

Implementation of
ISO/IEC 10177:1993

**Information
technology —
Telecommunications
and information
exchange between
systems — Provision of
the connection-mode
Network internal layer
service by intermediate
systems using
ISO/IEC 8208, the
X.25 Packet Layer
Protocol**

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National foreword

This British Standard reproduces verbatim ISO/IEC 10177:1993 and implements it as the UK national standard.

This British Standard is published under the direction of the Information Systems Technology Standards Policy Committee whose Technical Committee IST/6 has the responsibility to:

- aid enquirers to understand the text;
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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 iv, pages 1 to 28 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.

**Information technology —
Telecommunications and information
exchange between systems — Provision
of the connection-mode Network internal
layer service by intermediate systems
using ISO/IEC 8208, the X.25 Packet Layer
Protocol**

*Technologies de l'information — Télécommunications et échange
d'information entre systèmes — Fourniture du service de la couche
interne de réseau en mode connexion par des systèmes intermédiaires
utilisant l'ISO/CEI 8208, protocole X.25 de couche paquet*



Reference number
ISO/IEC 10177 1993(E)

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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.

International Standard ISO/IEC 10177 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Sub-Committee SC 6, *Telecommunications and information exchange between systems*.

Annex A and Annex B form an integral part of this International Standard. Annex C is for information only.

Introduction

This International Standard is one of the set of standards associated with the Network layer of ISO 7498's Reference Model for Open Systems Interconnection (OSI), aimed collectively at provision and support of the OSI Network service defined in ISO 8348. It has been developed within the general framework provided by ISO 8648, Internal Organization of the Network Layer, and in accordance with the more detailed model of intermediate-system functions defined in ISO/IEC 10028.

ISO/IEC 10028 defines the relaying functions of a Network-layer intermediate system, in terms of the Network internal layer service (NILS): the NILS models the information flow within the Network layer in support of instances of Network-layer communication, at a level of abstraction that is independent of particular protocols and subnetwork technologies. This International Standard specifies the mapping between the NILS and the X.25 packet layer protocol (specified in ISO/IEC 8208) for those cases where a real interworking unit — modelled by an abstract intermediate system — operates the X.25 packet layer protocol at its point of attachment to a real subnetwork, in support of the OSI connection-mode Network service.

The use of the X.25 packet layer protocol specified in this International Standard for interworking units is compatible with that specified in ISO 8878:1987 for real end systems; indeed, in certain scenarios, the same packet exchanges between an interworking unit and an end system are described by ISO 8878 when viewed from the end system, and by this International Standard when viewed from the interworking unit.

This International Standard applies to each environment in which ISO/IEC 8208 is used in support of the connection-mode Network service, including among others:

- a Packet Switched Public Data Network
- a Packet Switched Private Data Network
- a Local Area Network
- use of switched access to a packet switched (public or private) data network, eg, by ISDN, CSDN or PSTN
- other subnetworks where the DTE/DTE mode of the X.25 Packet Layer Protocol is used in support of the connection-mode Network service.

1 Scope

This International Standard specifies the method by which a Network-layer interworking unit (IWU) uses the X.25 packet layer protocol specified in ISO/IEC 8208 to support the OSI connection-mode Network service. The specification is expressed in terms of a mapping between the Network internal layer service defined in ISO/IEC 10028 and the Virtual Call (VC) and Permanent Virtual Circuit (PVC) services of the X.25 packet layer protocol.

An IWU to which this International Standard applies interconnects, for any individual Network connection, two real subnetworks, at least one of which is accessed using the X.25 packet layer protocol. When both subnetworks are accessed using the X.25 packet layer protocol, the specification applies independently to the IWU's operation on each subnetwork.

In addition, this International Standard uses ISO/IEC 10028's definition of the relaying functions of an intermediate system to extend its application beyond a single subnetwork point of attachment, to specify the requirements to be met by an IWU as a whole in supporting the OSI connection-mode Network service.

This International Standard covers operation of the X.25 packet layer protocol that is compatible with the 1984 and later versions of CCITT Recommendation X.25, and that is compatible with the 1980 version of X.25 when the Permanent Virtual Circuit service is used; compatibility with the 1980 version of X.25 for Virtual Calls is outside the scope of this International Standard.

To enable use of the PVC service, this International Standard defines a set of subnetwork dependent convergence protocol (SNDCP) procedures. These allow a given PVC to support one Network connection at a time, but to support different Network connections, with the same or different values for address and quality of service parameters, etc, at different times. The procedures also allow for the possibility of using a PVC in support of other protocols, but not simultaneously with these procedures (apart from transient collision cases, which do not fail unnecessarily).

To evaluate conformance of a particular implementation, it is necessary to have a statement of which capabilities and options have been implemented. Such a statement is called a Protocol Implementation Conformance Statement (PICS), as defined in ISO/IEC 9646-1. This International Standard provides the PICS proforma in compliance with the relevant requirements, and in accordance with the relevant guidance, given in ISO/IEC 9646-2.

This International Standard does not specify any requirements relating to the exchange of routing information or layer-management information between an IWU and other systems.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard 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/IEC 8208:1990, *Information technology — Data communications — X.25 Packet Layer Protocol for Data Terminal Equipment*.

ISO/IEC 8208:1990/Amd.3:1991, *Information technology — Data communications — X.25 Packet Layer Protocol for Data Terminal Equipment, Amendment 3: Conformance requirements*.

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

ISO/IEC 9646-1:1991, *Information technology — Open Systems Interconnection — Conformance testing methodology and framework — Part 1: General concepts*.

ISO/IEC 9646-2:1991, *Information technology — Open Systems Interconnection — Conformance testing methodology and framework — Part 2: Abstract test suite specification*.

ISO/IEC 10028:1993, *Information technology — Telecommunications and information exchange between systems — Definition of the relaying functions of a Network layer intermediate system*.

CCITT Recommendation X.213 (1992)

ISO/IEC 8348:1993, *Information technology — Network service definition for Open Systems Interconnection*.

c) Network connection

3.2 Network layer architecture definitions

This International Standard uses the following terms defined in ISO 8648:

- a) real subnetwork
- b) interworking unit
- c) intermediate system
- d) subnetwork dependent convergence protocol

3.3 Network layer relaying definitions

This International Standard uses the following terms defined in ISO/IEC 10028:

- a) Network internal layer service
- b) Network internal service access point
- c) Network hop end point

3.4 Addressing definitions

This International Standard uses the following terms defined in ISO/IEC 8348:

- a) authority and format identifier
- b) domain specific part
- c) initial domain part
- d) initial domain identifier
- e) subnetwork point of attachment
- f) subnetwork point of attachment address

3.5 X.25 packet layer protocol definitions

This International Standard uses the following terms defined in ISO/IEC 8208:

- a) DTE/DXE interface
- b) logical channel
- c) M-bit sequence
- d) packet layer entity
- e) packet receive sequence number
- f) packet send sequence number
- g) Permanent Virtual Circuit
- h) Qualifier bit
- j) upper window edge
- k) Virtual Call
- l) window

3 Definitions

3.1 Reference model definitions

This International Standard uses the following terms defined in ISO 7498:

- a) Network layer
- b) Network service

4 Abbreviations

AF	Address field
AFI	authority and format identifier
bit/s	bits per second
CONS	connection-mode Network service
D-bit	Delivery Confirmation bit
ED	expedited data
EETDN	End to End Transit Delay Negotiation
GFI	General Format Identifier
IDI	initial domain identifier
IWU	interworking unit
LQA	lowest quality acceptable
M-bit	More Data mark
MTCN	Minimum Throughput Class Negotiation
N	Network
NC	Network connection
NHEP	Network hop endpoint
NILS	Network internal layer service
NISAP	Network internal service access point
NSDU	Network service data unit
P(R)	packet receive sequence number
P(S)	packet send sequence number
PICS	protocol implementation conformance statement
PLP	packet layer protocol
PVC	Permanent Virtual Circuit
Q-bit	Qualifier bit
QOS	quality of service
RC	receipt confirmation
SNPA	subnetwork point of attachment
TDSAI	Transit Delay Selection And Indication
VC	Virtual Circuit

5 Overview and principles of the protocol mapping

5.1 Structure of the specification

Clauses 7 to 9 define a mapping of the NILS primitives and parameters to and from (a subset of) the packets, procedures and facilities of the X.25 PLP. That mapping applies to one side of an IWU — e.g., item (4-A) in Figure 1. Clause 6 specifies the requirements on an IWU supporting the CONS over X.25 PLP, in terms of that mapping and of the full NILS definition in ISO/IEC 10028. Clause 10 specifies the SNDCP procedures for use with PVCs. Annex A (normative) contains the PICS proforma, and Annex B (normative) lists the requirements applying to the related ISO/IEC 8208 PICS.

NOTE Apart from specification for the treatment of some mapping-protocol violations, in 8.7 and 9.1.1, all the direct normative provisions of this International Standard are contained in clause 6, and in clause 10 for PVCs. However, the statements of those provisions in clause 6 rely upon, and can only be interpreted by reference to, the extended definitions in clauses 7 to 9 and in ISO/IEC 10028.

5.2 NILS features to be supported

The features of the Network internal layer service for connection-mode operation are (see ISO/IEC 10028, clause 6):

- a) NC establishment
- b) QOS negotiation
- c) normal data transfer
- d) flow control
- e) expedited data transfer
- f) receipt confirmation
- g) NC reset
- h) NC release
- j) connection control
- k) error diagnostics

5.3 General characteristics of the mapping between X.25 PLP and NILS

The SNPA at which an IWU operates the X.25 PLP is identified with the DTE/DXE interface across which packets are transferred, as specified in ISO/IEC 8208. In normal relaying, packets received by the IWU are mapped, where appropriate, to indication and confirm primitives of the NILS; request and response primitives are mapped to packets transmitted by the IWU. Certain error conditions at the IWU can result in indication primitives which map either to transmitted packets or to no packets at all. Also, certain flow control conditions result in a mapping between indication primitives and transmitted packets, or between request primitives and received packets.

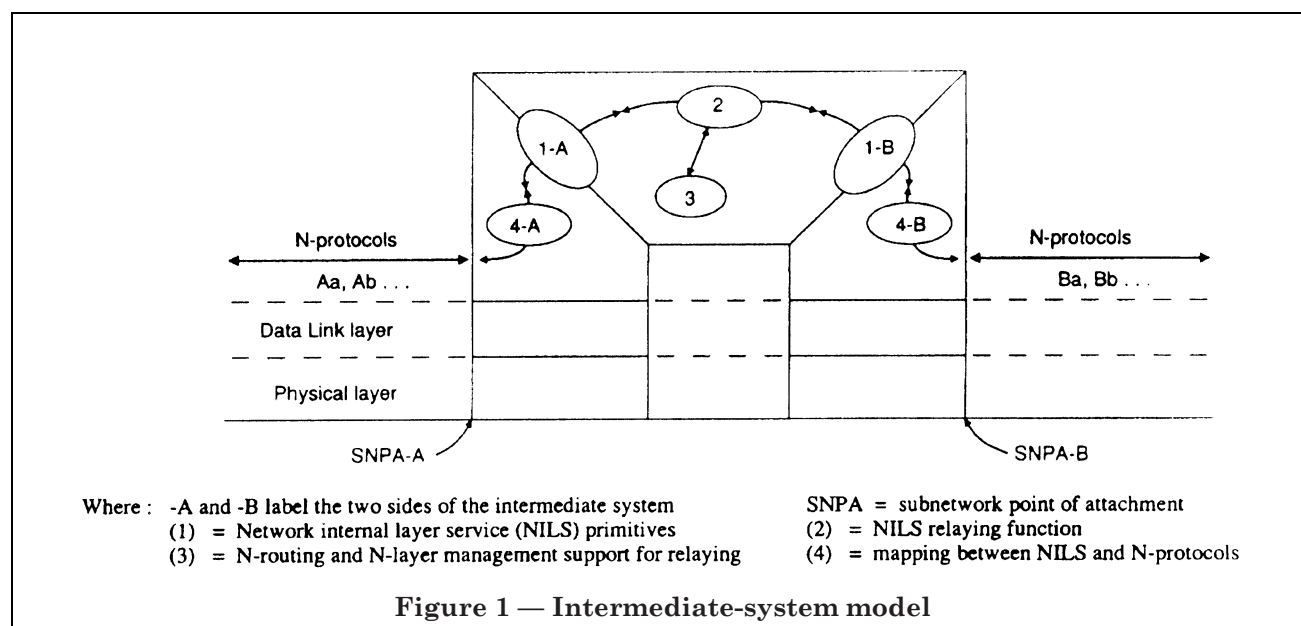


Figure 1 — Intermediate-system model

Figure 1, adapted from ISO/IEC 10028, illustrates the model used by ISO/IEC 10028 in defining the abstract relaying functions of an intermediate system: ISO/IEC 10028 itself covers items (1) to (3) of the model. The protocol mapping is considered to occur between packets at an SNPA where the X.25 PLP is used to access a real subnetwork, and NILS primitives exchanged at the immediately related Network internal service access point (NISAP) — e.g., between SNPA-A and the NILS primitives at item (1-A) in Figure 1, as shown by item (4-A). However, because of the abstract nature of the NILS and of an NISAP, and because there may be no access possible to the realizations of either in a particular IWU, conformance to this International Standard is defined in terms of observable behaviour at any suitable point in the path of the Network connection in question.

The protocol mapping is such that each NILS primitive is to be considered as a direct abstraction of the corresponding packet(s); similarly, the primitive's parameters are in general direct abstractions from information contained in fields of the packet(s), supplemented in a few cases by local knowledge.

NOTE 1 The mapping function has, therefore, no state of its own, and no buffering capability: details of the mapping can, of course, depend upon the state of the DTE/DXE interface specified in ISO/IEC 8208.

NOTE 2 NILS primitives are not to be viewed as modelling or otherwise representing anything like a programming interface to a protocol implementation, with the implied consequence that the implementation could intervene, below the NISAP, in the flow of Network-service-level information represented by the NILS. When a protocol implementation does intervene in the information flow, any effects of such intervention that are observable outside the IWU are ascribed by the ISO/IEC 10028 model to the relaying function, item 2 in Figure 1.

For example, consider the case where an INCOMING CALL packet contains the Expedited Data Negotiation facility encoding use of expedited data, and the IWU forwards a CALL REQUEST packet containing the EDN facility encoding no use of expedited data. The INCOMING CALL packet maps to an NI-CONNECT indication primitive having an Expedited Data Selection parameter with the value "use of Expedited Data", and the CALL REQUEST packet maps to an NI-CONNECT request primitive having an Expedited Data Selection parameter with the value "no use of Expedited Data": this corresponds to ISO/IEC 10028's REQ elementary sequence of NILS primitives, with parameter relationship P2 (b).

NOTE 3 NILS primitives that do not require forwarding of parameter information through the IWU might in practice be handled entirely within an implementation of the packet layer entity: for example, flow control (see 9.1.3 to 9.1.6) or response to NC resets (9.3.2, 9.3.3).

6 Conformance

6.1 Static conformance requirements

An implementation for which conformance to this International Standard is claimed shall support each feature of the NILS marked as Mandatory in column 3 of Table 1, using the elements of the protocol mapping referred to in column 2. The features marked as Optional in column 3 may be supported or omitted by the implementation; when such features are supported by an implementation they shall be available to any NC, except in so far as their use may be subject to local management controls.