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ISDN Virtual Call (VC) and Permanent Virtual Circuit (PVC) bearer services provided by the D-channel of the user access - basic and primary rate

ETSI

Contents

Foreword

This draft European Telecommunication Standard (ETS) has been produced by the Network Aspects (NA) Technical Committee of the European Telecommunications Standards Institute (ETSI), and is now submitted for the Public Enquiry phase of the ETSI standards approval procedure.

This European Telecommunication Standard (ETS) has been produced by the Network Aspects (NA) Technical Committee of the European Telecommunications Standards Institute (ETSI). It describes the stage one requirements of the ISDN Packet Mode Bearer Services (PMBS) provided on the D-channel of the user access. Services using the B-channel are covered in ETS 300 048 [4].

The requirements described in this ETS are applicable only to those services within Europe, and are based on ITU-T Recommendation I.232 [17]. This service description corresponds to case B (D-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].

Annexes A and B are normative, annexes C and D are informative.

Proposed transposition dates	
Date of latest announcement of this ETS (doa):	3 months after ETSI publication
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Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

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1 Scope

This European Telecommunication Standard (ETS) defines stage one of the ISDN Packet Mode Bearer Service (PMBS) provided on the D-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 standard, 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 packetised 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 authorisation leaving freedom, or 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 thetext 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 rev ision. 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: "Integrated Services Digital Network (ISDN): Primary rate user-network interface - Layer 1 specification and test principles".

[3]   ETS 300 012: "Integrated Services Digital Network (ISDN): Basic user-network interface - Layer 1 specification and test principles".

[4]   ETS 300 048 : "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

[5]   ETS 300 099: "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 (03/93): "International user classes of service in, and categories of access to, public data networks and Integrated Service Digital Networks (ISDNs)".

[9]   ITU-T Recommendation X.2 (03/93): "International data transmission services and optional user facilities in public data networks and ISDNs".

[10]   ITU-T   Recommendation X.25 (03/93): "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 (03/93): "Support of packet mode terminal equipment by an ISDN".

[12]   ITU-T Recommendation I.112 (03/93): "Vocabulary of terms for ISDNs".

[13]   CCITT Recommendation I.130 (1988): "Method for the characterisation 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: " Timetable for coordinated implementation of the full capability of the numbering plan for the ISDN era (E.164)".

[16]   ITU-T Recommendation I.210 (03/93): "Principles of telecommunication services supported by an ISDN and the means to describe them".

[17]   ITU-T Recommendation I.232 (1994): "Packet mode bearer services categories".

[18]   CCITT Recommendation X.121 (09/92): "International numbering plan for public data networks".

3 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; telecommunications 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.

Customised Service Profile: a set of individual service data allocated per ISDN-number for a period of time to a subscriber registered at the 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 D-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-D : basic ISDN Packet Mode Bearer Service provided by the D-channel

Semi-permanent data link: a data link, whose layer 2 address is allocated at subscription time, and which is permanently established and kept available by the network between the TE and the PH independent of X.25 calls (VC, PVC),

Preallocated logical link, PLL (called Permanent Logical Link in edition 1 of this ETS) **:** a data link, whose layer 2 address is allocated at subscription time, and which is established / released on-demand by the user or the network between the TE and the PH dependent on X.25 calls (VC).

Long-duration PLL : a data link, whose layer 2 address is allocated at subscription time, and which is established on-demand by the user between the TE and the PH independent of X.25 calls (VC, PVC).

Switched data link: a data link, whose layer 2 address is assigned at link activation time, and which is established / released on-demand by the user or the network between the TE and the PH, dependent on X.25 calls (VC).

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

CRF-S: Connection Related Function (in the local exchange) to which Subscribers are connected.
See ETS 300 099 [5] for a more detailed description.

4 Description

This service is described in respect of both the point-to-multipoint and the point-to-point access configurations. This covers the passive bus and Network Terminating 2 (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 D-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]).

No distinct user class is defined for the D-channel at 16 kbit/s. The use of class 30 may be available if the primary rate access (D-channel at 64 kbit/s) is offered.

> NOTE: In case of access via a Terminal Adaptor (TA), the following user classes are supported at the R reference points: 8-10, and in addition 11 and 13 on a D_{64}-channel (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-D 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. The access profile consists of ETS 300 007 [1] related service data and includes the access method and the notification class.

–   an X25 Service Profile. The X25 service profile consists of ITU-T Recommendation X.25 [10] layer 2 and layer 3 related service data. The user may subscribe to a customised (essential for PVC operation) X25 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.

> NOTE: ETS 300 007 [1] requires terminals to be identified by means of CCITT Recommendation E.164 [14] numbers. However, for an interim period, addressing according to annex D is possible. In this case the terminal address is determined at subscription time.

5.1.2 Access method

The access method defines the method of establishment and release of a connection between the user and Packet Handler 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 D-channel are within the scope of this standard. For access methods using the B-channel, refer to ETS 300 048 [4].

Services provided on the D-channel can only be offered and supported by the network according to ETS 300 007 [1] Case B.

Four D-channel access methods may be supported by the ISDN:

−   semi-permanent D-channel access;

−   preallocated logical link access;

−   long-duration preallocated logical link access;

−   switched D-channel access.

>   NOTE: Subscription to more than one instance of a D-channel access method per ISDN-
>   number is recognized as a possibility, but not described further on in this ETS. Hence
>   selection mechanisms between more than one logical link for an incoming call will be
>   network dependent.

5.1.2.1   Semi-permanent D-channel access

The semi-permanent D-channel access connection between the TE and the PH is permanently available, independent of ITU-T Recommendation X.25 [10] VC/PVCs. The network is responsible to establish and maintain the data link connection.

TheTEI-value in the Layer 2 address at the user-network interface is agreed upon at subscription time (manual TEI-assignment). The TEI-value shall be within the non-automatic TEI-range.

For this access method the subscriber is registered. Customized and standard service profiles can be used, but in case of the PVC service, the user must have a customized service profile.

5.1.2.2   Preallocated logical link access

The Preallocated Logical Link, (PLL), access connection between the TE and the PH is established (released) on-demand, by the user or network, depending on the first/last ITU-T Recommendation X.25 [10] VC, using this connection.

The TEI-value in the Layer 2 address at the user-network interface is agreed upon at subscription time (manual TEI-assignment). The TEI-value shall be within the non-automatic TEI-range.

For this access method the subscriber needs to be registered. Customized and standard service profiles may be used.

5.1.2.3   Long-duration preallocated logical link access

The long-duration PLL access connection between the TE and the PH is established (released) on-demandby the user, **independent** of ITU-T Recommendation X.25 [10] VC/PVCs.

The TEI-value in the Layer 2 address at the user-network interface is agreed upon at subscription time (manual TEI-assignment). The TEI-value shall be within the non-automatic TEI-range.

For this access method the subscriber needs to be registered. Customized and standard service profiles can be used, but in case of the PVC service, the user must have a customized service profile.

5.1.2.4   Switched D-channel access

The switched D-channel access connection between the TE and the PH is established (released) on-demand, by the user or network, depending on the first/last ITU-T Recommendation X.25 [10] VC, using this connection.

The TEI-value is either within the automatic or within the non-automatic TEI-range.

The TEI-value in the Layer 2 address at the user-network interface to be used for a VC is agreed upon dynamically at call request time; in case of incoming calls (network to user) ETS 300 403-1 [7] call offering procedure (conditional notification according to ETS 300 007 [1] may be used to interrogate the layer 2 address to be used for the call).

Subscription to or general availability of the switched D-channel access method implies subscription to or general availability of the basic service PMBS-D.

For this access method the subscriber needs not necessarily be registered, in which case he uses a default service profile. Else customized or standard service profiles can be used.

5.1.2.5 Notification class

For notification of the user of incoming packet calls, two classes are applicable for use with the D-channel access methods: the "no notification" and the "conditional notification" classes.

The "no notification" class applies to all D-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 D-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 D-channel access connection may then be established before incoming call packet delivery.

> NOTE: the "unconditional notification" class as defined in ITU-T Recommendation X.31 [11] is not supported.

5.1.3 X.25 service profile

The X.25 service profile is defined in ITU-T Recommendation X.25 [10].
Its layer 3 part includes, amongst others, subscription to:

− a logical channel range (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.

Layer 2 parameters for the D-channel access methods cannot be selected; they are determined by ETS 300 402-2 procedures and system parameters (LAPD) selected for the network.

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 D-channel may only be in conjunction with subscription to the semi-permanent or to the long-duration PLL access method.

5.2 Access connection procedures

All packet information is conveyed between the user and the PH in LAPD data link connections generally identified by Service Access Point Identifier (SAPI) 16. Each terminal has its own logical link(s) identified by Terminal End Point Identifier (TEI) value(s).

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

On layer 3, ITU-T Recommendation X.25 [10], packet layer procedures are used. Since the information field of LAPD frames is restricted to 260 octets, the maximum layer 3 packet size is 256 octets .

These procedures are required as part of the VC and PVC invocation and operation and therefore are referenced from 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 D-channel access

When the user has subscribed to the semi-permanent D-channel access method, both virtual calls and permanent virtual circuits may be supported. The following procedures apply:

5.2.1.1 Establishment

−   Layer 1 must be kept permanently active by the network.

−   The Layer 2 LAPD data link shall be established by means of ETS 300 402-2 [6] procedures by the network at subscription time.

−   The network shall keep the layer 2 active; in case of failure, it shall reestablish the data link layer.

5.2.1.2 Release

Layer 1 and layer 2 must be kept active permanently. Layer 2 shall be deactivated by means of ETS 300 402-2 [6] procedures by the network only when the semi-permanent D-channel access subscription is withdrawn.

5.2.2 Preallocated logical link access

When the user has subscribed to the PLL D-channel access method, only virtual calls are supported. The following procedures apply :

5.2.2.1 Establishment

−   Layer 1 can be permanently activated by the network or activated on-demand by the user or network. For Primary Rate Access (PRA), layer 1 is permanently active.

−   The Layer 2 preallocated logical link shall be established by means of ETS 300 402-2 [6] procedures on-demand, by the user or network, depending on the direction and time of the first ITU-T Recommendation X.25 [10] VC, using this data link.

5.2.2.2 Release

−   The Layer 2 preallocated logical link shall be released by means of ETS 300 402-2 [6] procedures, by the user or network, when the last ITU-T Recommendation X.25 [10] VC, using this data link has terminated.

−   Layer 1 may be kept active permanently, or deactivated by the network, when no more layer 2 link is active.

5.2.3 Long-duration preallocated logical link access

When the user has subscribed to the long-duration PLL D-channel access method, both virtual calls and permanent virtual circuits may be supported.The following procedures apply:

5.2.3.1 Establishment

−   Layer 1 can be permanently activated by the network or activated on-demand by the user. For Primary Rate Access (PRA), layer 1 is permanently active.

−   The Layer 2 long-duration preallocated logical link shall be established by means of ETS 300 402-2 procedures on-demand by the user, independent, but before the first ITU-T Recommendation X.25 [10] VC/PVC, using this data link.

5.2.3.2 Release

− The Layer 2 preallocated logical link may be released by the user, by means of ETS 300 402-2 [6] procedures, if not longer needed. In case the link is used for PVCs however, the user is responsible to keep the data link permanently established.

− Layer 1 must be kept active permanently if used for PVCs, otherwise it may be deactivated by the user when no more layer 2 link is active.

   NOTE : When there are PVCs on a long-duration PLL, release of the data link or layer 1 deactivation will bring the PVCs in an out of order status.

5.2.4 Switched D-channel access

When the user has subscribed to the switched D-channel access method, only virtual calls are supported. The following procedures apply:

5.2.4.1 Establishment

− Layer 1 can be permanently activated by the network or activated on-demand by the user or network. For Primary Rate Access (PRA), layer 1 is permanently active.

− In the case of incoming calls and if subscribed to ETS 300 007 [1] "Conditional Notification" class, call offering procedures using ETS 300 403-1 [7] signalling, may be used to interrogate the layer 2 address (TEI) to be used for the switched D-channel access.

− The Layer 2 data link shall be established by means of ETS 300 402-2 [6] procedures on-demand, by the user or network, depending on the direction and time of the first ITU-T Recommendation X.25 [10] VC, using this data link.

5.2.4.2 Release

− The Layer 2 data link shall be released by means of ETS 300 402-2 [6] procedures, by the user or network, when the last ITU-T Recommendation X.25 [10] VC, using this data link has terminated.

− Layer 1 may be kept active permanently, or deactivated by the network, when no more layer 2 link is active.

5.2.5 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 D-channel access connection procedures

Access Method	L1 activation	L2-Address Assignment	L2 establishment	L3 service
Semi-permanent D-channel	permanent by network	permanent at subscription	semi-permanent by network	VC and/or PVC
Preallocated Logical Link	permanent or on-demand by user or network	permanent at subscription	semi-permanent by user or network	VC
Long-duration Preallocated Logical Link	permanent or on-demand by user	permanent at subscription	semi-permanent by user	VC and/or PVC
Switched D-channel	permanent or on-demand by user or network	on-demand	on-demand by user	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 Layer 2 data link has already been assigned and activated then ITU-T Recommendation X.25 [10] packet layer calls may be made. If no D-channel data link exists yet, then TEI assignment and access connection procedures are needed to provide a data link between the terminal and the PH.

5.3.2.1.1 Access connection establishment

If the user subscribed to the switched D-channel access method and if;

−   no data link connection exists yet for this TE1/TA or the VC loading algorithm in the terminal or network requires the establishment of another D-channel data link;

−   and (for incoming calls only) the conditional notification class is subscribed to,
then a switched D-channel data link needs to be allocated and activated according to the procedure outlined in subclause 5.2.4.

If the user subscribed to the preallocated logical link D-channel access method and if

−   the preallocated data link connection is not yet activated or the VC loading algorithm in the terminal or network requires the establishment of another PLL data link.

Then this preallocated data link needs to be activated according to the procedure outlined in subclause 5.2.2.

If the user subscribed to the long-duration preallocated logical link or to the semi-permanent D-channel access method then the data link is already active since subscription time.

5.3.2.1.2 Terminal selection and identification

5.3.2.1.2.1 Terminal interface identification - network to terminal

Users can operate several packet terminals in their in-house installation. In general, an ISDN number is used to identify a user access. In addition, the Multiple Subscriber Number (MSN) or Direct Dialling In (DDI) facilities may be used, thus allowing the allocation of a specific ISDN number to a given terminal/terminal adaptor.

The PH selects a specific logical link (terminal) based on the ISDN number. Successive incoming calls to the same ISDN number shall be directly multiplexed on an already established logical link, 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 logical link (annex G of ITU Recommendation X.25 [10]). This would be a non-standard use of a facility intended to support the Open Systems Interconnection (OSI) network service. In addition to these methods, additional digits from the CCITT Recommendation X.121 [18] numbering scheme can be allocated to a user, if the addressing scheme in annex D is used.

5.3.2.1.2.2 Terminal Interface identification - terminal to network

In the case of semi-permanent, PLL, or long-duration PLL D-channel access method , the terminal is identified via th layer 2 address (i.e. the TEI-value), since the relationship between TEI and ISDN number is stored in the network during registration.

In the case of switched D-channel access method and using MSN, DDI or CCITT Recommendation X.121 [18] subaddresses, the terminal identity (ISDN number) is derived from the first call request after successful activation of layer 2. In this case the terminal shall provide its identity immediately after layer 2 activation, otherwise a call to the terminal may not be successful.

5.3.2.1.3 Call establishment

In the case of incoming calls (network to user), ETS 300 007 [1] procedures using ETS 300 403-1 [7] signalling may be used to notify the user of incoming calls and to interrogate the layer 2 address (TEI) when conditional notification is applicable. ITU-T Recommendation X.25 [10] packet layer call establishment procedures are operated on an active logical link.

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 Acess connection release

If the virtual call was using a switched or preallocated logical link D-channel access connection and if it was the last VC on that connection, then the access connection should be released as described in subclauses 5.2.2.2 and 5.2.4.2.

5.3.2.2 Permanent virtual circuit procedures

5.3.2.2.1 Access connection establishment

Permanent virtual circuits can be operated only on permanently activated layer 1 connections.

Layer 2 shall be permanently available. This requires usage of semi-permanent or long-duration preallocated logical link D-channel access proceduresas outlined in subclauses 5.2.1.1 and 5.2.3.1.

5.3.2.2.2 Terminal selection/identification

Fixed at subscription time.

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

The access connection shall remain active permanently. This requires usage of semi-permanent or long-duration preallocated logical link D-channel access procedures as outlined in subclauses 5.2.1.2 and 5.2.3.2.

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 Packet Handler is limited to those access methods he has subscribed to.

−   When the user invokes an access method he did not subscribe to.

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

5.4.2.2 Virtual call

In 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 layer 2 data link establishment or established data links in case of switched or preallocated logical links shall be terminated by the network.

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 semi-permanent or long-duration PLL option, the layer 2 connection shall be permanently established. The data links should not be released by the user or network. In the event of a long-duration PLL being released by the PH or network, the user shall re-establish the data link.

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 these services and:

-    existing Packet Switched Public Data Network (PSPDN) services;

- other ISDN VC and PVC services.

This interworking shall be ensured without 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

7.2.1 Interworking via D-channels

The services and procedures described in clause 5 apply also to point-to-point ISDN access arrangements (NT2, e.g. Private Telecommunication Network, PTN, (Private ISDN)), connected to the public ISDN at the T-reference point:

− either via one or several D_{16} -channels;

− or via one or several D_{64} -channels;

− or via a mix of n D_{16} -channels and m D_{64} -channels.

NT2-arrangements (PTNs) accessing the D-channel packet mode bearer services may provide their own PH function, but as a minimum require a frame handling, FH capability.

7.2.1.1 Private ISDN providing own PH function

In this scenario the PH in the PTN is accessing via D-channel(s) the public ISDN packet mode bearer services, acting on behalf of numerous terminals connected to the PTN at its S-reference point. These terminals may access the private PH via D- and/or B-channel(s) optionally. The private PH will handle PTN internal ITU-T Recommendation X.25 [10] calls itself, interworking with the public ISDN PH only for ITU-T Recommendation X.25 [10] calls with PTN-external destination or origin.

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 ISDN-PH.

A private ISDN providing an own PH function will typically behave as in a point to point configuration and use only one layer 2 address (SAPI=16,and e.g.TEI=0) at the T-reference point for access to PMBS-D,

7.2.1.2 Private ISDN providing own FH function

In this scenario only a FH function is available in the PTN, supporting the mapping and multiplexing between layer 2 links of its terminals at the S-reference point and layer 2 links at the T-reference point. As the private FH is only able to support this layer 2 multiplexing / demultiplexing, it cannot support PTN-internal ITU-T Recommendation X.25 [10] calls. All virtual calls, PTN-internal and -external, have to be routed via the public ISDN PH function. Only access via the D-channel is supported for terminals at the S-reference point of the PTN.

The individual PTN-Terminals will be registered with the ISDN-PH. They may subscribe to one or more of the D-channel access methods as described in subclause 5.1.2.

If the public ISDN CRF-S implements a FH-function according to ETS 300 099 [5], then a concatenation of FH-functions will occur when interworking via D-channels.

A private ISDN providing a FH function will typically behave as in a point to point configuration. Then, for switched D-channel access to the PMBS-D of the puplic ISDN, only one data link per D-channel (with layer 2 address SAPI=16,and e.g.TEI=0) can be used at the T-reference point. The FH may however use multiple data links per D-channel for semi-permanent, PLL, and long-duration PLL access via the T-

reference point, as the layer 2 addresses of these data links are not to be derived from the single TEI-value (e.g.TEI=0) of the signalling link layer 2 address.

As a network option (according to ETS 300 007 [1] annex D), some networks may however allow a private ISDN hosting a FH-function, to behave as in a point to multipoint configuration, such that also multiple switched D-channel data links can be established by call offering procedures, per D-channel (of Basic or Primary Rate Accesses) at the T-reference point.

7.2.2 Interworking via B-channels

In this scenario, like in subclause 7.2.1.2, only a FH function is available in the PTN and PTN-terminals may access this private FH via D-channels only. However, in this case the PTN is accessing the public ISDN PMBS-D via one or several B-channels instead of D-channels. The B-channel(s) will be connected transparently to the PH function of the public ISDN, independent of whether this PH is provided locally in the accessed CRF-S or remote. Thus multiple instances (concatenation) of frame handlers between the PTN-terminals and the ISDN-PH (causing service degradation) can be avoided with this scenario.

The FH function in the PTN will have to behave, from view of a remote public PH, exactly like a FH of the public CRF-S as specified in ETS 300 099 [5]. In fact the private FH is in this scenario the FH function of the public CRF-S, moved into the PTN and connected (by prolonged 64kbit/s-channel(s) ie. Bd-channels (see ETS 300 099 [5]), across the T-reference point) to the PH of the public ISDN. The establishment of these B-channels is either semi-permanent by OA&M-procedures at initialization time, or long duration resp. on demand by procedures to be found in ETS 300 007 [1] using ETS 300 403-1 [7] signalling procedures.

The individual PTN-terminals will be registered with the public PH. They may subscribe to one or more of the D-channel access methods as described in subclause 5.1.2.

In this scenario the FH of the PTN (like the FH of the public ISDN) may use any practicable number of layer 2 data links per B (Bd)-channel at the T-reference point, with a direct mapping to individual D-channel data links of PTN-subscribers at the S-reference point of the PTN.

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/values

Information transfer attributes

1) Information transfer mode.

   Packet.

2) Information transfer rate.

   > NOTE: The D-channel information transfer rate is either 16 kbit/s for basic access or 64 kbit/s for primary rate access; 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- Preallocated Logical Link - Long Duration PLL - Semi-permanent.

6)   Symmetry

Bi-directional symmetric.

7)   Communication configuration.

Point-to-point.

Access attributes

8)   Access channel;

D(16), D(64), B(64) (for PTNs).

9)   Access protocol;

a)   Access protocol layer 1:

−   ETS 300 012 [3] D(16) or ETS 300 011 [2] D(64).

b)   ISDN signalling access protocol layer 2:

−   ETS 300 402-2 [6]; SAPI = 0, if necessary.

NOTE: Only necessary in the case of Switched D-channel Access with dynamic allocation of TEIs (see subclause 5.1.2.4).

c)   ISDN signalling access protocol layer 3:

−   ETS 300 403-1 [7], if necessary.

NOTE: Only necessary for terminal selection purposes (applies in the direction network to DTE).

d)   ISDN PMBS protocol layer 2:

−   ETS 300 402-2 [6] ; SAPI=16.

e)   ISDN PMBS signalling protocol layer 3:

−   ITU-T Recommendation X.25 [10] PLP.

f)   ISDN PMBS Information transfer protocol layer 3:

−   ITU-T Recommendation X.25 [10] PLP.

General attributes

10)   Supplementary services and user facilities provided.

(MSN), (DDI), Sub-addressing.

NOTE: Only used in conditional notification for Switched D-channel Access with dynamic allocation of TEIs (see subclause 5.1.2.4) at the first virtual call to a DTE.

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

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			
	D 16	Bi-directional Symmetric	point-to-point	A
	D 64	Bi-directional Symmetric	point-to-point	A
See attribute 2)	PLL			
	D 16	Bi-directional Symmetric	point-to-point	A
	D 64	Bi-directional Symmetric	point-to-point	A
See attribute 2)	Long Duration PLL			
	D 16	Bi-directional Symmetric	point-to-point	A
	D 64	Bi-directional Symmetric	point-to-point	A
See attribute 2)	Semi-permanent			
	D 16	Bi-directional Symmetric	point-to-point	A
	D 64	Bi-directional Symmetric	point-to-point	A

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

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 D-channel Packet Mode Bearer Services 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:(Only Layer 3 parameters are listed, as layer 2 parameters are determined by the use of the D-channel):

- 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: A (9600 bits/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, Rec.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. Not applicable as a facility: default and only mode is modulo 128				
1.2	Multilink procedure - not relevant for the D-channel access On-line facility registration	A	-	A	-
1.4	Extended packet sequence numbering (modulo 128)	A note 1	A note 1	N	N
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	Nonstandard default packet sizes 16, 32, 64,	C1	C1	N	N
	256	A	A	A	A
1.12	Nonstandard default window sizes	A note 1	A note 1	E	E
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	E	-	E	-
1.18	Closed user group with outgoing access	A	-	E	-
1.19	Closed user group with incoming access	A	-	E	-
1.20	Incoming calls barred within a closed user group	A	-	E	-
1.21	Outgoing calls barred within a closed user group	A	-	E	-
1.22	Bilateral closed user group	A	-	N	-
1.23	Bilateral closed user group 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	Internetwork 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, Rec.X.2 [9]		Service provided by this ETS	
		VC	PVC	VC	PVC
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	Closed user group selection	E	-	E	-
2.5	Closed user group with outgoing access selection	C4	-	A	-
2.6	Bilateral closed user group selection	C5	-	N	-
2.7	Reverse charging	A	-	C11	-
2.8	Fast select	E	-	E	-
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 1: 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:
$$R * D/8 <= k * N1 \text{ (1)};$$

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 Closed User Group with outgoing access or Closed User Group 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 Closed User Group or Bilateral Closed User Group 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-D

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

-       switched D-channel access method;

-       conditional notification class;

-       standard ITU-T Recommendation X.25 [10] service profile as defined in annex A.

Annex D (informative):   Transition schemes for addressing and numbering

The following need to be borne in mind:

- provision of PMBS via and within ISDN in Europe is fundamental;

- terminal interchangeability between countries is recognised as essential and that this implies the reduction of options and the harmonisation of the policies of involved European telecommunications administrations;

- harmonisation of addressing and numbering aspects is necessary.

This service description defines ISDN packet mode VC and PVC using D channel consistent with ETS 300 007 [1] (ITU-T Recommendations X.31 [11]).

In conformance with the above statement and to ensure total compatibility throughout Europe, it is stated that the users of services are identified by ISDN (CCITT Recommendation E.164 [14]) numbers.

In order to reach this goal with the least possible impact, networks may provide, for an interim period, network options as means to encourage a smooth transition.

In particular, users that have subscribed to this service could still be identified by CCITT Recommendation X.121 [18] numbers, which would facilitate interworking between ISDNs and PSPDNs. Since only CCITT Recommendation E.164 [14] numbers can be conveyed in an incoming call signal for terminal selection purposes, CCITT Recommendation X.121 [18] numbers must be used only in conjunction with the no notification class defined in ETS 300 007 [1] (ITU-T Recommendation X.31 [11].

History

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