ETSI TECHNICAL REPORT

ETR 185

December 1995

Source: ETSI TC-RES

Reference: DTR/RES-03030

ICS: 33.020, 33.060.50

Key words: DECT, Profile, Data, LAN, WAN, PABX, Fax, Modem

Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Data Services Profile (DSP); Profiles overview

ETSI

European Telecommunications Standards Institute

ETSI Secretariat

Postal address: F-06921 Sophia Antipolis CEDEX - FRANCE
Office address: 650 Route des Lucioles - Sophia Antipolis - Valbonne - FRANCE
X.400: c=fr, a=atlas, p=etsi, s=secretariat - **Internet:** secretariat@etsi.fr

Tel.: +33 92 94 42 00 - Fax: +33 93 65 47 16

Contents

Blank page

Foreword

This ETSI Technical Report (ETR) has been produced by the Radio Equipment and Systems (RES) Technical Committee of the European Telecommunications Standards Institute (ETSI).

ETRs are informative documents resulting from ETSI studies which are not appropriate for European Telecommunication Standard (ETS) or Interim European Telecommunication Standard (I-ETS) status. An ETR may be used to publish material which is either of an informative nature, relating to the use or the application of ETSs or I-ETSs, or which is immature and not yet suitable for formal adoption as an ETS or an I-ETS.

Blank page

1 Scope

This ETR describes the objectives, structure and content of the Digital European Cordless Telecommunications (DECT) Data Services Profiles (DSPs), which define a set of profile standards for systems conforming to the DECT standard. They are a family of profile standards which build upon, and extend, each other, aimed at the general connection of terminals offering non-voice services between themselves or to other communications network, both public and private, via a DECT Fixed Part (FP).

This ETR also describes possible user scenarios in wireless mobile computing. These scenarios have formed the guidelines of the DECT DSPs.

2 References

For the purposes of this ETR, the following references apply:

[1] ETS 300 175-1: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Common Interface (CI); Part 1: Overview".

[2] ETS 300 175-2: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Common Interface (CI); Part 2: Physical (PHL) layer".

[3] ETS 300 175-3: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Common Interface (CI); Part 3: Medium Access Control (MAC) layer".

[4] ETS 300 175-4: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Common Interface (CI); Part 4: Data Link Control (DLC) layer".

[5] ETS 300 175-5: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Common Interface (CI); Part 5: Network (NWK) layer".

[6] ETS 300 175-6: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Common Interface (CI); Part 6: Identities and addressing".

[7] ETS 300 175-7: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Common Interface (CI); Part 7: Security features".

[8] ETS 300 175-8: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Common Interface (CI); Part 8: Speech coding and transmission".

[9] ETS 300 175-9: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Common Interface (CI); Part 9: Public Access Profile (PAP)".

[10] ETR 043: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Common Interface; Services and facilities requirements specification".

[11] ETR 056: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); System description document".

[12] ETS 300 435: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Data Services Profile (DSP); Base standard including inter-working to connectionless networks (service types A and B, Class 1)".

[13] ETS 300 651: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Data Services Profile (DSP); Generic data link service; Service Type C, Class 2".

[14] ETR 178: "Radio Equipment and System (RES); Digital European Cordless Telecommunications (DECT); A high level guide to the DECT standardization".

[15] Arik Elberse Teltec Ireland; IEE Colloquium on Teleworking and Teleconferencing: "DECT: The Ideal Telework Access Technology", June 1994.

[16] Commission of the European Communities: "Towards the Personal Communications Environment: GREEN PAPER on a common approach in the field of mobile communications in the European Union.", September 1994.

[17] Telecomeuropa's Personal Communications Newsletter; June 20th 1994.

[18] Andrew Bud, Olivetti Systems & Networks, Italy; 5th IEE International Conference on Mobile Radio & Personal Communications: "Data Services in DECT", December 1989.

[19] Jan Libenga, MOBILE europe March 1994, "Communicating into the Future with PDAs".

[20] ETS 300 444: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Generic Access Profile (GAP)".

3 Definitions and abbreviations

3.1 Definitions

For the purpose of this ETR, the following definitions apply:

authentication: The process whereby a DECT subscriber is positively verified to be a legitimate user of a particular Fixed Part (FP) and vice versa.

frame relay: Transmission of an Service Data Unit (SDU) with frame boundaries maintained but without notification of correct or otherwise receipt of that SDU.

Fixed Part (FP): A physical grouping that contains all of the elements in the DECT network between the local network and the DECT air interface.

interoperability: The ability of a FP from one manufacturer and a Portable Part (PP) from another manufacturer to communicate, exclusively by means of reliance on a common protocol profile.

mobile computing: The use of portable computer type equipment in different locations.

on-line media: The availability of a wide range of copyright material, such as encyclopedias, maps, directories, timetables and newspapers, to users for access via telecommunications networks.

Personal Intelligent Communicator (PIC): A hand held computer, possibly with a pen based user interface, and the ability to communicate via data networks.

Portable Part (PP): A 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.

roaming: The movement of a PP from one FP coverage area to another FP coverage area, where the capabilities of FPs enable the PP to make or receive calls in both areas.

teleservices: A type of telecommunications services that provides the complete capability, including terminal equipment functions, for communication between users, according to protocols that are established by agreement.

terminal mobility: The ability to access a set of communications services, associated with a specific terminal, in different locations.

3.2 Abbreviations

For the purposes of this ETR, the following abbreviations apply:

ATM	Asynchronous Transfer Mode
DECT CI	Digital European Cordless Telecommunications Common Interface
DSP	Data Services Profile
FP	Fixed Part
GAP	Generic Access Profile
GSM	Global System for Mobile communication
IPX/SPX	Internetwork Packet Exchange/Sequenced Packet Exchange
ISDN	Integrated Services Digital Network
LAN	Local Area Network
LAP	Link Access Protocol
MAN	Metropolitan Area Network
PABX	Private Automatic Branch Exchange
PAD	Packet Assembly/Disassembly
PCMCIA	Personal Computer Memory Card International Association
PDA	Personal Digital Assistant
PIC	Personal Intelligent Communicator
POS	Point Of Sale
PP	Portable Part
SDU	Service Data Unit
TCP/IP	Transmission Control Protocol/Internet Protocol
WAN	Wide Area Network
PIN	Personal Identification Number

4 User scenarios

The rapid evolution in mobile computing is one of the key trends in the development of the information society. Today more laptop computers than desktop computers are sold. In addition the market for Personal Intelligent Communicators (PICs) is predicted to be on the verge of mass-market takeoff. Some market analysts estimate that more than 100 million personal communicators will be sold by the year 2 000 (see Libenga [19]).

A major trend towards multimedia communications can also be seen. The number of users of various on-line services is increasing dramatically every day. There are over 20 million subscribers to the Internet, and new commercial services appear frequently. New software for teleconferencing and teleworking is continuously being developed.

The result of these two trends will be an exploding demand for systems and networks which permit users of mobile computers to communicate on the move, and, therefore, without wires. Such a possibility will transform the mobile computer and the PIC into terminals for telecommunications services thus enhancing their role as personal productivity tools. This will create opportunities for many new applications and services, in areas such as on-line media and business process re-engineering.

From this perspective, standards for wireless multi-media communications are urgent requirements to expand the market, reduce costs and permit the establishment of wireless networks.

The following subclauses describes user scenarios related to wireless data communication. The purpose of these subclauses is to give a background for user requirements and an introduction to the services and facilities that the DECT DSPs are aiming to support.

4.1 Wireless private access to data networks

4.1.1 Wireless Local Area Network (LAN)/Private Automatic Branch Exchange (PABX)

A wireless LAN can extend or even substitute for a standard wired LAN. The wireless LAN will function as a wired LAN does, using the same network protocols as wired LANs today (e.g. TCP/IP, IPX/SPX). The users of wireless LANs can be organizations which:

- need local terminal mobility;
- need to be flexible in re-configuring their LAN;
- require a temporary LAN;
- are situated in buildings where the installation of extra cabling is costly, disruptive or forbidden (such as historic buildings or those containing asbestos).

Relevant applications will include those running on most LANs today (such as MS-Office™, Word Perfect™ and Lotus Notes™) and new applications specially designed for mobile terminals. The new opportunities offered by cordless terminal mobility will create brand new markets for information technology.

In cases where terminal mobility is needed, the communications hardware for wireless access to a LAN or PABX has to be small enough to allow portable terminals (e.g. laptop computers) to be used without adding excessive weight or volume.

It is extremely important that the wireless LAN is at least as dependable as a wired LAN. The reason for this is the dependency placed on LANs to work without failure in modern businesses. This means that the wireless LAN has to give the user a very high degree of confidence that it will avoid corruption of data and deliver a minimum level of throughput in all places where coverage is defined.

The addition of data services to a wireless PABX can offer value added services with very little additional complexity and can use the same installed set of base stations that already provide speech services. In particular, services such as fax and access to files stored on a LAN can be provided. There is also the possibility of adding new cordless services such as cordless data entry and inventory control.

An infrastructure that can offer both wireless speech and data services over the same infrastructure will offer extremely flexible and cost effective solutions to users for whom staff mobility is a requirement.

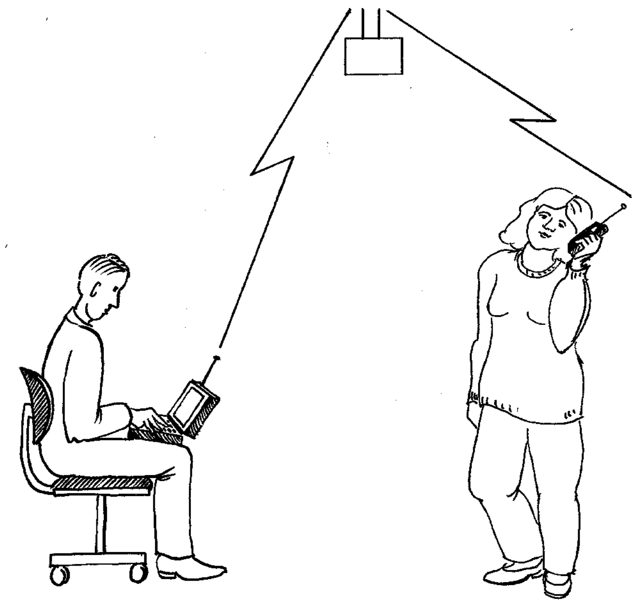

Figure 1: Wireless speech and data services over the same infrastructure

4.1.2 Roaming between wireless LANs/PABXs

Another important scenario is when roaming between networks such as LANs or PABXs is needed, the user is allowed to continue to use his network identity or "address" when moving between different networks. For instance, this would make it possible for an employee of a large company to travel from the main office to a branch office, still being connected via the local networks to his/her home networks, receiving electronic mail and retrieving documents from his or her home server. In this scenario, additional functions such as roaming and authentication procedures, have to be supported by the wireless networks.

The scope of the mobility offered to the user is increased in this scenario. Therefore, applications which are specially designed for mobile terminals will be able to offer even greater added value than in the scenario in subclause 4.1.1.

Roaming between wireless LANs/PABXs allows users' speech and data services to be available and automatically re-routed to them as they move between different LAN/PABX sites either within one company or between several companies. This can make possible enormous cost savings to user organizations as the productivity of their employees is increased.

4.2 Wireless public access to data networks

When a user becomes accustomed to the idea of terminal mobility, there will be a natural wish to extend this mobility. "Since I have coverage at work, I would also like to have access at the airport, hotel, conference center, at home,...".

To meet this demand, new public access networks may be created to provide multi-media wireless communications to mobile computers and PICs in key locations. Such an access service, referred to as "Datapoint", will not only give users access to existing network services, but will also probably give rise to the creation of new network services. These will be specifically targeted at the Datapoint user, providing information about local geography, support services, accommodation, transport connections and entertainment.

In addition, the interesting difference from a market point of view between this scenario and the two in subclause 4.1, is that the number of users could grow towards a mass market, including public and residential users.

To facilitate this migration towards public access, it is important that the communications adapter used in a wireless LAN also functions in a public access environment without hardware modifications. Furthermore, in a public environment inter-operability between equipment from different manufacturers will be essential.

4.2.1 Initial users

The initial users of a public service would probably be white collar workers, including executives and sales people, who travel a lot and need to stay in touch with their home office. In general, they will need access to a particular set of services, which is often referred to as a “mobile office”. Some relevant applications are listed in figure 2.

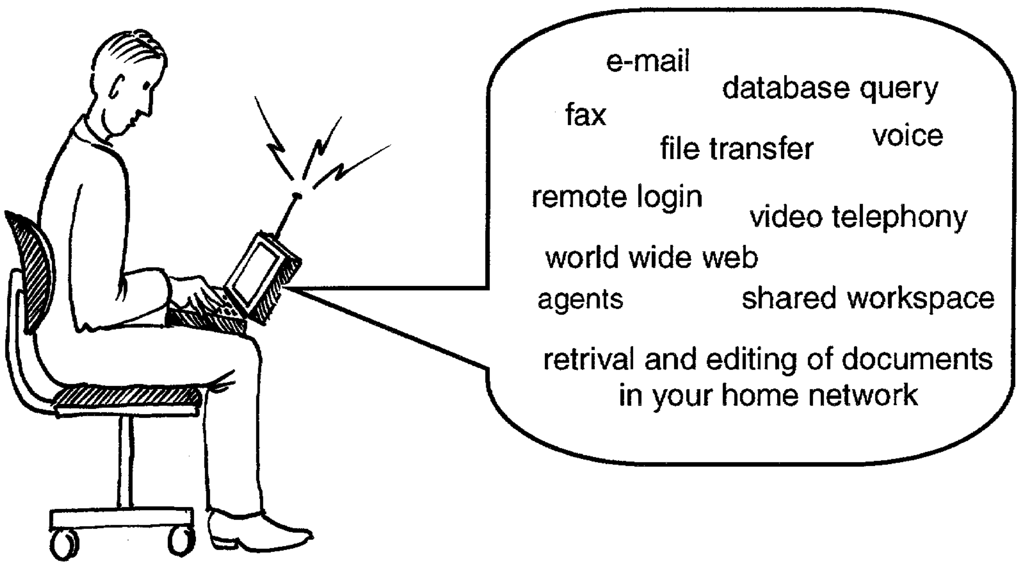

Figure 2: Applications in a system for wireless public access to data networks

These applications illustrate the trend towards higher throughput demands on the communications link. This trend has been very clear in the data communications world for several years, where ever faster voice-band modems have become available. Consequently, even an e-mail application might demand the level of throughput available from the Integrated Services Digital Network (ISDN), if the message sent includes a picture or even a video sequence.

This means that in planning for the future, a system for wireless public access to data networks may need to support throughputs comparable to those of basic rate ISDN.

4.2.2 Why will the market take off?

As has already been stated, the first users of wireless public access to data networks will probably be the business and professional community.

A comparison may be made with the development of the mobile telephony market. In early June 1994 the total number of subscribers using Nordic Mobile Telephone (NMT) handsets exceeded 2,5 million. When the technology was first proposed in the 1970's the estimated numbers of users by the end of the century was around 100 000 newsletter [17]. Initially, the cellular telephone systems were aimed strictly at the business community. Today, these systems are in everyday use among the general public. A similar history exists for the personal computer.

Factors contributing to similar growth in the market for wireless public access to data networks, a logical extension of the existing wireless telephony markets described above, include the increasing number of portable computers sold in the consumer market and the rapid expansion in the on-line media sector. Of course, this would demand a much wider geographical coverage, including city centers and other areas where people might want to access data networks, such as airports, stations, conference centers, hotels and shopping centers. It would also demand new applications, to enable customers to gain the full benefit from the service. Such applications would be tailor-made for mobile access to on-line media, but could also extend to other sectors of potential use, such as teleworking (an example of this application is given in Elberse [15]).

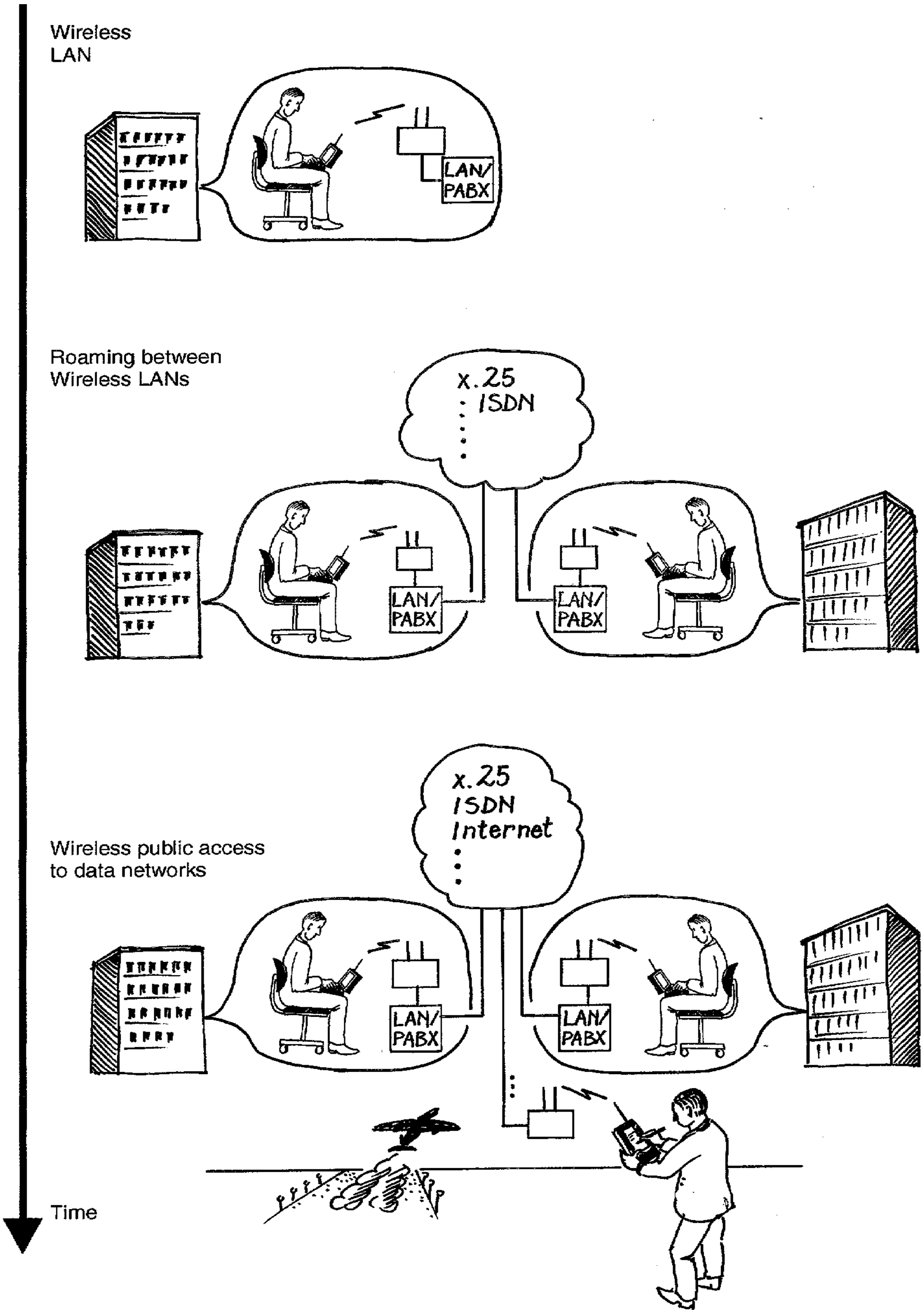

Figure 3: The evolution towards wireless public access to data networks

4.3 Vertical applications

A number of specific applications environments ("vertical applications") could gain particular benefit from wireless data communications, by virtue of their special operational needs. Examples include the industrial and medical sectors.

Industrial environments are envisaged as an area with a huge potential for wireless data communications, since mobility, flexibility and seamless reconfiguration of the production line is required. Four main areas for wireless data communications in industrial environments are foreseen:

- as part of the logistics in stock control and warehouses;
- as the communication part of the production line;
- as support for the maintenance and management functions;
- to provide wireless surveillance.

The usage of wireless data communications in stock warehouses has already been shown as a market that is expanding. The main reason is the mobility made possible by wireless data communications. Using wireless data communications together with bar code readers and pen based computers makes data acquisition more efficient and inventory control more reliable.

The increasing demand on manufacturing efficiency makes the ability to quickly rearrange the production line a necessity. Furthermore, as manufacturing is being more computerized, the provision of a wireless data communications standard provides the tools for this flexibility.

The operation of modern factories also requires that staff move around and are available where they are needed for management or maintenance tasks, and yet have access to all the available information regarding a given problem. Wireless data networks can provide the support necessary to improve the productivity of such personnel.

Wireless surveillance could include alarm acquisition from environmental equipment or picture transmission from cameras which are surveilling factories.

Hospitals are another example of an environment in which staff are highly mobile, and yet can gain enormous benefit from instant access to information data-bases. Such information may include patient records, drug data-bases or instrument logs. Wireless access to such data can save great amounts of time wasted on fetching information.

Conversely, the efficiency of a hospital can be greatly improved if doctors' notes, prescriptions and annotations can be integrated into the hospital information system immediately, without delay or administrative overhead, directly from the bedside. The use of PICs equipped with wireless data communications have been shown to be highly effective in this context.

4.4 Residential environment

The usage of wireless data communications in private homes, is expected to be a spin off from the use of small wireless PABXs for telephony. When the market for small PABXs takes off, prices will drop as a result of the increasing competition. In order to gain market share the manufactures will look for ways to differentiate their products. One way is to add new features like wireless modem, fax and/or LAN interworking. With a common standard these extra facilities will be relatively easy to implement. Users' increasing familiarity with wireless networks, first encountered in a professional or public environment, may also contribute to the growth of demand in the residential context.

With the penetration of personal computers and computer-based products in private homes, the ability to interconnect them into networks will be crucial.

The provision of a common standard that caters for both the business and private market segments will eventually benefit the total market. The prices for wireless data communications adapters is foreseen to evolve in the same way as for wired LAN adapters, modems, mobile phones and faxes.

4.5 Multimedia communication

"Tomorrow’s communicator will integrate the features of telephone, agenda and organizer, combined with PC functions." This is a quote from the European Commission's Green Paper on mobile communications [16], which stresses that the range of personal communicators of the future will include multimedia terminals with modest communications requirements.

The Green Paper continues "Industry has already introduced very small PCs ("palm-tops"). Ultimately these devices are likely to integrate all features that modern telephony offers. This will include video-phone and fax features, as well as the possibility to "plug" into office or private computers. They will integrate multimedia and telecommunications applications", a scenario which will demand ISDN-like throughput if video-telephony is to be supported.

4.6 Security

Security will be a major issue when wireless access is applied to data networks. A company installing a wireless LAN will demand wireless access to be comparable to wired access with respect to avoiding unauthorized access and eavesdropping.

Security will also be crucial in a public access environment if public confidence is to be maintained.

The various elements of this topic are summarized in the Green Paper "With regard to mobile and personal communications systems, major issues are also raised, inter alia, by encryption, authentication, prevention of fraud, protection of network management, data bases, and service providers."

4.7 Summary

This subclause lists some requirements for wireless access to data networks. Not all of these requirements must necessarily be met for a wireless data network to be able to function in a given environment. Nevertheless the more of these requirements can be met, the more versatile and acceptable the wireless network will be.

The requirements are:

1) a reliable system that will keep on functioning even under severe conditions;

2) very strong security features to avoid unauthorized access and eavesdropping;

3) mobility support to cater for terminal mobility in public and private environments;

4) throughput high enough to support relevant applications;

5) the ability to support multimedia, in particular voice and data, using the same infrastructure;

6) interoperability between equipment from different manufacturers;

7) small and light user kit;

8) the ability to use equipment designed for private use in a public environment without hardware modifications.

In the remainder of this ETR it will be shown how DECT can meet these requirements.

5 DECT features essential to the DECT DSPs

This clause describes some features of the DECT standard that are important for the data services outlined in clause 4.

5.1 General

The DECT standard was developed by ETSI for a wide range of high-density cordless applications, both private and public, throughout Europe.

The standard is supported by a range of pan-European regulatory instruments, including a pan-European frequency allocation in the 1 880 MHz to 1 900 MHz-band, now available in all member states, and Common Technical Regulations (CTR) covering type approvals throughout the European Union.

Throughout its life-cycle, the DECT standard has been envisaged as a multi-media telecommunications system, supporting both telephony and data transmission (see ETR 043 [10]), and its design has reflected the needs of this application from the earliest development phases (see Bud [18]). As a result, the DECT CI standard ETS 300 175 Parts 1 to 9 [1]-[9] contains a number of features specifically required for data services, upon which the DSPs are based.

5.2 Capacity

DECT is able to support an error corrected, net sustainable, throughput of up to 552 kbit/s. This can be achieved with a single DECT radio by using 23 of the 24 available time slots to transmit data from a FP to a PP or vice versa. This capacity can be dynamically varied during a data transfer.

5.3 Security

A number of powerful security services have been specified within DECT (see ETS 300 175-7 [7]). These are :

- authentication of a PT by an FT. This uses an authentication key which is known both to the PT and the FT. A session authentication key is computed from the authentication key, which means that the authentication key itself does not need to be revealed to visited networks;

- authentication of an FT by a PT. This is a PT initiated service that enables a PT to authenticate an FT through which it is making or receiving a call. The authentication mechanism is the reverse of the authentication of a PT;

- mutual authentication enables a PT and the FT through which a call is connected to continuously authenticate each other;

- data confidentiality provides for the encryption of the user data and certain control data over the air interface between a PT and an FT. Both the PT and the FT establish a common cipher key. With this key a key stream for encrypting data is generated. The cipher key may be fixed, or generated on a per call basis;

- the user authentication service allows an FT to authenticate a user in a manner similar to the on-line Personal Identification Number (PIN) verification provided by banking systems.

All these functions have been designed in such a way that sensitive information, such as cipher keys, is never transmitted over the air interface.

5.4 Mobility

DECT contains comprehensive, powerful, standardized support for mobility, including both local-area mobility and roaming between networks, both public and private. The location definition and registration procedures permits greater flexibility in the partitioning of networks. Standardized procedures provide identity and subscription management, service negotiation and other features necessary to provide a truly mobile service. A wide range of identity and address types support access information, access request, equipment identification, paging and billing (see ETR 056 [11]).

At the same time it is important to understand that DECT is a network access technology, providing the user with uniform access to a variety of possible wired networks. These networks may themselves have some degree of support for mobile users, which can be effectively inter-worked to DECT. The degree of mobility support available in the fixed network will of course limit the mobility service which the user can get, but it is unlikely that DECT will be the limiting factor.

5.5 Profiles

The DECT CI standard, ETS 300 175 Parts 1 to 9 [1]-[9], contains a large number of powerful capabilities and features, most of them optional, only a subset of which are appropriate to a given application. To apply the standard to a specific application, it is necessary to specify the necessary subset. This definition is called a profile, and it specifies all requirements for interoperability between equipment from different manufacturers. Where options are permitted in the CI, a profile will often specify the choice of option to be used, and if the CI standard has some ambiguity or lacks some provisions then this is clarified or added in the profile standard. Many profiles have already been defined for DECT and others are under development (see ETR 178 [14]).

6 The DECT DSPs

The DECT DSPs make use of the powerful mechanisms for data transmission provided by the DECT CI standard ETS 300 175 Parts 1 to 9 [1]-[9]. This is achieved through the interworking of data directly into the data transmission mechanisms of DECT, giving digital transmission between the attached network and the user equipment. Compared to modem solutions using a voice channel, the DECT DSPs, exploiting the full capabilities of the DECT CI standard, provide higher throughput, lower bit error rate, better reliability, improved spectrum usage and better battery economy. Compatibility with the Generic Access Profile (GAP), ETS 300 444 [20], wherever appropriate, ensures that integrated voice/data systems may be implemented efficiently.

This clause describes the DECT DSPs, and how these profiles may cater for the user requirements raised in clause 4.

6.1 Objective of the DECT DSPs

The objective of the DECT DSPs is to make possible inter-operability between FPs and PPs conforming to DECT and servicing a range of non-voice applications. To do so, they have to provide a clear and unambiguous definition of the protocol procedures, messages and information elements invoked to provide specified services. A number of specific services are defined to cover a wide range of applications.

In particular, the DECT DSPs seek to accomplish the following objectives:

- ensure that the complexity of equipment resulting from the support for inter-operability is kept low through restriction upon options;
- provide levels of functionality appropriate to the target application areas, whilst providing smooth upgrade paths with backward compatibility;
- serve different application areas with as small a number of closely related profile standards as possible;
- separate the development of the different parts of the profiles corresponding to the different application areas and services from each other as far as possible in order to allow standards development to respond effectively to market evolution without restricting technological innovation;
- make possible the implementation of multiple services (including voice and data) in the same equipment without conflict or confusion.

6.2 Description of services

The DECT DSPs are structured into a number of separate standards, each of which defines the aspects of the individual profile invoked to provide a different type or level of service. The result is a family tree of related standards. The service characteristics are summarized below and are described in more detail in the relevant standards themselves.

6.2.1 Service types

To meet the wide variety of possible applications for the DECT DSPs, six principal types of service are defined:

Type A: low speed frame relay, with a net sustainable throughput of up to 24 kbit/s, optimized for bursty data, low power consumption and low complexity applications such as hand-portable equipment;

Type B: high performance frame relay, with a net sustainable throughput of up to 552 kbit/s, optimized for high speed and low latency with bursty data. Equipment implementing the type B profile has to inter-operate with type A equipment;

Type C: non-transparent connection of data streams requiring Link Access Protocol (LAP) services, optimized for high reliability and low additional complexity. This builds upon the services offered by the type A/B profiles. Provision for a packet assembly/disassembly function for asynchronous data streams is also included;

Type D: transparent and isochronous connection of synchronous data streams optimized for interworking application requiring continuous data streams;

Type E: a short message transfer or paging service which may be unacknowledged or acknowledged, optimized for small SDUs, low PP complexity and ultra-low power consumption;

Type F: an application profile specifically supporting teleservices such as fax, building upon the services offered by the type A/B and C profiles, optimized for terminal simplicity, spectrum efficiency and network flexibility.

A number of these services classes are closely related to each other, in order to maximize the cross-compatibility and to minimize complexity. These relationships are shown in figure 4.

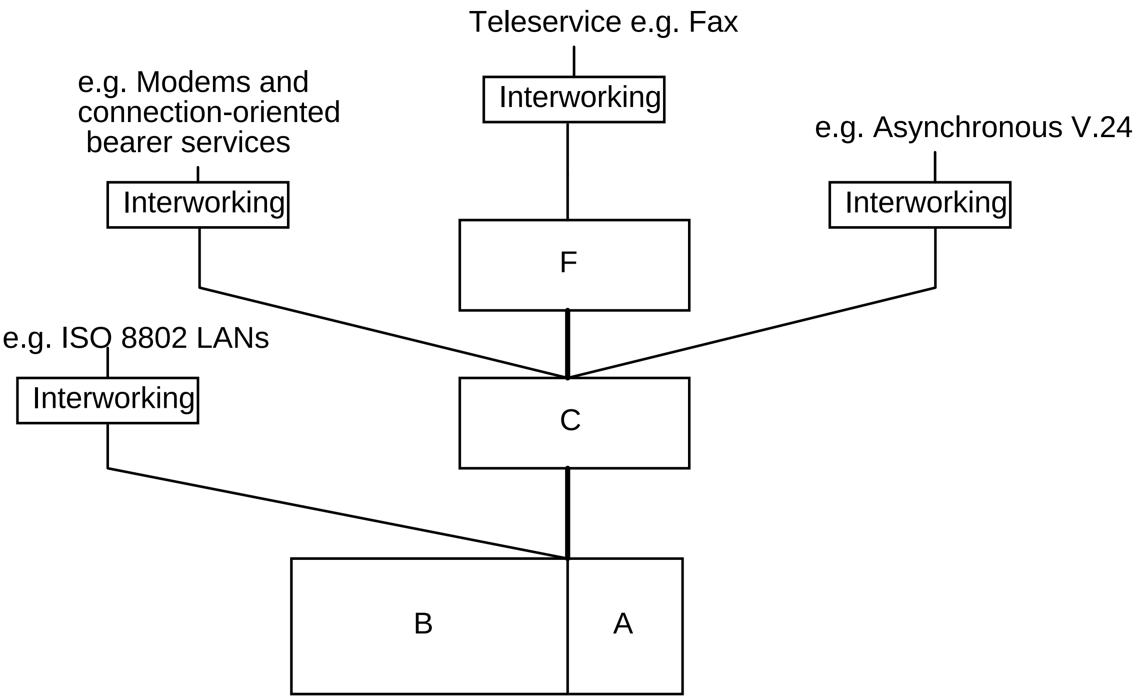

Figure 4: Relationship of service types

6.2.2 Mobility support

Since equipment conforming to the DECT DSPs will potentially be used in many different contexts, with different degrees of network flexibility and user requirements for mobility, two classes of mobility support are defined:

Class 1: Local area applications, for which terminals are pre-registered off-air with one or more specific FPs by the user, with parameters installed according to a profile-defined list, definition of the service and user parameters at the moment of service request is therefore implicit in the user identity (see subclause 4.1.1);

Class 2: Roaming applications, both public and private, for which terminals may move between FPs within a given domain and for which association of service parameters is explicit at the time of service request (see subclauses 4.1.2 and 4.2).

6.2.3 Application examples

The following examples show terminals, user applications and networks that can be associated with a certain service type and certain mobility class. However, tables 1, 2, and 3 serve solely for the purposes of illustration.

Table 1: Examples of terminals

Terminal	Service type	Mobility class
ATM terminal	B, C, D	1,2
In-office fax	F	1,2
In-office serial terminal	C	1,2
Industrial portable	A, B, C	1,2
MAN terminal	A, B, C	2
Mobile data n/w access	A, C	1,2
Multimedia terminal	B, C, D	1,2
Pager	E	1,2
Personal computer	A, B, C, F	1,2
Personal computer LAN	A, B	1,2
Personal Digital Assistant (PDA) on-site	A, C	1,2
Pocket computer LAN	A, B	1,2
Portable videophone	B, C, D	1,2
Portable videotext terminal	C	1,2
Point Of Sale (POS) terminal	C	1,2
Public fax	F	2
Public serial terminal	C	2
Public X25 terminal	C	2
Telemetry unit	E	1,2
Traveling PDA (PIC)	A, C	2

Table 2: Examples of networks

Network	Service type	Mobility class
LAN	A, B	1,2
MAN	C	2
WAN	C	2
ATM	B, C, D, F	1,2
PSTN	C, F	2
ISDN	C, D, F	2
GSM	C, F	2

Table 3: Examples of user applications

Application	Service type
Colour fax	F
E-mail	A, B, C, F
File transfer	A, B, C, F
Group 3/4 fax	F
Modem	C
Multimedia	B, C, D
Paging	E
Printing	A, B, C, F
Real-time video	D
Remote access	A, B, C
Server access	A, B, C
Telemetry	E
Video messaging	B, D

6.3 Structure of the DECT DSPs

The DECT DSPs form a family of related standards, in order to encourage focus and finalisation of the standards in those specific areas that have the highest priority in terms of market needs, without limiting the scope for innovation in areas of great long-term potential. Such granularity offers this flexibility without introducing particular complication into the implementation or interoperation of products.

The DECT DSPs are structured into a number of standards, which are shown in table 4.

Table 4: Profile component standards

	Mobility class 1	Mobility class 2
Service Type A	A.1	A.2
Service Type B	B.1	B.2
Service Type C	C.1	C.2
Service Type D	D.1	D.2
Service Type E	E.1	E.2
Service Type F	F.1	F.2

The service type chosen by the customer will depend upon the performance and services needed for the particular application, whereas the choice of mobility class will depend upon the capabilities of the network to which the user intends to attach and upon the degree of mobility demanded. Different contexts will therefore require adherence to different DECT DSPs. The commonalty between the various parts is such that multiple DECT DSPs can co-exist in a terminal without major penalty in terms of complexity or power consumption. The nature of non-voice terminals is generally such that new profile standard implementations can very easily be added once they become available or are required.

Each of the DECT DSPs comprises a detailed description of the service offered by that part, followed by a precise definition of the selection from ETS 300-175 Parts 1 to 9 [1]-[9], of the procedures, messages and information element coding for the physical, MAC, DLC and network layers, and also, where appropriate, the requirements on the management entity. In addition, each DECT Data Services Profile standard also specifies the interworking conventions necessary for successful interworking with a number of appropriate networks or applications.

6.4 The DECT DSPs - Summary

Subclause 4.7 lists eight requirements for wireless access to data networks. The DECT DSPs address these requirements as summarized below:

1) the protocols in the DECT DSPs ensure highly reliable data transport mechanisms. This reliability is also assured by requirements for equipment to undergo standardized test routines described within appropriate test standards. Underlying the technology are the hundreds of man-years invested over a period of seven years in the development and validation of the DECT standard and the DECT DSPs. This large amount of work makes the DECT standard and the DECT DSPs an extremely reliable set of standards upon which to base products;

2) DECT has very strong security features that also will be accessed by the DECT DSPs. Mobility class 2 includes GAP security, which has been agreed is strong enough for public use by public operators;

3) mobility class 2 will cater for roaming, both public and private;

4) the net sustainable throughput of the DECT DSPs will be up to 552 kbit/s. This throughput will be high enough to support most relevant applications, including those run over wired LANs today;

5) the DECT DSPs, in combination with the GAP, will be able to support multimedia, including voice and data using the same infrastructure;

6) through the standardization of the air interface between a PP and an FP, the DECT DSPs ensures interoperability between equipment from different manufacturers;

7) it is quite possible to make products according to the DECT DSPs that will be small and light enough to meet user requirements. Manufacturers have already demonstrated the feasibility of Personal Computer Memory Card International Association (PCMCIA) implementation of DECT products;

8) the DECT DSPs are all closely related. There is therefore no reason that, for instance, an upgrade of a PP from use in a private environment to use in a public environment should be anything more than a mere upgrade of software.

7 Profile implementation

Currently, ETSI has completed the development of the A.1 and B.1 profiles, and the C.2 profile is ready for its public enquiry phase. This clause presents these profiles in more detail.

7.1 Base standard (A.1 and B.1 profiles)

The A.1 and B.1 profiles are combined in a single standard, see ETS 300 435 [12].

This ETS specifies a generic frame relay service for use within closed user groups. This service is used by other standards within the DSPs when providing interworking to levels above the MAC layer of the attached networks (see figure 4).

Annexes to ETS 300 435 [12] contain interworking conventions for Ethernet (ISO 8802.3) and Token Ring (ISO 8802.5). This makes the ETS 300 435 [12] extremely well suited for inter-operable wireless connection to Ethernet and Token Ring and, in general, access to almost any other type of LAN. It is possible that ETSI may in future propose to standardize inter-working to such other LANs.

The contrasting characteristics of the A.1 and B.1 profiles are as follows:

- The A.1 profile is optimized for low power consumption and low complexity applications, through the use of a single duplex DECT bearer and paging mechanisms which ensure low average power drain. It includes the dynamic control of the radio link according to demand. It will support a net sustainable throughput of 24 kbit/s. This makes the A.1 profile very suitable for applications adapted for serial data transfer in hand-portable equipment.

- The B.1 profile is optimized for high speed (up to 552 kbit/s net sustainable throughput) and low latency with bursty data. It uses the DECT multi-bearer provisions to combine time-slots and, optionally, may use the asymmetric-channel feature for maximum uni-directional throughput. It includes the provisions necessary to page a portable terminal in under 50 ms. Dynamic control of the transmission resources ensures that spectrum occupancy is minimized. This makes the B.1 profile extremely well suited for applications demanding high performance, including some multimedia applications. This however does not prevent equipment implementing the B.1 profile from being portable, even hand-held.

When it comes to mobility, both A.1 and B.1 support Mobility Class 1 (see subclause 6.2.2). This means that equipment has to be pre-registered on each FP through which they need to communicate. This pre-registration installs all the necessary parameters in a static manner onto the FP. Within the domain of one FP, mobility between base stations is possible. The limitation of this class is that equipment may not be attachable to FPs with which it is not locally registered, and there exists no standardized opportunity to negotiate different service parameters. There are also certain limitations in the management of cipher keys, and most features required for public service are absent.

7.2 Generic Data Link Services (C.2)

The C.2 profile is in the form of a standard ETS 300 651 [13]. This ETS builds upon the generic frame relay service offered by ETS 300 435 [12]. The specification of service type C includes a Link Access Protocol (LAP) service which provides non-transparent data transfer. This provides flow control and further error recovery. In addition, it includes Packet Assembly/Disassembly (PAD) and bit PAD functions which facilitate asynchronous and synchronous data transfer respectively. Mobility management functions, supporting roaming in private and public environments, and service negotiation functions are provided by the Mobility Class 2 features. These mobility management functions are identical to those of ETS 300 444 [20] public option.

Annexes to ETS 300 444 [20] contain interworking conventions to specific connection-oriented services such as:

- interworking to CCITT Recommendation V.24 circuits, which is ideal for low-level wireless connection to devices such as printers, modems, industrial equipment and even other computers;
- interworking to connection oriented bearers, which is extremely well suited to the wireless connection of asynchronous and synchronous serial data applications to virtually any fixed network.

8 Future developments

There are plans to develop further profiles in the future. Details of profiles such as the profile A.2/B.2 and profile F are expected to be supplied in subsequent ETRs.

Further ETRs may be developed to amplify aspects of the implementation and applications of existing and planned data profiles, particularly with regard to the provision of multi-media public services.

History

Document history	
December 1995	First Edition
January 1996	Converted into Adobe Acrobat Portable Document Format (PDF)

ISBN 2-7437-0316-4
Dépôt légal : Décembre 1995