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Implementation of bearer services**

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Foreword

This final draft European Telecommunication Standard (ETS) has been produced by the Radio Equipment and Systems (RES) Technical Committee in co-operation with the Global System for Mobile Communication (GSM) Technical Committee of the European Telecommunications Standards Institute (ETSI), and is now submitted for the Voting phase of the ETSI standards approval procedure.

Introduction

This ETS is a part of a set of standards for the DECT/GSM Interworking Profile (IWP) concept that includes:

- general description of service requirements, functional capabilities and information flows, (ETS 300 466 [13]);
- access and mapping (protocol/procedure description for 3,1 kHz speech service), (ETS 300 370 [10]);
- GSM-MSC/DECT-FP fixed interconnection (ETS 300 499 [14]);
- GSM Phase 2 supplementary services implementation (ETS 300 703 [25]);
- implementation of bearer services (this ETS);
- short message services, point-to-point and cell broadcast (ETS 300 764 [26]);
- implementation of facsimile group 3 (ETS 300 792 [27]).

This ETS is based on Digital Enhanced Cordless Telecommunications (DECT) common interface specification ETS 300 175 [1] - [8] to enable DECT terminals to interwork in the public and private environment with DECT systems which are connected to a Global System for Mobile communications (GSM) core infrastructure.

In addition, this ETS is based on the DECT Generic Access Profile (GAP), ETS 300 444 [12], to enable the same DECT/GSM terminal to interwork with a DECT Fixed Part (FP) complying to the GAP requirements, irrespective of whether this FP provides residential, business or public access services. General attachment requirements and speech attachment requirements are based on TBR 6 [29] and TBR 10 [28].

Further details on the DECT system may be found in ETR 015 [31], ETR 043 [32], ETR 056 [33] and I-ETS 300 176 [9].

Proposed transposition dates	
Date of latest announcement of this ETS (doa):	3 months after ETSI publication
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Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

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1 Scope

This European Telecommunication Standard (ETS) is a part of the Digital Enhanced Cordless Telecommunications/Global System for Mobile communications (DECT/GSM) Interworking Profile and specifies the PP interworking requirements and FP interworking requirements/mappings necessary to ensure that the GSM bearer services can be provided over DECT, as specified in ETS 300 466 [13]. To enable DECT terminals to interwork with DECT systems which are connected to the GSM infrastructure, from the DECT side this ETS is based on the DECT/GSM interworking profile, access and mappings ETS 300 370 [10], as well as the DECT data services profile, generic data link service, service type C, Class 2, ETS 300 651 [24].

NOTE: For information, the DECT data service profile is based upon the GAP ETS 300 444 [12] and on the DECT common interface specification ETS 300 175 [1] - [8].

Interworking functions/mappings are specified for Mobile Switching Centre (MSC) attachment for the DECT FP as the FP is using the A-interface towards the GSM MSC in the respect that the FP emulates a GSM Base Station Controller (BSC) with regards to the GSM messages which are relevant to this ETS. The complete interface used between the DECT Fixed Part (FP) and the GSM Mobile Switching Centre (MSC) is specified in ETS 300 499 [14]. Attachment via other interfaces to GSM-networks is outside the scope of this ETS.

The DECT access protocols and FP and PP interworking/mappings necessary for the support of basic voice telephony service are specified in ETS 300 370 [10].

2 Normative references

This ETS incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

- [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 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] I-ETS 300 176: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Approval test specification".
- [10] ETS 300 370: "Radio Equipment and Systems (RES); Digital Enhanced Cordless Telecommunications / Global System for Mobile communications (DECT/GSM) inter-working profile; Access and mapping (Protocol/procedure description for 3,1 kHz speech service)".
- [11] ETS 300 435: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Data Services Profile (DSP); Base standard including interworking to connectionless networks (service types A and B, Class 1)".
- [12] ETS 300 444: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Generic Access Profile (GAP)".
- [13] ETS 300 466: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications/Global System for Mobile Communications (DECT/GSM) interworking profile; General description of service requirements; Functional capabilities and information flows".
- [14] ETS 300 499: "Radio Equipment and Systems (RES); Digital Enhanced Cordless Telecommunications / Global System for Mobile Communications (DECT/GSM) interworking profile; Mobile services Switching Centre (MSC) - Fixed Part (FP) interconnection".
- [15] ETS 300 501: "European digital cellular telecommunications system (Phase 2); Bearer Services (BS) supported by a GSM Public Land Mobile Network (PLMN) (GSM 02.02)".
- [16] ETS 300 557: "Digital cellular telecommunications system (Phase 2); Mobile radio interface layer 3 specification (GSM 04.08)".
- [17] ETS 300 562: "European digital cellular telecommunications system (Phase 2); Rate adaption on the Mobile Station - Base Station System (MS - BSS) Interface (GSM 04.21)".
- [18] ETS 300 563: "European digital cellular telecommunications system (Phase 2); Radio Link Protocol (RLP) for data and telematic services on the Mobile Station - Base Station System (MS - BSS) interface and the Base Station System - Mobile-services Switching Centre (BSS - MSC) interface (GSM 04.22)".
- [19] ETS 300 582: "European digital cellular telecommunications system (Phase 2); General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS) (GSM 07.01)".
- [20] ETS 300 583: "European digital cellular telecommunications system (Phase 2); Terminal Adaptation Functions (TAF) for services using asynchronous bearer capabilities (GSM 07.02)".
- [21] ETS 300 584: "European digital cellular telecommunications system (Phase 2); Terminal Adaptation Functions (TAF) for services using synchronous bearer capabilities (GSM 07.03)".
- [22] ETS 300 590: "Digital cellular telecommunications system (Phase 2); Mobile-services Switching Centre - Base Station System (MSC - BSS) interface; Layer 3 specification (GSM 08.08)".

- [23] ETS 300 608: "European digital cellular telecommunications system (Phase 2); Specification of the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface (GSM 11.11)".
- [24] ETS 300 651: "Radio Equipment and Systems (RES); Digital Enhanced Cordless Telecommunications (DECT); Data Services Profile (DSP); Generic data link service; Service type C, class 2".
- [25] ETS 300 703: "Radio Equipment and Systems (RES); Digital Enhanced Cordless Telecommunications / Global System for Mobile communications (DECT/GSM) Inter-Working Profile (IWP); GSM phase 2 supplementary services implementation".
- [26] ETS 300 764: "Radio Equipment and Systems (RES); Digital Enhanced Cordless Telecommunications / Global System for Mobile communications (DECT/GSM) Interworking Profile (IWP); Implementation of short message service, point-to-point and cell broadcast".
- [27] ETS 300 792: "Radio Equipment and Systems (RES); Digital Enhanced Cordless Telecommunications / Global System for Mobile communications (DECT/GSM); DECT/GSM interworking profile; Implementation of facsimile group 3".
- [28] TBR 10: "Radio Equipment and Systems (RES); Digital Enhanced Cordless Telecommunications (DECT); General terminal attachment requirements; Telephony applications".
- [29] TBR 6: "Radio Equipment and Systems (RES); Digital Enhanced Cordless Telecommunications (DECT); General terminal attachment requirements".
- [30] 91/263/EEC: "Council Directive of 29 April 1991 on the approximation of the laws of the Member States concerning telecommunications terminal equipment, including the mutual recognition of their conformity" (Terminal Directive).
- [31] ETR 015: "Radio Equipment and Systems; Digital European Cordless Telecommunications (DECT); Reference document".
- [32] ETR 043: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); Common interface; Services and facilities requirements specification".
- [33] ETR 056: "Radio Equipment and Systems (RES); Digital European Cordless Telecommunications (DECT); System description document".
- [34] ETR 100: "European digital cellular telecommunications system (Phase 2); Abbreviations and acronyms (GSM 01.04)".
- [35] ISO/IEC 9646-6: "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 6: Protocol profile test specification".

3 Definitions, abbreviations and symbols

3.1 DECT definitions

For the purposes of this ETS, the following definitions apply:

attach: The process whereby a PP within the coverage area of a FP to which it has access rights, notifies this FP that it is operative. The reverse process is detach, which reports the PP as inoperative.

NOTE 1: An operative PP is assumed to be ready to receive calls.

authentication: The process whereby a DECT subscriber is positively verified to be a legitimate user of a particular FP.

NOTE 2: Authentication is generally performed at call set-up, but may also be done at any other time (e.g. during a call).

bearer service: A type of telecommunication service that provides a defined capability for the transmission of signals between user-network interfaces.

NOTE 3: The DECT user-network interface corresponds to the top of the network layer (layer 3).

C-plane: The control plane of the DECT protocol stacks, which contains all of the internal DECT protocol control, but may also include some external user information.

NOTE 4: The C-plane stack always contains protocol entities up to and including the network layer.

call: All of the Network (NWK) layer processes involved in one network layer peer-to-peer association.

NOTE 5: Call may sometimes be used to refer to processes of all layers, since lower layer processes are implicitly required.

DECT Network (DNW): A network that uses the DECT air interface to interconnect a local network to one or more portable applications. The logical boundaries of the DECT network are defined to be at the top of the DECT network layer.

NOTE 6: A DECT Network (DNW) is a logical grouping that contains one or more fixed radio termination plus their associated portable radio termination. The boundaries of the DECT network are not physical boundaries.

Fixed Part (DECT 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.

NOTE 7: A DECT FP contains the logical elements of at least one fixed radio termination, plus additional implementation specific elements.

fixed part GSM PLMN attachment (DECT fixed part attached to a GSM MSC): A definition of a functional environment where a DECT system (FP) is attached to a GSM MSC. The MSC in this case refers to a functional entity providing the required MM and CC functionality defined in this ETS in order to communicate with the FP.

Fixed radio Termination (FT): A logical group of functions that contains all of the DECT processes and procedures on the fixed side of the DECT air interface.

NOTE 8: A fixed radio termination only includes elements that are defined in ETS 300 175 [1] to [8]. This includes radio transmission elements together with a selection of layer 2 and layer 3 elements.

Generic Access Profile (GAP): A defined part of ETS 300 175 [1] to [8] that ensures inter-operability between FPs and PPs for public business and residential access services.

geographically unique identity: This term relates to FP identities, Primary Access Rights Identities (PARIs) and Radio Fixed Part Identities (RFPIs). It indicates that two systems with the same PARI, or respectively two RFPs with the same RFPI, can not be reached or listened to at the same geographical position.

Global Network (GNW): A telecommunication network capable of offering a long distance telecommunication service.

NOTE 9: The term does not include legal or regulatory aspects, nor does it indicate if the network is a public or a private network.

globally unique identity: The identity is unique within DECT (without geographical or other restrictions).

handover: The process of switching a call in progress from one physical channel to another physical channel. These processes can be internal (see internal handover) or external (see external handover).

NOTE 10: There are two physical forms of handover, intra-cell handover and inter-cell handover. Intra-cell handover is always internal. Inter-cell handover can be internal or external.

incoming call: A call received at a PP.

inter-cell handover: The switching of a call in progress from one cell to another cell.

internal handover: Handover processes that are completely internal to one Fixed radio Termination (FT). Internal handover re-connects the call at the lower layers, while maintaining the call at the NWK layer.

NOTE 11: The lower layer reconnection can either be at the Data Link Control (DLC) layer (connection handover) or at the MAC layer (bearer handover).

inter-operability: The capability of FPs and PPs, that enable a PP to obtain access to teleservices in more than one location area and/or from more than one operator (more than one service provider).

inter-operator roaming: Roaming between FP coverage areas of different operators (different service providers).

Interworking Unit (IWU): A unit that is used to interconnect sub-networks.

NOTE 12: The IWU will contain the interworking functions necessary to support the required sub-network interworking.

intra-cell handover: The switching of a call in progress from one physical channel of one cell to another physical channel of the same cell.

intra-operator roaming: Roaming between different FP coverage areas of the same operator (same service provider).

Local Network (LNW): A telecommunication network capable of offering local telecommunication services.

NOTE 13: The term does not include legal or regulatory aspects, nor does it indicate if the network is a public network or a private network.

locally unique identity: The identity is unique within one FP or location area, depending on application.

location area: The domain in which a PP may receive (and/or make) calls as a result of a single location registration.

location registration: The process whereby the position of a DECT portable termination is determined to the level of one location area, and this position is updated in one or more databases.

NOTE 14: These databases are not included within the DECT FT.

Medium Access Control (MAC) connection: An association between one source MAC Multi-Bearer Control (MBC) entity and one destination MAC MBC entity. This provides a set of related MAC services (a set of logical channels), and it can involve one or more underlying MAC bearers.

outgoing call: A call originating from a PP.

Portable Application (PA): A logical grouping that contains all the elements that lie beyond the DECT network boundary on the portable side.

NOTE 15: The functions contained in the portable application may be physically distributed, but any such distribution is invisible to the DECT network.

Portable Part (DECT 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.

NOTE 16: A DECT PP is logically divided into one portable termination plus one or more portable applications.

Portable radio Termination (PT): A logical group of functions that contains all of the DECT processes and procedures on the portable side of the DECT air interface.

NOTE 17: A PT only includes elements that are defined in ETS 300 175 [1] to [8]. This includes radio transmission elements (layer 1) together with a selection of layer 2 and layer 3 elements.

Radio Fixed Part (RFP): One physical sub-group of a FP that contains all the radio end points (one or more) that are connected to a single system of antennas.

registration: An ambiguous term, that should always be qualified. See either location registration or subscription registration.

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

NOTE 18: Roaming requires the relevant FPs and PP to be inter-operable.

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

service type C: DECT data profile service providing 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 or B profiles.

subscription registration: The infrequent process whereby a subscriber obtains access rights to one or more FPs.

NOTE 19: Subscription registration is usually required before a user can make or receive calls.

U-plane: The user plane of the DECT protocol stacks. This plane contains most of the end-to-end (external) user information and control.

3.2 Abbreviations

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

ARI	Access Rights Identity. See SARI and TARI
BCD	Binary Coded Decimal
BPAD	Bit oriented Packet Assembler/Disassembler
BSC	GSM Base Station Controller
CC	Call Control
CISS	Call Independent Supplementary Services
CK	Cipher Key
CLMS	Connectionless Message Service
COMS	Connection Oriented Message Service
CRSS	Call Related Supplementary Services
C2	Data services Profile C, mobility class 2
DAM	DECT Authentication Module
DAM DA	DECT Authentication Module DECT Application
DECT	Digital Enhanced Cordless Telecommunications
DLC	Data Link Control, Layer 2b of the DECT protocol stack
DSAA	DECT Standard Authentication Algorithm
DTMF	Dual Tone Multi-Frequency
FP	Fixed Part
FT	Fixed radio Termination
GAP	Generic Access Profile
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
IPEI	International Portable Equipment Identity
IPUI	International Portable User Identity
ISDN	Integrated Services Digital Network
ISUP	Integrated Services Digital Network User Part
IWU	Interworking Unit
K	authentication Key
LAPU	Link Access Procedure (U-Plane)
LCE	Link Control Entity
LLME	Lower Layer Management Entity
MAC	Medium Access Control, Layer 2a of the DECT protocol stack
MAP	GSM Mobile Application Part
MM	Mobility Management, a NWK layer functional grouping
MSB	Most Significant Bit
MS	Mobile Station
MSC	Mobile Switching Centre
NWK	Network, Layer 3 of the DECT protocol stack
OSI	Open Systems Interconnection
PA	Portable Application
PAD	Packet Assembler/Disassembler
PARI	Primary Access Rights Identity
PARK	Portable Access Rights Key
PCM	Pulse Coded Modulation
PE	Portable Equipment
PLMN	Public Land Mobile Network
PP	Portable Part
PSTN	Public Switched Telephone Network
PT	Portable radio Termination. See definition
PTNX	Private Telecommunications Network Exchange
PUN	Portable User Number
PUT	Portable User Type
RAND	A Random challenge issued by a FP
RES	A Response calculated by a PP
RFP	Radio Fixed Part
RFPI	Radio Fixed Part Identity
RS	A value used to establish authentication session keys
SARI	Secondary Access Rights Identity
SIM	Subscriber Identity Module

SS	Supplementary Services
SRES	A GSM specific authentication response calculated by the GSM SIM or the DAM
TAF	Terminal Adaptation Function
TARI	Tertiary Access Rights Identity
TMSI	Temporary Mobile Subscriber Identity
TPUI	Temporary Portable User Identity
TUP	Telephony User Part
UPI	User Personal Identification

3.3 GSM abbreviations and definitions

Definition and specific GSM abbreviations may be found in ETR 100 [34].

3.4 Symbols for status columns

The symbols defined in this subclause are applied for procedures, features, messages, information elements, fields and field codings in this ETS if not explicitly otherwise stated. The interpretation of status columns in all tables is as follows:

- M for mandatory to map/support/use;
- O for optional to map/support/use;
- I for out-of-scope (not subject for testing);
- X for prohibited or excluded to map/support/use (the message, information element may be allowed to be used in the standard/standards but it is not allowed to be mapped/used depending on the environment/dynamic conditions etc.);
- N/A or -(dash) for not applicable to map/support/use;
- C for conditional to map/support/use (the message, information element mapping depends on the selection of other optional or/and conditional items).

NOTE: The symbol "-" in the mapping section of this ETS means that there is no message, information element or coding specified in this column.

4 General

This ETS specifies how non-transparent GSM bearer services are provided over the DECT air interface.

One of the main objectives is to describe how the GSM bearer services are mapped across the DECT air interface in a formal way, so that inter-operability of different manufacturer's equipment can be achieved. This is done by describing the interworking unit procedures and mappings loosely following CCITT Recommendations Q.600-series of ITU-T Recommendations (Q.601 to Q.699) and by describing an air interface profile following ISO 9646-6 [35]. ISO 9646-6 [35] enables the subsequent generation of tests cases, if required.

This ETS is made up of 3 main clauses:

Clause 5: Interworking requirements - includes reference configurations and the protocol architecture models. Also describes the main service requirements. The context of the interworking profile is also required.

Clause 6: Interworking Unit (IWU) mappings for bearer services shows the C-plane and U-plane mappings for the FP GSM PLMN attachment in respective order. Two IWUs are considered; the FP IWU and the PP IWU, although the FP IWU is expected to be the largest. The signalling mappings are described in terms of IWU procedures with informative data flow diagrams. Detailed descriptions follow using tables of what is mapped, what is ignored, and what is transferred transparently. These clauses also include other profile specific information.

Clause 7: Connection types - this clause identifies the main DECT connection types (U-plane + C-plane) at the air interface supporting optimized groups of services, from the IWU mappings for different configurations/models. Thus this subclause defines how alternate GSM bearer services can be selected through the DECT air interface.

5 Interworking requirements

5.1 General

This ETS defines the mandatory requirements for the FP in terms of interworking functions between the air interface and the external network as well as minimum requirements at the DECT air interface. It also defines the mandatory requirements for the PP in terms of interworking functions between the air interface and the PA as well as the minimum requirements for the PP at the DECT air interface.

Unless stated otherwise, the ETS 300 370 [10] requirements are the basis of this ETS.

The interworking mappings shall be based on the Phase 2 GSM standards.

The basis for interworking shall be the protocols defined in ETS 300 557 [16] and ETS 300 590 [22].

The procedures which are used depend on which Access Rights Identifier (ARI) type is chosen by the PP; either according to the minimum requirements of the data services profile C, class 2, annex C.4 [24] or the procedures as described in this ETS; i.e. the PPs, which are based on this ETS, shall always be capable of interworking with FPs which fulfil the minimum requirements of the data services profile C, class 2, annex C.4 [24]. The FPs, which fulfil the requirements of this ETS, and which support also non-GSM ARIs (classes A, B or C) shall also support the minimum requirements of the data services profile C, class 2, annex C.4 [24].

NOTE: The data services profile C, class 2, subclause C.4 "Interworking to connection oriented bearer services" describes how interworking to public connection oriented network services by using the C2 profile can be achieved. The C-plane procedures required by the clause C.4 are based on those of a GAP (ETS 300 444 [12]) telephone with additional mandatory elements to cover data specific aspects of the call set-up.

This ETS defines interworking environments for the FP and the PP in the case when DECT FPs are functionally attached to the GSM MSC i.e. broadcast attribute a39 "SIM services available" set to '1'B in all environments (public, business and residential). The PP shall be in alignment with the requirements as defined in this ETS.

Figure 1 illustrates the access capabilities of the terminal supported by this ETS.

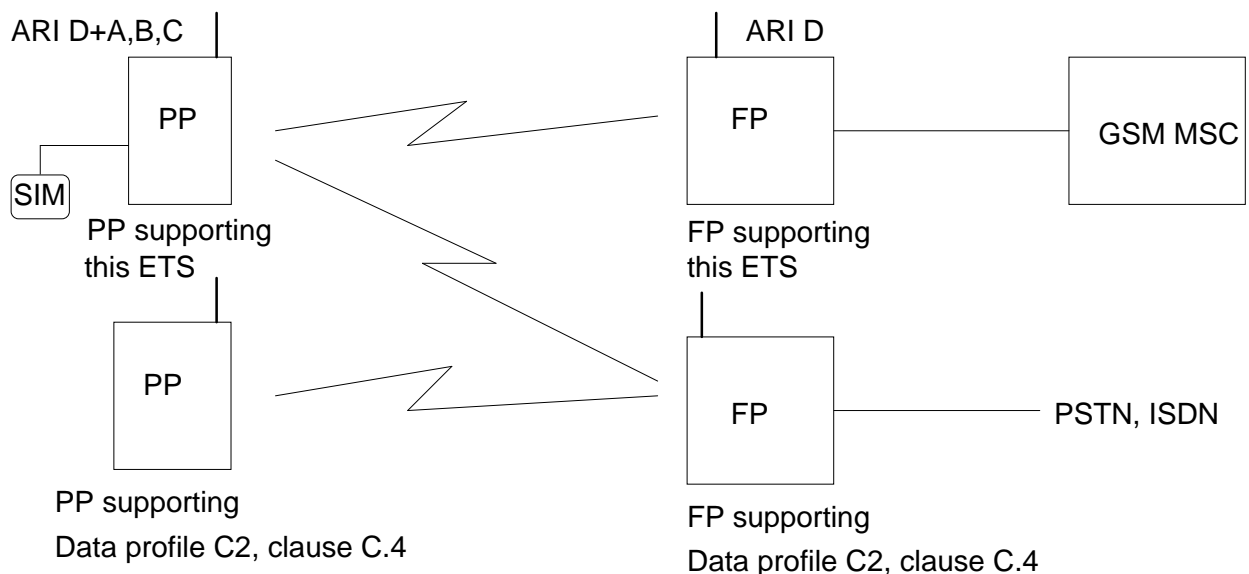


Figure 1: The profile access capabilities of terminals supported by this ETS

5.2 Reference configurations

The reference configuration of ETS 300 370 [10], subclause 5.2 shall apply.

5.3 General interworking model for FP GSM PLMN attachment

The general interworking model shown in figure 2 describes the general profile reference configuration of the FP and PP containing both control (C) and user (U) planes. The protocol architecture model also shows the location of the IWUs and the requirements of the air interface.

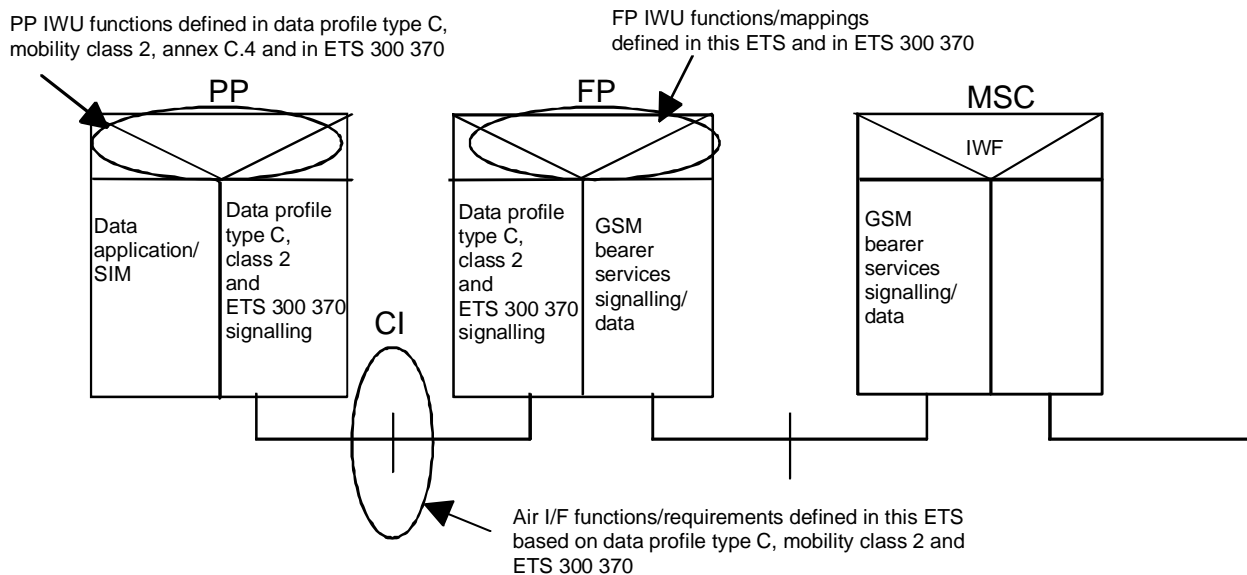


Figure 2: General interworking model for bearer services for FP GSM PLMN attachment

The C plane part of the IWU (figure 2) in the FP provides the mapping between a subset of the GSM Layer 3 and the corresponding DECT NWK protocols. The U plane part of the IWU in the FP provides the mapping between the GSM transmission plane protocol layers and the corresponding DECT data profile layer protocols.

The IWU in the PP provides the mapping between a subset of the DECT NWK protocols and the GSM application (SIM). The Terminal Adaptation Function (TAF) is part of the IWU in the PP and it provides mapping between the DECT U-plane and C-plane data related to the end-to-end service and the data application or the data terminal interface. The PP TAF defined in the DECT data services profile, service type C, class 2 annex C.4 [24] provides a CCITT Recommendation V.24 and V.25bis connection to the data application.

5.4 Service requirements

General description of service requirements, functional capabilities and information flows are specified in ETS 300 466 [13]. Table 1 defines the GSM bearer services as described in ETS 300 501 [15] supported by this ETS. Only GSM non-transparent (NT) bearer services are supported due to the used DECT air interface service, which is based on a non-transparent protocol (LAPU).

NOTE: The rates defined in table 1 are the rates that are used by the application and the maximum rate is 9,6 kbit/s although the DECT data profile service type C2 can provide in single slot operation up to 24 kbit/s rate on the air interface. This is due to the limitation of the GSM A interface.

Table 1: The GSM bearer services supported by this ETS

GSM bearer service number	GSM bearer service name	GSM connection type
21	Asynchronous 300 bit/s	NT
22	Asynchronous 1,2 kbit/s	NT
23	Asynchronous 1200/75 bit/s	NT
24	Asynchronous 2,4 kbit/s	NT
25	Asynchronous 4,8 kbit/s	NT
26	Asynchronous 9,6 kbit/s	NT
31	Synchronous 1,2 kbit/s	NT
32	Synchronous 2,4 kbit/s	NT
33	Synchronous 4,8 kbit/s	NT
34	Synchronous 9,6 kbit/s	NT
41	PAD access 300 bit/s	NT
42	PAD access 1,2 kbit/s	NT
43	PAD access 1200/75 bit/s	NT
44	PAD access 2,4 kbit/s	NT
45	PAD access 4,8 kbit/s	NT
46	PAD access 9,6 kbit/s	NT

5.5 Interworking context

5.5.1 General

The CC entity of PT and FT shall fulfil the minimum requirements of annex C.4 in ETS 300 651 [24] with the following modifications:

- The IWU-ATTRIBUTES element structure defined in annex A of this ETS shall be used.
- The peer attribute negotiation as specified in ETS 300 175-5 [5] subclause 15.2.5. and specified as optional in data services profile C, class 2 shall be supported.

NOTE 1: The link suspension and resumption procedures and LAPU SAPI 3 frame structure are supported as specified in the ETS 300 651 [24] subclause C.4.

In addition, the ETS 300 370 [10] Call Control requirements shall be required in both PT and FT.

NOTE 2: Thus the CC entity in the FP and PP fulfils the minimum requirements of the ETS 300 651 [24], and ETS 300 370 [10]. That is, the Call Control mandatory parts of the data services profile C, class 2 and DECT/GSM interworking profile for 3,1 kHz speech service are mandatory for this ETS.

The MM entity in the FT and PT shall fulfil the requirements of the ETS 300 370 [10].

NOTE 3: As a result this the PP profile also fulfils the minimum MM requirements of the data services profile C, class 2 (ETS 300 651 [24]) and the GAP profile (ETS 300 444 [12]).

The minimum U-plane requirements in the FT and PT shall fulfil the data services profile C, class 2 (ETS 300 651 [24]) requirements based on the service type A.

NOTE 4: The service type A refers to the data service profile A/B, class 1 (ETS 300 435 [11]) U-plane requirements, i.e. single slot functionality is the minimum requirement of the DECT lower layers.

This ETS does not require the support of the GAP based voice services i.e. the PP may be a data only terminal with the GSM access capabilities and a GSM subscription as defined in ETS 300 370 [10].

5.5.2 Basic interworking rules

The basic interworking rules defined in subclause 5.4.2 of ETS 300 370 [10] shall apply with following definitions:

- a FP belonging to ARI class D shall support this ETS;
- the profile as defined in this ETS may be used in association only with FPs with ARI class D;
- a PP belonging to ARI class D shall support this ETS in addition to ETS 300 651 [24], clause C.4.

Table 2 defines the associated GSM and DECT procedures required in the FP and the PP.

Table 2: Implementation/support requirements of DECT and GSM procedures in the FP and the PP

GSM procedure	DECT procedure	PP	FP
Authentication procedure	Authentication of PT	M	M
Identity procedure	Identification of PT	M	M
Attach procedure	Attach (= Location registration)	M	M
Detach procedure	Detach	M	M
Location updating procedure	Location registration	M	M
TMSI re-allocation procedure	Temporary identity assignment	M	M
Ciphering procedure	Cipher-switching initiated by FT Cipher-switching initiated by PT	M note 1	M note 1
MSC associated handover	External handover	O note 4	O note 4
CM service procedure	Outgoing call request	M	M
MM status procedure	-	-	I
-	Parameter retrieval (Location update)	M	M
Outgoing call initiation note 2	Outgoing call request and overlap sending procedure	M	M
Incoming call setup	Incoming call request	M	M
Accepted call establishment note 3	Accepted call establishment	M	M
Abnormal call clearing	Abnormal call release (call reject)	M	M
Normal call clearing	Normal call release	M	M
Paging	Paging	M	M
NOTE 1: Cipher switching initiated by the PT may depend on the implementation of external handover procedure.			
NOTE 2: Outgoing call initiation includes the following ETS 300 557 [16] (GSM 04.08) layer 3 procedures: 1) CM- service procedure; 2) receipt of Setup message.			
NOTE 3: Accepted call establishment consists of call proceeding confirmation, connection phases.			
NOTE 4: The implementation of this feature is optional in the PT and FT. Interworking requirements/mappings are process mandatory.			
TMSI: Temporary Mobile Subscriber Identity			

5.5.3 Interpretation of broadcast attributes

This subclause refers to annex F of ETS 300 175-5 [5] (Broadcast attributes coding). The codings are done as defined in ETS 300 370 [10] subclause 5.4.4 with the exceptions and additions listed here.

Standard capabilities:

a32 ADPCM/G.721 Voice service: may be set to value '1' (note);

a33 PAP/GAP voice supported: may be set to value '1' (note);

a34 Non-voice circuit switched service: shall be set to value '1'.

Extended fixed part capabilities:

a45 Data services Profile C: shall be set to value '1'.

NOTE: This ETS does not require the support of the voice service.

5.5.4 Interpretation of terminal capability

If the <<TERMINAL CAPABILITY>> information element is used the following codings shall be used to indicate the support of this ETS.

Profile Indicator_1 Coding (Octet 4) of TERMINAL CAPABILITY information element:

Bits	7 6 5 4 3 2 1	Meaning
	x x x x 1 x x	DECT/GSM interworking profile supported

Profile Indicator_2 Coding (Octet 4a) of TERMINAL CAPABILITY information element:

Bits	7 6 5 4 3 2 1	Meaning
	x x x 1 x x x	DECT/GSM interworking - GSM bearer service

Both codings are required.

6 Interworking mappings, FP attached to the GSM PLMN

6.1 FP C-plane IWU procedures

6.1.1 CC IWU procedures

6.1.1.1 General

The {CC-SETUP} shall contain the <<IWU ATTRIBUTES>> element. The <<IWU ATTRIBUTES>> information element shall define the GSM bearer service to be requested. The coding combinations used for alternate bearer services is defined in the clause 7 of this ETS.

Only BEARER CAPABILITY is recognized in the GSM messages. That is, if a GSM Call Control message contains multiple BEARER CAPABILITY information elements only the first one shall be mapped to DECT <<IWU-ATTRIBUTES>> element and conveyed to PP.

The DECT <<IWU-ATTRIBUTES>> information element shall be mapped into GSM BEARER CAPABILITY element.

The LOWER LAYER COMPATIBILITY and HIGHER LAYER COMPATIBILITY information elements, if present in a GSM CC message, shall be carried over the air interface as described in subclauses 6.1.5.1.2 and 6.1.5.1.3. If both elements are present, DECT <<Repeated indicator>> information element shall be used and the LOWER LAYER COMPATIBILITY shall be mapped to the first <<IWU-TO-IWU>> element and HIGHER LAYER COMPATIBILITY to the second <<IWU-TO-IWU>> element. The FP shall not do any mapping of these elements. The utilization of these elements is a matter of the DECT data application in PP i.e. this ETS does not define their usage.

6.1.1.2 Outgoing data call (PP to FP)

The PT and FT shall support the dialling information included in the <<MULTIKEYPAD>> information element in one {CC-INFO} message as defined in ETS 300 370 [10] subclause 6.1.1.1 case a) with the additional mapping of <<IWU-ATTRIBUTES>> as defined in subclause 6.1.4 of this ETS. The service negotiation as described in subclause 6.1.1.3 shall be supported in addition to the ETS 300 370 [10] procedures.

The PT may optionally and FT shall support dialling information included in the <<CALLED PARTY NUMBER>> information element of the {CC-SETUP} message as defined in ETS 300 370 [10] subclause 6.1.1.1 case b) with the additional mapping of the <<IWU-ATTRIBUTES>> defined in subclause 6.1.4 of this ETS. The service negotiation as described in subclause 6.1.1.3 shall be supported in addition to the ETS 300 370 [10] procedures.

6.1.1.3 Service negotiation in the case of outgoing call

The negotiation procedure is illustrated in figures 3 and 4. The figures illustrate the mappings required in addition to the ETS 300 370 [10] and related to the negotiation procedure in both cases, if the called part number is carried in one {CC-INFO} message or in {CC-SETUP} message, respectively.

The service negotiation procedures are indicated/requested with <<Negotiation indicator>> field of the <<IWU-ATTRIBUTES>> information element.

The negotiable parameter in the case of mobile originated call is <<Modem type>>.

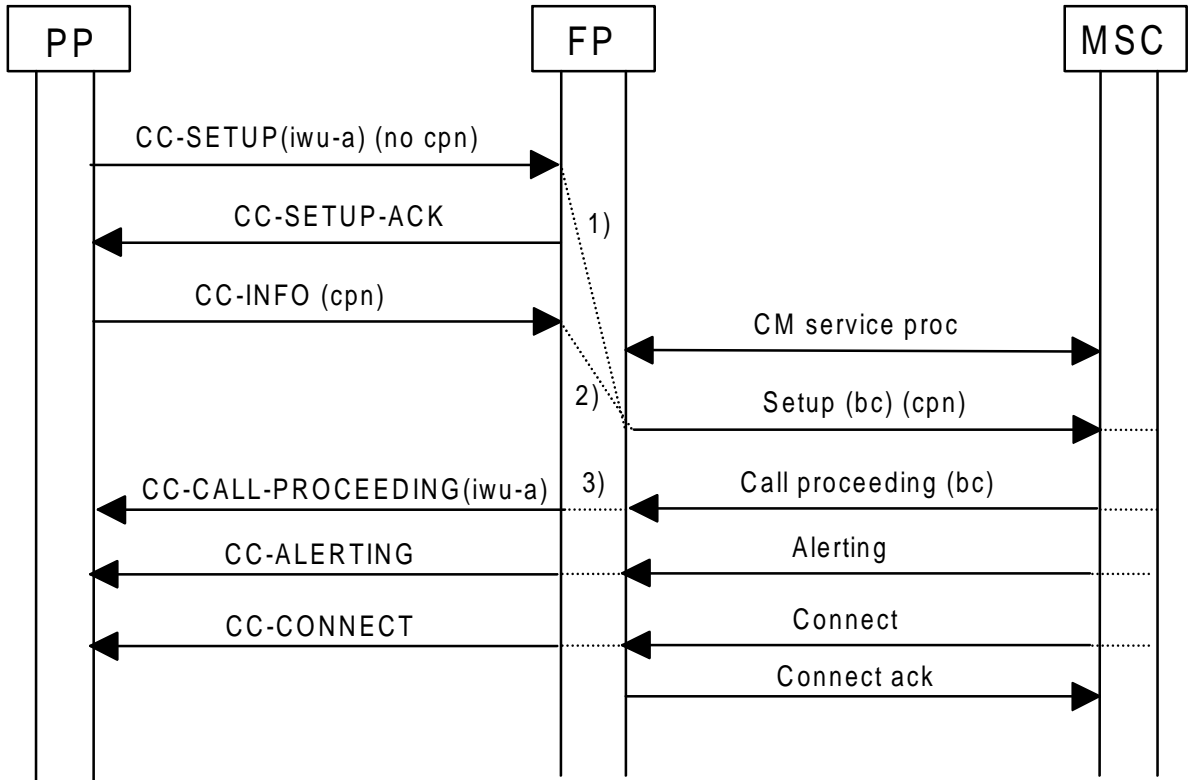


Figure 3: Peer attribute negotiation in the case of outgoing call when dialling information is received in {CC-INFO} message

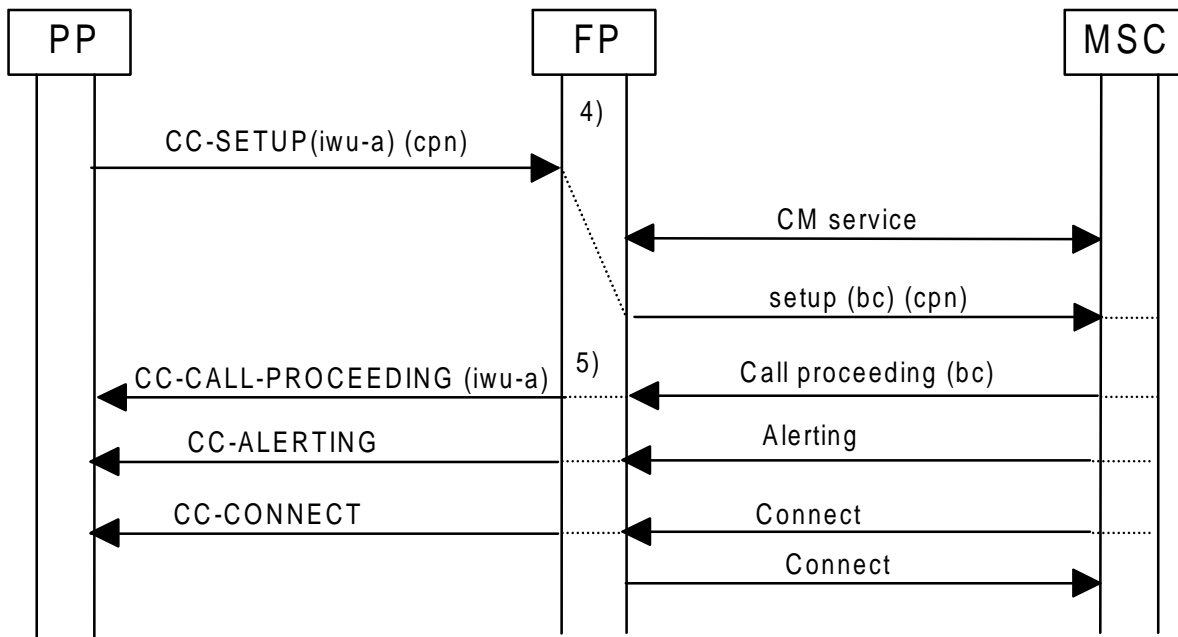


Figure 4: Peer attribute negotiation in the case of outgoing call when dialling information is received in {CC-SETUP} message (optional)

1), (figure 3) or 4), (figure 4): upon receipt of CC-SETUP-ind with <<IWU-ATTRIBUTES>> the FT IWU shall map the <<IWU-ATTRIBUTES>> information element contained in {CC-SETUP} message to the GSM BEARER CAPABILITY element of GSM {Setup} message as described in subclause 6.1.4.1.1.

2), (figure 3): in the case the <<CALLED PARTY NUMBER>> is not present in the {CC-SETUP} message the FP IWU shall wait for the {CC-INFO} message containing the <<MULTIKEYPAD>> carrying the called party number before it can submit a {Setup} message with BEARER CAPABILITY element towards the GSM network as defined in subclause 6.1.1.1 case a) of ETS 300 370 [10].

3), (figure 3) or 5), (figure 4): upon receipt of the GSM {Call proceeding} message the FP IWU shall map the values of the BEARER CAPABILITY in {Call proceeding} message into the <<IWU-ATTRIBUTES>> information element of the DECT {CC-CALL-PROCEEDING} message as defined in subclause 6.1.4.2.2.

If no {Call proceeding} message is received or the message does not contain BEARER CAPABILITY information element the service parameters have been accepted by the MSC IWF and no mapping between the BEARER CAPABILITY and <<IWU-ATTRIBUTES>> information element is needed.

After this the procedures shall proceed as described in ETS 300 370 [10] subclause 6.1.1.1.

NOTE: All other message and information element mappings are done according to ETS 300 370 [10].

6.1.1.4 Incoming data call (FP to PP)

The call procedures for incoming data call (FP to PP) shall be compatible with the procedures defined in the ETS 300 370 [10] subclause 6.1.1.3 with the additional mapping of <<IWU ATTRIBUTES>> as defined in subclause 6.1.4 of this ETS. The service negotiation as described in subclause 6.1.1.4.1 shall be supported in addition to the ETS 300 370 [10] procedures.

NOTE: This procedure is compatible with the C2 data profile ETS 300 651 [24] call establishment.

6.1.1.4.1 Service negotiation in the case of incoming data call

The negotiation procedures is illustrated in figures 5 and 6. The figures illustrate the mappings required in addition to the ETS 300 370 [10] and related to the negotiation procedure.

The negotiable parameters in the case of incoming data call are <<number of data bits>>, <<number of stop bits>>, <<number of parity bits>>, <<user layer 2 protocol>> and <<Modem type>>.

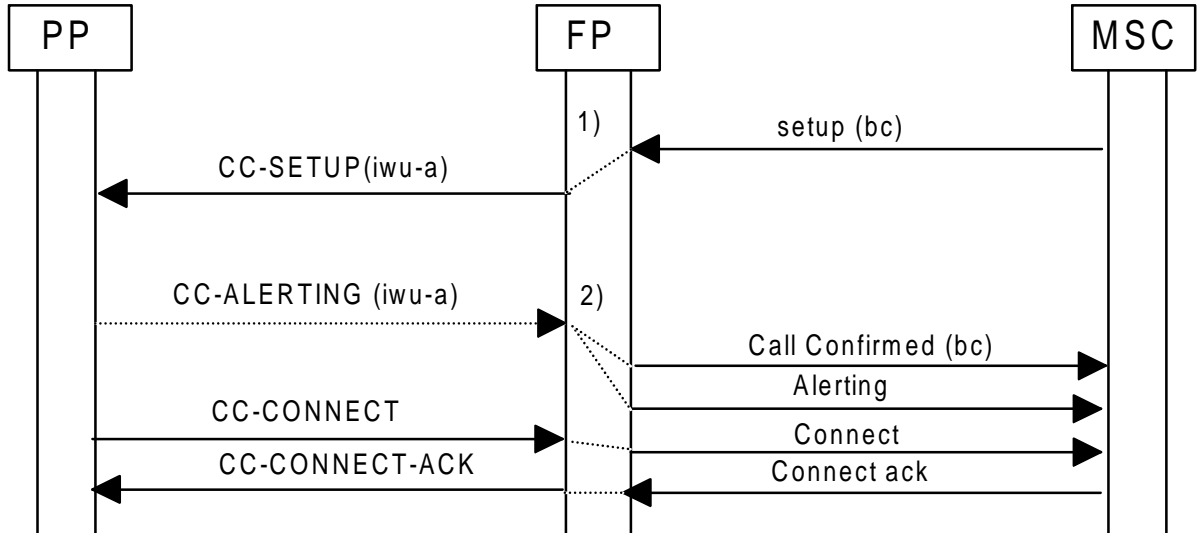


Figure 5: Peer attributes negotiation in the case of incoming call where the IWU receives MNCC-ALERT-ind prior to MNCC-CONNECT-ind

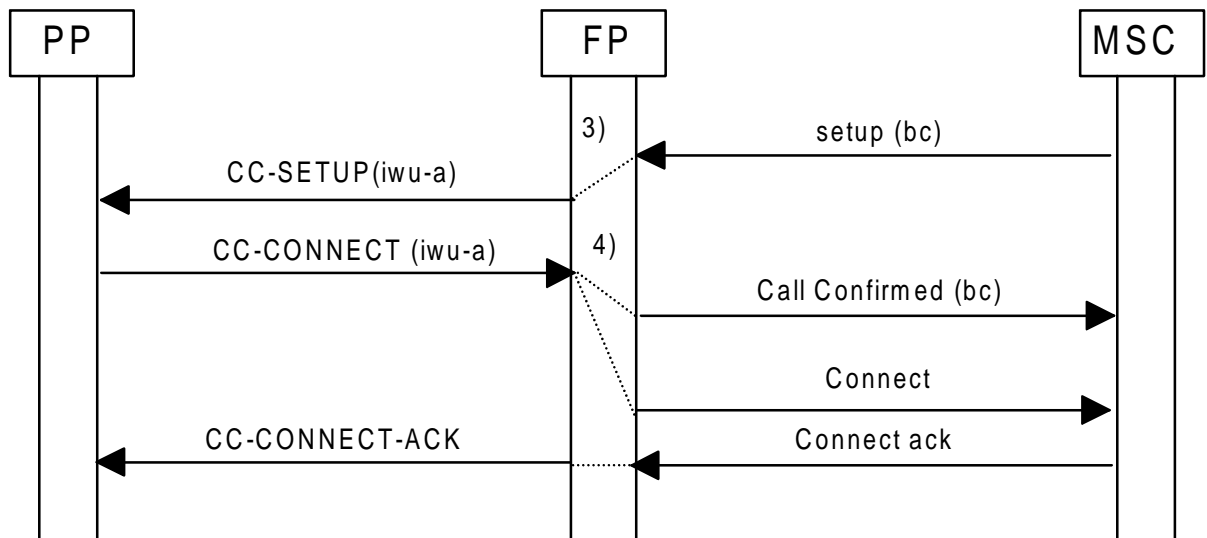


Figure 6: Peer attributes negotiation in the case of incoming call where the IWU receives MNCC-CONNECT-ind without MNCC-ALERT-ind

1), (figure 5) or 3), (figure 6): upon receipt of the GSM {Setup} message containing a BEARER CAPABILITY the FT IWU shall map the BEARER CAPABILITY into the <<IWU-ATTRIBUTES>> information element of the DECT {CC-SETUP} message as defined in subclause 6.4.2.1 and issue a MNCC-SETUP-req primitive as defined in the ETS 300 370 [10] subclause 6.1.1.3.

Two alternate cases for responses have been defined. The new values of the <<IWU-ATTRIBUTES>> can be carried in either in the in the {CC-ALERTING} message or in the {CC-CONNECT} message. The first arriving message of these two shall carry the new information.

2), (figure 5) or 4), (figure 6): upon receipt of a MNCC-CONNECT-ind (figure 6) or MNCC-ALERTING-ind (figure 5) with <<IWU-ATTRIBUTES>> element the FT IWU shall map the new values in the <<IWU-ATTRIBUTES>> information element of the {CC-CONNECT} or {CC-ALERTING} message into the GSM BEARER CAPABILITY element of the GSM {Call Confirmed} message as described in subclause 6.1.4.1.2 or 6.1.4.1.3, respectively. After this the procedures shall proceed as described in ETS 300 370 [10] subclause 6.1.1.3.

NOTE: All other message and information element mappings are done according to ETS 300 370 [10].

6.1.1.5 External Handover

External handover is supported as defined in ETS 300 370 [10].

6.1.1.6 Other CC procedures

Other CC procedure mappings shall be done according to ETS 300 370 [10].

Those C2 profile specific call control procedures that are not used in ETS 300 370 [10] shall not be mapped towards GSM.

NOTE: This rule is related to procedures such as call suspension and resumption.

6.1.2 MM IWU procedures

The MM procedures of ETS 300 370 [10] shall apply.

6.1.3 Other IWU procedures

Other IWU procedures shall be done according to ETS 300 370 [10].

6.1.4 Message mappings

6.1.4.1 DECT to GSM

Table 3: List of mapped messages

Item No	DECT message	Status in C2	GSM message	Status in GSM	Ref.	Map status	Note
1	CC-SETUP	M	SETUP	M	6.1.4.1.1	M	
2	CC-CONNECT	M	CALL CONFIRMED	M	6.1.4.1.2	M	
3	CC-ALERTING	M	CALL CONFIRMED	M	6.1.4.1.3	M	

All other message mappings are done according to ETS 300 370 [10].

6.1.4.1.1 CC-SETUP - SETUP

Table 4

Item No	Message coding DECT	Message coding GSM	Ref.	Map status	Note
	CC-SETUP	SETUP			
1	iwu-attributes	bearer capability	6.1.5.1.1	M	
2	iwu-to-iwu	lower layer compatibility	6.1.5.1.2	M	
3	iwu-to-iwu	higher layer compatibility	6.1.5.1.3	M	

All other information elements shall be mapped as defined in subclause 6.1.6.2.15 of ETS 300 370 [10].

6.1.4.1.2 CC-CONNECT - CALL CONFIRMED**Table 5**

Item No	Message coding DECT	Message coding GSM	Ref.	Map status	Note
	CC-CONNECT	CALL CONFIRMED			
1	iwu-attributes	bearer capability	6.1.5.1.1	M	

All other information elements shall be mapped to GSM {Connect} message as defined in subclause 6.1.6.2.9 of ETS 300 370 [10].

6.1.4.1.3 CC-ALERTING - CALL CONFIRMED**Table 6**

Item No	Message coding DECT	Message coding GSM	Ref.	Map status	Note
	CC-ALERTING	CALL CONFIRMED			
1	iwu-attributes	bearer capability	6.1.5.1.1	M	

All other element mappings shall be mapped to GSM {Alerting} message as defined in subclause 6.1.6.2.8 of ETS 300 370 [10].

6.1.4.2 GSM to DECT**Table 7: List of mapped messages**

Item No	GSM message	Status in GSM	DECT message	Status in C2	Ref.	Map status	Note
1	SETUP	M	CC-SETUP	M	6.1.4.2.1	M	
2	CALL PROCEEDING	M	CC-CALL-PROCE EDING	M	6.1.4.2.2	M	

All other message mappings shall be done according to ETS 300 370 [10].

6.1.4.2.1 SETUP - CC-SETUP**Table 8**

Item No	Message coding GSM	Message coding DECT	Ref.	Map status	Note
	SETUP	CC-SETUP			
1	bearer capability	iwu-attributes	6.1.5.2.1	M	
2	lower layer compatibility	iwu-to-iwu	6.1.5.2.2	M	
3	higher layer compatibility	iwu-to-iwu	6.1.5.2.3	M	

All other element mappings shall be done according to subclause 6.1.6.1.11 of ETS 300 370 [10].

6.1.4.2.2 CALL PROCEEDING-CC-CALL-PROCEEDING

Table 9

Item No	Message coding GSM	Message coding DECT	Ref.	Map status	Note
	CALL PROCEEDING	CC-CALL-PROCEEDING			
1	bearer capability	iwu-attributes	6.1.5.2.1	M	

All other element mappings shall be done according to subclause 6.1.6.1.9 of ETS 300 370 [10].

6.1.5 Information element mappings

6.1.5.1 DECT to GSM

6.1.5.1.1 Iwu-attributes - bearer capability

The mapping is done between a new <IWU-ATTRIBUTES> element defined in the annex B of this ETS and the GSM standard BEARER CAPABILITY element.

Table 10

Item No	Information element coding DECT	Information element coding GSM	Ref.	Map status	Note
	iwu-attributes	bearer capability			
1	ID for iwu attributes	Bearer capability IEI	ETS 300 370 [10], 6.1.8.1.4	M	
2	Length of contents	Length of bearer capabilities contents	ETS 300 370 [10], 6.1.8.1.5	M	
3	Coding standard	Coding standard	6.1.6.1.2.	M	
4	-	Radio channel requirements	7.1.2.1.	X	
5	Profile	-	7.1.3.2	X	
6	Negotiation indicator	-	7.1.3.2	X	
7	Profile subtype	-	7.1.3.2	X	
8	Transfer mode	Transfer mode	6.1.6.1.1	M	
9	Information transfer capability	Information transfer capability	6.1.6.1.1	M	
10	Structure	Structure	6.1.6.1.1	M	
11	Duplex mode	Duplex mode	6.1.6.1.1	M	
12	Configuration	Configuration	6.1.6.1.1	M	
13	NIRR	NIRR	6.1.6.1.1	M	
14	Establishment	Establishment	6.1.6.1.1	M	
15	Access identity	Access identity	6.1.6.1.1	M	
16	Rate adaptation	Rate adaptation	6.1.6.1.1	M	
17	Signalling access protocol	Signalling access protocol	6.1.6.1.1	M	
18	Layer 1 identity	Layer 1 identity	6.1.6.1.1	M	
19	User information layer 1 protocol	User information layer 1 protocol	6.1.6.1.1	M	
20	Synchronous /asynchronous	Synchronous /asynchronous	6.1.6.1.1	M	
21	Number of stop bits	Number of stop bits	6.1.6.1.1	M	
22	Negotiation	Negotiation	6.1.6.1.1	M	

(continued)

Table 10 (concluded)

Item No	Information element coding DECT	Information element coding GSM	Ref.	Map status	Note
	iwu-attributes	bearer capability			
23	Number of data bits excluding parity bit if present	Number of data bits excluding parity bit if present	6.1.6.1.1	M	
24	User rate	User rate	6.1.6.1.1	M	
25	Intermediate rate	Intermediate rate	6.1.6.1.1	M	
26	Network independent clock on transmission	Network independent clock on transmission	6.1.6.1.1	M	
27	Network independent clock on reception	Network independent clock on reception	6.1.6.1.1	M	
28	Parity information	Parity information	6.1.6.1.1	M	
29	Connection element	Connection element	6.1.6.1.1	M	Note 1
30	Modem type	Modem type	6.1.6.1.1	M	
31	Layer 2 identity	Layer 2 identity	6.1.6.1.1	M	
32	User information layer 2 protocol	User information layer 2 protocol	6.1.6.1.1	M	
NOTE: This field has no meaning for the DECT air interface but for the indication of the service used between the FP IWU and GSM PLMN.					

6.1.5.1.2 iwu-to-iwu - Lower layer compatibility

Table 11

Item No	Information element coding DECT	Information element coding GSM	Ref.	Map status	Note
	IWU-TO-IWU	Lower layer compatibility			
1	Element identifier	-		-	
2	Length of contents	-		-	
3	-	-		-	
4	S/R	-		-	note 1
5	protocol discriminator	-		-	note 2
6	IWU-TO-IWU information	lower layer compatibility		M	note 3
NOTE 1: Field uses default value '1'B; "Transmission of Message".					
NOTE 2: The Field uses default value coding '010001'B "GSM Recommendation 04.08, elements". GSM 04.08 is published as ETS 300 557 [16].					
NOTE 3: If the <<Lower layer compatibility>> information element is present in GSM CC messages, it shall be carried intact in <<iwu-to-iwu>> information element <iwu-to-iwu-information> field. This applies to both directions, PP IWU to FP IWU and FP IWU to PP IWU.					

6.1.5.1.3 Iwu-to-iwu - Higher layer compatibility

Table 12

Item No	Information element coding DECT	Information element coding GSM	Ref.	Map status	Note
	IWU-TO-IWU	Higher layer compatibility			
1	Element identifier	-		-	
2	Length of contents	-		-	
3	-	-		-	
4	S/R	-		-	note 1
5	protocol discriminator	-		-	note 2
6	IWU-TO-IWU information	higher layer compatibility		M	note 3
NOTE 1:	Field uses default value '1'B; "Transmission of Message".				
NOTE 2:	The Field uses default value coding '010001'B "GSM Recommendation 04.08, elements". GSM 04.08 is published as ETS 300 557 [16].				
NOTE 3:	If the <<Higher layer compatibility>> information element is present in GSM CC messages, it shall be carried intact in <<iwu-to-iwu>> information element <iwu-to-iwu-information> field. This applies to both directions, PP IWU to FP IWU and FP IWU to PP IWU.				

6.1.5.2 GSM to DECT

6.1.5.2.1 Bearer capability - Iwu-attributes

See subclause 6.1.5.1.1.

6.1.5.2.2 Lower layer compatibility - Iwu-to-iwu

See subclause 6.1.5.1.2.

6.1.5.2.3 Higher layer compatibility- iwu-to-iwu

See subclause 6.1.5.1.3.

6.1.6 Fields in information element coding

6.1.6.1 DECT to GSM and GSM to DECT

6.1.6.1.1 General coding principle for field values

This field shall be mapped transparently between DECT and GSM. That is, the coding of GSM field and DECT field are identical thus the value of the field does not change in IWU and it can be copied as it is between the systems.

6.1.6.1.2 Coding standard - Coding standard

Table 13

Item No	Field coding DECT	Field coding GSM	Ref.	Map status	Note
	Coding standard	Coding standard			
1	'01'B	'0'B		M	Profile defined coding <=> GSM coding

6.2 FP U-plane IWU procedures

6.2.1 General

The functionality of the FP IWU U-plane part shall be to map the synchronous, asynchronous and status data between DECT C2 profile U-plane protocols and GSM non-transparent service transmission plane protocols.

NOTE: Asynchronous and synchronous service refers to the end user service, not to the way data is carried over the air interface. In this context with synchronous service no constant delay can be guaranteed due to the air interface functionality.

6.2.2 Non-transparent service (NT)

6.2.2.1 General

The rate adaptation of the GSM data flow shall take place in the FP IWU. A general figure of the rate adaptation functions of GSM non-transparent (NT) is illustrated in figure 7. In the figure the interface between FP and MSC is the A interface.

The RLP entity and LAPU entity in FP shall function completely independently. That is, frame retransmissions and control information regarding RLP and LAPU functions are not dependent on each other.

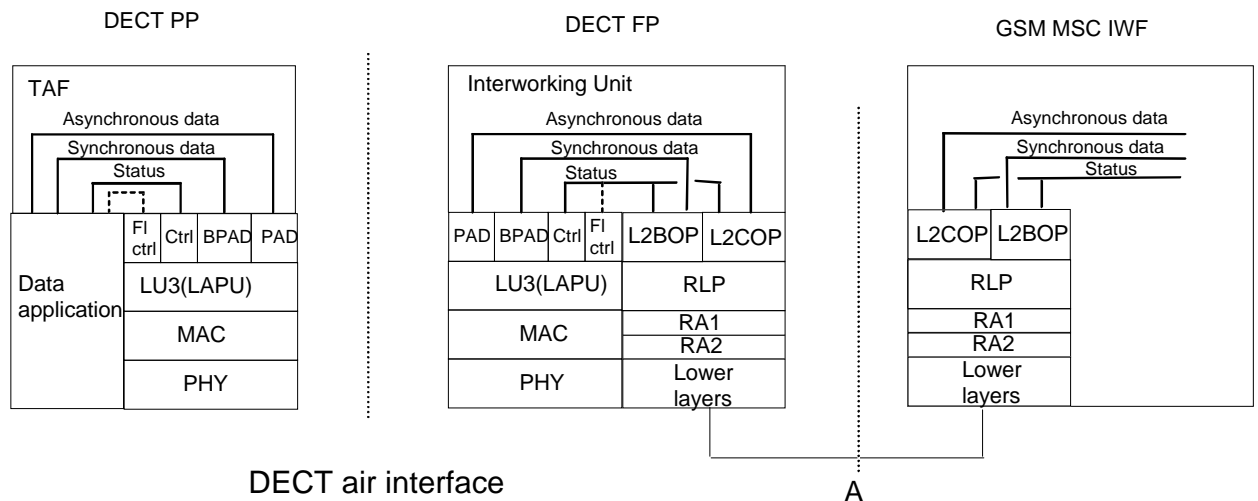


Figure 7: Rate adaptation for the DECT/GSM interworking of GSM non-transparent (NT) service

6.2.2.2 RLP and LAPU link establishment and synchronization

The RLP and LAPU links establishment shall take place fully independently according to the procedures of respective GSM and DECT specifications.

It is the responsibility of the FT IWU to guarantee that no user data is conveyed before both RLP and LAPU links have been successfully established. No CCITT Recommendation V.24 signalling information is conveyed before information regarding the ready status of the MSC-network connection is guaranteed.

The Layer 2 relay functionality as well as the PAD/BPAD function shall be determined in FP/IWU on the basis of the bearer capability information element signalled during the call establishment phase.

6.2.2.3 Asynchronous services interworking

6.2.2.3.1 Requirements

The FP interworking function for asynchronous services shall consist of the following entities:

- CCITT V.110 Rate adaptation 2 (RA2) as specified in ETS 300 562 (GSM 04.21) [17];
- GSM V.110 Rate adaptation 1 (RA1) for Non Transparent services as specified in ETS 300 562 (GSM 04.21) [17];
- RLP as specified in ETS 300 563 (GSM 04.22) [18] and L2COP function as specified in the ETS 300 583 (GSM 07.02) [20].

6.2.2.3.2 Data mapping

The data flow between the L2COP and the DECT LAPU frames using the DLU-LU3-DATA primitives shall be mapped as follows:

- the L2COP status octets shall not be carried in the LAPU information frames;
- the L2COP status bit (3 first bits) information of the status octet shall be mapped to the respective DECT function as defined in the subclause 6.2.3;
- character octets shall transferred to and from the C2 PAD function as defined in the subclause 10.1 of the data profile C, class 2 ETS 300 651 [24] following the rules defined in the same subclause. No start and stop bits shall be conveyed between the systems;
- no fill octets shall be forwarded to the C2. PAD function;
- break signal status received from GSM (status octet address field value 29) shall be mapped into the LAPU SAPI 3 control frame <<Break coding>> with indication of "Break condition occurred". The duration of the break signal in the BREAK/PAUSE duration octet should be in between 135 ms and 200 ms as defined by ETS 300 583 [20];

NOTE: ETS 300 583 [20] refers to CCITT Recommendation X.28 definition of the break signal.

- break signal status received from DECT direction (the LAPU control frame <<Break coding>> with indication of "Break condition occurred") shall be mapped into the L2COP address field as defined in ETS 300 583 [20]. The duration information shall be ignored.

The DECT PAD function shall be configured according to the values of the octets 8a and 8b of the <<iwu-attributes>> element if they are present. If no information for PAD functionality is available the BPAD function shall be used.

6.2.2.4 Synchronous services interworking

6.2.2.4.1 Requirements

The FP interworking function for synchronous services shall consist of the following entities:

- CCITT V.110 Rate adaptation 2 (RA2) as specified in ETS 300 562 (GSM 04.21) [17];
- GSM V.110 Rate adaptation 1 (RA1) for Non Transparent services as specified in ETS 300 562 (GSM 04.21) [17];
- RLP as specified in ETS 300 563(GSM 04.22) [18] and L2BOP function as specified in the ETS 300 584 (GSM 07.03) [21].

6.2.2.4.2 Data mapping

The data flow between the L2BOP and the DECT LAPU frames using the DLU-LU3-DATA primitives shall be mapped as follows:

- the L2BOP status octets shall not be carried in the LAPU information frames;
- the L2BOP status bit (3 first bits) information of the status octet shall be mapped to the respective function as defined in the subclause 6.2.3;
- the address bit (5 last bits) information of the status octet is utilized as follows: if address has the value 31 no L2BOP remaining information shall be forwarded to LAPU information frame. Other address values shall be ignored;
- user information shall be transferred to and from the C2 BPAD function as defined in subclause 10.2 of the data profile C, class 2 ETS 300 651 [24] following the rules defined in the same subclause;
- no fill octets shall be forwarded to the C2. BPAD function.

6.2.2.5 External handover procedures

The occurrence of external handover may lead into data loss if no specific measures are used due to the independence of the DECT LAPU and GSM RLP in the FP IWU. The following procedures are recommended to minimize the data loss:

- upon detection of the external handover procedure the FP 1 IWU may flow control the RLP and/or the data flow using the bit X and it should send the remaining data in its buffers to the PP over the LAPU link;
- data can be sent to the MSC direction as long as the U-plane link is present to empty the FP 1 IWU buffers;
- a new RLP entity is created in FP 2 IWU when the link between FP 2 IWU and MSC is established after the DECT U-plane LAPU link has been initiated;
- upon establishment of the link between the FP 2 IWU and MSC IWF the FP 2 IWU resets the RLP link by issuing a SABM command and releases the flow control if it has not yet been released;
- after this the data traffic via FP 2 IWU proceeds as normally.

6.2.3 Interchange circuit signalling mapping

DECT C2 data profile Control Status octet defined in C2 data profile, ETS 300 651 [24], subclause 10.4 shall be used with <<Frame type coding>> indicating "Voice band modem status interworking".

The CCITT Recommendation V.24 signalling status information shall be mapped between the DECT LAPU control frame function accessed through the DLU-LU3-DTR primitives and the GSM RLP status octet as follows:

- **in the direction of GSM to DECT:**
 - only in the change situation of a status of each SA, SB or X bit shall be mapped thus if not change has occurred in the status bits of the GSM data flow no LAPU control frame shall be sent;
 - the status change of the CCITT Recommendation V.24 interface circuits 107 and 109 mapping shall be done as shown in table 14;
 - circuit 106 status (X bit) is mapped to the flow control as defined in subclause 6.2.4;

- **in the direction of DECT to GSM:**

- the status of circuit 108 shall be clamped to the on state when the LAPU and RLP links have been established and to off state when connection is released;
- circuit 106 status (X bit) shall be mapped to the flow control as defined in subclause 6.2.4;
- circuit 105 shall be clamped permanently to the on condition;
- the FP IWU shall map the old status of the status bits towards GSM if no change in the circuit status has been recognized.

Table 14

V.24 circuit in direction of GSM => DECT	V.110 bit and its value	DECT LAPU control frame bit and its value	Note
107 (DSR)	S1, S2, S3, S6, S8 = SA	DSR coding	
	0	1	107 (DSR) ON
	1	0	107 (DSR) OFF
109 (DCD)	S4, S9 = SB	DCD coding	
	0	1	109 (DCD) ON
	1	0	109 (DCD) OFF

6.2.4 Flow control

The flow control situation indicated by the (circuit 106) X-bit or buffers backpressure shall be mapped into the C2 data profile ETS 300 651 [24] PAD/BPAD flow control functionality as defined in respective C2 profile PAD/BPAD subclauses. It is the matter of implementation to ensure that no data loss shall occur due to flow control.

End-to-end flow control is not recommended.

NOTE: The data rate difference between DECT and GSM part can be compensated by using the flow control between DECT and GSM parts.

6.3 PP C-plane IWU procedures

6.3.1 General

For CCITT Recommendation V.24 interworking in the PP IWU C-plane the C2 data profile, ETS 300 651 [24], clause C2 TAF procedures shall apply.

The mapping between the PP C-plane and V.25bis commands if used shall be done according to the C2 data profile, ETS 300 651 [24], subclause C.4.

For the SIM interworking the procedures of ETS 300 370 [10] shall apply.

6.3.2 Service negotiation in the case of outgoing call

In the call establishment phase the PP IWU shall submit the desired connection values in the <<IWU-ATTRIBUTES>> element of the {CC-SETUP} message when issuing the MNCC-SETUP-req primitive. The PP IWU may receive new values in the <<IWU ATTRIBUTES>> element of {CALL PROCEEDING} message.

6.3.3 Service negotiation in the case of incoming call

Upon receipt of MNCC-SETUP-ind primitive with <<IWU-ATTRIBUTES>> element the PP IWU may add the new desired attributes values to the <<IWU-ATTRIBUTES>> information element either in the {CC-CONNECT} message or {CC-ALERTING} and issue a MNCC-CONNECT-req primitive or MNCC-ALERT-req, respectively. The used message shall be the one that is sent first towards the FP.

The PP IWU shall not use <<IWU-ATTRIBUTES>> information element in the {CC-CONNECT} or {CC-ALERTING} message if it agrees with the service parameters proposed in the {CC-SETUP} message. If the PP IWU accepts the parameters proposed by MSC the call establishment proceeds as defined in ETS 300 370 [10].

6.4 PP U-plane IWU procedures

6.4.1 General

For CCITT Recommendation V.24 interworking in the PP IWU U-plane the C2 data profile, ETS 300 651 [24], annex C.4 TAF procedures shall apply.

6.4.2 External handover procedures

The occurrence of external handover may lead into data loss if no specific measures are used due to the independence of the DECT LAPU and GSM RLP in the FP IWU. The following procedures are recommended to minimize the data loss:

- upon detection of the external handover the PP IWU should stop the data transmission to the FP 1 IWU until the air interface link has changed to FP 2 IWU. The data already received from application can be buffered and the application should be flow controlled;
- the data can be received from the FP 1 IWU and forwarded to the application until the old U-plane LAPU link is disconnected;
- when the new LAPU link has been established to the FP 2 IWU and the old U-plane LAPU been released the data is forwarded and received through the new LAPU link.

7 Interworking connection types

7.1 Connection type definitions

7.1.1 General

The selection of the GSM bearer services defined in table 1 shall be done according to the coding of the GSM bearer service definitions of ETS 300 582 [19].

7.1.2 GSM elements

7.1.2.1 <Radio channel requirement> field

The value defined in ETS 300 582 [19] for the <Radio channel requirement> field in the GSM <<Bearer capability>> element is implementation dependent. That is, the element mapping has not been defined in this ETS thus the value of the field is ignored in the direction from GSM to DECT and the implementation dependent value shall be used in the direction from DECT to GSM.

7.1.3 DECT elements

7.1.3.1 <<BASIC SERVICE>> coding

Table 15: <<Basic service>> default coding

Octet	Information element field	Field value	Note
2	<Call Class>	'1000'B	"Normal Call Setup"
	<Basic Service>	'1111'B	"Other"

7.1.3.2 <<IWU-ATTRIBUTES>> coding for GSM bearer services

Table 16: <<iwu attributes>> default coding

Octet	Information element field	Field value	Note
3	<Coding standard>	'01'B	"Profile defined coding"
	<Profile>	'01000'B	"GSM circuit mode NT "
4	<Negotiation indicator>	'010'B	"Peer attribute negotiation)"
	<Profile subtype>	'0001'B	"GSM Phase 2 bearer service"
8c	<Connection element>	'01'B	"non transparent (RLP)" (note)
NOTE: The connection element is always "non transparent" since the DECT air interface service is non transparent (LAPU).			

Rest of the coding used for different GSM bearer services selection are as defined in ETS 300 582 [19].

7.1.4 <<CALL ATTRIBUTES>> coding

Table 17: <<Call attributes>> default coding

Octet	Information element field	Field value	Note
3	<Coding standard>	'00'B	"DECT standard coding"
	<Network layer attributes>	'01000'B	"DECT GSM IWP profile phase 2"
4	<C-plane class>	'010'B	"Class A link; shared"
	<C-plane routing>	'0010'B	"Cf preferred / Cs accepted"
5	<U-plane symmetry>	'00'B	"Symmetric"
	<LU identification>	'00011'B	"LU3"
6	<U-plane class>	'010'B	"Class 1"
	<U-plane frame type>	'0110'B	"FU6"
NOTE: These codings are compatible with C2 data profile codings with the exception of <Network layer attributes>.			

7.1.5 <<CONNECTION ATTRIBUTES>> coding

The following coding is the minimum requirement for GSM bearer service support i.e. one 24 kbit/s bearer is used.

Table 18: <<Connection attributes>> default coding

Octet	Information element field	Field value	Note
3	<Symmetry> <Connection identity coding>	'001'B '0000'B	"Symmetric connection" "Unknown"
4	<Target bearers>	'00001'B	"1 bearer"
5	<Mac slot size> <Mac service>	'100'B '0011'B	"full slot" "Ip; Mod-2 correct"
6	<Cf channel attributes> <Mac packet lifetime>	'010'B	"Cf demand/1 bearer (interrupting)" Implementation specific value
NOTE: These codings are compatible with C2 data profile codings.			

7.1.7 <<Window size>>

This element contents is implementation specific.

Annex A (normative): Profile specific network layer features

A.1 General

This annex contains profile specific coding for the DECT network layer.

A.2 <<IWU-ATTRIBUTES>> information element

The following <<IWU-ATTRIBUTES>> coding shall be used for GSM bearer services interworking.

NOTE: Beginning from Transfer Mode Field (octet 5) this element has the same content as BEARER CAPABILITY 1 element in GSM.

Bit:	8	7	6	5	4	3	2	1	Octet:
0	<< IWU-ATTRIBUTES >>								1
	Length of contents (L)								2
1	Coding		Profile						3
	0	1	0	1	0	0	0	0	
1	Negotiation indicator			Profile subtype				4	
	0	1	0	0	0	0	1		
1	Spare			Tr mod	Information transfer capability			5	
1	spare	structure		dupl mod	config	NIRR	establ	6	
	0								
1	access id.		rate adapt.		signalling access protocol			7	
0/1 ext	layer 1 id.		User information layer 1 protocol				S/A	8	
0/1 ext	S. bits	neg.	data bits	User rate			8a		
0/1 ext	Interm. rate		NIC on TX	NIC on RX	Parity			8b	
1	Connection element		Modem type					8c	
1	Layer 2 id.		User information layer 2 protocol					9	

IWU-ATTRIBUTES information element

Coding standard (octet 3):

Bits	7	6	Meaning
0	1	Profile defined coding	
All other values reserved.			

Profile (octet 3):

Bits	5	4	3	2	1	Meaning
0	1	0	0	0	GSM circuit mode NT	
0	1	0	0	1	GSM circuit mode T	
0	1	0	1	0	GSM packet mode	
0	1	0	1	1	GSM messaging	
0	1	1	0	0	GSM Facsimile group 3	
All other values reserved.						

Negotiation indicator (octet 4):

Bits	7 6 5	Meaning
	0 0 0	Negotiation not possible
	1 0 0	Exchanged parameter negotiation
	0 1 0	Peer attributes negotiation
	1 1 0	Exchange parameter and peer attributes negotiation
All other values reserved.		

Profile subtype (octet 4):

Bits	4 3 2 1	Meaning
	0 0 0 1	GSM Phase 2 bearer services
All other values reserved.		

Transfer mode (octet 5):

Bits	4	Meaning
	0	Circuit mode
	1	Packet mode

Information transfer capability (octet 5):

Bits	3 2 1	Meaning
	0 0 0	Speech
	0 0 1	Unrestricted digital information
	0 1 0	3,1 kHz audio ex PLMN
	0 1 1	Facsimile group 3
	1 1 1	Reserved. used by the network. The meaning is speech/facsimile group 3 - starting with speech
All other values reserved.		

Structure (octet 6):

Bits	6 5	Meaning
	0 0	SDU integrity
	1 1	Unstructured
All other values reserved.		

Duplex mode (octet 6):

Bits	4	Meaning
	0	half duplex
	1	full duplex

Configuration (octet 6):

Bits	3	Meaning
	0	point-to-point
All other values reserved.		

NIRR (octet 6):
(Negotiation of Intermediate Rate Requested)

Bits	2	Meaning
	0	No meaning is associated with this value
	1	Data up to and including 4,8 kbit/s, full rate, non-transparent, 6 kbit/s radio interface rate is requested

Establishment (octet 6):

Bits	1	Meaning
	0	demand
		All other values reserved.

Access identity (octet 7):

Bits	7	6	Meaning
	0	0	octet identifier
			All other values reserved.

Rate adaption (octet 7):

Bits	5	4	Meaning
	0	0	no rate adaption
	0	1	V.110/X.30 rate adaption
	1	0	X.31 flag stuffing
			All other values reserved.

Signalling access protocol (octet 7):

Bits	3	2	1	Meaning
	0	0	1	I.440/450
	0	1	0	X.21
	0	1	1	X.28 - dedicated PAD, individual NUI
	1	0	0	X.28 - dedicated PAD, universal NUI
	1	0	1	X.28 - non dedicated PAD
	1	1	0	X.32
				All other values reserved.

Layer 1 identity (octet 8):

Bits	7	6	Meaning
	0	0	octet identifier
			All other values reserved.

User information layer 1 protocol (octet 8):

Bits	5	4	3	2	Meaning
	0	0	0	0	default layer 1 protocol
					All other values reserved.

Synchronous/asynchronous (octet 8):

Bits	1	Meaning
	0	synchronous
	1	asynchronous

Number of Stop Bits (octet 8a):

Bits	7	Meaning
	0	1 bit (This value is also used in the case of synchronous mode)
	1	2 bits

Negotiation (octet 8a):

Bits	6	Meaning
	0	in-band negotiation not possible
		All other values reserved.

NOTE: See CCITT Recommendations V.110 and X.30.

Number of data bits excluding parity bit (octet 8a):

Bits	5	Meaning
	0	7 bits
	1	8 bits (this value is also used in the case of bit oriented protocols)

User rate (octet 8a):

Bits	4 3 2 1	Meaning
	0 0 0 1	0,3 kbit/s CCITT Recommendations X.1 and V.110
	0 0 0 1	0,3 kbit/s CCITT Recommendations X.1 and V.110
	0 0 1 0	1,2 kbit/s CCITT Recommendations X.1 and V.110
	0 0 1 1	2,4 kbit/s CCITT Recommendations X.1 and V.110
	0 1 0 0	4,8 kbit/s CCITT Recommendations X.1 and V.110
	0 1 0 1	9,6 kbit/s CCITT Recommendations X.1 and V.110
	0 1 1 0	12,0 kbit/s transparent(non compliance with CCITT Recommendations X.1 and V.110)
	0 1 1 1	1,2 kbit/s/75 bit/s CCITT Recommendation V.23, (asymmetric) CCITT Recommendations X.1, V.110.

All other values reserved.

NOTE: For facsimile group 3 calls the user rate indicates the first and maximum speed the mobile station is using.

Octet 8b for CCITT Recommendation V.110/X.30 rate adaptation

Intermediate rate (octet 8b):

Bits	7 6	Meaning
	1 0	8 kbit/s
	1 1	16 kbit/s

All other values reserved.

Network independent clock (NIC) on transmission (Tx) (see CCITT Recommendation V.110 and X.30) (octet 8b):

Bits	5	Meaning
	0	does not require to send data with network independent clock
	1	requires to send data with network independent clock

Network independent clock (NIC) on reception (Rx) (see CCITT Recommendation V.110 and X.30)(octet 8b):

Bits	4	Meaning
	0	cannot accept data with network independent clock (i.e. sender does not support this optional procedure)
	1	can accept data with network independent clock (i.e. sender does support this optional procedure)

Parity information (octet 8b):

Bits	3 2 1	Meaning
	0 0 0	odd
	0 1 0	even
	0 1 1	none
	1 0 0	forced to 0
	1 0 1	forced to 1

All other values reserved.

Connection element (octet 8c):

Bits	7	6	Meaning
0	0		transparent
0	1		non transparent (RLP)
1	0		both, transparent preferred
1	1		both, non transparent preferred

All other values reserved.

The requesting end (e.g. the one sending the SETUP message) should use the 4 values depending on its capabilities to support the different modes. The answering party shall only use the codings 00 or 01, based on its own capabilities and the proposed choice if any. If both MS and network support both transparent and non transparent, priority should be given to the MS preference.

Modem type (octet 8c):

Bits	5	4	3	2	1	Meaning
0	0	0	0	0	0	none
0	0	0	0	1		V.21
0	0	0	1	0		V.22
0	0	0	1	1		V.22 bis
0	0	1	0	0		V.23
0	0	1	0	1		V.26 ter
0	0	1	1	0		V.32
0	0	1	1	1		modem for undefined interface
0	1	0	0	0		autobauding type 1

All other values reserved.

Layer 2 identity (octet 9):

Bits	7	6	Meaning
0	0		octet identifier

All other values reserved.

User information layer 2 protocol (octet 9):

Bits	5	4	3	2	1	Meaning
0	0	1	1	0		X.25, link level
0	1	0	0	0		ISO 6429, codeset 0 (DC1/DC3)
0	1	0	0	1		X.75 layer 2 modified (teletex)
0	1	0	1	0		videotex profile 1
0	1	1	0	0		COPnoFICt (Character oriented Protocol with no Flow Control mechanism)

All other values reserved.

Annex B (informative): GSM transparent bearer services

The future editions of this ETS may support transparent bearer services when appropriate DECT air interface is available.

Annex C (informative): Bibliography

- ITU-T Recommendation Q.600-series: "Interworking of Signalling Systems".
- CCITT Recommendation V.21: "300 bits per second duplex modem standardized for use in the general switched telephone network".
- CCITT Recommendation V.22: "1200 bits per second duplex modem standardized for use in the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits".
- CCITT Recommendation V.22bis: "2400 bits per second duplex modem using the frequency division technique standardized for use on the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits".
- CCITT Recommendation V.23: "600/1200-baud modem standardized for use in the general switched telephone network".
- CCITT Recommendation V.24: "List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE)".
- CCITT Recommendation V.25bis: "Automatic calling and/or answering equipment on the general switched telephone network (GSTN) using the 100-series interchange circuits".
- CCITT Recommendation V.26: "2400 bits per second modem standardized for use on 4-wire leased telephone-type circuits".
- CCITT Recommendation V.26ter: "2400 bits per second duplex modem using the echo cancellation technique standardized for use on the general switched telephone network and on point-to-point 2-wire leased telephone-type circuits".
- CCITT Recommendation V.32: "A family of 2-wire, duplex modems operating at data signalling rates of up to 9600 bit/s for use on the general switched telephone network and on leased telephone-type circuit".
- CCITT Recommendation V.110: "Support of data terminal equipments with V-Series type interfaces by an integrated services digital network".
- CCITT Recommendation X.1: "International user classes of service in, and categories of access to, public data networks and integrated services digital networks (ISDNs)".
- CCITT Recommendation X.21: "Interface between data terminal equipment and data circuit-terminating equipment for synchronous operation on public data networks".
- CCITT Recommendation X.25: "Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit".
- CCITT Recommendation X.28: "DTE/DCE interface for a start-stop mode data terminal equipment accessing the packet assembly/disassembly facility (PAD) in a public data network situated in the same country".
- CCITT Recommendation X.30: "Support of X.21, X.21 bis and X.20 bis based data terminal equipments (DTEs) by an integrated services digital network (ISDN)".
- CCITT Recommendation X.31: "Support of packet mode terminal equipment by an ISDN".
- CCITT Recommendation X.32: "Interface between DTE and DCE for terminals operating in the packet mode and accessing a packet switched public data network through a public switched telephone network or an integrated services digital network or a circuit switched public data network".
- CCITT Recommendation X.75: "Packet-switched signalling system between public networks providing data transmission services".

History

Document history			
May 1996	Public Enquiry	PE 106:	1996-05-20 to 1996-09-13
December 1996	Vote	V 117:	1996-12-23 to 1997-02-14