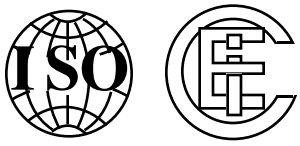
INTERNATIONAL STANDARD

ISO/IEC 8473-3

Second edition
1994-mm-dd

Information technology — Protocol for providing the connectionless–mode network service

Part 3 — Provision of the underlying service by an X.25 subnetwork



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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 JTC1. 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 8473-3 was prepared by the Joint Technical Committee ISO/IEC JTC1, *Information technology*. The identical text is published as ITU-T Recommendation X.622.

ISO/IEC 8473 consists of the following parts, under the general title *Information technology — Protocol for providing the connectionless–mode network service:*

— Part 1: Protocol specification

— Parts 2–*n*: Provision of the underlying service by specific types of subnetwork

Introduction

This is one of a set of Recommendations and International Standards produced to facilitate the interconnection of open systems. The set covers the services and protocols required to achieve such interconnection.

This Recommendation | International Standard is positioned with respect to other related Recommendations and International Standards by the layers defined in ITU-T Rec. X.200 | ISO/IEC 7498-1. In particular, it defines the way in which an X.25 subnetwork may be used within the Network layer to provide the abstract underlying service with respect to which the protocol defined by ITU-T Rec. X.233 | ISO/IEC 8473-1 is specified.

In order to evaluate the conformance of a particular implementation of this protocol, it is necessary to have a statement of which of the protocol's capabilities and options have been implemented. Such a statement is called a Protocol Implementation Conformance Statement (PICS), as defined in CCITT Rec. X.290 | ISO/IEC 9646-1. A PICS proforma, from which a PICS may be prepared for a specific implementation, is included in this Recommendation | International Standard as normative Annex A.

INTERNATIONAL STANDARD

ITU-T RECOMMENDATION

INFORMATION TECHNOLOGY — PROTOCOL FOR PROVIDING THE CONNECTIONLESS–MODE NETWORK SERVICE: PROVISION OF THE UNDERLYING SERVICE BY AN X.25 SUBNETWORK

1 Scope

This Recommendation | International Standard specifies the way in which the underlying service assumed by the protocol defined by ITU-T Rec. X.233 | ISO/IEC 8473-1 is provided by a subnetwork that conforms to ITU-T Recommendation X.25 through the operation of a Subnetwork Dependent Convergence Function (SNDCF) as described in ISO/IEC 8648.

This Recommendation | International Standard also provides the PICS proforma for this protocol, in compliance with the relevant requirements, and in accordance with the relevant guidance, given in CCITT Rec. X.290 | ISO/IEC 9646-1.

2 Normative references

The following 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 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 editions of the Recommendations and Standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards. The Telecommunication Standardization Bureau of the ITU maintains a list of the currently valid ITU-T Recommendations.

2.1 Identical Recommendations | International Standards

— ITU-T Recommendation X.200 (1994) | ISO/IEC 7498-1 : 1994, *Information technology — Open Systems Interconnection — Reference Model: Basic Reference Model.*

— CCITT Recommendation X.213 (1992) | ISO/IEC 8348 : 1992, *Information technology — Network service definition for Open Systems Interconnection.*

2.2 Paired Recommendations | International Standards identical in technical content

— CCITT Recommendation X.290 (1992), *OSI conformance testing methodology and framework for protocol Recommendations for CCITT applications — General concepts.*

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

2.3 Additional references

— ITU-T Recommendation X.25 (1993), *Interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit.*

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

— ISO/IEC 8208 : 1990, *Information technology — Data communications — X.25 Packet Layer Protocol for Data Terminal Equipment.*

— ISO/IEC 8648 : 1988, *Information processing systems — Open Systems Interconnection — Internal organization of the network layer.*

3 Definitions

3.1 Reference model definitions

This Recommendation | International Standard makes use of the following terms defined in ITU-T Rec. X.200 | ISO/IEC 7498-1:

a) network entity

b) Network layer

c) service

d) service data unit

e) protocol control information

3.2 Network layer architecture definitions

This Recommendation | International Standard makes use of the following terms defined in ISO/IEC 8648:

a) subnetwork

b) subnetwork dependent convergence protocol

c) subnetwork dependent convergence function

d) subnetwork access protocol

3.3 Network layer addressing definitions

This Recommendation | International Standard makes use of the following term defined in CCITT Rec. X.213 | ISO/IEC 8348:

a) subnetwork point of attachment

3.4 X.25 definitions

This Recommendation | International Standard makes use of the following terms defined in ITU-T Rec. X.25 and ISO/IEC 8208:

a) data circuit-terminating equipment

b) data terminal equipment

c) logical channel

d) permanent virtual circuit

e) virtual circuit

4 Abbreviations

CLNP connectionless-mode network protocol
DCE data circuit-terminating equipment
DTE data terminal equipment
PDU protocol data unit
PVC permanent virtual circuit
QoS quality of service
SDU service data unit
SN subnetwork
SNDCF subnetwork dependent convergence function
SNDCP subnetwork dependent convergence protocol
SNICP subnetwork independent convergence protocol
SNAcP subnetwork access protocol
SNPA subnetwork point of attachment
SNCR subnetwork connection reference
SNSDU subnetwork service data unit

5 Subnetwork dependent convergence function

5.1 General model

The general model for providing the underlying service assumed by the protocol in conjunction with a real subnetwork that uses a connectionless subnetwork access protocol is as follows. The generation of an SN-UNITDATA Request by the CLNP results in the generation of a corresponding subnetwork-specific UNITDATA request by the subnetwork dependent convergence function. The receipt of a subnetwork-specific UNITDATA indication associated with delivery of a connectionless data unit to its destination causes the SNDCF to generate an SN-UNITDATA Indication to the CLNP.

The general model for providing the underlying service assumed by the CLNP in conjunction with a real subnetwork that uses a connection-mode subnetwork access protocol is as follows. The generation of an SN-UNITDATA Request by the CLNP causes a connection (logical channel, logical link, or the equivalent) to be made available for the transmission of SN-User-data. If a connection cannot be made available, the SN-UNITDATA Request is discarded. The receipt of subnetwork-specific PDUs containing SN-User-data causes the SNDCF to generate an SN-UNITDATA Indication to the CLNP.

Where a real subnetwork is designed to use either a connectionless-mode or a connection-mode subnetwork access protocol, the provision of the underlying service assumed by the CLNP is achieved by using the connectionless-mode alternative.

5.2 Subnetwork user data

The SN-Userdata is an ordered multiple of octets, and is transferred transparently between the specified subnetwork points of attachment.

The underlying service assumed by the CLNP is required to support a service data unit size of at least 512 octets.

If the minimum service data unit sizes supported by all of the subnetworks involved in the transmission of a particular PDU are known to be large enough that segmentation is not required, then either the full protocol or the non-segmenting protocol subset may be used.

Data received from a subnetwork with protocol identification specifying this protocol (see ITU-T Rec. X.233 | ISO/IEC 8473-1) shall be processed according to this Recommendation | International Standard.

NOTE — Data with other protocol identification should be ignored, since it may have been sent by an implementation supporting additional protocols intended for use with this protocol.

5.3 Subnetwork dependent convergence functions used with X.25 subnetworks

The connection-mode service offered by subnetworks that use the X.25 Packet Level Protocol defined in ISO/IEC 8208 or ITU-T Rec. X.25 is manipulated by the subnetwork dependent convergence function so that a virtual circuit is made available for the transmission of SN-User-data following the generation of an SN-UNITDATA Request by the CLNP. In general, no explicit subnetwork dependent convergence protocol control information is exchanged between peer network entities during the data phase of operation in order to provide this mapping of service.

The SN-Destination-Address and SN-Source-Address parameters in the SN-UNITDATA request and indication are the CCITT Rec.X.121 DTE addresses used by the X.25 subnetwork.

If the X.25 subnetwork does not provide calling DTE information, a null SN-Source-Address parameter is supplied in the SN-UNITDATA Indication. The SNDCF shall include its own DTE address in the "calling DTE" field of the X.25 Call Request packet, in the case that the subnetwork does not include this parameter but permits its inclusion by DTEs.

NOTE — Some subnetworks which use the X.25 PLP employ addressing schemes other than CCITT Rec. X.121. The use of addressing schemes other than CCITT Rec. X.121 (e.g. CCITT Recommendations E.163 and E.164) is not precluded.

The SN-User-data parameter carries user data up to a maximum size specified by the subnetwork authority. The underlying service assumed by ITU-T Rec. X.233 | ISO/IEC 8473-1 requires that a subnetwork be capable of supporting a minimum service data unit size of 512 octets.

NOTE — The M-bit may be used in cases where an X.25 subnetwork cannot directly support a minimum packet size of 512 octets as well as in situations where a service data unit size greater than the minimum is required; e.g., where the non-segmenting protocol subset is used.

5.3.1 Call setup considerations

The mechanism and timing for opening a virtual circuit prior to the transmission of SN-User-data are a local matter. The opening of avirtual circuit may be initiated by:

a) the arrival of an SNSDU to be transmitted over an X.25 subnetwork at a time when no suitable virtual circuit is available;

b) the local queue of requests waiting for an existing virtual circuit reaching a threshold size at which an additional virtual circuit shall be made available (if possible) to maintain the requested QoS; or

c) the explicit intervention of system management.

When it has been determined that a (new) virtual circuit must be made available, the calling SNDCF performs all functions associated with establishing a virtual circuit. The called SNDCF performs those operations associated with accepting a call, but generates no SN-UNITDATA indication until the call setup is completed, at which time X.25 Data packet(s) may be exchanged. In general, the receipt of X.25 Data packets containing SN-User-data causes the SNDCF to generate an SN-UNITDATA indication to the CLNP. X.25 Reset packets, if received, have no effect on the operation of the SNDCF. The necessary procedures for the correct operation of the X.25 PLP are followed.

5.3.2 Call clearing considerations

The mechanisms for determining when a virtual circuit is to be cleared following the transmission of SN-User-data by the SNDCF are local matters. Examples of circumstances which would cause the SNDCF to clear a virtual circuit are:

a) the expiration of a timeout period following the transmission of one or more PDUs (see clause 5.3.4);

b) the need to use a specific interface to open an alternate virtual circuit from the local network entity to a different remote network entity;

c) the explicit intervention of system management; or

d) a provider-initiated clear of a virtual circuit.

When it has been determined that a virtual circuit shall be cleared, the SNDCF performs all functions associated with clearing a call. All packets other than a Clear Confirmation or Clear Indication are ignored. The same actions apply to receipt of a Clear Indication. In these circumstances, the SNDCF will retain user data submitted via SN-UNITDATA

requests while attempting to establish a new circuit; however, the SNDCF shall discard the user data if the transit delay indicated to the CLNP is likely to be exceeded.

NOTE — It is not a requirement that virtual circuits be dynamically opened or closed for the correct operation of the SNDCF herein described. The use of permanent virtual circuits (PVCs) or the maintenance of virtual circuits in a open state from system initialization is not precluded.

5.3.3 Protocol discrimination

The first octet of the call user data field of the Call Request packet shall be set to the value that indicates that the virtual circuit is to be used to provide the underlying service assumed by ITU-T Rec. X.233 | ISO/IEC 8473-1. The value is defined in ITU-T Rec. X.233 | ISO/IEC 8473-1.

5.3.4 Timeout periods

Timeout periods may be used to determine when a virtual circuit should be cleared (for example, when a virtual circuit has been idle for a long period of time) or when additional virtual circuits should be opened (for example, when there is an excessively long queue of data units waiting for the initial logical channel).

Implementations may choose to clear a virtual circuit after it has been idle for some period of time. If a timer is selected for this purpose, it is used in the following manner. When a virtual circuit is made available for the transmission of SNSDUs, a timer is initiated with a value representing the maximum period of time this virtual circuit may remain idle. Each time a data unit is transmitted by the underlying service, the timer is reset to this initial value. If no data units are queued for processing and this timer expires, the virtual circuit is cleared.

The selection of timeout values is a local matter.

NOTES

1) Additional virtual circuits may be opened when there is an excessively long queue of data units waiting for the initial logical channel. The timeout periods for determining when such additional virtual circuits are to be cleared may be shorter than the timeout period for the initial virtual circuit. (The timeout period may also be a fixed period of time.) Implementations may choose to close all additional virtual circuits if the queue of data units to be transmitted reaches some threshold (possibly zero).

2) Timeout periods are selected on the basis of economic and implementation-specific criteria. If there is no duration charge imposed by a given subnetwork authority for leaving a virtual circuit open, and if there is a charge for opening virtual circuits, then the timeout period may be selected so that the virtual circuit remains open for a long period of time. Timeout periods may also vary according to the time of day, traffic load (averaged over the recent past), or other factors.

5.3.5 Resolution of virtual circuit collisions

Two SNDCFs may simultaneously attempt to establish virtual circuits to each other. It is desirable to be able to detect this and to eliminate one virtual circuit while retaining the other, so as to avoid unnecessary call charges.

If the subnetwork supplies the DTE address of the calling DTE, it is possible to detect such a collision. A collision occurs when an incoming call is received from a DTE, while confirmation is still awaited for a previously initiated call to the same DTE.

If the calling DTE address is not supplied by the network, collisions are not detected.

A convention is established for determining which virtual circuit is to be preserved when a collision does occur. The convention is based on a comparison of the called and calling X.25 DTE addresses. The virtual circuit initiated by the SNDCF having the higher DTE address is the one which is retained.

Upon receipt of an X.25 Call Request packet while confirmation of a previously issued Call Request packet to the same DTE address is outstanding, an SNDCF shall perform the call collision resolution procedure described in the following steps:

a) The DTE address of the local SNDCF shall be compared with that of the remote SNDCF. If the addresses are of different length, the shorter is padded to the length of the longer by the addition of zero digits at the most significant (left) end of the address.

b) The comparison shall be performed, starting from the least significant (right) digit and progressing to the most (left).

c) As soon as a digit having the same position in each address has a different value, the comparison is stopped.

d) The address having the digit with the lower value (where 0 is the lowest and 9 is the highest) is regarded as being the lower address.

e) If the local SNDCF has the lower address, the SNDCF shall clear the virtual circuit which it initiated and accept the virtual circuit initiated by the remote SNDCF.

f) If the local SNDCF has the higher address, the SNDCF shall clear the virtual circuit initiated by the remote SNDCF and continue to await acceptance of the virtual circuit which it initiated.

If a request to establish a new virtual circuit is received once a virtual circuit is fully established, the new virtual circuit shall be accepted and that previously existing shall be cleared.

NOTE — This procedure is required in order to ensure rapid recovery from provider-initated clear of the virtual circuit in cases where both SNDCFs do not receive notification of this action at exactly the same time.

5.3.6 Use of multiple virtual circuits

In some circumstances, it may be desirable to use several X.25 virtual circuits between two network entities, for example, to increase throughput or resilience. In this case, each virtual circuit is separately visible to the CLNP and provides a distinct service. Each is supported by a distinct pair of independent SNDCFs. Nevertheless, it is necessary to distinguish between these independent virtual circuits in order to avoid incorrect detection of collisions.

Where multiple virtual circuits are required, they are distinguished during connection establishment by the conveyance of a two-octet subnetwork connection reference (SNCR) in the user data field of the X.25 Call Request packet. If no user data are present in the X.25 Call Indication packet (other than the protocol identifier encoded in octet 1), the receiving SNDCF shall proceed as though the SNCR had been explicitly conveyed with the value zero. When it is necessary to explicitly convey a subnetwork connection reference, the user data field of the X.25 Call Request Packet shall be set as illustrated in Table 1.

Protocol Identifier	Length Indication	SNCR Version	SNCR Value
Octet 1	Octet 2	Octet 3	Octets 4 and 5
0000 0000 or 1000 0001 (see note)	0000 0100	0000 0010	see 5.3.6

Table 1 — Subnetwork connection reference encoding

NOTE — The protocol identifier values are specified in ITU-T Rec. X.233 | ISO/IEC 8473-1. The value 0000 0000 identifies the inactive Network layer protocol subset of CLNP. The value 1000 0001 is used in all other cases.

Octets 1 through 3 are set to the values indicated. Octets 4 and 5 convey the reference for the subnetwork connection. Octet 4 conveys the low order octet of the SNCR; octet 5 conveys the high order octet.

The collision resolution procedure described in 5.3.5 shall be followed only when the two virtual circuits convey (explicitly or implicitly) the same SNCR.

The values of the SNCR may be chosen arbitrarily by the communicating SNDCFs. Where a known number of virtual circuits is required but there is no prior agreement on the SNCR values to be used, the values from zero up to one less than the number of virtual circuits required shall be used.

NOTE — The procedures described above have been specified in order to satisfy the following criteria:

a) unwanted duplicate virtual circuits should be rapidly detected and cleared;

b) it must be possible to have multiple virtual circuits between a pair of network entities where required, for example, for reasons of throughput or redundancy; and

c) for the common case in which only a single virtual circuit is required, minimal protocol control information (perferably none) should be required.

5.3.7 Priority

As part of its operation to manage virtual circuits, the SNDCF may perform a priority function with respect to SN-UNITDATA requests that specify priority as a QoS parameter. Specifically, the SNDCF may open a new virtual circuit to handle the higher-priority traffic, or close an existing virtual circuit in order to free a logical channel or local system resources to enable it to process higher-priority traffic for which no resources would otherwise be available.

5.3.8 ISO/IEC 8208 protocol elements

The following protocol elements of ISO/IEC 8208 are necessary for the provision of the underlying service assumed by ITU-T Rec. X.233 | ISO/IEC 8473-1:

a) virtual call service;

b) data transfer (without delivery confirmation bit and interrupt transfer procedures);

c) flow control procedures;

d) flow control and reset packets;

e) call setup and clearing packets;

f) DTE and DCE data packets;

g) restart procedures;

h) restart packets;

i) DCE timeouts;

j) DTE time limits; and

k) coding of X.25 network generated packets.

The following protocol elements are desirable but not necessary:

a) fast select and fast select acceptance,

b) flow control parameter negotiation;

c) transit delay selection and indication; and

d) throughput class negotiation.

All other services and facilities are optional.

NOTE — The mandatory protocol elements do not preclude the operation of the SNDCF over a subnetwork which uses the 1980 version of X.25.

Annex A[1]

PICS proforma

(This annex forms an integral part of this Recommendation | International Standard.)

A.1 Introduction

The supplier of a protocol implementation which is claimed to conform to this Recommendation | International Standard shall complete the following Protocol Implementation Conformance Statement (PICS) proforma.

A completed PICS proforma is the PICS for the implementation in question. The PICS is a statement of which capabilities and options of the protocol have been implemented. The PICS can have a number of uses, including use

- by the protocol implementor, as a check-list to reduce the risk of failure to conform to the standard through oversight;
- by the supplier and acquirer — or potential acquirer — of the implementation, as a detailed indication of the capabilities of the implementation, stated relative to the common basis for understanding provided by the standard PICS proforma;
- by the user — or potential user — of the implementation, as a basis for initially checking the possibility of interworking with another implementation (note that, while interworking can never be guaranteed, failure to interwork can often be predicted from incompatible PICSs);
- by a protocol tester, as the basis for selecting appropriate tests against which to assess the claim for conformance of the implementation.

A.2 Abbreviations and special symbols

A.2.1 Status symbols

M	mandatory
O	optional
O.<n>	optional, but support of at least one of the group of options labelled by the same numeral <n> is required
X	prohibited
<pred>:	conditional-item symbol, including predicate identification (see A.3.4)
^	logical negation, applied to a conditional item's predicate

A.2.2 Other symbols

<r>	receive aspects of an item
<s>	send aspects of an item

[1] Copyright release for PICS proformas

Users of this Recommendation | International Standard may freely reproduce the PICS proforma in this Annex so that it can be used for its intended purpose and may further publish the completed PICS.

A.3 Instructions for completing the PICS proforma

A.3.1 General structure of the PICS proforma

The first part of the PICS proforma — Implementation Identification and Protocol Summary — is to be completed as indicated with the information necessary to identify fully both the supplier and the implementation.

The main part of the PICS proforma is a fixed-format questionnaire divided into a number of major subclauses; these can be divided into further subclauses each containing a group of individual items. Answers to the questionnaire items are to be provided in the rightmost column, either by simply marking an answer to indicate a restricted choice (usually Yes or No), or by entering a value or a set or range of values.

NOTE — There are some items for which two or more choices from a set of possible answers can apply. All relevant choices are to be marked in these cases.

Each item is identified by an item reference in the first column; the second column contains the question to be answered; and the third column contains the reference or references to the material that specifies the item in the main body of this Recommendation | International Standard. The remaining columns record the status of the item — whether support is mandatory, optional, prohibited, or conditional — and provide space for the answers (see also A.3.4).

A supplier may also provide further information, categorized as either Additional Information or Exception Information. When present, each kind of further information is to be provided in a further subclause of items labelled A<i> or X<i>, respectively, for cross-referencing purposes, where <i> is any unambiguous identification for the item (e.g., a number); there are no other restrictions on its format or presentation.

A completed PICS proforma, including any Additional Information and Exception Information, is the Protocol Implementation Conformance Statement for the implementation in question.

NOTE — Where an implementation is capable of being configured in more than one way, a single PICS may be able to describe all such configurations. However, the supplier has the choice of providing more than one PICS, each covering some subset of the implementation's configuration capabilities, in cases where this makes for easier and clearer presentation of the information.

A.3.2 Additional information

Items of Additional Information allow a supplier to provide further information intended to assist in the interpretation of the PICS. It is not intended or expected that a large quantity will be supplied, and a PICS can be considered complete without any such information. Examples might be an outline of the ways in which a (single) implementation can be set up to operate in a variety of environments and configurations, or a brief rationale — based perhaps upon specific application needs — for the exclusion of features which, although optional, are nonetheless commonly present in implementations of this protocol.

References to items of Additional Information may be entered next to any answer in the questionnaire, and may be included in items of Exception Information.

A.3.3 Exception information

It may occasionally happen that a supplier will wish to answer an item with mandatory or prohibited status (after any conditions have been applied) in a way that conflicts with the indicated requirement. No pre-printed answer will be found in the support column for this; instead, the supplier shall write the missing answer into the Support column, together with an X<i> reference to an item of Exception Information, and shall provide the appropriate rationale in the Exception Information item itself.

An implementation for which an Exception Information item is required in this way does not conform to this Recommendation | International Standard.

NOTE — A possible reason for the situation described above is that a defect in the standard has been reported, a correction for which is expected to change the requirement not met by the implementation.

A.3.4 Conditional status

A.3.4.1 Conditional items

The PICS proforma contains a number of conditional items. These are items for which the status — mandatory, optional, or prohibited — that applies is dependent upon whether or not certain other items are supported, or upon the values supported for other items.

In many cases, whether or not the item applies at all is conditional in this way, as well as the status when the item does apply.

Where a group of items is subject to the same condition for applicability, a separate preliminary question about the condition appears at the head of the group, with an instruction to skip to a later point in the questionnaire if the "Not Applicable" answer is selected. Otherwise, individual conditional items are indicated by one or more conditional symbols (on separate lines) in the status column.

A conditional symbol is of the form "<pred>:<x>" where "<pred>" is a predicate as described in A.3.4.2, and "<x>" is one of the status symbols M, O, O.<n>, or X.

If the value of the predicate in any line of a conditional item is true (see A.3.4.2), then the conditional item is applicable, and its status is that indicated by the status symbol following the predicate; the answer column is to be marked in the usual way. If the value of a predicate is false, the Not Applicable (N/A) answer is to be marked in the relevant line. Each line in a multi-line conditional item should be marked: at most one line will require an answer other than N/A.

A.3.4.2 Predicates

A predicate is one of the following:

a) an item-reference for an item in the PICS proforma: the value of the predicate is true if the item is marked as supported, and is false otherwise;

b) a predicate name, for a predicate defined elsewhere in the PICS proforma (usually in the Major Capabilities section or at the end of the section containing the conditional item): see below; or

c) the logical negation symbol "^" prefixed to an item-reference or predicate name: the value of the predicate is true if the value of the predicate formed by omitting the "^" is false, and vice versa.

The definition for a predicate name is one of the following

a) an item-reference, evaluated as at (a) above;

b) a relation containing a comparison operator (=, < , etc.) with at least one of its operands being an item-reference for an item taking numerical values as its answer; the predicate is true if the relation holds when each item-reference is replaced by the value entered in the Support column as an answer to the item referred to; or

c) a boolean expression constructed by combining simple predicates, as in (a) and (b), using the boolean operators AND, OR, and NOT, and parentheses, in the usual way; the value of such a predicate is true if the boolean expression evaluates to true when the simple predicates are interpreted as described above.

Each item whose reference is used in a predicate or predicate definition is indicated by an asterisk in the Item column.

A.4 Identification

A.4.1 Implementation identification

Supplier	
Contact point for queries about the PICS	
Implementation name(s) and version(s)	
Other information necessary for full identification (e.g., name(s) and version(s) of machines and/or operating systems, system name(s))	

NOTES

1 Only the first three items are required for all implementations; other information may be completed as appropriate in meeting the requirement for full identification.

2 The terms Name and Version should be interpreted appropriately to correspond with a supplier's terminology (e.g., Type, Series, Model).

A.4.2 Protocol summary

Identification of protocol specification	ITU-T Recommendation X.622 (1994) | ISO/IEC 8473-3 : 1994
Identification of corrigenda and amendments to the PICS proforma	
Protocol version(s) supported	
Have any Exception Information items been required (see A.3.3)? YES ☐ NO ☐ (The answer YES means that the implementation does not conform to this Recommendation | International Standard)	

Date of statement	

A.5 Subnetwork dependent convergence functions for use with X.25 subnetworks

A.5.1 Applicability

Clause A.5 is applicable to all implementations that claim conformance to this Recommendation | International Standard.

A.5.2 ISO/IEC 8208 SNDCF Functions

Item	Function	Reference	Status	Support
XSNUD	Is Subnetwork User Data of at least 512 octets transfered transparently by the SNDCF?	5.2	M	Yes[]
XSNTD	Is Transit Delay determined by the SNDCF prior to the processing of user data?		M	Yes[]
	Call Setup Considerations – Is a new call setup :	5.3.1		
XCalla	a) when no suitable call exists?	5.3.1 a)	O.3	Yes[] No[]
XCallb	b) when queue threshold reached?	5.3.1 b)	O.3	Yes[] No[]
XCallc	c) by systems management?	5.3.1 c)	O.3	Yes[] No[]
XCalld	d) when queue threshold reached and timer expires?	5.3.4	O.3	Yes[] No[]
XCalle	e) by other local means?	5.3.1	O.3	Yes[] No[]

	Call Clearing Considerations - Are calls cleared:	5.3.2			
* XClra	a) when idle timer expires?	5.3.2 a) 5.3.4	O		Yes[] No[]
XClrb	b) when need to re-use circuit?	5.3.2 b)	O		Yes[] No[]
XClrc	c) by systems management?	5.3.2 c)	O		Yes[] No[]
XClrd	d) by provider?	5.3.2 d)	M		Yes[]
XClre	e) by other local means?	5.3.2	O		Yes[] No[]
XPD	X.25 Protocol Discrimination	5.3.3	M		Yes[]
XVCC	Resolution of VC collisions	5.3.5	M		Yes[]
XMCR	Multiple VCs - responding	5.3.6	M		Yes[]
* XMCI	Multiple VCs - initiating	5.3.6	O		Yes[] No[]
Xpri	X.25 Priority procedure	5.3.7	O		Yes[] No[]

A.5.3 X.25 call user data

Item	Parameter	Reference	Status		Support
PD-s	<s> Protocol Discrimination	5.3.3	M		Yes[]
PD-r	<r> Protocol Discrimination	5.3.3	M		Yes[]
LI-s	<s> Length Indication	5.3.6	XMCI:M	N/A[]	Yes[]
LI-r	<r> Length Indication	5.3.6	M		Yes[]
Ver-s	<s> SNCR Version	5.3.6	XMCI:O	N/A[]	Yes[]
Ver-r	<r> SNCR Version	5.3.6	M		Yes[]
SNCR-s	<s> SNCR Value	5.3.6	XMCI:M	N/A[]	Yes[]
SNCR-r	<r> SNCR Value	5.3.6	M		Yes[]

A.5.4 ISO/IEC 8208 SNDCF timers

Item	Timer	Reference	Status	Values	support	Values Supported
XIDL	X25 VC idle	5.3.4	XClra:O	Any	Yes[] No[]	
XNVC	additional VC	5.3.4	O	Any	Yes[] No[]	

A.5.5 ISO/IEC 8208 SNDCF multi-layer dependencies

Item	Dependency	Reference	Requirement	Values Supported
XSSg-r	<r>Maximum SN data unit size (Rx)	5.2	>= 512	
XSSg-t	<s>Maximum SN data unit size (Tx)	5.2	>= 512	

Item	Dependency	Reference	Status	Support
Xvc	X.25 Virtual call service	5.3.8	M	Yes[]
Xdt	X.25 Data transfer	5.3.8	M	Yes[]
Xfc	X.25 flow control procedures	5.3.8	M	Yes[]
Xfrp	X.25 flow control + reset packets	5.3.8	M	Yes[]
Xccp	X.25 call setup and clear packets	5.3.8	M	Yes[]
Xdp	X.25 DTE and DCE data packets	5.3.8	M	Yes[]
Xrs	X.25 restart procedures	5.3.8	M	Yes[]
XDcT	X.25 DCE timeouts	5.3.8	M	Yes[]
XDtT	X.25 DTE time limits	5.3.8	M	Yes[]
Xpco	X.25 network packet coding	5.3.8	M	Yes[]
Xfcn	X.25 flow control parameter - - negotiation	5.3.8	O	Yes[] No[]
Xtd	X.25 transit delay selection and - negotiation	5.3.8	O	Yes[] No[]
Xtc	X.25 throughput class negotiation	5.3.8	O	Yes[] No[]
Xoth	Other X.25 elements	5.3.8	O	Yes[] No[]