IEEE P802.11
Wireless LANs

DECT STATUS REPORT AND DATA SERVICES

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Abstract

The DECT specification is being developed under ETSI to provide a common air interface for a range of cordless voice and data applications. This contribution reports on the status of the standard and describes some of the services which have been defined for data.

Status of the DECT Standard

Digital European Cordless Telecommunications (DECT) is being developed as a standard for low cost cordless communication with a common frequency allocation across Europe.

At the June meeting of ETSI Technical Committee RES the DECT Common Interface (CI) Standard was approved for issue for public comment. Following incorporation of comments the revised Standard will be resubmitted to RES at its November meeting and later for approval of the ETSI Technical Assembly. The Standard is on schedule for publication at the end of 1991.

The indications are that DECT will be widely supported by equipment suppliers (both domestic phone systems and cordless PBXs) and PTOs across Europe. The end of 1992 will see the availability of first generation products. Whilst most developers are concentrating on telephony products at least one major European manufacturer has indicated that a cordless data product using DECT will be available during 1992.

There is also currently much discussion about the use of DECT for public access. The following applications are being considered:

- Fixed telepoint services using either PSTN or ISDN
- Mobile telepoint services using GSM
- Cordless local loop for bypass access where national regulations allow competition (as in the UK)

- Cordless local loop as a quick and convenient means of providing telecommunications infrastructure in Eastern Europe.

The CI Specification is to include a specific profile for the first two of these applications, the Public Access Profile (PAP).

Common Interface Specification

The CI Specification will be published in ten parts.

ETSI DE/RES 3001-1	Part 1	Overview
ETSI DE/RES 3001-2	Part 2	Physical Layer
ETSI DE/RES 3001-3	Part 3	Medium Access Control Layer
ETSI DE/RES 3001-4	Part 4	Data Link Control Layer
ETSI DE/RES 3001-5	Part 5	Network Layer
ETSI DE/RES 3001-6	Part 6	Identities and Addressing
ETSI DE/RES 3001-7	Part 7	Security Features
ETSI DE/RES 3001-8	Part 8	Speech Coding and Transmission
ETSI DE/RES 3001-9	Part 9	Public Access Profile
ETSI DE/RES 3001-10	Part 10	Cryptographic Algorithms

DECT is a microcellular system using self-trunking techniques. A range of between 50 and 200 metres between portable and fixed parts is achievable depending upon environment. The air interface uses a combination of FDMA, TDMA and TDD to provide a moderately high system capacity. The basic characteristics were described in an earlier contribution (Doc:IEEE P802.11/91-10) and are listed in Table 1 below for reference. DECT has been designed to support both voice and data services. Data services will typically use more than one slot per frame on a dynamic basis providing bit rates at the MAC service boundary of 736kbps (unprotected) or up to 588kbps (error corrected). This is the bit rate available to a single user with one radio resource. Systems may incorporate multiple frequency agile radios at the fixed part and together with spatial separation of fixed parts DECT based LANs will be able to offer system throughput equivalent to moderate performance wired LANs. There will of course be other performance differences such as the lower per user rate and higher access latency. Nonetheless it is considered that DECT will offer a low cost and available solution for a wide variety of cordless networking requirements. Provided conformance requirements are met equipment will be available for a pan-European market.

The DECT protocols have been developed based on OSI principles. The requirements to provide controlled handover at different levels and the nature of the radio medium however have led to a slightly different model. The general structure of the DECT protocols is illustrated in figure 1. In this paper functions designed to support data users above the MAC service boundary are described. The previous paper (91-10) described the lower layer services.

There are three levels of DECT conformance specified. CI-BASE is the minimum level of conformance to the CI specification and covers the physical and minimum MAC requirements. Other levels allow conformance with a CI profile with or without proprietary extensions. The conformance levels are:

CI-BASE	CI Approvals Test (Physical and minimum MAC)
CI-PROFILE	CI Operating Profile(s) (Initially there is just one profile defined, the PAP)
CI-PROFILE-PLUS	CI Operating Profile(s) with proprietary extensions.

Frequency Band:	1880 - 1900 MHz
Number of Carriers:	10
Carrier Spacing:	1.728 MHz
Gross Bit Rate:	1152 kbps
Multiplex on Carrier:	TDMA, 24 slots per frame
Duplexing:	TDD
Frame Length:	10 ms
Channel Throughput:	32 kbps Traffic channel per slot
	6.4 kbps Signalling channel per slot
Output Power:	250 mW peak
Estimated Range:	50 - 100 m in typical office environment
	500 m in free space

Table 1
DECT Basic Characteristics

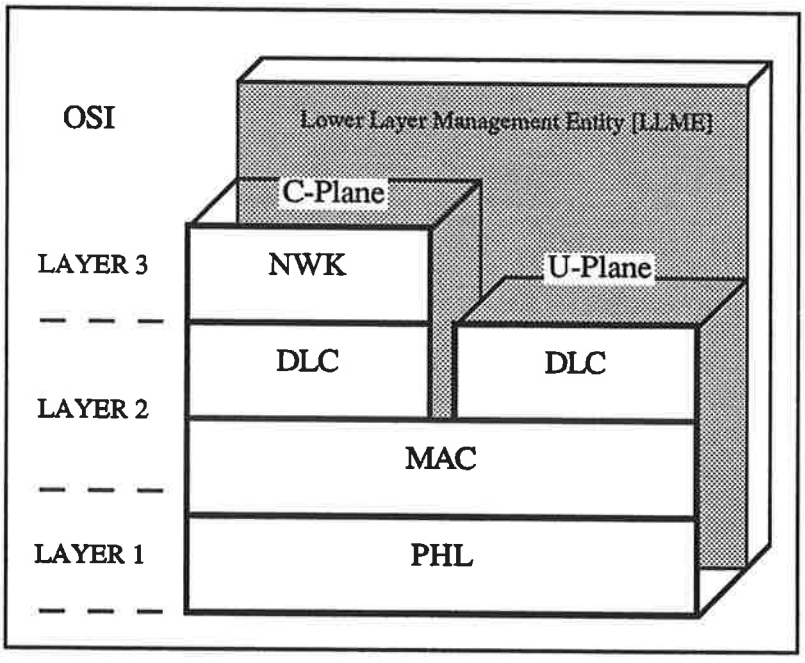

Figure 1
DECT Protocol Structure

System Description Document

The DECT CI specifies an air interface which provides for the transfer of user data at the Network Layer service boundary in the C-Plane (signalling) and at the DLC service boundary in the U-Plane (traffic). This transfer is

between a single portable and fixed part. In practice for DECT to provide a useful system higher layer protocols and the means to interwork to some attached network will be required. These are outside of the DECT specification. The System Description Document (SDD) will be issued in support of the CI specification. It contains information which will help system implementers use the DECT standard in a consistent way. The information contained in the SDD includes:

- Reference models
- Protocol Architectures
- Mobility Management functions
- Supplementary Service access and control
- Principles for interworking
- Interworking Profiles for attachment to a range of networks

The SDD will be available as a draft ETSI Technical Report at the Public Enquiry stage and will be published as an ETSI Technical Report in conjunction with the CI Specification at the end of the year.

DECT Data Services In The U-Plane

The U-Plane service is provided at the DLC boundary. The U-Plane is provided for the transport of user data although this is also possible to a limited extent in the C-Plane as will be described later. The U-Plane in the DLC Layer is illustrated in figure 2. The upper part of the U-Plane consists of a number of services LU1 through LU6. Each is accessed through a separate SAP. Implementations may implement any of these services depending upon system requirements. It is also possible for multiple instances of each to exist.

LU1 Transparent Unprotected Service (TRUP)

This provides a constant throughput, constant delay service at 32kbps and may be used for either speech or data.

LU2 Frame Relay Service (FREL)

LU2 is a generic frame relay service which transfers a single SDU between peer entities. Error protection is provided by the addition of a checksum to the SDU before segmentation into PDUs suitable for transmission by the MAC layer. LU2 has no knowledge of the structure of the SDU and so does not perform flag deletion or recreation, zero deletion or recreation nor any form of address translation.

LU3 Frame Switching Service (FSWI)

LU3 provides a LAP based closely on LAPM. This provides a reliable peer-to-peer acknowledged exchange of user data. The protocol is called LAPU. LAPU frames are transferred using a separate instance of LU2.

LU4 Forward Error Correction Service (FEC)

This is currently not defined.

LU5 Basic Rate Adaption Service (BRAT)

LU5 provides a mapping between user rates of 64kbps, 32kbps, 16kbps and 8kbps and the underlying MAC service. Both protected and unprotected services are defined using the appropriate MAC channels. Each instance of LU5 can provide upto 3 independent synchronous continuous bit streams with an aggregate data rate of 64kbps. A number of alternative mappings are defined.

LU6 Secondary Rate Adaption (SRAT)

This utilises the upper part of CCITT V.110 (primary rate conversion) to translate from asynchronous lower rates (RA0) or from synchronous lower rates to an intermediate rate (RA1). The intermediate rate may be any of 8, 16, 32 or 64kbps. LU6 also defines direct conversion of user rates of 48 or 56kbps to 64kbps. This service is always used in conjunction with the Basic Rate Adaption Service.

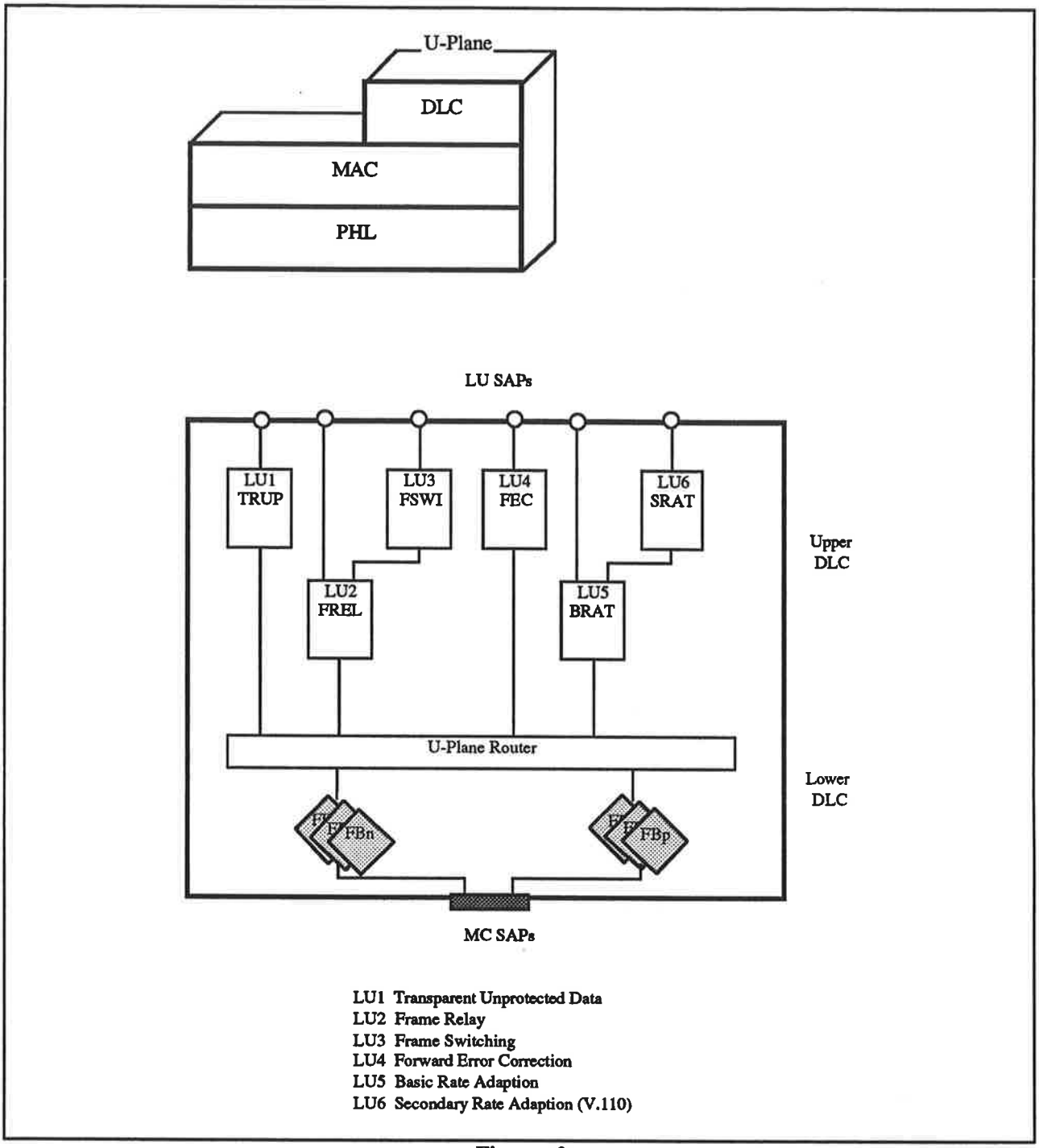

Figure 2
U-Plane DLC Model

Each LU service has a defined frame structure. LU frames are routed to buffering entities called FB. The reason for defining this structure is so that connection handover can be handled by the buffering entities and be transparent to the higher LU entities. Two versions of FB are defined corresponding to error protected MAC connections (FBp) and unprotected connections (FBn) respectively.

DECT Data Services In The C-Plane

It is also possible to transfer user data in the C-Plane. The C-Plane is primarily designed for control and consists of two entities LAPC and Lc. The LAPC protocol has similarities with LAPD used on ISDN. Lc buffers and fragments LAPC frames to and from the MAC layer. There can be multiple instances of LAPC. An independent broadcast service is also defined

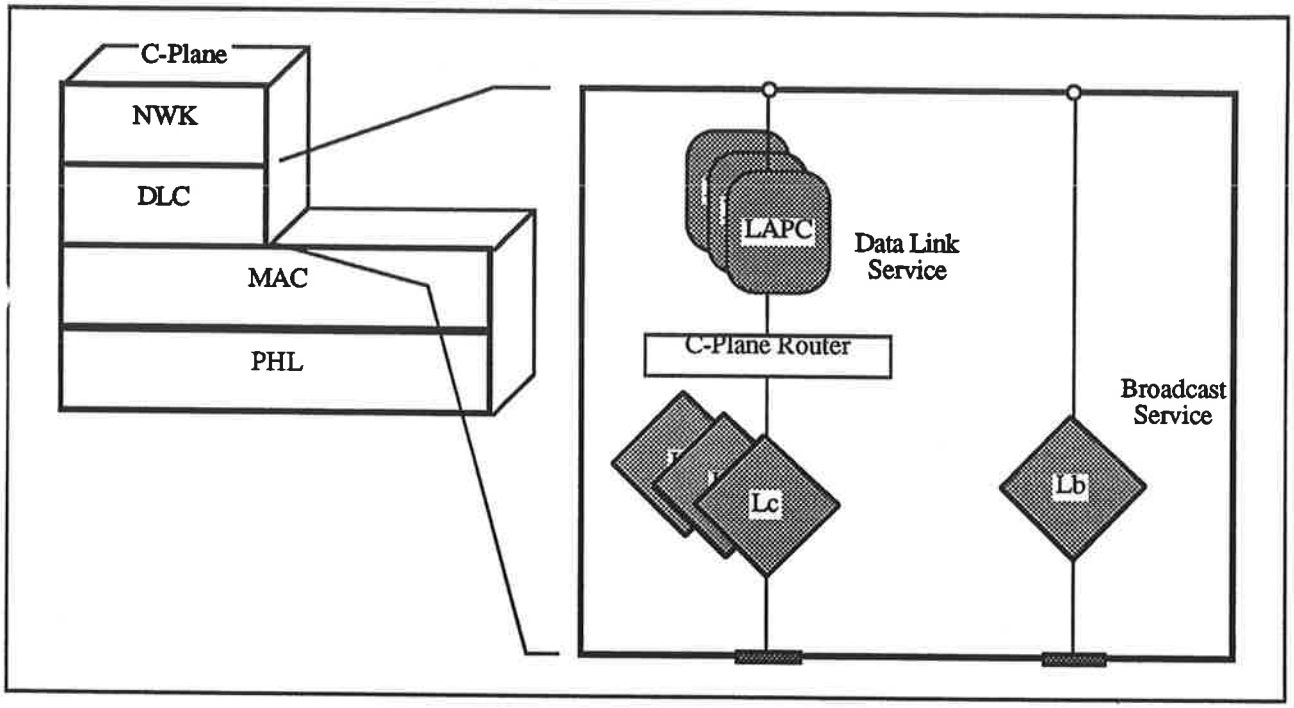

Figure 3
C-Plane DLC Model

The network layer above the DLC is illustrated by figure 4. A number of independent entities are defined. Two of these are designed to provide low rate data services using the U-plane.

COMS Connection Orientated Message Service

- Point-to point
- Connection orientated packet service
- acknowledged
- segmentation of long frames
- Simpler call establishment than normal
- Rapid suspend and resume of lower layer resources (similar to a virtual circuit)
- useful for interworking X.25 or ISDN user-to-user signalling

CLMS Connectionless Message Service

- Point-to-point or point-to-multipoint
- connectionless
- unacknowledged

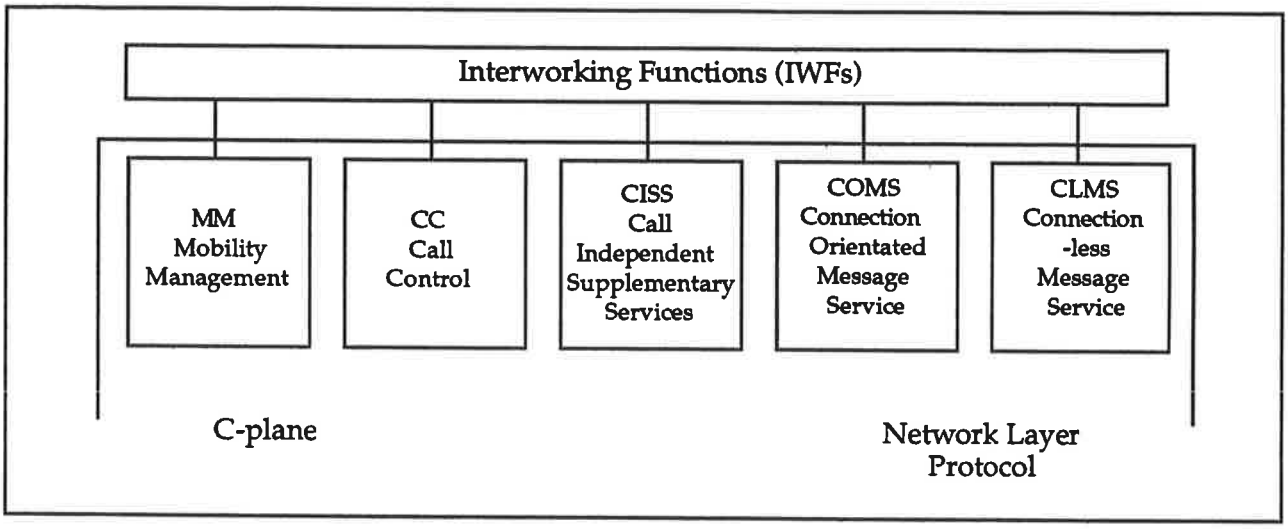

Figure 4
C-Plane Network Layer

Interworking DECT with ISO 8802 LANs

DECT may be used to provide a cordless drop to a local area network. If a number of such drops are provided then the LAN can provide routing and relaying between between DECT portables. Indeed, taken to its extreme the LAN may have no fixed and only cordless connections. Considering interworking to a LAN provides then model for how a cordless network using DECT may be constructed.We will consider here interworking to the MAC layer of a data only ISO 8802 LAN (8802.3, 8802.4, 8802.5). Interworking to this boundary has the advantage that the processes required are independent of higher layer LAN protocols. In addition, the efficiency of the interworking function will depend on the amount of processing required to convey information. It is therefore preferable to provide a fairly simple interworking function at a lower protocol layer.

LAN communication at the MAC layer is not dependent on the prior establishment of a call, or connection. In interworking LAN data over DECT, the Interworking Unit (IWU) is required to provide the necessary connection control and signalling in the C-plane in order to set up and maintain a virtual connection to support packet communication. User data is carried in the U-plane using the DECT frame relay (FREL) service.

The LAN subnetwork may be thought of as supporting a permanent physical connection over which data for multiple destinations (and from multiple sources) is multiplexed.

Protocol architecture models are illustrated in figures 5 for the C-Plane and 6 for the U-Plane.

User data will normally be transferred over the U-Plane. However short packets (containing say routing information) may be sent using COMS or CLMS. If the session is initiated by the DECT portable then a LAPC connection must first be established or a suspended connection resumed. From information supplied during DECT call establishment the IWU establishes a routing table. The DECT portable identity provides an ISO 8802 compatible locally administered 48 bit address. Locally administered addresses may be interworked to globally administered addresses by the IWU. The routing table allows packets arriving from the LAN to be selected for routing across the DECT subnetwork. Broadcast packets arriving from the LAN may be interworked into CLMS messages and sent over the DECT broadcast channel.

The SDD contains an interworking profile for connection to 802 LANs which provides more detail.

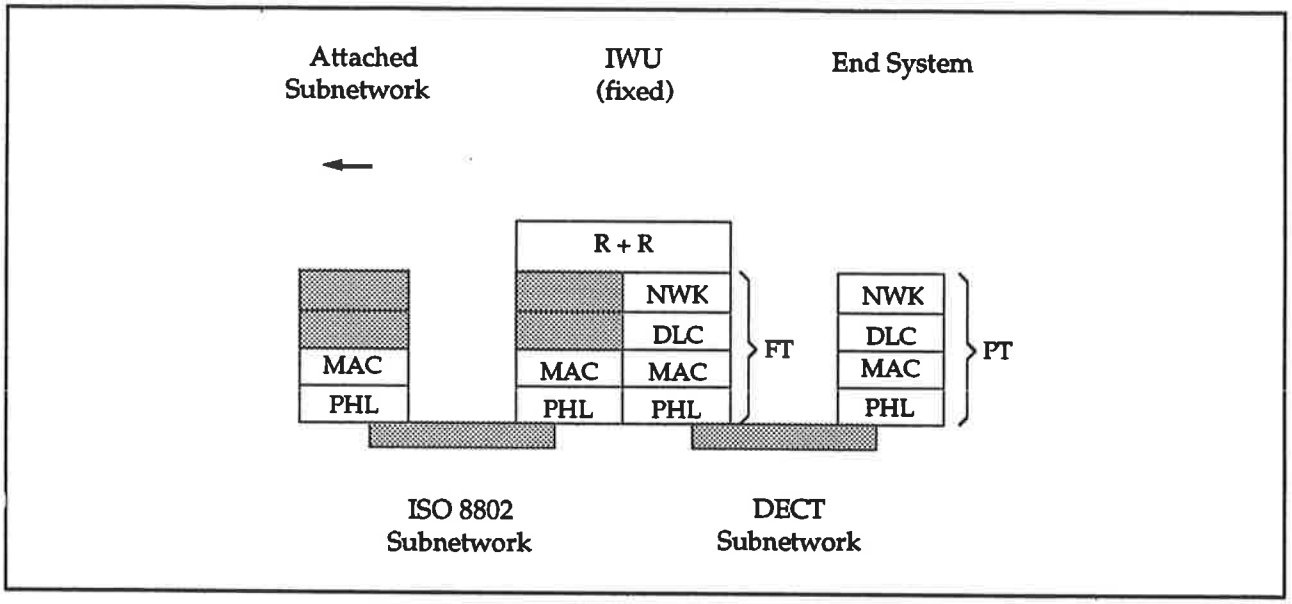

Figure 5
C-Plane Protocol Model for LAN Interworking

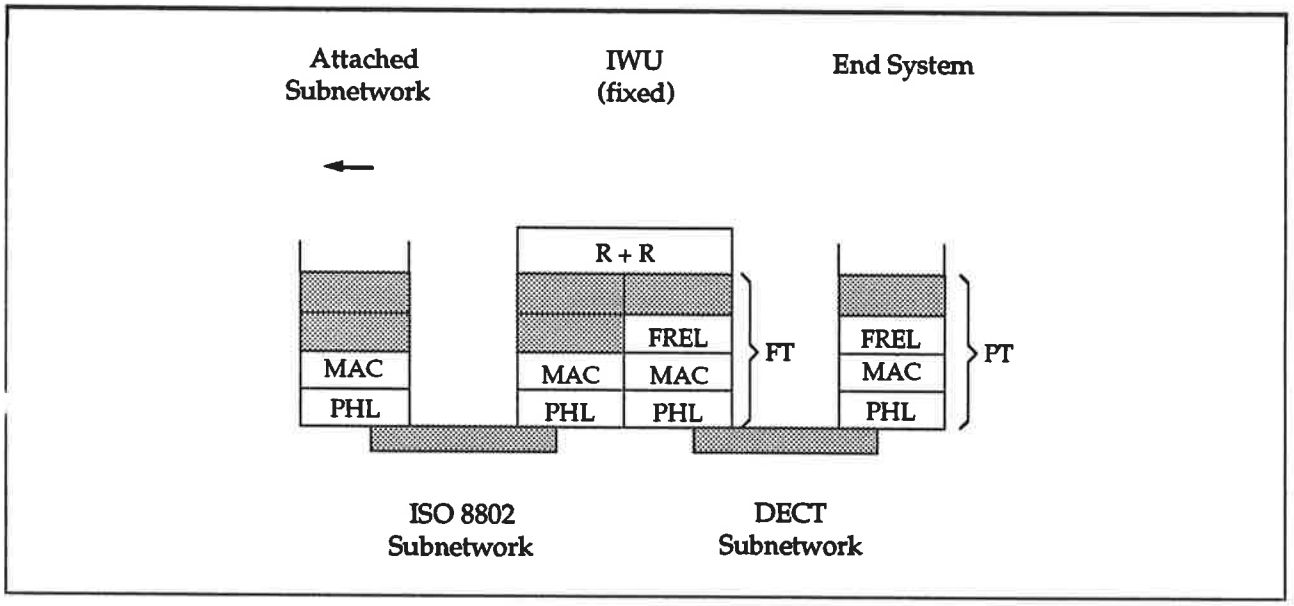

Figure 6
U-Plane Protocol Model for LAN Interworking

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SYMBIONICS

- DECT CI approved by TC RES
- Public Enquiry Stage
- Standard by end 1991
- First Products by end 1992

Part 1 Overview
Part 2 Physical Layer
Part 3 MAC
Part 4 Data Link Control Layer
Part 5 Network Layer
Part 6 Identities and Addressing
Part 7 Security Features
Part 8 Speech Coding and Transmission
Part 9 Public Access Profile
Part 10 Cryptographic Algorithms

CI-BASE CI

Approvals Test
(Physical and minimum MAC)

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CI-PROFILE-PLUS

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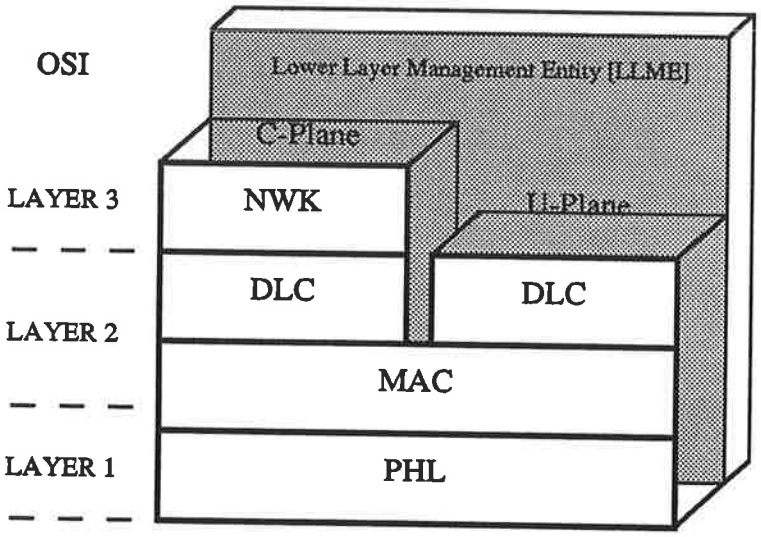

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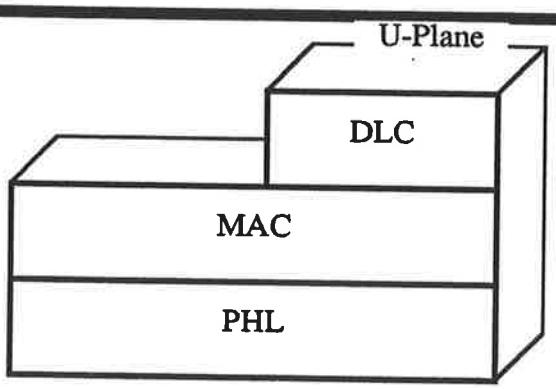

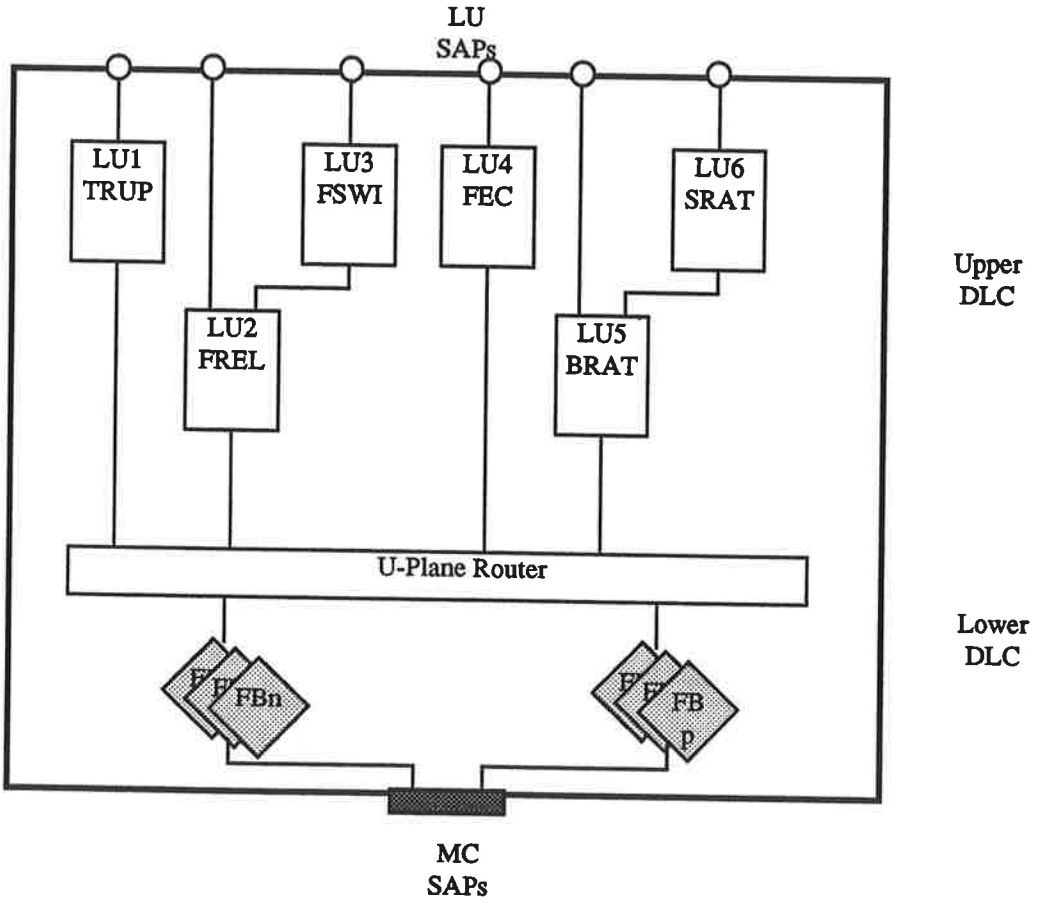

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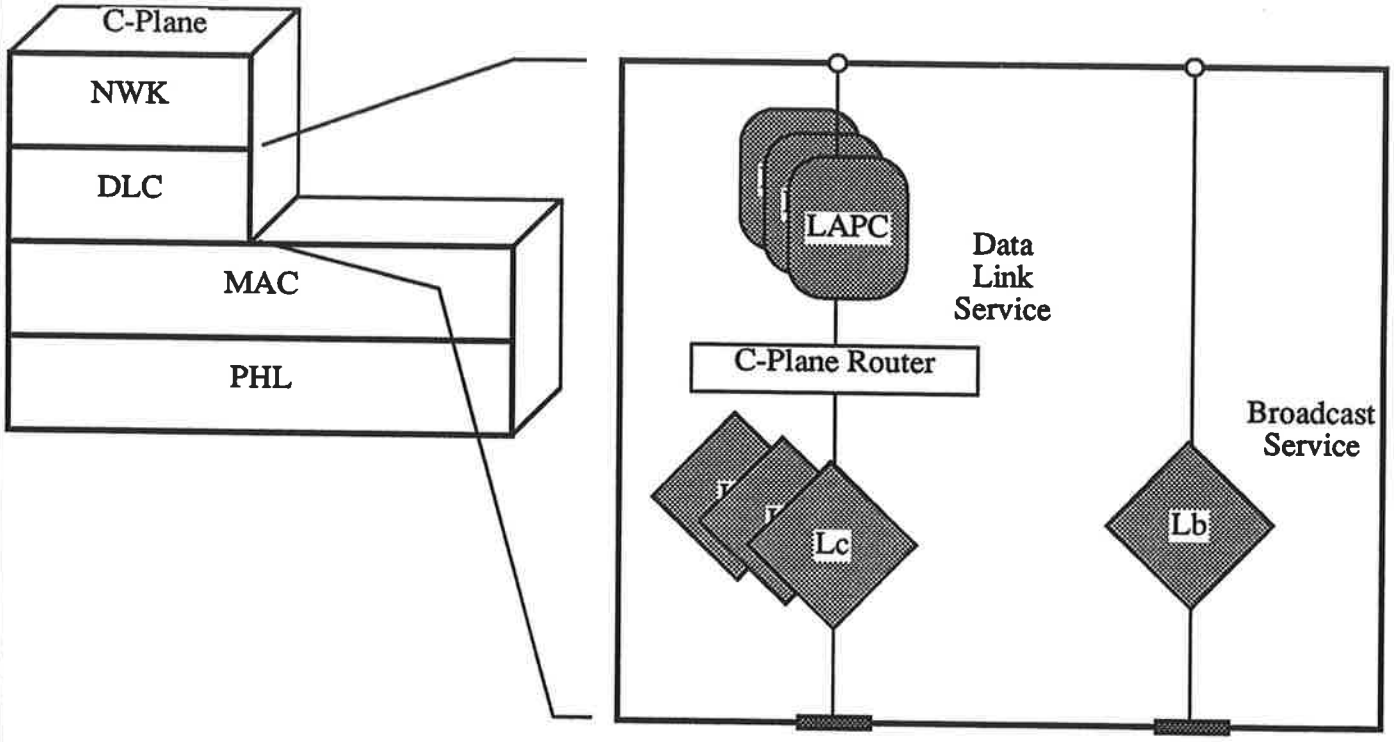
LU3 Frame Switching
LU4 Forward Error Correction
LU5 Basic Rate Adaption
LU6 Secondary Rate Adaption (V.110)

U-Plane Model



C-Plane Model

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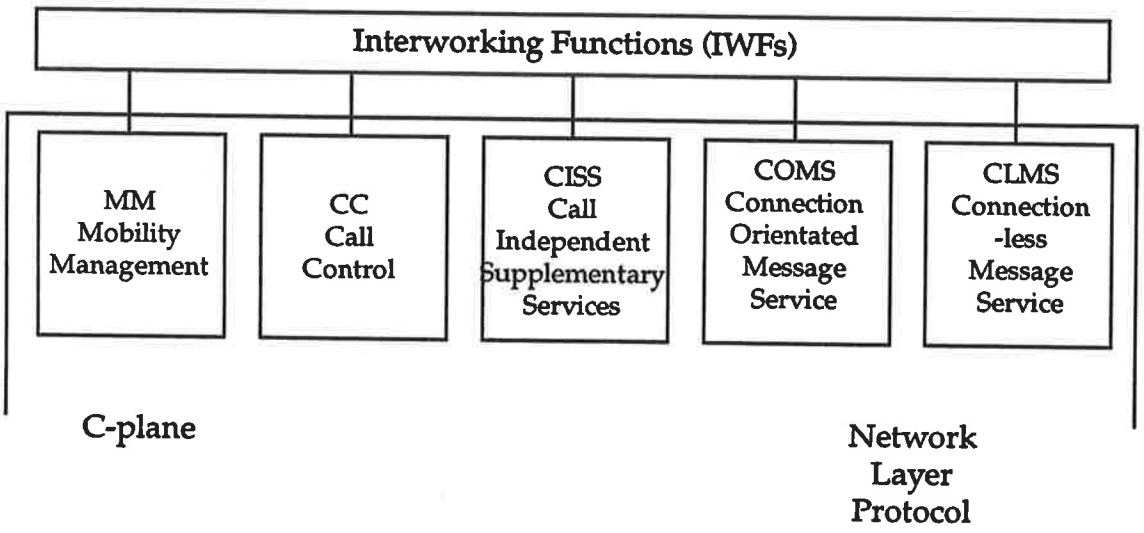

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COMS & CLMS

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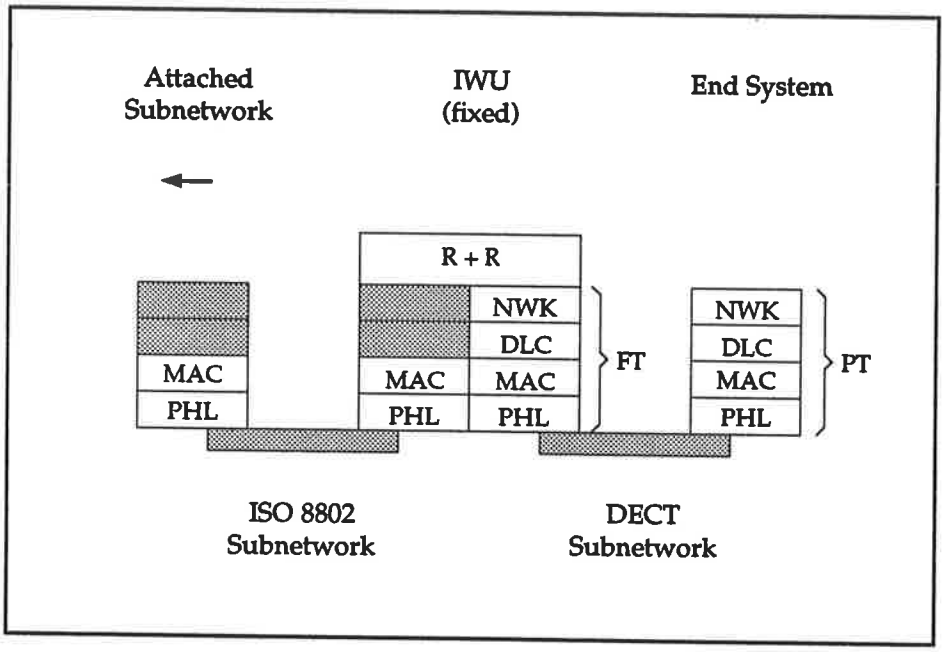

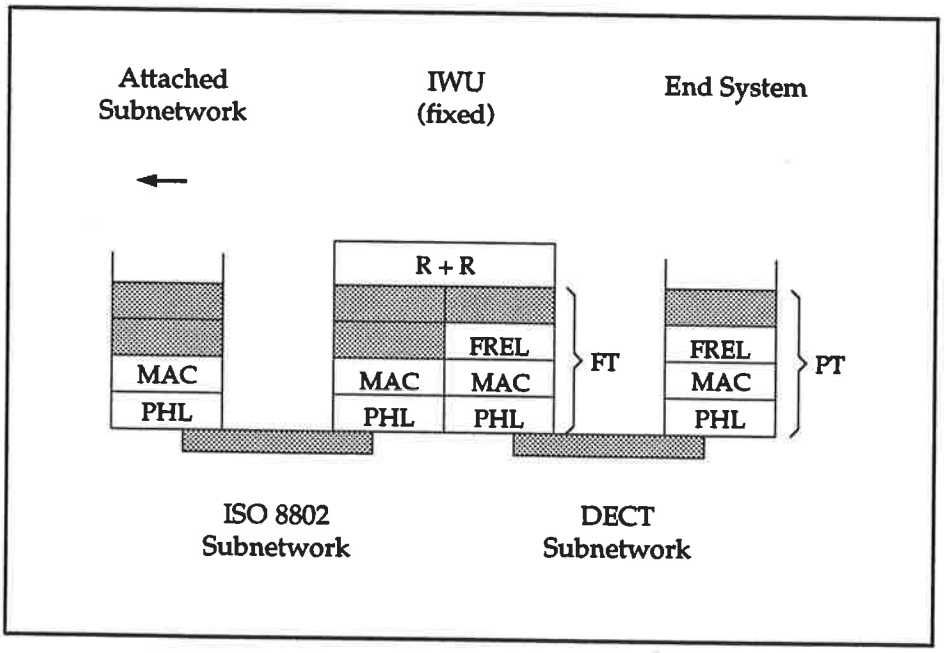

802 LAN Interworking

SYMBIONICS