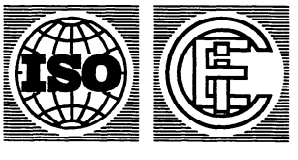
INTERNATIONAL STANDARD

ISO/IEC 8878

Second edition
1992-12-15

Information technology — Telecommunications and information exchange between systems — Use of X.25 to provide the OSI Connection-mode Network Service

Technologies de l'information — Télécommunications et échange d'informations entre systèmes — Utilisation du protocole X.25 pour fournir le service de réseau OSI en mode connexion



Reference number
ISO/IEC 8878:1992(E)

CONTENTS

Page

Foreword . . . iv

Introduction . . . v

1. Scope . . . 1

2. Normative references . . . 2
   2.1 Identical Recommendations | International Standards . . . 2
   2.2 Paired Recommendations | International Standards equivalent in technical content . . . 2
   2.3 Additional references . . . 2

3. Definitions . . . 2
   3.1 Reference Model definitions . . . 2
   3.2 Service Conventions definitions . . . 3
   3.3 Network Service definitions . . . 3
   3.4 X.25 definitions . . . 3
   3.5 X.96 definitions . . . 3

4. Abbreviations . . . 3
   4.1 Network Service abbreviations . . . 3
   4.2 X.25 abbreviations . . . 4

5. Overview . . . 4
   5.1 Elements of the X.25/PLP-1984 used to support the OSI CONS . . . 4
   5.2 General operation of the X.25/PLP-1984 for supporting the OSI CONS . . . 5

6. Network connection establishment phase . . . 7
   6.1 Primitive/Parameter and packet/field relationships . . . 7
   6.2 Procedures . . . 7

7. Network connection release phase . . . 15
   7.1 Primitive/Parameter and packet/field relationships . . . 15
   7.2 Procedures . . . 16

8. Data transfer phase — Data transfer service . . . 17
   8.1 Primitive/Parameter and packet/field relationships . . . 17
   8.2 Procedures . . . 17

9. Data transfer phase — Receipt confirmation service . . . 18
   9.1 Primitive and packet/field relationships . . . 18
   9.2 Procedures . . . 18

10. Data transfer phase — Expedited data transfer service . . . 19
   10.1 Primitive/Parameter and packet/field relationships . . . 19
   10.2 Procedures . . . 19

11. Data transfer phase — Reset service . . . 19
   11.1 Primitive/Parameter and packet/field relationships . . . 19
   11.2 Procedures . . . 19

© ISO/IEC 1992

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

ISO/IEC Copyright Office • Case postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

12. Response to protocol violations 21

13. Conformance 22
13.1 Conformance requirements 22
13.2 Optional features 22

Annex A: X.25 (1980) Subnetwork Dependent Convergence Protocol 23
A.1 Introduction 23
A.2 Scope 23
A.3 Abbreviations 24
A.4 Overview of the protocol 24
A.5 Protocol mechanisms 26
A.6 Protocol description 38
A.7 Protocol encoding in X.25 packets 48

Annex B: Classification 54
B.1 Classification of systems 54
B.2 Functionality of classes 54
B.3 Scenarios 54
B.4 Procedures for selecting class of operation 55
B.5 Interworking by relay system 55

Annex C: Subnetwork Convergence Protocol for Use With X.25 Permanent Virtual Circuits 58
C.1 Introduction and scope 58
C.2 Overview 58
C.3 Abbreviations 58
C.4 Protocol mechanisms 58
C.5 Protocol encoding for NC establishment and release 60

Annex D: Protocol Implementation Conformance Statement Proforma 62
D.1 Introduction 62
D.2 Scope 62
D.3 Normative references 62
D.4 Definitions 62
D.5 Abbreviations 63
D.6 Protocol Implementation Conformance Statement Proforma 64
D.7 Modified PICS requirements for ISO/IEC 8208 76

Annex E: Additional Considerations of CONS Primitives 83
E.1 Introduction 83
E.2 Environment for X.25/PLP operation 83

Annex F: Use of X.25/PLP NPAI 85
F.1 Introduction 85
F.2 Obtaining an SNPA address 85
F.3 Examples of Network Address encoding 85

Annex G: Transit Delay Calculations 87

Annex H: Example of Priority Negotiation 89

Annex I: Differences between Recommendation X.223 and ISO/IEC 8878 91

© ISO/IEC

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 8878 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*.

This second edition cancels and replaces the first edition (ISO 8878:1987), which has been technically revised. It consolidates Technical Corrigenda 1, 2 and 3, Addenda 1 and 2 and Amendment 1 as well as Technical Corrigendum 1 to Addendum 2.

NOTE — ISO/IEC DIS 8878-2 as well as defect reports 8878-012, 013, 014 and 015 have also been included in this second edition.

Annexes A, B, C and D form an integral part of this International Standard. Annexes E, F, G, H and I are for information only.

Introduction

This International Standard defines methods for providing the OSI Connection-Mode Network Service (CONS) through the use of the virtual circuit services of the X.25 Packet Layer Protocol (X.25 PLP). The method presented in the main body of this International Standard specifies a mapping between elements of the 1984 or later versions of the X.25/PLP (referred to as X.25/PLP-1984) using X.25 Virtual Call (VC) services and elements of the OSI CONS. Features associated with versions of X.25 later than 1984 are identified as to which version they relate. This International Standard is similar to CCITT Recommendation X.223; however, the two are currently published as separate documents.

Clause 13 contains the requirements for systems claiming conformance to this International Standard.

Other methods using other virtual circuit services and/or other versions of X.25 are also defined. In particular, a second method for VCs, which is presented in Annex A, defines a Subnetwork Dependent Convergence Protocol (SNDCP) that shall be used to provide the OSI CONS over subnetworks or with equipment using the 1980 or earlier versions of the X.25/PLP (referred to as X.25/PLP-1980). This SNDCP should only be used if the elements of the X.25/PLP-1984, as defined in 5.1 herein, are not available to support the OSI CONS. Annex B contains a classification of systems according to whether they implement the procedures defined in the main body of this International Standard, the procedures defined in Annex A, or both. In addition, it describes the possibilities and the rules for interworking between the classes of equipment identified.

Annexes A and B are integral parts of this International Standard. They are intended to provide a migration strategy towards the use of the 1984 version of X.25 in both subnetworks and DTEs. Because of the evolution of technology, the status of Annexes A and B will be reviewed in the future.

Annex C defines another method for providing the OSI CONS, in this case in conjunction with the PVC service of X.25.

Annex D provides the Protocol Implementation Conformance Statement (PICS) Proforma for this International Standard.

Annexes C and D are integral parts of this International Standard.

Annex E provides additional considerations on the relationship between the X.25 protocol procedures and the CONS primitives.

Annex F illustrates the use of X.25 Network Protocol Address Information (NPAI), i.e., the Address Field and the Address Extension Facilities.

Annex G illustrates the use of the X.25 transit delay facilities.

Annex H illustrates the use of the X.25 Priority Facility.

Annex I lists the differences between CCITT Rec. X.223 and ISO/IEC 8878.

Annexes E through I are not integral parts of this International Standard.

The relationship between the X.25/PLP-1984 and the OSI CONS is shown in Figure 1. This relationship is described only in terms of the Network Layer entities that provide the CONS. No discussion is given here to describe the actions of a Network Layer entity that only provides a relay function for a given network connection.

The OSI Network Service is defined 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.

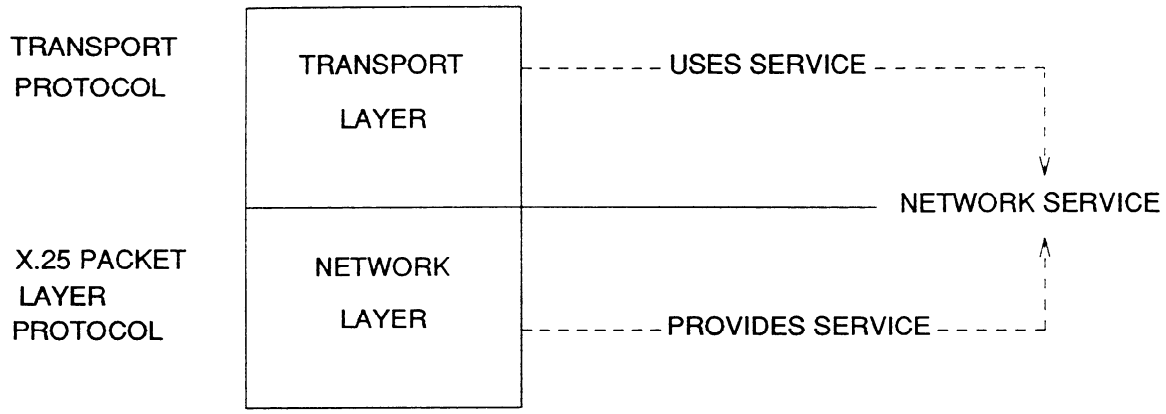


Figure 1 — Relationship of the X.25 Packet Layer Protocol to the OSI Connection-Mode Network Service

The OSI Network Service does not specify individual implementations or products nor does it constrain the implementation of entities and interfaces within a computer system.

The X.25/PLP-1984 is defined in terms of

a) procedures for Virtual Calls and Permanent Virtual Circuits;

b) formats of packets associated with these procedures;

c) procedures and formats for optional user facilities and CCITT-Specified DTE facilities.

The use of the word "Network" to name the "Network" Layer of the OSI Reference Model should be distinguished from the use of the word "network" to denote a communications network as conventionally understood. To facilitate this distinction, the term "subnetwork" is used for a collection of physical equipment, commonly called a "network" (reference CCITT Rec. X.200 | ISO 7498). Subnetworks may be either public or private networks. In the case of public networks, their properties may be determined by separate CCITT Recommendations such as CCITT Rec. X.21 for a circuit-switched network or CCITT Rec. X.25 for a packet-switched network.

Throughout the set of OSI-related Recommendations | International Standards, the term "Service" refers to the abstract capability provided by one layer of the OSI Reference Model to the layer above it. Thus, the Network Service is a conceptual architectural Service, independent of administrative divisions.

NOTE — It is important to distinguish the specialized use of the term "Service" within the set of OSI-related Recommendations | International Standards from its use elsewhere to describe the provision of a service by an organization (such as the provision of a service, as defined in CCITT Recommendations, by an Administration).

Information technology — Telecommunications and information exchange between systems — Use of X.25 to provide the OSI Connection-mode Network Service

1. Scope

The OSI Connection-mode Network Service (CONS) is defined in terms of a set of primitive actions and events and associated parameters. For a protocol to support this service, there must be a mapping between the abstract primitives and parameters of the CONS and the real elements of the protocol. For the X.25 Packet Layer Protocol (PLP), the main body of this International Standard provides such a mapping for the X.25/PLP-1984 using Virtual Calls.

This International Standard also provides a mapping of the CONS primitives and parameters to the X.25/PLP-1980 plus an SNDCP (Annex A). These mappings apply to the X.25 VC service. In addition, the method of selecting the appropriate mapping, if any, for different combinations of end systems and Network Layer relay systems implementing one or more of the mappings is defined (Annex B).

For the PVC service for both the X.25/PLP-1984 and the X.25/PLP-1980, a mapping of CONS primitives and parameters to the X.25/PLP is given in Annex C.

This International Standard specifies two sets of procedures from which three classes of implementation are described. The requirements of these procedures are applicable both to end system operation and to half the operation of a Network Layer relay. Where relay operation is concerned, the two halves of the relay may be the same or different classes of implementation.

This International Standard specifies the requirements to be met by a **System-1984** implementation. Implementations in this class are designed to operate directly and efficiently with other System-1984 implementations, including cases of operation across an X.25(1984) subnetwork.

This International Standard also specifies the procedures to be operated by a **System-1980** implementation. Implementations in this class are designed to operate directly with other System-1980 implementations, including cases of operation across any form of X.25 subnetwork, but will operate less efficiently than System-1984 implementations.

This International Standard also specifies the requirements to be met by a **Compatible** implementation. Implementations in this class are designed to operate directly with all other implementation classes, including cases of operation across any type of X.25 subnetwork. They make efficient use of X.25(1984) when placed in this environment.

The X.25/PLP is usually regarded as operating between an end system (i.e., a "Data Terminal Equipment" in X.25 terminology) and a packet-switched public data subnetwork. However, the X.25/PLP can also be used in other

environments to provide the OSI CONS. Examples of such other uses include

a) an end system connected to an X.25 packet-switched private data subnetwork;

b) an end system connected to a local area network;

c) direct connection or circuit-switched connection (including connection across a circuit-switched data subnetwork) of two end systems without an intervening packet-switched public data subnetwork;

d) an end system connected to an Integrated Services Digital Network.

2. Normative references

The following CCITT Recommendations and International 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 Recommendations and 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 edition of the Recommendations and Standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards. The CCITT Secretariat maintains a list of currently valid CCITT Recommendations.

2.1 Identical Recommendations | International Standards

— CCITT Recommendation X.213 (1992) | ISO/IEC 8348:1992, *Information Technology — Network Service Definition for Open Systems Interconnection.*

2.2 Paired Recommendations | International Standards equivalent in technical content

— CCITT Recommendation X.25 (1988), *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.*

NOTE — This Recommendation is referred solely with respect to its Packet Layer Protocol description. However, this Recommendation fully specifies the behaviour of the DCE while specifying only a minimum set of requirements for the DTE. Additional guidance for the design of DTEs is available in ISO/IEC 8208.

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

— 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.*

2.3 Additional references

— CCITT Recommendation X.96 (1988), *Call progress signals in Public Data Networks.*