ETSI TS 102 527-1 V1.2.1 (2008-06)

Technical Specification

Digital Enhanced Cordless Telecommunications (DECT); New Generation DECT; Part 1: Wideband speech

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Reference

RTS/DECT-NG0254

Keywords

7 kHz, audio, codec, DECT, GAP, IMT-2000, interoperability, mobility, profile, radio, speech, TDD, TDMA

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Foreword

This Technical Specification (TS) has been produced by ETSI Project Digital Enhanced Cordless Telecommunications (DECT).

The present document is based on EN 300 175 parts 1 [1] to 8 [8] and EN 300 444 [12]. General attachment requirements and speech attachment requirements are based on EN 301 406 [11] (replacing TBR 006 [i.2]) and EN 300 176-2 [10] (previously covered by TBR 010 [i.3]). Further details of the DECT system may be found in TR 101 178 [i.1].

The present document has been developed in accordance to the rules of documenting a profile specification as described in ISO/IEC 9646-6 [13].

The information in the present document is believed to be correct at the time of publication. However, DECT standardization is a rapidly changing area, and it is possible that some of the information contained in the present document may become outdated or incomplete within relatively short time-scales.

The present document is part 1 of a multi-part deliverable covering the New Generation DECT as identified below:

Part 1: "Wideband speech";

Part 2: "Support of transparent IP packet data";

Part 3: "Extended wideband speech services";

Part 4: "Software Update Over The Air (SUOTA) and Content Download".

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1 Scope

The present document specifies a set of functionalities of the New Generation DECT.

The New Generation DECT provides the following basic new functionalities:

- Wideband voice service.
- Packet-mode data service supporting Internet Protocol with efficient spectrum usage and high data rates.
- Extended Wideband speech services.

The present document describes the first part: Wideband speech service. For the description of the support of transparent IP packet data, see TS 102 527-2 [i.4]. For the description of Extended Wideband speech services, see TS 102 527-3 [i.5]

All New Generation DECT devices will offer at least one or both of these services. If the device offers the wideband voice service, it will support also the DECT standard 32 kbit/s voice service according to EN 300 444 [12] (GAP).

All DECT devices claiming to be compliant with this Application Profile will offer at least the basic services defined as mandatory. In addition to that, optional features can be implemented to offer additional DECT services.

The aim of the present document is to guarantee a sufficient level of interoperability and to provide an easy route for development of DECT wideband speech applications, with the features of the present document being a common fall-back option available in all compliant to this profile equipment.

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2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

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

[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".

[9] Void.

[10] ETSI EN 300 176-2: "Digital Enhanced Cordless Telecommunications (DECT); Test specification; Part 2: Speech".

[11] ETSI EN 301 406: "Digital Enhanced Cordless Telecommunications (DECT); Harmonized EN for Digital Enhanced Cordless Telecommunications (DECT) covering essential requirements under article 3.2 of the R&TTE Directive; Generic radio".

[12] ETSI EN 300 444: "Digital Enhanced Cordless Telecommunications (DECT); Generic Access Profile (GAP)".

[13] ISO/IEC 9646-6: "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 6: Protocol profile test specification".

[14] ISO/IEC 9646-7: "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 7: Implementation Conformance Statements".

[15] ITU-T Recommendation G.726 (12/1990): "40, 32, 24, 16 kbit/s Adaptive Differential Pulse Code Modulation (ADPCM) ".

[16] ITU-T Recommendation G.711 (11/1988): "Pulse code modulation (PCM) of voice frequencies".

[17] ITU-T Recommendation G.722 (11/1988): "7 kHz audio-coding within 64 kbit/s".

[18] ITU-T Recommendation G.729.1 (05/2006): "G.729 based Embedded Variable bit-rate coder: An 8-32 kbit/s scalable wideband coder bitstream interoperable with G.729".

[19] ISO/IEC JTC1/SC29/WG11 (MPEG): International Standard ISO/IEC 14496-3:2005/AMD 1:2007: "Coding of audio-visual objects - Part 3: Audio; AMENDMENT 1: Low Delay AAC profile".

[20] ISO/IEC JTC1/SC29/WG11 (MPEG): International Standard ISO/IEC 14496-3:2005: "Information Technology - Coding of audio-visual objects - Part 3: Audio".

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2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area**.** For non-specific references, the latest version of the referenced document (including any amendments) applies.

[i.1] ETSI TR 101 178: "Digital Enhanced Cordless Telecommunications (DECT); A high Level Guide to the DECT Standardization".

[i.2] ETSI TBR 006: "Digital Enhanced Cordless Telecommunications (DECT); General terminal attachment requirements".

[i.3] ETSI TBR 010: "Digital Enhanced Cordless Telecommunications (DECT); General terminal attachment requirements: Telephony applications".

[i.4] ETSI TS 102 527-2: "Digital Enhanced Cordless Telecommunications (DECT); New Generation DECT; Part 2: Support of transparent IP packet data".

[i.5] ETSI TS 102 527-3: "Digital Enhanced Cordless Telecommunications (DECT); New Generation DECT; Part 3: Extended wideband speech services".

[i.6] ITU-T Recommendation P.311 (06/2005): "Transmission characteristics for wideband (150-7000 Hz) digital handset telephones".

[i.7] IETF RFC 3640: "RTP Payload Format for Transport of MPEG-4 Elementary Streams".

[i.8] IETF RFC 3016: "RTP Payload Format for MPEG-4 Audio/Visual Streams".

[i.9] ITU-T Recommendation G.729: "Coding of speech at 8 kbit/s using conjugate structure algebraic-code-excited linear prediction (CS-ACELP)".

[i.10] IETF RFC 3261: "SIP: Session Initiation Protocol".

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3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in EN 300 444 [12] and the following apply:

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

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

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 the audio performance requirements described in the ITU-T Recommendation P.311 [i.6]

3.2 Symbols

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

M	Mandatory to support (provision mandatory, process mandatory)
O	Optional to support (provision optional, process mandatory)
I	out-of-scope (provision optional, process optional) not subject for testing
C	Conditional to support (process mandatory)
N/A	Not Applicable (in the given context the specification makes it impossible to use this capability)

Provision mandatory, process mandatory means that the indicated feature service or procedure shall be implemented as described in the present document, and may be subject to testing.

Provision optional, process mandatory means that the indicated feature, service or procedure may be implemented, and if implemented, the feature, service or procedure shall be implemented as described in the present document, and may be subject to testing.

NOTE: The used notation is based on the notation proposed in ISO/IEC 9646-7 [14].

3.3 Abbreviations

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

AAC	Advanced Audio Coding (MPEG)
AC	Authentication Code
ADPCM	Adaptive Differential Pulse Code Modulation
AI	Air Interface
CC	Call Control
CI	Common Interface
CLIP	Calling Line Identification Presentation
CNIP	Calling Name Identification Presentation
DECT	Digital Enhanced Cordless Telecommunications
DLC	Data Link Control
DTMF	Dual Tone Multi-Frequency
ER	Error Resilient (MPEG)
FP	Fixed Part
FT	Fixed radio Termination
GAP	Generic Access Profile
IA	Implementation Alternative
IE	Information Element
IP	Internet Protocol
IPUI	International Portable User Identity
ISDN	Integrated Services Digital Network
IWU	InterWorking Unit
LA	Location Area
LD	Low Delay (MPEG)
LLME	Lower Layer Management Entity
MAC	Medium Access Control
MM	Mobility Management
MPEG	Motion Picture Experts Group
NB	Narrow Band
NG	New Generation
NG-DECT	New Generation DECT
NWK	NetWorK
P	Public (environment)
PA	Portable Application
PABX	Private Automatic Branch eXchange
PARK	Portable Access Rights Key
PHL	PHysical Layer
PP	Portable Part
PRA	Primary Rate Access (ISDN)
PT	Portable radio Termination
R/B	Residential/Business (environment)
RFP	Radio Fixed Part
S/T	ISDN S/T Interface
SARI	Secondary Access Rights Identity
TCL	Telephone Coupling Loss
TPUI	Temporary Portable User Identity
TRUP	TRansparent UnProtected service
U	ISDN U-Interface
WB	Wideband

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Full standard:
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4 Description of services

4.1 Enhanced wideband speech

In traditional telephony applications the supported bandwidth is 3,1 kHz (300 Hz to 3,4 kHz). For better speech quality and a more natural sound, a bandwidth of at least 150 Hz to 7 kHz should be supported and may be extended even further.

New Generation DECT improves audio quality by implementing wideband enhanced quality audio codecs. All New Generation DECT wideband speech devices shall implement wideband (150 Hz to 7 kHz) audio (16 kHz frequency sampling). DECT devices supporting wideband audio shall support the speech coding format according to ITU-T Recommendation G.722 [17]. In addition to that, other wideband and super-wideband audio codecs, providing even better audio quality, may be implemented.

In order to transport the higher bitrate of the new enhanced codecs, the bitrate per channel at the air interface is doubled from 32 kbit/s in traditional DECT to 64 kbit/s.

All New Generation DECT wideband speech devices shall be backward compatible with traditional DECT 32 kbit/s voice (GAP) devices. New PPs shall operate with legacy base stations, and new bases shall support existing PPs. In such cases, the voice quality is the traditional DECT quality (32 kbit/s ADPCM).

4.1.1 Audio performance requirements

New Generation DECT handsets shall fulfil the audio performance requirements described in EN 300 175-8 [8]. Different audio specifications are available for different applications, services and performance levels. The basic audio specification for Wideband speech handsets (known as PP type 2a, see EN 300 175-8 [8]) fulfils the requirements of ITU-T Recommendation P.311 [i.6]. There is the option of implementing more demanding specifications (PP types 2b and 2c of EN 300 175-8 [8]) providing superior performance.

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4.2 Wideband speech scenarios

The following scenarios are envisaged.

4.2.1 Internal calls inside a New Generation DECT system

In such a case, wideband (150 Hz to 7 kHz) communication is possible between both terminals without any special issue.

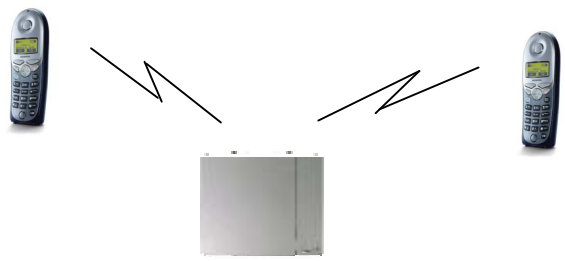

Figure 1: Internal wideband call

4.2.2 Calls between two New Generation DECT systems interconnected by ISDN

Two subscribers owning New Generation DECT base stations and handsets could establish a wideband voice communication between them if the DECT FPs are interconnected by an ISDN network with digital U or S/T interface, (or PRA) to the local exchange. The ISDN call should be digital unrestricted 64 kbit/s.

The scenario is also possible for business customers using PABX with DECT support and digital links to the public exchange.

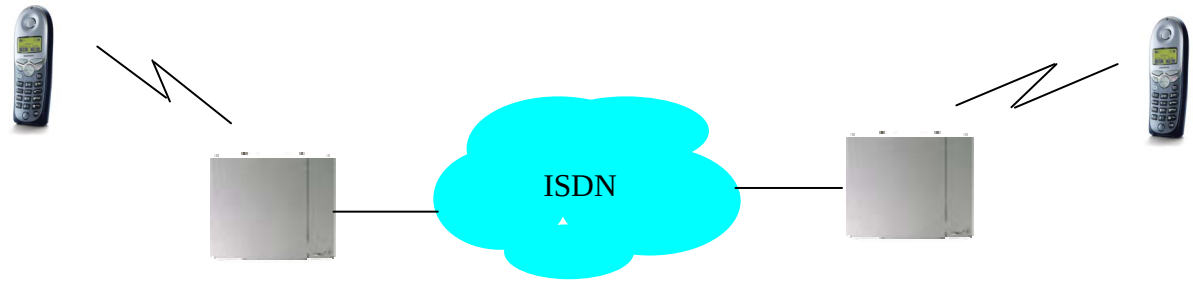

Figure 2: Wideband call via ISDN

4.2.3 Calls between two New Generation DECT systems interconnected by IP packet based network

Two subscribers owning New Generation DECT base stations and handsets, and interconnected via VoIP over an IP packet based network, could establish a wideband voice communication between them.

The IP packed based network can be either the Internet or a dedicated IP based network.

Figure 3: Wideband call via Internet

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4.2.4 Calls between a New Generation DECT system and a digital phone supporting compatible codecs

This scenario is possible, at least in the following cases.

4.2.4.1 Via ISDN

ISDN digital phones with S/T interface and supporting the ITU-T Recommendation G.722 [17] codec could establish wideband calls with New Generation DECT equipment. Identical scenario is possible for PABX digital terminals calling or called by New Generation DECT systems.

4.2.4.2 Via IP network

Digital phones with a VoIP interface could also establish wideband communications with New Generation DECT equipment. This scenario includes both, dedicated VoIP phone devices and computers implementing the necessary software. Due to the evolution of computer industry, nearly all modern Personal Computers have the capability to become a wideband phone with DECT compatible codecs.

4.2.4.3 Internal PABX calls

PABX supporting New Generation DECT and digital extensions with compatible wideband codecs could also benefit from the wideband voice quality for their internal calls.