Digital Enhanced Cordless Telecommunications (DECT);
Common Interface (CI);
Part 1: Overview
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Foreword

This European Standard (EN) has been produced by ETSI Technical Committee Digital Enhanced Cordless Telecommunications (DECT).

The present document is part 1 of a multi-part deliverable covering the Common Interface (CI) for the Digital Enhanced Cordless Telecommunications (DECT), as identified below:

- **Part 1**: "Overview";
- **Part 2**: "Physical Layer (PHL)";
- **Part 3**: "Medium Access Control (MAC) layer";
- **Part 4**: "Data Link Control (DLC) layer";
- **Part 5**: "Network (NWK) layer";
- **Part 6**: "Identities and addressing";
- **Part 7**: "Security features";
- **Part 8**: "Speech and audio coding and transmission".

The following aspects of the present document are subject to controlled distribution:

a) DECT identities, as defined in ETSI EN 300 175-6 [6];

b) some DECT cryptographic algorithms.

The cryptographic algorithms subjected to controlled distribution specify the details of the DECT Standard Authentication Algorithm (DSAA) and the DECT Standard Cipher (DSC). The cryptographic algorithms DECT Standard Authentication Algorithm #2 (DSAA2) and DECT Standard Cipher #2 (DSC2) are not subjected to controlled distribution.

These aspects are distributed on an individual basis. Further information and details of the current distribution procedures can be obtained from the ETSI Secretariat at the address on the second page of the present document.

Further details of the DECT system may be found in ETSI TR 101 178 [i.4], ETSI ETR 043 [i.5] and ETSI TR 102 185 [i.6].
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**Modal verbs terminology**

In the present document "shall", "shall not", "should", "should not", "may", "need not", "will", "will not", "can" and "cannot" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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1 Scope

The present document gives an introduction and overview of the complete Digital Enhanced Cordless Telecommunications (DECT) Common Interface (CI).

The present document contains an abstract of the other parts of the DECT standard together with a general description of:

- the objectives of the present document;
- the DECT Common Interface;
- the protocol architecture of DECT.

The present document also provides an extensive vocabulary; in particular it contains the common definitions of all the technical terms used in different parts of the present document.

The present document includes New Generation DECT, a further development of the DECT standard introducing wideband speech, improved data services, new slot types and other technical enhancements.

The present document includes DECT Evolution.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at https://docbox.etsi.org/Reference/.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

The following referenced documents are necessary for the application of the present document.


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

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

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

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

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

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

[8] ETSI EN 300 175-8: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 8: Speech and audio coding and transmission".
References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI EN 300 403-1: "Integrated Services Digital Network (ISDN); Digital Subscriber Signalling System No. one (DSS1) protocol; Signalling network layer for circuit-mode basic call control; Part 1: Protocol specification [ITU-T Recommendation Q.931 (1993), modified]".

[i.2] Recommendation ITU-R SM.1046-2: "Definition of spectrum use and efficiency of a radio system".


[i.4] ETSI TR 101 178: "Digital Enhanced Cordless Telecommunications (DECT); A High Level Guide to the DECT Standardization".

[i.5] ETSI ETR 043: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Services and facilities requirements specification".

[i.6] ETSI TR 102 185: "Digital Enhanced Cordless Telecommunications (DECT); Data Services Profile (DSP); Profile overview".

[i.7] ETSI ETR 310: "Digital Enhanced Cordless Telecommunications (DECT); Traffic capacity and spectrum requirements for multi-system and multi-service DECT applications co-existing in a common frequency band".

[i.8] ETSI TS 102 265: "Digital Enhanced Cordless Telecommunications (DECT); DECT access to IP networks".

[i.9] Recommendation ITU-T P.311: "Transmission characteristics for wideband (150-7000 Hz) digital handset telephones".

[i.10] ETSI TR 102 570: "Digital Enhanced Cordless Telecommunications (DECT); New Generation DECT; Overview and Requirements".

[i.11] ETSI TS 102 527-1: "Digital Enhanced Cordless Telecommunications (DECT); New Generation DECT; Part 1: Wideband Speech".

[i.12] ETSI TS 102 527-2: "Digital Enhanced Cordless Telecommunications (DECT); New Generation DECT; Part 2: Support of transparent IP packet data".

[i.13] ETSI TS 102 527-3: "Digital Enhanced Cordless Telecommunications (DECT); New Generation DECT; Part 3: Extended wideband speech services".
3 Definition of terms, symbols and abbreviations

3.1 Terms

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

**Access Rights Class (ARC):** type of access to a DECT network, such as public, residential or private

**Access Rights Details (ARD):** unique number within one ARC

**Access Rights Identity (ARI):** globally unique identity that shows the access rights related to a service provider

**NOTE:**
- PARI = Primary ARI;
- SARI = Secondary ARI;
- TARI = Tertiary ARI.

**algorithm:** mathematical process or function that transforms an input into an output

**algorithm identifier:** designator to show which algorithm is in use, so that the correct one may be chosen
antenna diversity: diversity implies that the Radio Fixed Part (RFP) for each bearer independently can select different antenna properties such as gain, polarization, coverage patterns and other features that may affect the practical coverage

NOTE: A typical example is space diversity, provided by two vertically polarized antennas separated by 10 cm to 20 cm.

asymmetric algorithm: See public key algorithm.

attach: process whereby a Portable Part (PP) within the coverage area of a Fixed Part (FP) to which it has access rights, notifies the FP that it is operative

authentication: corroboration that an entity is the one that is claimed

authentication of Fixed radio Termination (FT): process whereby the identity of an FT is verified to a DECT PT

authentication of Portable radio Termination (PT): process whereby a DECT PT is positively verified to be a legitimate user of a particular FP

authentication (of a subscriber): process whereby a DECT subscriber is positively verified to be a legitimate user of a particular FP

authentication of user: process whereby a DECT user is positively verified to be a legitimate user of a particular FP

bearer: See Medium Access Control (MAC) bearer or bearer service.

bearer handover: internal handover process provided by the MAC layer, whereby one MAC connection can modify its underlying bearers while maintaining the service provided to the Data Link Control (DLC) layer

bearer service: type of telecommunication service that provides a defined capability for the transmission of signals between user-network interfaces

broadcast: simplex point-to-multipoint mode of transmission

C-plane: control plane of the DECT protocol stacks, which contains all of the internal DECT protocol control, but may also include some external user information

call: all of the Network (NWK) layer processes involved in one NWK layer peer-to-peer association

cell: domain served by a single antenna(e) system (including a leaky feeder) of one FP

Central Control Fixed Part (CCFP): physical grouping that contains the central elements of a FP

centrex: implementation of a private telecommunication network exchange that is not located on the premises of the private network operator

Cipher Block Chaining Message Authentication Code (CBC-MAC): cryptographic technique for constructing a message authentication code from a block cipher

Cipher Key (CK): value that is used to determine the transformation of plaintext to ciphertext in a cryptographic algorithm

Cipher Key (CK) generation: process for generating cryptographic keys

ciphertext: output of a cryptographic algorithm

channel: See physical channel.

cluster: logical grouping of one or more cells between which bearer handover is possible

confidentiality: rendering information secret as ciphertext unless the capability is possessed to recover the plaintext from ciphertext

connection: See MAC connection.

connection handover: internal handover process provided by the DLC layer, whereby one set of DLC entities (C-plane and U-plane) can re-route data from one MAC connection to a second new MAC connection, while maintaining the service provided to the NWK layer
**Connection Less mode (C/L):** transmission mode that transfers one packet (one self-contained unit) of data from one source point to one (or more) destination points in a single phase

**Connection Oriented mode (C/O):** transmission mode that transfers data from one source point to one or more destination points using a protocol based on three phases:

- "Set-up”;
- "Data transfer”; and
- "Release”.

**Cordless Radio Fixed Part (CRFP):** Wireless Relay Station (WRS) that provides independent bearer control to a PT and FT for relayed connections

**Counter with CBC-MAC (CCM):** authenticated encryption algorithm designed to provide both authentication and confidentiality

**countermeasure:** device, instrument or procedure used to counteract or defend against a threat

**coverage area:** area over which reliable communication can be established and maintained

**cryptography:** secret writing

**Data Encryption Standard (DES):** United States Federal data encryption standard

**Data Link Control (DLC):** layer 2b of the DECT protocol stack

**decipherment:** rendering of ciphertext into plaintext

**DECT NetWork (DNW):** network that uses the DECT air interface to interconnect a local network to one or more portable applications

**DECT Standard Authentication Algorithm (DSAA):** algorithm used for authentication in DECT

**DECT Standard Authentication Algorithm #2 (DSAA2):** algorithm used for authentication in DECT

**DECT Standard Cipher (DSC):** algorithm used for data encryption in DECT

**DECT Standard Cipher #2 (DSC2):** algorithm used for data encryption in DECT

**Default Cipher Key (DefCK):** Derived Cipher Key (DCK) that is stored in both FP and PP to be used later by MAC to immediately encrypt with connection establishment

**Derived Cipher Key (DCK):** Cipher Key (CK) that is established as part of the procedure used to authenticate the PT

**distributed communication:** ability of a DECT terminal to provide means for or assist direct communication between any two terminals, members of a "closed" local DECT network

**DLC broadband data link:** link that can be associated with a logical MAC connection comprising a number of MAC (physical) connections

**DLC broadcast:** simplex "connectionless" mode of transmission from the DLC broadcast entity of one FT to the DLC broadcast entities in one or more PT

**DLC data link (DLC link):** association between two DLC layer entities

**DLC frame:** format used to structure all messages that are exchanged between DLC layer peer entities

**double duplex bearer:** use of two duplex bearers (see duplex bearer) which refer to the same MAC connection, sharing their simplex bearers (see simplex bearer) for the information flow

**double-simplex bearer:** use of two simplex bearers operating in the same direction on two physical channels

**double slot:** one 12th of a TDMA frame which is used to support one high capacity physical channel

**down-link:** transmission in the direction FT to PT
**duplex bearer**: use of two simplex bearers operating in opposite directions on two physical channels

**encipherment**: rendering of plaintext into ciphertext

**End System (ES)**: logical grouping that contains application processes and supports telecommunication services

**expedited (messages, procedures, operations)**: MAC C/O operations (messages, procedures, operations) intended for ultra-fast setup and release of bearers, allowing in most cases reduction in the number of messages and early or late U-plane transmission compared to regular procedures

**expedited connections**: advanced connections able to use the expedited messages of the advanced connection control part 2 set and their associate procedures for bearer setup and release

**extended MAC control messages**: MAC messages of the B-field connection control set

**external handover**: process of switching a call in progress from one FP to another FP

**Fast Encryption Algorithm (FEAL)**: particular encryption algorithm in the public domain

**field**: continuous region of data (i.e. adjacent bits) that jointly convey information

**fixed geometry Portable Part (PP)**: PP in which the electro-acoustic transducers and their associated acoustic components are held in fixed relative positions and/or orientations during all on-line conditions and test conditions of the PP

**Fixed Part (DECT Fixed Part) (FP)**: physical grouping that contains all of the elements in the DECT network between the local network and the DECT air interface

**Fixed radio Termination (FT)**: logical group of functions that contains all of the DECT processes and procedures on the fixed side of the DECT air interface

**flow control**: mechanism that is used to regulate the flow of data between two peer entities

**fragment**: one of the Service Data Units (SDUs) that is produced by the process of fragmentation

**fragmentation**: process of dividing a Protocol Data Unit (PDU) into more than one SDU for delivery to a lower layer

**frame**: See TDMA frame or DLC frame.

**full slot (slot)**: one 24th of a TDMA frame which is used to support one physical channel

**fullband speech**: voice service with a nominal pass-band wider than 50 - 14 000 Hz, usually understood to be 20 - 20 000 Hz

**generic**: generalized set or general purpose set, often in the sense of basic or ordinary

**Generic Access Profile (GAP)**: standard in addition to the DECT CI that ensures interoperability between FPs and PPs from different manufacturers

**geographically unique**: two FPs with the same PARI, or respectively two RFPs with the same RFPI, cannot be reached or listened to at the same geographical position

**Global NetWork (GNW)**: telecommunication network capable of offering a long distance telecommunication service

**globally unique identity**: identity is unique within DECT (without geographical or other restrictions)

**guard space**: nominal interval between the end of a radio transmission in a given slot and the start of a radio transmission in the next successive slot

**half slot**: one 48th of a TDMA frame which is used to support one physical channel

**handover**: process of switching a call in progress from one physical channel to another physical channel

**handset echo**: echo, perceptible by the far-end user, resulting from the coupling between the receiving and sending directions of the handset, mostly due to acoustic coupling between transducers
Headset PP (HPP): wireless headset telephone using the DECT air interface

NOTE: A HPP usually has only one speaker and one microphone combined with a limited set of keys (e.g. call button, volume plus, and volume minus). Headsets provide the equivalent functionality of a PP with hands-free operation.

Home Automation Network: network that connects all sensors and actors in a house or apartment, providing interoperability for devices of different vendors and typically has a connection to the Internet

NOTE: The Home Automation Network is used for various applications, from Home Automation and Security to Climate Control and Energy Management.

Hybrid Part (HyP): DECT terminal that provides FT as well as PT capabilities

impersonation: where one identity claims the part of another identity

incoming call: call received at a PP

Integrated Services Digital Network (ISDN): digital telecommunications infrastructure to the Consultative Committee on International Telegraphy and Telephony (CCITT) standards

intercell handover: switching of a call in progress from one cell to another cell

internal call: call between 2 users that does not make use of the local network resources

internal handover: handover processes that are completely internal to one FT

International Portable User Identity (IPUI): identity that uniquely defines one user within the domain defined by this access rights related to this IPUI

interoperability: capability of FPs and PPs, that enable a PP to obtain access to teleservices in more than one location area and/or from more than one operator (more than one service provider)

interoperator roaming: roaming between FP coverage areas of different operators (different service providers)

InterWorking Unit (IWU): unit that is used to interconnect subnetworks

intracell handover: switching of a call in progress from one physical channel of one cell to another physical channel of the same cell

intraoperator roaming: roaming between different FP coverage areas of the same operator (same service provider)

isochronous: essential characteristic of a time-scale or a signal such that the time intervals between consecutive significant instants either have the same duration or durations that are integral multiples of the shortest duration

key management: way in which cryptographic keys are generated, distributed and used

Key Stream Generator (KSG): cryptographic algorithm which produces a stream of binary digits which can be used for encipherment and decipherment

link: See DLC data link.

Local Area Network (LAN): electronic systems which are interconnected and in physical proximity to each other

Local Network (LNW): telecommunication network capable of offering local telecommunication services

locally unique identity: identity is unique within one FP or location area, depending on application

location area: domain in which a PP may receive (and/or make) calls as a result of a single location registration

location registration: process whereby the position of a DECT portable termination is determined to the level of one location area, and this position is updated in one or more databases

logical channel: generic term for any distinct data path

logical connection: association between two instances of the MAC MBC that can be used by higher layers to exchange U-plane or C-plane data
Low Complexity Communication Codec plus (LC3plus): standard for narrowband to fullband low delay audio communication” designed for very high quality communication application including all kind of audio signals, e.g. speech and music, as defined by ETSI TS 103 634 [i.26]

NOTE: LC3plus operates at sample rates 8 kHz, 16 kHz, 24 kHz, 32 kHz and 48 kHz and provides an audio bandwidth of up to 16 kHz in super-wideband mode and an audio bandwidth of up to 20 kHz in fullband mode. The codec also contains error protection capabilities and a very performant packet loss algorithm.

Lower Layer Management Entity (LLME): management entity that spans a number of lower layers, and is used to describe all control activities which do not follow the rules of layering

Lower Tester (LT): logical grouping that contains the test equipment, a functionally equivalent DECT PT, a functionally equivalent DECT FT and a test controller

MAC bearer (bearer): service element that is provided by each Cell Site Function (CSF)

MAC connection (connection): association between one source MAC Multi-Bearer Control (MBC) entity and one destination MAC MBC entity

Machine-to-Machine (M2M) solution: combination of devices, software and services that operate with little or no human interaction

masquerading: where one identity plays the part of, or acts as, another identity

Medium Access Control (MAC): layer 2a of the DECT protocol stack

Mesh network operation: distributed radio network where nodes are able to transmit, receive and forward data between each other and to transmit, receive and forward data to or from external network(s)

NOTE: A node operates as FP when receiving data from other node(s) and as PP when transmitting data to other node(s).

Message Authentication Code (MAC) (CCM): short piece of information generated by a cryptographic function used to authenticate and to protect the data integrity of a message

Message Integrity Code (MIC): alternative name for the Message Authentication Code

minimal MMS-message attributes: message meta-information used in the request-to-send, etc.

MMS-message attributes: message meta-information

Modulation and Coding Scheme (MCS): combination of the radio carrier Modulation scheme, such as BPSK through to 64QAM; and the channel Coding Scheme, such as rate 1/2 through 5/6, that are used when transmitting U-plane data

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

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

multicast: C/L downlink service intended for sending data to a group of PTs

multi-cell (system): system with a FP consisting of multiple cells

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

Multimedia Messaging Service (MMS): generic set of commands, information elements and functionality for file/messaging service

mutual authentication: where two entities corroborate the identity of each other

network (telecommunication network): all the means of providing telecommunication services between a number of locations where the services are accessed via equipment attached to the network
network echo: echo, perceptible by the DECT user, resulting from reflections in the network

NOTE: It is mostly due to hybrid impairments at both ends of the communication.

New Generation DECT: further development of the DECT standard introducing wideband speech, improved data services, new slot types and other technical enhancements

node: point at which switching occurs

NEMo++: long slot dummy bearer used to wake handsets from no-emissions mode and simultaneously provide the information required for ULE devices to achieve lock

No Emission Mode (NEMo): operation mode that switches down all RFP emissions when the system is idle

operator (DECT operator): individual or entity who or which is responsible for operation of one or more DECT FPs

outgoing call: call originating from a PP

Packet Data Protocol (PDP): terminology used in GPRS and 3GPP that refers to any of the data protocols transported over the radio packet service (IP, X.25, etc.)

paging: process of broadcasting a message from a DECT FP to one or more DECT PPs

paging area: domain in which the PP will be paged as a part of incoming call establishment

PARK Length Indicator (PLI): associates a group of FP ARIs to the PARK, by indicating how many of the first ARC + ARD bits are relevant

PDP context: terminology used in GPRS and 3GPP to denote the context associated to a packet data connection. It is equivalent to "virtual circuit"

Permanent Virtual Circuit (PVC): Virtual Circuit that can be established and cleared only by configuration

Personal Identity Number (PIN): short sequence of numbers (usually 4 to 8 digits) which may be used in an authentication process to prove identity

phase: one discrete part of a procedure, where the start and end of the part can be clearly identified (e.g. by the arrival or dispatch of a primitive)

Physical (PHY): layer 1 of the DECT protocol stack

physical channel (channel): simplex channel that is created by transmitting in one particular slot on one particular RF channel in successive TDMA frames

plaintext: information or data which is intelligible to everyone

Portable Access Rights Key (PARK): this states the access rights for a PP

Portable Application (PA): logical grouping that contains all the elements that lie beyond the DECT network boundary on the portable side

Portable HandSet (PHS): single physical grouping that contains all of the portable elements that are needed to provide a teleservice to the user

Portable Part (DECT Portable Part) (PP): physical grouping that contains all elements between the user and the DECT air interface

Portable radio Termination (PT): logical group of functions that contains all of the DECT processes and procedures on the portable side of the DECT air interface

Portable User Number (PUN): globally or locally unique number within one PUT

Portable User Type (PUT): this shows the numbering plan structure of a PUN

Primary Access Rights Identity (PARI): most frequently transmitted ARI

primitive: distinct (but abstract) data element that is passed between adjacent protocol layers
private: attribute indicating that the application of the so qualified term, e.g. a network, an equipment, a service, is offered to, or is in the interest of, a determined set of users

proprietary algorithm: algorithm which is the intellectual property of a legal entity

public: attribute indicating that the application of the so qualified term, e.g. a network, an equipment, a service, is offered to, or is in the interest of, the general public

Public Access Profile (PAP): profile which ensures interoperability between FPs and PPs for public access services

public access service: service that provides access to a public network for the general public

public key algorithm: cryptographic algorithm in which a different key is used for encryption and for decryption

radio channel: See RF channel or physical channel.

radio end point: physical grouping that contains one radio transceiver (transmitter/receiver), fixed or portable

Radio Fixed Part (RFP): one physical sub-group of a FP that contains all the radio end points (one or more) that are connected to a single system of antennas

Radio Fixed Part Identity (RFPI): identity frequently transmitted by every RFP:

- PARI;
- the RFPs local identity within that FP;
- domains for handover and location areas.

random number: number generated by a non-deterministic process

registration: See either location registration or subscription registration.

REpeater Part (REP): WRS that relays information within the half frame time interval

resume: procedure to re-establish the physical connection for a logical connection in suspended state

resumed state: state of an established logical connection, open at MB, DLC and NWK, with active TBCs and physical layer

RF carrier (carrier): centre frequency occupied by one DECT transmission

RF channel: nominal range of frequencies (RF spectrum) allocated to the DECT transmissions of a single RF carrier

roaming: movement of a PP from one FP coverage area to another FP coverage area, where the capabilities of the FPs enable the PP to make or receive calls in both areas

roaming service: service which can be used in more than one FP coverage area

RS: a cryptographic parameter used for the calculation of authentication session keys

RS_{128}: 128 bit variant of RS

RS_{128}': the RS_{128} used for the generation of KS'

RS1/RS2: components of RS_{128} when RS_{128} is assembled from two parts

Rivest, Shamir and Adleman (RSA) algorithm: public key algorithm

Secondary Access Rights Identity (SARI): less frequently broadcast than the PARI

security attribute: protocol element indicating security services, mechanisms, processes or algorithms that are supported

segment: one of the pieces of data that is produced by the process of segmentation

segmentation: process of partitioning one SDU from a higher layer into more than one PDU
Session Key (KS): key which is used only for a single session

service call: call initiated by a DECT PT for entering of FT related service and adjustment procedures in a transparent way

service provider (telecommunications service provider): individual, or entity, who, or which, interfaces to the customer in providing telecommunications service

service type A: low speed frame relay, with a net sustainable throughput of up to 24 kbit/s, optimized 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 kbit/s, optimized for high speed and low latency with burst data

service type C: non-transparent connection of data streams requiring Link Access Protocol (LAP) services, optimized for high reliability and low additional complexity

service type D: non-transparent service that supports Isochronous Data Bearer Services and is suitable for transparent transfer of isochronous data streams

service type E: short message transfer or paging service which may be unacknowledged or acknowledged, optimized for small SDUs, low PP complexity and ultra-low power consumption

service type F: application profile specifically supporting teleservices such as fax, building upon the services offered by the type A/B and C profiles, optimized for terminal simplicity, spectrum efficiency and network flexibility

sequencing (sequence numbering): process of adding a sequence number to a set of data packets so that the packets can be reassembled in the correct order, regardless of the order they are received

simplex bearer: MAC layer service that is created using one physical channel

Single Radio Fixed Part (SRFP): radio FP that contains only one radio end point

Software Upgrade Over The Air (SUOTA): capability to upgrade the Software or the Firmware in the PP by means of downloading it from the FP via the DECT air interface

stream cipher: algorithm in which the output is combined bit by bit with plaintext to produce the ciphertext

Subscriber Interface Module (SIM): smart card used for authentication in GSM

subscriber (customer): natural person or juristic person who has subscribed to telecommunication services, and is, therefore, responsible for payment

subscription registration: infrequent process whereby a subscriber obtains access rights to one or more FPs

super-wideband speech: voice service with enhanced quality compared to ADPCM G.726 and allowing the transmission of a maximum vocal frequency of at least 14 kHz

Supplementary Service (SS): service that modifies or supplements a basic telecommunication service:

1) DECT TRANSPARENT supplementary services:
   - the service elements are unspecified within the multi-part ETSI EN 300 175;

2) DECT STANDARD supplementary services:
   - the service elements are specified within the multi-part ETSI EN 300 175 by reference to other standards;

3) DECT SPECIFIC supplementary services:
   - the service elements are fully specified within the multi-part ETSI EN 300 175.

suspend: procedure to release the physical connection without releasing the logical connection

suspended state: state of an established logical connection open at MBC, DLC and NWK but with no associated TBCs and physical layer resources
switching: process of interconnecting functional units, transmission channels or telecommunication circuits for as long as required to convey signals

symmetric algorithm: cryptographic algorithm in which the same key is used for both encipherment and decipherment

synchronization: methods used to ensure that time correspondence exists between processes to ensure that data is not repeated or lost

synchronous: essential characteristics of time-scales or signals such that their corresponding significant instants occur at precisely the same average rate

synchronous transmission: transmission using isochronous signals in which the sending and receiving instruments are operating continuously in a constant time difference between corresponding significant instants

TDMA frame: time-division multiplex of 10 ms duration containing 24 successive full slots

telemunication: any transmission and/or emission and/or reception of signals representing signs, writings, images, and sounds or intelligence of any nature by wire, radio, optical or other electromagnetic systems

telesevice: type of telecommunication service that provides the complete capability, including terminal equipment functions, for communication between users, according to protocols that are established by agreement

Tertiary Access Rights Identity (TARI): available as a Yes/No answer upon a request including the wanted ARI, not broadcast at all

threat: indication of coming evil

TPUI domain: domain over which every TPUI is (locally) unique

U-plane: user plane of the DECT protocol stacks

ULE No Emission Mode: No Emission Mode for ULE

Ultra Low Energy (ULE): packet data technology based on DECT intended for M2M communications and optimized for ultra low power consumption under low or moderate data rate and traffic conditions

up link: transmission in the direction PT to FT

User Authentication Key (UAK): cryptographic key held by a user to prove identity

user (of a telecommunication network): person or machine delegated by a subscriber (by a customer) to use the services, and/or facilities, of a telecommunication network

variable geometry PP: PP that allows the position and/or orientation of its electro-acoustic transducers and their associated acoustic components to be changed during all on-line conditions of the PP

Virtual Call (VC): any packet-mode user connection that can be setup and released by means of NWK layer C-plane procedures

NOTE 1: A Virtual Call is the packet-mode equivalent of a circuit-mode call.

NOTE 2: Virtual Call is the DECT terminology for what in GPRS and UMTS is called "PDP context".

virtual circuit: any packet-mode user connection able to transport the user packet data protocol

NOTE 1: Each Virtual Circuit provides an independent and isolated context for each subscriber data session and is mapped to one DLC Link and to one MAC Logical connection

NOTE 2: Virtual circuits could be of two types: Virtual Calls (VC) and Permanent Virtual Circuits (PVC).

NOTE 3: A Permanent Virtual Circuit is the packet-mode equivalent of a circuit-mode leased line. A PVC is a degenerated case of a VC.

wideband speech: voice service with enhanced quality compared to ADPCM G.726 and allowing the transmission of a vocal frequency range of at least 150 Hz to 7 kHz, and fulfilling, at least, the audio performance requirements described in the Recommendation ITU-T P.311 [i.9]
Wireless Relay Station (WRS): physical grouping that combines elements of both PTs and FTs to relay information on a physical channel from one DECT termination to a physical channel to another DECT termination

XRES1: expected response calculated by a Fixed radio Termination (FT)

XRES2: expected response calculated by a Portable radio Termination (PT)

X.25: packet switched network

3.2 Symbols

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

NOTE: This list of symbols applies to all parts of this multi-part deliverable.

BS  Slow Broadcast channel
BT  Bandwidth Time product (Gaussian filters)
BU  ULE Broadcast channel
C   higher layer control Channel (see CS and CF)
CF  higher layer signalling Channel (fast)
CLF higher layer ConnectionLess channel (fast), (logical channel to the MAC layer)
CLS higher layer Connectionless channel (slow)
CS  higher layer signalling Channel (slow)
CT  one CS or CLS channel segment
dBc  dB relative to the peak power of an unmodulated carrier
dBm  dB relative to 1 milliwatt
dBm0 the absolute power level in decibels referred to a point of zero relative level
dBr  the relative power level in decibels
GF  higher layer information control channel (fast) (a logical channel to the MAC layer)
GFA higher layer information control channel (slow) (a logical channel to the MAC layer)
IN  higher layer Information channel unprotected (in general, any variant)
INA higher layer Information channel unprotected, minimum delay operation
INB higher layer Information channel unprotected, normal delay operation
Ip  higher layer Information channel protected (in general, any variant)
IPF higher layer Information channel (protected) transported multiplexed with signalling in the E+U type slots
IPK higher layer Information channel protected, with constant-size subfield format
IPKR higher layer Information channel protected, with constant-size subfield format and error correction
IPM higher layer Information channel (protected) with multi subfield format
IPMR higher layer Information channel (protected) with multi subfield format and error correction using MOD-2 retransmission mechanism
IPQ higher layer Information channel (protected) with single subfield format
IPQR higher layer Information channel (protected) with single subfield format and error correction using
IPX higher layer Information channel, encodec protected, minimum delay operation
kB  Kilobyte
MBn A header in the B-field E-mux format or a message sent using this format
MT  MAC control channel on A-tail field, or one message on such channel
MU  MAC control channel on B-field for ULE
N   identities channel
NS  Split identities channel on B-field for ULE
NT  identities information channel or one message in such channel
PU  ULE Paging channel on B-field
QH  4 bit Header in the Q1 channel
QT  system information and Multiframe marker
SN  higher layer connectionless channel (Unprotected)
SIP\textsubscript{P} higher layer connectionless channel (Protected)
SIP\textsubscript{PF} higher layer connectionless channel (protected) transported multiplexed with signalling in the \textit{E+U} type slots

3.3 Abbreviations

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

NOTE: This list of abbreviations applies to all parts of this multi-part deliverable.

A Algorithm
AAC-LD Advanced Audio Coding-Low Delay
AAL ATM Adaptation Layers
AC Authentication Code
ACK (positive) ACKnowledgement
ACP Adjacent Channel Power
ADPCM Adaptive Differential Pulse Code Modulation
ADSL Asymmetric Digital Subscriber Line
ADU Adapted Data Unit
AES Advanced Encryption Standard
ALI Assigned Link Identifier
A-MAP A-field MAP
AMCI Advanced MAC Connection Identifier
ANSI American National Standards Institute
ARC Access Rights Class
ARD Access Rights Details
ARI Access Rights Identity
ARL Acoustic Reference Level
ARQ Automatic Repeat reQuest
ASCII American Standard Code for Information Interchange
ASM Assigned link identifier with Synchronous Mode
ATM Asynchronous Transfer Mode
BA (bits) B-field identification bits, a group of bits in the A-field header
BCD Binary Coded Decimal
BCK (bit) B-field aCKnowledgement
BCT Business Cordless Telephone
BER Bit Error Ratio
B-MAP B-field MAP
BMC Broadcast Message Control
BMCI Basic MAC Connection Identifier
BRA ISDN Basic Rate Access
BRAT Basic R\textit{A}Te adaptation service
C/L ConnectionLess mode
C/O Connection Oriented mode
CAI Common Air Interface
CBC Connectionless Bearer Control
CBC-MAC Cipher Block Chaining Message Authentication Code
CBI Collective Broadcast Identifier
CC Call Control
CCF Cluster Control Function
CCFP Central Control Fixed Part
CCM Counter with CBC-MAC
CEP Connection End Point
CHO Connection HandOver
CHP Connection Handover Pending
CI Cell Identity
CI Common Interface (standard)
CISS Call Independent Supplementary Services
CK Cipher Key
CL higher layer ConnectionLess channel (protected; see CL\textsubscript{S} and CL\textsubscript{F})
CLIP Calling Line Identification Presentation
CLMS  ConnectionLess Message Service
CLRR  Circuit Loudness Rating, Receiving
CLRS  Circuit Loudness Rating, Sending
CLSS  ConnectionLess Supplementary Service
CMC  Connectionless Message Control
C-MMS Call control part of MMS
CN  Carrier Number
CNIP  Calling Name Identification Presentation
CODEC  COder-DECoder
COMS  Connection Oriented Message Service
C-plane  Control plane
CRC  Cyclic Redundancy Check
CRFP  Cordless Radio Fixed Part
CRSS  Call Related Supplementary Services
CS  Call Status
CSF  Cell Site Function
CSPDN  Circuit Switched Public Data Network
CT2  Cordless Telecommunication 2nd Generation
CTA  Cordless Terminal Adapter
CTS  Clear To Send

NOTE:  See Recommendation ITU-T V.24 [i.17].

CX  Co-eXistence standard
DAM  DECT Authentication Module
DBC  Dummy Bearer Control
DBPSK  Differential Binary Phase Shift Keying
DCD  Data Carrier Detect

NOTE:  See Recommendation ITU-T V.24 [i.17].

DCDL-net  Distributed Communication DECT Local network
CK  Derived Cipher Key
DCS  Dynamic Channel Selection
DECT  Digital Enhanced Cordless Telecommunications
DefCK  Default Cipher Key
DES  Data Encryption Standard
DLC  Data Link Control
DLEI  Data Link Endpoint Identifier (DLC layer)
DLI  Data Link Identifier (DLC layer)
DMAP  DECT Multimedia Access Profile
D-MAP  D-field MAP
DNW  DECT NetWork
DPRS  DECT Packet Radio Service


DPSK  Differential Phase Shift Keying
DQPSK  Differential Quaternary Phase Shift Keying
DSAA  DECT Standard Authentication Algorithm
DSAA2  DECT Standard Authentication Algorithm #2
DSC  DECT Standard Cipher (algorithm)
DSC2  DECT Standard Cipher #2 (algorithm)
DTAM  Digital Telephone Answering Machine
DTE  Data Terminal Equipment
DTMF  Dual Tone Multi-Frequency
E type  B-field multiplexer mode when the slot carries signalling only (channels C_F, G_F and M)
E/U-mux  B-field multiplexer (switching between E, U or E+U modes)
E+U type  B-field multiplexer mode when the slot carries U-plane data (channel I_PF) AND signalling
          (channels G_F and M)
ECN  Exchanged Connection Number (DLC/MAC layer)
EIRP  Equivalent Isotropically Radiated Power
EMC Equipment Manufacturer's Code
ERMES European Radio MESSaging System
ERP Ear Reference Point
ERP Effective Radiated Power
ES End System
ESC ESCape
FBN Frame Buffer (uNprotected)
FBP Frame Buffer (Protected)
FCC Federal Communications Commission
FCS Frame Check Sequence
FEC Forward Error Correction
FLEN Frame LENgth
FMID Fixed part MAC IDentity
F-MMS Fixed line-Multimedia Messaging Service
FP DECT Fixed Part
FREL Frame RELay service
F-SMS Fixed line-Short Messaging Service
FSWI Frame SWItching service
FT Fixed radio Termination
FU DECT DLC U-Plane Frame format
GAP Generic Access Profile
GBN Go Back N
GFSK Gaussian Frequency Shift Keying
GMSK Gaussian Minimum Shift Keying
GNW Global NetWork
GSM Global System for Mobile communications
HAN Home Automation Network
HATS Head And Torso Simulator
HDB Home Data Base
HOV HandOVer flag
HPP Headset PP
HTTP Hypertext Transfer Protocol
HyP Hybrid Part
I higher layer Information channel (see IN and IP) in general
IA5 International Alphabet No. 5 as defined by ITU-T
IE Information Element
IFEI International Fixed Equipment Identity
IMS IP Multimedia Subsystem
IP Internet Protocol
IPEI International Portable Equipment Identity
IPUI International Portable User Identity
IPv4 Internet Protocol Version 4
IPv6 Internet Protocol Version 6
IRC Idle Receiver Control
ISDN Integrated Services Digital Network
ISM Industrial, Scientific and Medical
IUT Implementation Under Test
IV Initialization Vector
IWF InterWorking Functions
IWP Interworking Profile
IWU InterWorking Unit
K authentication Key
KS' FT authentication Session Key
KS PT authentication Session Key
KSG Key Stream Generator
KSS Key Stream Segment
LA Location Area
LAL Location Area Level
LAN Local Area Network
LAPC DLC layer C-plane protocol entity
NOTE: See Recommendation ITU-T V.42 [i.16].

LAPM Link Access Procedure for Modems

LAP-U Link Access Procedure (U-plane) (a service offered by LU3)

Lb DLC layer C-plane protocol entity

LBN Logical Bearer Number

Lc a DLC layer C-plane protocol entity

LC3 Low Complexity Communication Codec

LCD Largest Common Denominator

LCE Link Control Entity

LCN Logical Connection Number (DLC/MAC layer)

LiA List Access

LLe Local echo Loss

LLME Lower Layer Management Entity

LLN Logical Link Number (DLC layer)

LNW Local NetWork

LRMS Low Rate Messaging Service

LRMS-PTM Low Rate Messaging Service, Point To Multi-point

LRMS-PTP Low Rate Messaging Service, Point To Point

LSB Least Significant Bit

LSTR Listener SideTone Rating

LT Lower Tester

LU DECT DLC U-Plane Service

M MAC control channel in general (on A-tail or B fields)

M0 RFP channel pre-selection algorithm for ULE

M1 PP channel selection algorithm for ULE

M2 PP collision handling and avoidance algorithm for ULE

MAC (CCM) Message Authentication Code

MAC Medium Access Control layer

MAP bit MAPpings

MBC Multi-Bearer Control

MCE Message Control Entity

MCEI MAC Connection Endpoint Identifier

MCI MAC Connection Identifier

MCS Multi-Channel Set

MCS Modulation and Coding Scheme

MDU Multiplexed Data Unit

ME Management Entity

MF MultiFrame, also Fading Margin

MIC Message Integrity Code

MM Mobility Management

MMI Man-Machine Interface

M-MMS Messaging part of MMS

MMS Multimedia Messaging Service

MMSP Multimedia Messaging Service Protocol

MOD-2 MODulo-2

MRP Mouth Reference Point

MSB Most Significant Bit

MSC Mobile Switching Centre

MUX time MUltiplExor

NACK Negative ACKnowledgement

NCF A header in the B-field E-mux format

NEMo No Emission Mode

NG-DECT New Generation DECT

NGN New Generation Network(s)

NLF New Link Flag

NLP Non-Linear Processor

NLR No Link Required

NR Normal-Reverse

NTP Normal Transmitted Power

NWK NetWorK layer
OID Other fixed part ID
OLR Overall Loudness Rating
OSI Open Systems Interconnection
P Paging channel
PA Portable Application
PABX Private Automatic Branch eXchange
PAD Packet Assembler/Disassembler
PAP Public Access Profile
PARI Primary Access Rights Identity
PARK {y} PARK with value y for it is Park length indicator
PARK Portable Access Rights Key
PAS Public Access Service
PBX Private Branch eXchange
PCI Protocol Control Information
PCM Pulse Code Modulation
PDU Protocol Data Unit
PH Physical (layer)
PHL PPhysical Layer
PHS Portable HandSet
PIN Personal Identity Number
PLI Park Length Indicator
PMID Portable part MAC IDentity (MAC layer)
POT(S) Plain Old Telephone (Service)
PP DECT Portable Part
ppm parts per million
PRA ISDN Primary Rate Access
PSCN Primary Scan Carrier Number
PSPDN Packet Switched Public Data Network
PSTN Public Switched Telephone Network
PT Portable radio Termination
PTN Private Telecommunication Network
PUN Portable User Number
PUT Portable User Type
PVC Permanent Virtual Circuit
PWT Personal Wireless Telecommunications
Q system information channel
QAM Quadrature Amplitude Modulation
QC Compound System Information Channel of B-field for ULE
QDU Quantization Distortion Unit
RA Rate Adaptation
RA Redundancy check of the A-field
RAM Random Access Memory
RAND-F RANDom challenge issued by a FT
RAND-P RANDom challenge issued by a PT
RfFP Reference Fixed Part
REP REpeater Part
RePP Reference Portable Part
RES1 RESponse calculated by a PT
RES2 RESponse calculated by an FT
RF Radio Frequency
RFPI Radio Fixed Part Identity
RFR Ready For Release
RLL Radio in the Local Loop
RLRH Receiving Loudness Rating of the Handset
ROM Read Only Memory
RPN Radio fixed Part Number
RR Receive Ready
RS cryptographic parameter used in the calculation of authentication session keys
RSS Radio Signal Strength
RSSI Radio Signal Strength Indicator
RTP Real-time Transport Protocol
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RU</td>
<td>Residential Unit</td>
</tr>
<tr>
<td>SAP</td>
<td>Service Access Point</td>
</tr>
<tr>
<td>SAPI</td>
<td>Service Access Point Identifier</td>
</tr>
<tr>
<td>SAR</td>
<td>Specific Absorption Rate</td>
</tr>
<tr>
<td>SARI</td>
<td>Secondary Access Rights Identity</td>
</tr>
<tr>
<td>SCK</td>
<td>Static Cipher Key</td>
</tr>
<tr>
<td>SDU</td>
<td>Service Data Unit</td>
</tr>
<tr>
<td>SEL</td>
<td>Selective</td>
</tr>
<tr>
<td>SIM</td>
<td>Subscriber Interface Module</td>
</tr>
<tr>
<td>SLRH</td>
<td>Sending Loudness Rating of the Handset</td>
</tr>
<tr>
<td>SMS</td>
<td>Short Message Service</td>
</tr>
<tr>
<td>SN</td>
<td>Slot Number</td>
</tr>
<tr>
<td>SP</td>
<td>Start Position</td>
</tr>
<tr>
<td>SPR</td>
<td>Spare Bits</td>
</tr>
<tr>
<td>SRAT</td>
<td>Secondary Rate Adaptation service</td>
</tr>
<tr>
<td>SRFP</td>
<td>Single Radio Fixed Part</td>
</tr>
<tr>
<td>SS</td>
<td>Supplementary Services</td>
</tr>
<tr>
<td>STMR</td>
<td>Side Tone Masking Rating</td>
</tr>
<tr>
<td>SUOTA</td>
<td>Software Update Over The Air</td>
</tr>
<tr>
<td>TA (bits)</td>
<td>Tail identification bits, a group of bits in the A-field header</td>
</tr>
<tr>
<td>TAF</td>
<td>Terminal Adaptation Function</td>
</tr>
<tr>
<td>TARI</td>
<td>Tertiary Access Rights Identity</td>
</tr>
<tr>
<td>TBC</td>
<td>Traffic Bearer Control</td>
</tr>
<tr>
<td>TCL</td>
<td>Telephone Coupling Loss</td>
</tr>
<tr>
<td>TCLw</td>
<td>weighted Terminal Coupling Loss</td>
</tr>
<tr>
<td>TCP</td>
<td>Transmission Control Protocol</td>
</tr>
<tr>
<td>TDD</td>
<td>Time Division Duplex</td>
</tr>
<tr>
<td>TDM</td>
<td>Time Division Multiplex</td>
</tr>
<tr>
<td>TDMA</td>
<td>Time Division Multiple Access</td>
</tr>
<tr>
<td>TELR</td>
<td>Talker’s Echo Loudness Rating</td>
</tr>
<tr>
<td>TI</td>
<td>Transaction Identifier</td>
</tr>
<tr>
<td>T-MUX</td>
<td>Tail MUX</td>
</tr>
<tr>
<td>TPUI</td>
<td>Temporary Portable User Identity</td>
</tr>
<tr>
<td>TRUP</td>
<td>Transparent UnProtected service</td>
</tr>
<tr>
<td>U type</td>
<td>B-field multiplexer mode when the slot carries U-plane data only (channels IN or IP)</td>
</tr>
<tr>
<td>UAK</td>
<td>User Authentication Key</td>
</tr>
<tr>
<td>UCN</td>
<td>U-plane Channel Number</td>
</tr>
<tr>
<td>UDP</td>
<td>User Datagram Protocol</td>
</tr>
<tr>
<td>ULE</td>
<td>Ultra Low Energy</td>
</tr>
<tr>
<td>ULI</td>
<td>Unassigned Link Identifier</td>
</tr>
<tr>
<td>ULN</td>
<td>U-plane Link Number</td>
</tr>
<tr>
<td>UMTS</td>
<td>Universal Mobile Telecommunication System</td>
</tr>
<tr>
<td>U-NEMo</td>
<td>ULE No Emission Mode</td>
</tr>
<tr>
<td>UPCS</td>
<td>Unlicensed Personal Communications Service</td>
</tr>
<tr>
<td>UPI</td>
<td>User Personal Identification</td>
</tr>
<tr>
<td>U-plane</td>
<td>User plane</td>
</tr>
<tr>
<td>USB</td>
<td>Universal Serial Bus</td>
</tr>
<tr>
<td>VC</td>
<td>Virtual Call</td>
</tr>
<tr>
<td>VDB</td>
<td>Visitors Data Base</td>
</tr>
<tr>
<td>VF</td>
<td>cable Velocity Factor</td>
</tr>
<tr>
<td>W-FT2FT</td>
<td>Wireless FT to FT communication</td>
</tr>
<tr>
<td>WIFI</td>
<td>IEEE 802.11 [i.20] family of standards</td>
</tr>
<tr>
<td>WLL</td>
<td>Wireless Local loop</td>
</tr>
<tr>
<td>WRS</td>
<td>Wireless Relay Station</td>
</tr>
<tr>
<td>XRES1</td>
<td>an eXpected RESponse calculated by a FT</td>
</tr>
<tr>
<td>XRES2</td>
<td>an eXpected RESponse calculated by a PT</td>
</tr>
<tr>
<td>ZAP</td>
<td>ability first to assign and then to re-program the account data held in the PP</td>
</tr>
</tbody>
</table>
4 Structure

4.0 General

The present multi-part deliverable consists of 8 parts (parts 1 (the present document) to 8 [8] inclusive) which are briefly described in clauses 4.1 to 4.8.


In addition there exists a DECT approval test specification ETSI EN 300 176 [9] which is not described in the present document.

4.1 Part 1: Overview

The overview (the present document) contains an introduction to the complete European Standard. It includes a description of the system and the protocol architecture and a vocabulary of terms.

4.2 Part 2: Physical Layer (PHL)

The PHL (ETSI EN 300 175-2 [2]) specifies radio parameters such as the frequency, timing and power values, the bit and slot synchronization and the transmitter and receiver performance. ETSI EN 300 175-2 [2] defines a basic 2-level modulation mode (GFSK) plus optional high level modulation modes up to 64 QAM, providing higher capacities.

4.3 Part 3: Medium Access Control (MAC) layer

The MAC layer (ETSI EN 300 175-3 [3]) specifies three groups of MAC services. These are the broadcast message control service, the connectionless message control service and the multi-bearer control service. It also specifies the logical channels, which are used by the above-mentioned services, and how they are multiplexed and mapped on to the physical channels.

4.4 Part 4: Data Link Control (DLC) layer

The DLC layer (ETSI EN 300 175-4 [4]) specifies two groups of DLC services. These are the services for the C-plane and the services for the U-plane.

For the C-plane a point-to-point service and a broadcast service are defined. The point-to-point service can operate in acknowledged or unacknowledged mode and provides addressing, frame delimiting, error control, flow control, segmentation of network layer information fields, fragmentation of DLC frames and connection handover.

For the U-plane the transparent unprotected service, the frame relay service, the frame switching service and the rate adoption service are defined.

4.5 Part 5: Network (NWK) layer

The NWK layer (ETSI EN 300 175-5 [5]) specifies the functions for the link control, the Call Control (CC), the Supplementary Services (SS), the Connection Oriented Message Service (COMS), the ConnectionLess Message Service (CLMS) and the Mobility Management (MM). For these groups it contains the procedures, messages and information elements.
4.6 Part 6: Identities and addressing

The identities and addressing (ETSI EN 300 175-6 [6]) specifies the main identities and addresses which are used in DECT. They are divided into the following four categories: FP identities, PP identities, connection related identities and equipment related identities.

Several of the FP identities and PP identities are allocated centrally in order to maintain global uniqueness for these identities.

4.7 Part 7: Security features

The security features (ETSI EN 300 175-7 [7]) specify the overall security architecture for DECT, the types of cryptographic algorithms required and the way in which they are to be used, and the requirements for integrating the security features provided by the architecture into the DECT air interface. It also describes how the features may be managed and how they relate to certain DECT fixed systems and local network configurations.

ETSI EN 300 175-7 [7] provides two sets of standard algorithms for authentication and ciphering: the DECT Standard Authentication Algorithm (DSAA), the DECT Standard Ciphering (DSC) the DECT Standard Authentication Algorithm #2 (DSAA2) and the DECT Standard Ciphering #2 (DSC2).

4.8 Part 8: Speech and audio coding and transmission

The speech and audio coding and transmission (ETSI EN 300 175-8 [8]) specifies the requirements for DECT equipment which includes all the necessary functions to provide real-time two-way speech conversation or other audio services. It defines the different speech and audio encoding algorithms supported by DECT and the detailed audio performance characteristics of DECT PPs and FPs such as sensitivity, frequency response, sidetone, terminal coupling loss, distortion, variation of gain with input level, out of band signals, noise, acoustic shock, delay and network echo control.

5 The objectives of the CI standard

The DECT standard has grown out of the need to provide cordless communications, both for voice traffic and for data traffic.

The DECT standard is designed to support this versatility of applications at a cost that encourages wide adoption. DECT provides personal telecommunication services in residential, neighbourhood and business environments. It is particularly targeted at the following applications:

- residential - domestic cordless telephones (PSTN, ISDN and IP access);
- public access services;
- cordless business telephones (PBXs and converged IP based business networks);
- cordless data - Local Area Networks (LANs) and point-to-point connections;
- wireless home networking;
- wireless access to the internet or intranet;
- machine to machine (M2M) or machine to man wireless communication (e.g. sensors, alarms, monitoring and metering devices);
- extensions to cellular radio and extensions of the local public network;
- Radio in the Local Loop (RLL).

The DECT standard supports narrowband (3.1 kHz) audio, wideband audio (7 kHz), superwideband audio (up to 14 kHz) and fullband audio (up to 20 kHz) with a range of audio codecs and acoustic models as defined in ETSI EN 300 175-8 [8].
The DECT standard supports circuit mode and packed mode data transmission with a maximum data rate of 844.8 kbit/s for 2 level modulation, single transceiver systems and 5,068 Mbit/s for systems implementing high level modulation (single transceiver). These rates could be multiplied using multiple radio channels in parallel. Refer to ETSI EN 301 649 [11] for description of packet data capabilities in DECT.

The DECT standard supports DECT Ultra Low Energy (ULE). DECT ULE provides packet mode data transmission capabilities with ultra low power composition. DECT CI provides specific features for the supporting of ULE operation modes, including specific messages, services and procedures. Refer to ETSI TS 102 939-1 [i.18] for description of DECT Ultra Low Energy (ULE).

DECT has also been selected by the ITU as one of the radio interfaces for "International Mobile Telecommunications 2000" (IMT-2000) [10]. As DECT is using a combination of frequency and time multiple access the corresponding air-interface is called "IMT-2000 FDMA/TDMA" by the ITU.

Because of different regulatory requirements in the USA, the American National Standards Institute (ANSI) has published (1997) a derivative of the DECT standard as the PWT standard, implementing the required adaptations, especially in the physical layer. However, during 2004 the requirements in the USA were modified, whereby standard DECT equipment may be used with minor modifications in the channel allocation procedures and in RF power setting. (See ETSI TS 102 497 [12] describing modifications differences in DECT standard to meet new UPCS rules.) This will make the PWT standard obsolete. Other requirements relevant for utilization of DECT in USA, e.g. in the UPCS 1 920 MHz to 1 930 MHz and IMS 2,4 GHz are specified in various ETSI DECT standards.

The specific variants for use of DECT in USA market over the UPCS band are specified in ETSI TS 102 497 [12].

One primary objective of this CI standard is to provide a basis for interoperability between equipment of different origin, so offering users a family of telecommunication services for voice or data, either as basic services, or with optional (and compatible) extensions.

While providing for compatibility, the present document provides standard escape routes that allow manufacturers to retain options for innovation and product differentiation (see clause 8). In addition, reserved codes have been included in the present document to provide mechanisms for evolutionary development of the present document. At the same time, the existence of the present document allows implementers to design systems that can provide telecommunications to users in several different locations.

At a more detailed level, the protocols in the present document are designed to provide for the specific services and facilities defined in ETSI ETR 043 [i.5] and Recommendation ITU-R M.816-1 [i.3]. In the design process, the following additional objectives were considered:

- the structure should allow any other reasonable application;
- the structure should allow any reasonable implementation.

Lastly, the present document also has the objective of regulating the use of, and interface of, two shared resources:

- the RF spectrum which is allocated to provide for the cordless operation of the communication system; and
- one or more networks for which the DECT network provides cordless connection.

It is the objective of the present standard to ensure that conforming equipment will be able to use the above resources efficiently and with the minimum degree of mutual interference, i.e. avoiding adverse effects to existing, or future, users of those resources, see also Recommendation ITU-R SM.1046-2 [i.2].

### 6 General description of the system

DECT is based on a micro-cellular radio communication system that provides low-power radio (cordless) access between PPs and (DECT) FPs at ranges up to a few hundred metres (up to several kms for fixed access systems). The basic technical characteristics are as follows:

- frequency band: 1 880 MHz to 1 980 MHz and 2 010 MHz to 2 025 MHz (see note 1);
- number of carriers: typical 10 (see note 1);
- carrier spacing: 1,728 MHz (see note 1);
maximum peak transmit power: 250 mW (see note 1);
carrier multiplex: TDMA; 12 double slots/24 full slots/48 half slots per frame;
frame length: 10 ms;
basic duplexing: TDD using 2 slots on same RF carrier;
gross bit rate: 1 152 kbit/s, 2 304 kbit/s, 3 456 kbit/s, 4 608 kbit/s or 6 912 kbit/s for 2-, 4-, 8-, 16- or 64-level modulation respectively (see note 2);
net channel rates: 6,4 kbit/s A-field (control/signalling) per slot.

B-field (traffic) rates per slot are described in table 1.

<table>
<thead>
<tr>
<th>Type of modulation</th>
<th>Maximum B-field (traffic) rate per slot</th>
<th>Maximum asymmetric B-field (traffic) data rate (11 double slots)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>half slot (j = 80)</td>
<td>long slot (j = 640)</td>
</tr>
<tr>
<td>2-level modulation</td>
<td>8 kbit/s</td>
<td>64 kbit/s</td>
</tr>
<tr>
<td>4-level modulation</td>
<td>16 kbit/s</td>
<td>128 kbit/s</td>
</tr>
<tr>
<td>8-level modulation</td>
<td>24 kbit/s</td>
<td>192 kbit/s</td>
</tr>
<tr>
<td>16-level modulation</td>
<td>32 kbit/s</td>
<td>256 kbit/s</td>
</tr>
<tr>
<td>64-level modulation</td>
<td>48 kbit/s</td>
<td>384 kbit/s</td>
</tr>
</tbody>
</table>

NOTE 1: The complete definition of frequency bands and carrier positions for DECT are found in ETSI EN 300 175-2 [2]. DECT is a member of the IMT-2000 family [10], the only member that provides for uncoordinated installations on an unlicensed spectrum. The most common spectrum allocation is 1 880 MHz to 1 900 MHz, but outside Europe spectrum is also available in 1 900 MHz to 1 920 MHz and in 1 910 MHz to 1 930 MHz (several countries). Carrier positions in the 902 MHz to 928 MHz and 2 400 MHz to 2 483,5 MHz ISM bands have been defined for the US market. New or modified carrier positions and/or frequency bands can be defined when needed. The number of carriers depends on the frequency spectrum in use and the carrier spacing. Maximum peak transmit power also depends on local regulations or environment requirements.

NOTE 2: Depending on radio capabilities or number of radios used a DECT system can provide higher data rate. The indicated here values are relevant for radios operating on 10 carriers and non-overlapping slots.

A connection is provided by transmitting bursts of data in the defined time slots. These may be used to provide simplex or duplex communications. Duplex operation uses one or several pairs of evenly (5 ms) spaced slots. Of the paired slots one is for transmit and one for receive.

The simplest duplex service uses a single pair of time slots to provide e.g. a 32 kbit/s (2-level modulation) digital information channel capable of carrying coded speech or other low rate digital data. Higher data rates are achieved by using more time slots in the TDMA structure, and a lower data rate may be achieved by using half-slot data bursts. Different uplink and downlink bitrates are realized by using asymmetric connections, where a different number of time slots is used for the uplink and downlink. For efficient transmission of packet data the radio connection can be suspended after the data has been sent and as soon as new data arrives, the radio connection is resumed again.

DECT is able to support a number of alternative system configurations ranging from single cell equipment (e.g. domestic FPs) to large multiple cell installations (e.g. large business cordless PBXs or converged IP based business systems), public pedestrian systems and fixed wireless access (radio local loop) systems.

The protocols are designed to support uncoordinated system installation, even where the systems co-exist in the same physical location. Efficient sharing of the radio spectrum (of the physical channels) is achieved using a careful mechanism for selection of channels prior to their use. This is called dynamic channel selection (see ETSI ETR 310 [i.7]).
In addition, the DECT protocols provide two internal mechanisms to support rapid handover of calls in progress (both intracell and intercell handover are supported). These handover mechanisms allow a high quality of service to be maintained where the mobility of the PP requires transparent re-connection to another FP or where a new physical channel is required in response to disturbances in the radio environment.

Wireless Relay Stations (WRSs) for wireless coverage enhancements, direct communication from PT to PT and wireless communication between FTs is also supported.

DECT is an access technology providing sufficient flexibility for access to various communication networks, e.g. IP, PSTN, ISDN, LAN, GSM, UMTS, etc.

7 Description of the protocol architecture

7.1 General

The structure of the present document is based on the layered principles used in the ISO Open Systems Interconnection (OSI) model. The complete CI corresponds to the lower 3 layers of the ISO OSI model. In order to take care of the uncertainties introduced by using radio transmissions at the PHL and to include the concept of handover, the layer 2 has been split into two sub-layers. Therefore DECT defines 4 layers of protocol.

7.2 The DECT layered structure

A structure of four layers is used for the signalling protocols as shown in figure 1.

![Figure 1: The layered structure](image)

The top of the NWK layer corresponds to the top of the OSI layer 3. The intermediate boundaries have no OSI equivalent but for ease of understanding an approximate correspondence is given below:

- **OSI Layer 1**: all of the PHL plus part of MAC layer;
- **OSI Layer 2**: most of MAC layer plus all of DLC;
- **OSI Layer 3**: all of the NWK layer.
7.3 Physical Layer (PHL)

The PHL (ETSI EN 300 175-2 [2]) divides the radio spectrum into the physical channels. This division occurs in two fixed dimensions, frequency and time.

The frequency and time division uses Time Division Multiple Access (TDMA) operation on multiple RF carriers. Typically ten carriers are provided within the actual frequency band (1 880 MHz to 1 900 MHz is the most common frequency allocation for DECT). The present document also provides for possible extensions of the band to meet future demand. On each carrier the TDMA structure defines 24 full-slots in a 10 ms frame, where each timeslot may be used to transmit oneself contained packet of data. Each transmitted packet contains a synchronization field, together with control information, service information and error control.

NOTE: In addition the radio spectrum is divided spatially into cells, where the same physical channels may be re-used in different (geographic) locations. The spatial re-use operates according to the principles of Dynamic Channel Selection (DCS) as described in ETSI ETR 310 [i.7] dealing with DECT features.

Each radio end point operates according to a timing reference and the PHL is then responsible for transmitting packets of data under direct control of the MAC layer. Adjacent FPs may be synchronized. This provides some advantages, particularly in high traffic situations (see ETSI ETR 310 [i.7]).

7.4 MAC layer

The MAC layer (ETSI EN 300 175-3 [3]) performs two main functions. Firstly, it selects physical channels, and then establishes and releases connections on those channels. Secondly, it multiplexes (and demultiplexes) control information, together with higher layer information and error control information, into slot-sized packets.

These functions are used to provide three independent services; a broadcast service, a connection oriented service and a connectionless service.

The broadcast service is a special DECT feature: it multiplexes a range of broadcast information into a reserved field (the A-field), and this field appears as part of all active transmissions. The broadcast service is always transmitted in every cell (even in the absence of user traffic) on at least one physical channel. These "beacon" transmissions allow PPs to quickly identify all FPs that are within range, to select one, and to lock to it without requiring any portable transmissions.

7.5 DLC layer

The DLC layer (ETSI EN 300 175-4 [4]) is concerned with the provision of very reliable data links to the NWK layer. Many of the imperfections of the radio transmissions are already removed by the efforts of the MAC layer, and the DLC layer is designed to work closely with the MAC layer to provide higher levels of data integrity than can be provided by the MAC layer alone.

The DECT layered model separates into two planes of operation at the DLC layer; the C-plane and the U-plane.

The C-plane is common to all applications, and provides very reliable links for the transmission of internal control signalling and limited quantities of user information traffic. Full error control is provided with a balanced Link Access Protocol (LAPC).

The U-plane provides a family of alternative services, where each service is optimized to the particular need of a specific type of services. The simplest service is the transparent unprotected service used for speech transmission. Other services support circuit mode and packet mode data transmission, with varying levels of protection.

7.6 Network (NWK) layer

The NWK (ETSI EN 300 175-5 [5]) layer is the main signalling layer of the protocol. It adopts a similar style to the ISDN layer 3 protocol (see ETSI EN 300 403-1 [i.1]) and offers a similar level of functions.

The NWK layer operates using an exchange of messages between peer entities. The basic set of messages supports the establishment, maintenance and release of calls. Additional messages support a range of extended capabilities.
The basic CC provides a circuit switched service selected from one of the range of DLC options. Other network layer services are SS, COMS, CLMS and MM. These services are arranged as independent entities, and a particular application can be realized using more than one.

The MM is a particularly important group of services. This group contains the procedures that support the special cordless mobility of PPs, for example authentication and location registration.

7.7 Lower Layer Management Entity (LLME)

The LLME contains defined procedures that concern more than one layer. The LLME procedures are included in ETSI EN 300 175-3 [3] to ETSI EN 300 175-5 [5]. Most of these procedures have only local significance, and they are defined in general terms to allow for alternative implementations. The location of some selected LLME procedures is as follows:

MAC layer:
- creation, maintenance and release of bearers, by activating and deactivating pairs of physical channels;
- physical channel management, including the choice of free physical channels and the assessment of the quality of received signals;
- switching between PT and FT mode when direct PT to PT or wireless FT to FT communication is provided.

DLC layer:
- connection management, which includes the establishment and release of connections in response to NWK layer demands;
- routing of C-plane and U-plane data to suitable connections.

NWK layer:
- service negotiation and mapping;
- application parameters (e.g. addresses) and DECT identities resolution.

7.8 Interworking Units (IWU)

Transport of the information to the end user requires additional layers of protocol that are outside the scope of the present document. In general, an IWU will be required to provide the necessary interworking functions. This IWU plays an important role in defining the exact service that is provided. Specifications of IWUs defining the interworking between the DECT air interface and various networks and line interfaces can be found in additional DECT profile specifications. A brief overview can be found in ETSI TR 101 178 [i.4].

8 Proprietary escapes within the CI

8.0 General

A set of defined escape routes has been provided for implementers that wish to implement proprietary additions or alternatives to the CI protocol, as shown in figure 2.
8.1 Primary escape routes

Two primary escape routes are defined within the CI standard, one at the MAC layer and one at the NWK layer. In both cases these escape routes provide the possibility for manufacturers to branch into a family of proprietary protocols. These branches provide a compatible method for proprietary systems to operate without causing confusion or interference to systems that implement the other CI provisions.

The lowest branch occurs at the MAC layer. The branch is defined at this level in order to ensure a minimum level of conformance to the CI. The minimum level of conformance therefore includes all of the PHL and the lower parts of the MAC layer (in particular, the MAC A-field header, A-field CRC and the channel selection procedures).

This MAC branch operates by using one reserved code in the MAC header field (the field that appears at the start of every transmission, see ETSI EN 300 175-3 [3]). All equipment shall understand this reserved code. This reserved code shall be used in every transmission from proprietary equipment and shall never be used by equipment that conforms to the standard branch. This means that transmissions from proprietary systems can be immediately identified by all other equipment.

For approvals testing purposes a small number of standard messages shall be supported by proprietary equipment when operating in a special test mode. No messages are mandated for proprietary equipment in normal operating mode.

At the NWK layer the escape route operates by using a reserved protocol discriminator code. All equipment shall understand this code, it shall be used exclusively by proprietary protocols (other codes are reserved for the standard protocols) to clearly indicate that a proprietary protocol is in use. In this case proprietary protocols can co-exist with standard protocols as part of the same equipment.

8.2 Secondary escape routes

In addition to these primary escape routes, a series of secondary escape routes are defined at all layers using reserved codes or optional elements, as appropriate. These small branches allow proprietary information to be included in addition to the CI information. They are designed to allow manufactures to enhance the CI with proprietary features without compromising the basic level of interoperability.
9 Levels of conformance

The following levels of CI conformance are defined:

- **CI-PROFILE-PLUS**: ETSI approved CI operating profile(s) with proprietary extensions;
- **CI-PROFILE**: ETSI approved CI operating profile(s) (e.g. GAP);
- **CI-BASE**: PHL and minimum MAC conformance.

The CI-Base defines the minimum level of conformance to the CI standard. It does not imply any speech transmission characteristics.

10 Further development of the DECT standard

10.1 IMT-2000

DECT has also been selected by the ITU as one of the radio interfaces for "International Mobile Telecommunications 2000" (IMT-2000) [10]. As DECT is using a combination of frequency and time multiple accesses the corresponding air-interface is called "IMT-2000 FDMA/TDMA" by the ITU.

10.2 The DECT Packet Radio Service (DPRS)

The DECT Packet Radio Service (DPRS) [11] provides packet data communications with up to 840 kbit/s (GFSK modulation) or up to 5 Mbit/s (High Level Modulation). DPRS supports multibearer, asymmetric connections, and efficient packet data handling.

The most relevant features of DPRS are the following:

- Channel access time (from suspend state) = 15 ms (first bearer), 25 ms (additional bearers).
- Connection Oriented and Full Mobility Management Procedures (similar to a cellular system).
- Simplified modes for Wireless LAN operation and low data rate applications.
- Dual ARQ architecture with ARQ at MAC and at DLC layer.
- Optional channel encoding (based on Turbo coding) for use with High Level Modulation modes.

10.3 DECT in international markets

10.3.0 General

DECT was initially developed as a European standard. It was later adopted by many other countries and today has become a word-wide de-facto standard for cordless telephony applications.

Currently, DECT is available near worldwide (the technology has been adopted in over 110 countries). The United States market was, in practice, opened to DECT by an FCC decision in 2005, and is now one of the most important markets in terms of growing. The introduction of DECT in Japan, the last important market, is currently under discussion with the local regulatory and standardization organizations and the necessary Technical Specification is planned to appear soon.

Because of different regulatory requirements, specific adaptations are needed for use of the technology over some non-European Countries. When this is needed, a specific Technical Specification (TS) covers the national requirements for each specific market.
10.3.1 United States of America

In the USA, the American National Standards Institute (ANSI) has published (1997) a derivative of the DECT standard as the PWT standard, implementing the required adaptations, especially in the physical layer. However, during 2004 the requirements in the USA were modified, whereby standard DECT equipment may be used with minor modifications in the channel allocation procedures and in RF power setting. (See ETSI TS 102 497 [12] describing modifications differences in DECT standard to meet new UPCS rules.) This will make the PWT standard obsolete. Other requirements relevant for utilization of DECT in USA, e.g. in the UPCS 1 920 MHz to 1 930 MHz and IMS 2.4 GHz are specified in various ETSI DECT standards.

The specific variants for use of DECT in USA market over the UPCS band are specified in ETSI TS 102 497 [12].

10.4 The New Generation DECT (NG-DECT)

New Generation DECT (NG-DECT) is the name given to the further development of the DECT standard performed from 2006 with primary target on VoIP applications. NG-DECT is implemented by the addition of new functions to the DECT base standard (keeping back-compatibility with all previous developments) and the creation of a dedicated set of Application Profiles defining new types of products.

New Generation DECT includes the following new features:

- Superior voice quality better than any existing technology (wideband and super-wideband speech).
- New codecs G.722 [i.21], G.729.1 [i.22] and MPEG-4 [i.23].
- Improved audio models (including acoustic interface) jointly developed with the participation of audio experts.
- Complete set of signalling and procedures for VoIP (SIP [i.24] and H.323 [i.25]) and mixed (base stations with dual PSTN and VoIP connectivity) scenarios supporting features such as multiple lines, multiple calls, call line and name identification, call transfer, conferencing, intrusion call, etc.
- New DECT headset devices (with DECT radio i/f).
- Support of Broadband Data and Audio Streaming.
- Video telephony capability.
- Plug & Play functionality of all components.
- Enhanced security.
- Automatic device detection and configuration (easy pairing).

New Generation DECT specifications started to appear in March 2007, with the publication of an Overview Report (ETSI TR 102 570 [i.10]). The following NG-DECT Technical Specifications have been published:

- ETSI TS 102 527-1 [i.11]: "New Generation DECT; Part 1: Wideband Speech".
- ETSI TS 102 527-2 [i.12]: "New Generation DECT; Part 2: Support of Transparent IP Packet Data".
- ETSI TS 102 527-3 [i.13]: "New Generation DECT; Part 3: Extended wideband speech services".
- ETSI TS 102 527-4 [i.14]: "New Generation DECT; Part 4: Light Data Services; Software Update over the air (SUOTA), content downloading and HTTP based applications".
- ETSI TS 102 527-5 [i.15]: "New Generation DECT; Part 5: Additional feature set nr. 1 for Extended wideband speech services".

10.5 DECT Ultra Low Energy (ULE)

DECT Ultra Low Energy (ULE) is a new packet data technology intended for Machine to Machine communications with ultra low power consumption operation. DECT ULE is based in DECT technology; however, it addresses a new application and a completely different market.
DECT ULE is a technology intended for sensors, alarms, machine-to-machine and industrial automation. The DECT ULE technology positioning is an optimal compromise between low energy consumption and medium range. This positioning addresses many application scenarios not covered by any existing technology, since current contenders have either, too much power consumption, limitations for accessing the spectrum, too short range or are not standardized.

Applications such utility meters and related devices are also covered by DECT ULE. Therefore, it is also linked to smart grids.

Due to the reduction of power compared to other technologies it addresses the green agenda with immediate reduction of environmental hazards (i.e. longer duration of batteries).

DECT ULE development has been materialized during years 2012-2014 with the production of the two firsts Technical Specification (TS) (ETSI TS 102 939-1 [i.18] and ETSI TS 102 939-2 [i.19]) and the inclusion of the required functions in the DECT base standard.

The first specification of DECT ULE is the ETSI TS 102 939-1 [i.18] "Digital Enhanced Cordless Telecommunications (DECT); Ultra Low Energy; Machine to Machine Communications; Part 1: Home Automation Network (phase 1)". It covers the base functionality of the technology for different applications in the area of Home Automation.

The second specification of DECT ULE is the ETSI TS 102 939-2 [i.19] "Digital Enhanced Cordless Telecommunications (DECT); Ultra Low Energy; Machine to Machine Communications; Part 2: Home Automation Network (phase 2)". It adds additional services and features for the same Home Automation area, such as support for multicast, support for voice and Software Update Over The Air (SUOTA).

Further specifications for DECT ULE covering additional features or other scenarios will be produced in the future by TC DECT.

From the point of view of DECT standardization, the Technical Specifications for DECT ULE are application profiles (AP) based on the DECT base standard, ETSI EN 300 175, parts 1 (the present document), 2 [2] to 8 to [8].

The base functionality for DECT ULE is available from the release V2.5.1 of the DECT base standard (the previous revision of the present document and others parts of ETSI EN 300 175). This new functionality includes the following specific functionalities:

- **MAC/PHY Layer:**
  - Unlocked, ultra low duty cycle operation for battery powered Portable Part devices with provisions for Fast Locking to the RFP.
  - Dedicated ULE "dummy" C/L channel using the B-field of regular dummy bearer containing:
    - Aids for fast re-synchronization.
    - General static broadcast information.
    - Channel selection information.
    - Dedicated ULE paging channels.
    - Provision for connectionless downlink channels (in further phases).
  - Ultra-fast "expedited" procedures optimized for ULE and allowing combined transmission of signalling and data packet in the very first frame.
  - Dedicated M_T messages, specific for the expedited procedures.
  - New paging channels specific for ULE transmitted in the B-field of the dummy bearer, implementing a wide range of modes from fast to ultra-slow paging.
  - Management algorithms for channel selection and handling access collisions.
  - U-plane based on MAC protected service I_PQR.

- **DLC Layer:**
  - New DLC service LU14 incorporating CCM authenticated encryption over existing service LU10.
- New channel $G_{FA}$ for DLC control.

- **Network (NWK) Layer:**
  - Connection Oriented model including CC (Call Control) and MM (Mobility Management) entities.
  - Additional IEs for negotiation of higher layer (application) protocol.

- **Security:**
  - New authenticated encryption based on CCM operating at DECT DLC layer.
  - Provides simultaneously strong encryption and continuous mutual authentication without the need of running NWK layer transactions.

Examples of DECT ULE devices, covered by ETSI TS 102 939-1 [i.18] (DECT ULE Phase 1) and making use of the ULE base functionality provided by the present document (and others parts of ETSI EN 300 175) are the following:

- **Actuator devices:**
  - Devices with fast response times (Fixed Part to Portable Part and vice versa) commonly used in for instance Electricity Plugs or Motor Drivers.

- **Slow Actuator devices:**
  - Devices with relatively fast response times (Fixed Part to Portable Part and vice versa) commonly used in for instance Thermostats.

- **Sensor devices:**
  - Devices with long sleep times and fast response times from Portable Part to Fixed Part. Typical examples are switches and push buttons, temperature sensors, smoke detectors and motion detectors.

### 10.6 DECT Evolution

DECT Evolution is a mid-term evolution program intended to explore the limits of TDMA/FDMA technology by adding new modulation schemes, channel coding, and reduction of latency. It is implemented as a series of improvements in DECT CI MAC layer (ETSI EN 300 175-3 [3]), Network layer (ETSI EN 300 175-5 [5]) and audio coding and transmission (ETSI EN 300 175-8 [8]). The most relevant features of DECT Evolution are the following:

- Enhanced support of High Level Modulation.
- Introduction of Modulation and Coding Schemes (MCSs).
- New MAC service I$_N$ with limited delay introducing handover with slot position tolerance.
- Improved procedures for double simplex bearers.
- New Channel List procedures and messages.
- Optimization of some MAC control messages.
- Support of multiple DLC LU instances per call.
- Support of multiple U-plane endpoints per connection.
- Support of combinations of slots and combinations of modulation states in multibearer connections.
- Possibility to add new channel codecs.
- New improved LC3plus [i.26] audio codec for narrowband, wideband, super-wideband and full-band voice services.
- Mesh network operation for IoT applications.
Annex A (informative):
Bibliography

- IETF RFC 0791: "Internet protocol".
- Recommendation ITU-T X.25: "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".
- Recommendation ITU-T P.10: "Vocabulary for performance, quality of service and quality of experience".
Annex B (informative):
Change history

The following table presents main changes from a published version to the next version (published or to be published).

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<th>Subject/Comment</th>
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<th>New</th>
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<td>1.6.1</td>
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<td>TS 102 265 [i.8] V1.1.1).</td>
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# History

## Document history

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