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ETSI

European Telecommunications Standards Institute

ETSI Secretariat

Postal address: F-06921 Sophia Antipolis CEDEX - FRANCE
Office address: 650 Route des Lucioles - Sophia Antipolis - Valbonne - FRANCE
X.400: c=fr, a=atlas, p=etsi, s=secretariat - **Internet:** secretariat@etsi.fr

Tel.: +33 92 94 42 00 - Fax: +33 93 65 47 16

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Foreword

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

The meaning of the abbreviation "DECT" has been changed to Digital Enhanced Cordless Telecommunications (DECT) by the decision of the 23rd ETSI Technical Assembly (ETSI TA), 7th November 1995.

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

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1 Scope

This ETS defines a data profile for Digital European Enhanced Telecommunications (DECT) systems conforming to ETS 300 175, Parts 1 to 9 [1]-[9]. 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.

This ETS defines the type C service, mobility class 1, as described in ETR 185 [12].

For the type C service, this ETS specifies a Link Access Protocol service for the DECT U-plane (LAPU) which adds full Data Link Control (DLC) functionality to the generic frame relay service specified in ETS 300 435 [11]. LAPU is based closely on the existing LAPC service and, allied with the generic frame relay service, offers a robust, non-transparent, transfer mechanism for synchronous and asynchronous bit streams. It builds upon the type A and type B generic frame relay services and is therefore fully compatible with both.

This ETS is intended for use in closed user groups and therefore specifies mobility class 1. It contains no requirements for Mobility Management (MM) or Call Control (CC) and, hence, requires no DECT C-plane functionality.

This ETS defines the specific requirements on the Physical (PHL), Medium Access Control (MAC) and DLC layers of DECT and on the Data Services Profile (DSP) base standard. This ETS also specifies Management Entity (ME) requirements and generic inter-working conventions which ensure the efficient use of the DECT spectrum.

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 300 175-1: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Common Interface (CI); Part 1: Overview".

[2] ETS 300 175-2: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Common Interface (CI); Part 2: Physical (PHL) layer".

[3] ETS 300 175-3: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Common Interface (CI); Part 3: Medium Access Control (MAC) layer".

[4] ETS 300 175-4: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Common Interface (CI); Part 4: Data Link Control (DLC) layer".

[5] ETS 300 175-5: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Common Interface (CI); Part 5: Network (NWK) layer".

[6] ETS 300 175-6: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Common Interface (CI); Part 6: Identities and addressing".

[7] ETS 300 175-7: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Common Interface (CI); Part 7: Security features".

[8] ETS 300 175-8: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Common Interface Part 8: Speech coding and transmission".

[9] ETS 300 175-9: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT) Common Interface (CI); Part 9: Public Access Profile (PAP)".

[10] ETR 043: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT) Common interface (CI); Services and facilities requirements specification".

[11] prETS 300 435: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Data Services Profile Base Standard including inter-working to connectionless networks (service types A and B, Class 1)".

[12] ETR 185: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Data Services Profile (DSP); Profile overview".

[13] ISO/IEC 8802: "Information processing - Local Area Networks".

3 Definitions and abbreviations

3.1 Definitions

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

Kbyte: 1 000 bytes.

Kbyte: 1 024 bytes.

mobility class 1: Local area applications, for which terminals are pre-registered off-air with one or more specific fixed parts, and establishment of service and user parameters is therefore implicit, according to a profile-defined list.

multiframe: A repeating sequence of 16 successive Time Division Multiple Access (TDMA) frames, that allows low rate or sporadic information to be multiplexed (e.g. basic system information or paging).

service type A: Low speed frame relay, with a net sustainable throughput of up to 24 kbits/s, optimised for burst data, low power consumption and low complexity applications such as hand-portable equipment.

service type B: High performance frame relay, with a net sustainable throughput of up to 552 kbits/s, optimised for high speed and low latency with burst data. Equipment implementing the type B profile will inter-operate with type A equipment.

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

TDMA frame: A time-division multiplex of 10 ms duration, containing 24 successive full slots. A TDMA frame starts with the first bit period of full slot 0 and ends with the last bit period of full slot 23.

3.2 Abbreviations

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

CC	Call Control
C-plane	Control plane
DCE	Data Circuit-terminating Equipment
DECT	Digital Enhanced Cordless Telecommunications
DLC	Data Link Control
DSP	Data Service Profile
DTE	Data Terminating Equipment
FP	Fixed Part
FT	Fixed radio Termination
IWF	Inter-Working Functions
IWU	Inter-Working Unit
LAN	Local Area data Network
LLME	Lower Layer Management Entity
LAP	Link Access Procedure
LAPC	A DLC protocol
MAC	Medium Access Control
ME	Management Entity
MM	Mobility Management
NWK	NetWorK
PAD	Packet Assembly/Disassembly facility
PHL	PHysicaL layer
PP	Portable Part
PT	Portable radio Termination
SAP	Second Audio Programme (Multi-Channel TV Sound)
SAPI	Service Access Point Identifier
SDU	Service Data Unit
TDMA	Time Division Multiple Access
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.

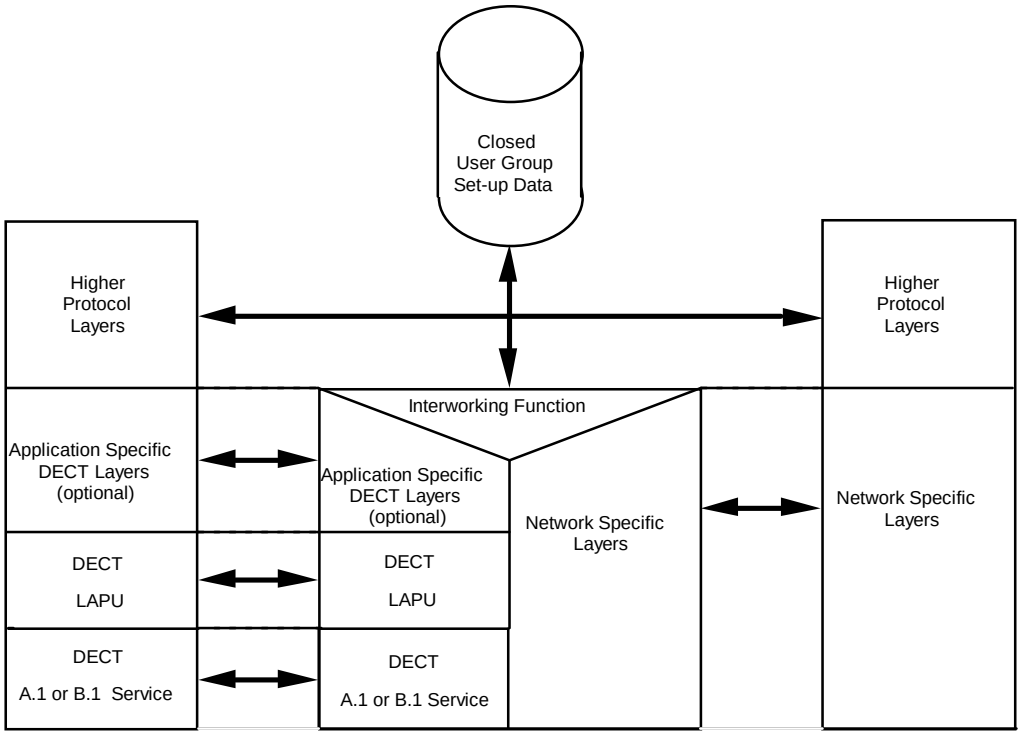

Figure 1: Profile reference configuration showing inter-working to a network via the DECT data link (LAPU) service

The profile reference configuration is based upon the following principles:

- inter-working is with an external network via the generic data link service (service type C);
- inter-working with the end system network layer or above is not a requirement of this ETS;
- the set of supported Portable Parts (PPs) shall constitute a closed user group.

4.2 Service objectives

The profile has the following service objectives, as outlined in ETR 043 [10]:

Maximum sustainable throughput:	24 kbit/s per bearer;
Establishment of PT to FT link:	50 ms;
Establishment of FT to PT link:	50 ms - 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;
SDU buffer size:	≥ 1 500 octets.

5 PHL layer requirements

The requirements of the service types A and B, defined in ETS 300 435 [11] shall apply.

6 MAC layer requirements

The requirements of the service types A and B, defined in ETS 300 435 [11] shall apply.

7 DLC layer requirements

The DLC U-plane shall be LU3 (see ETR 185 [12]) supported by LU2 (class 1), FU6, (see ETS 300 175-4 [4]). No C-plane functionality is required for the service type C, mobility class 1.

8 NWK layer requirements

Inter-operability between units shall be independent of NWK layer functionality. No DECT NWK layer services are required for the service type C, mobility class 1.

9 Management entity requirements

The requirements of the type A and B, mobility class 1 services given in ETS 300 435 [11] shall apply, as shall the requirements on the U-plane link resource management of the type C, mobility class 2 service (see ETR 185 [12]).

10 Generic inter-working conventions and procedures

The generic inter-working conventions and procedures defined for the type C, mobility class 2 service in ETS 300 435 [11], clause 10 shall apply.

11 Configuration capabilities

The following table lists those parameters which shall be installed in addition to those listed for the types A and B, mobility class 1 services (see ETS 300 435 [11]).

Table 1

Variable parameter	Value	Fixed(F)/Portable(P)
LU3 window size	0 - 3	F, P
LU3 buffer size	number of bytes	F, P
Network associated with identity	selected from annex A of this ETS, or annex B of ETS 300 435 [11]	F, P

Annex A (normative): Interworking conventions to specific networks

A.1 Interworking to V.24 circuits

A.1.1 Reference Configuration

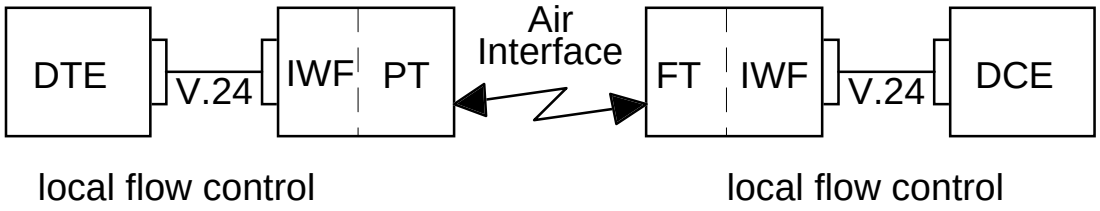

Figure A.1

The DTE-DCE connection shall support the functionality of a V.24 link for the following V.24 lines:

- circuit 103 (TXD);
- circuit 104 (RXD);
- circuit 106 (CTS);
- circuit 108 (DTR);
- circuit 109 (DCD);
- circuit 125 (RI);
- circuit 133 (RTR).

A.1.2 Global assumptions

In this application, LAPU establishment and release procedures shall be invoked by the Inter-Working Unit (IWU) through the Lower Layer Management Entity (LLME). No other establishment or release procedures shall be used.

The data stop and parity bits of the DCE-side Inter-Working Functions (IWF) shall be set according to the entries in the profile configuration table.

The DTE/DTE-side IWF and the DCE-side IWF/DCE connections may work at different data transmission speeds.

The configuration of a PP or an FP to interwork with a DTE or a DCE shall be a local matter. All data received by the PP or the FP from LU3 shall be transferred to the RXD line when interworking with a DTE or to the TXD line when interworking to a DCE. Information regarding the status of DCD and RI lines received by a DCE-side IWF from LU3 shall be ignored. Information regarding the status of the DSR line received by a DCE-side interworking unit from LU3 shall be interworked to the DTR line. Information regarding the status of the DTR line received by a DTE-side IWF from LU3 shall be interworked to the DSR line.

A.1.3 Interworking procedures and conventions

A.1.3.1 Procedures at the DTE-side IWF

The Inter-Working Functions shall emulate a DCE. Data received from the PAD shall be forwarded via the RXD line to the DTE and data shall be received via the TXD line from the DTE.

A.1.3.1.1 DTE-Initiated Link Establishment

If no V.24 link is established (the "No Link" state), then the IWF shall monitor the value of the DTR line. If this goes ON, then the IWF shall monitor the activity of the TXD line. If data is detected on the TXD line, then the IWF shall issue a set up request to the LLME and shall enter the "V.24 Link Requested" state. Furthermore, the state of the DTR line shall be submitted to the PAD buffer prior to submitting the received character to it.

In the "V.24 Link Requested' state, if the IWF receives a reject or release indication from the LLME, it shall clear the PAD buffer and shall return to the "No Link" state. Its subsequent action shall be locally determined on the basis of the release reason indicated by the LLME.

In the "V.24 Link Requested" state, if the IWF receives a connection indication from the LLME it shall enter a "Link Active" state. Once in this state, it shall set the values of the DSR line, RI line and DCD line to the values communicated to it by LU3.

A.1.3.1.2 DCE-Initiated Link Establishment

Upon the receipt of a set up indication from the LLME, the IWF shall determine that the service requested may be offered, and if so it will issue a connection confirmation to the LLME and enter the "Link Active" state. Once in this state, it shall set the values of the DSR line, RI line and DCD line to the values communicated to it by LU3. If the service cannot be supported, it shall issue a rejection to the LLME, indicating a release reason, and shall return to the "No Link" state.

A.1.3.1.3 DTE-Initiated Link Release

The IWF may choose at any time to release the link for implementation-specific reasons. In any case, the IWF shall release the link if:

- the DTR line goes OFF for more than five seconds; and

- the IWF has been in "Link Active" state for more than five seconds.

To release the link, the IWF shall issue a release request to the LLME, shall clear the PAD buffer and shall then enter the "No Link" state, turning the DSR line, RI line and DCD line OFF.

A.1.3.1.4 DCE-Initiated Link Release

If the IWF receives a release indication from the LLME, it shall enter the "No Link" state, shall clear the PAD buffer and turn the DSR line, RI line and DCD line OFF.

A.1.3.2 Procedures at the DCE-side IWF

The Inter-Working Function shall emulate a DTE. Data received from the PAD shall be forwarded via the TXD line to the DCE and data shall be received via the RXD line from the DCE.

A.1.3.2.1 DCE-Initiated Link Establishment

If no V.24 link is established, then the IWF shall monitor the value of the DSR line and the RI line. If the DSR line goes ON, then the IWF shall monitor the activity of the RXD line. If data is then detected on the RXD line, or if at any time the RI line goes ON irrespective of the state of the DSR line, then the IWF shall issue set up request to the LLME and shall enter the "V.24 Link Requested" state. Furthermore, the state of the DSR, DCD, and RI lines shall be submitted to the PAD buffer prior to submitting any received characters to it.

In this state, if the IWF receives a rejection or a release indication from the LLME, it shall clear the PAD buffer and shall return to the "No Link" state. Its subsequent action shall be locally determined on the basis of the release reason contained in the primitive.

In the "V.24 Link Requested" state, if the IWF receives a connection indication from the LLME it shall enter a "Link Active" state. Once in this state, it shall set the value of the DTR line to the value communicated to it by LU3.

A.1.3.2.2 DTE-Initiated Link Establishment

Upon the receipt of a set up indication from the LLME, the IWF shall determine that the service requested may be offered, and if so it shall issue a connection confirmation to the LLME and enter the "Link Active" state. Once in this state, it shall set the value of the DTR line to the value communicated to it by LU3. If the service cannot be supported, it shall issue a rejection to the LLME, indicating a release reason, and shall return to the "No Link" state.

A.1.3.2.3 DCE-Initiated Link Release

The IWF may choose at any time to release the link for implementation-specific reasons. In any case, the IWF shall release the link if:

- the DSR line goes OFF for more than five seconds; and

- the IWF has been in "Link Active" state for more than five seconds.

To release the link, the IWF shall issue a release request to the LLME, shall clear the PAD buffer and shall then enter the "No Link" state, turning the DTR line OFF.

A.1.3.2.4 DTE-Initiated Link Release

If the IWF receives a release indication from the LLME, it shall enter the "No Link" state, shall clear the PAD buffer and turn the DTR line OFF.

A.1.3.3 PAD function

The PAD function which is defined in ETR 185 [12], subclause 10.1 shall be used.

A.1.3.4 Timing conventions

PAUSE conditions, that means consecutive stop bits send by the DTE for a time greater than 100 ms, shall be interworked by the DTE-side IWF. PAUSE-conditions shall be transmitted to the DCE-side IWF at the termination of the condition, together with information regarding the length (see subclause A.1.3.5). Upon receiving a PAUSE-condition, the DCE-side IWF shall ensure that a PAUSE of at least the specified length is asserted on the link to the DCE between the character received immediately before reception of the PAUSE condition and the character received immediately after it.

A.1.3.5 Interworking of modem status lines, BREAK-Condition and PAUSE-Condition

On any change of one or more V.24 status lines or on the detection of the BREAK condition or PAUSE condition, the current line status values and the BREAK condition or PAUSE condition respectively shall be submitted to the PAD buffer. Such information shall be passed in sequence from the PAD buffer to the user control signalling data SAP, and transmitted in an I-frame.

If such information is passed to the signalling SAP, the current I-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 all listed V.24 lines and the condition which occurred. This I-frame shall be formatted as defined in ETR 185 [12], subclause 10.3.

A.1.3.5.1 BREAK condition

The measurement of the duration of a BREAK condition shall begin immediately upon its assertion on the TXD line at the DTE-side IWF or the RXD line at the DCE-side IWF. Once the BREAK condition has been terminated, the total duration of assertion measured shall be coded and transmitted as specified. The duration of the BREAK condition shall be measured for a maximum duration of 2,55 seconds, after which the BREAK condition and duration shall be coded and submitted in any case. It shall not be permitted to transmit two consecutive notifications of the BREAK condition, and the persistence of the BREAK condition beyond 2,55 seconds shall not be coded or notified to the PAD.

A.1.3.5.2 PAUSE condition

The measurement of the duration of a PAUSE condition shall begin 100 ms after its assertion on the TXD line at the DTE-side IWF or the RXD line at the DCE-side IWF. Once the PAUSE condition has been terminated by any occurrence, the total duration of assertion, including the 100 ms detection interval, shall be coded and submitted as specified. The duration of the PAUSE condition shall be measured for a maximum duration of 2,55 seconds, after which the PAUSE condition and duration shall be coded and submitted in any case. It shall not be permitted to transmit two consecutive notifications of the PAUSE condition, and the persistence of the PAUSE condition beyond 2,55 seconds shall not be coded or notified to the PAD.

At the receiver, upon reception of the PAUSE command, the time for which the RXD line at the DTE-side IWF or the TXD line at the DCE-side IWF have been in the PAUSE condition shall be determined and if the time is less than the value indicated in the PAUSE command the PAUSE condition shall be prolonged until it is equal to the coded value. Once this value has been reached the contents of the subsequent I-frames shall be transferred to the V.24 lines.

A.1.3.6 Interworking of flow control

A.1.3.6.1 Flow control across the DTE / DTE-side IWF interface

The IWF shall follow the flow control procedure which is described in ETR 185 [12], subclause 10.1.

The flow control indication should be performed using circuits 133 (RTR) and 106 (CTS), in which case:

- a DTE-side IWF not-ready condition shall be indicated by turning circuit 106 OFF and shall be cleared by turning circuit 106 ON; and

- a DTE not-ready condition shall be recognised by an ON-to-OFF transition and cleared by an OFF-to-ON transition of circuit 133.

A.1.3.6.2 Flow control across the DCE-side IWF / DCE interface

The IWF shall follow the flow control procedure which is described in ETR 185 [12], subclause 10.1.

The flow control indication should be performed using circuits 133 (RTR) and 106 (CTS), in which case:

- a DCE-side IWF not-ready condition shall be indicated by turning circuit 133 OFF and cleared by turning circuit 133 ON; and

- a DCE not-ready condition shall be recognised by an ON-to-OFF transition and cleared by an OFF-to-ON transition of circuit 106.

Flow control is handled locally at the DTE-side IWF and the DCE-side IWF. The chained flow control mechanisms between DTE and PP, PP and FP, and FP and DCE respectively result in end-to-end flow control between DTE and DCE. Another possibility is to use DC1 and DC3 characters (XON and XOFF) for flow-control between DTE and DCE. However, since the system may contain considerable buffer space and because the transmission speeds at DTE and DCE do not necessarily match, this method will work reliably only in conditions of a fully planned, co-ordinated and configured system. For applications of this profile, it is therefore strongly discouraged to work without hardware flow-control at the DTE and DCE.

A.1.3.7 Configuration capabilities

The following table lists those profile specific parameters which must be installed in addition to those listed for the type C, mobility class 1 service.

Table A.1

Variable parameter	Value	Fixed(F)/Portable(P)
Baud rate	0 - 537 kbyte/s	F
Data bits	5 - 8	F
Stop bits	1, 2	F
Parity	N, E, O, M, S	F

A.2 Interworking to ISO\IEC 8802-3 and 8802-5 networks

The provisions of ETS 300 435 [11], annex B, clauses B.1 and B.2 shall apply with interworking at the service boundary of LU3.

History

Document history			
January 1996	Public Enquiry	PE 100:	1996-01-22 to 1996-05-17