

AS/NZS 4217:1994
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AS/NZS 4217

Australian/New Zealand Standard

Information technology— Telecommunications and information exchange between systems—Provision of the connection-mode network internal layer service by intermediate systems using the X.25 packet layer protocol

[ISO/IEC title: 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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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee IT/1 on Information Systems—Interconnection. It is identical with and has been reproduced from 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*.

This Standard is issued as a Joint Standard under the terms of the Active Cooperation Agreement between Standards Australia and Standards New Zealand.

The objective of this Standard is to provide users of the OSI 7-layer model with a method by which a network-layer interworking unit uses the X.25 packet layer protocol to support the OSI connection-mode network services.

This Standard is one of a series of Open Systems Interconnection (OSI) Standards which are currently under development. Since OSI Standards are developmental, there may be some minor difficulties encountered in their implementation. For this reason, Standards Australia will be providing, through the OSI Help Desk, a service to coordinate and disseminate information concerning difficulties which are identified in using this Standard.

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For the purpose of this Standard, the source text should be modified as follows:

- (a) *Terminology* The words 'this Australian/New Zealand Standard' should replace the words 'this International Standard' wherever they appear.
- (b) *Decimal marker* Substitute a full point for a comma where it appears as a decimal marker.
- (c) *References* The references to international Standards should be replaced by references, where appropriate, to the following Australian or Joint Australian/New Zealand Standards:

<i>Reference to International Standard or other publication</i>		<i>Australian or Joint Australian/New Zealand Standard</i>	
ISO		AS	
7498	Information processing systems— Open Systems Interconnection— Basic Reference Model	2777	Information processing systems— Open Systems Interconnection— Basic reference model
8648	Information processing systems— Open Systems Interconnection— Internal organization of the Network Layer	3622	Information processing systems— Open Systems Interconnection— Internal organization of the network layer
ISO/IEC		AS/NZS	
8208	Information technology—Data communications—X.25 Packet Layer Protocol for Data Terminal Equipment	3621	Information technology—Data communications—X.25 packet layer protocol for data terminal equipment
8208/Amd.3	Amendment 3: Conformance requirements	—	
8348	Information technology—Net- work service definition for Open Systems Interconnection	AS 2994	Information technology—Open Systems Interconnection—Net- work service definition

ISO/IEC		AS/NZS	
9646	Information technology—Open Systems Interconnection— Conformance testing methodology and framework	4103	Information technology—Open Systems Interconnection— Conformance testing methodology and framework
9646-1	Part 1: General concepts	4103.1	Part 1: General concepts
9646-2	Part 2: Abstract test suite specification	4103.2	Part 2: Abstract test suite specification
10028	Information technology—Telecommunications and information exchange between systems— Definition of the relaying functions of a Network layer intermediate system	—	

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AUSTRALIAN/NEW ZEALAND STANDARD

Information technology—Telecommunications and information exchange between systems—Provision of the connection-mode network internal layer service by intermediate systems using the X.25 packet layer protocol**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*

3 Definitions

3.1 Reference model definitions

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

- a) Network layer
- b) Network service
- 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

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 SNDTCP 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):

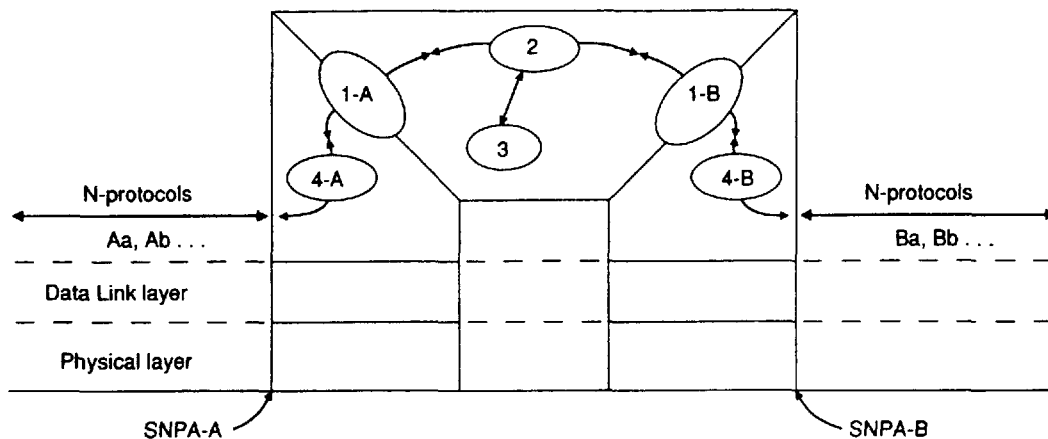
- a) NC establishment
- b) QOS negotiation
- c) normal data transfer
- d) flow control
- e) expedited data transfer
- f) receipt confirmation
- g) NC reset

- h) NC release
- j) connection control
- k) error diagnostics

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

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 NLS; 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, 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 NLS primitives exchanged at the immediately related Network internal service access point (NISAP) — e.g., between SNPA-A and the NLS primitives at item (1-A) in figure 1, as shown by item (4-A). However, because of the abstract nature of the NLS 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.



Where : -A and -B label the two sides of the intermediate system
 (1) = Network internal layer service (NLS) primitives
 (3) = N-routing and N-layer management support for relaying
 SNPA = subnetwork point of attachment
 (2) = NLS relaying function
 (4) = mapping between NLS and N-protocols

Figure 1 — Intermediate-system model

The protocol mapping is such that each NLS 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.

NOTES

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.

2 NLS 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 NLS. 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 NLS primitives, with parameter relationship P2 (b).

3 NLS 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.

Table 1 — Static conformance requirements

1. Feature	2. Defining clauses	3. Status
Use of VC service	6.2.1	O)
Use of PVC service	6.2.2, 10	) M (see O) Note)
Network connections	7	M
NC establishment, outgoing	8.1, 8.7 - 8.16	O)
NC establishment, incoming	8.1, 8.7 - 8.16	) M (see O) Note)
QOS negotiation	8.12 - 8.14	M
normal data transfer	9.1.1, 9.1.2	M
flow control	9.1.3 - 9.1.6	M
expedited data transfer	9.2.1 - 9.2.3	O
receipt confirmation	9.1.2, 9.1.7	O
NC reset	9.3.1 - 9.3.7	M
NC release	8.2 - 8.5, 8.8, 8.9, 8.15, 8.17, 8.18	M
NC release on mapping-protocol violation	8.6	O
NC reset on mapping-protocol violation	9.3.2 (c)	O
no action on ignorable mapping-protocol violation	9.1.1	O
connection control	8.16	O
error diagnostics	8.17, 8.18, 9.3.6, 9.3.7	M

Where :

M = Mandatory

O = Optional

NOTE — For each of these bracketed pairs of features, the features are individually optional, but it is mandatory to support at least one from each pair.

6.2 Requirements of the X.25 PLP implementation

6.2.1 Requirements when using Virtual Calls

The procedures, packets and facilities relating to the following X.25 PLP features are required for the NILS protocol mapping to Virtual Calls.

- a) Virtual Calls
- b) Virtual Call setup
- c) aborting of outgoing Virtual Call setup
- d) rejection of incoming Virtual Call setup
- e) Virtual Call clearing
- f) normal data transfer
- g) More Data mark (M-bit)
- h) flow control and window rotation
- j) reset
- k) D-bit negotiation at call setup
- l) Fast Select, if outgoing NC establishment is supported
- m) Throughput Class Negotiation facility
- n) Transit Delay Selection And Indication facility
- p) all CCITT-specified DTE facilities

In addition, the procedures and packets for each of the following features are required if the corresponding NS-provider option is supported.

- q) Interrupt data transfer (for NILS expedited data transfer)
- r) Delivery Confirmation (for NILS receipt confirmation)

In a DTE/DCE environment, subscription to the following facilities is required.

- s) Fast Select Acceptance, if incoming NC establishment is supported
- t) Throughput Class Negotiation

In a DTE/DTE environment, the two DTEs shall agree the use of Fast Select.

6.2.2 Requirements when using Permanent Virtual Circuits

The procedures, packets and facilities relating to the following X.25 PLP features are required for the NILS protocol mapping to PVCs.

- a) normal data transfer
- b) More Data mark (M-bit)
- c) flow control and window rotation
- d) reset

In addition, the procedures and packets for each of the following features are required if the corresponding NS-provider option is supported.

- e) Interrupt data transfer (for NILS expedited data transfer)
- f) Delivery Confirmation (for NILS receipt confirmation)

6.3 Dynamic conformance

6.3.1 Conformance at an SNPA

For an IWU to conform to this International Standard at an SNPA, any sequence of ISO/IEC 8208 packets sent and received on logical channels used to support Network connections, together with any RESTART packets:

- a) shall conform to ISO/IEC 8208; and
- b) when interpreted according to the mapping defined in clauses 7 to 9, shall correspond to sequences of NILS primitives, defined in ISO/IEC 10028.

NOTE — It is an implementation choice — see table 1 — whether or not mapping-protocol violations result in release or resetting of the affected NC as described in 8.6 and 9.3.4 below. If neither NC release nor NC reset is used when such a violation occurs, interpretation as in (b) above fails, but in that case the use of the logical channel cannot be interpreted as being in support of a Network connection.

6.3.2 Conformance as an interworking unit

For an IWU to conform to this International Standard as an interworking unit, it shall conform at the SNPA, as specified in 6.3.1. In addition, any observed behaviour of an NC on the remote side of the IWU shall correspond to possible sequences of NILS primitives which are related, as defined in ISO/IEC 10028 for sequences of primitives across hops and relays, (a) to those derived according to clauses 7 to 9 from the packets transferred at the SNPA; and (b) to any additional NILS primitives corresponding to failures of the lower-layer support for the packet layer at the SNPA or to protocol violations, as defined in 8.5 and 8.6 respectively.

6.4 Protocol implementation conformance statement

The supplier of an interworking unit which is claimed to conform to this International Standard shall complete a copy of the PICS proforma provided in Annex A.