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Information technology — Telecommunications and information exchange between systems — Protocol combinations to provide and support the OSI Network Service

Technologies de l'information — Télécommunications et échange d'information entre systèmes — Combinaisons de protocole pour la fourniture et le support du service de réseau OSI

Reference number
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Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/IEC TR 13532, which is a Technical Report of type 3, was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*.

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Introduction

This Technical Report provides a list of the protocol combinations commonly used to provide and support the OSI Network Service. It is a replacement for ISO/IEC 8880–1, ISO/IEC 8880–2 and ISO/IEC 8880–3.

In some layers of the OSI Reference Model Architecture, it is possible to refer to a single layer protocol standard specification as the place in which all information necessary to understand how to provide the layer service can be found. This is not possible in the Network Layer since the number of different subnetwork technologies and interconnection strategies that must be accommodated is too large to permit the specification of a single OSI Network Layer Protocol. It is therefore the intention of this Technical Report to serve as a point of reference for information concerning the ways in which Network Layer protocols may be used to provide the OSI Network Service in various environments.

CCITT Rec. X.213 | ISO/IEC 8348 defines the OSI Network Service. ISO 8648 outlines the architectural framework for the definition of Network Layer protocols and for describing the relationship of the various real world components which can participate in the provision of the Network Service. This Technical Report describes the application of the Network Layer architecture in ISO 8648 and the International Standard Network Layer protocols to the provision of the Network Service in real instances of use.

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Information technology — Telecommunications and information exchange between systems — Protocol combinations to provide and support the OSI Network Service

Section 1: General

1.1 Scope

This Technical Report provides information on the protocol combinations that are usually used to provide and support the OSI Network Service in the commonly available network environments. Section 2 provides information for the Connection-mode Network Service and Section 3 provides information for the Connectionless-mode Network Service.

1.2 Use of this Technical Report

This Technical Report is for use by ISO/IEC Technical Committees and other parties requiring a catalogue of the protocol combinations and options which may be used in the provision and support of the OSI Network Service.

1.3 References

The following standards contain provisions which, through reference in this text, constitute provisions of this Technical Report. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this Technical report 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.

1.3.1 Identical Recommendations | International Standards

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

CCITT Recommendation X.213 (1992) | ISO/IEC 8348:1993, *Information technology — Open Systems Interconnection — Network Service Definition.*

ITU-T Recommendation X.233 (1993) | ISO/IEC 8473-1:1994, *Information technology — Protocol for providing the connectionless-mode network service: Protocol specification.*

CCITT Recommendation X.612 (1992) | ISO/IEC 9574:1992, *Information technology — Provision of the OSI connection-mode network service by packet mode terminal equipment connected to an integrated services digital network (ISDN).*

CCITT Recommendation X.613 (1992) | ISO/IEC 10588:1993, *Information technology — Use of X.25 Packet Layer Protocol in conjunction with X.21/X.21 bis to provide the OSI connection-mode Network Service.*

CCITT Recommendation X.614 (1992) | ISO/IEC 10732:1993, *Information technology — Use of X.25 Packet Layer Protocol to provide the OSI connection-mode Network Service over the telephone network.*

ITU-T Recommendation X.622 (1994) | ISO/IEC 8473-3:1995, *Information technology — Protocol for providing the connectionless-mode network service: Provision of the underlying service by an X.25 subnetwork.*

1.3.2 Paired Recommendations | International Standards equivalent in technical content

ITU-T Recommendation X.222 (1995), *Use of the X.25 LAPB-Compatible Data Link Procedures to Provide the OSI Connection-mode Data Link Service.*

ISO/IEC 11575:1995, *Information technology — Telecommunications and information exchange between systems — Protocol mappings for the OSI Data Link service.*

CCITT Recommendation X.223 (1988), *Use of X.25 to provide the OSI connection-mode network service for CCITT applications.*

ISO/IEC 8878:1992, *Information technology – Telecommunications and information exchange between systems — Use of X.25 to provide the OSI Connection-mode Network Service*

1.3.3 Additional references

ISO/IEC 7776:1995, *Information technology — Telecommunications and information exchange between systems — High-level data-link control procedures — Description of the X.25 LAPB-compatible DTE data link procedures.*

ISO/IEC 8208:1995, *Information technology — Data communications — X.25 Packet Layer Protocol for Data Terminal Equipment.*

ISO/IEC 8473-2:—[1], *Information technology — Protocol for providing the connectionless-mode network service — Part 2: Provision of the underlying service by an ISO/IEC 8802 subnetwork.*

ISO/IEC 8473-4:1995, *Information technology — Protocol for providing the connectionless-mode network service: Provision of*

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the underlying service by a subnetworks that provides the OSI data link service.

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

ISO/IEC 8802-2:1994, *Information technology — Telecommunications and information exchange between systems — Local and metropolitan area networks — Specific requirements — Part 2: Logical link control.*

ISO/IEC 8881:1989, *Information processing systems — Data communications — Use of the X.25 packet level protocol in local area networks.*

CCITT Recommendation V.25, *Automatic Equipment and/or Parallel Automatic Calling Equipment on the General Switched Telephone Network Including Procedures for Disabling of Echo Control Devices for Both Manually and Automatically Established Calls.*

CCITT Recommendation V.25 bis, *Automatic calling and/or answering equipment on the general switched telephone network (GSTN) using the 100 series interchange circuits.*

CCITT Recommendation X.21, *Interface between Data Terminal Equipment (DTE) and Data Circuit Terminating Equipment (DCE) for Operation on Public Data Networks.*

CCITT Recommendation X.21 bis, *Use on Public Data Networks of Data Terminal Equipment (DTE) which is designed for interfacing to synchronous V-Series modems.*

CCITT Recommendation X.30, *Support of X.21, X.21 bis, and X.20 bis based data terminal equipments (DTEs) by an integrated services digital network (ISDN).*

CCITT Recommendation X.31 (I.462), *Support of Packet Mode Terminal Equipment by an ISDN.*

CCITT Recommendation X.32, *Interface Between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for Terminals Operating in the Packet Mode accessing a packet switched public data network through a public switched telephone network or a circuit switched public data network.*

1.4 Definitions

1.4.1 Reference model definitions

This Technical Report makes use of the following terms defined in ITU-T Rec. X.200 | ISO/IEC 7498-1.

a) OSI Network Layer;

b) OSI Network Service;

c) Service;

d) Protocol;

e) Connection-mode;

f) Connectionless-mode

g) Intermediate System

h) End-system.

1.4.2 Network Layer architecture definitions

This Technical Report makes use of the following term defined in ISO 8648:

a) Subnetwork.

1.4.3 Local area network definitions

This Technical Report makes use of the following terms defined in ISO 8802:

a) Local Area Network;

b) Logical Link Control;

c) Medium Access Control.

1.4.4 ISDN definitions

This Technical Report makes use of the following terms defined in CCITT Rec. X.612 | ISO/IEC 9574:

a) B Channel;

b) D Channel;

c) R reference point;

d) reference point;

e) S reference point;

f) T reference point;

g) Terminal Adaptor;

h) Terminal Equipment.

1.5 Abbreviations

BAC	Balanced Asynchronous Class
CONS	Connection-mode Network Service
CLNS	Connectionless-mode Network Service
CSDN	Circuit-Switched Data Network
DCE	Data Circuit-terminating Equipment
DTE	Data Terminal Equipment
ISDN	Integrated Services Digital Network
LAN	Local Area Network
LAPB	Link Access Procedures Balanced
LLC	Logical Link Control
MAC	Medium Access Control
NSAP	Network Service Access Point
OSI	Open Systems Interconnection
PH	Packet Handler

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PLP	Packet Level Protocol	SNDCP	Subnetwork Dependent Convergence Protocol
PSDN	Packet Switched Data Network	TA	Terminal Adaptor
PSTN	Public Switched Telephone Network	TE	Terminal Equipment

Section 2: Provision and support of the connection-mode Network Service

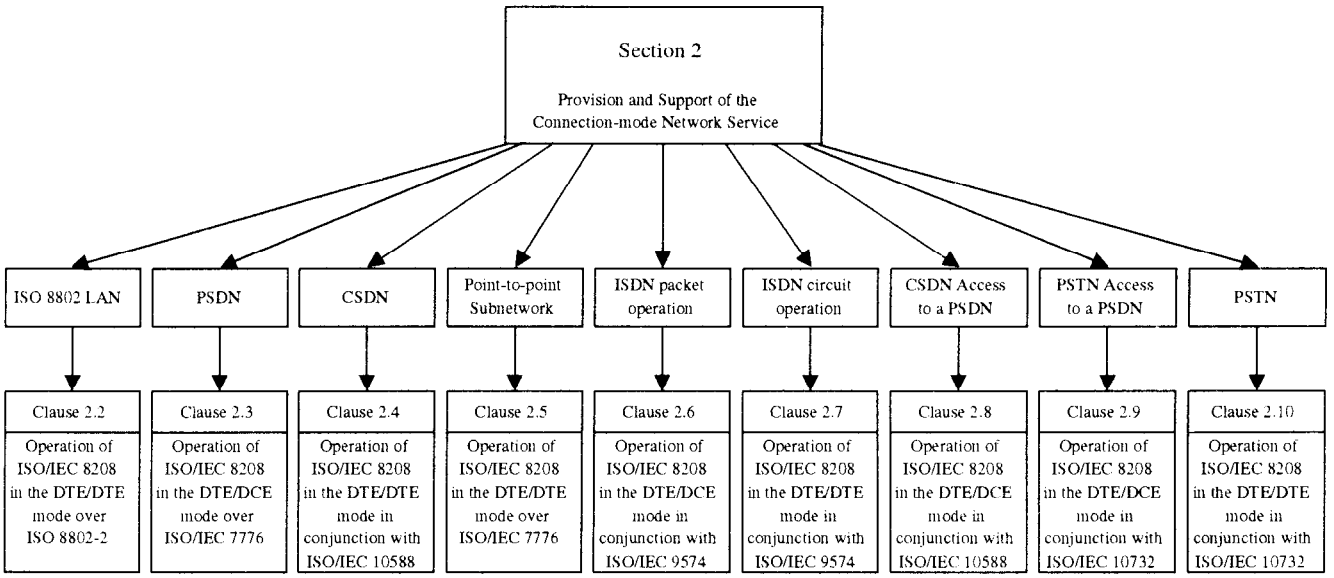

Figure 1 — Protocols to provide and support the connection-mode Network Service

2.1 Overview

Figure 1 illustrates the protocol combinations and environments described in this section.

2.2 Operation of ISO/IEC 8208 in the DTE/DTE mode over ISO 8802–2

2.2.1 Applicability

This clause applies when the X.25 PLP, as standardized in ISO/IEC 8208, operating over ISO 8802–2 is used to provide the CONS at an NSAP in an end-system attached to an ISO 8802 LAN.

2.2.2 Procedures for operation

When providing the OSI CONS in the configuration identified in 2.2.1 above, the following apply independently of the type of MAC procedure used:

a) the definition of the CONS is as specified in CCITT Rec. X.213 | ISO/IEC 8348;

b) the mapping of the elements of the CONS to the elements of the X.25 PLP are as required by CCITT Rec. X.223 | ISO/IEC 8878 for a conforming implementation that does not use the X.25 (1980) SNDCP;

c) the general procedures and formats of the X.25 PLP are as specified in ISO/IEC 8208 for a DTE operating in DTE/DTE mode;

d) the specific considerations for using the X.25 PLP in the ISO 8802 LAN environment identified above are as required by the conformance clause of ISO/IEC 8881; and

e) the general procedures and formats of LLC are as specified in ISO 8802–2.

2.3 Operation of ISO/IEC 8208 in the DTE/DCE mode over ISO/IEC 7776

2.3.1 Applicability

This clause applies when the X.25 PLP, as standardized in ISO/IEC 8208, operating over ISO/IEC 7776 is used to provide the CONS at an NSAP in an end-system attached to a PSDN.

2.3.2 Procedures for operation

When providing the OSI CONS in the configuration identified in 2.3.1 above, the following apply:

a) the definition of the CONS is as specified in CCITT Rec. X.213 | ISO/IEC 8348;

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b) the mapping of the elements of the CONS to the elements of the X.25 PLP are as required by CCITT Rec. X.223 | ISO/IEC 8878 for a conforming implementation that does not use the X.25 (1980) SNDCP;

c) the general procedures and formats of the X.25 PLP are as specified in ISO/IEC 8208 for a DTE operating in DTE/DCE mode; and

d) LAPB-compatible procedures and formats are as specified in ISO/IEC 7776.

2.4 Operation of ISO/IEC 8208 in the DTE/DTE mode in conjunction with CCITT Rec. X.613 | ISO/IEC 10588

2.4.1 Applicability

This clause applies when the X.25 PLP, as standardized in ISO/IEC 8208, operating over ISO/IEC 7776 is used to provide the CONS at an NSAP in an end-system attached to a CSDN.

2.4.2 Procedures for operation

When providing the OSI CONS in the configuration identified in 2.4.1 above, the following apply:

a) The definition of the CONS is as specified in CCITT Rec. X.213 | ISO/IEC 8348;

b) The particular considerations for the CSDN environment, when used to directly connect two end-systems, are given in CCITT Rec. X.613 | ISO/IEC 10588;

c) The mapping of the elements of the CONS to the elements of the X.25 PLP are as required by CCITT Rec. X.223 | ISO/IEC 8878 for a conforming implementation that does not use the X.25 (1980) SNDCP;

d) The general procedures and formats of the X.25 PLP are as specified in ISO/IEC 8208 for a DTE operating in the DTE/DTE mode; and

e) Additional applicable standards are ISO/IEC 7776, CCITT Recs. V.25, X.21, X.21 bis, X.30, X.31 and X.32.

2.5 Operation of ISO/IEC 8208 in the DTE/DTE mode over ISO/IEC 7776

2.5.1 Applicability

This clause applies when the X.25 PLP, as standardized in ISO/IEC 8208, operating over ISO/IEC 7776 is used to provide the CONS at an NSAP in an end-system attached to a point-to-point subnetwork.

2.5.2 Procedures for operation

When providing the OSI CONS in the configuration identified in 2.5.1 above, the following apply:

a) the definition of the CONS is as specified in CCITT Rec. X.213 | ISO/IEC 8348;

b) the mapping of the elements of the CONS to the elements of the X.25 PLP are as required by CCITT Rec. X.223 | ISO/IEC 8878 for a conforming implementation that does not use the X.25 (1980) SNDCP;

c) the general procedures and formats of the X.25 PLP are as specified in ISO/IEC 8208 for a DTE operating in DTE/DTE mode; and

d) the single link procedures are as defined in ISO/IEC 7776.

2.6 Operation of ISO/IEC 8208 in the DTE/DCE mode in conjunction with CCITT Rec. X.612 | ISO/IEC 9574

2.6.1 Applicability

This clause applies when the X.25 PLP, as standardized in ISO/IEC 8208, is used to provide the CONS at an NSAP in an end-system attached to an ISDN and using it for Packet Operation.

2.6.2 Procedures for operation

When providing the OSI CONS in the configuration identified in clause 2.6.1, the following apply:

a) the definition of the CONS is as specified in CCITT Rec. X.213 | ISO/IEC 8348;

b) the particular considerations for the ISDN environment, which is dependent on the TE configuration, are given in CCITT Rec. X.612 | ISO/IEC 9574;

c) the mapping of the elements of the CONS to the elements of the X.25 PLP are as required by CCITT Rec. X.223 | ISO/IEC 8878 for a conforming implementation that does not use the X.25 (1980) SNDCP;

d) the general procedures and formats of the X.25 PLP are as specified in ISO/IEC 8208 for a DTE operating in the DTE/DCE mode;

e) additional applicable standards depending on the TE configuration are given in CCITT Rec. X.612 | ISO/IEC 9574 as depicted in table 1.

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Table 1. Additional applicable standards depending on the TE configuration

Type of TE	*Reference point*	*Underlying connection perceived by the TE*	*Additional applicable standards*
TE 1, or TE2/TA	S/T	D Channel	CCITT Q.931 (see note 1), CCITT Q.921, and either CCITT I.430 or CCITT I.431
		B Channel: semi-permanent	CCITT Q.931 (see note 1), CCITT Q.921 (see note 1), ISO/IEC 7776, and either CCITT I.430 or CCITT I.431
		B Channel: demand	CCITT Q.931, CCITT Q.921, ISO/IEC 7776 and either CCITT I.430 or CCITT I.431
TE2	R	Leased circuit	ISO/IEC 7776, and one of: CCITT X.21, CCITT X.21 bis or CCITT V-series
		Direct call	
		Circuit switched	
NOTE 1 - This protocol can be absent in some systems			

2.7 Operation of ISO/IEC 8208 in the DTE/DTE mode in conjunction with CCITT Rec. X.612 | ISO/IEC 9574

2.7.1 Applicability

This clause applies when the X.25 PLP, as standardized in ISO/IEC 8208, is used to provide the CONS at an NSAP in an end-system attached to an ISDN and using it for Circuit Operation.

2.7.2 Procedures for operation

When providing the OSI CONS in the configuration identified in clause 2.7.1, the following apply:

a) the definition of the CONS is as specified in CCITT Rec. X.213 | ISO/IEC 8348;

b) the particular considerations for the ISDN environment, which is dependent on the TE configuration, are given in CCITT Rec. X.612 | ISO/IEC 9574;

c) the mapping of the elements of the CONS to the elements of the X.25 PLP are as required by CCITT Rec. X.223 | ISO/IEC 8878 for a conforming implementation that does not use the X.25 (1980) SNDCP;

d) the general procedures and formats of the X.25 PLP are as specified in ISO/IEC 8208 for a DTE operating in the DTE/DTE mode; and

e) additional applicable standards are CCITT Recs. Q.931, Q.921, and either I.430 or I.431.

2.8 Operation of ISO/IEC 8208 in the DTE/DCE mode in conjunction with CCITT Rec. X.613 | ISO/IEC 10588

2.8.1 Applicability

This clause applies when the X.25 PLP, as standardised in ISO/IEC 8208, is used to provide the CONS at an NSAP in an end-system attached to a PSDN by a CSDN.

2.8.2 Procedures for Operation

When providing the OSI CONS in the configuration identified in clause 2.8.1, the following apply:

a) The definition of the CONS is as specified in CCITT Rec. X.213 | ISO/IEC 8348;

b) The particular considerations for the CSDN environment, when used to access a PSDN, are given in CCITT Rec. X.613 | ISO/IEC 10588;

c) The mapping of the elements of the CONS to the elements of the X.25 PLP are as required by CCITT Rec. X.223 | ISO/IEC 8878 for a conforming implementation that does not use the X.25 (1980) SNDCP;

d) The general procedures and formats of the X.25 PLP are as specified in ISO/IEC 8208 for a DTE operating in the DTE/DCE mode; and

e) Additional applicable standards are ISO/IEC 7776, and CCITT Recs. V.25, X.21, X.21 bis, X.30, X.31 and X.32.

2.9 Operation of ISO/IEC 8208 in the DTE/DCE mode in conjunction with CCITT Rec. X.614 | ISO/IEC 10732

2.9.1 Applicability

This clause applies when the X.25 PLP, as standardised in ISO/IEC 8208, is used to provide the CONS at an NSAP in an end-system attached to a PSDN by a PSTN.

2.9.2 Procedures for Operation

When providing the OSI CONS in the configuration identified in clause 2.9.1 the following apply:

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a) The definition of the CONS is as specified in CCITT Rec. X.213 | ISO/IEC 8348;

b) The particular considerations for the PSTN environment, when used to access a PSDN, are given in CCITT Rec. X.614 | ISO/IEC 10732;

c) The mapping of the elements of the CONS to the elements of the X.25 PLP are as required by CCITT Rec. X.223 | ISO/IEC 8878 for a conforming implementation that does not use the X.25 (1980) SNDCP;

d) The general procedures and formats of the X.25 PLP are as specified in ISO/IEC 8208 for a DTE operating in the DTE/DCE mode; and

e) Additional applicable standards are CCITT Recs. V.25, V.25 bis and X.32.

2.10 Operation of ISO/IEC 8208 in the DTE/DTE mode in conjunction with CCITT Rec. X.614 | ISO/IEC 10732

2.10.1 Applicability

This clause applies when the X.25 PLP, as standardised in ISO/IEC 8208, is used to provide the CONS at an NSAP in an end-system attached to another end-system by a PSTN.

2.10.2 Procedures for Operation

When providing the OSI CONS in the configuration identified in clause 2.10.1 the following apply:

a) The definition if the CONS is as specified in CCITT Rec. X.213 | ISO/IEC 8348;

b) The particular considerations for the PSTN environment, when used to directly connect two end-systems, are given in CCITT Rec. X.614 | ISO/IEC 10732;

c) The mapping of the elements of the CONS to the elements of the X.25 PLP are as required by CCITT Rec. X.223 | ISO/IEC 8878 for a conforming implementation that does not use the X.25 (1980) SNDCP;

d) The general procedures and formats of the X.25 PLP are as specified in ISO/IEC 8208 for a DTE operating in the DTE/DTE mode; and

e) Additional applicable standards are CCITT Recs. V.25, V.25 bis and X.32.

Section 3: Provision and support of the connectionless-mode Network Service

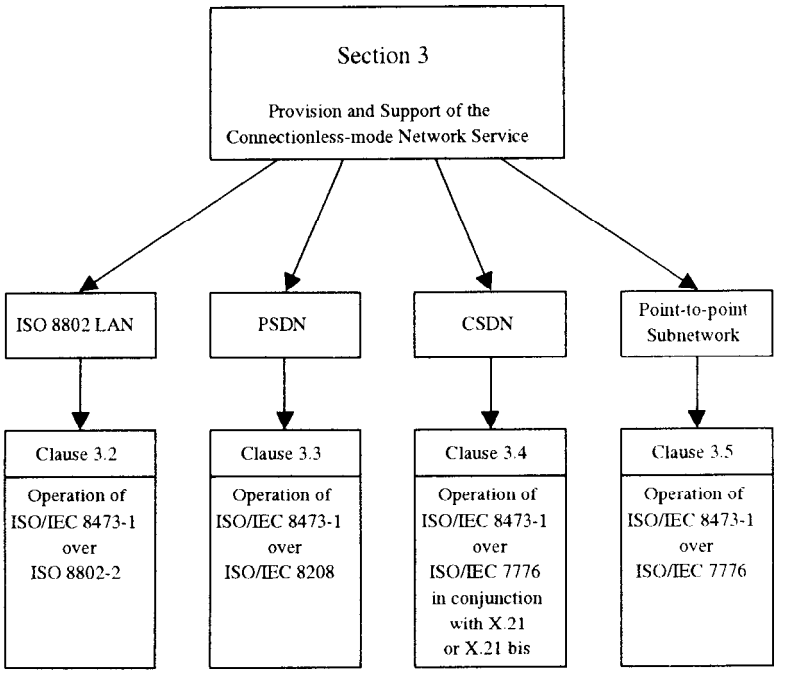

Figure 2 — Protocols to provide and support the connectionless-mode Network Service

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3.1 Overview

Figure 2 illustrates the protocol combinations and environments described in this section.

3.2 Operation of ITU-T Rec. X.233 | ISO/IEC 8473–1 over ISO 8802–2

3.2.1 Applicability

This clause applies when the protocol for providing the CLNS as standardized in ITU-T Rec. X.233 | ISO/IEC 8473–1, operating over ISO 8802–2 is used to provide the CLNS at an NSAP in an end-system attached to an ISO 8802 LAN.

3.2.2 Procedures for Operation

When providing the OSI CLNS in the configuration identified in clause 3.2.1 the following apply independently of the type of MAC procedures used:

a) The definition if the CLNS is as specified in CCITT Rec. X.213 | ISO/IEC 8348;

b) The conformance requirements of the protocol for providing the CLNS are as specified in ITU-T Rec. X.233 | ISO/IEC 8473–1;

c) The mapping of the service used by ITU-T Rec. X.233 | ISO/IEC 8473–1 onto the service provided by ISO 8802–2 is as specified in ISO/IEC 8473–2; and

d) the general procedures and formats of LLC are as specified in ISO 8802–2.

3.3 Operation of ITU-T Rec. X.233 | ISO/IEC 8473–1 over ISO/IEC 8208

3.3.1 Applicability

This clause applies when the protocol for providing the CLNS as standardized in ITU-T Rec. X.233 | ISO/IEC 8473–1, operating over ISO/IEC 8208 in the DTE/DCE mode is used to provide the CLNS at an NSAP in an end-system attached to a PSDN.

3.3.2 Procedures for Operation

When providing the OSI CLNS in the configuration identified in clause 3.3.1 the following apply:

a) The definition if the CLNS is as specified in CCITT Rec. X.213 | ISO/IEC 8348;

b) The conformance requirements of the protocol for providing the CLNS are as required by the conformance clause of ITU-T Rec. X.233 | ISO/IEC 8473–1;

c) The mapping of the service used by ITU-T Rec. X.233 | ISO/IEC 8473–1 onto the service provided by terminal equipment operating in a packet switched mode of operation using the X.25 PLP is as specified in ITU-T Rec. X.622 | ISO/IEC 8473–3;

d) the X.25 PLP is as specified in ISO/IEC 8208; and

e) the LAPB-compatible procedures and formats are as specified in ISO/IEC 7776.

3.4 Operation of ITU-T Rec. X.233 | ISO/IEC 8473–1 over ISO/IEC 7776 in conjunction with CCITT Recs. X.21 or X.21 bis

3.4.1 Applicability

This clause applies when the protocol for providing the CLNS as standardized in ITU-T Rec. X.233 | ISO/IEC 8473–1, operating over ISO/IEC 7776 is used to provide the CLNS at an NSAP in an end-system attached to a CSDN.

3.4.2 Procedures for Operation

When providing the OSI CLNS in the configuration identified in clause 3.4.1 the following apply:

a) The definition if the CLNS is as specified in CCITT Rec. X.213 | ISO/IEC 8348;

b) The conformance requirements of the protocol for providing the CLNS are as required by the conformance clause of ITU-T Rec. X.233 | ISO/IEC 8473–1;

c) The mapping of the service used by ITU-T Rec. X.233 | ISO/IEC 8473–1 onto the Data Link Service is as specified in ISO/IEC 8473–4;

d) The mapping of the Data Link Service to ISO/IEC 7776 is specified in ITU-T Rec. X.222 | ISO/IEC 11575;

e) the calling end-system is assigned address "A" and the called end-system is assigned address "B" unless the assignment is known a priori; and

f) the procedures for the interface between DTE and DCE for synchronous operation on Public Data Networks are as defined in CCITT Recs. X.21 or X.21 bis.

3.5 Operation of ITU-T Rec. X.233 | ISO/IEC 8473–1 over ISO/IEC 7776

3.5.1 Applicability

This clause applies when the protocol for providing the CLNS as standardized in ITU-T Rec. X.233 | ISO/IEC 8473–1, operating over ISO/IEC 7776 is used to provide the CLNS at an NSAP in an end-system attached to a point-to-point subnetwork.

3.5.2 Procedures for Operation

When providing the OSI CLNS in the configuration identified in clause 3.5.1 the following apply:

a) The definition if the CLNS is as specified in CCITT Rec. X.213 | ISO/IEC 8348;

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b) The conformance requirements of the protocol for providing the CLNS are as required by the conformance clause of ITU-T Rec. X.233 | ISO/IEC 8473–1;

c) The mapping of the service used by ITU-T Rec. X.233 | ISO/IEC 8473–1 onto the data Link Service is as specified in ISO/IEC 8473–4; and

d) The mapping of the Data Link Service to ISO/IEC 7776 is specified in ITU-T Rec. X.222 | ISO/IEC 11575.

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