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**Information technology — Telecommunications and information exchange between systems — Provision of the OSI connection-mode network service by packet mode terminal equipment connected to an integrated services digital network (ISDN)**

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*Technologies de l'information — Télécommunications et échange d'informations entre systèmes — Fourniture du service de réseau OSI en mode connexion par un terminal en mode paquet raccordé à un réseau numérique avec intégration des services (RNIS)*

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## Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) together form a system for world wide standardization as a whole. 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 approval before their acceptance as International Standards. They are approved in accordance with procedures requiring at least 75% approval by the national bodies voting.

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# Information technology - Telecommunications and information exchange between systems - Provision of the OSI connection-mode network service by packet mode terminal equipment connected to an integrated services digital network (ISDN)

## Section 1 : General

### 1.1 Scope

This International Standard specifies the method of providing the OSI Connection-mode Network Service (CONS) by packet mode terminal equipment connected to an Integrated Services Digital Network (ISDN) in accordance with the procedures described in CCITT Recommendation X.31. This is done by specifying the mapping of the CONS primitives and parameters to and from the elements of the protocols used by two types of packet mode terminal equipment:

- a) an X.25 DTE (TE2) connected to an R reference point and accessing an ISDN; and
- b) a packet mode ISDN terminal (TE1) operating ISO 8208 packet layer protocol (PLP) and connected to an ISDN at either the S or T reference point.

NOTE - The definitions of TE1, TE2 and TA equipment, and R, S, and T reference points are given in CCITT Recommendation I.411. This International Standard applies to a TE1 or TE2/TA (i.e., an OSI End System) regardless of whether it is a physically separate system or embedded in other equipment such as a PBX.

This International Standard addresses the provision of the CONS using Virtual Calls as described in CCITT Recommendation X.25, it does not address the use of X.25 Permanent Virtual Circuits.

NOTE - This International Standard uses numbers to identify layers, rather than their names. This is done to align the terminology of this document with the terminology of the related CCITT Recommendations for ISDN, and does not imply any change in the functionality of the layers from that defined in the Basic Reference Model for Open Systems Interconnection.

### 1.2 Normative references

The following 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 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 editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 7776 : 1986, *Information processing systems - Data communications - High-level data link control procedures - Description of the X.25 LAPB-Compatible DTE data link procedures.*

NOTE - See also CCITT Recommendation X.25

ISO 8208 : 1987, *Information processing systems - Data communications - X.25 Packet Level Protocol for Data Terminal Equipment.*

NOTE - See also CCITT Recommendation X.25

ISO 8878 : 1987, *Information processing systems - Data communications - Use of X.25 to provide the OSI connection-mode network service.*

NOTE - See also CCITT Recommendation X.223

CCITT Recommendation I.231, *Circuit-mode bearer service categories.*

CCITT Recommendation I.232, *Packet-mode bearer service categories.*

CCITT Recommendation I.430, *Basic User-Network Interface Layer 1 Specification.*

CCITT Recommendation I.431, *Primary Rate User-Network Interface Layer 1 Specification.*

CCITT Recommendation Q.921 (I.441), *ISDN User-Network Interface Data Link Layer Specification.*

CCITT Recommendation Q.931 (I.451), *ISDN User-Network Interface Layer 3 Specification.*

CCITT Recommendation V.25 bis, *Automatic Answering 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 X.21, *Interface Between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for Synchronous 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.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 and accessing a packet switched public data network through a public switched telephone network or a circuit switched public data network.*

NOTE - All references to CCITT Recommendations refer to the text of these Recommendations as approved by the CCITT Plenary Assembly in 1988

### 1.3 Definitions

This International Standard makes use of the following terms.

#### 1.3.1 Reference Model definitions (ISO 7498)

- a) Network connection
- b) Network Layer
- c) Network Service

#### 1.3.2 Service conventions definitions (ISO/TR 8509)

- a) Network Service provider
- b) Network Service user

#### 1.3.3 Network Service definitions (ISO 8348)

- a) N-CONNECT request
- b) N-DISCONNECT indication

#### 1.3.4 X.25 definitions (ISO 8208)

- a) DATA packet
- b) Data terminal equipment
- c) INCOMING CALL packet
- d) Throughput class
- e) User data field

#### 1.3.5 CCITT Recommendation X.31 Definitions

- a) Conditional notification class of service
- b) ISDN Virtual Circuit Bearer Service
- c) No notification class of service
- d) Packet handling function
- e) PSPDN Service
- f) Unconditional class of service
- g) Semi-permanent access (see Note)
- h) Demand access

NOTE - Some CCITT Recommendations for ISDN use the term 'permanent' to describe this feature.

#### 1.3.6 CCITT Recommendation I.112 Definitions

- a) terminal equipment
- b) reference point

#### 1.3.7 CCITT Recommendation I.411 Definitions

- a) R reference point
- b) S reference point
- c) T reference point
- d) Terminal adaptor

#### 1.3.8 CCITT Recommendation I.412 Definitions

- a) B Channel
- b) D Channel

#### 1.3.9 CCITT Recommendation X.121 Definitions

- a) prefix
- b) escape

### 1.4 Abbreviations

#### 1.4.1 Reference Model abbreviations

- NS Network Service
- OSI Open Systems Interconnection

#### 1.4.2 Network service abbreviations

- CONS Connection-mode Network Service
- QOS Quality of Service

#### 1.4.3 X.25 abbreviations

- DCE Data Circuit-terminating Equipment
- DTE Data Terminal Equipment
- LAP Link Access Procedure
- PLP Packet Layer Protocol
- PSDN Packet Switched Data Network
- RPOA Recognized Private Operating Agency

#### 1.4.4 ISDN abbreviations

- AU Access Unit
- ISDN Integrated Services Digital Network
- PH Packet Handling function
- SAPI Service Access Point Identifier
- TA Terminal Adaptor
- TE Terminal Equipment
- HLC Higher Layer Compatibility

### 1.5 Overview

#### 1.5.1 ISDN environment

The support of the packet mode terminal equipment within the scope of this International Standard by an ISDN is described in CCITT Recommendation X.31. Throughout this International Standard references to CCITT Recommendation Q.931 procedures indicate their use as described in CCITT Recommendation X.31. Two cases for ISDN support of packet mode terminal equipment are defined in CCITT Recommendation X.31: one, the case where the support is via the ISDN Virtual Circuit Service (see figure 1a), and the other where the support is via access to PSDN services (see figure 1b), respectively referred to as "case B" and "case A".

In case A an ISDN transparent circuit connection, either semi-permanent (i.e., non-switched) or demand (i.e., switched), is used. The corresponding ISDN bearer service is a 64 kbit/s service as described in CCITT Recommendation I.231. The sub-network functions available to the user are those of the PSDN described in CCITT Recommendation X.25 (semi-permanent access) and CCITT Recommendation X.32 (demand access), as well as in other X-Series CCITT Recommendations (e.g., X.2, X.121).

In case B the ISDN virtual circuit bearer service is used, as described in CCITT Recommendation I.232. The sub-network functions available are those described in the I.2xx-Series CCITT Recommendations.

In case A only B channels may be used to access the PSDN, while in case B both B and D channels may be used to access the ISDN packet handling function.

**1.5.2 CONS in this ISDN environment**

ISO 8878 specifies the method for providing the OSI Connection-mode Network Service (CONS) through the use of the X.25 packet layer protocol. When operating in an ISDN environment, a few requirements additional to those contained in ISO 8878 are necessary.

The requirements for providing CONS by terminal equipment connected to an ISDN at the S or T reference points are specified in section two of this International Standard.

The requirements for providing CONS in X.25 DTEs presenting an X.21, X.21bis, or V.25bis interface at the R reference point and connected to an ISDN through a TA are specified in section three of this International Standard.

This International Standard uses the X.25 PLP to convey all elements, of all three phases, of the OSI Connection-mode Network Service.

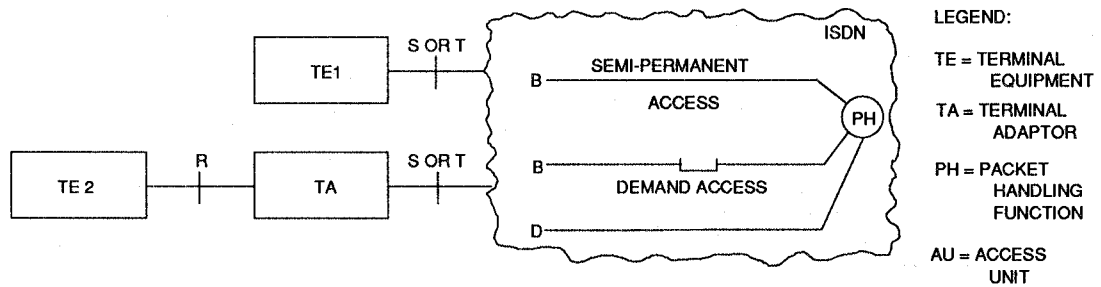


Figure 1a) - Configurations for case B access

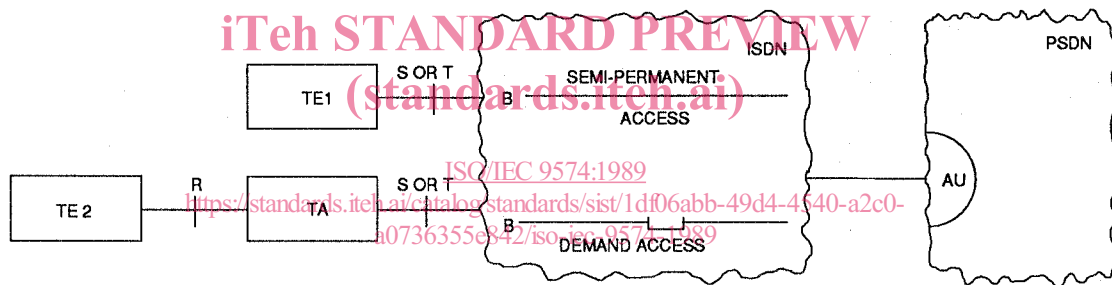


Figure 1b) - Configurations for case A access

## Section 2 : Provision of the CONS in systems attached at the S/T reference point

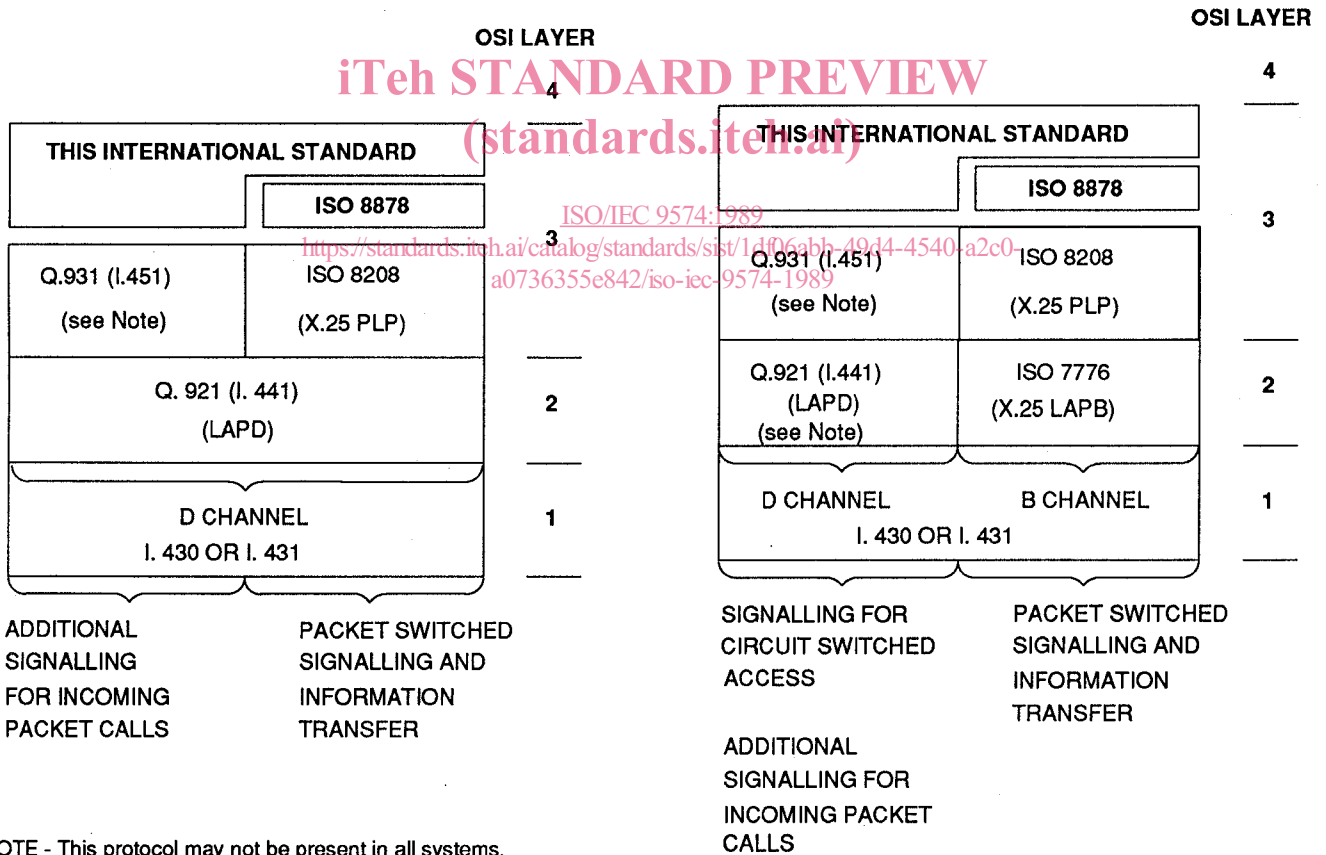
### 2.1 Procedures for TE1s or TE2/TAs to provide CONS

This section of this International Standard covers the three cases that exist taking into account the various types of underlying connections that can be available to the packet mode TE1 or TE2/TA (see table 1). The protocol layers applicable to these cases are given in figures 2 and 3 as referenced in table 1.

The mapping of the elements of the CONS to the protocol and procedures of ISO 8208 shall be as required by ISO 8878 for a conforming implementation that does not use the X.25(1980) Sub-network Dependent Convergence Protocol. The remaining clauses in this section specify the provisions required in addition to these mappings, by systems attached to an interface at the S/T reference point.

Table 1 - Cases covered by section two

Underlying connection perceived by the terminal equipment	Figure	Subclause
D channel	2	2.2
B channel : Semi-permanent	3	2.3.1
B channel : Demand	3	2.3.2



NOTE - This protocol may not be present in all systems.

Figure 2 - Protocol layers at S and T reference points when D channel is used in ISDN

NOTE - These two protocols may not be present in all systems.

Figure 3 - Protocol layers at S and T reference points when B channel is used in ISDN



## 2.2 Additional procedures for a TE1 or TE2/TA to provide the CONS when using the ISDN D channel

This clause is only applicable in case B access. TE1s and TE2/TAs supporting packet operation on the ISDN D channel present a stack of protocols at the S or T reference point in accordance with the CCITT Recommendations indicated in figure 2. At the physical layer, I.430 shall be used if the ISDN access is a basic interface and I.431 shall be used if the ISDN access is a primary rate interface. At the data link layer, Q.921 shall be used to provide the LAPD procedures. At the network layer, ISO 8208 shall be used to provide the packet layer protocol and Q.931 may be used to provide the "call-offering procedure" which, when present, takes place before the conveyance of X.25 INCOMING CALL packets. The Q.931 procedures enable terminal identification (basic access) and a determination of which channel (D or B) a specific INCOMING CALL packet is to be conveyed on. The following limitations shall apply :

- a) The maximum User Data field length of ISO 8208 DATA packets shall not exceed 256 octets.
- b) The ISO 8208 Throughput Class used shall not exceed 16 kbits/sec on a basic interface.

The subscription and negotiated facilities in the X.25 Call Establishment packets shall be used, as necessary, to indicate values consistent with these restrictions.

### 2.2.1 Outgoing calls

ISO 8208 procedures shall be operated over the ISDN layer 2 protocol using SAPI=16 as defined in CCITT Recommendation X.31. No additional procedures are required.

NOTE - The address fields of the ISO 8208 packets contain sub-network addresses that are valid for the ISDN (e.g. E.164 for public ISDNs, where a valid E.164 address could be Escape Code + X.121 number. A network dependent prefix may also be required).

### 2.2.2 Incoming calls

The procedures applying to incoming calls vary according to whether the ISDN call offering procedures are used.

NOTE - The address fields of the ISO 8208 packets contain sub-network addresses that are valid for the ISDN.

#### 2.2.2.1 Without call offering procedures

These procedures are used by the sub-network if

- a) the interface to which the TE1 or TE2/TA is connected has subscribed to the "Conditional Notification class of service", and the network does not use the call offering procedures for this incoming call; or
- b) the interface to which the TE1 or TE2/TA is connected has subscribed to the "No Notification class of service".

ISO 8208 procedures shall be operated over the ISDN layer 2 procedures using a SAPI=16 as defined in CCITT Recommendation X.31. No additional procedures are required.

#### 2.2.2.2 With call offering procedures

These additional procedures are used if the conditions in 2.2.2.1 do not apply (see note 1).

ISO 8208 protocol procedures shall be used over the ISDN layer 2 procedures using SAPI=16. In addition the ISDN call offering procedures are also operated over the ISDN layer 2 procedures, using either SAPI=0 or SAPI=16. Systems conforming to this International Standard, that operate these ISDN call offering procedures, shall implement these procedures using SAPI=0 and may also implement these procedures using SAPI=16 (see notes 2 and 3). The ISDN call offering procedures (see notes 4 and 5) determine which TE1 or TE2/TA is to receive the call and are not visible to the NS user. The ISO 8208 procedures are then operated after the ISDN call offering procedures have been completed.

#### NOTES

1 This includes when the interface to which the TE1 or TE2/TA is connected has subscribed to the "Unconditional Notification class of service".

2 CCITT Recommendation X.31 states (note 4 to Section 6.2.2.3.1): "Networks providing packet mode call offering shall provide Q.931 signalling procedures for packet mode calls on SAPI=0. For an interim period, some networks, by subscription agreement, may offer SAPI=16 broadcast call offering procedures for providing Q.931 signalling. This option will use all Q.931 procedures for packet mode calls with the following restriction: All calls will be offered as "D channel exclusive" and will not provide channel negotiation procedures. Terminals implementing SAPI=16 procedures shall also implement SAPI=0 procedures for portability."

3 In order to maximise terminal portability during the interim period identified in note 2, systems should implement the call offering procedures on both SAPI=0 and SAPI=16.

4 These procedures may use Q.931 addressing, sub-addressing, and compatibility checking information elements, to determine which TE1 or TE2/TA is to receive the call. In order to avoid unnecessary connection failures, it is suggested that incoming calls are not rejected on the basis of compatibility information unless this information identifies as required, a functionality that the terminal is not capable of (eg. a call should not be rejected because the HLC information element is not present).

5 These procedures may require D channel selection, or may offer the terminal a choice of D or B channels. No distinction is made here between these ways of selecting the D channel. Subclause 2.3 covers the case where a B channel is selected.

## 2.3 Additional procedures for a TE1 or TE2/TA to provide the CONS when using the ISDN B channel

TE1s and TE2/TAs supporting packet operation on the ISDN B channel present stacks of protocols at the S or T reference point in accordance with the CCITT Recommendations indicated in figure 3. One stack, which may be null, is used to support signalling on SAPI=0 for circuit switched access to the packet handling function and the 'call offering procedure', and the other is used to support packet switched signalling and information transfer. At the physical layer, I.430 shall be used if the ISDN access is a basic interface, and I.431 shall be used if the ISDN access is a primary rate interface. At the data link layer, Q.921 (I.441) shall be used over the D channel (signalling) and ISO 7776 shall be used over the B channel (information). At the network layer, Q.931 shall be used over the D channel to convey circuit switched signalling and for the ISDN call offering procedure. Also at the network layer, ISO 8208 shall be used over the B channel for the packet layer protocol (see note).

The following sub-clauses specify the requirements in addition to those specified in clause 2.1 for the cases of an underlying semi-permanent connection, and an underlying demand access connection between the TE1 or TE2/TA and the packet handling function.

NOTE - In case B the address fields of the ISO 8208 packets contain sub-network addresses that are valid for the ISDN. In case A the address fields of the ISO 8208 packets contain sub-network addresses that are valid for the PSDN.