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Information technology — Protocol for providing the connectionless-mode network service: Provision of the underlying service by a subnetwork that provides the OSI data link service

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Technologies de l'information — Protocole de fourniture du service de réseau en mode sans connexion: Fourniture du service sous-jacent par un sous-réseau fournissant le service de liaison de données OSI

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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.

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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.

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International Standard ISO/IEC 8473-4 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology,* Subcommittee SC 6, *Telecommunications and information exchange between systems*, in collaboration with ITU-T. The identical text is published as ITU-T Recommendation X.623.

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*

— *Part 2: Provision of the underlying service by an ISO/IEC 8802 subnetwork*

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

— *Part 4: Provision of the underlying service by a subnetwork that provides the OSI data link service*

Annex A forms an integral part of this part of ISO/IEC 8473.

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.

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ITU-T RECOMMENDATION

INFORMATION TECHNOLOGY – PROTOCOL FOR PROVIDING THE CONNECTIONLESS-MODE NETWORK SERVICE: PROVISION OF THE UNDERLYING SERVICE BY A SUBNETWORK THAT PROVIDES THE OSI DATA LINK SERVICE

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 provides the OSI Data Link service defined by CCITT Rec. X.212 | ISO/IEC 8886, 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

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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 currently valid ITU-T Recommendations.

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2.1 Identical Recommendations | International Standards

- ITU-T Recommendation X.200 (1994) | ISO/IEC 7498-1:1994, *Information technology – Open Systems Interconnection – Basic Reference Model.*
- CCITT Recommendation X.213 (1992) | ISO/IEC 8348:1993, *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.*

- CCITT Recommendation X.212 (1988), *Data link service definition for Open Systems Interconnection for CCITT applications.*

  ISO/IEC 8886:1992, *Information technology – Telecommunications and information exchange between systems – Data link service definition for Open Systems Interconnection.*

2.3 Additional references

- 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) Data link layer;

d) service;

e) service data unit;

f) data link service;

g) 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:

– subnetwork point of attachment.

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3.4 Data link service definitions

This Recommendation | International Standard makes use of the following terms defined in CCITT X.212 | ISO/IEC 8886:

a) data link service access point address;

b) data link connection.

4 Abbreviations

CLNP	Connectionless-mode network protocol
DL	Data link layer
DLSDU	Data link layer service data unit
PDU	Protocol data unit
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.

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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.

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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 subnetworks that provide the OSI data link service

This subclause defines a mapping of the OSI Data Link service to the underlying service assumed by ITU-T Rec. X.233 | ISO/IEC 8473-1. The OSI Data Link service definition defines two types of Data Link service: a connectionless service and a connection-mode service. SNDCFs are defined for subnetworks that provide either of these two modes of service.

5.3.1 SNDCF used with the connectionless Data Link service

The primitives defined for provision of the underlying service assumed by the CLNP map directly onto the UNITDATA Request and Indication primitives defined for the connectionless Data Link service. Subnetwork dependent convergence functions perform a mapping of the connectionless Data Link service onto the underlying service assumed by the CLNP. The mapping is as follows. The generation of an SN-UNITDATA request by the CLNP results in the generation of a DL-UNITDATA request (as described in CCITT Rec. X.212 | ISO/IEC 8886) by the subnetwork dependent convergence function. A corresponding DL-UNITDATA indication prompts the SNDCF to generate an SN-UNITDATA indication to the CLNP. No explicit subnetwork dependent convergence protocol control information is exchanged between Network entities to provide this mapping of service.

The parameters of the SN-UNITDATA primitives are mapped onto the DL-UNITDATA primitives as follows. The SN-Destination-Address and SN-Source-Address parameters are conveyed in the DL-Destination-Address and DL-Source-Address parameters, respectively. The addresses used in the SN-UNITDATA request and indication primitives are the Data Link service access point addresses described in CCITT Rec. X.212 | ISO/IEC 8886.

The SN-Quality-of-Service parameter is conveyed. The available QOS is known prior to the issuance of the DL-UNITDATA request. There is no discrimination among DLSDUs.

The SN-Userdata parameter is conveyed in the DL-Userdata parameter. The subnetwork must be able to support the service data unit requirements defined in 5.2.

5.3.2 SNDCF used with the connection-mode Data Link service

The primitives defined for provision of the underlying service assumed by the CLNP are mapped onto the primitives defined for the connection-mode Data Link service. Subnetwork dependent convergence functions perform a mapping of the connection-mode Data Link service onto the underlying service assumed by the CLNP. The mapping is as follows.

On receiving an SN-UNITDATA request from the CLNP machine, the SNDCF determines if a Data Link connection already exists between this source and destination address pair to convey the user data. If so, it issues a DL-DATA request containing the SN-Userdata as the DL-Userdata.

If a Data Link connection does not already exist, a DL-CONNECT request is issued by the local/calling SNDCF with the source and destination Data Link service access point addresses specified in the SN-UNITDATA request and waits for a DL-CONNECT confirm. The SN-Quality-of-Service parameter is conveyed. The available QOS is known prior to the issuance of the DL-CONNECT request. There is no requirement to use expedited data.

When the remote/called SNDCF receives a DL-CONNECT indication from the Data Link layer, it issues a DL-CONNECT response. Once the corresponding DL-CONNECT confirm is received by the local/calling SNDCF, it may issue a DL-DATA request(s) conveying user data. When the remote/called SNDCF receives a DL-DATA indication from the Data Link layer, it issues an SN-DATA indication which conveys the corresponding destination and source addresses as well as the SN-Userdata. The SN-Userdata parameter is conveyed in the DL-Userdata parameter. The subnetwork must be able to support the service data unit requirements defined in 5.2.

The mechanism and timing for opening a Data Link connection prior to the transmission of SN-Userdata are a local matter. The opening of a Data Link connection may be initiated by:

a) the arrival of an SNSDU to be transmitted over a subnetwork at a time when no suitable Data Link connection is available;

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

c) the explicit intervention of system management.

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Collision detection and correction are resolved within the Data Link layer.

When it has been determined that a Data Link connection shall be cleared, the local/calling SNDCF issues a DL-DISCONNECT request primitive, specifying itself (the local data link service user) as the originator of the release, and a reason code as defined in CCITT Rec. X.212 | ISO/IEC 8886. Once the request primitive has been issued, the local SNDCF considers the Data Link connection released, and resumes idle state processing. When the remote SNDCF receives the corresponding DL-DISCONNECT indication, the Data Link connection release phase is complete and the remote SNDCF resumes idle state processing as well.

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Data Link connection release may also be initiated by the Data Link service provider or by the called Data Link service user to refuse a connection. The action taken by the local SNDCF in these circumstances is the same as described above. The mechanism and timing for releasing a Data Link connection following the transmission of SN-Userdata by the SNDCF are also local matters. Examples of circumstances which would cause the SNDCF to clear a Data Link connection are:

a) the expiration of a timeout period following the transmission of one or more PDUs;

b) the need to use a specific interface to open an alternate Data Link connection 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 Data Link connection.

NOTE 1 – It is not a requirement that Data Link connections be dynamically opened or closed for the correct operation of the SNDCF herein described. The use of permanent Data Link connections or the maintenance of Data Link connections in a open state from system initialization is not precluded.

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

Implementations may choose to clear a Data Link connection 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 Data Link connection is made available for the transmission of SNSDUs, a timer is initiated with a value representing the maximum period of time this Data Link connection 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 Data Link connection is cleared.

The selection of timeout values is a local matter.

NOTE 2 – Additional Data Link connections may be opened when there is an excessively long queue of data units waiting for the initial connection The timeout periods for determining when such additional Data Link connections are to be cleared may be shorter than the timeout period for the initial Data Link connection. (The timeout period may also be a fixed period of time.) Implementations may choose to close all additional Data Link connections if the queue of data units to be transmitted reaches some threshold (possibly zero).

NOTE 3 – 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 Data Link connection open, and if there is a charge for opening Data Link connections, then the timeout period may be selected so that the Data Link connection 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.

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