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Technical Specification

**Digital Enhanced Cordless Telecommunications (DECT);
DECT Packet Radio Service (DPRS);
Application Specific Access Profile (ASAP):
Ethernet (Eth) Interworking**



Reference

DTS/DECT-A0192

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Foreword

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

1 Scope

The present document is to define a data Application Specific Access Profile (ASAP) intended for enterprise, small office and home office (SOHO) and Home (residential/private) markets combining a selection of Ethernet Interworking DECT-DPRS (EN 301 649 [3]) data 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 DATA applications, with the features of the present document being a common fall-back option available in all compliant to this profile equipment.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

- [1] ETSI EN 300 175-2: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 2: Physical layer (PHL)".
- [2] ETSI EN 300 176-1: "Digital Enhanced Cordless Telecommunications (DECT); Approval test specification; Part 1: Radio".
- [3] ETSI EN 301 649: "Digital Enhanced Cordless Telecommunications (DECT); DECT Packet Radio Service (DPRS)".
- [4] 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".
- [5] ISO/IEC 8073 (1997): "Information technology - Open Systems Interconnection - Protocol for providing the connection-mode transport service".
- [6] ISO/IEC 9646-7: "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 7: Implementation conformance statement".
- [7] ISO/IEC 8802-3 (1996): "Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications".

3 Definitions, abbreviations and symbols

3.1 Definitions

For the purposes of the present document, the terms and definitions given in EN 301 649 [3] apply.

3.2 Abbreviations

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

ASAP	Application Specific Access Profile
C	Conditional
DECT	Digital Enhanced Cordless Telecommunications
DLC	Data Link Control
DMAP	DECT Multimedia Access Profile
DPRS	DECT Packet Radio Service
EN	European Norm
FREL	Frame Relay
FT	Fixed radio Termination
I	Irrelevant (Out of scope)
IP	Internet Protocol
ISDN TA	Integrated Services Digital Network Terminal Adapter
LAN	Local Area Network
LCE	Link Control Entity
M	Mandatory
MAC	Medium Access Control
ME	Management Entity
NWK	Network
O	Optional
PC	Personal Computer
PHL	PHysical Layer
PP	Portable Part
PPP	Point-to-Point Protocol
PT	Portable radio Termination
SOHO	Small Office and Home Office
U-plane	User-plane
USB	Universal Serial Bus
WLAN	Wireless LAN

3.3 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);
O.x	option comprising number of items;
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);
X	excluded, not allowed.

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 [6].

4 Service Objectives

4.1 General application environments

4.1.1 Enterprise

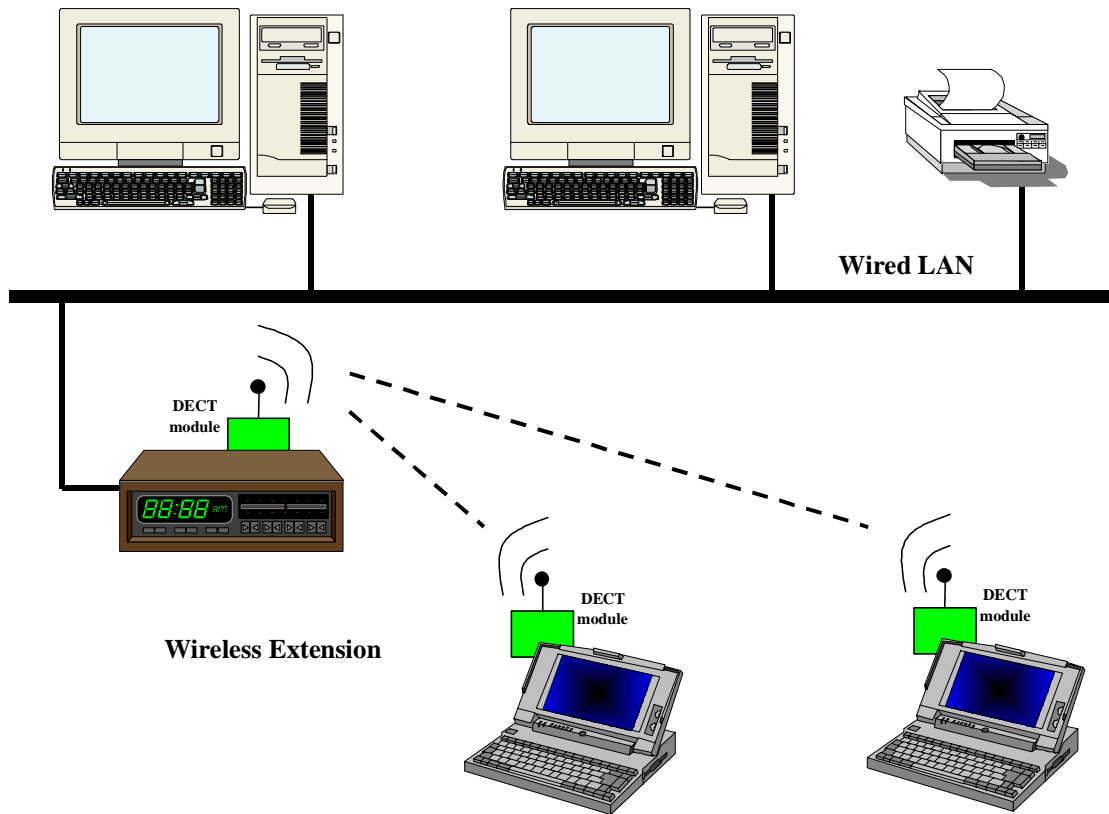
Contrary to the Residential/Private environment, the Enterprise environment is characterized by a controlled distribution, installation and use of specially dedicated terminals. Depending on their role such terminal may be divided in 3 broader groups: Wireless extension to wired corporate LAN, On-site professional mobile data applications, and, Isolated cable replacement.

Independently from the group terminals belongs to some common characteristics of the terminals could be noted:

- the end-user terminal is used for a specific business process by a (limited) number of employees;
- the terminals are mostly not personal terminals, but are shared by multiple employees;
- the terminals are often based on standard IT technology, but have been adapted to meet specific requirements. They are often ruggedised, have long standby and operating times (at least one work-shift, or 8 hours), and are light weight and easy to carry;
- the terminals are often designed to carry out the transaction(s) as quickly as possible. User interfaces are tailored towards the specific applications;
- the terminals need to exchange information, in real time;
- possible re-usage of the already installed cordless phone infrastructure.

Scenario 1

The application scenario of DECT terminals used as Wireless Extension of wired corporate LAN is similar to the Scenario 2 of the Residential/private environment described below. It is based on the fact that all today's enterprises have already installed and operational some sort of wired LAN. In this regard it may be envisaged for example the provision of wireless connection spots like meeting rooms, "mobile rooms" (i.e. mobile offices) where for example a number of Laptops could be provided for with wireless access to the corporate wired LAN.



**Figure 1: Wireless Ethernet (LAN) Extension to Wired LAN
without Distributed Communication - FT implemented as a Router**

Another example is the formation of local wireless LAN for wireless control of a set of industrial devices.

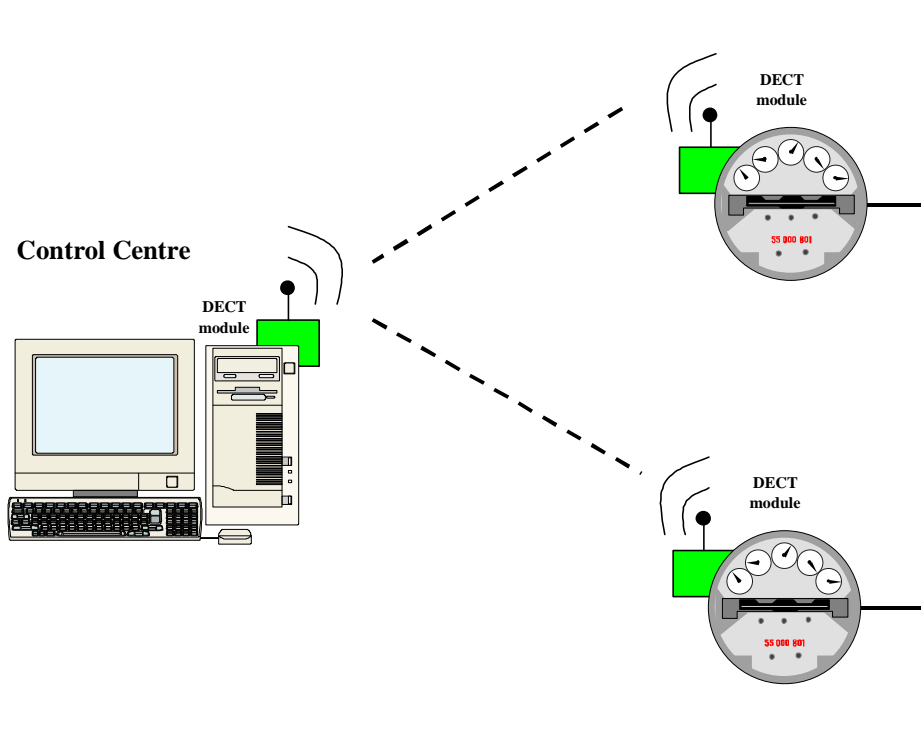


Figure 2: Wireless LAN for remote retrieval of information from a system of sensors

Scenario 2

The application scenario of DECT terminals used as on-site professional mobile data applications may be applied to satisfy different professional requirements. Some examples of on-site mobile professional data applications:

- hospital applications (entering or retrieving patient information). Patient information can be retrieved or entered at bedside.
- hospitality applications (order entry, access to guest information, access to tasks that need to be carried out). Hotel employees are by nature of their jobs highly mobile - by providing electronic access while mobile, many jobs can be streamlined or carried out more efficiently.
- point-of-sale applications (order entry, credit card processing, checking available stock). Example is the restaurant business, where by reducing the distance and time that employees need to walk, employees can work more efficiently. Also in the retail business examples can be found where mobile sales points can be used, and where customers are served on the spot.
- inventory applications (bar-code reading, etc). By updating stock information real-time, significant savings can be achieved by reducing the inventory. Other examples are dispatch display on forklift trucks, order picking information, etc. For order picking applications, voice assistance can be useful so that the employees can keep their hands-free for handling the goods.
- (generic) information retrieval applications (for example, a service engineer in a factory needs to get access to the central control application to retrieve some information).

In the figure below an example of re-usage of the already installed cordless phone infrastructure (a PABX) is depicted where cordless tablets are added providing in addition to the usual cordless voice services the possibilities for remote data storage and retrieval.

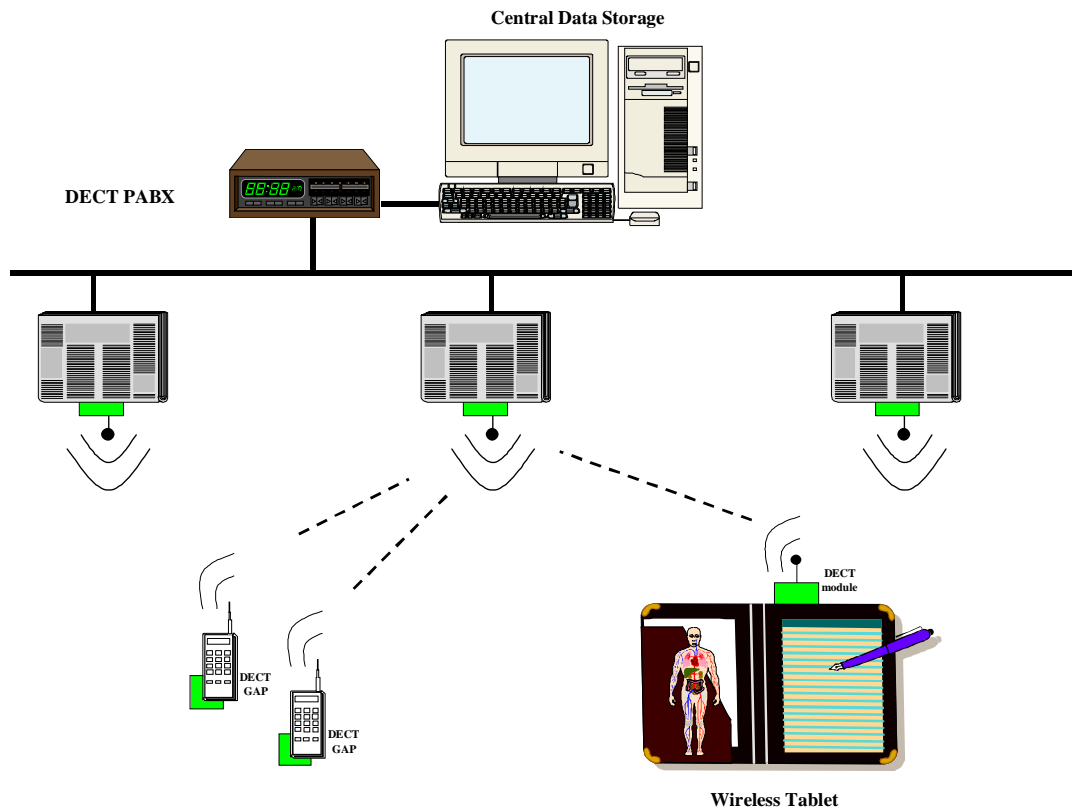


Figure 3: A Wireless Tablet added to a PABX as an On-site professional mobile data application

Scenario 3

In this scenario the requirements of this ASAP are applied to terminals providing an isolated cable replacement for remote access to different devices. Examples could be replacement of cable between a wired LAN and a copy machine, printer or another peripheral, or, adding a wireless entrance control camera.

4.1.2 Small office and home office (SOHO)

The SOHO environment may be considered in most of the case as either a minimized replica of the enterprise environment, or, as a magnified replica of the residential private environment, therefore all of the examples given in the relevant for the enterprise and for the residential private environments may be applied.

4.1.3 Home (residential private)

The residential/private environment is characterized by uncontrolled distribution and use in the Home of a selection of one or more devices of varying type. Initially such a home is expected to have one external line (PSTN, ISDN, xDSL, Cable) and one or 2 PCs with basic peripherals, e.g. a printer, and, possibly a Laptop brought home, from time to time, from the office. Home user needs will be basically aiming towards internal connection between the PC(s) and the peripherals and external connection to the Internet. Use of more than one external line, some of which will be dedicated to data only, and internal connection of multiple, including non-communication, devices is to be expected in the near future.

Two typical applications of the Ethernet ASAP can be envisaged in the residential/private environment.

Scenario 1

In this scenario the ASAP is applied as a simple physical carrier replacement in a home LAN where most of the LAN physical carriers are ordinary Ethernet cables and only one, or a few, are replaced by DECT connection(s).

In such a model DECT PT and FT are designed as add-on modules to existing LAN terminals like PCs, Routers, Hubs, etc. Most likely they do not represent very sophisticated devices, i.e. simple on-air transport mechanism of LAN data units is provided. As today's Set-top boxes (xDSL and Cable) are very often provided with an Ethernet connection, a typical implementation in this case will be replacement of the cable that would connect the PC to the Set-top box for Internet surfing. The maximum throughput of such an Ethernet cable replacement implementation will be up to 552 Kbit/s when the 2 level modulation scheme has been used and up to 2 Mbit/s with the 8 level scheme.

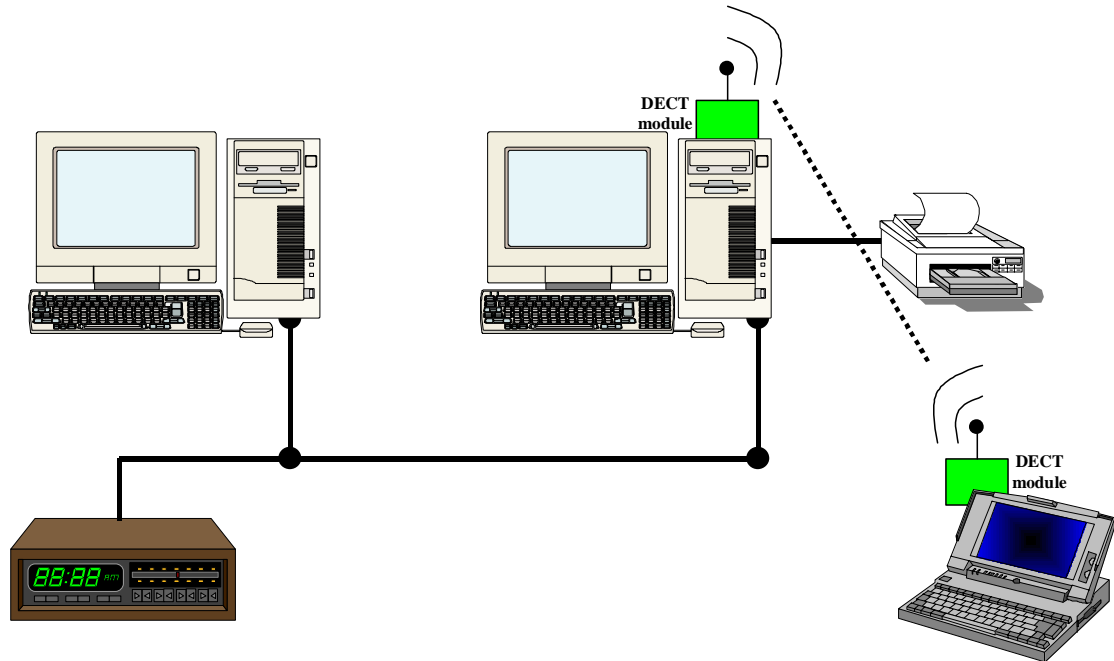


Figure 4: Adding a wireless connection of an office laptop to an existing wired Home LAN

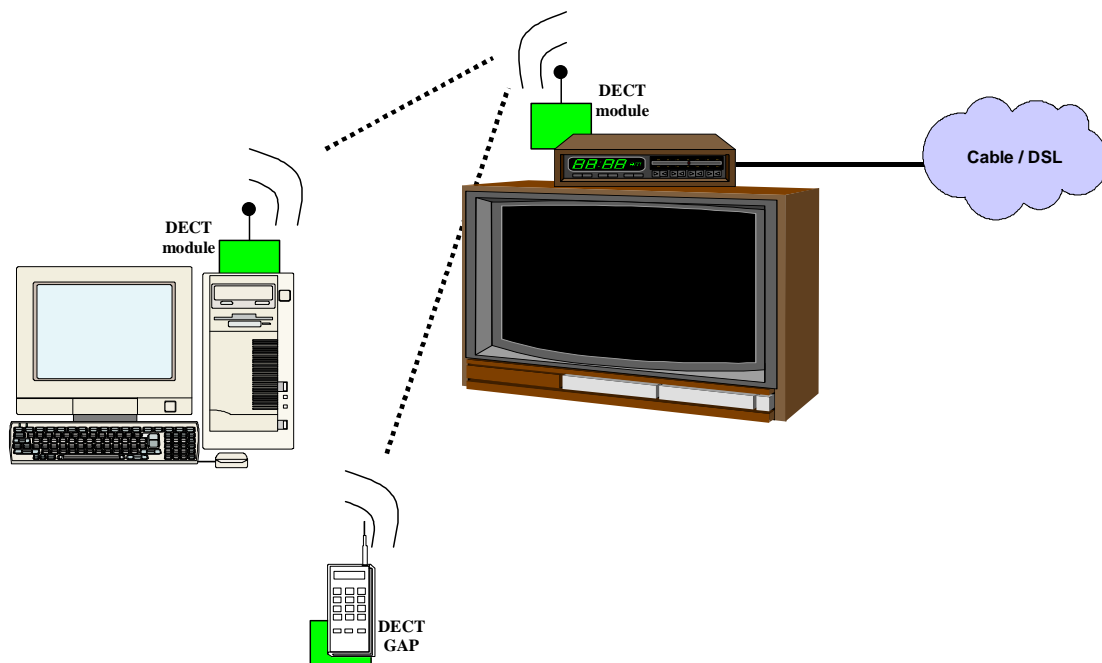


Figure 5: Wireless Ethernet connection to a Set-top box (e.g. Cable or xDSL modem); Voice capability may be additionally introduced

Scenario 2

In this scenario the ASAP is applied to build a Wireless LAN where most of the LAN physical carriers are replaced by DECT connections and a few may still be ordinary Ethernet cables.

In such a model the DECT FT is either designed as a more complex Ethernet device, e.g. a Router or Gateway, or, as a module being part of the PC which plays the role of the Server in the home LAN. Various devices could be envisaged to be connected, ranging from PCs and peripherals through digital cameras, various home electrical appliances, sensors and controls. In many cases connection to an external network will be provided as well. Voice capabilities either using voice over IP or Circuit switched could be expected as well. The maximum throughput per on air Ethernet connection will be up to 552 Kbit/s when the 2 level modulation scheme has been used and up to 2 Mbit/s with the 8 level scheme; if the optional distributed communication feature is used the wireless LAN system throughput will be 10 times higher.

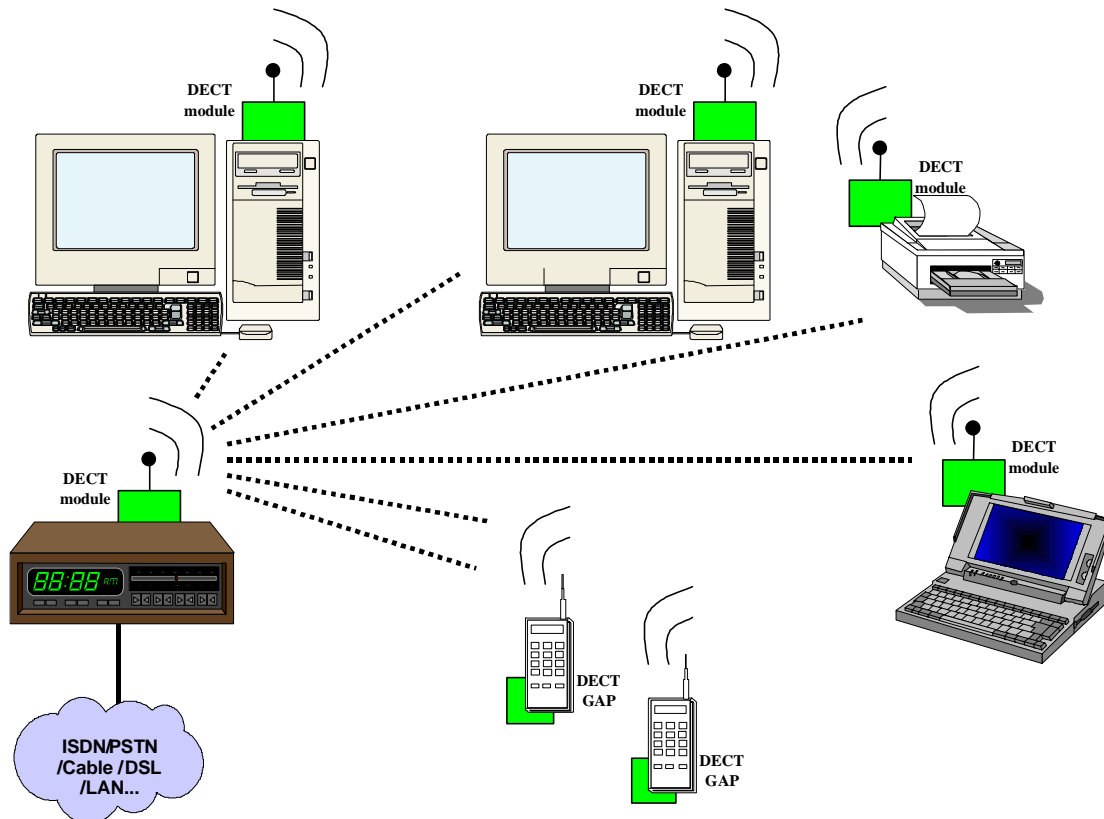


Figure 6: Wireless Ethernet (LAN) without Distributed Communication - FT implemented as a Router (including Gateway); Voice capability

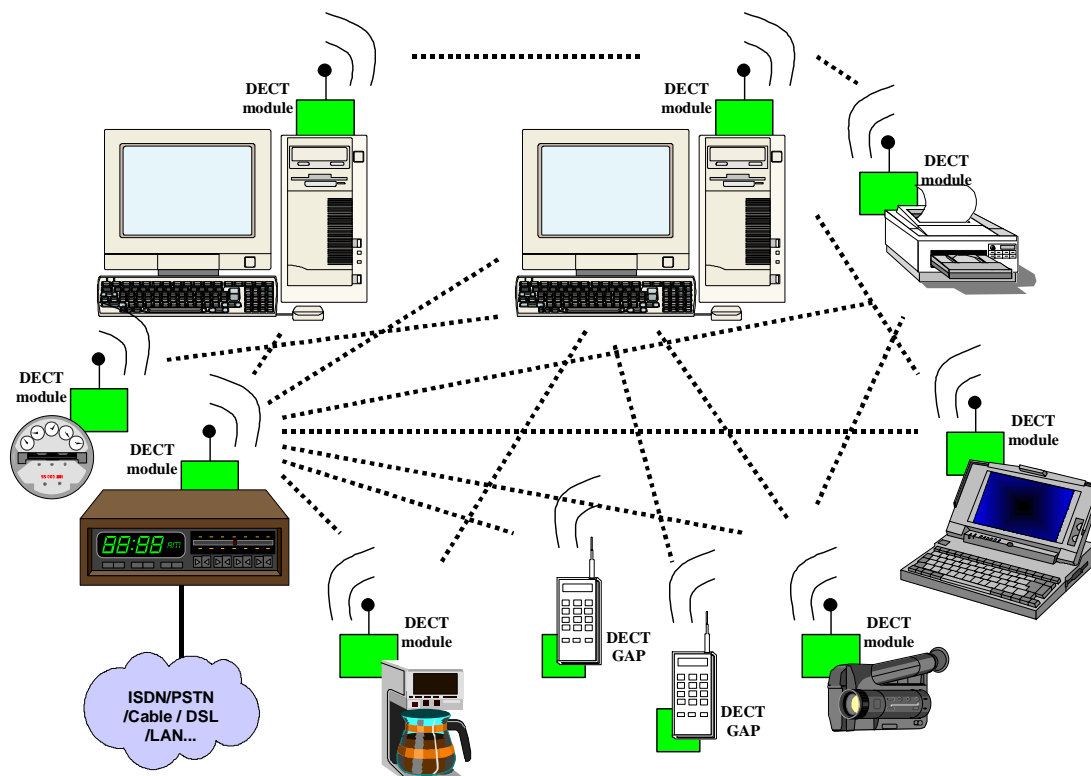


Figure 7: Wireless Ethernet (LAN) with Distributed Communication - FT implemented as a Router (including Gateway); Voice capability; All possible direct connections not shown

4.2 DECT Protocol

The basic general packet oriented data services that DECT could offer and the requirements to the terminals in regard to provision of such services are described in EN 301 649 [3], the DECT DATA Packet Radio Service (DPRS) Profile.

This profile focuses on an application solution using Ethernet LAN connectivity for Data services.

The reference model of this DECT Ethernet LAN application is schematically depicted on figure 8.

It is not a requirement for this profile to mandate connection of the FT to an external network. The external data protocols required for support in regard to this profile are indicated in clause 5.

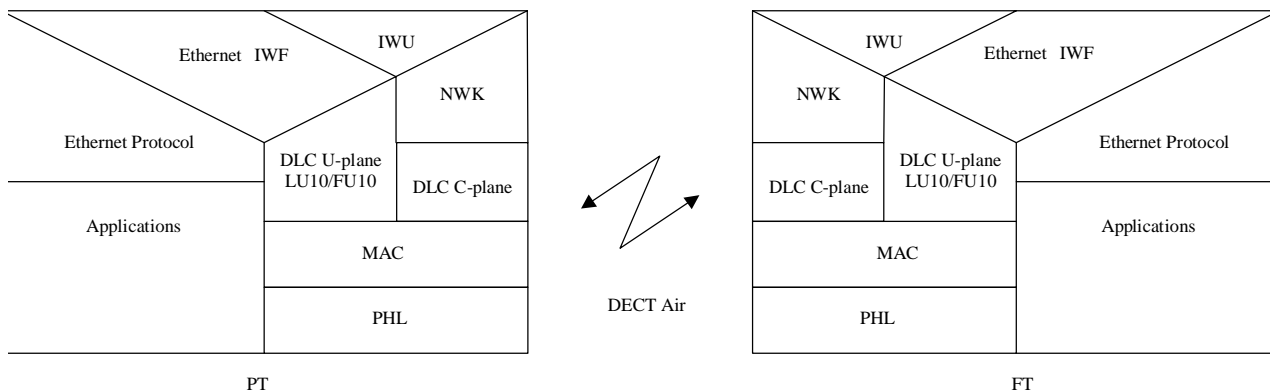


Figure 8: Reference configuration for Ethernet LAN ASAP

4.3 USB Implementation

For interworking between DECT and USB the following typical architectural model for wireless connection of analogue Modems / ISDN TAs should apply:

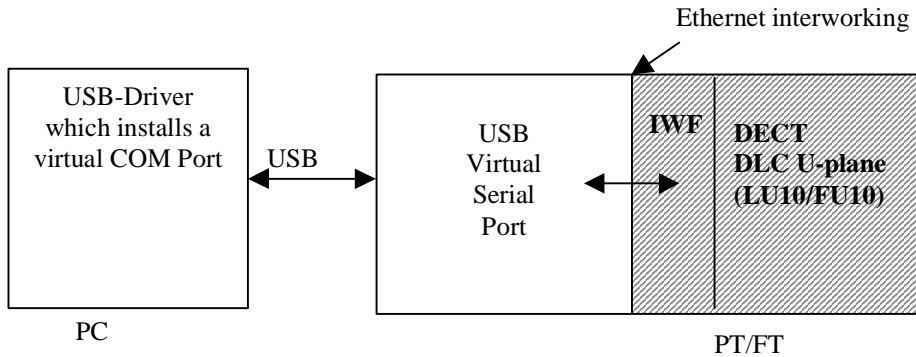


Figure 9: Reference configuration for Ethernet USB ASAP

5 Relevant Requirements

In any case the requirements of EN 300 176-1 [2] and any of the harmonized standard EN 301 406 [4] shall apply as well.

For the Wireless LAN (ISO 8802-3 [7] (Ethernet)) applications the requirements of the EN 301 649 [3] relevant for Class 2 equipment apply with the modifications stated in clause 6 of the present document.

Additional, not covered by other standards, requirements are described in clause 6.3 and Annexes.

This profile standard is based on or/and reference requirements in regard to services, features, procedures and elements of procedures specified in other standards and therefore shall be used together with those standards. A schematic standards relation diagram is depicted in figure 10:

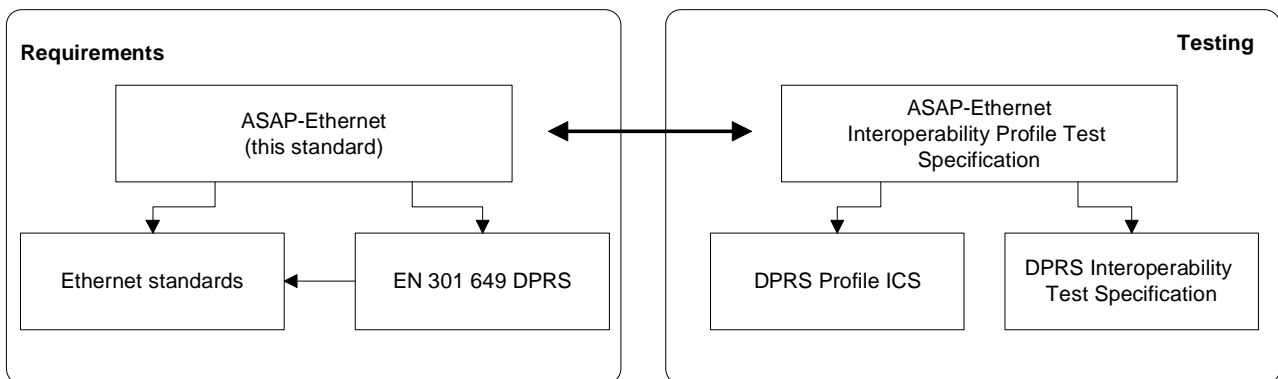


Figure 10: Standards relations Ethernet LAN ASAP

6 Profile Specific Requirements

6.1 General

The requirements Tables in the following clauses are derived from the EN 301 649 [3] and the status of each particular item in regard to the required support for this profile is explicitly stated when it constitutes change to the status indicated in EN 301 649 [3].

The exact description of a modification of an existing requirement and additional requirements are provided in clause 6.3.

6.2 Requirements Tables

6.2.1 General

The tables listed in this clause define all the protocol elements i.e. features, services, and procedures which are mandatory, optional, or conditional under the provision of another protocol element, or outside the scope of the present document, or in some context not applicable according to the status column designation as defined in clause 3.3.

All optional elements shall be process mandatory according to the procedures described in the present document.

A terminal that claims being compliant to this profile shall be capable of indicate and proving the indicated support to the application(s) as defined in tables 1 and 2.

Table 1: General Class and Service support

Item	Name of service	Reference	Support status	
			PT	FT
DPRS-G.1	DPRS Class 1	3.1, 4.1 [5]	I	I
DPRS-G.2	DPRS Class 2	3.1, 4.1 [5]	M	M
DPRS-G.3	Frame Relay (FREL)	Annex B [5]	M	M
DPRS-G.4	Character stream	Annex C [5]	I	I

Table 2: General Service/Interworking support

Service	Interworking	Ref.	Status	
			PT	FT
DPRS-G.3, Frame Relay (FREL)		Annex B [5]	M	M
	Ethernet	B.4 [5]	M	M
	Token Ring	B.5 [5]	I	I
	IP	B.6 [5]	I	I
	PPP	B.7 [5]	I	I
DPRS-G.4, Character stream		Annex C [5]	I	I
	V.24	C.4 [5]	I	I

6.2.2 NWK layer

6.2.2.1 NWK features

In regard to the WLAN applications NWK layer requirements the following modifications to EN 301 649 [3], clause 8.1 shall apply with the following modification.

Table 3: NWK features

Feature supported				
Features			Status	
Item no.	Name of feature	Ref.	PT	FT
DPRS-N.1	Outgoing call	4.3.4 [6]	M	M
DPRS-N.3	On hook (full release)	4.3.4 [6]	M	M
DPRS-N.8	Incoming call	4.3.4 [6]	M	M
DPRS-N.11	Location registration	4.3.4 [6]	M	M
DPRS-N.12	On air key allocation	4.3.4 [6]	M	M
DPRS-N.15	Alerting	4.3.4 [6]	M	O
DPRS-N.20	Terminate access rights FT initiated	4.3.4 [6]	M	M

6.2.2.2 NWK features to procedures mapping

In regard to the WLAN applications NWK layer feature to procedure mapping requirements the requirements specified in EN 301 649 [3], clause 8.2 shall apply with the following modification.

Table 4: NWK feature to procedure mapping

Feature/Procedure mapping				
Feature/Procedure			Status	
Feature Name	Procedure name	Ref.	PT	FT
DPRS-N.2, Off Hook		4.3.4 [5]	M	M
	Outgoing call request	12.1 [5]	M	M
	Incoming call connection	12.2 [5]	M	M

6.2.3 DLC Layer

6.2.3.1 DLC service

In regard to the WLAN applications the DLC layer requirements the following modifications to EN 301 649 [3], clause 7.1 shall apply with the following modification.

Table 5: DLC service

			Status	
Item no.	Name of service	Ref.	PT	FT
DPRS-D.13	Connectionless U-plane	4.3.3	O	O

6.2.3.2 DLC service to procedure mapping

In regard to the WLAN applications DLC layer service to procedure mapping requirements the requirements specified in EN 301 649 [3], clause 7.2 shall apply.

6.2.4 MAC layer

6.2.4.1 MAC services

In regard to the WLAN applications the MAC layer requirements the following modifications to EN 301 649 [3], clause 6.1 shall apply with the following modification.

Table 6: MAC service

Item	Name of service	Reference	Support status	
			PT	FT
DPRS-M.9	C _S higher layer signalling	4.3.2	M	M
DPRS-M.10	C _F higher layer signalling	4.3.2	O	O

6.2.4.2 MAC service to procedure mapping

In regard to the WLAN applications MAC layer service to procedure mapping requirements the requirements specified in EN 301 649 [3], clause 6.2 shall apply.

6.2.5 Management Entity (ME)

In regard to the WLAN applications ME requirements the following modifications to EN 301 649 [3], clause 9.1 shall apply.

Table 7: Management Entity Requirements

Feature/Procedure mapping			Status	
Feature	Procedure	Ref.	PT	FT
DPRS-ME.1, Class 1 management		4.3.7	I	I
DPRS-ME.2, Class 2 management		4.3.7	M	M

6.2.6 Application Features

6.2.6.1 Application features

In regard to the WLAN applications the Application Features requirements as defined in EN 301 649 [3], clause 8.3 shall apply.

6.2.6.2 Application features to procedures mapping

In regard to the WLAN applications feature to procedure mapping requirements the requirements specified in EN 301 649 [3], clause 8.4 shall apply.

6.2.7 Distributed Communications

In regard to the WLAN.24 applications the requirements as defined in EN 301 649 [3], clause 8.5 shall apply.

6.2.8 PHL Requirements

In regard to the WLAN applications the PHL requirements as defined in EN 301 649 [3], clause 5 shall apply.

6.3 Profile Specific Procedures Description

6.3.1 General

This clause identifies differences and additions to the feature/service/procedure definitions and descriptions as specified in EN 301 649 [3], DPRS.

6.3.2 Management Entity requirements

No differences/additions - the Requirements as specified in EN 301 649 [3], clauses 9 and A.1 shall apply.

6.3.3 MAC layer requirements

No differences/additions - the Requirements as specified in EN 301 649 [3], clause 10 shall apply.

6.3.4 DLC layer requirements

No differences/additions - the Requirements as specified in EN 301 649 [3], clause 11 shall apply.

6.3.5 NWK layer requirements

The Requirements as specified in EN 301 649 [3], clause 12 shall apply with the modifications listed in the present clause.

6.3.5.1 Terminal capability indication

The contents of the <Terminal Capability> information elements shall be based on the requirements of the EN 301 649 [3], clause 12.3.

For the purpose of this ASAP only the status of the fields and specific values implementation that **has changed** is indicated in this clause. For the rest whatever specified in EN 301 649 [3] shall apply.

Table 8: Values used within the <<TERMINAL CAPABILITY>> information element

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
<<Terminal capability>>			
	<ext4>	0	
	<Profile indicator_1>	"x1xxxx"B	OUT OF SCOPE (DPRS Stream support)
	<ext4a>	0	
	<Profile indicator_2>	"xxxxx1"B	MANDATORY (DPRS FREL support)
	<ext4b>	0	
	<Profile indicator_3>	"x1xxxx"B	MANDATORY (Ethernet support)
		"1xxxxx"B	OUT OF SCOPE (Token Ring support)
	<ext4c>	0	
	<Profile indicator_4>	"xxxxx1"B	OUT OF SCOPE (IP support)
		"xxxx1x"B	OUT OF SCOPE (PPP support)
		"xxx1xx"B	OUT OF SCOPE (V.24 support)

6.3.5.2 Call Resources/Parameters negotiation

The contents of the messages applicable to this procedure shall be based on the requirements of the EN 301 649 [3], clause 12.5.

For the purpose of this ASAP only the status of the fields and specific values implementation that **has changed** is indicated in this clause. For the rest whatever specified in EN 301 649 [3] shall apply.

Table 9: Values used within the {CC-SETUP} message

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
<<IWU attributes>>			
	<Coding standard>	01	Profile defined coding
	<Profile>	00000	MANDATORY (FREL support)
		00001	OUT OF SCOPE (Stream support)

6.3.5.3 IWU-attributes change

The contents of the messages applicable to this procedure shall be based on the requirements of the EN 301 649 [3], clause 12.7.

For the purpose of this ASAP only the status of the fields and specific values implementation that **has changed** is indicated in this clause. For the rest whatever specified in EN 301 649 [3] shall apply.

Table 10: Values used within the {CC-SERVICE-CHANGE} message

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
<<IWU attributes>>			
	<Profile>	00001	OUT OF SCOPE (Stream support)
		00000	MANDATORY (FREL support)
	<Profile Subtype>	0000	MANDATORY (Ethernet (WLAN))
		1000	OUT OF SCOPE (Interworking to V.24 circuits (RS232))
		0001	OUT OF SCOPE (ISO 8802-5 (clause B.5 [3]))
		0010	OUT OF SCOPE (Internet Protocol (IP) (clause B.6 [3]) (IETF RFC 791))
		0100	OUT OF SCOPE (Point-to-Point Protocol (clause B.7 [3]) (IETF RFC 1661))

6.3.5.4 Collective and Group Ringing

The contents of the messages applicable to this procedure shall be based on the requirements of the EN 301 649 [3], clause 12.13.

For the purpose of this ASAP only the status of the fields and specific values implementation that **has changed** is indicated in this clause. For the rest whatever specified in EN 301 649 [3] shall apply.

Table 11: Values used within the {LCE-REQUEST-PAGE} message

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
	<IWU identification>	0001	MANDATORY (Ethernet)
		0010	OUT OF SCOPE (Token Ring)
		0011	OUT OF SCOPE (IP)
		0100	OUT OF SCOPE (PPP)
		0101	OUT OF SCOPE (V.24)

6.3.5.5 Broadcast attributes management

The contents of the messages applicable to this procedure shall be based on the requirements of the EN 301 649 [3], clause 12.16.

For the purpose of this ASAP only the status of the fields and specific values implementation that **has changed** is indicated in this clause. For the rest whatever specified in EN 301 649 [3] shall apply.

Table 12: Extended Higher Layer Capabilities interpretation by the PP

BIT Number	Attribute	Value	Note
a29	Ethernet	1	MANDATORY
a30	Token Ring	x	OUT OF SCOPE
a31	IP	x	OUT OF SCOPE
a32	PPP	x	OUT OF SCOPE
a33	V.24	x	OUT OF SCOPE
a45	DPRS Stream support	x	OUT OF SCOPE
a46	DPRS FREL support	1	MANDATORY

6.3.6 Interworking requirements

No differences/additions - the Requirements as specified in EN 301 649 [3], clauses B.1 to B.4 shall apply.

6.3.7 Power management

To fight mutual interference between data terminals operating in different local DECT networks when using for the transmission most of the slots from a frame, control of the transmission power is recommended.

If transmission power control procedure is implemented, the requirements in EN 300 175-2 [1] , annex E shall fully apply.

Annex A (informative): Bibliography

- ETSI EN 300 175-1: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 1: Overview".
- ETSI EN 300 175-3: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 3: Medium Access Control (MAC) layer".
- ETSI EN 300 175-4: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 4: Data Link Control (DLC) layer".
- ETSI EN 300 175-5: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 5: Network (NWK) layer".
- ETSI EN 300 175-6: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 6: Identities and addressing".
- ETSI EN 300 175-7: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 7: Security features".
- Universal Serial Bus (USB) Specification (Compaq Computer Corporation, Intel Corporation, Microsoft Corporation, NEC Corporation).
- ETSI EN 300 824: "Digital Enhanced Cordless Telecommunications (DECT); Cordless Terminal Mobility (CTM); CTM Access Profile (CAP)".
- "The Ethernet, A Local Area Network: Data Link Layer and Physical Layer Specification", AA-K759B-TK, Digital Equipment Corporation, Maynard, MA.
- "The Ethernet - A Local Area Network", Version 1.0, Digital Equipment Corporation, Intel Corporation, Xerox Corporation, September 1980.
- "The Ethernet, A Local Area Network: Data Link Layer and Physical Layer Specifications", Digital, Intel and Xerox, November 1982.
- "The Ethernet, A Local Area Network: Data Link Layer and Physical Layer Specification", X3T51/80-50, Xerox Corporation, Stamford, CT., October 1980.
- ETSI EN 301 650: "Digital Enhanced Cordless Telecommunications (DECT); DECT Multimedia Access Profile (DMAP); Application Specific Access Profile (ASAP)".
- ISO 8802-5: "Information technology - Telecommunications and information exchange between systems - Local and Metropolitan Area Networks - Specific requirements - Part 5: Token ring access method and physical layer specifications".
- IETF RFC 791: "Internet Protocol".
- IETF RFC 1661: "The Point-to-Point Protocol (PPP)".

History

Document history		
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