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## Information technology — Protocol identification in the network layer

*Technologies de l'information — Identification des protocoles dans la  
couche réseau*

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Printed in Switzerland

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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.

In exceptional circumstances, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.

Attention is drawn to the possibility that some of the elements of this Technical Report may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC TR 9577 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 Rec. X.263.

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This fourth edition cancels and replaces the third edition (ISO/IEC TR 9577:1996), which has been technically revised.

## Introduction

Identifying protocols by information in a uniform part of the protocol control information fulfils two requirements:

- a) It enables an entity to verify that the protocol received is of the type and kind expected; and
- b) It permits an entity to discriminate among a number of different protocols (both OSI and non-OSI) that might co-exist in a common environment.

This Recommendation | Technical Report contains a description of the means used to identify protocols and where that information is located in a protocol, together with a record of those values of protocol identifiers which have been used by ITU-T and ISO/IEC, and by other authorities. This Recommendation | Technical Report does not attempt to provide any general architectural principles for the functions of protocol identification, nor does it attempt to provide judgements as to whether a protocol might have more than one value of protocol identifier.

By reference to this Recommendation | Technical Report, future protocols can be developed to include a protocol identifier and the values of such protocol identifiers can be chosen on a knowledgeable basis.

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**TECHNICAL REPORT****ITU-T RECOMMENDATION****INFORMATION TECHNOLOGY – PROTOCOL IDENTIFICATION  
IN THE NETWORK LAYER****1 Scope**

This Recommendation | Technical Report provides:

- a) the description of a means to permit a protocol to be identified;
- b) a record of the structure and allowable ranges of protocol identifier(s) which can be assigned by ITU-T, ISO/IEC and other authorities;
- c) a record of the values of protocol identifiers used by OSI Network layer protocols and non-OSI protocols occupying a similar position: in particular, protocols with protocol control information commencing in octet 1 of the protocol data unit (header-oriented protocols), and protocols with protocol control information commencing in the final octet of the protocol data unit (trailer-oriented protocols), are covered; and
- d) a record of the values that are in use as protocol control information in non-Network layer protocols where they impact on Network layer protocol identification.

The application of this Recommendation | Technical Report is:

- a) in the identification of internationally standardized Network layer protocols operating directly above the Data Link service;
- b) in the identification of protocols used in conjunction with internationally standardized Network layer protocols that operate directly above the Data Link service; and
- c) to distinguish between Internationally standardized Network layer protocols, and other internationally standardized protocols used in conjunction with internationally standardized Network layer protocols.

This Recommendation | Technical Report is for use by ITU-T Study Groups, ISO/IEC Technical Committees and other authorities in applying the principles contained in clause 4, and in selecting an unused value or values from the range of values permitted in clauses 5 or 6, as appropriate. When a new value is selected, that value and its usage should be brought to the attention of ITU-T Study Group 7 or ISO/IEC JTC 1 SC6 so that this Recommendation | Technical Report can be amended.

**2 References**

The following Recommendations and International Standards contain provisions which, through reference in this text, constitute provisions of this Recommendation | Technical Report. 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 | Technical Report 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 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.224 (1995) | ISO/IEC 8073:1997, *Information technology – Open Systems Interconnection – Protocol for providing the connection-mode transport service.*
- 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.260 (1996) | ISO/IEC 14765:1997, *Information technology – Framework for protocol identification and encapsulation.*
- ITU-T Recommendation X.273 (1994) | ISO/IEC 11577:1995, *Information technology – Open Systems Interconnection – Network layer security protocol.*
- ITU-T Recommendation X.633 (1996) | ISO/IEC 14700:1997, *Information technology – Open Systems Interconnection – Network Fast Byte Protocol.*
- ITU-T Recommendation X.634 (1996) | ISO/IEC 14699:1997, *Information technology – Open Systems Interconnection – Transport Fast Byte Protocol.*

## 2.2 Paired Recommendations | International Standards equivalent in technical content

- ITU-T Recommendation X.223 (1993), *Use of X.25 to provide the OSI connection-mode network service for ITU-T applications.*  
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ISO/IEC 8878:1992, *Information technology – Telecommunications and information exchange between systems – Use of X.25 to provide the OSI Connection-mode Network Service.*  
<https://standards.iteh.ai/catalog/standards/sist/cbed1820-0143-4e1a-8e99-2611293-6b5007-5007-5007-5007>
- ITU-T Recommendation X.264 (1993), *Transport protocol identification mechanism.*  
ISO/IEC 11570:1992, *Information technology – Telecommunications and information exchange between systems – Open Systems Interconnection – Transport protocol identification mechanism.*

## 2.3 Additional references

- CCITT Recommendation G.764 (1990), *Voice packetization – Packetized voice protocols.*
- ITU-T Recommendation I.365.2 (1995), *B-ISDN ATM adaptation layer sublayers: Service specific coordination function to provide the connection-oriented network service.*
- ITU-T Recommendation I.365.3 (1995), *B-ISDN ATM adaptation layer sublayers: Service specific coordination function to provide the connection-oriented transport service.*
- ITU-T Recommendation Q.931 (1993), *ISDN user-network interface layer 3 specification for basic call control.*
- ITU-T Recommendation Q.932 (1993), *Generic procedures for the control of ISDN supplementary services.*
- ITU-T Recommendation Q.933 (1995), *Signalling specifications for frame mode switched and permanent virtual connection control and status monitoring.*
- ITU-T Recommendation Q.2119 (1996), *B-ISDN ATM adaptation layer – Convergence function for SSCOP above the frame relay core service.*



- ITU-T Recommendation Q.2931 (1995), *Digital Subscriber Signalling System No. 2 – User-Network Interface (UNI) layer 3 specification for basic call/connection control.*
- ITU-T Recommendation T.70 (1993), *Network-independent basic transport service for the telematic services.*
- ITU-T Recommendation X.25 (1996), *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.*
- ITU-T Recommendation X.29 (1993), *Procedures for the exchange of control information and user data between a Packet Assembly/Disassembly (PAD) facility and a packet mode DTE or another PAD.*
- ITU-T Recommendation X.36 (1995), *Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for public data networks providing frame relay data transmission service by dedicated circuit.*
- ITU-T Recommendation X.37 (1995), *Encapsulation in X.25 packets of various protocols including frame relay.*
- ITU-T Recommendation X.39 (1996), *Procedures for the exchange of control information and user data between a Facsimile Packet Assembly/Disassembly (FPAD) facility and a packet mode Data Terminal Equipment (DTE) or another FPAD.*
- ITU-T Recommendation X.45 (1996), *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, designed for efficiency at higher speeds.*
- ITU-T Recommendation X.48 (1996), *Procedures for the provision of a basic multicast service for Data Terminal Equipments (DTEs) using Recommendation X.25.*
- ITU-T Recommendation X.49 (1996), *Procedures for the provision of an extended multicast service for Data Terminal Equipments (DTEs) using Recommendation X.25.*
- CCITT Recommendation X.610 (1992), *Provision and support of the OSI connection-mode network service.*
- ISO/IEC 8208:1995, *Information technology – Data communications – X.25 Packet Layer Protocol for Data Terminal Equipment.*
- ISO/IEC 8802 (All parts), *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks.*
- ISO 9542:1988<sup>1)</sup>, *Information processing systems – Telecommunications and information exchange between systems – End system to Intermediate system routeing exchange protocol for use in conjunction with the Protocol for providing the connectionless-mode network service (ISO 8473).*
- ISO/IEC 10030:1995, *Information technology – Telecommunications and information exchange between systems – End System Routeing Information Exchange Protocol for use in conjunction with ISO/IEC 8878.*
- ISO/IEC 10589:1992, *Information technology – Telecommunications and information exchange between systems – Intermediate system to Intermediate system intra-domain routeing information exchange protocol for use in conjunction with the protocol for providing the connectionless-mode Network Service (ISO 8473).*
- ISO/IEC 10747:1994, *Information technology – Telecommunications and information exchange between systems – Protocol for exchange of inter-domain routeing information among intermediate systems to support forwarding of ISO 8473 PDUs.*
- ISO/IEC 11572:1997, *Information technology – Telecommunications and information exchange between systems – Private Integrated Services Network – Circuit mode bearer services – Inter-exchange signalling procedures and protocol.*
- ISO/IEC 11582:1995, *Information technology – Telecommunications and information exchange between systems – Private Integrated Services Network – Generic functional protocol for the support of supplementary services – Inter-exchange signalling procedures and protocol.*

<sup>1)</sup> Currently under revision.

## ISO/IEC TR 9577 : 1999 (E)

- ISO/IEC TR 13532:1995, *Information technology – Telecommunications and information exchange between systems – Protocol combinations to provide and support the OSI Network Service*.
- RFC 791, *Internet Protocol*. J. Postel (September 1981).
- RFC 1548, *The Point-to-Point Protocol (PPP)*. W. Simpson (December 1993).
- RFC 2460, *Internet Protocol, Version 6 (IPv6) Specification* (December 1998).
- FRF.9 (Frame Relay Forum), *Data Compression over Frame Relay Implementation Agreement* (January 1996).
- FRF.12 (Frame Relay Forum), *Fragmentation over Frame Relay Implementation Agreement* (December 1997).
- FRF.priv (Frame Relay Forum), *Frame Relay Privacy Implementation Agreement*.
- FRF.OA&M (Frame Relay Forum), *Frame Relay Operations, Administration and Maintenance (OA&M) Protocol and Procedures Implementation Agreement*.

### 3 Abbreviations

For the purposes of this Recommendation | Technical Report, the following abbreviations apply:

GFI	General Format Identifier
IPI	Initial Protocol Identifier
NCMS	Network Connection Management Subprotocol
OSI	Open Systems Interconnection
PDU	Protocol Data Unit
SPI	Subsequent Protocol Identifier
TPDU	Transport Protocol Data Unit

### 4 Protocol identifiers

The protocol operating directly over the Data Link layer is termed the initial protocol and is identified by the Initial Protocol Identifier (IPI).

The protocol carried by the initial protocol is termed the subsequent protocol and is identified by a Subsequent Protocol Identifier (SPI).

The subsequent protocol can carry further subsequent protocols, identified by further SPIs, iteratively.

For the purposes of this Recommendation | Technical Report, the octets referred to as IPI and SPI are viewed as protocol identifiers. In some cases the protocol itself gives other names to these octets, and might also view the function of the octets as being distinct from protocol identification. ITU-T Rec. X.25 and ISO/IEC 8208 provide an example (see Annex A). It is possible to identify such protocols by the means described in this Recommendation | Technical Report. It is also possible for a given protocol to be identified in more than one way, in different contexts.

ITU-T Rec. X.260 | ISO/IEC 14765 contains a more detailed specification of the framework for protocol identification on which the above concepts are based.

NOTE – Guidelines for the processing of protocol identifiers are given in Annex B.

## 5 Initial protocol identifier

### 5.1 General

The location of the IPI for a header-oriented protocol is the first octet of the protocol control information; this is depicted in Figure 1. The value of the IPI unambiguously identifies the initial protocol within the set of header-oriented protocols.

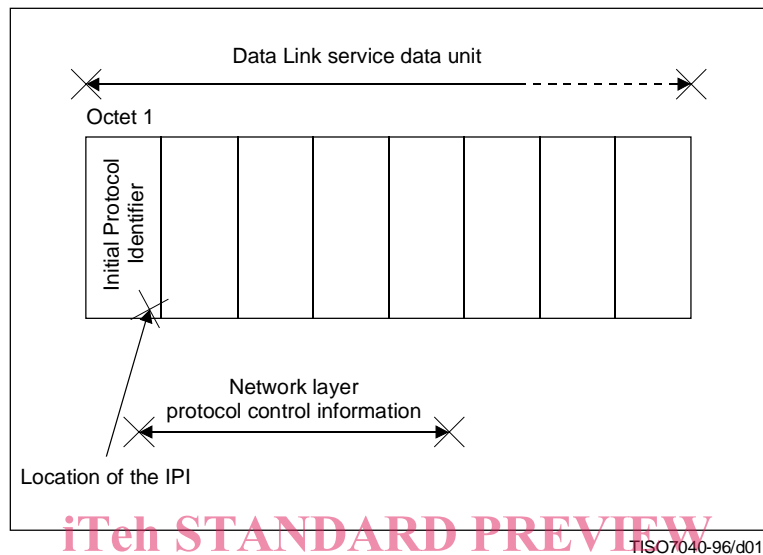


Figure 1 – Location of the IPI

ISO/IEC TR 9577:1999

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The location of the IPI for a trailer-oriented protocol is the final octet of the protocol control information; this is depicted in Figure 2. The value of the IPI unambiguously identifies the initial protocol within the set of trailer-oriented protocols.

It is not possible in general to mix header-oriented and trailer-oriented protocols on the same data link: *a priori* knowledge is needed of the nature of the protocols to be received at a particular Data Link service access point.

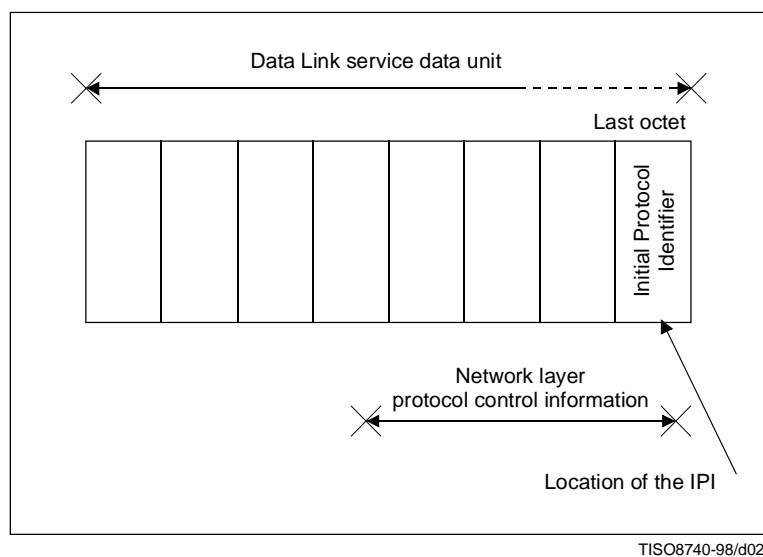


Figure 2 – Location of the IPI for trailer-oriented protocols