. The ability of an NS user to add objects to a queue will be determined by the behavior of the NS user removing objects from that queue and the state of the queue. Objects are entered or removed from the queue, either as the

result of interactions at the two NSAPs, or as the result of NS provider initiatives.

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

The objects which may be placed in a queue as a result of interactions at an NSAP (see clauses 12-14) are:

- a) connect objects (associated with N-CONNECT primitives and all of their parameters);
- b) octets of normal NS-user-data (associated with an N-DATA primitive);
- c) indications of end-of-NSDU (associated with completion of an N-DATA primitive);
- d) expedited NSDUs (associated with N-EXPEDITED-DATA primitives and all their parameters);
- e) data acknowledgment objects (associated with N-DATA-ACKNOWLEDGE primitives);
- f) reset objects (associated with N-RESET primitives and their parameters);
- g) disconnect objects (associated with N-DISCONNECT primitives and all their parameters).

Note: The description of flow control (see clause 9.2.3) requires a less abstract description than that used for describing sequences of primitives in clauses 11-14. While primitives are defined to be indivisible, for purposes of this queue model information associated with N-DATA primitives is conceptually subdivided into a sequence of octets of NS-user-data followed by an end-of-NSDU indication. This does not imply any particular subdivision in any real interface.

The objects which may be placed in a queue as a result of NS provider initiatives (see clauses 12, 13, and 14) are:

- a) reset objects (associated with N-RESET primitives and all their parameters);
- b) synchronization mark objects (see clause 9.2.4);
- c) disconnect objects (associated with N-DISCONNECT primitives and all their parameters).

The queues are defined to have the following general properties:

- 1) a queue is empty until a connect object has been entered and can be returned to this state, with loss of its contents, by the NS provider (see clauses 9.2.4 and 9.2.5);
- 2) objects may be entered into a queue as a result of the actions of the source NS user, subject to control by the NS provider; objects may also be entered into a queue by the NS provider;
- 3) objects are removed from the queue under the control of the receiving NS user;
- 4) objects are normally removed under the control of the NS user in the same order that they were entered (however see clause 9.2.3);
- 5) a queue has a limited capacity, but this capacity is not necessarily either fixed or determinable.

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9.2.2 NC Establishment

A pair of queues is associated with an NC between two NSAPs when the NS provider receives an N-CONNECT request primitive at one of the NSAPs and a connect object is entered into one of the queues. From the standpoint of one of the NS users of the NC, the queues remain associated with the NC until a disconnect object (associated with an N-DISCONNECT primitive) is either entered or removed from a queue at that NSAP.

If NS user A denotes the NS user who initiates NC Establishment, (resulting in a connect object being entered into the queue from NS user A to NS user B), then no object other than a disconnect object may be entered into the queue from A to B until after the connect object associated with the N-CONNECT confirm has been removed. In the queue from NS user B to NS user A, objects can be entered only after a connect object associated with an N-CONNECT response from NS user B has been entered; it is possible for a disconnect object to be placed in the queue from B to A instead of a connect object to release the NC.

The properties exhibited by the queues while the NC exists represent the agreements reached among the NS users and the NS provider during the NC Establishment procedure concerning quality of service and the use of the Receipt Confirmation and Expedited Data Transfer services.

9.2.3 Data Transfer Operations

Flow control on the NC is represented in this queue model by the management of the queue capacity, allowing objects of certain types to be added to the queues. The conditions affecting entry of reset and disconnect objects are described in item 2) below and in clauses 9.2.4 and 9.2.5. The flow control relationship between the other types of objects is summarized by Table 1.

Once in the queue, the NS provider may manipulate pairs of adjacent objects, resulting in:

- 1) change of order; the order of any pair of objects may be reversed, if and only if, the following object is of a type defined to be able to advance ahead of the preceding object. No object is defined to be able to advance ahead of another object of the same type.
- 2) deletion; any object may be deleted if, and only if, the following object is defined to be destructive with respect to the preceding object. If necessary, the last object on the queue will be deleted to allow a destructive object to be entered - they may therefore always be added to the queue. Disconnect objects are defined to be destructive with respect to all other objects. Reset objects are defined to be destructive with respect to all other objects except connect, disconnect, and other reset objects.

[ISO page 11]

Table 1
Flow Control Relationships Between Queue Model Objects

The addition of may prevent further addition of object y x	Octets of NS-user-data or end-of-NSDU	Expedited NSDU	Data Acknowledgement
Octets of normal NS-user-data or end-of-NSDU	Yes	Yes	No
Expedited NSDU	No	Yes	No
Data Acknowledgement	No	No	No

The relationships between objects which may be manipulated in the above fashion are summarized in Table 2.

Whether the NS provider performs actions resulting in change of order and deletion or not will depend upon the behavior of the NS users and the agreed QOS for the NC. In general, if an NS user does not cause objects to be removed from a queue, the NS provider shall, after some unspecified period of time, perform all permitted actions of types 1) and 2) above.

9.2.4 Reset Operations

The invocation of a Reset procedure is represented in the two queues as follows:

- 1) invocation of a Reset procedure by the NS provider is represented by the introduction into each queue of a reset object followed by a synchronization mark object.
- 2) a Reset procedure invoked by an NS user is represented by the addition of a reset object to one queue. In this case, the NS provider will insert a reset object followed by a synchronization mark object into the other queue.

The completion of a Reset procedure by the issuance of an N-RESET response by an NS user results in a reset object being placed in the queue from the responding NS user.

[ISO page 12]

Table 2. Ordering Relationships Between Queue Model Objects.

Following object x is defined with respect to preceding object y	Connect	Octets of normal NS-user-data	End-of-NSDU	Expedited NSDU	Data acknowledgement	Reset	Synchronization mark	Disconnect
Connect	N/A	--	--	--	--	--	--	DES
Octets of normal NS-user-data	N/A	--	--	AA	AA	DES	--	DES
End of NSDU	N/A	--	--	AA	AA	DES	--	DES
Expedited NSDU	N/A	--	--	--	AA	DES	--	DES
Data acknowledgement	N/A	--	--	AA	--	DES	--	DES
Reset	N/A	--	--	--	--	--	--	DES
Synchronization mark	N/A	N/A	N/A	N/A	N/A	DES	N/A	DES
Disconnect	N/A	N/A	N/A	N/A	N/A	N/A	N/A	DES

Key: "AA" indicates that object x is defined to be able to advance ahead of the preceding object y.
 "DES" indicates that object x is defined to be destructive with respect to the preceding object y.
 "---" indicates that object x is neither destructive with respect to object y nor able to advance ahead of object y.
 "N/A" indicates that object x will not occur in a position succeeding object y in a valid state of a queue.

A synchronization mark object cannot be removed from a queue by an NS user; a queue appears empty to an NS user when a synchronization mark object is the next object in it. Unless destroyed by a disconnect object, a synchronization mark object remains in the queue until the next object following it in the queue is a reset object. Both the synchronization mark object and the following reset object are then deleted by the NS provider.

Note: Associated with the invocation of a Reset procedure are restrictions on the issuance of certain other types of primitives. These restrictions will result in restrictions on the entry of certain object types into the queue until the Reset procedure is complete.

9.2.5 NC Release

The insertion into a queue of a disconnect object, which may occur at any time, represents the initiation of an NC Release procedure. The Release procedure may be destructive with respect to other objects in the two queues and eventually results in the emptying of the queues and the disassociation of the queues with the NC.

The insertion of a disconnect object may also represent the rejection of an NC Establishment attempt or the failure to complete NC Establishment. In such cases, if a connect object representing an N-CONNECT request primitive is deleted by a disconnect object, then the disconnect object is also deleted. The disconnect object is not deleted when it deletes any other object, including the case where it deletes a connect object representing an N-CONNECT response.

10. QUALITY OF NETWORK SERVICE

The term "Quality of Service" (QOS) refers to certain characteristics of an NC as observed between the NC endpoints. QOS describes aspects of an NC which are attributable solely to the NS provider; it can only be properly determined in the absence of NS user behavior (which is beyond the control of the NS provider) which specifically constrains or impairs the performance of the Network Service.

A value of QOS applies to an entire NC. When determined or measured at both ends of an NC, the QOS observed by the NS users at the two ends of the NC is the same. This is true even in the case of an NC spanning several subnetworks where each subnetwork offers different services.

10.1 Determination of QOS

QOS is described by means of QOS-parameters. The definition of each of these QOS-parameters specifies the way in which the QOS-parameter's value is measured or determined, making reference where appropriate, to primitive events of the NS.

Note 1: It is important to distinguish the use of the term "QOS-parameters" from the more general term "parameters" as defined in

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Documents

This publication is a Draft for Development and is therefore not to be regarded as a British Standard. See page 1

clause 5.2 and used throughout this Network Service Definition. A "QOS-parameter" refers to a specific aspect or component of the QOS for an NC. As described below, a particular QOS-parameter may or may not be related to a parameter defined as part of a Network Service primitive.

Note 2: For purposes of accuracy and/or convenience, the definition and measurement formula for some QOS-parameters includes a component attributable to the NS user(s). In such cases, to evaluate the QOS attributable solely to the NS provider, this NS user-dependent component must be factored out.

Note 3: The definition of NS QOS-parameters in terms which provide a means for measurement should not be read to imply that QOS monitoring or that verification of stated QOS values is, or must be, performed by the NS provider or by the NS users.

It is in terms of the NS QOS-parameters that information about QOS is exchanged among the NS provider and NS users.

Information about the QOS requirements of the NS users may be used by the NS provider for purposes such as protocol selection, route determination, and allocation of resources. Information about the QOS available from the NS provider may be used by NS users for purposes such as selecting QOS enhancement mechanisms and determining the QOS values provided to NS users at higher layers.

The NS QOS-parameters can be divided into two categories as follows:

- a) those whose values are "conveyed" between peer NS users by means of the NS during the Establishment phase of an NC. As part of this conveyance, a three-party "negotiation" among the NS users and the NS provider for the purpose of agreeing upon a particular QOS-parameter value may take place; and
- b) those whose values are not "conveyed" or "negotiated" among the NS users and the NS provider. For these QOS-parameters, however, information about the values which is useful to the NS provider and each NS user may be made known by local means.

The NS QOS-parameters are defined in clauses 10.2.1 to 10.2.12 below.

The set of NS QOS-parameters that belong to the first category, and the procedures and constraints that apply to conveying and negotiating those QOS-parameters, are specified in clause 12.2.7. Once the NC is established, and throughout the lifetime of the NC, the agreed values for these two QOS-parameters are not "renegotiated" at any point, and there is no guarantee that the originally negotiated values will be maintained. The NS user should also be aware that, once an NC is established, changes in QOS on the NC are not explicitly signalled in the NS.

For QOS-parameters in the second category, the values for a particular NC are not negotiated, nor are they directly conveyed from NS user to NS user. As a local matter, however, there may be means by which the values of one or more of these QOS-parameters are known and utilized by the NS provider

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and each NS user. Despite the local nature of particular NS user/NS provider interactions which may occur for the purposes of exchanging QOS-parameter information, the characteristics of an NC which the QOS-parameters describe are applicable and can be observed on a complete NC, end-to-end basis. Thus, in order to give a full characterization of the properties of NC's, the definitions of the entire set of QOS-parameters which apply to the NS, including those classified in category 2, are included in this Network Service Definition. Other aspects related to category 2 parameters, such as the circumstances of their availability and use, as well as other QOS issues, such as the relationship to OSI management, and multi-layer QOS relationships, are the subjects of other OSI QOS-related specifications.

Note: For non-negotiated QOS-parameters associated with the Data Transfer phase of an NC, when specified, a value of such a QOS-parameter applies to both directions of transfer on the NC.

10.2 Definition of QOS-Parameters

QOS-parameters can be classified as:

- a) QOS-parameters which express Network Service performance, as shown in Table 3.

Table 3
Classification of Performance QOS-Parameters

PHASE	PERFORMANCE CRITERION	
	SPEED	ACCURACY/RELIABILITY
NC ESTABLISHMENT	NC Establishment Delay	NC Establishment Failure Probability (misconnection/NC refusal)
DATA TRANSFER	Throughput	Residual Error Rate (corruption, duplication/loss) NC Resilience
	Transit Delay	Transfer Failure Probability
NC RELEASE	NC Release Delay	NC Release Failure Probability