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

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Contents

Intellectual Property Rights	8
Foreword.....	8
Modal verbs terminology.....	8
1 Scope	9
2 References	9
2.1 Normative references	9
2.2 Informative references.....	10
3 Definitions and abbreviations.....	10
3.1 Definitions.....	10
3.2 Abbreviations	11
4 Wireless Relay Station (WRS).....	12
4.1 Introduction	12
4.2 Description	13
4.3 Reference model.....	14
4.4 Terminology	14
5 Service and feature definitions	15
5.1 System-level feature definitions	15
5.2 PHL service definitions	15
5.3 MAC service definitions	16
5.4 DLC service definitions.....	17
5.5 NWK feature definitions	17
5.6 Management Entity definitions	17
6 General requirements	17
6.1 General	17
6.2 Specific conventions.....	18
6.2.1 Use of symbols in support status tables	18
6.3 System-level feature requirements	18
6.3.1 System-level features	18
6.3.2 System-level feature to procedure mapping.....	18
6.4 PHL requirements.....	18
6.4.1 PHL services.....	18
6.4.2 Modulation schemes	19
6.4.3 PHL service to procedure mapping.....	19
6.5 MAC layer requirements	20
6.5.1 MAC layer services	20
6.5.2 MAC service to procedure mapping	21
6.6 DLC layer requirements	23
6.6.1 DLC layer services.....	23
6.6.2 DLC service to procedure mapping	24
6.7 NWK layer requirements.....	24
6.7.1 NWK features	24
6.7.2 NWK features to procedures mapping.....	25
6.8 Management Entity requirements.....	26
6.8.1 Management Entity services	26
6.8.2 Management Entity service to procedures mapping	26
7 Procedures description	26
7.1 General	26
7.2 System-level procedures.....	26
7.3 PHL procedures.....	26
7.3.1 General.....	26
7.3.2 Timing	27
7.3.3 Z-field mapping	27

7.3.4	Fast hopping radio	27
7.3.5	Antenna diversity	27
7.3.5.1	General	27
7.3.5.2	Antenna diversity at CRFP_PT	27
7.3.5.3	Antenna diversity at CRFP_FT	27
7.3.6	Sliding collision detection	28
7.3.7	Synchronization Window	28
7.3.8	Minimal Normal Transmit Power	28
7.3.9	Transmitted Power Management	28
7.4	MAC procedures	29
7.4.1	General	29
7.4.2	Physical channel selection	29
7.4.3	Maximum allowed system load	29
7.4.4	Fixed part capabilities	29
7.4.4.1	General	29
7.4.4.2	Fixed Part Capabilities	29
7.4.4.3	Extended Fixed Part Capabilities	29
7.4.4.4	Extended Fixed Part Capabilities (Part 2)	30
7.4.5	Hop control	30
7.4.6	Frame multiplexing structure	30
7.4.7	Logical channel mapping	32
7.4.8	Quality Control and Flow Control	32
7.4.8.1	General	32
7.4.8.2	I _N data handling	33
7.4.8.3	I _P data handling	33
7.4.9	MAC layer control messages	33
7.4.10	CRFP Connection-oriented mode procedures	33
7.4.10.1	General	33
7.4.10.2	Creation of a Relay Multi Bearer Control (RMBC)	33
7.4.10.3	Normal C/O bearer setup (Basic)	33
7.4.10.4	Normal C/O bearer setup (Advanced)	34
7.4.10.5	Dual C/O bearer setup (Basic)	35
7.4.10.6	Dual C/O bearer setup (Advanced)	36
7.4.10.7	C/O connection release	37
7.4.10.8	C/O abnormal connection release	38
7.4.11	CRFP connection suspend and resume	39
7.4.12	Bearer handover	41
7.4.13	Relay of higher layer data	44
7.4.14	"No emission" mode	45
7.4.15	ULE related procedures	45
7.4.15.1	Relay of I _{P_error_correct} service	45
7.4.15.2	Setting the Q2 bit	45
7.4.15.3	Use of BCK bit for flow control and end-to-end integrity	45
7.4.15.3.1	General	45
7.4.15.3.2	Lifetime counters	46
7.4.15.3.3	Setting of BCK/Q2 bits in "no-B-field" frames	46
7.4.15.4	Repeater upper segment channel selection	47
7.4.15.5	Relay of MAC expedited messages	47
7.4.15.6	Conversion of single-burst access to multi-burst setup	47
7.4.15.7	Use of "Wait" message	47
7.4.15.8	C/O scenarios mandatory sequences	47
7.4.15.8.1	General	47
7.4.15.8.2	Single burst uplink, PT initiated (1)	49
7.4.15.8.3	Single burst uplink, PT initiated (2)	50
7.4.15.8.4	Single burst uplink, PT initiated - optimal slot positions	51
7.4.15.8.5	Single burst downlink PT initiated	52
7.4.15.8.6	Single burst downlink PT initiated - optimal slot positions	53
7.4.15.8.7	Bidirectional - Single-bursts in both directions - PT initiated	54
7.4.15.8.8	Bidirectional - Multi-bursts (two packets) in both directions - PT initiated	56
7.4.15.8.9	Bidirectional - Multi-bursts (two packets) in both directions - PT initiated - optimal slot positions	57
7.4.15.9	G _{FA} channel relay	58

7.4.15.10	Handling of ULE bearer replacement (inter-cell)	58
7.4.16	Procedures for the relay of I_P _error_detect service.....	58
7.4.16.1	Transparent relay of I_P _error_detect service	58
7.4.16.2	Detection and setting of the I_P _error_detect service	58
7.4.16.3	Service change to/from I_P _error_detect service	58
7.4.16.4	BA codes supported	59
7.4.16.4.1	General	59
7.4.16.4.2	Handling of "no-B field" case.....	59
7.4.16.5	Handling of error cases in I_P _error_detect service	59
7.4.16.5.1	Setting the bits Q1 and Q2.....	59
7.4.16.5.2	Setting the BA bits and B-field content.....	59
7.4.16.5.3	Flow control with C_S or C_F traffics.....	60
7.4.17	Procedures for the local/relayed mode switching	60
7.4.17.1	General and managing rules.....	60
7.4.17.1.1	General	60
7.4.17.1.2	Terminology	60
7.4.17.1.3	Management	60
7.4.17.2	Switching to local mode.....	60
7.4.17.3	Switching to full-relayed mode.....	61
7.4.17.4	Switching between local modes.....	61
7.4.17.5	Switching point and error handling.....	61
7.4.17.6	Higher layer signalling handling.....	62
7.4.17.7	Effects of the local mode.....	62
7.4.17.7.1	U-plane	62
7.4.17.7.2	Channel C_S	62
7.4.17.7.3	Channel C_F	62
7.4.17.7.4	A-field M_T channel signalling	62
7.4.17.7.5	B-field MAC control signalling.....	63
7.4.18	C channel operation	63
7.4.18.1	C_S channel	63
7.4.18.1.1	General	63
7.4.18.1.2	C_S channel transparent relay.....	64
7.4.18.1.3	C_S channel end-system operation.....	64
7.4.18.1.4	C_S channel retransmission and flow control	64
7.4.18.2	C_F channel.....	64
7.4.18.2.1	General	64
7.4.18.2.2	B-field control Multiplexer (E/U-MUX), C_F modes.....	64
7.4.18.2.3	C_F channel transparent relay	64
7.4.18.2.4	C_F channel end-system operation.....	65
7.4.18.2.5	C_F channel relay activation	65
7.4.18.2.6	C_F channel retransmission and flow control	65
7.4.18.2.7	C_F channel end-system specific WRS procedures: activation.....	65
7.4.18.2.8	C_F channel end-system specific WRS procedures: single LAPC instance and coordination with C_S channel.....	65
7.4.19	ULE C/L procedures	66
7.4.19.1	ULE Dummy bearer operation: general.....	66
7.4.19.2	ULE Dummy bearer generation: subfield B0 fields and N_C channel	66
7.4.19.3	ULE Dummy bearer generation; paging channel P_U and paging related fields: HN, CA, SFa, SFb.....	66
7.4.19.4	ULE Dummy bearer generation: subfield B2 fields: channels Q_U and M_U	67
7.4.19.5	B-field paging addressed to a WRS	67
7.4.19.6	C/L multicast procedures: general.....	67
7.4.19.7	C/L multicast procedures: multicast channel over the dummy bearer	67
7.4.19.8	C/L multicast procedures: multicast channel over additional C/L bearers.....	67
7.4.19.8.1	General	67
7.4.19.8.2	Error handling.....	68
7.4.20	Downlink broadcast	68
7.4.20.1	N_T message.....	68
7.4.20.2	Q_T - static system information ($Q_H = 0$).....	69
7.4.20.3	Q_T - extended RF carrier information ($Q_H = 2$).....	69
7.4.20.4	Q_T - FP capabilities ($Q_H = 3$), extended FP capabilities ($Q_H = 4$) and extended FP capabilities part 2($Q_H = 12$).....	69
7.4.20.5	Q_T - SARI support ($Q_H = 5$).....	69

7.4.20.6	Q _T - Multiframe number (Q _H = 6)	70
7.4.21	A-field paging broadcast.....	70
7.4.21.1	Short page, normal/extended paging	70
7.4.21.2	Zero-length page, normal/extended paging	71
7.5	DLC procedures	71
7.5.1	General.....	71
7.5.2	DLC variables	71
7.5.3	Connection handover	71
7.5.4	Lc frame delimiting and sequencing service.....	72
7.5.4.1	General	72
7.5.4.2	C _S channel fragmentation and recombination	72
7.5.4.3	C _F channel fragmentation and recombination	72
7.5.4.4	Selection of logical channels (C _S and C _F)	72
7.5.5	Class A link establishment.....	72
7.6	NWK procedures.....	73
7.6.1	General.....	73
7.6.2	Over-the-air maintenance	73
7.6.2.1	General	73
7.6.2.2	Retrieval of WRS RPN	73
7.6.2.3	Indication/modification of WRS RPN	74
7.6.3	Identities and addressing.....	75
7.6.4	Subscription data	75
7.6.5	Obtaining access rights for WRS	76
7.6.6	Location registration for WRS.....	77
7.6.7	Higher layer information FP broadcast	78
7.7	Security procedures	79
7.7.1	General.....	79
7.7.2	CRFP initialization of PT cipher key	80
7.7.3	Management for encryption of relayed connections	81
7.7.4	Indication of cipher key	81
7.7.5	Enhanced security procedures.....	82
7.7.5.1	Re-keying	82
7.7.5.1.1	General	82
7.7.5.1.2	MAC Re-keying	82
7.7.5.1.3	NWK Re-keying.....	82
7.7.5.2	Early Encryption	85
7.7.5.2.1	General	85
7.7.5.2.2	MAC Early Encryption.....	85
7.7.5.2.3	NWK Early Encryption.....	88
7.7.5.2.4	Provision of lower DefCKs in advance	89
7.7.5.2.5	Provision of lower DefCKs "just-in-time".....	89
7.7.6	DSC2 operation	91
7.7.7	Relay of the "START.GRANT" message.....	91
7.8	Management Entity procedures.....	92
7.8.1	Initialization of CRFP.....	92
7.8.2	CRFP MAC modes	93
7.8.3	CRFP states and state transitions	93
Annex A (normative): WRS interworking for Fixed Parts		94
A.1	Introduction	94
A.2	Fixed Part requirements.....	94
A.2.1	MAC layer.....	94
A.2.2	DLC layer	94
A.2.3	NWK layer	95
A.3	Fixed Part procedures.....	95
A.3.1	Q _T - Fixed part capabilities	95
A.3.2	Q _T - Extended fixed part capabilities.....	96
A.3.3	Intra-cell Bearer Handover	96
A.3.4	Bearer handover bit mask management.....	96
A.3.5	Indication/Modification of WRS RPN	96

A.3.6	C_S and C_F management in links between FP and any WRS	97
A.3.7	Dual cipher switching.....	97
History	99

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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.

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.

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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.

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

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].

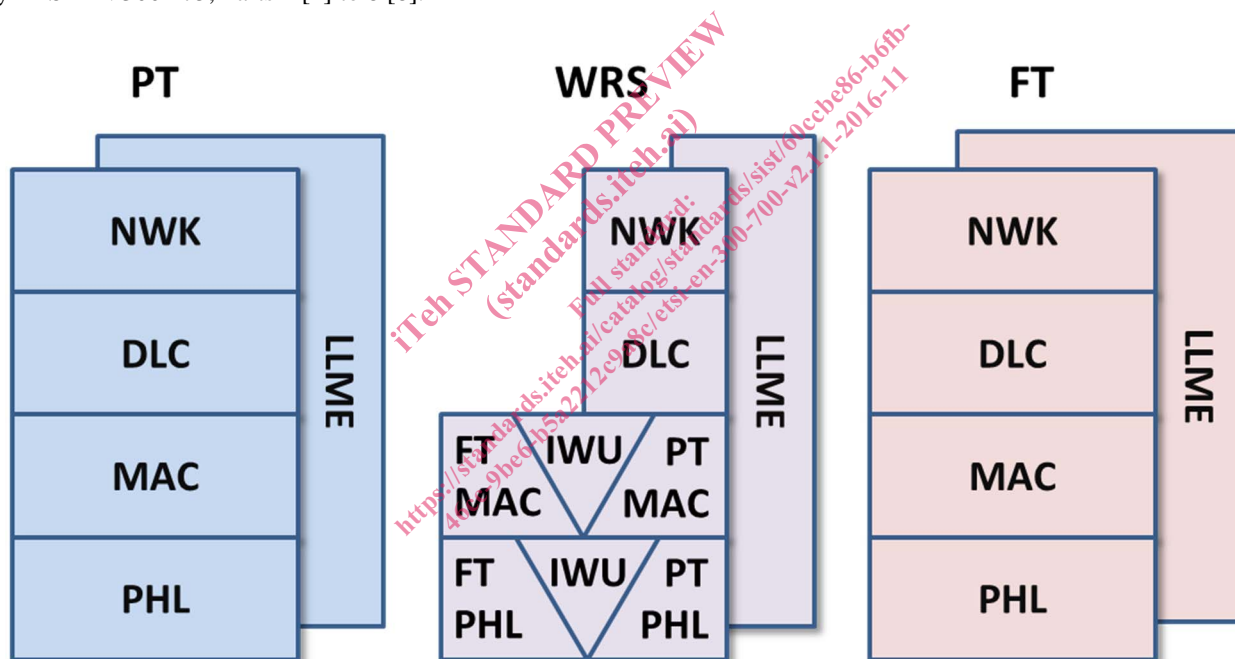


Figure 1: WRS Protocol Stack Reference Model

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.