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SUBJECT:	DECT - A STANDARD FOR CORDLESS DATA NETWORKS
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Abstract

The standard for Digital European Cordless Telecommunications, DECT, will offer a European standard for cordless communication with both voice and data capabilities. This paper provides an introduction to DECT and considers the characteristics that make it a suitable system for cordless local area network applications.

Basic Principles

The DECT standard is currently being defined by ETSI working group RES 3 and is due to be published in late 1991. Work on the standard has substantial commercial backing throughout ETSI Europe and it is expected that equipment will start to become available during the later part of 1992.

The DECT concept is one of versatility of application at a cost that encourages wide availability and market adoption. It is envisaged that DECT will provide personal communication services in residential, neighbourhood and business environments and is particularly targeted at the following application areas:

- Residential - domestic cordless telephones
- Public access - telepoint services
- Cordless business PBX systems
- Cordless data - local area networks
- Evolutionary applications - extensions to cellular radio services, extensions of the local public network

Technical Summary

DECT is based on a microcellular radio communication system, offering low-power cordless access between portable and infrastructure at ranges up to a few hundred metres. The basic technical characteristics are as follows:

Frequency band:	1880-1900MHz
Number of carriers	11
Carrier spacing	1.728MHz
Basic data rate	1152kbps
Multiplex on carrier	TDMA, 24 slots per frame
Duplexing	TDD, 12 slots per direction
Frame length	10ms
Channel throughput	32kbps traffic data 6.4kbps signalling data
Output power	250mW
Estimated range	50-100m in a typical office environment 500m in free space

Bursts of 420 bits are transmitted in each time slot, comprising 32 bits of synchronisation data and a 388 bit MAC packet. The MAC packet is formed from 40 octets of user information, whether speech or data, together with 8 octets of signalling information. Communication may be simplex, by the transmission of data in one slot in every frame, or duplex, using two slots on the same carrier evenly spaced by a half frame (5ms).

The key technical features of DECT are designed to allow high capacity, while maintaining quality of service. A simple but efficient Dynamic Channel Selection (DCS) procedure is used in which physical channels are allocated in a decentralised manner between each portable and its closest base station. This is in contrast to cellular services such as TACS and GSM, which have a centralised channel allocation. DCS, used together with base station broadcast information, allows a portable to choose a channel that is best for the required connection depending on the radio environment. This has the advantage that no prior distribution of channels to specific services or base stations is required.

DECT is able to support a number of system configurations, ranging from single cell to synchronised multi-cell installations. The DECT protocols allow rapid handover both intra-cell or inter-cell, without interruption of service or loss of data. Uncoordinated system installations are also permitted within the same area and are able to co-exist on the common DECT frequency allocation. However, it should be noted that handover is not possible between unsynchronised base stations without potential loss of data.

Data Facilities

The requirements for efficient transfer of LAN data over an air interface are quite different than those for speech communication. Traffic typically consists of directionally asymmetrical bursts of

data, at fairly high rates. In order to support LAN applications, DECT offers the following facilities:

- A packet mode bearer service having the ability to transfer unrestricted digital data while maintaining service data unit (SDU) integrity.
- Frame relay, frame switching and rate adaption functions.
- The ability to set up connections having asymmetric throughput characteristics. This is in contrast to voice communication which usually involves a symmetrical connection.
- Support for a logically connectionless 'datagram' service, essential for LAN applications.
- Fast connection setup time of less than 50ms. This is important in data applications since connections may be dropped during idle periods to conserve spectrum, the penalty being increased access latency. DECT also supports virtual connections, allowing a logical connection to be maintained while suspending physical communication.
- Support for multicast and broadcast services in addition to point-point communication.
- The capacity for relatively high data throughput rates by the ability to use more than one slot per frame. Two service types are possible, either variable throughput, fixed delay, up to a maximum of 736kbps, or variable throughput, variable delay (error corrected), up to a maximum of 588kbps. Note that these throughput figures are at the MAC/DLC protocol layer boundary. It is recognised that in certain data applications, such as LANs, significant traffic may be generated at air interfaces by a single user at a single location. To ensure that a reasonable grade of service is available to all users of DECT, mechanisms are provided to ensure equitable access to the service.
- Restricted access to the network by authentication and security of data during transmission by encryption.
- Facilities for detection of (and optionally recovery from) transmission, format or operational errors, and lost, or duplicated frames.

Cordless Local Area Networking

Cordless LANs potentially offer several advantages over traditional cabled systems, including :

- Flexibility in environments where network stations do not have a fixed position, or are portable
- Potential savings on cabling costs
- Avoidance of cabling difficulties, particularly in older buildings or in hazardous environments
- Ease of installation

Applications range from simple cordless drops to a traditional cabled installation for individual portable terminals, to a facility offering cordless LAN connectivity to a number of users within a given service area. In addition there are likely to be applications in remote bridging, providing a method of communication between two LANs where cabling is impractical.

Products offering cordless PC LAN connectivity have recently become available in the US, many of which are based on low power CDMA (spread spectrum) radio technology operating in the ISM

band (902-928MHz) under section 15 of the FCC rules. In Europe, the potential market demand for cordless LAN products has remained largely untapped, primarily due to a lack of spectrum and standardisation. IEEE Project 802.11 may address the standardisation issue, however, there is no guarantee that the resulting spectrum requirements will be accomodated throughout Europe. While DECT may not offer a data capability optimised for cordless LAN applications, it does offer several features that will make it a serious contender in the European cordless data market:

- A recognised standard - There is a significant market trend in the Information Technology industry towards 'open' systems, enabled by commonly agreed standards. In this environment the commercial success of cordless LAN products will be critically dependent on the existance of such standards.

- A pan-European spectrum allocation - With moves towards closer European integration, it is essential that a European standard be adopted for cordless LAN connectivity. DECT has the promise of a pan-European 20MHz spectrum allocation between 1880 and 1900MHz, with a possible extension to 50MHz if demand is sufficient. It is predicted that the initial 20MHz allocation is likely to be sufficient to meet the densest voice and data requirements in a typical office environment.

- Integrated voice and data - Emerging office connectivity standards are increasingly offering mixed media capabilities with integrated voice and data. IEEE working group 802.9 is considering Integrated Voice and Data (IVD), and both FDDI 2 and the IEEE 802.6 Metropolitan Area Network standard will support mixed media communication. In the field of telecommunications, both voice and data services are supported in ISDN. With a background in cordless telephony, DECT offers the capability to extend the mixed media capabilities of these networks in applications requiring cordless connectivity. It should be noted that DECT is not intended to be purely a cordless LAN standard, as 802.11, but rather a cordless telecommunications standard supporting a data capability. Therefore, it is likely that there will be some optimisation for voice applications.

- Interworking - Access to wide area connectivity services is an essential facility in many LAN installations. In the development of the DECT specification, consideration has been given to interworking with ISDN, X25 packet switched services and IEEE 802 LANs.

- Control of Equipment - Effective regulation of equipment in the field is essential to reduce problems such as inteference to other radio services. In order to achieve this, DECT equipment will be subject to a type approval procedure.

- Security - In a market survey of potential cordless LAN users, 70% cited security of the radio link as an important factor which could affect the uptake of cordless LAN technology. DECT offers authentication procedures to prevent unauthorised access to the network and encryption of transmitted data to guard against eavesdropping.

- Mobile data facilities - In application areas where portability is important, there may be additional benefits if the data service can be extended outside the office. In principle, DECT used together with a wide area data service, may be used to provide data facilities in a public access (telepoint), or residential environment.

- Good price-performance - DECT offers a medium performance data capability based on low cost technology developed primarily for a consumer market. It is likely that many cordless data applications will be adequately served by the facilities that DECT provides.

It should also be noted that within the FCC Notice of Inquiry, DECT has been proposed as a possible candidate for the US PCS market.

References

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