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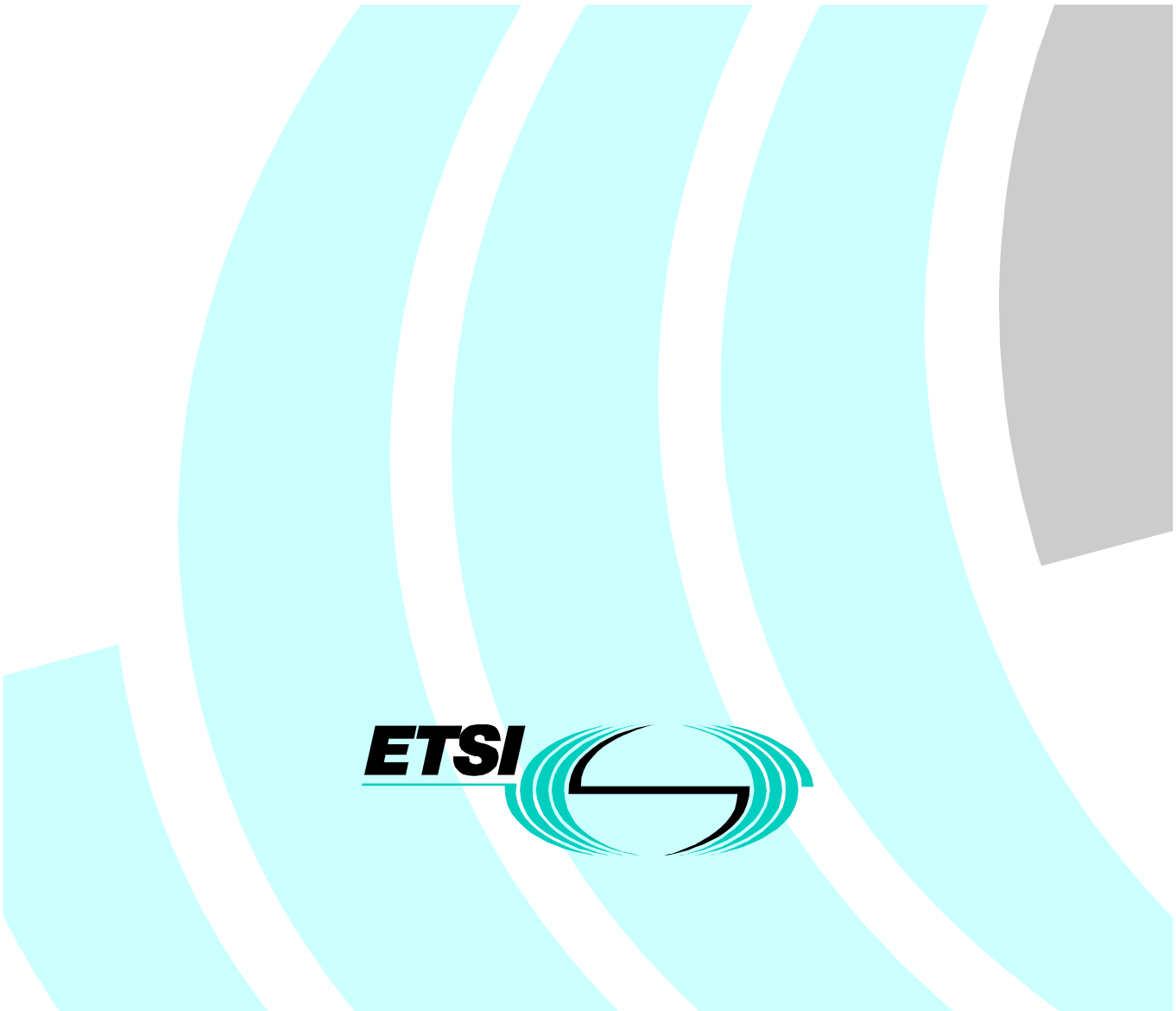
European Standard (Telecommunications series)

Digital Enhanced Cordless Telecommunications (DECT); Data Services Profile (DSP); Point-to-Point Protocol (PPP) interworking for internet access and general multi-protocol datagram transport



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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Project Digital Enhanced Cordless Telecommunications (DECT).

National transposition dates	
Date of adoption of this EN:	19 June 1998
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Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 March 1999
Date of withdrawal of any conflicting National Standard (dow):	31 March 1999

1 Scope

The present document defines a profile for Digital Enhanced Cordless Telecommunications (DECT) systems conforming to EN 300 175, parts 1 to 7 [1] to [7]. It is part of a family of profiles that build upon and extend each other, aimed at the general connection of terminals supporting non-voice services to a fixed infra-structure, private and public.

The present document is intended for use in roaming applications and so specifies mobility class 2. It thus specifies the requirements on the Network (NWK) layer Call Control (CC) and Mobility Management (MM) entities, to provide full public services.

The present document builds upon services offered by the data service profiles as defined in ETS 300 701 [9] and ETS 300 651 [8]. It specifies an interworking profile for non-voice equipment with roaming mobility, providing Point-to-Point Protocol (PPP) transmission to allow dial-up internet access and general multi-protocol datagram transport. PPP packet transfers on the DECT air interface are specified via a high efficient DECT packet transmission protocol. However, interworking to the fixed network may be via a number of interface protocols, including X.25, frame relay, Asynchronous Transfer Mode (ATM), and traditional circuit switched voice band modem and Integrated Services Digital Network (ISDN) connection.

The present document defines the specific requirements on the Physical (PHL), Medium Access Control (MAC), data Link Control (DLC) and NWK layers of DECT. The standard also specifies Management Entity (ME) requirements and generic interworking conventions which ensure the efficient use of the DECT spectrum.

2 Normative references

References may be made to:

a) specific versions of publications (identified by date of publication, edition number, version number, etc.), in which case, subsequent revisions to the referenced document do not apply; or

b) all versions up to and including the identified version (identified by "up to and including" before the version identity); or

c) all versions subsequent to and including the identified version (identified by "onwards" following the version identity); or

d) publications without mention of a specific version, in which case the latest version applies.

A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] EN 300 175-1: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 1: Overview".

[2] EN 300 175-2: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 2: Physical layer (PHL)".

[3] EN 300 175-3: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 3: Medium Access Control (MAC) layer".

[4] EN 300 175-4: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 4: Data Link Control (DLC) layer".

[5] EN 300 175-5: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 5: Network (NWK) layer".

[6] EN 300 175-6: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 6: Identities and addressing".

[7] EN 300 175-7: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 7: Security features".

[8] ETS 300 651: "Digital Enhanced Cordless Telecommunications (DECT); Data Services Profile (DSP); Generic data link service; Service type C, class 2".

[9] ETS 300 701: "Digital Enhanced Cordless Telecommunications (DECT); Data Services Profile (DSP); Generic frame relay service with mobility (service types A and B, class 2)".

[10] RFC 1618 (1994): "PPP over ISDN".

[11] RFC 1661 (1994): "The Point-to-Point Protocol (PPP)".

[12] RFC 1662 (1994): "PPP in HDLC-like Framing".

[13] RFC 1989 (1996): "PPP Link Quality Monitoring".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following definitions apply:

interworking unit: A unit that is used to interconnect subnetworks.

interworking functions: Functions contained into the interworking unit, in order to support the required subnetwork interworking.

mobility class 2: Private and public roaming applications for which terminals may move between Fixed Parts (FPs) within a given domain and for which association of service parameters is explicit at the time of service request.

service type C: Non-transparent connection of data streams requiring Link Access Procedure (LAP) services, optimised for high reliability and low additional complexity. This builds upon the services offered by the type A or B profiles.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ACCM	Async-Control-Character-Map
ATM	Asynchronous Transfer Mode
CC	Call Control
C-plane	Control Plane
CRC	Cyclic Redundancy Check
DECT	Digital Enhanced Cordless Telecommunications
DLC	Data Link Control
DSP	Data Services Profile
FP	Fixed Part
FT	Fixed radio Termination
HDLC	High level Data Link Control
I_P	higher layer Information channel (Protected)
ISDN	Integrated Services Digital Network
IWF	InterWorking Functions
IWU	InterWorking Unit
LAP	Link Access Procedure
LAP-C	Link Access Procedure (Control)
LAP-U	Link Access Procedure (U-plane)
LCP	Link Control Protocol
LLS	Lower Layer Status
MAC	Medium Access Control
ME	Management Entity
MM	Mobility Management
MNCC	Mobile Network Call Control

NWK	Network
PDU	Protocol Data Unit
PHL	Physical
PICS	Protocol Implementation Conformance Statement
PP	Portable Part
PPP	Point-to-Point Protocol
PT	Portable radio Termination
RFC	Request For Comment
RFP	Radio Fixed Part
SAP	Service Access Point
SAPI	Service Access Point Identity
SDU	Service Data Unit
U-plane	User plane

4 Description of services

4.1 Reference configuration

The reference configuration for this profile shall be as shown in figure 1.

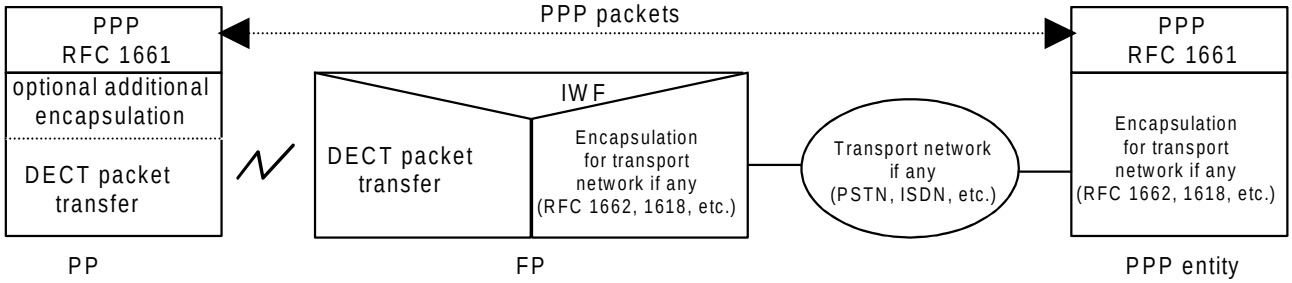

Figure 1: Profile reference configuration (U-plane)

This profile is aimed at applications requiring the transport of PPP packets to a peer entity. A typical application is the on-demand access to an internet service provider. The DECT air interface will be accessed by means of the standard procedures already defined by the C.2 data services profile, ETS 300 651 [8]. A PP wishing to access this service shall request the PPP profile by means of the standard DECT signalling, specifying also the address of the peer entity, and the method of encapsulation.

The Interworking Unit (IWU), if necessary, shall set up a point-to-point connection through the transport network. When such a connection is established, IWU shall encapsulate PPP packets in the way selected by the user.

4.2 Service objectives

The profile has the following service objectives:

Table 1

Offered services	Status
point-to-point SDU transfer PP-FP	Yes
point-to-point SDU transfer FP-PP	Yes
Service change and negotiation	Yes
Data streaming	Optional
Segmentation of higher layer user information	Mandatory
in-band user control signalling	Optional
Encryption	Optional

Table 2

Performance	
Maximum sustainable throughput	24 kbit/s per bearer
Establishment of PT to FT link	50 ms
Establishment of FT to PT link	50 - 160 ms
Undetected error rate	Less than 10^{-10} per bit
Services	point-to-point SDU transfer PP-FP point-to-point SDU transfer FP-PP
maximum supported PPP packet size	1 526 octets

5 PHL layer requirements

The requirements of the service type C, mobility class 2, defined in ETS 300 651 [8], shall apply.

6 MAC layer requirements

The requirements of the service type C, mobility class 2, defined in ETS 300 651 [8], shall apply.

7 DLC layer requirements

7.1 C-Plane requirements

The requirements of the service type C, mobility class 2, defined in ETS 300 651 [8], shall apply.

7.2 U-Plane requirements

The requirements of the service type C, mobility class 2, defined in ETS 300 651 [8], shall apply. In particular, segmentation of higher layer user messages in the information field shall be supported, as described in ETS 300 651 [8], subclause A.3.3.5. Any implementation of FP and PP claiming to conform to this profile will support a maximum size of the information field in the LU3 frame of 1 526 octets.

8 NWK layer requirements

The requirements of the service type C, mobility class 2, defined in ETS 300 651 [8] shall apply.

The call control entity shall support the packet mode procedures, as described in EN 300 175-5 [5] and indicated by turning off condition C1 and turning on condition C7 in annexes F and G of ETS 300 651 [8].

9 Management entity requirements

9.1 Link resource management

The request to suspend the call is issued by the InterWorking Functions (IWF) to the DECT network layer through service primitives, but it shall be a management entity decision as to when to suspend or to resume a call.

The ME may choose at any time to suspend the call according to implementation-specific algorithms. In any case, the ME shall suspend or release the call at least if all the following conditions are satisfied:

- the encapsulation entity in the IWF has not passed a whole PPP packet for transmission to LAP-U for a period of 5/n seconds, where n is the number of active duplex and double simplex MAC bearers related to the LAP-U connection;
- the segmentation entity in the IWF contains no pending data in its receiving PPP packet assembly buffers;
- LAP-U is in an idle condition, as defined in ETS 300 651 [8] annex A, subclause A.6.2;
- there is no peer-to-peer signalling procedure ongoing or pending.

The ME involving the PP and the FP shall not resume the call until either of the following conditions are met:

- there is data to be sent over the U-plane;
- there is a signalling message to be sent by a C-Plane entity.

The LU3 entity in the Portable Part shall never signal any Down/Up events to the PPP entity, as a consequence of a call suspension/resumption.

Reporting-period timers for the Link Quality Monitoring protocol, as defined in RFC 1989 [13], should be negotiated by the PPP entities, during the LCP setup phase, in such a way that their value is much greater than 5 seconds, so that this protocol does not interfere with the suspension/resumption management procedure.

10 Generic interworking conventions and procedures

10.1 LU3 SDU format

The upper layer entities in both the Portable Part and the IWF shall exchange PPP data with the LU3 entities by means of protocol SDUs. Three different types of SDUs are defined:

- type A shall contain a PPP packet, as defined in RFC 1661 [11];
- type B shall contain a PPP frame as defined in RFC 1662 [12] subclause 3.1;
- type C shall contain a PPP frame as for type B, together with octets inserted by the octet transparency procedure as defined in RFC 1662 [12].

For each interworking service, the proper annex will specify which type of SDU shall be used.

To ensure interoperability between different equipment, all PPs claiming to conform to this profile shall support SDU type A. The support of SDU types B and C shall be mandatory except for PPs designed to provide this service with a maximum data rate in excess of 64 kbit/s.

10.2 Control frame for PPP lower layer up signal

Control frames shall be sent using the LAP-U Service Access Point Identity (SAPI) indicating user control signalling data. Such frames shall be sent in the FP->PP direction only.

The following frame format shall be used:

Bit	8	7	6	5	4	3	2	1	Octet
	frame type								1
	0	LLS	0	0	0	0	0	0	2

Frame type coding (octet 1):

Bits	**8 7 6 5 4 3 2 1**	**Meaning**
	0 0 0 0 0 0 1 0	PPP lower layer status frame

Lower Layer Status (octet 2):

Bits	**7**	**Meaning**
	0	PPP lower layer down
	1	PPP lower layer up

The PPP Lower Layer Status (LLS) shall be transferred to the PP whenever a status change of the protocol upon which the PPP protocol is layered is detected by the FP/IWF, on the fixed subnetwork connection. Examples of such events at the physical layer are modems starting/ending handshake, retrain or rate changes sequences, or any failure whatsoever.

On any change of PPP LLS, the FP/IWF shall pass this status to the user control signaling data Service Access Point (SAP), for transmission in a LAP-U I-frame.

If an I-frame is being processed, this frame shall be closed and transmitted immediately. The next I-frame to be sent shall be an I-frame with the SAPI indicating user control signalling data and with the data field containing the actual state of PPP LLS.

10.3 Call control interworking

The FP/IWF shall map the DECT C-Plane Call Control procedures onto those proper of the transport network, if any.

10.3.1 PP originated call

The FP/IWF shall request to establish a connection over the transport network when a {CC-SETUP} message is received, where the <<IWU-ATTRIBUTES>> information element shall indicate the Interworking resources requested by the PP; if these resources are not available, a peer attribute negotiation can be started. If no acceptable resources can be negotiated, the call shall be released. <<IWU-ATTRIBUTES>> contents shall be mapped to the transport network signaling where necessary.

The <<CALLED-PARTY-NUMBER>> information element shall contain the destination address of the remote party, specified in a suitable numbering plan.

If the local fixed network provides call progress indication, these shall not be interworked to the DECT network. The call procedures shall be continued by sending a MNCC-CONNECT-req primitive to the IWU, when an "Answer" indication is detected from the remote party. This primitive definition is a matter of the local fixed network. For instance, when a circuit switched network is selected, the "Answer" indication may be triggered by the "off-hook" detection; when a packet switched connection-oriented network is selected, this primitive shall be triggered by the FP/IWF when receiving a packet establishing the virtual circuit.

Depending on the attached local fixed network and the called party, it may not be possible to detect any of the above. Under such circumstances the FP/IWF is permitted to issue a MNCC-RELEASE-req primitive following a timeout period, indicating release reason "timer expired".

When the call control is in the Active state, and before data exchange between PPP parties may begin, a PPP lower layer establishment phase could be necessary, if the data connection over the transport network is not yet available. When the data connection is established, the FP/IWF shall indicate to the PPP entity in the PP the lower layer status, as described in subclause 10.2.

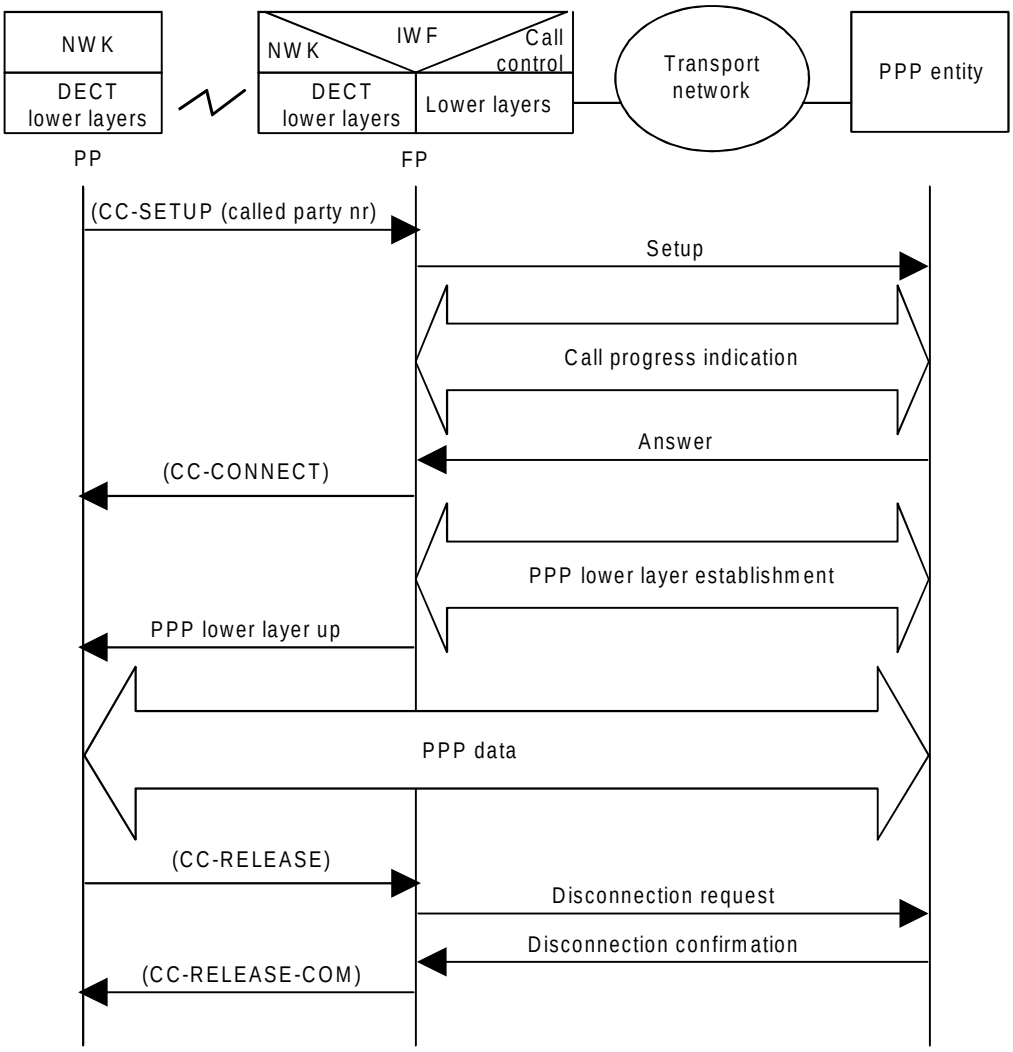

Figure 2: Call control procedures interworking- PP originated call

10.3.2 PP terminated call

A MNCC-SETUP-req shall be sent to the IWU when a "Setup" request is received from the fixed network. The definition of this event is a matter of the fixed network.

For an incoming call, those parameters of the <<IWU-ATTRIBUTES>> information element which cannot be derived from the fixed network shall be locally determined. They shall be used by the IWU in the MNCC-SETUP.req primitive. A PP-initiated peer attribute negotiation may be used to modify these values.

If a {CC-ALERTING} message is received, the FP/IWF shall generate the MNCC-ALERT-ind primitive. This indication may be interworked to the local network call progress indication.

When a {CC-CONNECT} message is received by he FP/IWF, a MNCC-CONNECT-ind shall be transmitted by the IWU. This primitive shall trigger the "Answer" action, whose definition is a matter of the local fixed network. For instance, when a circuit switched network is selected, the "Answer" indication may be an "off-hook" generation; when a packet switched connection-oriented network is selected, this primitive shall trigger the transmission of a packet confirming the establishment of the virtual circuit.

When the call control is in the Active state, and before data exchange between PPP parties begin, a PPP lower layer establishment phase could be necessary, if the data connection over the transport network is not yet available. When the data connection is established, the FP/IWF shall indicate to the PPP the lower layer status as described in subclause 10.2.

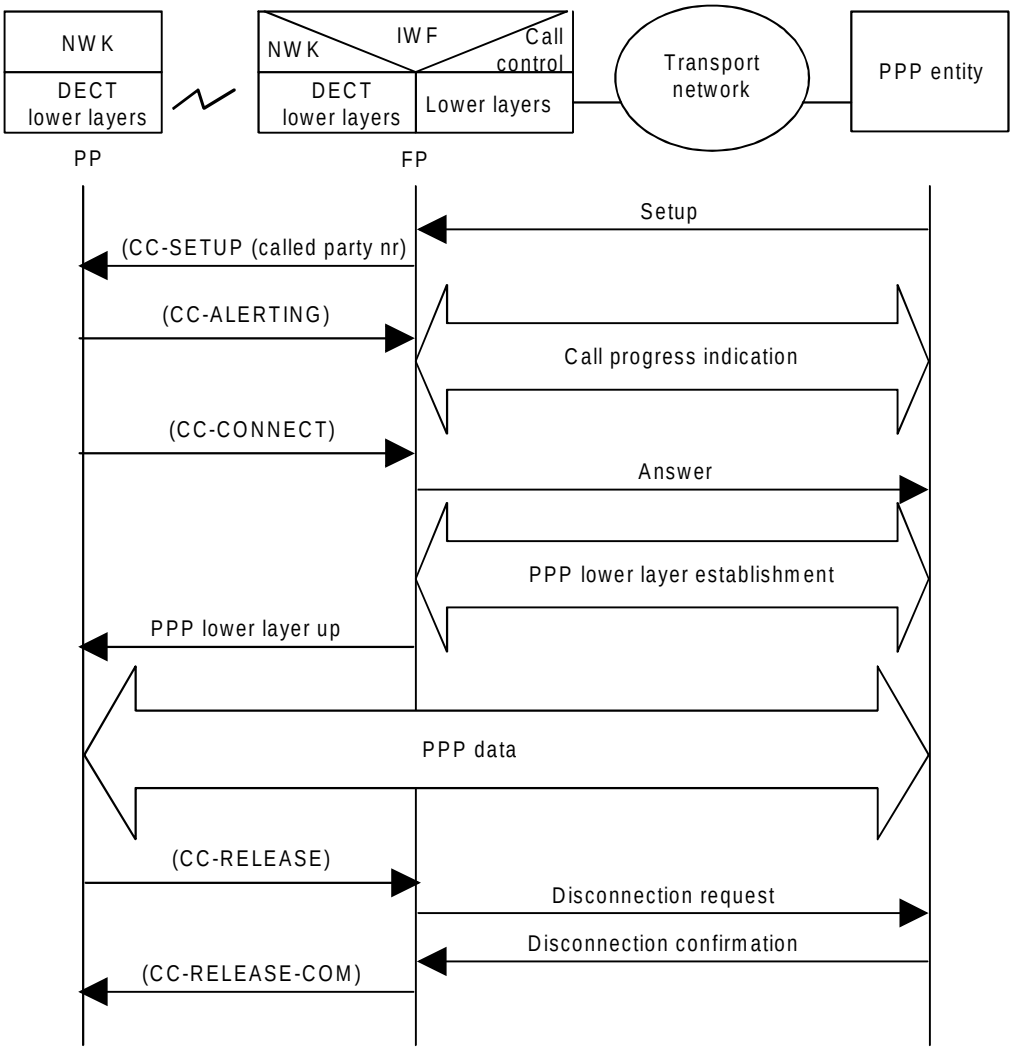

Figure 3: Call control procedures interworking - PP terminated call

Annex A (normative): Interworking specific codings

Devices implementing the interworking units described in this profile shall use the following IWU-Attributes coding:

Bit:	8	7	6	5	4	3	2	1	Octet:
0	<<IWU-ATTRIBUTES>>								1
Length of Contents (L)									2
	CodeStd		Profile						3
1	0	1	0	0	0	0	1		
	Negotiation indicator		Profile subtype						4
1			0	0	1	1			
1	PPP interworking service								5
0/1	Specific interworking service codings								6
...									...
0/1	Specific interwoking service codings								N

Negotiation indicator (octet 4):

Bits 7 6 5	Meaning
0 0 0	Negotiation not possible
0 1 0	Peer attribute negotiation
1 0 0	Exchanged attribute negotiation
1 1 0	Exchanged attribute negotiation and Peer attribute negotiation

All other values reserved.

PPP interworking service (octet 5)

Bits 7 6 5 4 3 2 1	Meaning
0 0 0 0 0 0 0	Native PPP service
0 0 0 0 0 0 1	Modem service
0 0 0 0 0 1 0	ISDN service
0 0 0 0 0 1 1	X.25 service
0 0 0 0 1 0 0	Frame Relay service

All other values reserved.

Each of the following annexes for interworking conventions to specific networks defines its proper service codings, starting from byte 6 inclusive.

Annex B (normative): Interworking conventions to specific fixed network services

B.1 Native PPP service

Type A SDU, as defined in subclause 10.1, shall be used.

B.1.1 Reference configuration

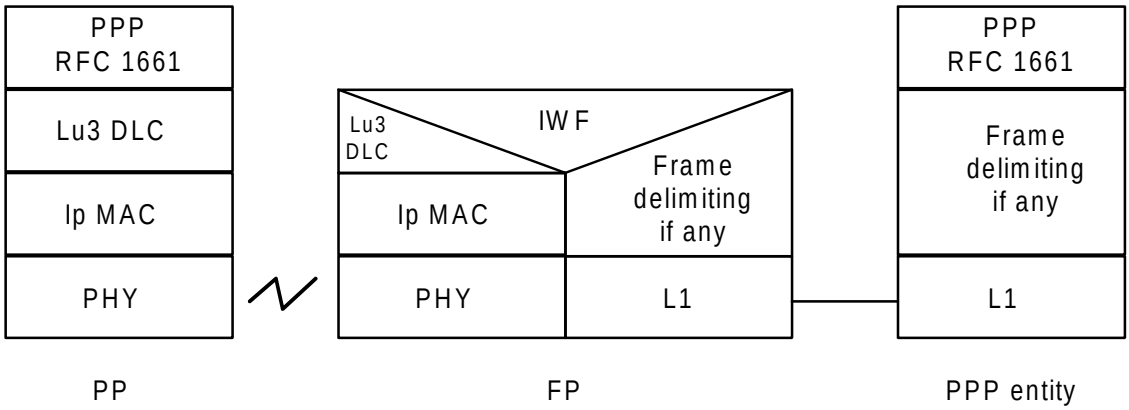

Figure B.1: Native PPP service

B.1.2 IWU attributes specific codings

Devices implementing the IWUs described in this annex shall use the IWU-Attributes coding as defined in annex A, up to byte number 5 included.

B.2 Modem service

This interworking annex shall be based on the framing techniques described in RFC 1662 [12].

B.2.1 Interworking with octet-stuffed framing

Type C SDU, as defined in subclause 10.1, shall be used. Octets could be added to a PPP packet for both flag and escape character transparency and the Async-Control-Character-Map (ACCM) treatment (see RFC 1662 [12] subclause 4.2).

Each octet shall be transferred to modems in asynchronous format, with one stop bit, eight bits of data and no parity (see RFC 1662 [12]).

B.2.1.1 Reference configuration

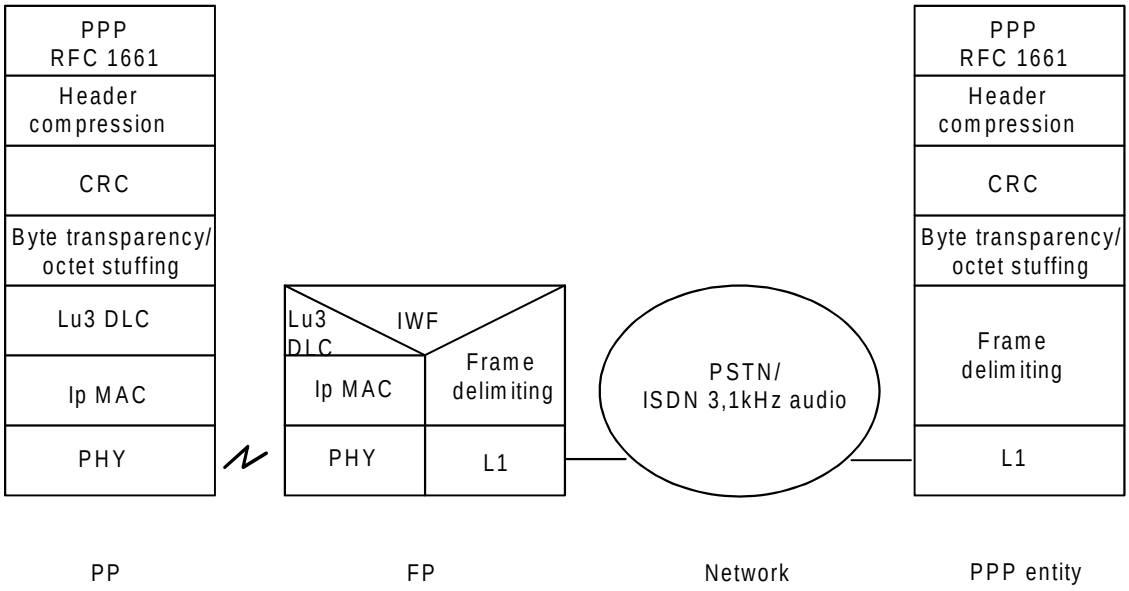

Figure B.2: Interworking with octet-stuffed framing (U-plane)

B.2.1.2 Specific interworking conventions

The PPP frames shall be transmitted as follows:

- first the address field will be transmitted, if address and control compression is not performed; else the first byte of the protocol field will be transmitted. The last transmitted field will be the PPP Cyclic Redundancy Check (CRC). All octets shall be transmitted least significant bit first.

No SDUs shall be passed to the LU3 SAP during PPP both inter-octet and inter-frame idle periods.The FP/IWF shall transmit the idle bits time-fill pattern to the network, during PPP inter-frame idle periods. If stream mode is supported, the same applies for inter-octet idle period also.

Moreover, the FP/IWF shall only detect the opening an closing flags of a PPP frame going to the PP, which will be passed as a single type C SDU to the LU3 SAP.

B.2.2 Interworking with bit-stuffed framing

Type B SDU, as defined in subclause 10.1, shall be used.

B.2.2.1 Reference configuration

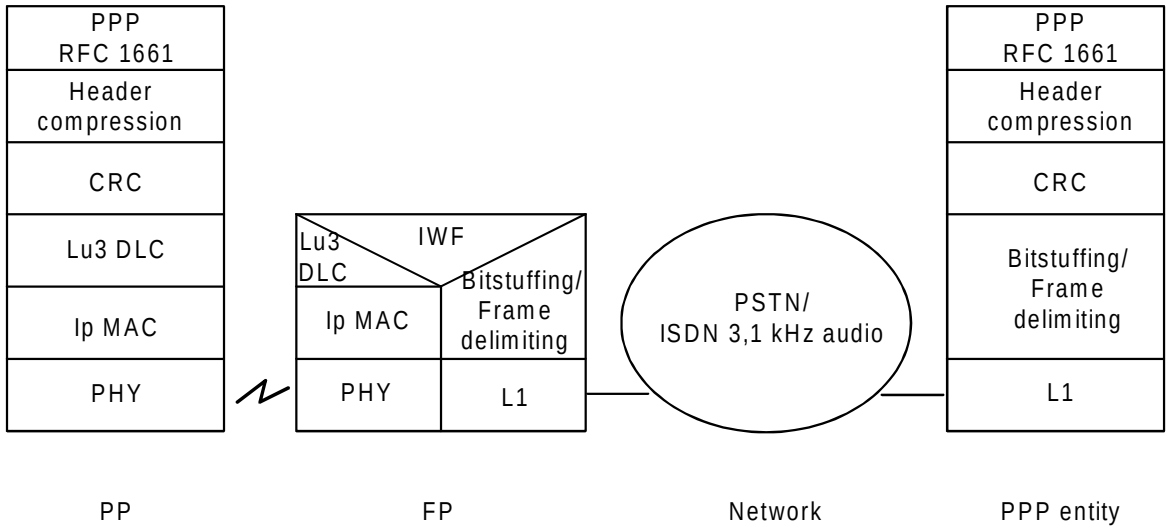

Figure B.3: Interworking with bit-stuffed framing

B.2.2.2 Specific interworking conventions

No SDU shall be passed to the LU3 SAP during PPP inter-frame idle period.

The FP/IWF shall operate the High level Data Link Control (HDLC) bitstuffing. The FP/IWF shall transmit HDLC flags as the time-fill pattern to the network, during PPP inter-frame idle periods.

Moreover, the FP/IWF shall only detect the opening and closing flags of a PPP frame, which will be passed as a type B SDU to the LU3 SAP.

B.2.3 IWU attributes specific codings

Devices implementing the IWUs described in this annex shall add the following coding to the IWU-Attributes information element defined in annex A, starting from byte number 6:

0/1	Data rate				6
1	Frm	Modem type			6a
1	Euc	Eec	Fbk	reserved	7 (note 1)

NOTE 1: Octet 7 is optional and maybe omitted if indicated by the L field.

Data rate (octet 6):

Bits	7 6 5 4 3 2 1	Meaning
	0 0 0 0 0 0 0	unspecified
	0 0 0 0 1 x x	(xx+1) × 50 bit/s. (50 - 200 bit/s)
	0 0 0 1 x x x	(xxx+1) × 300 bit/s. (300 - 2 400 bit/s)
	0 0 1 x x x x	(xxxx+2) × 2 400 bit/s. (4,8 - 40,8 kbit/s)
	0 1 x x x x x	(xxxxx+1) × 8 000 bit/s. (8 - 256 kbit/s) (note 3)
	1 0 x x x x x	(xxxxx+6) × 9 600 bit/s. (57,6 - 355,2 kbits/s) (note 3)
	1 1 0 x x x x	(xxxx+11) × 24 000 bit/s. (264 - 624 kbits/s) (note 3)
	1 1 1 0 0 0 0	75 bit/s
	1 1 1 0 0 0 1	110 bit/s
	1 1 1 0 0 1 0	134,5 bit/s
	1 1 1 0 0 1 1	75 / 1 200 bit/s (note 2)
	1 1 1 0 1 0 0	1 200 / 75 bit/s (note 2)
	All other values reserved.	

NOTE 2: The first rate is the transmit rate in forward direction of the call. The second rate is the transmit rate in backward direction of the call.

NOTE 3: Some bit rates (24, 96, 144, 192, 240, 288, and 336 kbit/s) are codeable in several different ways. These codings are all valid.

Framing (Frm) (octet 6a):

Bits	7	Meaning
	0	Octet-stuffed (asynchronous) framing
	1	Bit-stuffed (synchronous) framing

Modem type (octet 6a):

Bits	7 6 5 4 3 2 1	Meaning
	0 0 0 0 0 0	automoding
	0 0 0 0 0 1	V.21
	0 0 0 0 1 0	V.22
	0 0 0 0 1 1	V.22bis
	0 0 0 1 0 0	V.23
	0 0 0 1 0 0	V.32
	0 0 1 1 0 1	V.35
	0 0 0 1 0 1	V.32bis
	0 0 0 1 1 0	V.34
	All other values reserved.	

NOTE 4: Only full duplex modems can support a PPP connection (see RFC 1662 [12]).

NOTE 5: When modem value is "automoding", it is assumed that a multistandard modem is available in the IWU. The modulation shall be negotiated over the external network connection at modem startup.

End User Compression (Euc) (octet 7):

Bits	7	Meaning
	0	Do not use data compression over the modem connection
	1	Use data compression over external network (default if octet 7 is not present, and asynchronous operation is selected)

End User Correction (Eec) (octet 7):

Bits	6	Meaning
	0	Do not use V.42 data correction over the modem connection
	1	Use V.42 data correction over the modem connection (default if octet 7 is not present, and asynchronous operation is selected)

Fall back (Fbk) (octet 7):

Bits	5	Meaning
	0	Do not enable inband modem rate negotiation during a connection
	1	Enable inband modem rate negotiation during a connection (default if octet 7 is not present)

B.3 ISDN service

This interworking annex shall be based on the framing techniques described in RFC 1618 [10] and RFC 1662 [12].

B.3.1 Interworking with bit-synchronous framing

See subclause B.2.2.

B.3.1.1 Reference configuration

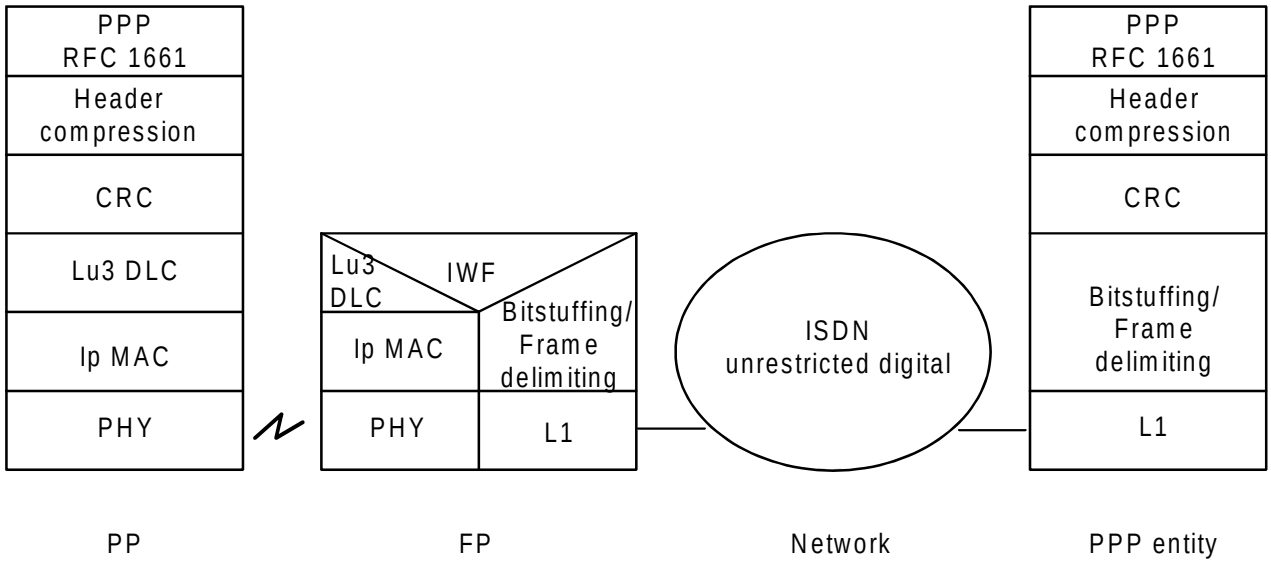

Figure B.4: Interworking with bit-synchronous framing

Frames shall be transferred to the ISDN, where a bit-synchronous reference point is available.

B.3.2 Interworking with octet-synchronous framing

Type C SDU, as defined in subclause 10.1, shall be used. Octets shall be added to PPP packets for flag and escape character transparency only.

B.3.2.1 Reference configuration

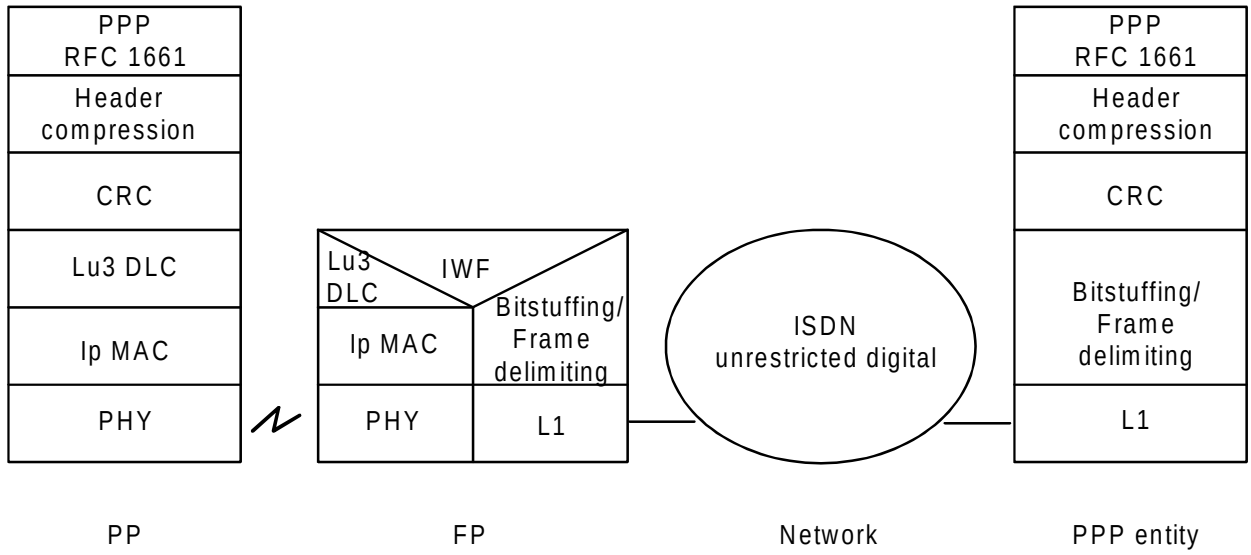

Figure B.5: Interworking with bit-synchronous framing

Frames shall be transferred to the ISDN, where an octet-synchronous reference point is available.

B.3.3 IWU attributes specific codings

Devices implementing the IWUs described in this annex shall add the following coding to the IWU-Attributes information element defined in annex A, starting from byte number 6:

0/1	Frm	reserved	6 (note)

NOTE: Octet 6 is optional and may be omitted if indicated by the L field.

Framing (Frm) (octet 6):

Bits	**7**	**Meaning**
	0	Octet-synchronous framing
	1	Bit-synchronous framing (default if octet 6 is omitted)

History

Document history				
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