

**Implementation of
ISO/IEC 8348:1993**

Information technology — Open Systems Interconnection — Network Service Definition

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Contents

	Page
Committees responsible	Inside front cover
National foreword	ii
Foreword	vii
Text of ISO/IEC 8348	1

National foreword

This British Standard reproduces verbatim ISO/IEC 8348:1993 including Amendment 5 and implements it as the UK national standard. This British Standard supersedes BS 7220:1990, which is withdrawn.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the ISO/IEC title page, pages ii to viii, pages 1 to 60 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

INTERNATIONAL STANDARD

ISO/IEC
8348

Second edition
1993-06-15

AMENDMENT 5
1994-11-01

Information technology — Open Systems Interconnection — Network Service Definition

AMENDMENT 5: Group Network addressing

*Technologies de l'information — Interconnexion de systèmes ouverts —
Définition du service de réseau*

AMENDEMENT 5: Adressage de réseau groupé



Reference number
ISO/IEC 8348:1993/Amd.5:1994(E)

Contents

	Page
Foreword	vii
0 Introduction	1
Section 1. General	
1 Scope	1
2 Normative references	1
2.1 Paired Recommendations International Standards equivalent in technical content	2
2.2 Additional references	2
3 Definitions	2
3.1 Basic reference model definitions	2
3.2 Service conventions definitions	3
3.3 Network Service definitions	3
3.4 Network addressing definitions	3
3.5 Network layer architecture definitions	5
4 Abbreviations	5
5 Conventions	5
5.1 General conventions	5
5.2 Parameters	5
5.3 NC endpoint identification convention	6
6 Overview and general characteristics	6
7 Types and classes of Network Service	6
Section 2. Definition of the connection-mode service	
8 Features of the connection-mode Network Service	8
9 Model of the connection-mode Network Service	8
9.1 Model of the connection-mode Network Layer Service	8
9.2 Model of a Network Connection	8
9.2.1 Queue model concepts	8
9.2.2 NC establishment	10
9.2.3 Data transfer operations	10
9.2.4 Reset operations	12
9.2.5 NC release	12
10 Quality of the connection-mode Network Service	12
10.1 Determination of QOS	12
10.2 Definition of QOS-parameters	13
10.2.1 NC establishment delay	13
10.2.2 NC establishment failure probability	14
10.2.3 Throughput	14
10.2.4 Transit delay	14
10.2.5 Residual error rate	14
10.2.6 Transfer failure probability	15
10.2.7 NC resilience	15
10.2.8 NC release delay	15
10.2.9 NC release failure probability	16
10.2.10 NC protection	16
10.2.11 NC priority	16
10.2.12 Maximum acceptable cost	16
11 Sequence of primitives	16
11.1 Relation of primitives at the two NC end points	16
11.2 Sequence of primitives at one NC endpoint	17

		Page
12	Connection establishment phase	17
12.1	Function	17
12.2	Types of primitives and parameters	17
12.2.1	Addresses	17
12.2.2	Called address parameter	21
12.2.3	Calling address parameter	21
12.2.4	Responding address parameter	21
12.2.5	Receipt confirmation selection parameter	21
12.2.6	Expedited data selection parameter	21
12.2.7	QOS-parameter set	21
12.2.7.1	Throughput	22
12.2.7.2	Transit delay	23
12.2.7.3	NC Protection	24
12.2.7.4	NC Priority	26
12.2.8	NS-user-data parameter	27
12.3	Sequence of primitives	27
13	Connection release phase	29
13.1	Function	29
13.2	Types of primitive and parameters	29
13.2.1	Originator parameter	29
13.2.2	Reason parameter	30
13.2.3	NS-user-data parameter	30
13.2.4	Responding address parameter	30
13.3	Sequence of primitives when releasing an established NC	30
13.4	Sequence of primitives in an NS user rejection of an NC establishment attempt	32
13.5	Sequence of primitives in an NS provider rejection of an NC establishment attempt	32
14	Data transfer phase	32
14.1	Data transfer	32
14.1.1	Function	32
14.1.2	Types of primitives and parameters	32
14.1.2.1	NS-user-data parameter	33
14.1.2.2	Confirmation request parameter	33
14.1.3	Sequence of primitives	33
14.2	Receipt confirmation service	33
14.2.1	Function	33
14.2.2	Types of primitives and parameters	34
14.2.3	Sequence of primitives	34
14.3	Expedited data transfer service	34
14.3.1	Function	34
14.3.2	Types of primitives and parameters	35
14.3.2.1	NS-user-data parameter	35
14.3.3	Sequence of primitives	35
14.4	Reset service	35
14.4.1	Function	35
14.4.2	Types of primitives and parameters	35
14.4.2.1	Originator parameter	36

	Page
14.4.2.2 Reason parameter	36
14.4.3 Sequence of primitives	36
Section 3. Definition of the connectionless-mode service	
15 Features of the connectionless-mode Network Service	39
16 Model of the connectionless-mode Network Service	39
16.1 Model of the connectionless-mode Network Layer Service	39
16.2 Model of a network connectionless-mode transmission	39
17 Quality of the connectionless-mode Network Service	40
17.1 Determination of QOS	40
17.2 Definition of network connectionless-mode QOS-parameters	41
17.2.1 Transit delay	41
17.2.2 Protection from unauthorized access	41
17.2.3 Cost determinants	41
17.2.4 Residual Error Probability	41
17.2.5 Priority	41
17.3 Route selection considerations	42
18 Sequence of primitives	42
19 Data transfer	42
19.1 Function	42
19.2 Types of primitives and parameters	43
19.2.1 Addresses	43
19.2.2 Quality of Service	43
19.2.3 NS-Userdata	43
19.3 Sequence of primitives	44
Annex A Network Layer Addressing	45
A.1 General	45
A.2 Scope	45
A.3 Concepts and terminology	45
A.3.1 Network addresses	45
A.3.1.1 Subnetwork address	45
A.3.1.2 NSAP address	46
A.3.1.3 Network protocol address information	46
A.3.2 Domains	46
A.3.2.1 Global network addressing domain	46
A.3.2.2 Network addressing domain	47
A.3.3 Authorities	47
A.3.4 Network address allocation	47
A.4 Principles for creating the OSI Network addressing scheme	48
A.4.1 Hierarchical structure	48
A.4.2 Global identification of any NSAP	48
A.4.3 Route independence	49
A.5 Network address definition	49
A.5.1 Network address semantics	49
A.5.1.1 The IDP	50
A.5.1.1.1 The AFI	50
A.5.1.1.2 The IDI	50
A.5.1.2 The DSP	50
A.5.2 Network address abstract syntax	50

	Page
A.5.2.1 Abstract syntax and allocation of the IDP	50
A.5.2.1.1 Abstract syntax and allocation of the AFI	51
A.5.2.1.2 Format and allocation of the IDI	51
A.5.2.2 Abstract syntax and allocation of the DSP	53
A.5.2.3 Abstract syntax of the DSP	54
A.5.3 Network address encodings	54
A.5.4 Maximum Network address length	55
A.6 Character based DSP allocation	55
A.7 Reference publication formats	56
A.8 Network entity titles	56
Annex B Rationales for the material in Annex A	56
B.1 IDI formats (A.5.2.1.2)	56
B.2 Reservation of AFI values 00–09 (Table A.2)	57
B.3 Derivation of the preferred encodings (A.5.3)	57
Annex C Facilities for conveying service characteristics in the connectionless-mode Network Services	58
C.1 Introduction	58
C.2 Function	58
C.3 Types of primitives and parameters	58
C.4 Service Characteristics	59
C.4.1 Congestion Control	59
C.4.2 Sequence preservation probability	59
C.4.3 Maximum NSDU lifetime	59
C.5 Types of primitives and parameters	59
C.5.1 Destination address	60
C.5.2 Service characteristics/QOS parameter	60
C.5.3 Reason for report	60
Figure 1 — Queue model of a Network Connection	9
Figure 2 — Components of residual error rate	15
Figure 3 — Summary of Network Service primitive time sequence diagrams	19
Figure 4 — State transition diagram for sequences of primitives at an NC endpoint	20
Figure 5 — Sequence of primitives in successful NC establishment	27
Figure 6 — Sequence of primitives in NS user invoked NC release	31
Figure 7 — Sequence of primitives in simultaneous NS user invoked NC release	31
Figure 8 — Sequence of primitives in NS provider invoked NC release	31
Figure 9 — Sequence of primitives in simultaneous NS user and NS provider invoked NC release	31
Figure 10 — Sequence of primitives in NS user rejection of an NC establishment attempt	32
Figure 11 — Sequence of primitives in NS provider rejection of an NC establishment attempt	32
Figure 12 — Sequence of primitives in data transfer	33
Figure 13 — Sequence of primitives in successful data transfer with receipt confirmation	34
Figure 14 — Sequence of primitives in expedited data transfer	35
Figure 15 — Sequence of primitives in NS user invoked reset	37

	Page
Figure 16 — Sequence of primitives in simultaneous NS user invoked reset	37
Figure 17 — Sequence of primitives in NS provider invoked reset	37
Figure 18 — Sequence of primitives in simultaneous NS user and NS provider invoked reset	38
Figure 19 — Model of a network-connectionless-mode-transmission	40
Figure 20 — State transition diagram for sequences of connectionless-mode primitives at one NSAP	43
Figure 21 — Sequence of primitives in a network-connectionless-mode transmission	44
Figure A.1 — Subnetwork address	45
Figure A.2 — NSAP address	46
Figure A.3 — Network addressing domains	47
Figure A.4 — Hierarchical structure of NSAP address	48
Figure A.5 — Relationship of NSAP address semantics and syntax	49
Figure A.6 — NSAP address structure	50
Figure C.1	58
Table 1 — Flow control relationships between queue model objects	10
Table 2 — Ordering relationships between queue model objects	11
Table 3 — Classification of performance QOS-parameters	13
Table 4 — QOS-parameters not associated with performance	14
Table 5 — Summary of Network Service primitives and parameters	18
Table 6 — NC establishment primitives and parameters	20
Table 7 — Negotiated QOS-subparameters for throughput QOS-parameters	23
Table 8 — Negotiation of throughput QOS-subparameters	25
Table 9 — Negotiated QOS-subparameters for transit delay QOS-parameter	26
Table 10 — Negotiation of transit delay QOS-subparameters	28
Table 11 — Negotiated QOS-subparameter for NC Protection QOS-parameters	29
Table 12 — Negotiated QOS-subparameters for NC Priority QOS-parameter	29
Table 13 — NC release primitives and parameters	29
Table 14 — Data transfer primitives and parameters	33
Table 15 — Expedited data transfer primitives and parameters	35
Table 16 — Reset primitives and parameters	35
Table 17 — Connectionless-mode service primitives and parameters	43
Table A.1 — Individual AFI allocations	51
Table A-X — Relationship of AFI Individual and Group values	51
Table A-Y — AFI values reserved for future allocation	52
Table A.2 — AFI values for individual Network addresses	52
Table A.3 — Maximum DSP length	54
Table C.1 — Facility and Report parameters and primitives	60

Descriptors: Data processing, information interchange, open systems interconnection, network interconnection, data transmission, network service, definitions.

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

This amendment to International Standard ISO/IEC 8348:1993 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 6, *Telecommunications and information exchange between systems*.

This amendment to ISO/IEC 8348:1993 has not been approved by ITU-T and is an ISO/IEC amendment only. When approved by ITU-T a second edition of the amendment will be published conforming to the Rules for presentation of ISO/IEC/ITU-T common texts.

Amendments 1 to 4 were consolidated into the second edition of ISO/IEC 8348.

Section 1. General

0 Introduction

This Amendment to ISO/IEC 8348:1993 defines the concept of **group Network address**.

ISO/IEC 8348:1993 defines the Network service access point (NSAP) address as an identifier for a single NSAP, supporting a Network service that is exclusively unicast (i.e., between a single source NSAP and a single destination NSAP). This Amendment does not change the definition of the NSAP address, but adds a new type of identifier — the group Network address — that supports a multicast Network service (i.e., between a single source NSAP, identified by an individual Network address, and a group of destination NSAPs, identified by a group Network address). The multicast Network service is itself defined in a separate Amendment to ISO/IEC 8348:1993.

This Amendment defines group Network addresses by creating a new set of AFI values, one for each existing AFI value, and a fixed one-to-one mapping between each of the existing AFI values and a corresponding group AFI value. The syntax of a group Network address is identical to the syntax of an individual Network address, except that the value of the AFI in an individual Network address may be only one of the values already allocated for individual Network addresses, whereas the value of the AFI in a group Network address may be only one of the values allocated for group Network addresses by this Amendment. The AFI values allocated for group Network addresses have been chosen in such a way that they do not overlap, in the preferred encoding defined by ISO/IEC 8348:1993, with any of the AFI values that have already been allocated for individual Network addresses.

1 Scope

This Recommendation | International 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 Recommendation | International Standard are

- 1) to specify the characteristics of a conceptual Network Service and thus, supplement the Reference Model in guiding the development of Network Layer protocols;
- 2) to encourage convergence of the capabilities offered by providers of subnetworks;
- 3) 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 Recommendation | International Standard.) A definition of the quality of service is an important element of this Recommendation | International Standard;
- 4) 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 Recommendation | International 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 Recommendation | International Standard. Instead, conformance is achieved through implementation of conforming OSI Network protocols which fulfill the Network Service defined in this Recommendation | International Standard.

2 Normative references

The following CCITT Recommendations and International Standards contain provisions which, through reference in this text, constitute provisions of this Recommendation | International Standard. At the time of publication, the editions indicated were valid. All Recommendations and International Standards are subject to revision, and parties to agreements based on this Recommendation | International Standard are encouraged to investigate the possibility of applying the most recent edition of the CCITT Recommendations and International Standards listed below. Members of the IEC and ISO maintain registers of currently valid International Standards. The CCITT Secretariat maintains a list of the currently valid CCITT Recommendations.

2.1 Paired Recommendations | International Standards equivalent in technical content

— CCITT Recommendation X.200 (1988), *Reference model of Open Systems Interconnection for CCITT Applications*.

ISO 7498:1984, *Information processing systems — Open Systems Interconnection — Basic Reference Model*.

— CCITT Recommendation X.210 (1988), *Open Systems Interconnection layer service definition conventions*.

ISO/TR 8509:1987, *Information processing systems — Open Systems Interconnection — Service conventions*.

— CCITT Recommendation X.224 (1988), *Transport protocol specification for Open Systems Interconnection for CCITT applications*.

ISO/IEC 8073:1992, *Information technology — Telecommunications and information exchange between systems — Open Systems Interconnection — Protocol for providing the connection-mode transport services*.

2.2 Additional references

— CCITT Recommendation E.163 (1998), *Numbering plan for the international telephone service*.

— CCITT Recommendation E.164 (1991), *The numbering plan for the ISDN era*.

— CCITT Recommendation F.69 (1988), *Plan for telex destination codes*.

— CCITT Recommendation X.121 (1992), *International numbering plan for public data networks*.

— CCITT Recommendation X.300 (1988), *General principles for interworking between public networks and between public networks and other networks for the provision of data transmission services*.

— ISO/IEC 646:1991, *Information technology — ISO 7-bit coded character set for information interchange*.

— ISO 2375:1985, *Data processing — Procedure for registration of escape sequences*.

— ISO 3166:1988, *Codes for the representation of names of countries*.

— ISO 6523:1984, *Data interchange — Structures for the identification of organizations*.

— ISO 7498:1984/Add. 1:1987, *Information processing systems — Open Systems Interconnection — Basic Reference Model — Addendum 1: Connectionless-mode transmission*.

— ISO 8648:1988, *Information processing systems — Open Systems Interconnection — Internal organization of the Network Layer*.

3 Definitions

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

3.1 Basic reference model definitions

This Recommendation | International Standard is based on the concepts developed in the Basic Reference Model for Open Systems Interconnection and makes use of the following terms defined in CCITT Rec. X.200 | ISO 7498:

- a) expedited Network-Service-data-unit;
- b) Network-address,
- c) Network Connection;
- d) Network-entity,
- e) Network-protocol control information,
- f) Network-protocol data unit,
- g) Network Layer.
- h) Network-relay.
- i) Network-routing,
- j) Network Service;
- k) Network-Service-access-point;
- l) Network-Service-access-point-address;

- m) Network-Service-data-unit;
- n) OSI environment,
- o) subnetwork;
- p) title.

3.2 Service conventions definitions

This Recommendation | International Standard also makes use of the following terms defined in CCITT Rec. X.210 | ISO/TR 8509, as they apply to the Network Layer:

- a) confirm;
- b) indication;
- c) Network Service user;
- d) Network Service provider;
- e) primitive;
- f) request;
- g) response.

3.3 Network Service definitions

For the purpose of this Recommendation | International 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

3.3.4

network connection

an association established by a Network Layer between two NS users for the transfer of data, which provides explicit identification of a set of Network data transmissions and agreement concerning the services to be provided by the set

NOTE This definition clarifies that given in CCITT Rec. X.200 | ISO 7498.

3.3.5

network connection-mode data transmission

the transfer of an NSDU from a source NSAP to a destination NSAP within the context of an NC that has previously been established

3.3.6

network connectionless-mode data transmission

the transmission of an NSDU from a source NSAP to a destination NSAP outside the context of an NC and without any requirement to maintain any logical relationship among multiple invocations

3.4 Network addressing definitions

Annex A, describing network addressing makes use of the following terms as defined below:

3.4.1

DTE address

information used to identify a point of attachment to a public data network

3.4.2

subnetwork point of attachment

a point at which a real end system, interworking unit, or real subnetwork is attached to a real subnetwork, and a conceptual point at which a subnetwork service is offered within an end or intermediate system

3.4.3

subnetwork point of attachment address

information used in the context of a particular real subnetwork to identify a subnetwork point of attachment; or information used in the context of a particular subnetwork to identify the conceptual point within an end or intermediate system at which the subnetwork service is offered. This term is used interchangeably with the (equivalent) shortened form *subnetwork address*

3.4.4

network protocol address information

information encoded in a Network protocol data unit to carry the semantics of a Network service access point address (This is known as an “address signal” or as the “coding of an address signal” in the public network environment.)

3.4.5

naming domain

a context within which a name allocated by a naming authority is unambiguous. Where the name is an address, the context within which the name is allocated is called an *addressing domain*

3.4.6

global network addressing domain

an addressing domain consisting of all of the Network service access point addresses in the OSI environment

3.4.7

network addressing domain

a subset of the global network addressing domain consisting of all of the Network service access point addresses allocated by one or more addressing authorities

3.4.8

naming authority

that which allocated names from a specified naming domain, and which ensures that names so allocated are unambiguous. Where the naming authority allocates addresses, it is called an *addressing authority*

3.4.9

network addressing authority

an addressing authority that assigns and administers Network service access point addresses within one or more network addressing domains

3.4.10

abstract syntax

a notation which enables data types to be defined, and values of those types specified, without determining the way in which they will be represented (encoded) for transfer by protocols

3.4.X

group network address

an address that identifies a set of zero or more Network service access points; these may belong to multiple Network entities, in different end systems

3.4.Y

individual network address

an address that identifies a single NSAP

NOTE Where the distinction between a group Network address and an individual Network address is not important, the term NSAP address is used.

3.5 Network layer architecture definitions

This Recommendation | International Standard makes use of the following terms defined in CCITT Rec. X.300 and ISO 8648.

- a) subnetwork;
- b) real subnetwork;
- c) subnetwork service;
- d) real end system;
- e) interworking unit;
- f) intermediate system;
- g) relay entity.

4 Abbreviations

AFI	Authority and format identifier
CC	Country code
COR	Confirmation of receipt
DCC	Data country code
DSP	Domain specific part
ENSDU	Expedited Network-Service-data-unit
ICD	International code designator
IDI	Initial domain identifier
IDP	Initial domain part
ISDN	Integrated services digital network
N	Network
NC	Network Connection
NL	Network Layer
NPAI	Network protocol addressing information
NPDU	Network protocol data unit
NS	Network Service
NSAP	Network-Service-access-point
NSDU	Network-Service-data-unit
OSI	Open Systems Interconnection
PSTN	Public switched telephone network
PTT	Postal, telephone and telegraph
QOS	Quality of Service
RPF	Reference publication format
SNPA	Subnetwork point of attachment

5 Conventions

5.1 General conventions

This Service Definition uses the descriptive conventions given by CCITT Rec. X.210 | ISO/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.

5.2 Parameters

Service primitives, used to represent service-user/service-provider interactions (see CCITT Rec. X.210 | ISO/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 and 19. Each “X” in the tables indicates that the primitive labeling the column in which it falls may carry the parameter labeling 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) an 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 NCs 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 NCs. Such an implicit identification is not described as a parameter of the service primitives in this Service Definition.

NOTE The implicit NC endpoint identification must not be confused with the address parameters of the N-CONNECT primitives (see 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.

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 and group Network addressing) which allows NS users to refer unambiguously to one another.

7 Types and classes of Network Service

There are two types of Network Service:

- a) a connection-mode service (defined in clause 2); and
- b) a connectionless-mode service (defined in clause 3).

For a given instance of communication, the mode of service provided to both NS users is the same (i.e. connection-mode or connectionless-mode). Choice of provision of the connectionless-mode Network Service or the connection-mode Network Service is made in accordance with ISO 7498/Add.1.

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

There are no distinct classes of Network Service defined.

However, for the connection-mode service, 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 as defined in 14.1 to 14.3.

Section 2. Definition of the connection-mode service

8 Features of the connection-mode Network Service

The connection-mode 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 7). Expedited NSDUs are limited in length and their transmission is subject to a different flow control from normal data across the NSAP;
- 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 7);
- h) the unconditional, and therefore possibly destructive, release of an NC by either of the NS users or by the NS provider.

9 Model of the connection-mode Network Service

9.1 Model of the connection-mode Network Layer Service

This Service Definition uses the abstract model for a layer service defined in clause 4 of CCITT Rec. X.210|ISO/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.

9.2 Model of a Network Connection

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

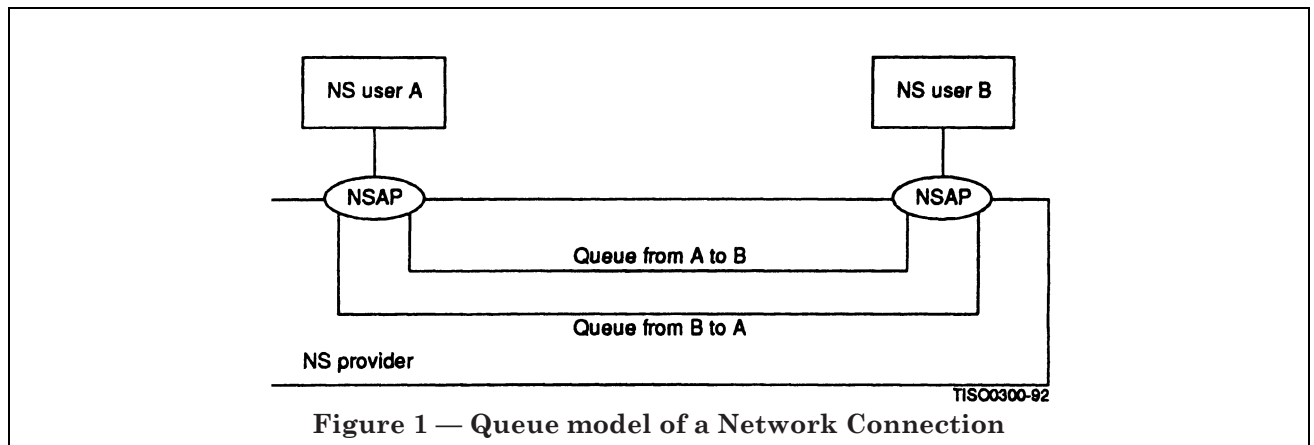
This queue model of an NC is discussed only to aid in the understanding of the end-to-end service features perceived by users of the Network Service. It is not intended to serve as a substitute for a precise, formal description of the Network Service, nor as a complete specification of all allowable 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 service definition, statements in clauses 12 to 14 concerning 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 1).



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 behaviour 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 to 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 9.2.3) requires a less abstract description than that used for describing sequences of primitives in clauses 11 to 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 to 14) are

- 1) reset objects (associated with N-RESET primitives and all their parameters);
- 2) synchronization mark objects (see 9.2.4);
- 3) disconnect objects (associated with N-DISCONNECT primitives and all their parameters).

The queues are defined to have the following general properties:

- i) 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 9.2.4 and 9.2.5);
- ii) 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;
- iii) objects are removed from the queue under the control of the receiving NS user;
- iv) objects are normally removed under the control of the NS user in the same order that they were entered (however see 9.2.3);
- v) a queue has a limited capacity, but this capacity is not necessarily either fixed or determinable.

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 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 b) below and in 9.2.4 and 9.2.5. The flow control relationship between the other types of objects is summarized by Table 1.

Table 1 — Flow control relationships between queue model objects

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

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

- a) *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.
- b) *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 in the queue will be deleted to allow a destructive object to be entered. Destructive objects 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 and disconnect objects.

The relationships between objects which may be manipulated as described in a) and b) above are summarized in Table 2.

Table 2 — Ordering relationships between queue model objects

with respect to preceding object y	Following object x is defined							
	Connect	Octets of normal NS user-data	End-of-NSDU	Expedited NSDU	Data acknowledgment	Reset	Synchronization mark	Disconnect
Connect	N/A	—	N/A	—	—	—	N/A	DES
Octets of normal NS user-data	N/A	—	—	AA	AA	DES	N/A	DES
End-of-NSDU	N/A	—	N/A	AA	AA	DES	N/A	DES
Expedited NSDU	N/A	—	—	—	AA	DES	N/A	DES
Data acknowledgment	N/A	—	—	AA	—	DES	N/A	DES
Reset	N/A	—	N/A	—	—	DES	—	DES
Synchronization mark	N/A	—	—	—	—	DES	N/A	DES
Disconnect	N/A	N/A	N/A	N/A	N/A	N/A	N/A	DES
AA Indicates that object x is defined to be able in 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.								