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**Digital Enhanced Cordless Telecommunications (DECT);  
Wireless Relay Station (WRS)**

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## Foreword

This draft European Standard (EN) has been produced by ETSI Technical Committee Digital Enhanced Cordless Telecommunications (DECT), and is now submitted for the combined Public Enquiry and Vote phase of the ETSI standards EN Approval Procedure.

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
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## Modal verbs terminology

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# 1 Scope

The present document defines the Digital Enhanced Cordless Telecommunications (DECT) Wireless Relay Station (WRS). A WRS is an additional building block for the DECT fixed network.

The present document defines provisions needed for a controlled and reliable application of the DECT WRS infrastructure building block.

The DECT WRS defined by the present document supports the DECT New Generation (NG-DECT) and DECT Ultra Low Energy (ULE) profiles.

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## 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.

- [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] ETSI EN 300 444: "Digital Enhanced Cordless Telecommunications (DECT); Generic Access Profile (GAP)".
- [10] ETSI TS 102 527-3: "Digital Enhanced Cordless Telecommunications (DECT); New Generation DECT; Part 3: Extended Wideband Speech Services".
- [11] ETSI TS 102 527-4: "Digital Enhanced Cordless Telecommunications (DECT); New Generation DECT; Part 4: Light Data Services; Software Update Over The Air (SUOTA), content downloading and HTTP based applications".

- [12] ETSI TS 102 939-1: "Digital Enhanced Cordless Telecommunications (DECT); Ultra Low Energy (ULE); Machine to Machine Communications; Part 1: Home Automation Network (phase 1)".
- [13] ETSI TS 102 939-2: "Digital Enhanced Cordless Telecommunications (DECT); Ultra Low Energy (ULE); Machine to Machine Communications; Part 2: Home Automation Network (phase 2)".
- [14] ETSI EN 300 176-1: "Digital Enhanced Cordless Telecommunications (DECT); Test specification; Part 1: Radio".

## 2.2 Informative references

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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.

Not applicable.

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## 3 Definitions and abbreviations

### 3.1 Definitions

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

**Cordless Radio Fixed Part (CRFP):** WRS that provides independent bearer control to a Portable radio Termination (PT) and Fixed radio Termination (FT) for relayed connections

**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

NOTE: A DECT FP contains the logical elements of at least one FT, plus additional implementation specific elements.

**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

NOTE: A FT only includes elements that are defined in the DECT CI standard. This includes radio transmission elements together with a selection of layer 2 and layer 3 elements.

**handover:** process of switching a call in progress from one physical channel to another physical channel. These processes can be internal (see internal handover) or external (see external handover)

NOTE: There are two physical forms of handover, intra-cell handover and inter-cell handover. Intra-cell handover is always internal. Inter-cell handover can be internal or external.

**Inter Working Unit (IWU):** unit that is used to interconnect sub networks

NOTE: The IWU contains the interworking functions necessary to support the required sub network interworking.

**Medium Access Control (MAC) Connection (CONNECTION):** association between one source MAC Multi-Bearer Control (MBC) entity and one destination MAC MBC entity

NOTE: This provides a set of related MAC services (a set of logical channels), and it can involve one or more underlying MAC bearers.

**Portable Part (DECT Portable Part) (PP):** physical grouping that contains all elements between the user and the DECT air interface. PP is a generic term that may describe one or several physical pieces

NOTE: A DECT PP is logically divided into one PT plus one or more Portable Applications (PAs).

**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

NOTE: A PT only includes elements that are defined in the DECT CI standard. This includes radio transmission elements (layer 1) together with a selection of layer 2 and layer 3 elements.

**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

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

**V1 WRS:** Wireless Relay Station defined according to any revision before 2.1.1 of the present document.

**V2 WRS:** Wireless Relay Station defined according to revision 2.1.1 or later of the present document.

**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 for another DECT termination

NOTE: The DECT termination can be a PT or an FT or another WRS.

## 3.2 Abbreviations

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

AC	Authentication Code
ARI	Access Rights Identity
ARQ	Automatic Retransmission reQuest
BCK	B-filed aCKnowledgement
BMC	Broadcast Message Control
C/L	Connection-Less
C/O	Connection-Oriented
CFRP	Is this typo and should it be CRFP?
CK	Cipher Key
CN	Carrier Number
CRC	Cyclic Redundancy Check
CRFP	Cordless Radio Fixed Part
DCK	Derived Cipher Key
DECT	Digital Enhanced Cordless Telecommunications
DefCK	Default Cipher Key
DLC	Data Link Control
DPRS	Data Packet Radio service
DSAA2	DECT Standard Authentication Algorithm #2
DSC	DECT Standard Cipher
DSC2	DECT Standard Cipher #2
ECN	Exchanged Connection Number
FMID	Fixed part MAC Identity
FP	Fixed Part
FP-WRS	Fixed Part - WRS
FT	Fixed radio Termination
GAP	Generic Access Profile
GFSK	Gaussian Frequency Shift Keying
IE	Information Element
IP	Internet Protocol
IPEI	International Portable Equipment Identity
IPUI	International Portable User Identity
IWU	Inter Working Unit
KSG	Key Stream Generator
LAPC	DLC Layer C-plane upper protocol entity

LBN	Logical Bearer Number
LLME	Lower Layer Management Entity
LSB	Least Significant Bit
MAC	Medium Access Control
MBC	Multi Bearer Control
ME	Management Entity
MM	Mobility Management
MMI	Man Machine Interface
MUX	time MultipleXor
NG-DECT	New Generation - DECT
NLF	New Link Flag
NTP	Normal Transmit Power
NWK	Network
OA&M	Operation, Administration and Maintenance
PAP	Public Access Profile
PARI	Primary Access Rights Identity
PARK	Portable Access Rights Key
PHL	PHysical Layer
PHS	Personal Handy-phone System
PHY	Physical layer
PMID	Portable part MAC Identity
PP	Portable Part
PP-WRS	Portable Part - WRS
PSCN	Primary receiver Scan Carrier Number
PT	Portable radio Termination
REP	Repeater Part
RF	Radio Frequency
RFP	Radio Fixed Part
RFPI	Radio Fixed Part Identity
RMBC	Relay Multi Bearer Control
RPN	Radio fixed Part Number
RSSI	Radio Signal Strength Indicator
RX	Receive
SAP	Service Access Point
SARI	Secondary Access Rights Identity
SDU	Service Data Unit
SN	Slot pair Number
SUOTA	Software Update Over The Air
TARI	Tertiary Access Rights Identity
TBC	Traffic Bearer Control
TPUI	Temporary Portable User Identity
TX	Transmit
UAK	User Authentication Key
ULE	Ultra Low Energy
WRS	Wireless Relay Station

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## 4 Wireless Relay Station (WRS)

### 4.1 Introduction

A WRS is a physical grouping that contains both Fixed Termination (FT) and Portable Termination (PT) elements, and which transfers information between a Radio Fixed Part (RFP) and a Portable Part (PP). The FT element acts towards a PP exactly as an ordinary RFP. The PT element acts like a PP towards the RFP, and is locked to the closest/strongest RFP. The WRS contains interworking between its FT and its PT, including transparent transfer of the higher layer DECT services.

WRS links may be cascaded, which means that the RFP that the WRS locks to may in fact be another WRS.

Compared to an RFP, a WRS may introduce capacity restrictions to the services offered. The restrictions may increase with the number of cascaded WRS links (hops). Single WRS link applications can be generally applied. However, special precautions are needed when applying cascaded WRS links. For example, the capacity may be too low, or there may be a need to adjust the audio echo control requirements.

Installing or adding a WRS to a DECT infrastructure is not possible outside the control of the system operator/installer/owner, which provides the required system identities, access rights and authentication/encryption keys.

NOTE 1: Previous versions of the present document defined two different WRS concepts, the Cordless Radio Fixed Part (CRFP) and the Repeater Part (REP). The present document only defines the requirements for the CRFP. The REP had several aspects that made it complex to implement, and it is no longer supported in the present document.

NOTE 2: Since only one type of repeater is defined in the present document, the terms "repeater", "WRS" and "CRFP" are somewhat synonymous. The precise technical term is "CRFP", but the terms "WRS" and simply "repeater" can also be used more generally.

## 4.2 Description

The WRS, as shown in Figure 1, provides interworking on the DECT air interface between a PT and an FT as defined by ETSI EN 300 175, Parts 1 [1] to 8 [8].

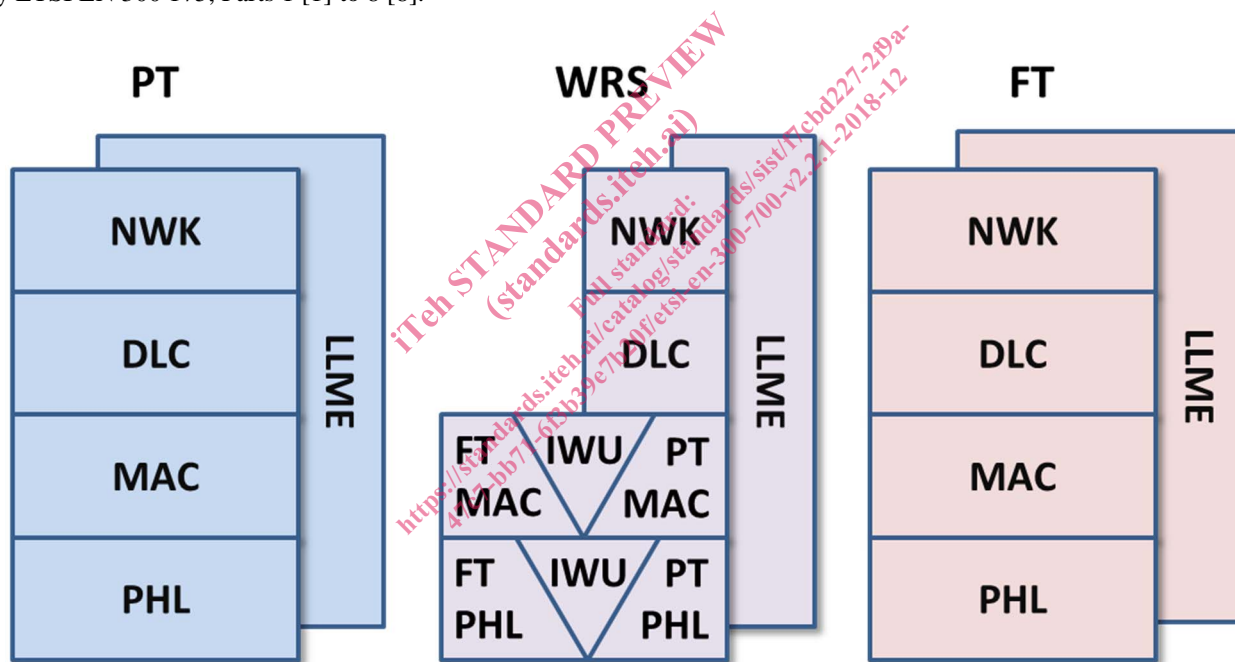


Figure 1: WRS Protocol Stack Reference Model

The PT may also be the PT side of another WRS in a multi-hop scenario. The FT may also be the FT side of another WRS in a multi-hop scenario.

The reference model of Figure 1 establishes the following basic principles of the WRS:

- Interworking with PTs as defined by ETSI EN 300 175, Parts 1 [1] to 8 [8].
- Interworking with FTs as defined by ETSI EN 300 175, Parts 1 [1] to 8 [8], with additions defined in the present document (Annex A).
- Interworking between PT and FT side is provided at Medium Access Control (MAC) layer and Physical (PHY) layer.
- A logical grouping of PT and WRS operates as a PT.
- A logical grouping of FT and WRS operates as a FT.