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

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Contents

Foreword

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 Service (PMBS) provided on the D-channel of the user access. Services using the B-channel are covered in ETS 300 048.

The requirements described in this ETS are applicable only to those services within Europe, and are based on CCITT Recommendation I.232 [12]. This service description corresponds to case B (D-channel) of draft ETS 300 007 [1] (the European equivalent to CCITT Recommendation I.462/X.31 case B).

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

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

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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.

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

In addition, this ETS specifies the base functionality where the service is provided to the user via a private 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 categories 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 CCITT Recommendation I.232 [12].

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 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 300 125 (1991): "Integrated Services Digital Network (ISDN);   User-network interface data link layer specifications; Application of CCITT Recommendations Q.920/I.440 and Q.921/I.441".

[3]   ETS 300 102-1 (1990): "Integrated Services Digital Network (ISDN); User-network interface layer 3; Specifications for basic call control".

[4]   CCITT Recommendation X.25 (1988): "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".

[5]   CEPT Recommendation T/CD 08-03: "General interworking and service aspects of packet switched public data networks".

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

[7]   ETS 300 011: "Integrated Services Digital Network (ISDN); Primary rate user-network interface; Layer 1 specification and test principles".

[8]   CCITT Recommendation I.112 (1988): "Vocabulary of terms for ISDNs".

[9]   CCITT Recommendation I.210 (1988): "Principles of telecommunication services supported by an ISDN and the means to describe them".

[10]   CCITT Recommendation E.164 (1988): "Numbering plan for the ISDN era".

[11]   CCITT Recommendation X.1 (1988): "International user classes of service in public data networks and Integrated Service Digital Networks (ISDNs)".

[12]   CCITT Recommendation I.232: "Packet-mode bearer services categories".

[13]   CCITT Recommendation I.130 (1988): "Method for the characterisation of telecommunication services supported by an ISDN and network capabilities of an ISDN".

3   Definitions

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

Integrated Services Digital Network (ISDN): see CCITT Recommendation I.112 [8], § 2.3, definition 308.

service; telecommunications service: see CCITT Recommendation I.112 [8], § 2.2, definition 201.

supplementary service: see CCITT Recommendation I.210 [9], § 2.4.

virtual call: see CCITT Recommendation X.25 [4], § 3.

permanent virtual circuit: see CCITT Recommendation X.25 [4], §3.

service profile: see CCITT Recommendation X.25 [4].

packet handler: see ETS 300 007 [1].

semipermanent: see ETS 300 007 [1].

party number: as ISDN number, a number conforming to the numbering plan and structure specified in CCITT Recommendation E.164 [10].

party subaddress: see CCITT Recommendation E.164 [10], § 11.2.

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 CCITT Recommendation X.25 [4] 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] (CCITT Recommendation I.462/X.31).

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 D64-channel (see CCITT Recommendation X.1 [11]).

5 Procedures

5.1 Provision and withdrawal

This service shall either be provided by prior arrangement with the service provider, or be available on a general basis.

The user may subscribe to:

- a specific CCITT Recommendation X.25 [4] profile (essential for PVC operation); or

- a standard service profile, as described in Annex A.

> NOTE: ETS 300 007 [1] requires terminals to be identified by means of CCITT Recommendation E.164 [10] numbers. However, for an interim period, addressing according to Annex C is possible. In this case the terminal address is determined at subscription time.

5.2 Normal procedures

5.2.1 Activation, deactivation and registration

Not applicable.

5.2.2 Invocation and operation

VC and PVC virtual circuit procedures can be invoked and operated by a given terminal concurrently.

5.2.2.1 Virtual call procedures

5.2.2.1.1 Layer 1 activation

Layer 1 shall be permanently active or activated on demand by the Data Terminating Equipment (DTE) or the Packet Handler (PH). For Primary Rate Access (PRA), layer 1 is permanently active.

5.2.2.1.2   Layer 2 activation (logical link)

All packet information is conveyed in logical links identified by Service Access Point Identifier (SAPI) = 16. Each terminal has its own logical link (SAPI = 16) identified by Terminal End Point Identifier (TEI) value.

Three different methods of layer 2 activation can be identified as network options.

-        Method 1 - Semi-permanent layer 2:

        Logical links between the TA / Terminal Equipment type 1 (TE1) and the network PH are activated at subscription time. The network shall keep the data link layer in the activated state.

-        Method 2 - On demand Layer 2 with fixed TEI values (see ETS 300 125 [2]):

        The TEI of the TA/TE1 is assigned at subscription time (known by the network), ie. manual TEI assignment is used. The activation of a logical link is initiated either by the TA/TE1 or the network depending on the direction of the first VC. No ETS 300 102 [3] (CCITT Recommendation Q.931) procedures are used.

-        Method 3 - On demand Layer 2 with dynamic TEI allocation (see ETS 300 125 [2]):

        The activation of a logical link is initiated either by the TA/TE1 or the network depending on the direction of the first VC. In the case of incoming calls (network to user), ETS 300 102 Part 1 [3] (CCITT Recommendation Q.931) call offering procedure (conditional notification class according to ETS 300 007 [1]) may be used to interrogate the layer 2 address (TEI) to be used for the call.

        NT2s may use multiple layer 2 connections (ie. multiple TEIs) concurrently. However, this multiplexed layer 2 packet transfer capability implies that the incoming calls, if notification takes place, are notified via the broadcast link (SAPI = 0) in order to allow the user (i.e. the NT2) to respond on the appropriate SAPI = 0 data link, corresponding to the SAPI=16 data link to be used for the CCITT Recommendation X.25 [4] incoming call packet presentation.

5.2.2.1.3   Terminal selection and identification

5.2.2.1.3.1   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 CCITT Recommendation X.25 [4] 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 CCITT Recommendation X.25 [4]). 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 numbering scheme can be allocated to a user as described in CEPT Recommendation T/CD 08-03 [5] if the addressing scheme in Annex C is used.

5.2.2.1.3.2   **Terminal Interface identification - terminal to network**

In the case of non-dynamic assignment of TEIs the terminal is identified by the layer 2 address (TEI value).

In the case of dynamic assignment of TEIs and using MSN, DDI or CCITT Recommendation X.121 subaddresses, the terminal identity 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.

5.2.2.1.4   **Call establishment**

ETS 300 007 [1] procedures using ETS 300 102 Part 1 [3] signalling may be used to notify the user of incoming calls when conditional notification is applicable. Networks shall provide at least one of the two notification classes defined in ETS 300 007 [1]: no notification class and conditional notification class. These classes may be provided on a subscription basis.

CCITT Recommendation X.25 [4] packet layer procedures are operated on an active logical link.

5.2.2.1.5   **Data transfer**

CCITT Recommendation X.25 [4] packet layer data transfer procedures apply.

5.2.2.1.6   **Terminating the call**

CCITT Recommendation X.25 [4] packet layer call clearing procedures apply.

5.2.2.1.7   **Layer 2 deactivation**

The terminal/network should deactivate layer 2 after clearing the last VC unless layer 2 is semi-permanent or follow on calls are expected.

5.2.2.1.8   **Layer 1 deactivation**

Layer 1 should be deactivated (from the network side) if it is not needed by other services. However, it shall remain active for semi-permanent layer 2 (see subclause 5.2.2.1.2, Method 1). Layer one shall be permanently active for Primary Rate Access (PRA).

5.2.2.2   **Permanent virtual circuit procedures**

5.2.2.2.1   **Layer 1 activation**

Layer 1 shall be permanently active.

5.2.2.2.2   **Layer 2 activation**

Layer 2 shall be permanently available. This may be achieved using methods 1 or 2 outlined in subclause 5.2.2.1.2.

5.2.2.2.3   **Terminal selection/identification**

Fixed at subscription time.

5.2.2.2.4   **Call establishment**

Not applicable.

5.2.2.2.5 **Data transfer**

CCITT Recommendation X.25 [4] packet layer data transfer procedures apply.

5.2.2.2.6 **Terminating the call**

Not applicable.

5.2.2.2.7 **Layer 2 deactivation**

Layer 2 shall be permanently available. This may be achieved using methods 1 or 2 of subclause 5.2.2.1.2.

5.2.2.2.8 **Layer 1 deactivation**

Layer 1 shall be permanently active.

5.2.3 **Interrogation and editing**

Not applicable.

5.3 **Exceptional procedures**

5.3.1 **Activation, deactivation and registration**

Not applicable.

5.3.2 **Invocation and operation**

5.3.2.1 **Virtual call**

In case of failure situations due to calling/called user error, user state, or network conditions, appropriate failure indications shall be signalled from the network to the user, and the call set-up or activated call may be terminated.

5.3.2.2 **Permanent virtual circuit**

In case of failure situations due to user error, user state, or network conditions, appropriate failure indications shall be signalled from the network to the user.

5.3.3 **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

This stage 1 service description applies to point-to-point ISDN access arrangements (NT2, e.g. Private Automatic Branch Exchange (PABX)) with or without a PH function. NT2 arrangements as a minimum require a frame handling capability.

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

   Demand - Permanent.

6) Symmetry

Bi-directional symmetric.

7) Communication configuration

Point-to-point.

Access attributes

8) Access channel

D(16), D(64).

9) Access protocol

a) Access protocol layer 1:

- ETS 300 012 [6] or ETS 300 011 [7] (CCITT Recommendations I.430 D(16) or I.431 D(64)).

b) ISDN signalling access protocol layer 2:

- ETS 300 125 [2] (CCITT Recommendation Q.921); SAPI = 0, if necessary.

NOTE: Only necessary in the case of on demand Layer 2 with dynamic allocation of TEIs (see subclause 5.2.2.1.2, Method 3).

c) ISDN signalling access protocol layer 3:

- ETS 300 102 Part 1 [3] (CCITT Recommendation Q.931), if necessary.

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

d) ISDN PMBS protocol layer 2:

- ETS 300 125 [2] (CCITT Recommendation Q.921); SAPI=16.

e) ISDN PMBS signalling protocol layer 3:

- CCITT Recommendation X.25 [4] PLP.

f) ISDN PMBS Information transfer protocol layer 3:

- CCITT Recommendation X.25 [4] PLP.

General attributes

10) Supplementary services and user facilities provided

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

NOTE: Only used in conditional notification for the first call to a DTE.

Standard CCITT Recommendation X.2 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 1

Information transfer rate	Establishment of communication	Symmetry	Communication configuration	Provision
See attribute 2)	Demand D 16	Bi-directional Symmetric	point-to-point point-to-point	A
	D 64	Bi-directional Symmetric	point-to-point	A
See Attribute 2)	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

The following service profile is defined to be applicable to users who have not subscribed to a different specific service profile. Support of the OSI network layer service is a general requirement of this standard service profile:

- single link procedure, modulo 128;

- standard basic packet sequence numbering (modulo 8);

- incoming/outgoing calls allowed;

- two-way logical channels: 2;

- default maximum packet length: 128 octets;

- default window size: 2;

- fast select acceptance facility;

- default throughput class: A (9600 bits/s);

- throughput class negotiation facility available;

- transit delay negotiation allowed;

- CCITT-specified DTE facilities to support the OSI network service (Annex G to CCITT Recommendation X.25 [4]).

    NOTE 1:   Type of address and numbering plan identifier will be available in the future (at the latest by time T).

    NOTE 2:   No other facilities available.

Annex B (normative): User facilities

Table B.1: Optional user facilities

	X.2 (Version 84)	CCITT		Service provided by this ETS	
	Optional user facility	VC	PVC	VC	PVC
1	Optional user facilities assigned for an agreed contractual period				
1.1	Extended packet sequence numbering (modulo 128)	A	A	N	N
1.2	Nonstandard default window sizes	A	A	E	E
1.3	Nonstandard default packet sizes 16, 32, 64,	A	A	N	N
	256	A	A	A	A
1.4	Default throughput class assignment	A	A	E	E
1.5	Flow control parameter negotiation	E	–	E	–
1.6	Throughput class negotiation	E	–	E	–
1.7	Packet retransmission	A	A	N	N
1.8	Incoming calls barred	E	–	E	–
1.9	Outgoing calls barred	E	–	E	–
1.10	One-way logical channel outgoing	E	–	E	–
1.11	One-way logical channel incoming	A	–	E	–
1.12	Closed user group	E	–	E	–
1.13	Closed user group with outgoing access	A	–	E	–
1.14	Closed user group with incoming access	A	–	E	–
1.15	Incoming calls barred within a closed user group	A	–	E	–
1.16	Outgoing calls barred within a closed user group	A	–	E	–
1.17	Bilateral closed user group	A	–	N	–
1.18	Bilateral closed user group within outgoing access	A	–	N	–
1.19	Reverse charging acceptance	A	–	E	–
1.20	Fast select acceptance	E	–	E	–
1.21	Multilink procedure - not relevant for D-channel				
1.22	Charging information	A	–	A	–
1.23	Direct call	FS	–	N	–
1.24	Hunt group	A	–	A	–
1.25	On-line facility registration	A	–	A	–
1.26	D-bit modification	A	A	N	N
1.27	Local charge prevention	A	–	A	–
1.28	Call redirection	A	–	E	–
1.29	Network user identification	A	–	A	–
1.30	Extended frame sequence numbering. Not applicable as a facility: default and only mode is modulo 128				
1.31	RPOA selection	A	–	N	–
2	Optional user facilities on a per-call basis				
2.1	Closed user group selection	E	–	E	–
2.2	Bilateral closed user group selection	A	–	N	–
2.3	Reverse charging, Note 1)	A	–	E	–
2.4	RPOA selection	A	–	N	–
2.5	Flow control parameter negotiation	E	–	E	–
2.6	Fast select	E	–	E	–
2.7	Throughput class negotiation	E	–	E	–
2.8	Abbreviated address calling	FS	–	N	–
2.9	Charging information	A	–	A	–
2.10	Transit delay selection and indication	E	–	E	–
2.11	Call redirection or forwarding to alternate DTE	A	–	A	–
2.12	Called line address modified notification	A	–	E	–
2.13	Network user identification	A	–	A	–
2.14	Closed user group with outgoing access selection	A	–	A	–
3	Additional features				
3.1	Extended interrupt	E	E	E	E
3.2	CCITT-specified DTE facilities	E	–	E	–
4	New facilities X.2 (Version 88)				
4.1	Call deflection subscription	A	–	A	–
4.2	Call deflection selection	A	–	A	–
4.3	TOA/NPI address subscription	FS	–	NOTE 2	–
4.4	NUI override	A	–	A	–

E = essential for conformance.
A = additional.
N = presently not offered, unlikely to be available on many networks in the future.
FS = further study is required.

NOTE 1: For the time being, only for national use.

NOTE 2: Type of address and numbering plan identifier will be available in the future (at the latest by time T).

Annex C (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] (CCITT Recommendations I.462/X.31).

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 [10]) 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 numbers, which would facilitate interworking between ISDNs and PSPDNs. Since only CCITT Recommendation E.164 [10] numbers can be conveyed in an incoming call signal for terminal selection purposes, CCITT Recommendation X.121 numbers must be used only in conjunction with the no notification class defined in ETS 300 007 [1] (CCITT Recommendation I.462/X.31).

Annex D (informative):   Bibliography

The following informative references are used within this document:

I.430   CCITT Recommendation I.430 (1988): "Basic user-network interface -Layer 1 specification".

I.431   CCITT Recommendation I.431 (1988): "Primary rate user-network interface - Layer 1 specification".

I.441   CCITT Recommendation I.441 (1988): "Integrated Services Digital Network (ISDN) user-network interface, data-link layer specification".

I.451   CCITT Recommendation I.451 (1988): "ISDN user-network interface layer 3 specification for basic call control".

I.462   CCITT Recommendation I.462 (1988): "Support of packet mode terminal equipment by an ISDN".

Q.921   CCITT Recommendation Q.921 (1988): "ISDN user-network interface -Data Link Layer Specification".

Q.931   CCITT Recommendation Q.931 (1988): "ISDN user-network interface layer 3 specification for basic call control".

X.2   CCITT Recommendation X.2 (1988): "International data transmission services and optional user facilities in public data networks and ISDNs".

X.31   CCITT Recommendation X.31 (1988): "Support of packet mode terminal equipment by an ISDN".

X.121   CCITT Recommendation X.121 (1988): "International numbering plan for public data networks".

History

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