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**Integrated Services Digital Network (ISDN);
ISDN Packet Mode Bearer Services (PMBS);
ISDN Virtual Call (VC) and Permanent Virtual Circuit (PVC)
bearer services provided by the B-channel of the user access -
basic and primary rate**

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Foreword

This European Telecommunication Standard (ETS) has been produced by the Network Aspects (NA) Technical Committee of the European Telecommunications Standards Institute (ETSI).

Annexes A and B are normative, annex C is informative.

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Introduction

In accordance with CCITT Recommendation I.130 [13], the following three level structure is used to describe the supplementary telecommunication services as provided by European public telecommunications operators under the pan-European Integrated Services Digital Network (ISDN):

- stage 1: is an overall service description, from the user's stand-point;
- stage 2: identifies the functional capabilities and information flows needed to support the service described in stage 1; and
- stage 3: defines the signalling system protocols and switching functions needed to implement the service described in stage 1.

This ETS describes the stage one requirements of the ISDN Packet Mode Bearer Services (PMBS) provided on the B-channel of the user access. Services using the D-channel are covered in ETS 300 049 [4].

The requirements described in this ETS are applicable only to those services within Europe and are based upon ITU-T Recommendation I.232 [17]. This service description corresponds to case B (B-channel) of ETS 300 007 [1] (the European equivalent to ITU-T Recommendation X.31 [11]).

The requirements for stage three of these services are contained in ETS 300 007 [1].

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1 Scope

This European Telecommunication Standard (ETS) defines the stage one of the Packet Mode Bearer Service (PMBS) provided by the B-channel of the user access for the pan-European Integrated Services Digital Network (ISDN) as provided by European public telecommunications operators. Stage one is an overall service description from the user's point of view (see CCITT Recommendation I.130 [13]), but does not deal with the details of the human interface itself.

This ETS makes use of ETS 300 007 [1], which is a stage three ETS, in order to provide a description of the procedures. This mechanism would not normally be used in a stage one standard.

In addition this ETS specifies the base functionality where the service is provided to the user via a private ISDN.

This ETS does not define details of the interworking requirements of private ISDNs with the public ISDN.

This ETS does not specify the additional requirements where the service is provided to the user via a telecommunications network that is not an ISDN but does include interworking requirements of other networks with the public ISDN.

Charging principles are outside the scope of this ETS.

The ISDN Virtual Call (VC) and Permanent Virtual Circuit (PVC) bearer service category provides the unrestricted transfer (without alteration) of user information in a packetized manner over a virtual circuit between reference points via the basic and primary rate access. Each of the reference points can be either an S or coincident S and T reference point.

NOTE: Network operators can also provide information transfer with the same attributes where the reference point is T.

The ISDN VC and PVC bearer service category is described in ITU-T Recommendation I.232 [17].

This ETS is applicable to the stage three standards for the ISDN PMBS. The term "stage three" is also defined in CCITT Recommendation I.130 [13]. Where the text indicates the status of a requirement, (i.e. as strict command or prohibition, as authorization leaving freedom, as a capability or possibility), this shall be reflected in the text of the relevant stage three standards.

Furthermore, conformance to this ETS is met by conforming to the stage three standards with the field of application appropriate to the equipment being implemented. Therefore no method of testing is provided for this ETS.

2 Normative references

This ETS incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to, or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

- [1] ETS 300 007 (1991): "Integrated Services Digital Network (ISDN); Support of packet-mode terminal equipment by an ISDN".
- [2] ETS 300 011 (1992): "Integrated Services Digital Network (ISDN): Primary rate user-network interface - Layer 1 specification and test principles".
- [3] ETS 300 012 (1992): "Integrated Services Digital Network (ISDN): Basic user-network interface; Layer 1 specification and test principles".
- [4] ETS 300 049 (1992): "Integrated Services Digital Network (ISDN); ISDN Packet Mode Bearer Service (PMBS); ISDN Virtual Call (VC) and Permanent Virtual Circuit (PVC) bearer services provided by the D-channel of the user access - basic and primary rate".

- [5] ETS 300 099 (1992): "Integrated Services Digital Network (ISDN); Specification of the Packet Handler access point Interface (PHI)".
- [6] ETS 300 402-2 (1995): "Integrated Services Digital Network (ISDN); Digital Subscriber Signalling System No. one (DSS1) User-network interface data link layer; Part 2: General application protocol specification [ITU-T Recommendation Q.921 (1993), modified]".
- [7] ETS 300 403-1 (1995): "Integrated Services Digital Network (ISDN); Digital Subscriber Signalling System No. one (DSS1); User-network interface layer 3 specification for basic call control; Part 1: Protocol specification [ITU-T Recommendation Q.931 (1993), modified]".
- [8] ITU-T Recommendation X.1 (1993): "International user classes of service in public data networks and Integrated Service Digital Networks (ISDNs)".
- [9] ITU-T Recommendation X.2 (1993): "International data transmission services and optional user facilities in public data networks and ISDNs".
- [10] ITU-T Recommendation X.25 (1993): "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".
- [11] ITU-T Recommendation X.31 (1993): "Support of packet mode terminal equipment by an ISDN".
- [12] ITU-T Recommendation I.112 (1993): "Vocabulary of terms for ISDNs".
- [13] CCITT Recommendation I.130 (1988): "Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN".
- [14] CCITT Recommendation E.164 (1991): "Numbering plan for the ISDN era".
- [15] CCITT Recommendation E.165 (1988): "Timetable for co-ordinated implementation of the full capability of the numbering plan for the ISDN era (E.164)".
- [16] ITU-T Recommendation I.210 (1993): "Principles of telecommunication services supported by an ISDN and the means used to describe them".
- [17] CCITT Recommendation I.232 (1988): "Packet mode bearer services categories"

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this ETS, the following definitions apply:

Integrated Services Digital Network (ISDN): See ITU-T Recommendation I.112 [12], subclause 2.3, definition 308.

service; telecommunication service: See ITU-T Recommendation I.112 [12], subclause 2.2, definition 201.

Supplementary Service: See ITU-T Recommendation I.210 [16], subclause 2.4.

Virtual Call, VC: See ITU-T Recommendation X.25 [10], clause 3. Instead of "virtual call" also the term "X.25" call is used in this ETS.

Permanent Virtual Circuit (PVC): see ITU-T Recommendation X.25 [10], clause 3.

customized service profile: A set of individual service data allocated per ISDN-number for a period of time to a subscriber registered at the Packet Handler (PH). This data includes:

- **an access profile:** ETS 300 007 [1]-related data (e.g. notification class, access method);
- **an X.25 service profile:** ITU-T Recommendation X.25 [10], layer 2 and 3 related data.

standard service profile: A set of service data predefined at the PH for subscribers not requiring a fully individual service profile. The standard service profile comprises just the ITU-T Recommendation X.25 [10]-related data. The other part of the service data (the access profile) can still be allocated individually at subscription time.

See annex A for the standard service profile applicable for users subscribing to B-channel access.

default service profile: A set of service data which applies for subscribers not registered at the PH. This default service profile may be network specific, and includes both, the ETS 300 007 [1]-related data (access profile) and ITU-T Recommendation X.25 [10]-related data (X.25 service profile).

See annex C for the proposed default service profile.

Packet Handler (PH): See ETS 300 007 [1].

PMBS-B: Basic ISDN PMBS provided by the B-channel.

semi-permanent B-channel: A B-channel established by OAM-procedures at subscription, independent of ITU-T Recommendation X.25 [10] calls; not to be released after last virtual call.

switched long-duration B-channel: A B-channel established by ETS 300 403-1 [7] signalling procedures, independent of ITU-T Recommendation X.25 [10] calls; not to be released after the last virtual call.

switched B-channel: A B-channel established on-demand by ETS 300 403-1 [7] signalling procedures, dependent of ITU-T Recommendation X.25 [10] virtual calls; normally to be released after the last virtual call.

ISDN number: A number conforming to the numbering plan and structure specified in CCITT Recommendation E.164 [14].

party number: As ISDN number.

party subaddress: See CCITT Recommendation E.164 [14], subclause 11.2.

3.2 Abbreviations

For the purposes of this ETS, the following abbreviations apply:

CUG	Closed User Group
DDI	Direct Dialling In
DTE	Data Terminal Equipment
ISDN	Integrated Services Digital Network
LAPB	Link Access Procedure Balanced
MSN	Multiple Subscriber Number
OSI	Open Systems Interconnection
PH	Packet Handler
PMBS	Packet Mode Bearer Services
PSPDN	Packet Switched Public Data Network
PTN	Private Telecommunication Network
PVC	Permanent Virtual Circuit
TA	Terminal Adaptor
TE	Terminal Equipment
VC	Virtual Call

4 Description

This service is described for both the point-to-multipoint and point-to-point configurations. This covers the passive bus and NT2 access arrangements.

These packet mode bearer services allow users (e.g. terminals) in a point-to-point communication configuration to communicate via the ISDN using ITU-T Recommendation X.25 [10] encoding, by means of procedures over a B-channel in both directions continuously and simultaneously, for the duration of a call as described in ETS 300 007 [1] (ITU-T Recommendation X.31 [11]). User class 30 as described in ITU-T Recommendation X.1 [8] is supported.

NOTE: In case of access via a Terminal Adaptor (TA), the following user classes are supported at the R-reference point: 8-13 (see ITU-T Recommendation X.1 [8]).

5 Procedures

5.1 Provision and withdrawal

5.1.1 General

The ISDN VC and PVC bearer services shall be either provided by prior arrangement with the service provider or be available on a general basis. In the latter case, a default service profile applies (see annex C for a PMBS-B default service profile).

Networks may offer either or both B-channel and D-channel VC- and PVC-bearer services on a general basis.

The user may subscribe, on a per ISDN number basis, to:

- an Access Profile (AP). The AP consists of ETS 300 007 [1] related service data and includes the access method and the notification class;

an X.25 Service Profile. The X.25 service profile consists of ITU-T Recommendation X.25 [10] layer 2 and layer 3 related service data. The user may subscribe to a customized (essential for PVC operation) X.25 service profile or to a standard service profile offered by the network. The network shall at least support the standard ITU-T Recommendation X.25 [10] service profile as described in annex A.

NOTE: The subscription to more than one B- or D-channel access method or ITU-T Recommendation X.25 [10] service profile per ISDN number is recognized as a possibility, but not described further on in this ETS. Concurrent subscription to the switched (see subclause 5.1.2.2) and to the switched long-duration (see subclause 5.1.2.3) access method is not possible as there are no means for the network to recognize at call setup, which type of access the subscriber is requesting.

5.1.2 Access method

The access method defines the method of establishment and release of a connection between the user and PH which gives access to the ISDN VC and PVC service.

The network may offer a subset of the access methods using the B- or D-channel, to which the user can subscribe. Only access methods using the B-channel are within the scope of this ETS. For access methods using the D-channel, refer to ETS 300 049 [4].

Only B-channel access methods according to ETS 300 007 [1] Case B are described in this ETS. Case A access methods are exclusively described in ETS 300 007 [1].

5.1.2.1 Semi-permanent B-channel access

The B-channel access connection is permanently available, independent of ITU-T Recommendation X.25 [10] VC/PVCs.

The user may subscribe to multiple instances of this access method. For each of them:

- a B-channel timeslot on the ISDN access shall be assigned at subscription time;
- a customized Link Access Procedure Balanced (LAPB) profile (see ITU-T Recommendation X.25 [10], subclause 2.4.8) and logical channel range (ITU-T Recommendation X.25 [10], annex A) may be subscribed to in addition. This overrules the corresponding part of the X.25 service profile that relates to the ISDN number.

NOTE: The logical channel range defines the logical channels to be used for PVCs and hence includes possible subscription to PVC services.

5.1.2.2 Switched B-channel access

The switched B-channel access connection is established (released) on-demand, by means of ETS 300 403-1 [7] signalling procedures, depending on the first/last virtual call (X.25 virtual call), using this channel.

Subscription to or general availability of the switched B-channel access method implies subscription to or general availability of the basic service PMBS-B (as specified in ETS 300 007 [1]).

The user may subscribe to a maximum number N of switched B-channel connections, on a per ISDN number basis.

5.1.2.3 Switched long-duration B-channel access

The switched long-duration B-channel access connection is established (released), by means of ETS 300 403-1 [7] signalling procedures, under control of the user and **independent** of the first/last virtual call (X.25 virtual call), using this channel.

NOTE: This long-duration access connection:

- reduces the blocking probability of the VC service, as compared to the switched access, because the connection will in general already exist before any VC is established;
- increases the availability of the VC service, as compared to the semi-permanent access, because it does not depend upon administrative intervention in case of connection failure.

Subscription to the switched long-duration B-channel access method implies subscription to a basic service, characterized by the B-channel packet mode bearer capability (as specified in ETS 300 007 [1]).

The user may subscribe to a maximum number N of switched long-duration B-channel connections, on a per ISDN number basis. However, when the X.25 service profile includes PVC subscription, then this maximum number shall be one.

NOTE: This is necessary because the mapping of PVCs on multiple on-demand access connections is ambiguous.

5.1.2.4 Notification class

Out of the three notification classes defined in ETS 300 007 [1] for notification of the user of incoming packet calls, two classes are applicable for use with the B-channel access methods: the "no notification" and the "conditional notification" classes.

The "no notification" class applies to all B-channel access methods. No ETS 300 403-1 [7] signalling procedures are used to notify the user of incoming calls. An incoming call packet will directly be delivered over an existing access connection.

The "conditional notification" class can be subscribed to for switched B-channel access method only. ETS 300 403-1 [7] call offering procedures may be used to notify the subscriber of an incoming packet call. A switched B-channel access connection may then be established before incoming call packet delivery.

NOTE: The "unconditional notification" class from ITU-T Recommendation X.31 [11] is not supported by this standard.

5.1.3 X.25 service profile

The X.25 service profile is defined in ITU-T Recommendation X.25 [10].

It includes, amongst others, subscription to:

- a LAPB profile (see ITU-T Recommendation X.25 [10], subclause 2.4.8). This profile only applies to B-channel access connections. It does not apply to semi-permanent B-channel access instances if there is subscription to a customized LAPB profile for this particular instance;
- a logical channel range (see ITU-T Recommendation X.25 [10] annex A) including those defined for PVCs. It does not apply to those access instances for which there is subscription to a customized logical channel range.

Subscription to the VC bearer service is possible in conjunction with any access method and independent of the number of such access connections.

Subscription to PVC services provided by the B-channel may only be in conjunction with subscription to the semi-permanent or to the switched long-duration B-channel access method.

5.2 Access connection procedures

The procedures for establishment (release) of an access connection between the Data Terminal Equipment (DTE) and the PH involve layer 1 activation (deactivation), B-channel establishment (release) and layer 2 activation (deactivation).

These procedures are required as part of the VC and PVC invocation and operation and therefore are referenced from subclause 5.3. Some of these procedures however occur at provisioning and withdrawal.

Detailed procedures can be found in ETS 300 007 [1].

5.2.1 Semi-permanent B-channel access

When the user has subscribed to the semi-permanent B-channel access method, the following procedures apply:

5.2.1.1 Establishment

- Layer 1 shall be permanently active.
 - The B-channel connection shall be established by means of administrative procedures when the semi-permanent B-channel access method is provisioned.
 - Layer 2 shall be activated by means of ITU-T Recommendation X.25 [10] LAPB procedures by the network when the semi-permanent B-channel access method is provisioned, after the B-channel connection is established.
 - The network shall keep the layer 2 active; in case of failure, it shall reactivate the data link layer.

5.2.1.2 Release

- Layer 2 shall be deactivated by means of ITU-T Recommendation X.25 [10] LAPB procedures by the network when the semi-permanent B-channel access subscription is withdrawn.
- The B-channel connection shall be released by means of administrative procedures when the semi-permanent B-channel access subscription is withdrawn.

5.2.2 Switched B-channel access

When the user has subscribed to the switched B-channel access, the following procedures apply:

5.2.2.1 Establishment

- Layer 1 shall be permanently active or activated on-demand by the side which initiates the B-channel connection. For Primary Rate Access (PRA), layer 1 is permanently active.
- The B-channel connection shall be established on-demand as specified by ETS 300 007 [1] using ETS 300 403-1 [7] signalling procedures, when required for VC establishment. The user or network shall initiate the establishment in case of respectively outgoing or incoming VCs.
- Layer 2 shall be activated by means of ITU-T Recommendation X.25 [10] LAPB procedures by the side which initiated the B-channel connection, after the B-channel connection is established. Also the other side may activate layer 2.

5.2.2.2 Release

- Layer 2 shall be deactivated by means of ITU-T Recommendation X.25 [10] LAPB procedures by the network after release of the last virtual call. Also the user may deactivate the layer 2.
- The B-channel connection shall be released, as specified by ETS 300 007 [1] using ETS 300 403-1 [7] signalling procedures, by the network after layer 2 deactivation. Also the user may release the B-channel.

5.2.3 Switched long-duration B-channel access

When the user has subscribed to the switched long-duration B-channel access, the following procedures apply:

5.2.3.1 Establishment

- Layer 1 shall be permanently active or activated on-demand by the user. For PRA, layer 1 is permanently active.
- The B-channel connection shall be established (in general before the first virtual call) by the user as specified by ETS 300 007 [1] using ETS 300 403-1 [7] signalling procedures.
- Layer 2 shall be activated by means of ITU-T Recommendation X.25 [10] LAPB procedures by the user after the B-channel connection is established. Also the network may activate layer 2.
- When the network supports PVCs on switched long-duration connections, then the user shall keep the connection established and the layer 2 active, independent of the existence of virtual calls. In case of failure the user shall re-establish the connection and/or reactivate layer 2.

5.2.3.2 Release

In the normal case, switched long-duration B-channel connections are kept established even when the last virtual call has terminated. However, if release is wanted, it is the users responsibility:

- Layer 2 shall be deactivated by the user by means of ITU-T Recommendation ITU-T Recommendation X.25 [10] LAPB procedures.

- The B-channel connection shall be released by the user, as specified by ETS 300 007 [1] using ETS 300 403-1 [7] signalling procedures.

NOTE: When there are PVCs on a switched long-duration B-channel connection, release of the connection will bring the PVCs in an out of order status.

5.2.4 Summary of access connection procedures

Table 1 is providing an overview of the normal procedures associated with the various access methods and the possibility to operate VC and/or PVC on them.

Table 1: Summary of B-channel access connection procedures

access method	L1 activation	B-Ch. connection establishment	L2 establishment	L3 service
semi-permanent B-channel	permanent	semi-permanent	semi-permanent by network	VC and/or PVC
switched	permanent	semi-permanent by user	semi-permanent by user	PVC (and VC)
long duration B-channel	permanent or demand by user	demand by user	demand by user	VC
switched B-channel	permanent or demand by user/network	demand by user/network	demand by user/network	VC

5.3 Normal procedures

5.3.1 Activation, deactivation and registration

Not applicable.

5.3.2 Invocation and operation

VC and PVC procedures can be invoked and operated by a given terminal concurrently. Both VC and PVC procedures require procedures for establishment and release of an access connection, as described in subclause 5.2.

5.3.2.1 Virtual call procedures

If a B-channel has already been established between the terminal and the PH and a LAPB data link has been activated then ITU-T Recommendation X.25 [10] packet layer calls may be made. If no B-channel connection exists then channel establishment procedures are needed to provide a communication path between the terminal and the PH.

5.3.2.1.1 Access connection establishment

If the user has subscribed to the switched B-channel access method and if:

- no B-channel connection exists yet or the VC loading algorithm in the terminal or network requires the establishment of another B-channel connection;
- and the subscribed maximum number of switched connections is not yet exceeded;
- and (for incoming calls only) the conditional notification class is subscribed to;

then a switched B-channel access connection needs to be established according to the procedure outlined in subclause 5.2.2.1.

5.3.2.1.2 Terminal selection and identification

For certain applications the subscription to the Multiple Subscriber Number (MSN) or Direct Dialling In (DDI) supplementary service is necessary for the purpose of terminal selection.

For certain applications for outgoing calls the calling party number and/or calling party subaddress shall be sent to the network by the calling user during call set-up and used by the network as a network option for terminal identification or selection of the user's profile.

Public networks conforming to this ETS do not provide channel negotiation.

Successive incoming calls to the same ISDN number shall be directly multiplexed on an already established B-channel irrespective of information contained in the ITU-T Recommendation X.25 [10] called address extension facility field.

NOTE: In the case of no notification class, the PH could make use of this information to identify a specific B-channel (see annex G to ITU-T Recommendation X.25 [10]). This would be a non-standard use of a facility intended to support the Open Systems Interconnection (OSI) network service and would remain a network option.

5.3.2.1.3 Call establishment

ETS 300 007 [1] procedures using ETS 300 403-1 [7] signalling may be used to notify the user of incoming calls when conditional notification is applicable. ITU-T Recommendation X.25 [10] packet layer call establishment procedures are operated.

5.3.2.1.4 Data transfer

ITU-T Recommendation X.25 [10] packet layer data transfer procedures apply.

5.3.2.1.5 Call release

ITU-T Recommendation X.25 [10] packet layer call clearing procedures apply.

5.3.2.1.6 Access connection release

If the virtual call was using a switched B-channel access connection and if it was the last VC on that connection, then the access connection should be released as described in subclause 5.2.2.2.

5.3.2.2 Permanent virtual circuit procedures

5.3.2.2.1 Access connection establishment

The access connection is permanently available and no procedures are needed at invocation time. When the user subscribed to the semi-permanent B-channel access method, the procedures described in subclause 5.2.1.1 apply at provisioning. When he subscribed to the switched long-duration B-channel access method, then the procedures of subclause 5.2.3.1 apply.

5.3.2.2.2 Terminal selection and identification

Fixed at subscription time.

When the network supports PVCs on switched long-duration B-channel connections, then the user shall have an CCITT Recommendation E.164 [14] number and may have subscribed to MSN/DDI. The calling party number and/or calling party subaddress may be sent to the network by the calling user during access connection establishment. It may be used by the network as a network option for selection of the user's profile concerning PVCs.

5.3.2.2.3 Call establishment

Not applicable.

5.3.2.2.4 Data transfer

ITU-T Recommendation X.25 [10] packet layer data transfer procedures apply.

5.3.2.2.5 Call release

Not applicable.

5.3.2.2.6 Access connection release

When the user subscribed to the semi-permanent B-channel access method, the procedures described in subclause 5.2.1.2 apply at provisioning. When the user subscribed to the switched-long-duration B-channel access method, then the procedures of subclause 5.2.3.2 apply.

5.3.3 Interrogation and editing

Not applicable.

5.4 Exceptional procedures

5.4.1 Activation, deactivation and registration

Not applicable.

5.4.2 Invocation and operation

5.4.2.1 Invalid invocation

A subscriber invoking access to the PH is limited to those access methods he has subscribed to, and also shall not exceed the maximum subscribed number N of connections of this type:

- when the user invokes an access method he did not subscribe to and which is not available on a general basis;
- or when the user invokes the N + 1st switched response switched long-duration B-channel access to the PH.

Then the network will reject the call and will inform the user by an appropriate indication.

5.4.2.2 Virtual call

Control of the user-PH access connection

In the case of failure situations due to calling/called user error, user state or network conditions such as network congestion or the temporary unavailability of the PH, appropriate failure indications shall be signalled from the network to the user (either on VC layer 3, or by ETS 300 403-1 [7] signalling) and the B-channel establishment or established B-channel(s) (in case of switched or switched long-duration B-channels only) shall be terminated by the network.

The B-channel(s) should not be released by the user until all ITU-T Recommendation X.25 [10] virtual calls have been cleared. In the event of the user releasing a B-channel whilst existing ITU-T Recommendation X.25 [10] calls are still in progress, the ITU-T Recommendation X.25 [10] calls shall be cleared by the network and appropriate indications given to the user.

Control of ITU-T Recommendation X.25 [10] calls

In the case of the ITU-T Recommendation X.25 [10] call(s), the procedures of ITU-T Recommendation X.25 [10] shall apply.

5.4.2.3 Permanent virtual circuit

Control of the User-Packet Handler access connection

For the switched long-duration option, in the case of calling/called user error, user state or network conditions such as network congestion or the temporary unavailability of the PH, appropriate failure indications shall be signalled from the network to the user (either on PVC layer 3, or by ETS 300 403-1 [7] signalling) and the B-channel establishment or established B-channel(s) may be terminated by the network.

The B-channel(s) should not be released by the user. In the event of a switched long-duration B-channel being released by the network, the user shall re-establish the B-channel.

Control of the PVC

As regards the PVC, the procedures of ITU-T Recommendation X.25 [10] shall apply.

5.4.3 Interrogation and editing

Not applicable.

6 Network capabilities for charging

Charging principles are outside the scope of this standard.

7 Interworking

7.1 Interworking between public networks

Full interworking shall be ensured between this service and:

- existing Packet Switched Public Data Network (PSPDN) services;
- other ISDN VC and PVC services.

This interworking shall be ensured without any service restriction. However, degradation to some quality of service parameters, e.g. call set-up time, may be experienced in some cases.

7.2 Interworking between private and public ISDNs

This stage 1 description applies to B channels which have been extended into a private ISDN whereby the private ISDN may or may not provide packet handling functions.

7.2.1 Private ISDN providing own PH-Function

The private PH, which is serving numerous terminals within the private ISDN is connected via one or more B-channels with the public PH. The TEs may access the private PH via D- or B-channel optionally. The connections between the private PH and the PH of the public ISDN across the T-reference point may be of one of the types:

- semi-permanent B-channel;
- switched B-channel;
- switched long-duration B-channel.

According to procedures described in clause 5, PVCs across the T-reference point will require switched long-duration or semi-permanent B-channels. If a PVC (VC) is used across the T-reference point, it can only interwork with a PVC (VC) at the S-reference point.

Generally for the PTN-PH the same options and restrictions apply as for individual subscribers of the public ISDN, as regards:

- subscription to an access profile and an ITU-T Recommendation X.25 [10] service profile, described in subclause 5.1.1 and annexes A and B;
- and for access connection procedures, described in subclause 5.2.

Individual PTN-subscribers have no own subscription and registration in the public PH.

7.2.2 Private ISDN not providing own PH-Function

A transparent circuit mode connection (B-channel) will have to be established between the Terminal Equipment (TE) at the S-reference point and the PH. It will be used exclusively for virtual connections between this TE and the PH. This B-channel normally shall be established at the S- and T-reference point in the same mode of operation:

- for switched, and for switched long-duration B-channels to be established, basic call control procedures apply, together with the DDI supplementary service for incoming calls (PH to TE direction);
- for semi-permanent B-channels OAM-procedures apply at the PH, the public ISDN, and the private ISDN.

Each PTN-subscriber on a DDI number basis, may subscribe to either the standard ITU-T Recommendation X.25 [10] service profile of the public PH (see annex A), or to an individual optional X.25 user profile (see annex B).

8 Interaction with supplementary services

Not applicable.

NOTE: Each supplementary service description identifies the applicability to this bearer service category.

9 Attributes and values of attributes (including the provision of individual bearer services)

9.1 Attributes and values

Information transfer attributes:

- 1) Information transfer mode.

Packet.

- 2) Information transfer rate.

NOTE: B-channel information transfer rate is 64 kbit/s. However, the throughput achieved depends on several conditions such as window size, characteristics of the destination DTE and network conditions.

- 3) Information transfer capability.

Unrestricted.

- 4) Structure.

Service data unit integrity.

- 5) Establishment of communication.

Switched - Switched Long-duration - Semi-permanent.

- 6) Symmetry.
Bi-directional symmetric.
- 7) Communication configuration.
Point-to-point.

Access attributes

- 8) Access channel.
B-channel.
- 9) Access protocol
 - a) Access protocol layer 1:
 - ETS 300 011 [2] D(64) or ETS 300 012 [3] D(16).
 - b) ISDN signalling access protocol layer 2:
 - ETS 300 402-2 [6].
 - c) ISDN signalling access protocol layer 3:
 - ETS 300 403-1 [7].
 - d) ISDN PMBS protocol layer 2:
 - ITU-T Recommendation X.25 [10] LAPB (B-channel).
 - e) ISDN PMBS signalling protocol layer 3:
 - ITU-T Recommendation X.25 [10] Packet Layer Protocol (PLP) (B-channel).
 - f) ISDN PMBS Information transfer protocol layer 3:
 - ITU-T Recommendation X.25 [10] PLP (B-channel).

General attributes

- 10) Supplementary services and user facilities provided.

MSN, DDI, sub-addressing.

NOTE: Only used in conditional notification for switched B-channel establishment towards a DTE.

Standard ITU-T Recommendation X.2 [9] facilities are offered (see annex B).

9.2 Provision of individual bearer services

- a) Overall provision: Additional (A).
- b) Variations of secondary attributes:

Table 2: Variations of secondary attributes

information transfer rate	establishment of communication	symmetry	communication configuration	provision
see attribute 2)	switched	bi-directional symmetric	point-to-point	A
see attribute 2)	switched long-duration	bi-directional symmetric	point-to-point	A
see attribute 2)	semi-permanent	bi-directional symmetric	point-to-point	A

Annex A (normative): Standard service profile for PMBS-B

The following standard service profile (comprising only ITU-T Recommendation X.25 [10] related data) is defined to be applicable to users who have registered with the PH for B-channel PMBS but not subscribed to a different specific service profile. Support of the OSI network layer service is a general requirement of this standard service profile:

- LAPB timer T1: 1 second.
- Standard LAPB window size: 7.
- Single link procedure, modulo 8.
- Standard basic packet sequence numbering (modulo 8).
- Incoming/outgoing calls allowed.
- Two-way logical channels: 2.
- Default maximum packet length: 128 octets.
- Default layer 3 window size: 2.
- Fast select acceptance facility.
- Default throughput class: D (64 kbits/s).
- Throughput class negotiation facility available.
- Transit delay negotiation allowed.
- ITU-T-specified DTE facilities to support the OSI network service (see annex G to ITU-T Recommendation X.25 [10]).
- Type of Address and Numbering Plan Identifier TOA/NPI address subscription facility, shall be part of the standard service profile but only after Time T, as defined in CCITT Recommendation E.165 [15].

Annex B (normative): User facilities

Table B.1: Optional user facilities

	Optional user facility	ITU-T Recommendation X.2 [9]		Service provided by this ETS	
		VC	PVC	VC	PVC
1	Optional user facilities assigned for an agreed contractual period				
1.1	Extended frame sequence numbering	C1	C1	N	N
1.2	Multilink procedure	A	A	A	A
1.3	On-line facility registration	A	-	A	-
1.4	Extended packet sequence numbering (modulo 128)	A	A	N	N
		(see note)	(see note)		
1.5	D-bit modification	A	A	N	N
1.6	Packet retransmission	A	A	N	N
1.7	Incoming calls barred	E	-	E	-
1.8	Outgoing calls barred	E	-	E	-
1.9	One-way logical channel outgoing	E	-	E	-
1.10	One-way logical channel incoming	A	-	E	-
1.11	Non standard default packet sizes 16, 32, 64, 2048, 4096	C1	C1	N	N
	256	A	A	E	E
	512, 1024	A	A	A	A
1.12	Non standard default window sizes	A	A	E	E
		(see note)	(see note)		
1.13	Default throughput classes assignment	A	A	E	E
1.14	Flow control parameter negotiation	E	-	E	-
1.15	Basic throughput class negotiation	E	-	E	-
1.16	Extended throughput class negotiation	E	-	N	-
1.17	Closed User Group (CUG)	E	-	E	-
1.18	CUG with outgoing access	A	-	E	-
1.19	CUG with incoming access	A	-	E	-
1.20	Incoming calls barred within a CUG	A	-	E	-
1.21	Outgoing calls barred within a CUG	A	-	E	-
1.22	Bilateral CUG	A	-	N	-
1.23	Bilateral CUG with outgoing access	A	-	N	-
1.24	Fast select acceptance	E	-	E	-
1.25	Reverse charging acceptance	A	-	E	-
1.26	Local charging prevention	A	-	A	-
1.27	NUI subscription	A	-	A	-
1.28	NUI override	A	-	A	-
1.29	Charging information	A	-	A	-
1.30	RPOA subscription	A	-	N	-
1.31	Hunt group	A	-	A	-
1.32	Call redirection	A	-	E	-
1.33	Call deflection subscription	A	-	A	-
1.34	TOA/NPI address subscription	FS	-	C10	-
1.35	Direct Call	FS	-	N	-
1.36	Inter-network call redirection/deflection prevention subscription	A	-	N	-
1.37	Global alternative address registration	A	-	N	-
1.38	Interface specific alternative address registration	C2	-	N	-
1.39	Alternative address usage subscription	A	-	N	-
	(continued)				

Table B.1 (concluded): Optional user facilities

	Optional user facility	ITU-T Recommendation X.2 [9]		Service provided by this ETS	
2	Optional user facilities on a per-call basis				
2.1	Flow control parameter negotiation	E	-	E	-
2.2	Basic throughput class negotiation	E	-	E	-
2.3	Extended throughput class negotiation	C3	-	N	-
2.4	CUG selection	E	-	E	-
2.5	CUG with outgoing access selection	C4	-	A	-
2.6	Bilateral CUG selection	C5	-	N	-
2.7	Reverse charging	A	-	C11	-
2.8	Fast select	E	-	E	-
		VC	PVC	VC	PVC
2.9	Network user identification selection	C6	-	A	-
2.10	Charging information	A	-	A	-
2.11	RPOA selection	A	-	N	-
2.12	Call deflection selection	C7	-	A	-
2.13	Call redirection or call deflection notification	C8	-	E	-
2.14	Called line address modified notification	E	-	E	-
2.15	Transit delay selection and indication	E	-	E	-
2.16	Abbreviated address calling	-	-	N	-
2.17	Internetwork call redirection/deflection status selection	A	-	N	-
2.18	Alternative address selection	C9	-	N	-
3	Additional features				
3.1	Extended interrupt user data field (1 to 32 octet)	E	E	E	E
3.2	ITU-T-specified DTE facilities	E	-	E	-

- VC = applicable when the virtual call service is being used
- PVC = applicable when the permanent virtual circuit service is being used
- E = essential for conformance.
- A = additional.
- M = mandatory.
- N = presently not offered, unlikely to be available on many networks in the future.
- FS = for further study.
- Cn = Condition number n (see list below).

NOTE: The relationship among parameters in layer 3 for a single virtual circuit is similar to that given under equation (1) under condition C1. When a packet window size larger than 2 is needed to fully utilize a virtual circuit, then the non-standard default window size facility is required. If this window size is also larger than 7, then the extended packet sequence numbering facility is also required. The precise relationships for single and multiple logical channel cases is for further study.

C1 The relationship among several parameters to be used for efficient line utilization is expressed as:
 $R * D/8 <= k * N1$ (1);

where:

- R is transmission rate (bit/s);
- D is total round trip delay (seconds);
- k is Layer 2 window size;
- N1 is frame size (octets).

If a combination of variables k and N1 do not satisfy equation (1), then k, N1, or both should be increased. If the values of k and/or N1 which satisfy the equation (1) are such that Extended Frame Sequence Numbering and/or Non-standard Default Packet Size (which, in turn, influences N1) are required, then one or both of these facilities are M; otherwise they are A.

- C2 If Alternative Address Usage subscription is offered, then M; otherwise prohibited.
- C3 If Extended Throughput Class Negotiation for a contractual period is offered, then M; otherwise prohibited.
- C4 If CUG with outgoing access or CUG with incoming access is offered and the network offers the capability of choosing whether to have a preferential CUG, then M; otherwise prohibited.
- C5 If Bilateral CUG or Bilateral CUG with outgoing access is offered, then M; otherwise prohibited.
- C6 If NUI subscription or NUI Override is offered, then M; otherwise prohibited.
- C7 If Call Deflection subscription is offered, then M; otherwise prohibited.
- C8 If Call Redirection or Call Deflection is offered, then M; otherwise prohibited.
- C9 If Alternative Address Usage subscription is offered, then M; otherwise prohibited.
- C10 A until Time T, E from Time T onwards.
- C11 E for calls within one ISDN, A for calls between different networks.

Annex C (informative): Default service profile for PMBS-B

The following service profile is proposed to be applied for subscribers not registered with the PH, when the ISDN Packet Mode Bearer Services (PMBS) provided by the B-channel are available on a general basis:

- switched B-channel access method, maximum number N limited on a network basis;
- conditional notification class;
- parameters and facilities according to the standard X.25 service profile as defined in annex A.

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