
**Information technology — Open Systems
Interconnection — Network Fast Byte
Protocol**

*Technologies de l'information — Interconnexion de systèmes
ouverts (OSI) — Protocole de byte rapide de réseau*

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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 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 14700 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.633.

Annex A forms an integral part of this International Standard. Annex B is for information only.

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Introduction

This Recommendation | International Standard is one of a set of Recommendations | International Standards produced to facilitate the interconnection of information processing systems. This set of Recommendations | International Standards covers the services and protocols required to achieve such interconnection.

The Network Fast Byte Protocol Recommendation | International Standard is positioned with respect to other related Recommendations | International Standards by the layers defined in the Reference Model for Open Systems Interconnection (see ITU-T Rec. X.200 | ISO/IEC 7498-1). It is most closely related to, and lies within the field of application of the Network Service definition (ITU-T Rec. X.213 | ISO/IEC 8348). It also uses and makes reference to the Data Link Service definition (see ITU-T Rec. X.212 | ISO/IEC 8886), whose provisions it assumes in order to accomplish Network Fast Byte's aims. The interrelationship of these Recommendations | International Standards is illustrated in Figure Intro. 1.

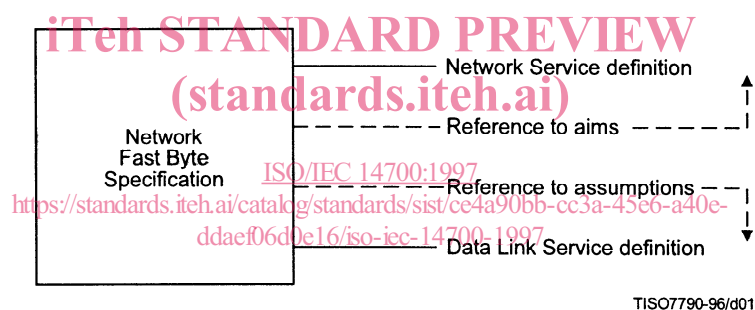


Figure Intro. 1 – Relationship between the Network Fast Byte Protocol and adjacent services

This Recommendation | International Standard specifies a common encoding and protocol procedures. It is intended that the Network Fast Byte should be simple and cater for a specific range of Data Link Service qualities possible. This Recommendation | International Standard does not define mechanisms that can be used to optimize or enhance the quality of the Data Link Service.

The primary aim of this Recommendation | International Standard is to provide a set of rules for communication expressed in terms of the procedures to be carried out by peer entities at the time of communication. These rules for communication are intended to provide a sound basis for development in order to serve a variety of purposes:

- as a guide for implementors and designers;
- for use in the testing and procurement of equipment;
- as part of an agreement for the admittance of systems into the open systems environment;
- as a refinement of the understanding of OSI.

As it is expected that the initial users of this Recommendation | International Standard will be designers and implementors of equipment, this contains, in notes or in annexes, guidance on the implementation of the procedures defined herein.

This Recommendation | International Standard contains a clause on conformance of equipment claiming to implement the procedures in this Recommendation | International Standard (see clause 8). To evaluate conformance of a particular implementation, it is necessary to have a statement of which capabilities and options have been implemented for a given OSI protocol. Such a statement is called a Protocol Implementation Conformance Statement (PICS). A PICS proforma is provided in Annex A. Attention is drawn to the fact that this Recommendation | International Standard does not contain any tests to demonstrate this conformance.

It should be noted that it may not be possible with current technology to verify that an implementation will operate the protocol defined in this Recommendation | International Standard correctly under all circumstances. It is possible by means of testing to establish confidence that an implementation correctly operates the protocol in a representative sample of circumstances. It is, however, intended that this Recommendation | International Standard can be used in circumstances where two implementations fail to communicate in order to determine whether one or both have failed to operate the protocol correctly.

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INTERNATIONAL STANDARD

ITU-T RECOMMENDATION

**INFORMATION TECHNOLOGY
OPEN SYSTEMS INTERCONNECTION –
NETWORK FAST BYTE PROTOCOL**

1 Scope

This Recommendation | International Standard specifies:

- a) procedures when operating over the connection-mode data link service for the connection-mode transfer of data and control information from one network entity to a peer network entity;
- b) the structure and encoding of the NPDUs used for the transfer of data and control information.

The procedures are defined in terms of:

- a) the interactions between peer network entities through the exchange of NPDUs;
- b) the interactions between a network entity and the network service user in the same system through the exchange of network service primitives;
- c) the interactions between a network entity and the data link service provider through the exchange of data link service primitives.

These procedures are applicable to instances of communication between systems which support the Network Layer of the OSI Reference Model and wish to interconnect in the open systems environment using the Network Fast Byte Protocol.

This Recommendation | International Standard specifies, in clause 8, conformance requirements for systems implementing these procedures and provides the PICS proforma in compliance with the relevant requirements, and in accordance with the relevant guidance, given in ITU-T Rec. X.296 and ISO/IEC 9646-7. It does not contain tests which can be used to demonstrate this conformance.

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 International 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 edition of the Recommendations and International 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.

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: The Basic Model.*
- ITU-T Recommendation X.210 (1993) | ISO/IEC 10731:1994, *Information technology – Open Systems Interconnection – Basic Reference Model: Conventions for the definition of OSI services.*
- ITU-T Recommendation X.212 (1995) | ISO/IEC 8886:1996, *Information technology – Open Systems Interconnection – Data link service definition.*

- ITU-T Recommendation X.213 (1995) | ISO/IEC 8348:1996, *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*.
- ITU-T Recommendation X.263 (1995) | ISO/IEC TR 9577...¹⁾, *Information technology – Protocol identification in the Network layer*.

2.2 Paired Recommendations | International Standards equivalent in technical contents

- ITU-T Recommendation X.223 (1993), *Use of X.25 to provide the OSI connection-mode network service for ITU-T 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*.
- ITU-T Recommendation X.290 (1995), *OSI conformance testing methodology and framework for protocol Recommendations for ITU-T applications – General concepts*.
ISO/IEC 9646-1:1994, *Information technology – Open Systems Interconnection – Conformance testing methodology and framework – Part 1: General concepts*.
- ITU-T Recommendation X.296 (1995), *OSI conformance testing methodology and framework for protocol Recommendations for ITU-T applications – Implementation conformance statements*.
ISO/IEC 9646-7:1995, *Information technology – Open Systems Interconnection – Conformance testing methodology and framework – Part 7: Implementation Conformance Statements*.

3 Definitions

NOTE – The definitions contained in this clause make use of abbreviations defined in clause 4.

3.1 This Recommendation | International Standard is based on the concepts developed in ITU-T Rec. X.200 | ISO/IEC 7498-1 and makes use of the following terms defined in it:

- a) concatenation and separation; [ISO/IEC 14700:1997](https://standards.iteh.ai/catalog/standards/sist/ce4a90bb-cc3a-45e6-a40e-ddaef06d0e16/iso-iec-14700-1997)
- b) segmenting and reassembling;
- c) multiplexing and demultiplexing;
- d) splitting and recombining;
- e) flow control;
- f) connection-mode network service;
- g) connection-mode data link service.

3.2 For the purposes of this Recommendation | International Standard, the following definitions apply:

- 3.2.1 equipment:** Hardware or software or a combination of both; it need not be physically distinct within a computer system.
- 3.2.2 local matter:** A decision made by a system concerning its behavior in the Network Layer that is not subject to the requirements of this protocol.
- 3.2.3 initiator:** A network entity that acts on an N-CONNECT request from the NS-user.
- 3.2.4 responder:** A network entity with whom an initiator wishes to establish a network connection.
- 3.2.5 sending network entity:** A network entity that sends a given NPDU.
- 3.2.6 receiving network entity:** A network entity that receives a given NPDU.
- 3.2.7 error indication:** A DL-RESET indication that a network entity receives from the DLS-provider.
- 3.2.8 invalid NPDU:** An NPDU that does not comply with the requirements of this Recommendation | International Standard for structure and encoding.

¹⁾ To be published.

3.2.9 protocol error: An NPDU whose use does not comply with the associated procedures.

3.2.10 transparent (data): NS-user data that is transferred intact between network entities and which is unavailable for use by the network entities.

3.2.11 calling: A classification associated with the initiator (e.g. a calling address is the address of the initiator; a data transfer direction of calling-to-called is the direction of transfer which originates at the initiator and terminates at the responder).

3.2.12 called: A classification associated with the responder (e.g. a called address is the address of the responder; a data transfer direction of called-to-calling is the direction of transfer which originates at the responder and terminates at the initiator).

3.3 This Recommendation | International Standard uses the following terms defined in ITU-T Rec. X.290 and ISO/IEC 9646-1:

- a) PICS proforma;
- b) Protocol Implementation Conformance Statement (PICS).

3.4 This Recommendation | International Standard uses the following terms defined in ITU-T Rec. X.210 | ISO/IEC 10731:

- a) network service user;
- b) data link service provider.

4 Symbols and abbreviations

For the purposes of this Recommendation | International Standard, the following abbreviations apply:

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4.1 Data units

NPDU	Network-protocol-data-unit
NSDU	Network-service-data-unit
DLSDU	Data-link-service-data-unit

4.2 NPDU types

FB-NPDU Fast Byte NPDU

4.3 NPDU fields

EON	End of NSDU
Q	Q-bit parameter
NPCI	Network Layer Protocol Control Information
Null-PCI	Null PCI data transfer parameter

4.4 Miscellaneous

NS-user	Network-service user
NS-provider	Network-service provider
NSAP	Network-service-access-point
DLS-provider	Data link service provider
DLSAP	Data-link-service-access-point
QOS	Quality of Service
CODLS	Connection-mode Data Link Service

5 Overview of the Network Fast Byte Protocol

The Network Fast Byte Protocol applies to the provision of the OSI connection-mode network service in end systems, eliminates the round trip delay associated with the establishment and release of a network connection, and requires very low PCI overhead. The Network Fast Byte Protocol is required for use in situations in which enhancements to the data link QOS are not required, and efficiency of operation (e.g. reduction of round trip delays on establishment and release) is of primary concern. The protocol ensures an interoperable method for accomplishing this, by standardizing a "mapping" between the network and data link services.

Unlike traditional protocols, the Fast Byte protocol does not define different PDU types (e.g. connect, release, reset, etc.). The Fast Byte protocol defines a single PDU, and the semantics of this PDU are dependent on the service primitive in which the PDU is received.

5.1 Service provided by the Network Layer

The Network Fast Byte Protocol supports the OSI connection-mode network service defined in ITU-T Rec. X.213 | ISO/IEC 8348 with the following restrictions:

- 1) the optional receipt confirmation and optional expedited data services are not supported;
- 2) no enhancement of the data link service QOS is provided, so that the network service QOS approximates to the corresponding data link service QOS.

This protocol is intended to complement, as opposed to replace, the suite of existing protocols which supports the connection-mode network service (e.g. ITU-T Rec. X.223 and ISO/IEC 8878).

For support of the OSI connectionless-mode network service, ITU-T Rec. X.233 | ISO/IEC 8473-1 applies.

Information is transferred to and from the NS-user in the network service primitives listed in Table 1.

5.2 Service assumed from the Data Link Layer

The Network Fast Byte Protocol assumes the use of the OSI connection-mode data link service (CODLS) defined in ITU-T Rec. X.212 | ISO/IEC 8886.

When operating over CODLS, information is transferred to and from the DLS-provider in the data link service primitives listed in Table 2.

NOTES

- 1 The parameters listed in Table 2 are those in the data link service.
- 2 The way the primitives and parameters are exchanged between the network entity and the DLS-provider is a local matter.

5.3 Functions of the Network Layer

5.3.1 Overview of functions

The functions in the Network Layer are primarily concerned with the data transfer, routing and relaying, and the enhancement of Quality of Service. The Network Fast Byte Protocol is intended for use in situations where enhancements are not required, and the efficiency of operation is of primary concern. The Network Fast Byte Protocol eliminates the round trip propagation delay associated with the establishment and release of a network connection, and requires very low PCI overhead. The following functions are therefore not supported:

- a) multiplexing;
- b) error detection;
- c) error recovery;
- d) flow control;
- e) expedited data;
- f) encryption;
- g) accounting mechanisms;
- h) status exchanges and monitoring of QOS;
- i) temporary release of data link connections.

Table 1 – Network Service primitives

Primitives	Notes	Parameters	Notes
N-CONNECT indication	request	Called Address Calling Address Receipt Confirmation Selection Expedited Data Selection QOS-parameter Set NS-user-data	1 1 2 3
N-CONNECT confirm	response	Responding Address Receipt Confirmation Selection Expedited Data Selection QOS-parameter Set NS-user-data	1 1 2 3
N-DATA indication	request	NS-user-data Confirmation request	4
N-DATA-ACKNOWLEDGE indication	request		4 4
N-EXPEDITED DATA indication	request	NS-user-data	4 4
N-RESET	request	Reason	
N-RESET	indication	Originator Reason	
N-RESET confirm	response		
N-DISCONNECT	request	Reason NS-user-data Responding Address	3
N-DISCONNECT	indication	Originator Reason NS-user-data Responding Address	3
<p>NOTES</p> <p>1 The NS-user may select the support of receipt confirmation and/or expedited data in a N-CONNECT request; however, the non-support of these services shall be indicated in the associated N-CONNECT confirm.</p> <p>2 QOS parameter values, and QOS negotiation capabilities, are limited by those available from the underlying data link service provider. The Fast Byte protocol does not support enhancement of the QOS offered by the underlying service. Where the underlying service supports a range of QOS-parameter values, the Fast Byte protocol may use the corresponding negotiation facilities of the underlying service. A similar level of QOS service may be requested from the network service or, in the presence of local knowledge, a lower level may be requested. The actual level of QOS achieved may be lower than, similar to, or even higher than that requested.</p> <p>3 Maximum length = maximum length of the user-data parameter of the underlying service minus the NPCI length.</p> <p>4 Not supported.</p>			

5.3.2 Connection establishment

The purpose of connection establishment is to establish a network connection between two NS-users. The following functions of the network layer during this phase match the NS-users' requested Quality of Service with the services offered by the network layer:

- a) map network addresses onto data link addresses;
- b) transport of NS-user data (see 6.2).

5.3.3 Data transfer

The purpose of data transfer is to permit duplex transmission of NSDUs between the two NS-users connected by the network connection. This purpose is achieved by means of two-way simultaneous communication and by the use of segmenting and reassembly (see 6.7, 6.8 and 6.9).

Table 2 – Connection-Oriented Data link service primitives

Primitives	X	Parameters	X/Y/Z
DL-CONNECT request indication	X X	Called Address Calling Address QOS parameter set DLS-user-data	X X Y X
DL-CONNECT response confirm	X X	Responding Address QOS parameter set DLS-user-data	X Y X
DL-DATA request indication	X X	DLS-user-data	X
DL-RESET request	X	Reason	X
DL-RESET indication	X	Originator Reason	Z Z
DL-RESET response confirm	X X		
DL-DISCONNECT request	X	Reason DLS-user-data	X X
DL-DISCONNECT indication	X	Originator Reason DLS-user-data	Z Z X
<p>X The Network Fast Byte Protocol assumes that this capability is provided by all DLS-providers.</p> <p>Y The Network Fast Byte Protocol assumes that this facility is provided by all DLS-providers. The QOS-parameter values supported by the DLS-provider limit the corresponding values provided to the NS-user, since there are no mechanisms in the Network Fast Byte Protocol for enhancing the DLS-provided QOS.</p> <p>Z Not used by the Network Fast Byte Protocol.</p>			

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5.3.4 Release <https://standards.iteh.ai/catalog/standards/sist/ce4a90bb-cc3a-45e6-a40e-ddae06d0e16/iso-iec-14700-1997>

The purpose of release (sec 6.3, 6.4, 6.5, and 6.6) is to provide disconnection of the network connection, regardless of the current activity.

5.4 Operation over CODLS

It is assumed that each network entity is aware of the Quality of Service provided by particular data link connections. The Network Fast Byte Protocol has been designed to be used with data link connections with an acceptable residual error rate (for example, not signalled by disconnect or reset) and an acceptable rate of signalled errors.

5.5 Model of the Network Layer

A network entity communicates with its NS-users through one or more NSAPs by means of the service primitives as defined by the network service definition (see ITU-T Rec. X.213 | ISO/IEC 8348). Service primitives will cause or be the result of network protocol data unit exchanges between the peer network entities supporting a network connection. These protocol exchanges are effected using the services of the Data Link Layer as defined by the data link service definition (see ITU-T Rec. X.212 | ISO/IEC 8886) through one or more DLSAPs (see Figure 1).

Network connection endpoints are identified in end systems by an internal, implementation dependent, mechanism so that the NS-user and the network entity can refer to each network connection.

6 Network Fast Byte Protocol specification

This clause contains elements of procedure which comprise the Network Fast Byte Protocol specification.

In the specific case in which the Network Fast Byte Protocol is operated over a subnetwork employing out-of-band signalling which is listed in B.1, then the procedures which are applicable are specified in B.2, through appropriate references to the procedures in clause 6, and through references to other subnetwork specific Recommendations | International Standards. No modifications to the procedures in clause 6 are made in Annex B.