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**Digitalne izboljšane brezvrvične telekomunikacije (DECT) - Skupni vmesnik (CI) - 7.
del: Varnostne lastnosti**

Digital Enhanced Cordless Telecommunications (DECT) - Common Interface (CI) - Part
7: Security features

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Contents

Intellectual Property Rights	8
Foreword.....	8
Introduction	9
1 Scope	12
2 References	12
2.1 Normative references	12
2.2 Informative references.....	13
3 Definitions and abbreviations.....	13
3.1 Definitions.....	13
3.2 Abbreviations	14
4 Security architecture.....	15
4.1 Background	15
4.2 Security services.....	15
4.2.1 Authentication of a PT	15
4.2.2 Authentication of an FT	15
4.2.3 Mutual authentication	15
4.2.4 Data confidentiality.....	15
4.2.5 User authentication	16
4.3 Security mechanisms	16
4.3.1 Authentication of a PT	16
4.3.2 Authentication of an FT	17
4.3.3 Mutual authentication	18
4.3.4 Data confidentiality.....	18
4.3.4.1 Derived Cipher Key (DCK)	19
4.3.4.2 Static Cipher Key (SCK).....	19
4.3.4.3 Default Cipher Key (DefCK).....	19
4.3.5 User authentication	19
4.4 Cryptographic parameters and keys	20
4.4.1 Overview	20
4.4.2 Cryptographic parameters.....	20
4.4.3 Cryptographic keys	21
4.4.3.1 Authentication key K	21
4.4.3.2 Authentication session keys KS and KS'.....	22
4.4.3.3 Cipher key CK	23
4.5 Security processes	23
4.5.1 Overview	23
4.5.2 Derivation of authentication key, K.....	23
4.5.2.1 K is derived from UAK.....	24
4.5.2.2 K is derived from AC.....	24
4.5.2.3 K is derived from UAK and UPI.....	24
4.5.3 Authentication processes	24
4.5.3.1 Processes for the derivation of KS and KS'.....	25
4.5.3.2 Processes for the derivation of DCK, RES1 and RES2.....	25
4.5.4 Key stream generation	26
4.6 Combinations of security services.....	26
5 Algorithms for security processes	27
5.1 Background	27
5.1.1 A algorithm	27
5.2 Derivation of session authentication key(s).....	27
5.2.1 A11 process	27
5.2.2 A21 process	28
5.3 Authentication and cipher key generation processes.....	28
5.3.1 A12 process	28
5.3.2 A22 process	28

6	Integration of security	29
6.1	Background	29
6.2	Association of keys and identities	29
6.2.1	Authentication key	29
6.2.1.1	K is derived from UAK	29
6.2.1.2	K derived from AC	29
6.2.1.3	K derived from UAK and UPI	30
6.2.2	Cipher keys	30
6.3	NWK layer procedures	30
6.3.1	Background	30
6.3.2	Authentication exchanges	31
6.3.3	Authentication procedures	32
6.3.3.1	Authentication of a PT	32
6.3.3.2	Authentication of an FT	32
6.3.4	Transfer of Cipher Key, CK	32
6.3.5	Re-Keying	32
6.3.6	Encryption with Default Cipher Key	33
6.4	MAC layer procedures	33
6.4.1	Background	33
6.4.2	MAC layer field structure	33
6.4.3	Data to be encrypted	34
6.4.4	Encryption process	35
6.4.5	Initialization and synchronization of the encryption process	37
6.4.6	Encryption mode control	37
6.4.6.1	Background	37
6.4.6.2	MAC layer messages	38
6.4.6.3	Procedures for switching to encrypt mode	38
6.4.6.4	Procedures for switching to clear mode	43
6.4.6.5	Procedures for re-keying	44
6.4.7	Handover of the encryption process	45
6.4.7.1	Bearer handover, uninterrupted ciphering	46
6.4.7.2	Connection handover, uninterrupted ciphering	46
6.4.7.3	External handover handover with ciphering	46
6.4.8	Modifications for half and long slot specifications	46
6.4.8.1	Background	46
6.4.8.2	MAC layer field structure	47
6.4.8.3	Data to be encrypted	47
6.4.8.4	Encryption process	47
6.4.8.5	Initialization and synchronization of the encryption process	47
6.4.8.6	Encryption mode control	48
6.4.8.7	Handover of the encryption process	48
6.4.9	Modifications for double slot specifications	48
6.4.9.1	Background	48
6.4.9.2	MAC layer field structure	48
6.4.9.3	Data to be encrypted	49
6.4.9.4	Encryption process	49
6.4.9.5	Initialization and synchronization of the encryption process	50
6.4.9.6	Encryption mode control	50
6.4.9.7	Handover of the encryption process	50
6.4.10	Modifications for multi-bearer specifications	50
6.4.11	Modifications for 4-level, 8-level, 16-level and 64-level modulation formats	51
6.4.11.1	Background	51
6.4.11.2	MAC layer field structure	51
6.4.11.3	Data to be encrypted	51
6.4.11.4	Encryption process	51
6.4.11.5	Initialization and synchronization of the encryption process	57
6.4.11.6	Encryption mode control	57
6.4.11.7	Handover of the encryption process	57
6.5	Security attributes	57
6.5.1	Background	57
6.5.2	Authentication protocols	58
6.5.2.1	Authentication of a PT	58

6.5.2.2	Authentication of an FT	59
6.5.3	Confidentiality protocols	60
6.5.4	Access-rights protocols	62
6.5.5	Key numbering and storage	62
6.5.5.1	Authentication keys	62
6.5.5.2	Cipher keys	63
6.5.6	Key allocation	64
6.5.6.1	Introduction	64
6.5.6.2	UAK allocation	64
7	Use of security features	65
7.1	Background	65
7.2	Key management options	66
7.2.1	Overview of security parameters relevant for key management	66
7.2.2	Generation of authentication keys	67
7.2.3	Initial distribution and installation of keys	67
7.2.4	Use of keys within the fixed network	68
7.3	Confidentiality service with a Cordless Radio Fixed Part (CRFP)	73
7.3.1	General	73
7.3.2	CRFP initialization of PT cipher key	73
Annex A (informative):	Security threats analysis	74
A.1	Introduction	74
A.2	Threat A - Impersonating a subscriber identity	75
A.3	Threat B - Illegal use of a handset (PP)	75
A.4	Threat C - Illegal use of a base station (FP)	75
A.5	Threat D - Impersonation of a base station (FP)	76
A.6	Threat E - Illegally obtaining user data and user related signalling information	76
A.7	Conclusions and comments	77
Annex B (informative):	Security features and operating environments	79
B.1	Introduction	79
B.2	Definitions	79
B.3	Enrolment options	79
Annex C (informative):	Reasons for not adopting public key techniques	81
Annex D (informative):	Overview of security features	82
D.1	Introduction	82
D.2	Authentication of a PT	82
D.3	Authentication of an FT	83
D.4	Mutual authentication of a PT and an FT	83
D.4.1	Direct method	83
D.4.2	Indirect method 1	83
D.4.3	Indirect method 2	83
D.5	Data confidentiality	83
D.5.1	Cipher key derivation as part of authentication	84
D.5.2	Static cipher key	84
D.6	User authentication	84
D.7	Key management in case of roaming	84
D.7.1	Introduction	84
D.7.2	Use of actual authentication key K	84

D.7.3	Use of session keys.....	85
D.7.4	Use of precalculated sets	85
Annex E (informative): Limitations of DECT security.....		86
E.1	Introduction	86
E.2	Protocol reflection attacks	86
E.3	Static cipher key and short Initial Vector (IV)	86
E.4	General considerations regarding key management.....	87
E.5	Use of a predictable challenge in FT authentication	87
Annex F (informative): Security features related to target networks		88
F.1	Introduction	88
F.1.1	Notation and DECT reference model	88
F.1.2	Significance of security features and intended usage within DECT.....	88
F.1.3	Mechanism/algorithm and process requirements	89
F.2	PSTN reference configurations	90
F.2.1	Domestic telephone	90
F.2.2	PBX.....	91
F.2.3	Local loop.....	93
F.3	ISDN reference configurations.....	94
F.3.1	Terminal equipment	94
F.3.2	Network termination 2.....	95
F.3.3	Local loop.....	95
F.4	X.25 reference configuration.....	95
F.4.1	Data Terminal Equipment (DTE).....	95
F.4.2	PAD equipment.....	96
F.5	GSM reference configurations.....	96
F.5.1	Base station substation	96
F.5.2	Mobile station.....	96
F.6	IEEE 802 reference configuration.....	96
F.6.1	Bridge.....	96
F.6.2	Gateway.....	96
F.7	Public access service reference configurations	97
F.7.1	Fixed public access service reference configuration	97
Annex G (informative): Compatibility of DECT and GSM authentication		98
G.1	Introduction	98
G.2	SIM and DAM functionality	98
G.3	Using an SIM for DECT authentication.....	99
G.4	Using a DAM for GSM authentication	99
Annex H (informative): DECT Standard Authentication Algorithm (DSAA).....		101
Annex I (informative): Void		102
Annex J (informative): DECT Standard Cipher (DSC).....		103
Annex K (normative): Clarifications, bit mappings and examples for DSAA and DSC		104
K.1	Ambiguities concerning the DSAA.....	104
K.2	Ambiguities concerning the DSC DECT-standard cipher.....	105

Annex L (informative):	Bibliography.....	107
Annex M (informative):	Change history	108
History		109

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SIST EN 300 175-7 V2.3.1:2010

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Foreword

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

The present document is part 7 of a multi-part deliverable. Full details of the entire series can be found in part 1 [1].

The following cryptographic algorithms are subject to controlled distribution:

- a) DECT Standard Authentication Algorithm (DSAA);
- b) DECT Standard Cipher (DSC).

These algorithms 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 first page of the present document.

Further details of the DECT system may be found in TR 101 178 [i.1] and ETR 043 [i.2].

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Introduction

The present document contains a detailed specification of the security features which may be provided by DECT systems. An overview of the processes required to provide all the features detailed in the present document is presented in figure 1.

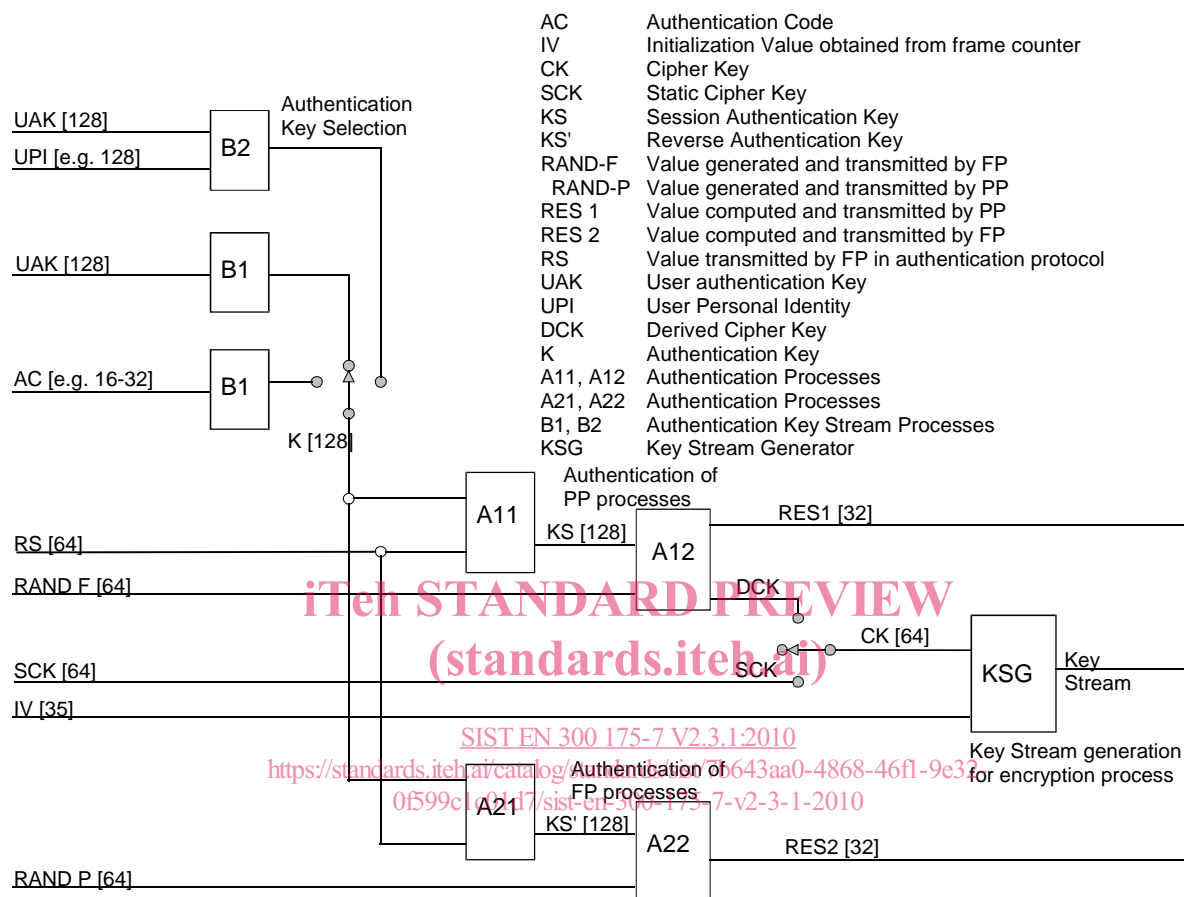


Figure 1: Overview of DECT security processes

The present document consists of four main clauses (clauses 4 to 7), together with a number of informative/normative and important annexes (A to K). The purpose of this introduction is to briefly preview the contents of each of the main clauses and the supporting annexes.

Each of the main clauses starts with a description of its objectives and a summary of its contents. Clause 4 is concerned with defining a security architecture for DECT. This architecture is defined in terms of the security services which may be offered (see clause 4.2), the mechanisms which shall be used to provide these services (see clause 4.3), the security parameters and keys required by the mechanisms (challenges, keys, etc.), and which shall be passed across the air interface or held within DECT Portable Parts (PPs), Fixed Parts (FPs) or other network entities (for example management centres) (see clause 4.4), the processes which are required to provide the security mechanisms (see clause 4.5) and the recommended combinations of services (see clause 4.6).

Clause 5 is concerned with specifying how certain cryptographic algorithms are to be used for the security processes. Two algorithms are required:

- a key stream generator; and
- an authentication algorithm.

The key stream generator is only used for the encryption process, and this process is specified in clause 4.4. The authentication algorithm may be used to derive authentication session keys and cipher keys, and is the basis of the authentication process itself. The way in which the authentication algorithm is to be used to derive authentication session keys is specified in clause 5.2. The way in which the algorithm is to be used to provide the authentication process and derive cipher keys is specified in clause 5.3.

Neither the key stream generator nor the authentication algorithm is specified in the present document. Only their input and output parameters are defined. In principle, the security features may be provided by using appropriate proprietary algorithms. The use of proprietary algorithms may, however, limit roaming in the public access service environment, as well as the use of PPs in different environments.

For example, for performance reasons, the key stream generator will need to be implemented in hardware in PPs and FPs. The use of proprietary generators will then limit the interoperability of systems provided by different manufacturers.

Two standard algorithms have been specified. These are the DECT Standard Authentication Algorithm (DSAA, see annex H) and the DECT Standard Cipher (DSC, see annex J).

Because of the confidential nature of the information contained in them, these annexes are not included in the present document. However, the algorithms will be made available to DECT equipment manufacturers. The DSAA may also need to be made available to public access service operators who, in turn, may need to make it available to manufacturers of authentication modules.

Clause 6 is concerned with integrating the security features into the DECT system. Four aspects of integration are considered. The first aspect is the association of user security parameters (in particular, authentication keys) with DECT identities. This is the subject of clause 6.2. The second aspect of integration is the definition of the NWK layer protocol elements and message types needed for the exchange of authentication parameters across the air interface. This is dealt with in clause 6.3. The MAC layer procedures for the encryption of data passed over the air interface are the subject of clause 6.4. Finally, clause 6.5 is concerned with security attributes which DECT systems may support, and the NWK layer messages needed to enable PPs and FPs to identify which security algorithms and keys will be used to provide the various security services.

Clause 7 is concerned with key management issues. Careful management of keys is fundamental to the effective operation of a security system, and clause 7.2 is intended to provide guidance on this subject. The clause includes an explanation of how the DECT security features may be supported by different key management options.

For example, schemes which allow authentication keys to be held in a central location within a public access service network are described, as are schemes which allow authentication keys to be derived locally in public access service base stations. The clause is very much less specific than the other clauses in the present document. This is because the key management issues discussed are not an integral part of the CI. In the end it is up to network operators and service providers to decide how they are going to manage their cryptographic keys. The present document can at best provide some suggestions and guidelines.

The main text is supplemented by a set of informative annexes. There are two types of annex. Those of the first type provide background information justifying the inclusion of a particular service, or the use of a particular type of mechanism in the security features. Those of the second type provide guidance on the use and management of certain of the security features. The content of each of the annexes is briefly reviewed below.

Annex A contains the results of a security threats analysis which was undertaken prior to designing the DECT security features.

Annex B is concerned with the impact of the security features on roaming, in particular with the concurrent use of a PP in public access service, wireless Private Branch eXchange (PBX) and residential environments.

Annex C is provided for background information. It contains a justification for some of the decisions taken by EG-1, for example, why symmetric rather than public key (asymmetric) cryptographic mechanisms were selected.

Annex D provides an overview of the DECT security features specified in the present document.

No security system is perfect, and annex E discusses the limitations of the DECT security features.

Annex F relates the security features specified in the present document to the DECT environments identified in TR 101 178 [i.1]. Each of the local networks identified in the reference model is considered in turn. For each of these networks a security profile is suggested. The networks considered are Public Switched Telephone Network (PSTN), Integrated Services Digital Network (ISDN), ITU-T Recommendation X.25 [i.3], Global System for Mobile communications (GSM), Local Area Networks (LANs) and public access service.

Annex G consists of a brief discussion of the compatibility of DECT and GSM authentication. In particular, the concept of a DECT Authentication Module (DAM) is considered and its functionality compared with the functionality of the GSM Subscriber Interface Module (SIM).

Annex H refers to the DECT Standard Authentication Algorithm.

Annex J refers to the DECT Standard Cipher.

Annex K contains normative clarifications, bit mappings and examples for DSAA and DSC.

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1 Scope

The present document is one of the parts of the specification of the Digital Enhanced Cordless Telecommunications (DECT) Common Interface (CI).

The present document specifies the security architecture, the types of cryptographic algorithms required, the way in which they are to be used, and the requirements for integrating the security features provided by the architecture into the DECT CI. It also describes how the features can be managed and how they relate to certain DECT fixed systems and local network configurations.

The security architecture is defined in terms of the security services which are to be supported at the CI, the mechanisms which are to be used to provide the services, and the cryptographic parameters, keys and processes which are associated with these mechanisms.

The security processes specified in the present document are each based on one of two cryptographic algorithms:

- an authentication algorithm; and
- a key stream generator.

The architecture is, however, algorithm independent, and either the DECT standard algorithms, or appropriate proprietary algorithms, or indeed a combination of both can, in principle, be employed. The use of the employed algorithm is specified in the present document.

Integration of the security features is specified in terms of the protocol elements and processes required at the Network (NWK) and Medium Access Control (MAC) layers of the CI.

The relationship between the security features and various network elements is described in terms of where the security processes and management functions may be provided.

The present document does not address implementation issues. For instance, no attempt is made to specify whether the DSAA should be implemented in the PP at manufacture, or whether the DSAA or a proprietary authentication algorithm should be implemented in a detachable module. Similarly, the present document does not specify whether the DSC should be implemented in hardware in all PPs at manufacture, or whether special PPs should be manufactured with the DSC or proprietary ciphers built into them. The security architecture supports all these options, although the use of proprietary algorithms may limit roaming and the concurrent use of PPs in different environments.

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.

2 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 reference document (including any amendments) applies.

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

2.1 Normative references

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] Void.
- [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] Void.
- [8] Void.
- [9] ETSI TS 100 977: "Digital cellular telecommunications system (Phase 2+); Specification of the Subscriber Identity Module - Mobile Equipment (SIM-ME) Interface (3GPP TS 11.11 Release 1999)".

2.2 Informative references

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 TR 101 178: "Digital Enhanced Cordless Telecommunications (DECT); A High Level Guide to the DECT Standardization".
- [i.2] ETSI ETR 043: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Services and facilities requirements specification".
- [i.3] ITU-T Recommendation 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".
- [i.4] ETSI ETR 056: "Digital Enhanced Cordless Telecommunications (DECT); System description document".
- [i.5] IEEE 802: "Standard for Local and Metropolitan Area Networks: Overview and Architecture".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in EN 300 175-1 [1] and the following apply:

RAND_F: RANDom challenge issued by an FT

RAND_P: RANDom challenge issued by a PT

RES1: RESponse calculated by a PT

RES2: RESponse calculated by an FT

XRES1: an eXpected RESponse calculated by a FT

XRES2: an eXpected RESponse calculated by a PT