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**Digital Enhanced Cordless Telecommunications (DECT);
DECT Packet Radio Service (DPRS)**



ETSI 

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Project Digital Enhanced Cordless Telecommunications (DECT), and is now submitted for the ETSI standards One-step Approval Procedure.

Proposed national transposition dates	
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1 Scope

The present document defines the standard for packet radio services for Digital Enhanced Cordless Telecommunications (DECT) systems conforming to EN 300 175 Parts 1 [1] to 7 [7]. It is the basis of profiles, which define more specific applications (Application Specific Access Profiles ASAPs), aimed at the connection of terminals supporting packet data services to a fixed infrastructure, both private and public.

The present document defines a basic service, with the service classes 1 or 2. Service class 1 provides for applications in closed user groups, whereas service class 2 is intended for use in private and public roaming applications.

The annexes to the present document contain the conventions for interworking of the frame-relay and character oriented services.

The present document defines the additional requirements on the Physical Layer (PHL), Medium Access Control (MAC) layer, Data Link Control (DLC) layer and Network (NWK) layer of DECT. The standard also specifies Management Entity (ME) requirements, which ensure the efficient use of the DECT spectrum.

2 References

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

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

- [1] ETSI EN 300 175-1: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 1: Overview".
- [2] ETSI EN 300 175-2: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 2: Physical layer (PHL)".
- [3] ETSI EN 300 175-3: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 3: Medium Access Control (MAC) layer".
- [4] ETSI EN 300 175-4: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 4: Data Link Control (DLC) layer".
- [5] ETSI EN 300 175-5: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 5: Network (NWK) layer".
- [6] ETSI EN 300 175-6: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 6: Identities and addressing".
- [7] ETSI EN 300 175-7: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 7: Security features".
- [8] ETSI EN 300 444: "Digital Enhanced Cordless Telecommunications (DECT); Generic Access Profile (GAP)".
- [9] ETSI EN 300 824: "Digital Enhanced Cordless Telecommunications (DECT); Cordless Terminal Mobility (CTM); CTM Access Profile (CAP)".
- [10] ISO/IEC 8802-3 (1996): "Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications".

- [11] ISO/IEC 8802-5 (1998): "Information technology - Telecommunications and information exchange between systems - Local and Metropolitan Area Networks - Specific requirements - Part 5: Token ring access method and physical layer specifications".
- [12] IETF RFC 791 (1981): "Internet Protocol", J. Postel.
- [13] IETF RFC 1661 (1994): "The Point-to-Point Protocol (PPP)", W. Simpson, Editor.
- [14] IETF RFC 1662 (1994): "PPP in HDLC-like Framing", W. Simpson, Editor.
- [15] ITU-T Recommendation V.24 (1988): "List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE)".
- [16] ISO/IEC 9646-7: "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 7: Implementation Conformance Statements".
- [17] Universal Serial Bus (USB) Specification (Compaq Computer Corporation, Intel Corporation, Microsoft Corporation, NEC Corporation).

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply.

Access Rights Identity (ARI): see EN 300 175-6 [6].

service class 1: local area applications, for which terminals are pre-registered off-air with one or more specific Fixed Parts (FPs), and establishment of service and user parameters is therefore implicit, according to a profile-defined list

service class 2: private and public roaming applications for which terminals may move between FPs within a given domain and for which association of service parameters is explicit at the time of service request

multiframe: repeating sequence of 16 successive Time Division Multiple Access (TDMA) frames, that allows low rate or sporadic information to be multiplexed (e.g. basic system information or paging)

TDMA frame: time-division multiplex of 10 ms duration, containing 24 successive full slots. A TDMA frame starts with the first bit period of full slot 0 and ends with the last bit period of full slot 23

physical Connection: association between two sets of TBCS at MAC layer including the underlying bearers that belong to a single Logical connection

logical connection: association between two instances of the MAC MBC that can be used by higher layers to exchange U-plane or C-plane data

link: association between two DLC layer entities. This can either be one DLC C-plane association or one DLC U-plane association. Usually, but not necessarily, one DLC Link is mapped to one Logical connection

virtual circuit: in service class 2, a Virtual Circuit is any user connection opened at NWK layer. Virtual circuits could be of two types: Virtual Calls (VC) and Permanent Virtual Circuits (PVC). A Virtual circuit is mapped to one Link and to one Logical connection (MBC)

Virtual Call (VC): any packet-mode user connection that can be set up and released by means of NWK layer C-plane procedures. A Virtual Call is the packet-mode equivalent of a circuit-mode call. Virtual Calls can only be provided by DPRS service class 2

Permanent Virtual Circuit (PVC): Virtual Circuit that can be established and cleared only by configuration

NOTE: A Permanent Virtual Circuit is the packet-mode equivalent of a circuit-mode leased line. A PVC can be provided by both DPRS mobility class 1 and 2. Service class 1 provides by construction a PVC between any pair of FP, PP. In service class 2, a PVC is a degenerated case of a VC.

suspended state: state of an established Logical connection with no associated TBC's or physical layer resources

suspend: procedure to release the Physical connection without releasing the Logical connection

resumed state: state of an established Logical connection, open at MB, DLC and NWK, with active TBC's and physical layer

resume: procedure to establish the Physical Connection related to a Suspended Logical connection

physical Connection release: procedure to release all bearers and TBC's associated with a Logical connection. Physical Connection release is always under control of the Management Entity (ME)

physical Connection establishment: procedure to activate all bearers and TBC's related to a single Logical connection. The Physical Connection establishment is always under control of the Management Entity (ME)

logical connection establishment: in service class 2, the procedure to create a logical connection. The Logical connection establishment is instantiated by the DLC upon request of the NWK layer

logical connection release: in service class 2, the procedure to release a logical connection. The Logical connection release is usually instantiated by the DLC upon request of the NWK layer, but under certain circumstances it could also be initiated by the ME

3.2 Symbols

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

M	for mandatory to support (provision mandatory, process mandatory)
O	for optional to support (provision optional, process mandatory)
O.x	option comprising number of items
I	for out-of-scope (provision optional, process optional) not subject for testing
C	for conditional to support (process mandatory)
N/A	for not-applicable (in the given context the specification makes it impossible to use this capability)
X	excluded, not allowed

The symbols defined in this clause are applied for procedures, features, and services in the present document if not explicitly otherwise stated. The interpretation of status columns in all tables is as follows:

Provision mandatory, process mandatory means that the indicated feature service or procedure shall be implemented as described in the present document, and may be subject to testing.

Provision optional, process mandatory means that the indicated feature, service or procedure may be implemented, and if implemented, the feature, service or procedure shall be implemented as described in the present document, and may be subject to testing.

NOTE: The used notation is based on the notation proposed in ISO/IEC 9646-7 [16].

3.3 Abbreviations

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

AC	Authentication Code
ACK	Acknowledgement
ARI	Access Rights Identity
ARQ	Automatic Retransmission reQuest
C	higher layer control Channel (see C _S and C _F)
C/L	ConnectionLess
CC	Call Control. A NWK layer functional grouping
C _F	higher layer signalling Channel (Fast)
C-plane	Control plane
CRC	Cyclic Redundancy Check
C _S	higher layer signalling Channel (Slow)
CSMA/CD	Carrier Sense Multiple Access with Collision Detection

CUG	Closed User Group
DCE	Data Circuit terminating Equipment
DCDL-net	Distributed Communication DECT Local network
DECT	Digital Enhanced Cordless Telecommunications
DLC	Data Link Control
DTE	Data Terminal Equipment
ECN	Exchanged Connection Number
EDEL	End DELimiter
FC	Frame Control
FCS	Frame Check Sequence
FP	Fixed Part
FREL	Frame Relay
FS	Frame Status
FT	Fixed radio Termination
GAP	Generic Access Profile
HDLC	High level Data Link Control
HyP	Hybrid Part
I	higher layer Information channel (see I_N and I_P)
I_N	higher layer Information channel (unprotected)
I_P	higher layer Information channel (protected)
I_{PQ}	higher layer Information channel (protected) single B-field
I_P	Internet Protocol
IPUI	International Portable User Identity
ISDN	Integrated Services Digital Network
IWF	Interworking Functions
IWU	InterWorking Unit
L	Length
LA	Location Area
LAN	Local Area Network
LBN	Logical Bearer Number
LCE	Link Control Entity
L_I	Length Indicator
LLME	Lower Layer Management Entity
LSB	Least Significant Bit
M	MAC control channel
MAC	Medium Access Control
MBC	Multi Bearer Control
MCI	MAC Connection Identifier
ME	Management Entity
MM	Mobility Management
MSB	Most Significant Bit
MUX	time MUltipleXors
N	identities channel
NWK	Network
OAM	Operation And Maintenance
P	Paging channel
PAD	Packet Assembler-Disassembler
PARI	Primary Access Rights Identity
PDU	Protocol Data Unit
PHL	PHysical Layer
PHY	PHYsical
PMID	Portable part MAC IDentity
PP	Portable Part
PPP	Point-to-Point Protocol
PT	Portable radio Termination
PVC	Permanent Virtual Circuit
Q	system information channel
RFP	Radio Fixed Part
RFPI	Radio Fixed Part Identity
SAP	Service Access Point

SARI	Secondary Access Rights Identity
SDEL	Start DELimiter
SDU	Service Data Unit
SFD	Start Frame Delimiter
SI _p	Higher layer connectionless channel (protected)
TARI	Tertiary Access Rights Identity
TBC	Traffic Bearer Control
TDMA	Time Division Multiple Access
TPUI	Temporary Portable User Identity
U-plane	User-plane

4 Description of services

4.1 Data services structure

The DPRS standard defines the way to implement packet-data services over the DECT air interface. DPRS mandates a set of minimum requirements to be supported, and some additional options, which may be either configured for service class 1, or negotiated at call setup for service class 2 equipment.

The DPRS standard forms the core for DECT packet data applications; it may either be used as a basis for other data profiles, or for direct interworking to other networks. The application service type determines which of the interworking functions has to be selected (from annexes B and C). The application service requirements determine whether a C-plane is needed or not.

The relation between DPRS entities are shown on figures 1 and 2 where a "DECT terminal" may represent depending on the real implementation a PP, FP or a HyP (see note 1). A DPRS DECT terminal can be connected to (or incorporated in) an external network or application.

NOTE 1: Through the present document at many places when describing the communication between two DECT terminals the DECT traditional abbreviations FT (FP) and PT (PP) have been used. This approach has been chosen to ease understanding and does not exclude the usage of a HyP instead - for the HyP applications complete information can be found in Distributed communications description in EN 300 175-5 [5].

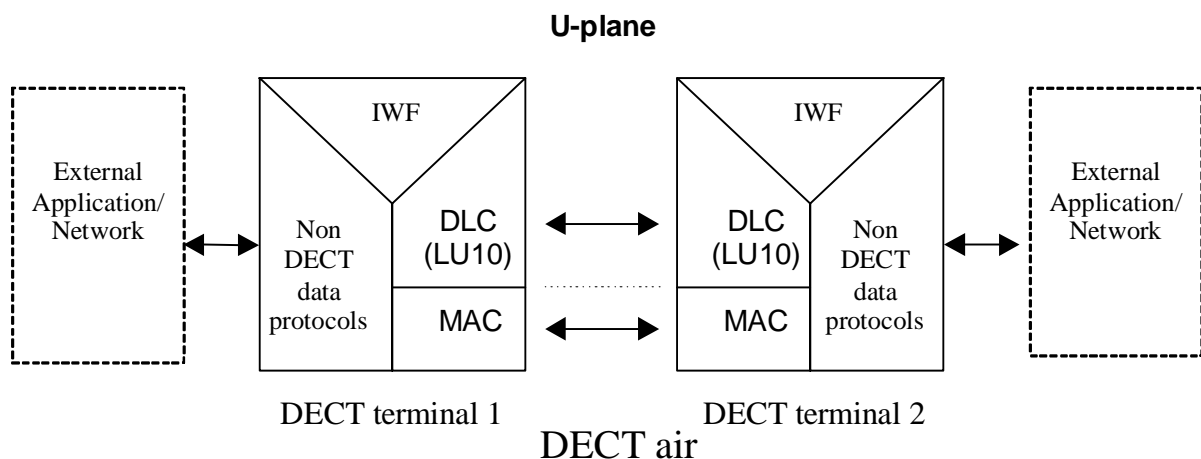


Figure 1: Reference configuration for DPRS U-plane

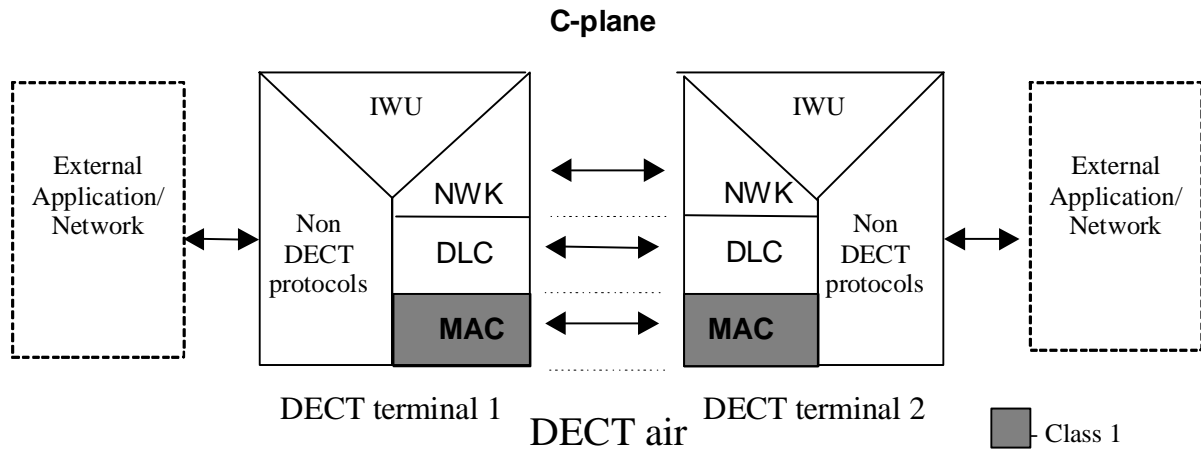


Figure 2: Reference configuration for DPRS C-plane

DPRS offers to the user a maximum delay frame relay or streamed data service, incorporating procedures for flow control (path by path, using bandwidth control) and automatic retransmission (DLC transmission class 2).

Additional requirements for interworking to external frame relay applications/networks are defined in annex B.

Additional requirements for interworking to external stream-oriented applications/networks are defined in annex C.

Service class 1 excludes call-setup procedures (see note 2), and therefore in this case the virtual circuit is implicitly and permanently present. These applications are intended for Closed User Groups (CUG). This means that PPs are statically registered within the FP, and service parameters are configured as defined in annex A.

NOTE 2: Class 1 does not provide the complete C-plane DECT protocols and terminates DECT C-plane just above the MAC layer (see figure 2). The service offered is analogous to a permanent virtual circuit (PVC).

Service class 2 offers a full DECT C-plane, including call-setup procedures, service management and service negotiation. In this case the virtual circuit is only present within the context of a call. The applications are intended for private and public roaming, and service parameters are negotiated during the call-setup phase, and may be changed during the active phase of the call.

Specific Interworking Functions (IWF) determine the interactions between the DECT U-plane and the relevant Application protocol.

4.2 Service objectives

The DPRS has the performance and service objectives given in the following tables.

Table 1: Performance objectives

Performance	
Maximum supported SDU size for Frame Relay services (annex B)	$\geq 1\ 528$ octets
Maximum supported SDU size for character oriented services (annex C)	≥ 29 octets
Maximum one-way delay	Down to 50ms configurable
Maximum sustainable unidirectional throughput (per slot)	115,2 kbps net
Maximum sustainable unidirectional throughput (per transceiver)	2 Mbit/s net
Maximum sustainable full bi-directional throughput (per transceiver)	1 Mbit/s net
Maximum system throughput	20 Mbit/s (10 parallel unidirectional connections in a DCDL-net)
Establishment of PT to FT physical connection (average)	< 50 ms
Establishment of FT to PT physical connection (average)	< 50 ms
Undetected bit error ratio	< 10^{-10}
Uncorrected bit error ratio (for air interface BER 10^{-3} and delay = 100 ms)	< 10^{-7}

Table 2: Summary of service capabilities

Service	Class 1	Class 2
Point-to-point protected data transfer PP-FP with ARQ	YES	YES
Point-to-point protected data transfer FP-PP with ARQ	YES	YES
Point-to-multi-point data transfer FP-PP	OPTIONAL	OPTIONAL
Point-to-point data transfer PP-PP (distributed communication)	OPTIONAL	OPTIONAL
Authentication	-	YES
Encryption	YES	YES
Permanent Virtual Circuit (PVC) operation	YES	YES
Virtual Call (VC) operation	-	YES
Intra-cell bearer handover (see note)	YES	YES
Inter-cell bearer handover (see note)	-	YES
Inter-cell connection handover (for multicell systems)	-	YES
Inter-cell external handover	-	OPTIONAL
NOTE: Bearer handover capability may be provided by the bearer replacement procedure.		

4.3 Service definitions

For the purposes of the present document the following service definitions apply.

4.3.1 PHL service definitions

See PHL requirements in clause 5.

4.3.2 MAC service definitions

general [DPRS-M.1]: a set of basic requirements regarding data formats, multiplexing, CRC usage, scanning and locking, which are prerequisites to communication between peer MAC entities.

non-continuous broadcast [DPRS-M.2]: a simplex service from FT to PT which allows PTs to acquire more Q-channel information (i.e. TARI) and to request a new dummy bearer.

continuous broadcast [DPRS-M.3]: a simplex service from FT to PT whereby the FT maintains at least one bearer with continuous transmissions. The PT can use the information carried in this bearer to lock to the FT and to obtain knowledge about the FT. (GAP-M.2)

paging broadcast [DPRS-M.4]: a service whereby the identities of specific PTs can be broadcast by the FT. This service is normally used by the FT to request a specific PT to set up a link to the FT. (GAP-M.3)

advanced connection [DPRS-M.5]: a service providing connection between FT and PT consisting of one or more duplex and zero or more double simplex bearers. Advanced connections have a common connection number, called Exchanged Connection Number (ECN) which is assigned by the ME. Therefore, more than one advanced connection may exist between a PT and one FT. The service includes the means for setting-up and releasing the required bearer(s).

I_p error detection service [DPRS-M.6]: the I_p information is protected by DLC layer retransmission procedures based on error detection by means of the B-sub field CRC's. The DLC layer takes care of packet lifetime control.

I_p error correction service [DPRS-M.7]: the I_p information is protected by MAC layer procedures based on a modulo 2 retransmission scheme. The DLC layer requests the maximum allowed transmission time. Due to the retransmission mechanism, the effective throughput is variable.

U-plane point-to-multipoint service [DPRS-M.8]: a simplex service from FT to PT whereby the FT transfers a single SDU of U-plane data from one source point to one (or more) destination points. The service uses the S_{IP} logical channel: the S_{IP} information is protected by MAC layer error detection procedure based on 16 bit CRCs.

C_S higher layer signalling [DPRS-M.9]: a low rate connection oriented data service with ARQ using the C_S-channel to transfer higher layer signalling data. (GAP-M.5)

C_F higher layer signalling [DPRS-M.10]: a high rate connection oriented data service with ARQ using the C_F-channel to transfer higher layer signalling data.

encryption activation [DPRS-M.11]: a service providing means for enabling the encryption whereby on demand all higher layer data is transferred across the DECT air interface in an encrypted form. Always initiated by the PT. A connection release automatically disables ciphering. (GAP-M.7)

encryption deactivation [DPRS-M.12]: a service providing means for disabling the encryption whereby on demand all higher layer data is transferred across the DECT air interface in an encrypted form. A connection release automatically disables ciphering. (GAP-M.14)

quality control [DPRS-M.13]: provides means for monitoring and controlling the radio link quality. (GAP-M.6)

physical channel selection [DPRS-M.14]: defines the policy for the dynamic selection of a channel, caused by the fact that an old one has to be changed or a new one is needed. Detection of bad quality on the physical channel in use (i.e. due to weak signals or interference), detection of a RFP with a stronger signal than the one of the own RFP, detection of local congestion are all criteria that can be used to select the channel.

Secondary Access Rights Identity (SARI) support [DPRS-M.15]: the ability to support, in addition to the primary Access Rights Identity (ARI), secondary ARIs that the FT broadcasts less frequently than PARIs. These may be used to reflect an inter-operators agreement allowing a portable to access more than one operator or services through FT. (GAP-M.13)

bearer replacement [DPRS-M.16]: bearer quality maintenance by setting up a replacement bearer in the same cluster, with different LBN and without the requirement of maintaining identical data on both bearers. Subsequently the old bearer is released; for efficiency, the sequence of setup and release may be reversed.

bearer handover [DPRS-M.17]: bearer quality maintenance by setting up a replacement bearer in the same cluster, with identical LBN and maintaining identical data on both bearers. Subsequently the old bearer is released.

connection handover [DPRS-M.18]: connection quality maintenance by setting up replacement bearers in the same or a different cluster, each with identical LBN and maintaining identical data bearers with identical LBN. Subsequently the old bearers are released.

G_F-channel [DPRS-M.19]: the G_F-channel is a fast simplex channel that is used to provide control of U-plane entities. For example it is used to carry acknowledgements for asymmetric connections.

4.3.3 DLC service definitions

LU10 Enhanced Frame RELay service (EFREL) [DPRS-D.1]: an enhanced frame relay service accessed through the LU10 SAP. The LU10 shall operate on a generic field of user data that shall be transferred into and out of the DLC U-plane as a single SDU. This SDU is assumed to contain one external frame, but the operation of LU10 shall be independent of the actual contents of the SDU. LU10 shall provide mechanisms that offer reliable transport of the generic SDUs, and that preserve the SDU boundaries.

FU10a [DPRS-D.2]: offers a defined fixed length frame structure and buffering functions for transmission of U-plane data to the MAC layer (at the transmit side) or accepts data from the MAC layer (at the receiving side) on demand and with minimum delay. Frame type FU10a is used for the forward path of unidirectional links.

FU10b [DPRS-D.3]: offers a defined fixed length frame structure and buffering functions for transmission of higher layer U-plane control data from the DLC to the MAC layer (at the transmit side) or accepts data from the MAC layer (at the receiving side) on demand and with minimum delay. Only be used for symmetrical connections using bi-directional links.

FU10c [DPRS-D.4]: offers a defined fixed length frame structure and buffering functions for transmission of higher layer U-plane control data from the DLC to the MAC layer (at the transmit side) or accepts data from the MAC layer (at the receiving side) on demand and with minimum delay. Used to carry acknowledgements or negative acknowledgement for connections. Frame type FU10c is used for the backward control path of unidirectional links: it contains a list of receive sequence numbers for the forward link.

Data Link Service (LAPC + Lc) class A service [DPRS-D.5]: a single frame acknowledged C-plane data link service providing a data link between one FT and one PT. The higher layer information is segmented (if necessary) and transmitted in numbered frames. The Lc service, upon which LAPC is defined, provides frame delimiting, transparency and frame synchronization. (GAP-D.1)

Data Link Service (LAPC + Lc) class U service [DPRS-D.6]: an unacknowledged C-plane data link service providing a data link between one FT and one or more PTs. The higher layer information is segmented (if necessary) and transmitted in unnumbered frames. The Lc service, upon which LAPC is defined, provides frame delimiting, transparency and frame synchronization, but no error recovery is defined.

Lc Service [DPRS-D.7]: a service providing channel dependant fragmentation, recombination, frame synchronization and frame delimiting transparency. Fragmentation is obtained by means of dividing a LAPC data unit into more than one service data units for delivery to the MAC layer C logical channel, whilst recombination is obtained by means of joining several service units received from the MAC layer C logical channel into a LAPC data unit. Allows the LLME to select the logical channel for Lc operation on a frame-by-frame basis.

broadcast Lb service [DPRS-D.8]: a simplex point-to-multipoint transmission using simple fixed length DLC frames providing a restricted broadcast service in direction FP to PP(s). (GAP-D.3)

intercell voluntary connection handover [DPRS-D.9]: internal handover process provided and initiated by the DLC layer (as a result of a particular policy, implementers dependent, application on link management. E.g. continued poor quality of service from the MAC layer), whereby one set of DLC entities (C-plane and U-plane) can re-route data from one MAC connection to a second new MAC connection not in the domain of the same cell, while maintaining the service provided to the NWK layer. (GAP-D.5)

connection modification [DPRS-D.10]: service that allows the DLC to modify a connection with connection type "Unknown".

encryption activation [DPRS-D.11]: transporting the NWK layer encryption request and the cipher key to the MAC layer, thereby enabling the encryption process in the MAC layer. (GAP-D.6)

encryption deactivation [DPRS-D.12]: transporting the NWK layer encryption deactivation request to the MAC layer, thereby disabling the encryption process in the MAC layer. (GAP-D.9)

Connectionless U-plane [DPRS-D.13]: Provision of data to multiple addresses using the SI_p MAC channel.

4.3.4 NWK feature definitions

outgoing call [DPRS-N.1]: a call initiated at a DECT PP. (GAP-N.1)

off-hook [DPRS-N.2]: the ability to indicate the action of going off-hook, e.g. to start call set-up or accept a call. (GAP-N.2)

on-hook (FULL Release) [DPRS-N.3]: the ability to indicate the action of going on-hook (e.g. to terminate a call) and fully release the radio resource. (GAP-N.3)

dialled digits (basic) [DPRS-N.4]: the capability to dial digits 0-9, x, #. (GAP-N.4)

register recall [DPRS-N.5]: The ability of the PP to request the invocation of the supplementary service "register recall" over the DECT interface and the ability of the FP to transmit the request to the local network. Register recall means to seize a register (with dial tone) to permit input of further digits or other action. (GAP-N.5)

go to DTMF signalling (defined tone length) [DPRS-N.6]: go to DTMF signalling with defined tone length. (GAP-N.6)

pause (dialling pause) [DPRS-N.7]: the ability to generate or indicate a dialling pause, e.g. to await further dial tone. (GAP-N.7)

incoming call [DPRS-N.8]: a call received at a DECT PP. (GAP-N.8)

authentication of PP [DPRS-N.9]: the process by which the identity of a DECT PP is checked by the FP. (GAP-N.9)

authentication of user [DPRS-N.10]: the process by which the identity of a user of a DECT PP is checked by the FP. The User Personal Identification (UPI), a personal identification of 0 to 8 digits, manually entered by the user, is used for user authentication. (GAP-N.10)

location registration [DPRS-N.11]: a facility whereby a PP can be registered with a FP or a cluster of FPs such that incoming calls, radio pages or messages may be routed to it. (GAP-N.11)

on-air key allocation [DPRS-N.12]: the capability to transform Authentication Code (AC) into User Authentication Key (UAK) using the key allocation procedure. (GAP-N.12)

identification of PP [DPRS-N.13]: the ability for the FP to request and PP to provide specific identification parameters. (GAP-N.13)

service class indication/assignment [DPRS-N.14]: assignment by the FP to PP of the service class and indication to the FP by the PP of the contents of its service class. (GAP-N.14)

alerting [DPRS-N.15]: activates or deactivates alerting at the PP using any appropriate indication. (GAP-N.15)

ZAP [DPRS-N.16]: the ability first to assign and then to re-program the account data held in the PP so that access rights may be suspended subject to the conditions set by the service provider being met, coupled with the ability to re-program the account data again to reinstate access rights once these conditions have been met. One ZAP field shall be provided per account field. The PP has the right to authenticate the FP prior to the execution of ZAP suspend. (GAP-N.16)

encryption activation FT initiated [DPRS-N.17]: the activation of the encryption process requested by FT. (GAP-N.17)

subscription registration procedure on-air [DPRS-N.18]: a standardized procedure for loading subscription registration data into a PP in real time over the air-interface. (GAP-N.18)

link control [DPRS-N.19]: the ability to request, accept, maintain and release a data link for the purposes of a NWK layer procedure. (GAP-N.19)

terminate access rights FT initiated [DPRS-N.20]: the ability of the FP to delete a subscription in the PP. (GAP-N.20)

partial release [DPRS-N.21]: the ability to release an established or in progress Call Control (CC) call whilst retaining the radio resource for the purpose of accessing further services. (GAP-N.21)

go to DTMF (infinite tone length) [DPRS-N.22]: go to DTMF signalling, indicating infinite DTMF tone duration. (GAP-N.22)

go to pulse [DPRS-N.23]: go to pulse (decadic) signalling. (GAP-N.23)

signalling of display characters [DPRS-N.24]: the transmission to the PP of characters to be displayed on the user's PP display (if provided). (GAP-N.24)

display control characters [DPRS-N.25]: characters sent to the PP to control the user's display in the PP (if provided). Such characters include cursor control, clear screen, home, flash, inverse video etc. (GAP-N.25)

authentication of FT [DPRS-N.26]: the process by which the identity of a FP is checked by the PP. (GAP-N.26)

encryption activation PT initiated [DPRS-N.27]: the activation of the encryption process suggested by PT. The real time start of ciphering is done in the MAC layer and is always initiated by the PT. (GAP-N.27)

encryption deactivation FT initiated [DPRS-N.28]: the deactivation of the encryption process requested by FT. The real time stop of ciphering is done in the MAC layer and is always initiated by the PT. (GAP-N.28)

encryption deactivation PT initiated [DPRS-N.29]: the deactivation of the encryption process suggested by PT. The real time stop of ciphering is done in the MAC layer and is always initiated by the PT. (GAP-N.29)

Calling Line Identification Presentation (CLIP) [DPRS-N.30]: the ability to provide the calling party number to the called party before accepting the call. (GAP-N.30)

internal call [DPRS-N.31]: a call between 2 users that does not make use of the local network resources. This is typically useful in residential environments. (GAP-N.31)

service call [DPRS-N.32]: a call initiated by a DECT PT for entering of FT related service and adjustment procedures in a transparent way. After having sent the service call indication, the PT behaves according to the rules of a normal call. (GAP-N.32)

Dynamic parameters allocation [DPRS-N.33]: the ability to assign/negotiate DPRS protocol handling specific parameters.

Service Negotiation [DPRS-N.34]: the ability to negotiate call/service parameters during call set-up.

In call service change [DPRS-N.35]: the ability to modify call/service parameters (e.g. bandwidth, IWU parameters etc.) while the call is maintained.

NWK layer management [DPRS-N.36]: management of NWK layer related data (e.g. identities, location registration, etc.).

Identity assignment [DPRS-N.37]: the ability to assign and store different types of PT related identities.

DECT external handover [DPRS-N.38]: external handover is the process of switching a call in progress from one Fixed Part (FP-1) to another Fixed Part (FP-2). This means the handover occurs between two independent systems, where each system has its own lower layers of protocol and has an independent set of network layer Service Access Points (SAPs). To make external handover possible, a common management entity above the two fixed terminations is necessary. (CAP-N.1)

Message waiting indication [DPRS-N.39]: this feature enables a user to receive an indication of the status of a message server (e.g. a voice mailbox) to which the user has access. (CAP-N.4)

Detach [DPRS-N.40]: this feature enables a PT to report to the FT that the PT is not ready to receive calls. (CAP-N.5)

Enhanced location registration [DPRS-N.41]: this feature enables automatic location registration of PT at expected intervals of time. (CAP-N.6)

On-air modification of user parameters [DPRS-N.42]: this feature enables the FT to modify the active subscription data of the PT. (CAP-N.7)

4.3.5 Application service definitions

AC to bitstring mapping [DPRS-A.1]: mapping of the AC into a bitstring. (GAP-A.1)

multiple subscription registration [DPRS-A.2]: the ability of PP to store more than one subscription. (GAP-A.2)

manual entry of the Portable Access Rights Key (PARK) [DPRS-A.3]: the ability of the PP to accept a manual entry of the PARK for ensuring attachment to the right FP in a physical area covered by many providers. (GAP-A.3)

4.3.6 Distributed Communication

Distributed Communication [DPRS-DC.1]: the ability of a DECT terminal to provide means for or assist direct communication between any two terminals, members of a "closed" local DECT network. Such terminals may be of type HyP, or, of type PP or FP (when additional specific procedures are provided).

4.3.7 Management Entity

Class 1 Management [DPRS-ME.1]: Inter and intra DECT protocol layers management of the simplified version of DPRS protocol requirements that does not incorporate C-plane.

Class 2 Management [DPRS-ME.2]: Inter and intra DECT protocol layers management of the full version of DPRS protocol requirements that does incorporate C-plane.

4.4 General Class/Service/Interworking support

Table 3: General Class and Service support

Item	Name of service	Reference	Support status	
			PT	FT
DPRS-G.1	DPRS Class 1	3.1, 4.1	O.31	O.32
DPRS-G.2	DPRS Class 2	3.1, 4.1	O.31	O.32
DPRS-G.3	Frame Relay (FREL)	annex B	O.33	O.34
DPRS-G.4	Character stream	annex C	O.33	O.34
O.31, O.32, O.33, O.34: At least one of these services shall be supported.				
NOTE: The reference column refers to the relevant clause in the present document.				

Table 4: General Service/Interworking support

Service	Interworking	Reference	Status	
			PT	FT
DPRS-G.3, Frame Relay (FREL)		annex B	O.41	O.42
	Ethernet	clause B.4	C.43	C.44
	Token Ring	clause B.5	C.43	C.44
	IP	clause B.6	C.43	C.44
	PPP	clause B.7	C.43	C.44
DPRS-G.4, Character stream		annex C	O.41	O.42
	V.24 [15]	clause C.4	M	M
O.41, O.42: At least one of these Services shall be supported.				
C.43, C.44: At least one of these interworking shall be supported.				
NOTE: The reference column refers to the relevant clause in the present document.				

5 PHL requirements

5.1 General requirements

PT and FT shall support the PHL requirements of EN 300 444 [8] clause 11.

5.2 Modulation schemes

The following modulation schemes defined by EN 300 175-2 [2] annex D shall be supported.

Table 5: Allowed combinations of modulation schemes

Modulation scheme	S-field	A-field	B + Z-field	support status
1a	GFSK	GFSK	GFSK	C51
1b	$\pi/2$ -DBPSK	$\pi/2$ -DBPSK	$\pi/2$ -DBPSK	C52
2	$\pi/2$ -DBPSK	$\pi/2$ -DBPSK	$\pi/4$ -DQPSK	O
3	$\pi/2$ -DBPSK	$\pi/2$ -DBPSK	$\pi/8$ -D8PSK	O
C51: If 1b is not supported mandatory, else optional.				
C52: If 1a is not supported mandatory, else optional.				

For the 4- and 8-level modulation option, the requirements of EN 300 175-2 [2] annex D shall apply.

6 MAC layer requirements

In case of mobility class 2, the MAC extended fixed part information message shall be used and, therefore, bit a12 of the fixed part information field shall be set to 1.

6.1 MAC services

Table 6: MAC service support for mobility class 1 and 2

Item	Name of service	Reference	Support status	
			PT	FT
DPRS-M.1	General	4.3.2	M	M
DPRS-M.2	Non continuous broadcast	4.3.2	O	O
DPRS-M.3	Continuous broadcast	4.3.2	M	M
DPRS-M.4	Paging broadcast	4.3.2	M	M
DPRS-M.5	Advanced connections	4.3.2	M	M
DPRS-M.6	I _p -error_detection service	4.3.2	M	M
DPRS-M.7	I _p -error_correction service	4.3.2	O	O
DPRS-M.8	U-plane point-to-multipoint service	4.3.2	O	O
DPRS-M.9	C _S higher layer signalling	4.3.2	C61	C61
DPRS-M.10	C _F higher layer signalling	4.3.2	C62	C62
DPRS-M.11	Encryption activation	4.3.2	M	M
DPRS-M.12	Encryption deactivation	4.3.2	C63	C63
DPRS-M.13	Quality control	4.3.2	M	M
DPRS-M.14	Physical channel selection	4.3.2	M	M
DPRS-M.15	SARI support	4.3.2	C61	C62
DPRS-M.16	Bearer replacement	4.3.2	M	M
DPRS-M.17	Bearer handover	4.3.2	O	O
DPRS-M.18	Connection handover	4.3.2	M	O
DPRS-M.19	G _F -channel	4.3.2	M	M
DPRS-M.20	I _{pq} -error_detection service	4.3.2	C64	C64
DPRS-M.21	I _{pq} -error_correction service	4.3.2	O	O
C61: IF (CLASS 1) THEN I ELSE M.				
C62: IF (CLASS 1) THEN I ELSE O.				
C63: If DPRS-N.28 or DPRS-N.29 then M else I.				
C64: If (4 or 8-level modulation scheme) then M else I.				
NOTE: The reference column refers to the relevant clause in the present document.				

6.2 MAC service to procedure mapping

Table 7: MAC service to procedure mapping

Service	Procedure	Reference	Status	
			PT	FT
DPRS-M.1 General			M	M
	General	10.1	M	M
DPRS-M.2 Non continuous broadcast			O	O
	Request for specific Q-channel information	10.2.1	O	O
	Request for a new dummy	10.2.2	O	O
DPRS-M.3 Continuous broadcast			M	M
	Downlink broadcast	10.3	M	M
DPRS-M.4 Paging broadcast			M	M
	Normal paging	10.4.3, 10.4.1, 10.4.2	M	M
	Fast paging	10.4.4, 10.4.1, 10.4.2	O	O
	Low duty cycle paging	10.4.5, 10.4.1, 10.4.2	O	O
	MAC paging	10.4.6, 10.4.1, 10.4.2	M	M
DPRS-M.5 Advanced connection			M	M
	Fast setup	10.10.1.2	O	O
	Logical connection setup	10.5	M	M
	Logical connection release	10.6	M	M
	Connection modification	10.7	M	M
	Single bearer Physical connection setup	10.8.1	M	M
	Multi bearer Physical connection setup	10.8.2	O	O
	Physical Connection release	10.9	M	M
	Single duplex bearer setup	10.10.1	M	M
	Double simplex bearer setup	10.10.2	O	O
	Unacknowledged bearer release	10.11.1	M	M
	Acknowledged bearer release	10.11.2	O	O
	Fast bearer release	10.11.3	O	O
DPRS-M.6 I _p error detection service			M	M
	Protected I-channel error-detect mode	10.13.1	M	M
DPRS-M.7 I _p error correction service			O	O
	Protected I-channel error-correct mode	10.13.2	M	M
DPRS-M.8 U-plane point-to-multipoint service			O	O
	Connectionless SI _p mode	10.13.3	M	M
DPRS-M.9 C _S higher layer signalling			C71	C71
	C _S -channel data	10.14.1	M	M
DPRS-M.10 C _F higher layer signalling			C72	C72
	C _F -channel data	10.14.2	M	M
DPRS-M.11 Encryption activation			M	M
	Encryption process - initialization and synchronization	10.15.1	M	M
	Encryption mode control	10.15.2	M	M

Service	Procedure	Reference	Status	
			PT	FT
	Encryption handover control	10.15.3	M	M
DPRS-M.12 Encryption deactivation			C73	C73
	Encryption mode control	10.15.2	M	M
DPRS-M.13 Quality control			M	M
	RFPI handshake	10.16.1	M	M
	PT frequency correction procedure	10.16.2	O	O
	Bearer quality report	10.16.3	M	M
	Bearer and connection control	10.16.4	O	O
	A-CRC handshake	10.16.5	M	M
DPRS-M.14 Physical channel selection			M	M
	Physical channel selection	10.17	M	M
DPRS-M.15 SARI support			C71	C72
	Downlink broadcast	10.3.2.3	M	M
DPRS-M.16 Bearer replacement			M	M
	Bearer replacement	10.18	M	M
DPRS-M.17 Bearer handover			O	O
	Bearer handover	10.19	M	M
DPRS-M.18 Connection handover			M	O
	Advanced connection handover	10.12	M	M
DPRS-M.19 G _F -channel			M	M
	G _F -channel data	10.20.1	M	M
DPRS-M.20 I _{pq} -error-detection service			C74	C74
	Protected I-channel error-detect mode	10.13.1	M	M
DPRS-M.21 I _{pq} -error-correction service			O	O
	Protected I-channel error-correct mode	10.13.2	M	M
C71: IF (CLASS 1) THEN I ELSE M.				
C72: IF (CLASS 1) THEN I ELSE O.				
C73: If DPRS-N.28 or DPRS-N.29 then M else I.				
C74: If (4- or 8-level modulation scheme) then M else I.				
NOTE: The reference column refers to the relevant clause in the present document.				

7 DLC-layer requirements

7.1 DLC services

Table 8: DLC service status

Item no.	Name of service	Reference	Status	
			PT	FT
DPRS-D.1	LU10 Enhanced Frame RELay service (EFREL)	4.3.3	M	M
DPRS-D.2	FU10a	4.3.3	M	M
DPRS-D.3	FU10b	4.3.3	O	O
DPRS-D.4	FU10c	4.3.3	M	M
DPRS-D.5	Data Link Service (LAPC + Lc) class A service	4.3.3	M	M
DPRS-D.6	Data Link Service (LAPC + Lc) class U service	4.3.3	O	O
DPRS-D.7	Lc Frame delimiting and sequencing service	4.3.3	M	M
DPRS-D.8	Broadcast Lb service	4.3.3	M	M
DPRS-D.9	Inter-cell voluntary connection handover	4.3.3	M	O
DPRS-D.10	Connection modification	4.3.3	M	M
DPRS-D.11	Encryption activation	4.3.3	M	M
DPRS-D.12	Encryption deactivation	4.3.3	C81	C81
DPRS-D.13	Connectionless U-plane	4.3.3	C82	C82
C81: If DPRS-N.28 or DPRS-N.29 then M else I.				
C82: If (Ethernet OR Token ring) THEN O ELSE I.				
NOTE: The reference column refers to the relevant clause in the present document.				

7.2 DLC feature to procedure mapping

Table 9: DLC service to procedure mapping

Service	Procedure	Reference	Status	
			PT	FT
DPRS-D.1 LU10 Enhanced Frame RELay service (EFREL)		4.3.3	M	M
	U-plane transmission class 2	11.1.2	M	M
DPRS-D.2 FU10a		4.3.3	M	M
	FU10a frame operation	11.2.1	M	M
DPRS-D.3 FU10b		4.3.3	O	O
	FU10b frame operation	11.2.2	M	M
DPRS-D.4 FU10c		4.3.3	M	M
	FU10c frame operation	11.2.3	M	M
DPRS-D.5 Data Link Service (LAPC + Lc) class A service		4.3.3	M	M
	Class A link establishment	11.3.1	M	M
	Class A acknowledged information transfer	11.3.2	M	M
	Class A link release	11.3.3	M	M
	Class A link re-establishment	11.3.4	M	M
DPRS-D.6 Data Link Service (LAPC + Lc) class U service		4.3.3	O	O
	Class U use of LLN for unacknowledged information transfer	11.4.1	M	M
	Class U link establishment	11.4.2	M	M
	Class U unacknowledged information transfer	11.4.3	M	M
	Class U unacknowledged release	11.4.4	M	M
DPRS-D.7 Lc Frame delimiting and sequencing service		4.3.3	M	M
	C _S -channel fragmentation and recombination	11.5.1	M	M
	C _F -channel fragmentation and recombination	11.5.2	O	O
	Selection of logical channels (C _S and C _F)	11.5.3	M	M
DPRS-D.8 Broadcast Lb service		4.3.3	M	M
	Normal operation	11.6.1	M	M
	Expedited operation	11.6.2	C92	C92
DPRS-D.9 Inter-cell voluntary connection handover		4.3.3	M	O
	Class A connection handover	11.7.1	M	M
DPRS-D.10 Connection modification		4.3.3	M	M
	Connection modification	11.8	M	M
DPRS-D.11 Encryption activation		4.3.3	M	M
	Encryption switching	11.9	M	M
	Connection handover of ciphered connection	11.9.2.2	M	C94
DPRS-D.12 Encryption deactivation		4.3.3	C93	C93
	Encryption switching	11.9	M	M
DPRS-D.13 Connectionless U-plane		4.3.3	C91	C91
	FU10a frame operation	11.2.1	M	M
	Connectionless point-to-multipoint transmission	11.10	M	M

			Status	
Service	Procedure	Reference	PT	FT
C91:	If (Ethernet OR Token ring) THEN O ELSE I.			
C92:	If N.19 - fast paging implemented then M else I.			
C93:	If DPRS-N.28 or DPRS-N.29 then M else I.			
C94:	If DPRS-D.9 then M else I			
NOTE:	The reference column refers to the relevant clause in the present document.			

8 NWK layer requirements

The NWK layer provisions shall include the following entities:

- Call Control (CC);
- Mobility Management (MM);
- Link Control Entity (LCE);
- Connectionless Message Service (CLMS).

Only mobility class 2 equipment requires a NWK layer. For mobility class 1 equipment configuration parameters shall be according to annex A of the present document.

All NWK layer procedures, unless explicitly stated shall be as defined in GAP-EN 300 444 [8], or when relevant, as defined in EN 300 824 [9].

8.1 NWK features

Table 10: NWK features status

Feature supported				
Features			Status	
Item no.	Name of feature	Reference	PT	FT
DPRS-N.1	Outgoing call	4.3.4	O	O
DPRS-N.2	Off hook	4.3.4	M	M
DPRS-N.3	On hook (full release)	4.3.4	M	M
DPRS-N.4	Dialled digits (basic)	4.3.4	O	O
DPRS-N.5	Register recall	4.3.4	O	O
DPRS-N.6	Go to DTMF signalling (defined tone length)	4.3.4	O	O
DPRS-N.7	Pause (dialling pause)	4.3.4	O	O
DPRS-N.8	Incoming call	4.3.4	O	O
DPRS-N.9	Authentication of PP	4.3.4	M	M
DPRS-N.10	Authentication of user	4.3.4	O	O
DPRS-N.11	Location registration	4.3.4	M	O
DPRS-N.12	On air key allocation	4.3.4	M	O
DPRS-N.13	Identification of PP	4.3.4	O	O
DPRS-N.14	Service class indication/assignment	4.3.4	O	O
DPRS-N.15	Alerting	4.3.4	O	O
DPRS-N.16	ZAP	4.3.4	O	O
DPRS-N.17	Encryption activation FT initiated	4.3.4	M	M
DPRS-N.18	Subscription registration procedure on-air	4.3.4	M	M
DPRS-N.19	Link control	4.3.4	M	M
DPRS-N.20	Terminate access rights FT initiated	4.3.4	M	O
DPRS-N.21	Partial release	4.3.4	O	O
DPRS-N.22	Go to DTMF (infinite tone length)	4.3.4	O	O
DPRS-N.23	Go to Pulse	4.3.4	O	O
DPRS-N.24	Signalling of display characters	4.3.4	O	O
DPRS-N.25	Display control characters	4.3.4	O	O
DPRS-N.26	Authentication of FT	4.3.4	O	O
DPRS-N.27	Encryption activation PT initiated	4.3.4	O	O
DPRS-N.28	Encryption deactivation FT initiated	4.3.4	O	O
DPRS-N.29	Encryption deactivation PT initiated	4.3.4	O	O
DPRS-N.30	Calling Line Identification Presentation (CLIP)	4.3.4	O	O
DPRS-N.31	Internal call	4.3.4	O	O
DPRS-N.32	Service call	4.3.4	O	O
DPRS-N.33	Dynamic parameters allocation	4.3.4	M	M
DPRS-N.34	Service Negotiation	4.3.4	M	M
DPRS-N.35	In call service change	4.3.4	O	O
DPRS-N.36	NWK layer management	4.3.4	M	M
DPRS-N.37	Identity assignment	4.3.4	O	O
DPRS-N.38	DECT External handover	5.1 [9]	O	O
DPRS-N.39	Message Waiting Indication	5.1 [9]	O	O
DPRS-N.40	Detach	5.1 [9]	O	O
DPRS-N.41	Periodic location registration	5.1 [9]	O	O
DPRS-N.42	On-air modification of user parameters	5.1 [9]	O	O

NOTE: The reference column refers to the relevant clause in the present document, except where stated otherwise.

8.2 NWK feature to procedure mapping

Table 11: NWK feature to procedure mapping

Feature/Procedure mapping			Status	
Feature	Procedure	Ref.	PT	FT
DPRS-N.1, Outgoing call		4.3.4	O	O
	Outgoing call request	12.1	M	M
	Overlap sending	8.3 [8]	M	O
	Outgoing call proceeding	8.4 [8]	M	O
	Outgoing call confirmation	8.5 [8]	M	O
	Outgoing call connection	8.6 [8]	M	M
DPRS-N.2, Off Hook	Sending keypad information	8.10 [8]	O	O
		4.3.4	M	M
	Outgoing call request	12.1	M	M
DPRS-N.3, On Hook (full release)	Incoming call connection	8.15 [8]	M	M
		4.3.4	M	M
	Normal call release	8.7 [8]	M	M
DPRS-N.4, Dialed digits (basic)	Abnormal call release	8.8 [8]	M	M
		4.3.4	O	O
DPRS-N.5, Register recall	Sending keypad information	8.10 [8]	M	M
		4.3.4	O	O
DPRS-N.6 Go to DTMF signalling (defined tone length)	Sending keypad information	8.10 [8]	M	M
		4.3.4	O	O
DPRS-N.7, Pause (dialling pause)	Sending keypad information	8.10 [8]	M	M
		4.3.4	O	O
DPRS-N.8, Incoming call	Sending keypad information	8.10 [8]	M	M
		4.3.4	O	O
	Incoming call request	12.2	M	M
	Incoming call confirmation	8.13 [8]	M	M
	PT alerting	8.14 [8]	M	M
DPRS-N.9, Authentication of the PP	Incoming call connection	8.15 [8]	M	M
		4.3.4	M	M
	Authentication of PT	8.24 [8]	M	M
DPRS-N.10, Authentication of the user		4.3.4	O	O
	Authentication of user	8.25 [8]	M	M
DPRS-N.11, Location registration		4.3.4	M	O
	Location registration	8.28 [8]	M	M
	Location update	8.29 [8]	M	O
	Terminal capability indication	12.3	M	M
DPRS-N.12, On air key allocation		4.3.4	M	O
	Key allocation	8.32 [8]	M	M
DPRS-N.13, Identification of PP		4.3.4	O	O
	Identification of PT	8.22 [8]	M	M
DPRS-N.14, Service class indication/assignment		4.3.4	O	O
	Obtaining access rights	8.30 [8]	M	M
	Authentication of PT	8.24 [8]	M	M
DPRS-N.15, Alerting		4.3.4	O	O
	PT alerting	8.14 [8]	M	M
DPRS-N.16, ZAP		4.3.4	O	O
	Obtaining access rights	8.30 [8]	M	M
	Incrementing the ZAP value	8.26 [8]	M	M
	Authentication of FT	8.23 [8]	O	M
DPRS-N.17, Encryption activation FT initiated		4.3.4	M	M
	Cipher-switching initiated by FT	8.33 [8]	M	M
	Storing the Derived Cipher Key (DCK)	8.27 [8]	M	M
DPRS-N.18, Subscription registration user procedure on-air		4.3.4	M	M
	Obtaining access rights	8.30 [8]	M	M
	Terminal capability indication	12.3	M	M

Feature/Procedure mapping			Status	
Feature	Procedure	Ref.	PT	FT
DPRS-N.19, Link control		4.3.4	M	M
	Indirect FT initiated link establishment	12.11	M	M
	Fast Paging	12.12	O	O
	Collective and group ringing	12.13	O	O
	Direct FT initiated link establishment	12.14	O	O
	Direct PT initiated link establishment	8.36 [8]	M	M
	Link release "normal"	8.37 [8]	M	M
	Link release "abnormal"	8.38 [8]	M	M
	Link release "maintain"	8.39 [8]	I	I
DPRS-N.20, Terminate access rights FT initiated		4.3.4	M	O
	FT terminating access rights	8.31 [8]	M	M
	Authentication of FT	8.23 [8]	O	M
DPRS-N.21, Partial release		4.3.4	O	O
	Partial release	8.9 [8]	M	M
DPRS-N.22, Go to DTMF (infinite tone length)		4.3.4	O	O
	Sending keypad information	8.10 [8]	M	M
DPRS-N.23, Go to Pulse		4.3.4	O	O
	Sending keypad information	8.10 [8]	M	M
DPRS-N.24, Signalling of display characters		4.3.4	O	O
	Display	8.16 [8]	M	M
	Terminal capability indication	12.3	M	M
DPRS-N.25, Display control characters		4.3.4	O	O
	Display	8.16 [8]	M	M
	Terminal capability indication	12.3	M	M
DPRS-N.26, Authentication of FT		4.3.4	O	O
	Authentication of FT	8.23 [8]	M	M
DPRS-N.27, Encryption activation PT initiated		4.3.4	O	O
	Cipher-switching initiated by PT	12.9	M	M
	Storing the DCK	8.27 [8]	M	M
DPRS-N.28, Encryption deactivation FT initiated		4.3.4	O	O
	Cipher-switching initiated by FT	8.33 [8]	M	M
DPRS-N.29, Encryption deactivation PT initiated		4.3.4	O	O
	Cipher-switching initiated by PT	12.9	M	M
DPRS-N.30, Calling Line Identification Presentation (CLIP)		4.3.4	O	O
	Incoming call request	12.2	M	M
DPRS-N.31, Internal call		4.3.4	O	O
	Internal call set-up	8.18 [8]	M	M
	Internal call keypad	12.4	O	O
DPRS-N.32, Service call		4.3.4	O	O
	Service call set-up	8.20 [8]	M	M
	Service call keypad	8.21 [8]	O	O
DPRS-N.33, Dynamic parameters allocation		4.3.4	M	M
	Dynamic parameters allocation	12.8	M	M
DPRS-N.34, Service Negotiation		4.3.4	M	M
	Call Resources/Parameters negotiation	12.5	M	M
DPRS-N.35, In call service change		4.3.4	O	O
	Bandwidth Change	12.6	M	M
	IWU-attributes change	12.7	M	M
DPRS-N.36, NWK layer management		4.3.4	M	M
	Management of MM procedures	12.18	M	M
	Management - Location registration initiation	13.2 [8]	M	C113
	Management - Assigned individual TPUI	13.3 [8]	M	C113

Feature/Procedure mapping			Status	
Feature	Procedure	Ref.	PT	FT
	Management - PMID	12.19	M	M
	Management - DCK	13.6 [8]	M	M
	Management - Broadcast attributes	12.17 [8]	M	M
	Management - Storage of subscription related data	13.7 [8]	M	M
	U-plane handling	12.17	M	M
	Length of NWK layer messages	12.20	M	M
	Identities	12.21	M	M
DPRS-N.37, Identity Assignment		4.3.4	O	O
	Temporary Identity Assign	12.10	M	M
DPRS-N.38, DECT External handover		5.1 [9]	O	O
	Handover candidate indication	9.1.1.1 [9]	M	M
	Handover candidate retrieval	9.1.1.2 [9]	M	O
	Target FP selection	9.1.2 [9]	M	N/A
	Handover reference indication	9.1.3.1 [9]	M	C112
	Handover reference retrieval	9.1.3.2 [9]	M	C112
	External handover call setup	9.1.4 [9]	M	M
	Ciphering procedure PT initiated	9.1.5.1 [9]	O	O
	Ciphering procedure FT initiated	9.1.5.2 [9]	M	M
	U-plane handling	9.1.6 [9]	M	M
DPRS-N.39, Message Waiting Indication		5.1 [9]	O	O
	Message waiting indication	9.7 [9]	M	M
DPRS-N.40, Detach		5.1 [9]	O	O
	Detach	9.5 [9]	M	M
DPRS-N.41, Periodic location registration		5.1 [9]	O	O
	Enhanced location registration	9.6 [9]	M	M
DPRS-N.42, On-air modification of user parameters		5.1 [9]	O	O
	On-air modification of user parameters	9.8 [9]	M	M
	FT authentication	8.23 [9]	M	M
C111: If single cluster system: O else M.				
C112: At least one of these procedures shall be supported.				
C113: If DPRS-N.11 then M else I.				
NOTE: The reference column refers to the relevant clause in the present document, except where stated otherwise.				

8.3 Application features

Table 12: Application feature to procedure mapping

Feature supported			Status	
Item no.	Name of feature	Reference	PT	FT
DPRS-A.1	AC_bitstring_mapping	4.3.5	M	M
DPRS-A.2	Multiple subscription registration	4.3.5	O	N/A
DPRS-A.3	Manual entry of the PARK	4.3.5	O	N/A
NOTE: The reference column refers to the relevant clause in the present document.				

8.4 Application feature to procedure mapping

Table 13: Application feature to procedure mapping

Feature/Procedure mapping			Status	
Feature	Procedure	Ref.	PT	FT
DPRS-A.1, AC to bitstring mapping		4.3.5	M	M
	AC to bitstring mapping	14.2 [8]	M	M
DPRS-A.2, Multiple subscription registration		4.3.5	O	N/A
	Subscription control	14.1 [8]	M	N/A
DPRS-A.3, Manual entry of the PARK		4.3.5	O	N/A
	Manual entry of the PARK	14.3 [8]	M	N/A
NOTE: The reference column refers to the relevant clause in the present document, except where stated otherwise.				

8.5 Distributed Communications

Table 14: Distributed Communication procedure status

Feature/Procedure mapping					
Feature/Procedure			Status		
Feature Name	Procedure name	Reference	PT	FT	HyP
DPRS-DC.1		4.3.6	O	O	M
	General Requirements	13.2	M	M	M
	HyP Identities handling	13.3.1	N/A	M	M
	Membership Access Rights Allocation	13.3.2	M	M	M
	Re-initialization of membership access rights	13.3.3	M	M	M
	Members Data Transfer	13.3.4	M	M	M
	Presence/Absence Indication	13.3.5	M	M	M
	Bandwidth management	13.3.6	M	M	M
	Direct Link Establishment	13.3.7	M	M	M
	Indirect Link Establishment	13.3.8	M	M	M
	MASTER management	13.3.9	M	M	M
	Common Subscription Database management	13.3.10	M	M	M
	Handover issues	13.3.11	M	M	M
	Usage of PPs or FPs in DCDL-net	13.5	M	M	M
NOTE: The reference column refers to the relevant clause in the present document.					

9 Management Entity Requirements

9.1 Introduction

The Management Entity (ME) is responsible for management of physical resources and logical associations between and into the DECT protocol layers.

Table 15: Management Entity Requirements

Feature/Procedure mapping			Status	
Feature	Procedure	Reference	PT	FT
DPRS-ME.1, Class 1 management		4.3.7	C152	C152
	Logical Connection management	9.4.1, 9.2.2	M	M
	Suspend management	9.3.1.2, 9.3.2.2	M	M
	Resume management	9.3.1.1.2, 9.3.2.1	M	M
	Stay Alive	9.4.3	M	M
	Dynamic Bandwidth management	9.3.1.4, 9.3.2.3	C151	C151
DPRS-ME.2, Class 2 management		4.3.7	C153	C153
	Logical Connection management	9.4.2, 9.2.3	M	M
	Suspend management	9.3.1.2, 9.3.2.2	M	M
	Resume management	9.3.1.1.2, 9.3.2.1	M	M
	Stay Alive	9.4.3	M	M
	Dynamic Bandwidth management	9.3.1.4, 9.3.2.3	C151	C151
C151: IF (DPRS-M.5. Multi bearer Physical connection setup) THEN M ELSE I.				
C152: IF DPRS Class 1 supported THEN M ELSE I.				
C153: IF DPRS Class 2 supported THEN M ELSE I.				
NOTE: The reference column refers to the relevant clause in the present document.				

9.2 Description of the DPRS operation principles

9.2.1 General

In DPRS, the management of the "physical connections" is always under control of the Management Entity (ME). The ME decides in real time the activation, release, or change of bandwidth of the physical connection, based on the existence of U-plane data or C-plane messages to be transmitted, and according to the requirements described in this clause. The higher layer entities are responsible for the presence or absence of the valid data at the MAC service boundaries upon which such lower layer resource management is based.

9.2.2 Service class 1

Service class 1 is a simplified version of DPRS that does not incorporate C-plane. Class 1 is intended for small private applications with restricted mobility and control features. Because of back-compatibility reasons, class 1 uses a specific ad-hoc solution with some differences with class 2 equipment.

In service class 1, the "physical connection", the MBC instance, and the DLC link, are permanently associated. The activation and release of the physical resources are done by set-up and release of the DLC "link". All requirements provided in this clause are valid, taken into account that the activation or release of a "physical connection" have associated the activation or release of the MBC and DLC layers.

Service class 1 provides a user service that is equivalent to a Permanent Virtual Circuit (PVC).

9.2.3 Service class 2

Service class 2 provides additionally the capabilities of the DECT C-plane. In service class 2, any NWK layer service is permanently mapped to a DLC layer "link" and to a MBC logical instance called "logical connection". All these entities exist during the length of a user connection. User connections could be "Virtual calls" (VC) or "Permanent Virtual Circuits" (PVC).

The allocation of physical resources to the "logical connection" is performed in real time by the Management Entity, based on the existence of U-plane data or C-plane messages to be transmitted, and according to the requirements described in this clause. The set of bearers and TBC's temporally allocated to a "logical connection" is the "physical connection".

A "logical connection" is in active state if it has associated a "physical connection" and in suspended state otherwise.

9.3 Resource and physical connection management

This clause describes when a "Physical Connection" should be set up or released, and which procedures should be used.

9.3.1 Requirements applicable to the Fixed Part (FP)

9.3.1.1 Conditions for resumption and management procedures

9.3.1.1.1 General

The FP may resume a Physical Connection, if any of the following conditions meet:

- there are user plane data to be transmitted downstream;
- there are high layer C-plane data to be transmitted downstream (applicable only to service class 2);
- there are MAC control messages to be transmitted downstream.

NOTE: The activation of the Physical Connection as consequence of the handshake procedure is considered as part of condition 3 (see clause 9.4.3).

9.3.1.1.2 ME procedures for FT initiated connection resumption

For equipment of both mobility class 1 and mobility class 2, MAC connection establishment from the FP to the PP goes as follows.

The FP shall try to establish the Physical Connection using the FT initiated set-up procedure (fast set-up) (see clause 10.10.1.2) if the FT supports Fast Setup, and the PP supports fast set-up and is supposed to be in idle-locked state with set-up detection.

- The PP will be supposed to be in idle-locked state with set-up detection if the time elapsed since the Physical Connection was released by last time is lower than timer T909.

The fast set-up procedure should result in at least one set-up attempt. If the PP is supposed not to be in idle-locked state with set-up detection, then the fast set-up is not required.

If Fast set-up procedure has failed or has not been used, then the FP may try to establish the Physical Connection using MAC-resume paging (see clause 10.4).

In this case, the FP shall use Fast MAC-resume paging (see clause 10.4), if the FT supports Fast Paging, and the PP is known to support fast paging, and use normal MAC-resume paging (see clause 10.4) otherwise.

- The ME may freely choose the number of MAC-paging attempts.

NOTE: MAC paging is not required if the FP has done a Fast Setup attempt and Fast Setup is supported by the PP.

If the previous set-up procedures have failed, the FP shall try to establish the Physical Connection using LCE-resume paging (see clause 12.15). The FP shall use fast LCE-resume paging, the FT supports Fast Paging, and, if the PP is known to support fast paging, otherwise it shall use normal paging. The fast paging should result in at least one paging attempt.

If the fast paging fails or has not been used or if the PP does not support fast paging then the FP should try to establish a Physical Connection with normal LCE-resume paging.

In case of no response from the PT, the FT may repeat the paging attempt according to implementation specific algorithms. Process may continue until violation of the handshake (stay alive) procedure (clause 9.4.3), when the connection shall be released.

Class 1 systems

For class 1 systems, the paging shall be initiated by the ME, by issuing a MAC_PAGE-req primitive. The SDU passed with the primitive shall be such that the contents of the paging message is as defined in EN 300 175-5 [5] clause 8.2.1, short format message, using default TPUI, with the following exception:

- the LCE header field shall have the value 111 (I_p -error-correct), or 110 (I_p -error-detect).

Receipt of a paging message with a mobility class 1 TPUI indicates that the paging message should be handled by the ME. Upon receipt of a MAC-PAGE-ind primitive with the TPUI of the PP as parameter, the ME shall issue a MAC_CON-req primitive.

Class 2 Systems: MAC-resume paging

The MAC resume paging shall be done according to clause 10.4.

Class 2 Systems: LCE-resume paging

The LCE resume paging shall be done according to the procedure described in clause 12.15.

9.3.1.2 Connection Suspension conditions

9.3.1.2.1 General

The ME of the FP may request a suspension of the connection at any time according to implementation specific algorithms.

In addition to that, the FP shall request a suspension of the connection in the following cases:

- in case of no user-data or C-plane activity;
- by violation of the minimum number of bearers (MAC Bandwidth command);
- by loss of all received bearers;
- by loss of the last duplex bearer controlling the connection.

The FT shall indicate the relevant Suspension reason as indicated in clause 10.7.1. If the FT indicates for suspension reason the < Local temporary transmission/reception limits > and the minimum number of bearers negotiated by the NWK layer was "0" the PT shall accept the suspension even if there is a data for transmission up-link. In all other cases, if there is data for transmission up-link, the PT may reject the suspension, see clause 10.7.1. In any case, the FP is allowed to force the PP down to the minimum number of bearers, negotiated by the NWK layer.

NOTE: Under "number of bearers" throughout the present document, the number of simplex bearers in one direction is to be understood, e.g. a double simplex bearer consist of 2 simplex bearers, whereas, a duplex bearer consist of 1 uplink and 1 down-link simplex bearers.

9.3.1.2.2 Connection suspension due to no data activity

The ME of the FP shall request a suspension of the connection if no new PDU or C-plane message has been transmitted nor received during a consecutive period of T903 indicating suspension reason < No data for transmission >. See clause 10.7.1 for suspend procedure.

NOTE: Timer T903 is set by the FP (see annex A).

9.3.1.2.3 Connection suspension due to violation of the minimum number of bearers (MAC Bandwidth command)

The FP shall suspend the connection if the MAC layer is unable to set the "minimum number of bearers" for any of the directions of the connection, and this situation exists for more time than T906 indicating suspension reason < Violation of the minimum number of bearers >. See clause 10.7.1 for the suspend procedure.

NOTE: See annex A for definition and value of T906.

9.3.1.2.4 Connection suspension by loss of all received bearers

The FP will suspend the connection if all received bearers of the connection are lost, and this situation exists for more time than T908.

NOTE: See annex A for definition and value of T908.

9.3.1.2.5 Activation of Fast Scan mode after Connection suspension

After the suspension of the connection, if the PP supports fast set-up, and parameter T909 (annex A) (class 2 devices) is different from zero, the PP shall pass to Idle-locked state with set-up detection (fast scan mode), as defined in EN 300 175-3 [3] clause 11.3.3.2.

The PP shall remain in this state for at least the time specified in the parameter T909. During this time, the PP shall accept FT initiated bearer set-up using the procedure defined in clause 10.10.1.2. After this time the PP may pass to normal Idle-locked state with page detection (EN 300 175-3 [3] clause 11.3.3.1).

For service class 1 equipment the value of T909 is stored in the PP configuration table (see clause A.2).

For service class 2 equipment, T909 is variable parameter (see clause A.1.3.2) that can be negotiated between FT and PT by means of the << SETUP-CAPABILITY >> NWK layer information element (see clause 12.8).

9.3.1.3 Conditions for Bandwidth modification

9.3.1.3.1 General

The ME of the FP could decide a change in the bandwidth of a connection at any time according to implementation specific algorithms. The FP will use the Bandwidth modification procedure described in clause 10.7.

The PP shall mandatory accept any change of Bandwidth instanced by the FP if the requested bandwidth is within the maximum and minimum values negotiated at NWK layer.

9.3.2 Requirements applicable to the Portable Part (PP)

9.3.2.1 Conditions for connection resumption

The Connection will be resumed by the PP if and only if any of the following conditions meet:

- the PP has U-plane data ready to be sent upstream;
- the PP has C-plane data ready to be sent upstream;
- the PP has MAC control messages to be transmitted upstream;

- the PP initiated this procedure with the result of being refused by the FP, as described in clause 9.3.2.1.5, and a time equal to WtB ("Waiting time B"), defined in annex A, has elapsed.

NOTE: The resumption of the Physical Connection as consequence of the handshake procedure is considered as part of condition 3.

If the connection was previously suspended by the FP, (clause 9.3.1.2.1), the PP shall not request a connection resume during an interval equal to WtB ("Waiting time B") as defined in annex A.

9.3.2.1.1 Procedure for PT initiated Connection resumption

The sequence of procedures for the resumption of a connection shall consist on PT initiated pilot bearer set-up (clause 10.10) followed by connection modification (clause 10.7).

9.3.2.1.2 "RFP-busy-for-data" flag

The PT shall not initiate the PT initiated connection resumption procedure if the RFP has activated the RFP-busy-for-data flag in RFP status (EN 300 175-3 [3] clause 7.2.4.3.9).

9.3.2.1.3 Waiting time for collision avoidance after deactivation of "RFP-busy-for-data" flag

If the RFP had activated the RFP-busy-for-data flag in RFP status (EN 300 175-3 [3] clause 7.2.4.3.9), after the deactivation of this flag, the PT shall wait a random interval WtA (see clause A.1.2.1) before initiating any bearer set-up procedure, to prevent access collisions. In case of access collision during the following PT initiated set-up procedure (clause 10.10), the PT shall wait a random interval WtA before repeating the access request attempt. In case of successive collisions, formula will be applied with successive increment in the spreading range.

9.3.2.1.4 Bandwidth after resumption

As consequence of the procedure, the FP will inform the PP about the number of bearers (bandwidth) to be used. This value shall be within the range negotiated by the network layer. The PP will use always the bandwidth mandated by the FP.

9.3.2.1.5 Resumption rejection by the FP

If as consequence of the set-up procedure, the FP rejects the access attempt with the message Bandwidth = zero, the PP will do the following actions:

- PT shall immediately release all bearers;
- PT shall wait the waiting time WtB (see clause A.1.2.2) and shall repeat the pilot bearer set-up procedure (clause 10.10).

In case of repetitive failures the waiting time WtB shall be increased to obtain congestion avoidance, according to the formulae given in annex A.

9.3.2.2 Conditions for Connection Suspension

9.3.2.2.1 General

The ME of the PP may request a suspension of the Connection at any time according to implementation specific algorithms.

In addition to that, the PP shall initiate a suspension of the Connection in the following cases:

- in case of no user-data or C-plane activity;
- by violation of the minimum number of bearers (MAC Bandwidth command);
- by loss of all received bearers;
- by loss of the last duplex bearer controlling the connection.

The PT shall indicate the relevant Suspension reason as indicated in clause 10.7.1. If the PT indicates for suspension reason the < Local temporary transmission/reception limits > and the minimum number of bearers negotiated by the NWK layer was "0" the FT shall accept the suspension even if there is a data for transmission down-link. In all other cases, if there is data for transmission downlink, the FT may reject the suspension, see clause 10.7.1.

9.3.2.2.2 Connection suspension due to no data activity

The ME of the PP shall request a suspension of the connection if no new PDU or C-plane message has been transmitted nor received during a consecutive period of T903 indicating suspension reason < No data for transmission >. See clause 10.7.1 for suspend procedure.

NOTE: Timer T903 is broadcasted by the FP (see annex A).

9.3.2.2.3 Connection suspension due to violation of the minimum number of bearers (MAC Bandwidth command)

The PP shall suspend a Connection if the MAC layer is unable to set the "minimum number of bearers" for any of the directions of the connection, and this situation exists for more time than T906 indicating suspension reason < Violation of the minimum number of bearers >. See clause 10.7.1 for suspend procedure.

NOTE: See annex A for definition and value of T906.

9.3.2.2.4 Connection suspension by loss of all received bearers

The PP will suspend a Connection if all received bearers of the connection are lost, and this situation exists for more time than T908.

NOTE: See annex A for definition and value of T908.

9.3.2.2.5 Activation of fast scan mode after Connection suspension

The same requirements specified in clause 9.3.1.2.5 are applicable in this case.

9.3.2.3 Conditions for Bandwidth modification

9.3.2.3.1 General

The ME of the PP could request a change in the bandwidth of a connection at any time according to implementation specific algorithms. The PP will use the Bandwidth modification procedure described in clause 12.6.

The Bandwidth modification requested by the PP has the nature of suggestion. The FP is free to accept or not the Bandwidth modification requested by the PP. The PP will mandatory accept the Bandwidth indicated by the FP in the answer to the Bandwidth message if the value is within the maximum and minimum values negotiated at NWK layer.

When as described in clause 10.7.1, the PP requests a suspension of the Connection, the FP will decide, taken into account the existence or not of data downstream, whether to suspend the Connection, or to modify the bandwidth (i.e. reverting the direction). Decision is indicated in the values of the bandwidth message sent by the FP.

When a PT has requested a bandwidth modification that involves increasing the number of bearers, and it has been refused by the FT, the PT shall not repeat the request of bandwidth extension during an interval WtB (see clause A.1.2.2).

NOTE: The PT may request bandwidth modification reducing number of bearers at any time.

9.4 Logical Connection management

This clause describes when the "Logical Connections" should be suspended or released, and which procedures should be used.

9.4.1 Requirements for class 1 devices

In DPRS service class 1, the setting of the "Virtual Calls" (VC) or the "Permanent Virtual Calls" (VC) does not include C-plane activities and should be considered as setting up directly a Logical Connection.

9.4.2 Requirements for class 2 devices

9.4.2.1 General Description

DPRS service class 2 supports two types of user Connections: Virtual calls (VC) and Permanent Virtual Circuits (PVC).

"Virtual Calls" (VC) are packet-mode user connections that can be set up and released by means of NWK layer C-plane procedures. A "Virtual Call" is the equivalent in packet-mode to a circuit-mode "Call".

"Permanent Virtual Circuit" (PVC) are packet-mode user connections that are established and cleared by configuration. A "Permanent Virtual Circuit" is the equivalent in packet-mode to a circuit-mode "Leased Line".

In DPRS, service class 2, any user connection has permanently associated a DLC layer "link" and a MAC "logical connection" (MBC).

9.4.2.2 Normal procedures of virtual call set-up and release

Virtual Calls are set up always by means of the NWK layer CC-SETUP (clause 12.5) procedure. Set up of the Virtual Call will cause the creation of a DLC "link" and a MAC "logical connection" (MBC) associated to the call.

The normal release of VC's is done by means of the NWK layer Call release procedure (see clause 12). The CC-RELEASE message (see clause 12) shall be exchanged between both peers. The releasing of the virtual call automatically causes the clearing of the DLC and MAC "logical connection" (MBC) associated to the call.

9.4.2.3 Abnormal release of Virtual Calls

Virtual Calls may be released by the ME without NWK layer Call-release procedures in case of violation of the handshake (stay alive) procedure described in next clause. The abnormal release of a virtual call shall automatically cause the clearing of all NWK, DLC and MAC resources associated to the call.

In the case of PVC's set up by configuration, the connections shall never be released. In case of failure of the handshake procedure, a notification will be send to the OAM subsystem in the FP side.

9.4.2.4 Release of Logical Connection

The MAC logical connection is released in the following cases:

- in case of normal release of the Virtual Call (see clause 9.4.2.2);
- in case of abnormal release of the Virtual Call (see clause 9.4.2.3);
- as consequence of connection handover procedure (see clause 11.7).

9.4.3 The handshake (stay alive) procedure

During suspended state of one connection PT may due to different reasons release the connection without noticing the FT, e.g. PT leaves the coverage area or is switched off. To prevent the FT from hanging a specific handshake control for a suspended connection is introduced which shall be operated through the stay-alive procedure as described in this clause.

The stay alive procedure consists of a successful bearer establishment followed by a connection modification negotiation for bandwidth "0" (i.e. new connection suspension negotiation), followed by connection modification to bandwidth "0" (suspension).

NOTE 1: In order to expedite the process, the PT is allowed to send the messages bearer_request and BANDWIDTH.req in the same frame.

To get a handshake control for suspended connections, a connection shall not be in suspended state for more than T910. To meet this rule, the PT is responsible to perform a handshake with the FT at least T910-T200 after entering the suspend state. In order to avoid connection release caused by a single bearer set-up procedure that failed, PTs shall perform handshake attempts in shorter time intervals than T910. The PT shall try five handshake attempts within T910. After successful handshake (successful bearer setup) the Timer T910 and the counter for handshake attempts shall be reset.

The FP is allowed to initiate a handshake with the PT at any time.

Upon entering the connection SUSPENDED state every side shall start timer T910. Upon successful establishment of a pilot bearer for a suspended connection timer T910 shall be cancelled at both sides.

If a MAC connection associated to a Virtual Call has been in suspend state for more than T910, the connection, including the controlling MBC, the associated DLC and the virtual call shall be released.

NOTE 2: As no physical connection is established, this clearing procedure doesn't need any further air interface (bearer release) procedure.

NOTE 3: T200 is the MAC connection set-up timer. Its value can be found in EN 300 175-3 [3] clause A.1.

In regard to the stay alive procedure, the parameters in the bandwidth modification message shall be set as follows:

$$T_{Up} = 0, T_{down} = 0, M_{up} = 0, M_{down} = 5$$

If during the stay-alive procedure, before answering to the connection modification negotiation for bandwidth "0", the responding side receives internal indication that there is higher layers data for downlink transmission this side may:

- either accepts the suspension by sending back the BANDWIDTH.cfm message with the same values as received in the BANDWIDTH.req and initiate afterwards a resumption;
- or alternatively, it may ignore the BANDWIDTH.req received and send its own BANDWIDTH.req with the relevant needed values. If during stay alive procedure the initiating side receives a BANDWIDTH.req suggesting values different than 0 it shall abandon the stay alive procedure and continue with the de-facto "resumption" procedure.

10 MAC layer procedures

10.1 General

10.1.1 Frame and multiframe structure

The FT and PT shall support frame and multiframe structures as defined in EN 300 175-3 [3] clause 4.2.

10.1.2 Bit mappings

The FT and PT shall support D-MAP D00 and D32 and A-MAP as defined in EN 300 175-3 [3] clause 6.2.1.

FT and PT shall support D-Map D64 with $f = 0$, if modulation scheme 2 (4 level modulation) is supported according to clause 5.2 of the present document.

FT and PT shall support D-Map D96 with $f = 0$, if modulation scheme 3 (8 level modulation) is supported according to clause 5.2 of the present document.

In relation to the modulation schemes supported, the following B-field formats as defined in EN 300 175-3 [3] clause 6.2.1.3 shall be supported:

Table 16: Protected B-field formats B-MAP to support

Modulation scheme	Multisubfield protected B-field format	Singlesubfield protected B-field format
1a/1b	mandatory	optional
2	mandatory	mandatory
3	mandatory	mandatory
NOTE: Modulation schemes 2 and 3 are optional to support.		

10.1.3 Time multiplexers

The FT and PT shall support T-MUX, E/U-MUX E32 and U32b, and C-MUX as defined in EN 300 175-3 [3] clause 6.2.2.

According to the modulation schemes and B-MAP formats supported, the following E/U-Mux schemes as defined in EN 300 175-3 [3] clause 6.2.2.2 shall apply:

Table 17: E/U-Mux schemes to support

Modulation scheme	Multisubfield protected B-field format E-MUX	Multisubfield protected B-field format U-Mux	Singlesubfield protected B-field format U-Mux
1a/1b	E32 mandatory	U32b mandatory	U32c optional
2	E64 mandatory	U64b optional	U64c mandatory
3	E96 mandatory	U96b optional	U96c mandatory
NOTE: Modulation schemes 2 and 3 are optional to support.			

10.1.4 Scrambling

The FT and PT shall support scrambling as defined in EN 300 175-3 [3] clause 6.2.4.

10.1.5 Error control

The FT and PT shall support R-CRC and X-CRC generation as defined in EN 300 175-3 [3] clause 6.2.5.

For modulation schemes 1a and 1b as defined in clause 5.2 of the present document, FT and PT shall support 16-Bit R-CRC as defined in EN 300 175-3 [3] clause 6.2.5.2.

For modulation schemes 2 and 3 as defined in clause 5.2 of the present document, FP and PT shall support 32-Bit CRC as defined in EN 300 175-3 [3] clause 6.2.5.5.

10.1.6 A-tail identifications

The FT and PT shall understand all A-field tail identifications (bits a0 to a2) as defined in EN 300 175-3 [3] clause 7.1.2. The value 101 - "escape" need not be understood. To distinguish a connectionless bearer from a non-connectionless bearer the Nt message send on a connectionless bearer shall carry the value "Identity information (N_t) on connectionless bearer" (010) and the value "Identity information (N_t)"(011) in all other cases.

10.1.7 B-field identifications

The FT and PT shall understand all B-field identifications (bits a4 to a6) as defined in EN 300 175-3 [3] clause 7.1.4.

10.1.8 RFP idle receiver scan sequence

The FT shall support primary scan as defined in EN 300 175-3 [3] clause 11.8.

10.1.9 PT receiver scan sequence

The PT receive scan sequence, whenever active, shall lead the RFP primary scan by one frame, as defined in EN 300 175-3 [3] clause 11.9.

If PT has blind slots, i.e. slots on which setup of bearer is not possible due to implementation limitations these shall be indicated during subscription and location registration to the FT as described in clause 12.3.

NOTE: Indication for PT blind slots has been introduced to the present document after version 1.1.1. Therefore PTs developed before version 1.2.0 may have limitation but will not be able to indicate them to the FT. Therefore, a FT supporting fast setup should be aware that failure of the setup may be due to PT limitations which has not been announced. Some examples of possible limitations could be inability of the PT to receive setup on slots adjacent to the slot on which the PT is locked or currently transmitting, or PT is able to receive only on every second slot odd or even. In such situation the FT should repeat the setup on different slot expecting possible limitations.

10.1.10 PP states and state transitions

The procedure shall be performed as specified in EN 300 175-3 [3] clause 11.3.3, with the following provisions:

- The PT shall allow fast setup (if supported) for a period of time immediately following the transition from Active_Locked to Idle_Locked state. The duration of this period is communicated to MAC by ME (see clause 9.3.1.3).

10.1.11 Identities

The provisions of EN 300 175-3 [3] clause 11.7 and EN 300 175-6 [6] shall be implemented with respect to the structure and use of identities.

10.2 Non continuous broadcast

10.2.1 Request for specific Q-channel information

This procedure relates to TARI support. When supported it shall be implemented according to the requirements in this clause.

The FT shall indicate the availability of TARI information in the TARI related field of the Q_i-5 message as indicated in EN 300 175-3 [3] clause 7.2.3.6 and clause 10.3.2.3 in the present document. If this field is set to "No" the PT shall not request TARI information.

The PT shall have the capability to submit and the FT shall understand and respond to, requests for specific Q-channel information as defined in EN 300 175-3 [3] clause 9.3.1.2.

The PT shall have the capability to initiate, and the FT shall understand and respond to a request for extended system information as defined in EN 300 175-3 [3] clause 11.2.

10.2.2 Request for a new dummy

The PT shall have the capability to initiate, and the FT shall understand and react upon a request for a new dummy bearer as defined in EN 300 175-3 [3] clause 9.3.2.

10.3 Downlink broadcast

The procedure shall be performed as defined in EN 300 175-3 [3] clause 9.1.1.

10.3.1 N_T messages

The FT shall be capable of sending and the PT shall be capable of receiving and processing the N_T message as defined in EN 300 175-3 [3] clause 7.2.2, with contents as defined in table 18.

Table 18: Values used within N_T message

MAC message/broadcast element	Field within the message/broadcast element	Standard values within the MAC message	Normative action/comment
<< RFPI >>			
	< E-bit >	0	No SARI.
		1	SARI available. Relates to service SARI support.
	< PARI >	All	
	< RPN >	All	

10.3.2 Q_T messages

10.3.2.1 Q_T - static system information

The FT shall be capable of sending and the PT shall be capable of receiving and processing the Q_T static system information message as defined in EN 300 175-3 [3] clause 7.2.3.2, with contents as defined below.

Table 19: Values used within static system info

MAC message	Field within the message	Standard values within the MAC message	Normative action/comment
<< Static system info >>			
	< Q_H >	0	
	< NR >	0, 1	PT shall support all values in order to gain lock. Asymmetric connections are not required to be supported by the PT.
	< SN >	0 to 11	PT shall support all values.
	< SP >	0	PT shall support all values in order to gain lock. Half slot connections are not required to be supported by the PT.
	< ESC >	0, 1	PT may ignore and assume the value to be 0.
	< Txs >	0 to 3	PT may ignore and assume the value to be 0.
	< Ext-car >	0, 1	PT shall support all values in order to keep in synchronization with the primary scan.
	< RF-car >	All	The PT shall not use carriers, which are not supported.
	< SPR >	0	PT may ignore.
	< CN >	0 to 9, 10 to 32	PT shall support normal values, and extended frequencies. The PT is not required to support transmission/reception on the extended frequencies.
	< SPR >	0	Until other values are defined PT shall assume this value has been set to 0.
	< PSCN >	0 to 9, 10 to 32	PT shall support normal values, PT may be not able to transmit on any of the extended frequencies, however it shall be able to calculate the exact position of the PSCN based on all indicated to be supported by the FT carriers.

In case of the < Ext-car > bit is set to 1, the RFP shall also broadcast the extended RF carrier information message as defined in EN 300 175-3 [3] clause 7.2.3.3, where the fields are allowed the following values:

Table 20: Values used within extended RF carrier info

MAC message	Field within the message	Standard values within the MAC message	Normative action/comment
<< Extended RF carrier information >>			
	< Q _H >	2	
	< RF carriers >	a12 - a34: {0, 1}	These bits may be set to indicate support for carriers 10-32.
	< RF band >	All relevant	For values see EN 300 175-2 [2].
	< SPR >	0	PT may ignore.
	< Nr of RF carriers >	All	

10.3.2.2 Q_T - FP capabilities

10.3.2.2.1 Standard FP Capabilities

The FP shall indicate its standard capabilities using the fixed part capabilities Q_T message as described in EN 300 175-3 [3] clause 7.2.3.4, with contents as defined below. The PT shall be able to receive and understand this message.

Table 21: Values used within Standard FP capabilities

MAC message	Field within the message	Standard values within the MAC message	Normative action/comment
<< FP capabilities >>			
	< Q _H >	3	
	< a12 >	1	Extended FP info (Q _H = 4).
	< a17 >	1	Full slot.
	< a19 >	[0, 1]	low duty cycle Idle Locked mode allowed.
	< a21 >	[0, 1]	C/L uplink, relates to Distributed communication.
	< a22 >	[0, 1]	C/L downlink, relates to procedure Dynamic Parameter Allocation, clause 12.8, SI _p service and Distributed communication.
	< a25 >	1	B-field set-up.
	< a26 >	[0, 1]	C _F messages, if PT supports only C _S messages it may ignore this value.
	< a29 >	1	I _{p_error_detect} .
	< a30 >	[0, 1]	I _{p_error_correction} , if PT supports only I _{p_error_detect} it may ignore this value.
	< a31 >	[0, 1]	Multibearer connections.

10.3.2.2.2 Extended FP Capabilities

The FP shall indicate its extended capabilities using the Extended fixed part capabilities Q_T message as described in EN 300 175-3 [3] clause 7.2.3.5, with contents as defined below. The PT shall be able to receive and understand this message.

Table 22: Values used within Extended FP capabilities

MAC message	Field within the message	Standard values within the MAC message	Normative action/comment
<< FP capabilities >>			
	< Q_H >	4	
	< a21 >	1	MAC suspends and resume procedure supported.
	< a22 >	[0, 1]	I_{PQ} services supported.
NOTE: For the higher layer capabilities see clause 12.16.			

10.3.2.3 Q_T - SARI list contents

The FT may send and the PT shall be capable of receiving and processing (if broadcast by the FT) the Q_T SARI message as defined in EN 300 175-3 [3] clause 7.2.3.6, with contents as defined below.

This is relevant if the N_T message indicates SARI support.

Table 23: Values used within SARI list contents

MAC message	Field within the message	Standard values within the MAC message	Normative action/comment
<< SARI list contents >>			
	< Q_H >	5	
	< SARI list length >	All	
	< TARIs yes/no >	All	The PP may ignore it if Tertiary Access Rights Identity (TARI) request is not supported (support of TARI is not required).
	< Black yes/no >	All	The PP shall be able of distinguishing ARI from black ARI even if TARI is not supported.
	< ARI or black-ARI >	All	

10.3.2.4 Multiframe number

Q_t6 message carries the multiframe number which is used in the encryption algorithm. Both, FT and PT, shall be able to transmit and respectively retrieve the information carried in this message.

Table 24: Values used within Q_T multiframe number message

MAC message	Field within the message	Standard values within the MAC message	Normative action/comment
<< multiframe number >>			
	< Q header >	6	
	< spare >	111100001111B	
	< multi frame number >	All	The number of the multiframe, modulo 2^{**24} .

10.4 Paging broadcast

10.4.1 Paging message formats

The FT and PT shall support the following paging message formats as defined in EN 300 175-3 [3] clause 7.2.4.1 (for MAC resume paging message):

10.4.1.1 Long or full page message format

Table 25: Values used within long and full-page message format

MAC message	Field within the message	Standard values within the MAC message	Normative action/comment
<< Pt long page format >> or << Pt full page format >>			
	< P _r -header extend flag > (a8)	0,1	a8 = 1 means another page message shall start in the next frame in this multiframe that is permitted to contain a Pt type.
	< BS SDU length indication > (a9 - a11)		
		010	Full-page message shall be used to carry LCE resume page message.
		100	Not the last 36 bits of a long page (see note).
		101	The first 36 bits of a long page (see note).
		110	The last 36 bits of a long page (see note).
		111	All of a long page (first and last) (see note).
	< BS-channel data > (a12 - a47)	All	The content of the BS-channel data is defined by the LCE-message definition.
NOTE: Long page message format shall be used to carry CLMS-fixed - channel data - otherwise not applicable.			

10.4.1.2 Short page message format

Table 26: Values used within short page message format

MAC message	Field within the message	Standard values within the MAC message	Normative action/comment
<< Pt short page format >>			
	< P _t -header extend flag > (a8)	0,1	a8 = 1 means another page message shall start in the next frame in this multiframe that is permitted to contain a Pt type.
	< BS SDU length indication > (a9 - a11)	001	Short page message.
	< BS-channel data > (a12 - a31)	All	The content of the BS-channel data is defined by the LCE-message definition.
	< MAC info type > (a32 - a35)	Various	The definition of MAC layer information to be supported is done by clause 10.4.2.
	< MAC information > (a36 - a47)	Various	The definition of MAC layer information to be supported is done by clause 10.4.2.

10.4.1.3 Zero length page message format

Table 27: Values used within zero length page message format

MAC message	Field within the message	Standard values within the MAC message	Normative action/comment
<< Pt zero length page format >>			
	< Pt-header extend flag > (a8)	0,1	a8 = 1 means another page message shall start in the next frame in this multiframe that is permitted to contain a Pt type.
	< BS SDU length indication > (a9 - a11)	000	Zero length page message.
	< 20 LSBits of RFPI > (a12 - a31)	All	
	< MAC info type > (a32 - a35)	Various	The definition of MAC layer information to be supported is done by clause 10.4.2.
	< MAC information > (a36 - a47)	Various	The definition of MAC layer information to be supported is done by clause 10.4.2.

10.4.1.4 MAC resume page message format

Table 28: Values used within MAC resume page message format

MAC message	Field within the message ²	Standard values within the MAC message	Normative action/comment
<< Pt MAC resume page format >>			
	< Pt-header extend flag > (a8)	0,1	a8 = 1 means another page message shall start in the next frame in this multiframe that is permitted to contain a Pt type.
	< BS SDU length indication > (a9 - a11)	011	MAC resume page.
	< PMID >(a12 - a31)	All	PMID.
	< ECN > (a32-a35)	All	Exchanged connection number.
	(a36 - a47)	1111 1111 1111	Reserved.

10.4.1.5 MAC layer information in zero and short length paging messages

The following MAC layer information types defined by EN 300 175-3 [3] clause 7.2.4.3 shall be supported (understood) by a PT:

Table 29: Types of MAC layer paging information to be supported by a PT

a ₃₂	a ₃₃	a ₃₄	a ₃₅	MAC information type
0	0	0	1	Blind slot information for circuit mode service.
0	0	1	0	Other bearer.
0	0	1	1	Recommended other bearer.
0	1	0	1	Dummy or C/L bearer position.
1	0	0	1	Bearer handover/replacement information.
1	0	1	0	RFP-status and Modulation Types. (see note) (The Modulation Types replaces the spare bits.)
1	1	0	0	C/L bearer position
1	1	1	1	Blind slot information for packet mode service. (This replaces the Modulation Types information.)

NOTE: The procedure how to react on RFP-status "RFP-busy-for-data" during suspension is defined by clause 9.3.2.1.2 and during bearer establishment is defined in clause 10.10.

10.4.1.5.1 RFP status

RFP status		Modulation Types			
		A-field	(B + Z)-fields		
a ₃₆	a ₃₉	a ₄₀	a ₄₃	a ₄₄	a ₄₇

Figure 3

Table 30

RFP status	Meaning
0xxx	RFP clear for data.
1xxx	RFP busy for data (see note).
NOTE: "RFP busy for data" means that the RFP recommends PPs not to send access request messages for data towards this RFP.	

Bits a₄₀ to a₄₃ define the modulation schemes supported in the A-field, in addition to the default one (see note).

Table 31

a ₄₀	a ₄₁	a ₄₂	a ₄₃	A-field modulation scheme
X	X	X	0	2-level modulation supported.
X	X	X	1	2-level modulation not supported.
X	X	0	X	4-level modulation not supported.
X	X	1	X	4-level modulation supported.
X	0	X	X	8-level modulation not supported.
X	1	X	X	8-level modulation supported.
1	X	X	X	Reserved.
0	0	0	0	Previous "spare" code: only 2-level modulation supported.

Bits a₄₄ to a₄₇ define the modulation schemes supported in the (B + Z)-fields, in addition to the default one.

Table 32

a ₄₄	a ₄₅	a ₄₆	a ₄₇	(B + Z)-fields modulation scheme
X	X	X	0	2-level modulation not supported.
X	X	X	1	2-level modulation supported.
X	X	0	X	4-level modulation supported.
X	X	1	X	4-level modulation not supported.
X	0	X	X	8-level modulation supported.
X	1	X	X	8-level modulation not supported.
0	X	X	X	Reserved.
1	1	1	1	Previous "spare" code: only 2-level modulation supported.

NOTE: The "default" modulation scheme is profile dependant (see clause 5.2).

10.4.2 MAC layer information messages procedures

The following MAC layer information message procedures are defined as described below. Each supported message shall be broadcasted at least once every 10 s.

10.4.2.1 Blind slot information for circuit mode service

RFPs that have blind slots due to technological limitations, such as a slow synthesizer, shall announce these blind slots. This may include blind slots due to active bearers as well. Also the slots reserved for packet mode service may be indicated as blind for circuit mode service. This can be dynamically configured by the Management Entity, to optimize the available slots for different services. The idea behind the reserved slots for a specific service is the highly dynamic behaviour of packet mode services, while circuit mode services often carry unprotected voice samples, which should not be impacted by frequent disturbance that may be generated by the packet mode service. By separating the services in different slots, this interference is avoided.

Not available (blind) slot means that the FP mandates the PP not to attempt a set up on this slot for that service type.

If the PP receives blind slot information, it is mandatory for that PP to use it in the process of channel selection. The PP does not have to wait for the blind slot information before making the channel selection.

NOTE: This information is coded identically to the GAP blind full slots to allow compatibility.

10.4.2.2 Bearer handover/replacement information

It is mandatory for RFPs not supporting bearer handover or bearer replacement within the whole FP to broadcast the bearer handover information.

10.4.2.3 Other bearer position

The RFP is recommended to broadcast the "other bearer" information indicating the position of a 2nd dummy bearer or traffic bearer, if such bearer exists.

10.4.2.4 Recommended other bearer position

The RFP is recommended to broadcast the "recommended other bearer" information indicating the position of another bearer. This message shall not be sent unless the bearer that it is sent on will be released in less than or equal to 4 multiframe.

10.4.2.5 Dummy or C/L bearer position

The RFP shall announce the dummy bearer position, if a dummy bearer exists.

10.4.2.6 C/L bearer position

The RFP shall announce the connectionless downlink bearer position, if such a bearer exists. The bearer position must be announced 1 Multi-Frame (4 MF in case of low duty cycle) in advance of transmission of C/L data via this bearer.

10.4.2.7 RFP-status and Modulation Types

The RFP should send the RFP-status information "RFP busy-for-data/not-busy-for-data" as soon as possible after a detection of a change in RFP-status, i.e. in the first allowed frame after the change. It is recommended that the RFP periodically sends the RFP-status information. It is not recommended to send this message very often when the status changes frequently, because the other messages may be delayed too long. A practical limit may be to send this information not more than once a second.

RFPs which are capable of Higher Layer Modulation shall transmit this message to announce this capability, otherwise the peer will assume that only default modulation is available. For the present document, this is 2-level modulation.

10.4.2.8 Blind slot information for packet mode service

The RFP shall announce the slots which are blocked for packet mode service. The coding of the message is identical to 10.4.2.1 Blind slot information for circuit mode service, except that the MAC layer information type bits equal 1111, or value "F".

10.4.3 Normal paging

The procedure shall be performed as defined by EN 300 175-3 [3] clauses 9.1.3.1 and 9.1.3.2. This procedure includes transmission and reception of Zero length page messages.

10.4.4 Fast paging

The procedure shall be performed as defined by EN 300 175-3 [3] clauses 9.1.3.1 and 9.1.3.2.

PT and FT shall indicate the support of this procedure via NWK layer exchange (see clause 12.8).

10.4.5 Low duty cycle paging

The procedure shall be performed as defined by EN 300 175-3 [3] clause 9.1.3.2.

10.4.6 MAC paging

The procedure shall be performed as defined by EN 300 175-3 [3] clauses 9.1.3.1 and 9.1.3.2.

The normal and fast paging procedures may be used for the transmission of a MAC paging message (see clause 10.4.1.4). MAC paging is not triggered by a request from higher layer Broadcast channels and requires assistance from the ME.

10.5 Logical Connection Setup

Logical Connection Setup is the procedure of creation of MBC. This procedure is immediately followed by a Physical connection setup.

The creation of an MBC is defined by EN 300 175-3 [3] clause 10.2.4.1.

Physical Connection setup is defined by clause 10.8.

10.6 Logical Connection Release

Logical Connection Release is the procedure of removal of an MBC. This procedure is preceded by either a NWK layer release procedure or by a handshake failure.

The NWK layer release procedure will cause DLC layer to send a MAC_DIS_req primitive to MBC.

The handshake procedure as defined in clause 9.4.2.3 will cause the ME to send a MAC_DIS_req primitive.

Logical connection release will also cause Physical Connection release as defined in clause 10.8.

10.7 Connection Modification

10.7.1 Connection Modification to change bandwidth

The connection modification procedure to change the bandwidth shall be supported as defined by EN 300 175-3 [3] clause 10.3.1.

The procedure shall be used in the following three cases:

- as part of the setup of a multibearer connection;
- modification of the bandwidth of an existing connection;
- release of a Physical Connection (i.e. suspend, modify to zero bandwidth).

The connection modification procedure consists of two phases:

- bandwidth negotiation;
- bandwidth modification.

10.7.1.1 Bandwidth negotiation

The following describes the negotiation, initiating side may be FT or PT.

The initiating side shall indicate the bandwidth request by means of a BANDWIDTH.req message. The receiving side shall reply to this with a BANDWIDTH.cfm message. The bandwidth indicated by the BANDWIDTH.cfm message is the negotiated bandwidth.

In case of call setup, a bandwidth negotiation procedure shall be initiated by the call originating side.

In case of resume, a bandwidth negotiation procedure shall be initiated by the side which initiated the resume.

If a bandwidth negotiation is initiated and the provided parameters in the request message are in the range negotiated at NWK layer, the responding side shall not ignore the request.

The only exception from this rule is if bandwidth modification with number of bearers equal to 0 (i.e. suspension) is requested due to "no data for transmission". In this case, if the responding side has data for transmission, it is allowed to ignore the request.

In all other cases, the values included in the respond message shall be equal or lower than the values received in the bandwidth modification request, providing that these values are as well within the range of values agreed at the NWK layer negotiation.

If the requested values are outside the range configured or negotiated NWK level, then the receiving in this case side may ignore the request which will leave the negotiated values being equal to the values before the request. Alternatively, the receiving side may choose to respond with values within the range which will make the procedure not to fail.

As the FT is the master side, controlling the bandwidth, the rules for rejecting a bandwidth request are different for FT and PT:

- Rejection of the FT requested bandwidth by the PT can only happen under conditions defined in clause 9.3.1.3.1. Rejection of the FT requested bandwidth equal to 0 by the PT (suspension) can only happen under conditions defined in clause 9.3.1.2.1.
- Rejection of the PT requested bandwidth by the FT is always allowed.

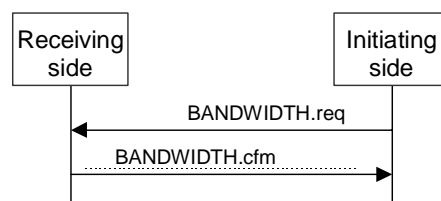


Figure 4: Bandwidth negotiation

In order to improve efficiency of bandwidth usage, it shall be allowed to use the BANDWIDTH_T messages instead of the BANDWIDTH_B messages, wherever appropriate, but the bandwidth-confirm shall be send as the same type of message as the request.

The following fields as defined in EN 300 175-3 [3] clause 7.2.5.3.9 of the BANDWIDTH_T request and confirm messages shall be supported by the PT and the FT.

Table 33: Values used within BANDWIDTH_T message

MAC message	Field within the message	Standard values within the MAC message	Normative action/comment
<< M _T message >>			
	< M _T header >	0001	"Advanced connection control".
	< Command >	8	"Bandwidth_T.request".
		9	"Bandwidth_T.confirm".
	< MUp >	0, 1 to 23	Bandwidth values (see notes 1 and 2).
	< MDown >	0, 1 to 23	Bandwidth values (see notes 1 and 2).
	< TUp >	0, 1 to 23	Bandwidth values (see notes 1 and 2).
	< TDown >	0, 1 to 23	Bandwidth values (see notes 1 and 2).
NOTE 1: The bandwidth value 0 is used in these messages to initiate a connection suspension, see clause 10.7.1. Otherwise the bandwidth values shall be within the limits configured (mobility class 1) or negotiated at call setup (mobility class 2).			
NOTE 2: In case of a connection setup due to the handshake procedure, the bandwidth is immediately negotiated to 0, and the pilot bearer released.			

The following fields as defined in EN 300 175-3 [3] clause 7.3.2.6 of the BANDWIDTH_B request and confirm messages shall be supported by the PT and the FT.

Table 34: Values used within BANDWIDTH_B message

MAC message	Field within the message	Standard values within the MAC message	Normative action/comment
<< MBn message >>			
	< MBn header >	X001	"Advanced connection control".
	< Command >	8	"Bandwidth_B.request".
		9	"Bandwidth_B.confirm".
	< FMID >	All	
	< MUp >	0, 1 to 23	Bandwidth values (see notes 1 and 2).
	< MDown >	0, 1 to 23	Bandwidth values (see notes 1 and 2).
	< TUp >	0, 1 to 23	Bandwidth values (see notes 1 and 2).
	< TDown >	0, 1 to 23	Bandwidth values (see notes 1 and 2).
NOTE 1: The bandwidth value 0 is used in these messages to initiate a connection suspension, see clause 10.7.1. Otherwise the bandwidth values shall be within the limits configured (mobility class 1) or negotiated at call setup (mobility class 2) or service change.			
NOTE 2: In case of a connection setup due to the handshake procedure, the bandwidth is immediately negotiated to 0, and the pilot bearer released.			

10.7.1.2 Bandwidth modification

Depending on the actual situation, different procedures can be used to modify the bandwidth of a connection. To add additional duplex bearers, the single duplex bearer setup procedure shall be used as defined in clause 10.10.1. To add additional simplex bearers, the double simplex bearer setup procedure shall be used as defined in clause 10.10.2. To release bearers, the unacknowledged bearer release procedure shall be used as defined in clause 10.11.1. To reverse double simplex bearers, the fast release procedure shall be used as defined in clause 10.11.3.

The procedures are symmetric, and for the description below the following definition holds:

Table 35: Master/Slave definition

current connection	Modified connection	PT	FT
n.a.	Asymmetric uplink	Master	Slave
n.a.	Symmetric	Master	Slave
n.a.	Asymmetric downlink	Slave	Master
Asymmetric uplink	Suspended	Slave	Master
Symmetric	Suspended	Slave	Master

The order of actions to be performed is as follows:

- release by the slave of any surplus double simplex bearers in the direction slave to master, by either the unacknowledged or fast release procedure;
- release by the master of any surplus bearer;
- set-up by the master of any additional bearer.

10.7.1.3 Suspend

The suspend procedure is a special case of bandwidth modification, with negotiated value equal zero.

Additional situations will also lead to a suspend, without prior exchange of bandwidth negotiation messages:

- loss of all bearers of a connection;
- loss of the last duplex bearer, controlling the connection;
- violation of bandwidth, see clause 9.3.1.2.3.

In these additional situations, the bandwidth modification is immediately performed.

To request the suspension the initiating side shall use one of the following messages:

Table 36: Values used within BANDWIDTH_T.request message

MAC message	Field within the message	Standard values within the MAC message	Normative action/comment
<< M _T message >>			
	< M _T header >	0001	"Advanced connection control".
	< Command >	8	"Bandwidth_T.request".
	< MUp >	00000	Suspend.
	< MDown >	00000	Shall not be used (see note).
		00001	Suspend reason - No data for transmission.
		00010	Suspend reason - Local temporary transmission/reception limits.
		00011	Suspend reason - Data overflow.
		00100	Suspend reason - Violation of the minimum number of bearers.
		00101	Suspend reason - Handshake for stay alive procedure.
	< TUp >	00000	Suspend.
	< TDown >	00000	Suspend.
NOTE: When < TUp > and < TDown > are set to "00000" the meaning of the values set in < MDown > field shall be understood as to indicate the reason for the requested suspension. The value "00000" shall not be used for backwards compatibility reasons. If a terminal receives this value it shall understand it as Suspension reason unknown.			

The following fields as defined in EN 300 175-3 [3] clause 7.3.2.6 of the BANDWIDTH_B request and confirm messages shall be supported by the PT and the FT.

Table 37: Values used within BANDWIDTH_B.request message

MAC message	Field within the message	Standard values within the MAC message	Normative action/comment
<< MB _n message >>			
	< MB _n header >	X001	"Advanced connection control".
	< Command >	8	"Bandwidth_B.request".
	< FMID >	All	
	< MUp >	00000	Suspend.
	< MDown >	00000	Shall not be used (see note).
		00001	Suspend reason - No data for transmission.
		00010	Suspend reason - Local temporary transmission/reception limits.
		00011	Suspend reason - Data overflow.
		00100	Suspend reason - Violation of the minimum number of bearers.
		00101	Suspend reason - Handshake for stay alive procedure.
	< TUp >	00000	Suspend.
	< TDown >	00000	Suspend.
NOTE: When < TUp > and < TDown > are set to "00000" the meaning of the values set in < MDown > field shall be understood as to indicate the reason for the requested suspension. The value "00000" shall not be used for backwards compatibility reasons. If a terminal receives this value it shall understand it as Suspension reason unknown.			

To indicate acceptance of the suspension the responding side shall send back a confirm message:

Table 38: Values used within BANDWIDTH_T.confirm message

MAC message	Field within the message	Standard values within the MAC message	Normative action/comment
<< M _T message >>			
	< M _T header >	0001	"Advanced connection control".
	< Command >	9	"Bandwidth_T.confirm".
	< MUp >	00000	Suspend.
	< MDown >	00000	Suspend.
	< TUp >	00000	Suspend.
	< TDown >	00000	Suspend.

Or respectively:

Table 39: Values used within BANDWIDTH_B.confirm message

MAC message	Field within the message	Standard values within the MAC message	Normative action/comment
<< MB _n message >>			
	< MB _n header >	X001	"Advanced connection control".
	< Command >	9	"Bandwidth_B.confirm".
	< FMID >	All	
	< MUp >	00000	Suspend.
	< MDown >	00000	Suspend.
	< TUp >	00000	Suspend.
	< TDown >	00000	Suspend.

10.7.1.4 Resume

Resumption is the procedure to leave the suspend state by setting up a pilot duplex bearer, followed by bandwidth negotiation and modification when necessary. Management Entity will trigger this procedure as defined in clauses 9.3.1.1 and 9.3.2.1.

In case of a connection resumption in a different cluster than where the connection was suspended, the PT will use the "connection_handover_request" rather than the "access_request" type of bearer request message.

10.7.1.5 Bandwidth modification rejection

A request for bandwidth negotiation shall not be rejected if the requested values are in the range of the values negotiated at the NWK layer.

A request for connection suspension may be rejected according to the rules defined in clauses 9.3.1.2 and 9.3.2.2. If a PT or FT wants to reject a bandwidth modification it shall send back in the confirmation message the following values for MUp-MDown-TUp-Tdown.

Table 40: Values used within BANDWIDTH_B.confirm message

MAC message	Field within the message	Standard values within the MAC message	Normative action/comment
<< M _T message >>			
	< M _T header >	0001	"Advanced connection control".
	< Command >	9	"Bandwidth_T.confirm".
	< MUp >	11111	
	< MDown >	11111	
	< TUp >	11111	
	< TDown >	11111	

Or respectively:

Table 41: Values used within BANDWIDTH_B.request message

MAC message	Field within the message	Standard values within the MAC message	Normative action/comment
<< MB _n message >>			
	< MB _n header >	X001	"Advanced connection control".
	< Command >	9	"Bandwidth_B.confirm".
	< FMID >	All	
	< MUp >	11111	
	< MDown >	11111	
	< TUp >	11111	
	< TDown >	11111	

10.7.2 Connection modification to change service type

The MAC connection modification procedure to change the service type is needed to change the actual service type of a logical connection to a new one due to the result of the NWK service negotiation defined by clause 12.5 or service changes defined in clauses 12.6 and 12.7.

The connection modification procedure to change the service type between the following service types defined by EN 300 175-3 [3] clauses 5.6.2.1 and 5.6.2.2:

- I_p-error-detect;
- I_p-error-correct;
- I_{PQ}-error-detect;
- I_{PQ}-error-correct.

The connection modification procedure to change the service type is mandatory to support, if other MAC service types than I_p-error-correct are supported.

The connection modification procedure to change the service type shall be performed as defined by EN 300 175-3 [3] clause 10.3.2.1. The attributes_request and attributes_confirm message exchanged for this procedure shall be the ATTRIBUTES_T.req/cfm message as defined by EN 300 175-3 [3] clause 7.2.5.3.8.

10.7.3 Connection modification to change the modulation scheme

The modulation scheme is related to a physical connection. A physical connection is always setup using the profile related default modulation scheme.

The default modulation scheme for this profile is:

- 2-level-modulation for S- and A-field;
- 2-level-modulation for B- and Z-field.

If other than this default modulation schemes are supported, the PT and FT shall support the connection modification procedure to change the modulation scheme as defined by this clause.

In case of a call setup, this connection modification procedure is used to switch the logical and physical connection to the modulation scheme negotiated by the NWK service negotiation defined by clause 12.5.

In case of a connection resumption, this connection modification procedure is used to switch the physical connection to the modulation scheme negotiated for the related logical connection without any further NWK service negotiation.

The connection modification procedure to change the modulation scheme shall be performed as defined by EN 300 175-3 [3] clause 10.3.4. The attributes `_request` and attributes `_confirm` message exchanged for this procedure shall be the `ATTRIBUTES_T.req/cfm` message as defined by EN 300 175-3 [3] clause 7.2.5.3.8.

10.7.4 ATTRIBUTES_T.req/cfm

The `ATTRIBUTES_T.req/cfm` message as defined by EN 300 175-3 [3] clause 7.2.5.3.8 shall be used for connection modification to change service type and/or modulation scheme.

The following fields as defined in EN 300 175-3 [3] clause 7.2.5.3.8 of the `ATTRIBUTES_T.req/cfm` messages shall be supported by the PT and the FT.

Table 42: Values used within ATTRIBUTES_T.req/cfm messages

MAC message	Field within the message	Standard values within the MAC message	Normative action/comment
<< MT message >>			
	< MT header >	0001	"Advanced connection control".
	< Command >	6	"Attributes_T.request".
		7	"Attributes_T.confirm".
	< ECN >	All	
	< LBN >	1 to 15	The value 15 is reserved for the pilot bearer.
	< up/down/ss/sm >	All	
	< service type >	2	I _P -error-detect.
		3	I _P -error correct (optional).
		6	I _{PQ} -error detect (mandatory for 4 and 8-level modulation).
		7	I _{PQ} -error correct (optional).
	< max. lifetime >	0 to 7	If only I _P error detect is supported, this value may be ignored.
	< slot type >	0	Full slot.
	< C _F >	[0, 1]	
	< A-field modulation type >	3	Default modulation scheme to use for bearer setup is 2-level modulation.
	< (B + Z) field mod. type >	3	Default modulation scheme to use for bearer setup is 2-level modulation.
		2	4-level-modulation.
		1	8-level-modulation.

10.8 Physical Connection Setup

The MBC will establish a Physical Connection upon request of the ME. It either can be a single bearer Physical Connection or a multibearer Physical Connection.

10.8.1 Single bearer physical connection setup

The procedure of single bearer Physical Connection setup shall be performed as defined by EN 300 175-3 [3] clause 10.2.4.2. Only B-field advanced single bearer setup procedure shall be used (refer to clause 10.10.1).

10.8.2 Multibearer Physical Connection setup

The procedure of multibearer Physical Connection setup shall be performed as defined by EN 300 175-3 [3] clause 10.2.4.3. Only B-field advanced single bearer setup procedure shall be used for duplex bearer setup (refer to clause 10.10.1). For creation of double simplex bearers in case of asymmetric connections the B-field advanced double simplex bearer setup procedure shall be used (refer to clause 10.10.2).

Terminals that claim support of multibearer connections shall mandatory support symmetric multibearer connections and optionally the asymmetric multibearer connections.

10.9 Physical Connection Release

Physical Connection release is the procedure to release all bearers associated to a logical connection (clause 10.11).

10.10 Bearer Setup

Before attempting a bearer setup a PT shall check the setting of the RFP-status, see clause 10.4.2.

If "RFP-busy-for-data" is indicated the PT shall not initiate a DPRS bearer setup towards this RFP, the PT should try to find another RFP which is free for data.

NOTE: This requirement has been included to clarify situations when a PT may try to perform a DPRS bearer setup to a RFP which does not provide DPRS services. Examples could include, bearer replacement and bearer handover during an active DPRS connection to a RFP supporting DPRS services, or, DPRS MM transactions or Call setup.

10.10.1 Single duplex bearer setup

This procedure shall be performed as defined in EN 300 175-3 [3] clause 10.5.1.3, taking into account the additions defined in the following clauses. A single duplex bearer setup can either be a pilot bearer setup or a setup of an additional duplex bearer.

The following fields as defined in EN 300 175-3 [3] clause 7.3.2 of the BEARER_REQUEST and BEARER_CONFIRM and WAIT messages shall be supported by the PT and the FT.

Table 43: Values used within Advanced Connection Control messages during duplex bearer

MAC message	Field within the message	Standard values within the MAC message	Normative action/comment
<< MBn message >>			
	< MBn header >	X001	"Advanced connection control".
	< Command >	0	"Access_request".
		1	"Bearer handover request" (optional).
		2	"Connection_handover_request" (optional).
		3	Unconfirmed access request (see note 3).
		4	"Bearer_confirm".
		5	"Wait".
		12	Unconfirmed handover (see note 3).
	< FMID >	All	
	< PMID >	All	
	< ECN >	All	(see note 1).
	< LBN >	1 to 15	The value 15 is reserved for the pilot bearer (see note 1).
	< up/down/ss/sm >	"11"B	Symmetric single bearer connection; (see notes 1 and 2).
	< service type >	2	I _p -error -detect (see note 1).
		3	I _P error correct (optional); (see note 1).
		6	I _{PQ} error detect (mandatory for 4- and 8-level modulation); (see note 1).
		7	I _{PQ} error correct (optional); (see note 1).
	< max. lifetime >	0 to 7	(see note 1) if only I _p error detect is supported, this value may be ignored.
	< slot type >	0	Full slot (see note 1).
	< A-field modulation type >	3	Default modulation scheme to use for bearer setup is 2 – level modulation. (see note 1).
	< (B + Z) field mod. type >	3	Default modulation scheme to use for bearer setup is 2 – level modulation. (see note 1).
NOTE 1: For command values 0, 1, 2 and 4 only.			
NOTE 2: The eventual character of a multibearer connection will be determined during bandwidth negotiation phase when the type of the connection may be modified.			
NOTE 3: Only for double simplex bearer setup procedures.			

10.10.1.1 PT initiated Single duplex bearer setup

This procedure shall be performed as defined by EN 300 175-3 [3] clause 10.5.1.3.1.

Optionally, a number of WAIT messages may be exchanged.

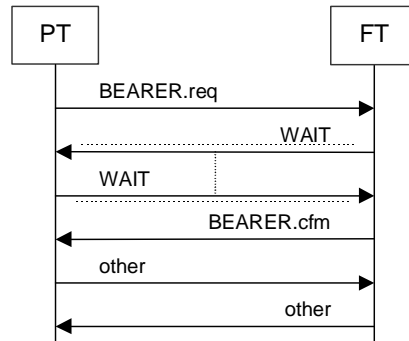


Figure 5: PT initiated setup of single duplex bearer

NOTE: In case of a connection modification procedure the "other" messages may be replaced by the BANDWIDTH request/confirm.

10.10.1.2 FT initiated Single duplex bearer setup

This procedure shall be performed as defined by EN 300 175-3 [3] clause 10.5.1.3.2.

The FT initiated connection setup is also referred to as fast setup. The only bearer-request message allowed in this case is the access-request. Optionally a number of WAIT messages may be exchanged.

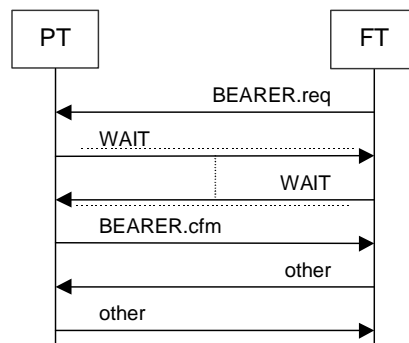


Figure 6: FT initiated setup of pilot bearer (fast setup)

NOTE: In case of a connection modification procedure the "other" messages may be replaced by the BANDWIDTH request/confirm.

10.10.1.3 Usage of channel list messages for single duplex bearer setup

The following fields of the CHANNEL_LIST message as defined in EN 300 175-3 [3] clauses 7.3.2.7 and 10.5.2 shall be understood by the receiving side and taken into account for channel selection as defined by EN 300 175-3 [3] clauses 11.4.2 and 11.4.3:

Table 44: Values used within the MB CHANNEL_LIST message

MAC message	Field within the message	Standard values within the MAC message	Normative action/comment
<< MBn message >>			
	< MBnheader >	X001	"Advanced connection control".
	< Command >	10	"Channel_list".
	< RPN >	All	
	< Command >	001	GOOD
	S/D	All	
	SN	0 to 11	
	SP	0	
	CN	0 to 9	

10.10.2 Double simplex bearer setup

The procedure is defined by EN 300 175-3 [3] clause 10.5.1.4.

The direct double simplex bearer setup shall be supported.

In case the R-side wants to select a channel it shall use either the GOOD or the LISTEN channel list message.

NOTE 1: The LISTEN message requires a deviation from the scanning sequence on the selected slots, the GOOD message allows channel selection with unmodified scanning.

The direct double simplex bearer setup procedure is defined by EN 300 175-3 [3] clause 10.5.1.4. Only B-field direct bearer setup procedure shall be used.

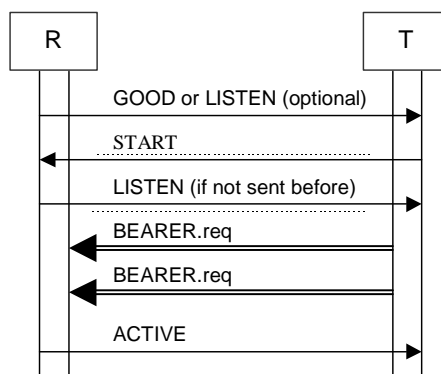


Figure 7: Successful direct double simplex bearer setup

NOTE 2: Each side has a line for the duplex bearer and a line for the double simplex bearer. All channel list messages should be sent at the same duplex bearer.

The following fields of the CHANNEL_LIST message as defined in EN 300 175-3 [3] clauses 7.3.2.7 and 10.5.2 shall be understood by the receiving side and taken into account for channel selection as defined by EN 300 175-3 [3] clauses 11.4.2 and 11.4.3:

Table 45: Values used within the MB CHANNEL_LIST message

MAC message	Field within the message	Standard values within the MAC message	Normative action/comment
<< MBn message >>			
	< MBnheader >	X001	"Advanced connection control".
	< Command >	1010	"Channel_list".
	< RPN >	All	
	< Command >	000 110 111	ACTIVE LISTEN START Other messages may be send.
	S/D	All	
	SN	0 to 11	
	SP	0	
	CN	0 to 9	

NOTE 3: The channel list messages GOOD and POOR should be used to improve the response time of the procedure.

10.11 Bearer Release

The following fields of the RELEASE message as defined in EN 300 175-3 [3] clause 7.3.2.10 shall be supported by the PT and the FT.

Table 46: Values used within MBn RELEASE message

MAC message	Field within the message	Standard values within the MAC message	Normative action/comment
<< MBn message >>			
	< MBn header >	X001	"Advanced connection control".
	< Command >	15	"Release".
	< FMID >	All	
	< PMID >	All	
	< LBN >	All	
	< reason >	1 2 3 4 11	Bearer release. Connection release (see note 1). Bearer setup or HO failed (see note 2). BHO successfully completed (see note 2). Reversal.

NOTE 1: The connection release reason shall only be used during logical connection release.

NOTE 2: Only used when double simplex bearer handover is supported.

10.11.1 Unacknowledged release

To release a duplex or a double simplex bearer with the unacknowledged release procedure, the transmitting side sends a RELEASE message with reason "bearer release" or "connection release" in two consecutive frames, and then immediately seizes all transmission on this bearer. This is defined in EN 300 175-3 [3] clause 10.7.2.1.

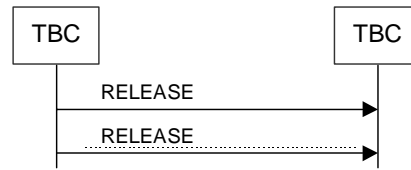


Figure 8: Unacknowledged release

10.11.2 Acknowledged release

To release a double simplex bearer with the acknowledged release procedure, the receiving side sends a RELEASE message with reason "bearer release" via any bearer in the reverse direction. This is defined in EN 300 175-3 [3] clause 10.7.2.2.

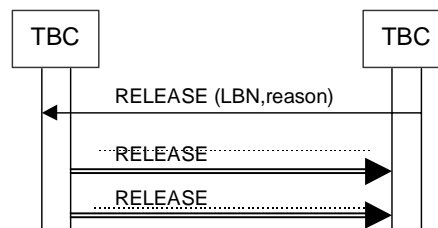


Figure 9: Acknowledged release

10.11.3 Fast release

To reverse the transmission direction on a double simplex bearer with the fast release procedure, the transmitting side sends a RELEASE message with the reason field set to "reversal" on both simplex bearers, and starts scanning on both released simplex bearers for the next 4 frames. The receiver of the RELEASE message may use the released bearer to set up a double simplex bearer into the other direction, using the normal double simplex bearer setup procedure. This is defined in EN 300 175-3 [3] clause 10.7.2.3.

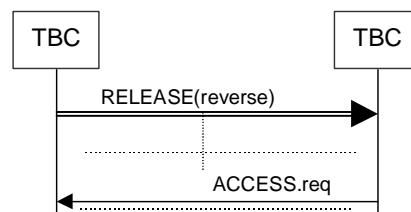


Figure 10: Fast release

10.12 Advanced connection handover

The procedure shall be performed as defined in clause 10.5. This procedure will be used only for intercell connection handover, anyhow the procedure is equivalent for intra- and inter-cell handover.

For connection handover in the case of resumption: see clause 10.7 of the present document.

Before starting the CHO the bandwidth of the old connection may be reduced to the minimum to allow a higher amount of selectable bearers for the new connection.

10.13 I-channel operation

The connection oriented logical I channel data use one of the following service types defined by EN 300 175-3 [3] clauses 5.6.2.1 and 5.6.2.2:

- I_P -error-detect;
- I_P -error-correct;
- I_{PQ} -error-detect;
- I_{PQ} -error-correct.

In relation to the modulation schemes supported, the following I_P services shall be supported:

Table 47: I_P services to support

Modulation scheme	I_P -error-detect	I_{PQ} -error-detect	I_P -error-correct	I_{PQ} -error-correct
1a/1b	M	O	O	O
2	O	M	O	O
3	O	M	O	O

NOTE: Modulation schemes 2 and 3 are optional to support.

10.13.1 Protected I-channel error-detect mode

The FT and PT shall support protected I-channel operation in error-detect mode as defined in EN 300 175-3 [3] clause 10.8.3.2.

The I_P -error-detect mode shall apply for the I_P services I_P -error-detect and I_{PQ} -error-detect.

10.13.2 Protected I-channel error-correct mode

The FT and PT shall support protected I-channel operation in error-correct mode as defined in EN 300 175-3 [3] clause 10.8.2.

The I_P -error-correct mode shall apply for the I_P services I_P -error-correct and I_{PQ} -error-correct.

10.13.2.1 Unilateral jump

FT and PT shall support unilateral data jump procedure according to EN 300 175-3 [3] clause 10.8.2.5.2.

10.13.2.2 Bearer reset

FT and PT shall support bearer reset according to EN 300 175-3 [3] clause 10.8.2.5.3.

10.13.3 Connectionless S_{IP} mode

The S_{IP} service uses the connectionless downlink procedure as defined by EN 300 175-3 [3] clause 9.1.2. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

The S_{IP} protected data connectionless downlink service is used by the FP-PP point-to-multipoint service to transfer the data frames, after the LU10 framing and FU10a segmentation functions have been performed on the point-to-multipoint SDU (see clause 11).

The FP shall only transmit S_{IP} data starting at the start of a paging cycle. A PP shall understand the presence of S_{IP} data to be indicated by the coding $BA = S_{IP}$.

The connectionless downlink bearer used to carry the S_{IP} service shall be announced by the PT MAC layer information = "Dummy or C/L bearer" or "C/L bearer position".

A connectionless bearer is marked as a connectionless bearer by the value of the TA-bits = 010.

The TDMA frame immediately following the frame in which S_{IP} data was received shall also be monitored to find out whether it contains S_{IP} data.

In this way S_{IP} data shall be understood to be present in each subsequent TDMA frame until the BA and MAC layer information codings indicate that the S_{IP} data field is no longer present. No further S_{IP} information shall then be available until the start of the next paging cycle.

The start of a paging cycle in this context shall be that time-slot in frame 0 of a multiframe that is carrying the start of a paging message. When paging repetition is supported by the fixed part, the modulo 4 of the number of this multiframe shall be 0.

PPs in `low_duty_cycle` mode shall listen to frames where the modulo 4 of the number of the multiframe is 0.

New connectionless downlink bearers shall be announced by the FP by broadcast of the PT MAC layer information = "Dummy or C/L bearer" or "C/L bearer position" at least one multiframe or 4 multiframe if `low_duty_cycle_mode` is allowed at this FP in advance of the first transmission of S_{IP} data.

10.14 C-channel operation

10.14.1 C_S -channel

FT and PT shall support C_S -channel data transmission and reception as defined in EN 300 175-3 [3] clauses 10.8.1 and 10.8.1.1.

10.14.2 C_F -channel

FT and PT shall support C_F -channel data transmission and reception as defined in EN 300 175-3 [3] clauses 10.8.1 and 10.8.1.2.

If both sides have indicated that they support C_F -channel (see 10.3.2.2.1 for the FT and 12.3 for the PT) all C-plane transmission shall take place on the C_F -channel.

10.15 Encryption

10.15.1 Encryption process - initialization and synchronization

The procedure shall use DSCA and shall be performed as defined in EN 300 175-7 [7] clauses 6.4.4 and 6.4.5. Encryption shall be applied to each of the logical C, I, and G_F -channels.

If encryption is provided by the FT, the FT shall support broadcast of multiframe number as defined in EN 300 175-3 [3] clauses 7.2.3.7, 9.1.1 and 10.3.2.3 in the present document. The multiframe number shall be synchronized between the RFPs in the whole internal handover area.

10.15.2 Encryption mode control

The procedure shall be performed as defined in EN 300 175-7 [7] clause 6.4.6.

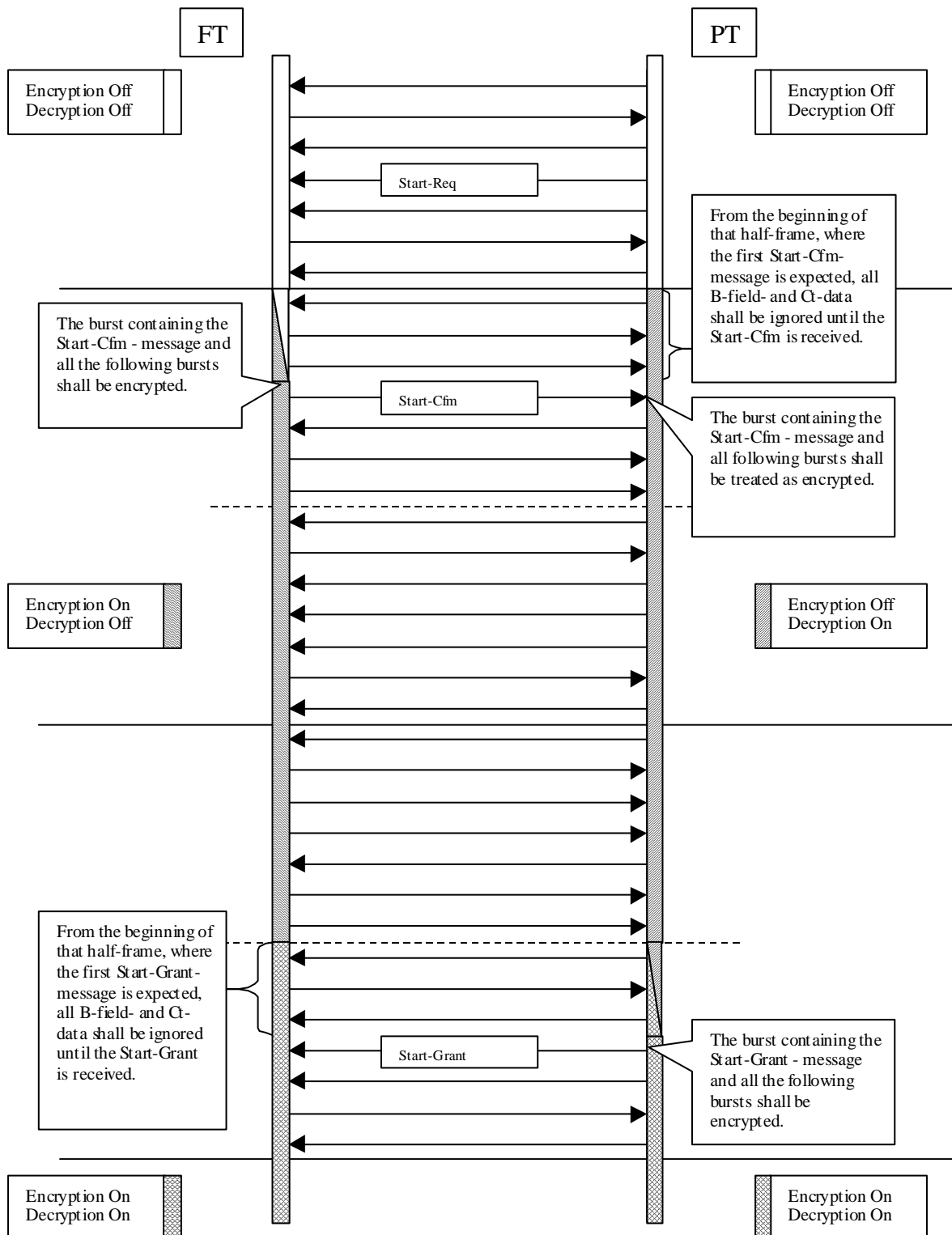


Figure 11: Encryption procedures

10.15.2.1 M_T message

The following fields as defined in EN 300 175-3 [3] clause 7.2.5.7 in the MAC control (M_T) message shall be supported by the PT and the FT.

Table 48: Values used within M_T message

MAC message	Field within the message	Standard values within the MAC message	Normative action/comment
<< M _T message >>			
	< M _T header >	5	Encryption control.
	< Command >	0	Start Encryption Request.
		1	Start Encryption Confirm.
		2	Start Encryption Grant.
		4	Stop Encryption Request (see note).
		5	Stop Encryption Confirm (see note).
		6	Stop Encryption Grant (see note).
NOTE: These commands are only required if encryption deactivation is supported.			

10.15.2.2 PT procedure for enabling encryption

If the PT-MAC receives a MAC_ENC_EKS-req primitive then it shall start the encryption switching process on one bearer as described in EN 300 175-7 [7] clause 6.4.6.3. In case of a multi-bearer connection, all other bearers of the connection shall switch to encrypted mode at the same time as the bearer performing the single bearer encryption mode procedure.

Additional bearers that are setup after the connection has switched to encrypt mode shall switch to encryption mode immediately after the bearer has been established.

10.15.2.3 PT procedure for disabling encryption

If the PT-MAC receives a MAC_ENC_EKS-req primitive then it shall start the encryption switching process on one bearer as described in EN 300 175-7 [7] clause 6.4.6.4. In case of a multi-bearer connection, all other bearers of the connection shall switch to clear mode at the same time as the bearer performing the single bearer encryption mode procedure.

10.15.3 Handover encryption process

The procedure shall be performed as described in EN 300 175-7 [7] clause 6.4.7.

The additional bearers of the new multibearer connection shall switch to encrypt at the same time as the bearer performing the single bearer encryption mode procedure.

10.16 Quality control

10.16.1 RFPI handshake

RFPI handshake procedure shall be performed as defined in EN 300 175-3 [3] clause 11.5.1.

10.16.2 PT frequency correction

PT frequency correction procedure shall be performed as defined in EN 300 175-3 [3] clause 11.5.2.2.

10.16.3 Bearer quality report

Receiver side will send bits Q1 and Q2 reporting quality of received bearers. Report shall be done in bits a3 and a7 of a field in the reverse bearer in case of duplex bearers, or using the MAC-mod2-ACK message, defined in D.1.4.1 (EN 300 175-3 [3] clause 7.3.4.4) in double simplex bearers. In I_{p_error_correct}, bit BCK shall be send in the place of Q1.

The bit Q1 shall be set as defined in EN 300 175-3 [3] clause 10.8.1.3.2. The use of bit Q1 is optional. The bit Q2 shall be set as described in EN 300 175-3 [3] clause 10.8.1.3.1.

FT and PT should use the information of the received bits Q1 and Q2 to take the decision to perform bearer replacement procedures.

FT may use the information of the Q1 and Q2-bits sent by the PT, to decide whether to switch antenna or not.

By negotiation it is possible to avoid the insertion of the message in all frames, or to suppress the message. In this case the procedure described in clause 10.16.4 shall be used for quality control purposes.

The negotiation is performed as described in clause 12.8.

In absence of negotiation the report shall be send in all frames.

10.16.4 Bearer and connection control

PT and FT shall use the "Bearer and connection control" message EN 300 175-3 [3] clause 7.3.4.2, to request the other side to perform antenna switch, bearer replacement or bearer handover. Requests for bearer handover may be understood as requests for bearer replacements or bearer handover in DPRS.

Table 49: Values used within Bearer and Connection Control messages.

MAC message	Field within the message	Standard values within the MAC message	Normative action/comment
<< MBn message >>			
	< MBn header >	X011	"Quality Control".
	< Command >	0000	Antenna switch (s) for the bearers identified by LBN indicated in < param_1 > and < param_2 > - Optional (see note).
		0001	Antenna switch for all bearers of this connection to the RFP identified by its RPN indicated in < param_1 > - Optional (see note).
		0010	Bearer handover/bearer replacement of the bearer(s) identified by LBN in < param_1 > and < param_2 > - Optional (see note).
		0011	Connection handover - Optional (see note).
		0100	Frequency control for the bearer identified by LBN indicated in < param_1 > - Optional (see note).
		0101	Frequency control for all bearers of this connection to the RFP identified by its RPN indicated in < param_1 > - Optional (see note).
		0110	Advance timing for all the bearers of this connection to the RFP identified by its RPN indicated in < param_1 > - Optional (see note).
		0111	PT informs that it is transmitting prolonged preamble in all the frames - Optional (see note).
		1000	frequency replacement to carrier CN on slot pair SN indicated in < param_1 > and < param_2 > respectively - Optional (see note).
	< FMID >	All	
	< PMID >	All	
	< param_1 >	All	
	< param_2 >	All	
	< spare >	0000 1111	
NOTE: An implementation that claims support of the procedure Bearer and Connection Control shall support at least one of the commands and the related procedures.			

10.16.5 A-CRC handshake

If no correct A-CRC has been received (in regard to the active FT identity) during a time of T908, the bearer shall be released. Duplex bearers shall use the unacknowledged bearer release procedure defined in clause 10.11.1. Double simplex bearers receiving side shall use the acknowledged bearer release procedure as defined in clause 10.11.2.

NOTE: The normal reaction on the release of a bearer because of A-CRC handshake failure will be a bearer replacement. In case of release of all bearers the suspend-state will be entered.

10.17 Physical channel selection

The selection of a physical channel for a new bearer shall be performed according to the requirements in EN 300 175-3 [3] clause 11.4. The selection procedure for additional bearers in a multibearer connection shall also take into account the channel list procedures as defined in EN 300 175-3 [3] clause 10.5.2.

10.18 Bearer replacement

This procedure is the main way to improve the quality of a connection by changing bearers to different channels within the same cluster.

"Bearer replacement" is defined to be the procedure where an old bearer is replaced with a new bearer that has a different LBN or where the old bearer was lost before the new bearer is setup with the same LBN. The procedure to setup the new bearer is defined by clause 10.10. The procedure to release the old bearer is defined in clause 10.11.

For replacement of one bearer of an I_p -error-correct connection the procedure is defined in EN 300 175-3 [3] clause 10.8.2.5.1.

NOTE: The timer T906 guards the time the amount of bearers is less than the minimum.

It is preferred to first drop the old bearer and then set-up the new bearer, or to do this simultaneously. It is not required to have the new bearer active before the old bearer is released.

10.19 Bearer handover request

The procedure shall be performed as defined in EN 300 175-3 [3] clauses 10.6.2 and 10.6.3. The B-field procedures shall be supported. The bearer setup procedures are defined by clause 10.10 and the bearer release procedure is defined by clause 10.11.

The procedure is equivalent for intra- and inter-cell handover.

The FT should not release the old bearer within 10 ms after the establishment of the new bearer.

Bearer handover is optional to be supported by DPRS compliant terminals. If PT supports it but FT does not, normally, the FT will not respond to the bearer handover request send by the PT. In any case if bearer handover procedure fails, the PT shall try bearer replacement or connection handover (if connection handover is supported by the FT).

10.20 G_F -channel

10.20.1 G_F -channel data

FT and PT shall support G_F -channel data transmission and reception as defined in EN 300 175-3 [3] clause 7.3.6.

11 DLC layer procedures

11.1 LU10 Enhanced Frame RELay service (EFREL)

The procedure shall be performed as defined in EN 300 175-4 [4] clause 11.12.1. The following text together with the associated clauses define the mandatory requirements with regard to the present document.

The SDU shall be segmented into fixed length segments, where the segment length shall depend on the PDU structure chosen (clause 11.2).

The MAC $I_{p_error_detection}$ mode shall be used. The MAC $I_{p_error_correction}$ mode can be negotiated by the network layer and replace the MAC $I_{p_error_detection}$ mode.

The transmission class 2 shall be used.

The selective retransmission protocol (SEL) shall be used.

Modulus shall be 512, i.e. the receive sequence number and the send sequence number has a default range from 0 to 511. If the window size ≤ 128 both peers shall ignore the 9th bit (ES9) of the sequence numbers.

11.1.1 Window size

The window size can be negotiated in the range of 1 to 256 by the NWK-layer.

The default value for the window size is 32.

This default value will be used in absence or failure of NWK-Layer negotiation.

Any DPRS device shall support at least the following values for the window size:

Table 50: Window size data rates

Minimum mandatory supported window size	Maximum Data rate supported (at the air i/f)
32	Up to 96 kbit/s
64	> 96 kbit/s to 200 kbit/s
128	> 200 kbit/s

Any PT shall accept in a negotiation any value proposed by the FT between the default (32) and the minimum mandatory supported window size.

A FT shall propose in the negotiation a window size value equal to the minimum mandatory value of table 50, if it has opened only one DPRS connection (only one PT is connected to this FT with a single DPRS connection).

11.1.2 U-plane transmission class 2

11.1.2.1 Sending side procedures

The procedure shall be performed as defined in EN 300 175-4 [4] clause 14.3.4.1. The following text together with the associated clauses define the mandatory requirements with regard to the present document.

The sequence numbers shall be added using the rules defined below.

If a connection oriented MAC service is used (see EN 300 175-3 [3] clause 5.6), then the send sequence number shall be set to zero at the start of the MAC connection, and this value shall be used for the first transmitted frame over that MAC connection. The send sequence numbers of successive frames shall be contiguous (Modulus) during the lifetime of that MAC connection.

If a connectionless MAC service is used (see EN 300 175-3 [3] clauses 5.7 and 9.1.2.2), then the send sequence number of the first segment of a DLC SDU may be arbitrarily chosen. The send sequence numbers of successive frames shall be contiguous (Modulus) within one DLC SDU.

At the transmitting side a complete SDU shall be received in a DL_U_DATA-req primitive. The SDU shall be passed to the segmenting function and segmented into an integral number of segments. The last segment shall be filled with fill octets if necessary. The information content of each PDU shall be marked using the length indicator as described in EN 300 175-4 [4] clause 14.2.3.3.

Several PDUs may be submitted once to the MAC layer in a single MAC_CO_DATA-req primitive in response to each MAC_CO_DTR-ind primitive. The number of PDUs shall be less than or equal to the maximum number requested in the MAC_CO_DTR-ind primitive.

11.1.2.2 Receiving side procedure

The procedure shall be performed as defined in EN 300 175-4 [4] clause 14.3.4. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

The receive sequence number shall be set to 0 at service establishment.

Several PDUs may be received from the MAC layer in a single MAC_CO_DATA-ind primitive. The receive side shall re-order the PDUs using the send sequence numbers. The receive side shall then search for SDU boundaries using the extended more bit as defined in EN 300 175-4 [4] clause 13.3.

A complete SDU shall be assumed to exist, and shall be passed to the IWU using a DL_U_DATA-ind primitive when the following conditions are satisfied:

- two successive boundaries have been identified using the extended More bit (i.e. there are no intermediate boundaries);
- PDUs have been successfully received for all of the sequence numbers that lie between those boundaries.

11.2 FU 10 framing (FU10a, FU10b, FU10c)

The procedure shall be performed as defined in EN 300 175-4 [4] clause 12.11. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

11.2.1 FU10a

FU10a frames as defined in see EN 300 175-4 [4] clause 12.11 shall be used for the forward path of the unidirectional link.

11.2.2 FU10b

FU10b frames as defined in see EN 300 175-4 [4] clause 12.11 can only be used for bi-directional links and can only be used after negotiation by the network layer, see clause 12.5.

11.2.3 FU10c

FU10c frames as defined in see EN 300 175-4 [4] clause 12.11, with total length of 7 octets shall be used for the backward control path.

The SN NACKed in a FU10c frame shall be provided in order, i.e. if NACK SN = 1 and NACK SN = 2 are to be sent NACK SN = 1 shall be included in the FU10c before NACK SN = 2. The modulo operation shall be taken into account, e.g. for SN = [0,255], SN = 0 shall be included after SN = 255.

If there are not enough NACKs to be sent in one FU10c frame, the last NACKed SN shall be replicated in all remaining octets before the FU10c is sent.

Example of completion of a FU10c frame in case the receiver has successfully received all PDUs with numbers up to SN = 254 and PDU with SN = 2, missing SN = 255, 0 and 1:

Octet_1 - ACK 254
 Octet_2 - NACK 255
 Octet_3 - NACK 0
 Octet_4 - NACK 1
 Octet_5 - NACK 1
 Octet_6 - NACK 1
 Octet_7 - "01000000" (1 ACK plus 5 NACKs)

11.3 Class A operation

The class A link operation can be either PT or FT initiated. To simplify the description this clause considers on the PT initiated procedures; for the FT initiated procedures, "PT" shall be replaced with "FT" and vice versa. This is valid for the entire clause 11.3 and the associated clauses.

11.3.1 Class A link establishment

The procedure shall be performed as defined in EN 300 444 [8] clause 9.1 except of clause 9.1.1.4 which is replaced by clause 11.2.1.1. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

If class B acknowledged transfer is requested but not supported by the receiving side (B acknowledged transfer is not required to be supported for DPRS), the I_frame requesting class B operation shall be treated as though it was a class A frame, see EN 300 175-4 [4] clauses 9.2.4.3.1 and 9.2.4.3.2 b).

11.3.1.1 Lower Layer Management Entity (LLME) establishment of a MAC connection

The procedure shall be performed as defined in EN 300 175-4 [4] clause 10.2 and EN 300 175-3 [3] clause 8.1.1. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

For a link to be established a suitable MAC connection is needed. If such one does not exist the LLME shall request it.

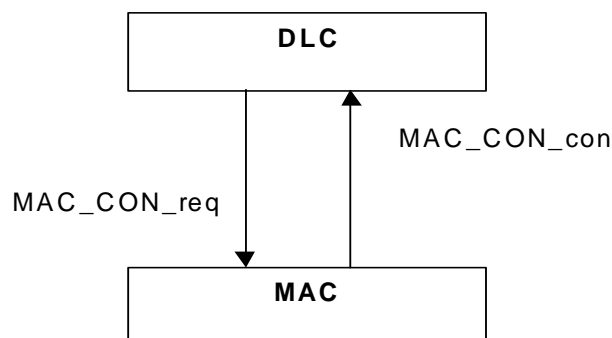


Figure 12: Establishment of a MAC connection initiating side

Table 51: Values used within the MAC_CON-req primitive

Parameter	Information within the parameter	Normative action/comment
<< MCEI >>	MAC Connection Endpoint Identifier	Refer to EN 300 175-4 [4] clause 10.2.4.4.
<< PMID >>	Portable part MAC Identity (PMID)	
<< CHO flag >>	Y/N	Y - if the connection is required for Connection handover.
<< Old MCEI >>	All relevant	Only needed for Connection handover and Basic type connections.
<< C _F required >>	0, 1	C _F is optional.
<< Slot type >>	Full slot	
<< Service type >>	l _p _error_detection	
	l _p _error_correction	Optional.
	l _{pq} _error_detection	Optional, for modulation scheme 1a and 1b; mandatory, for modulation schemes 2 and 3.
	l _{pq} _error_correction	Optional.
<< up/down/sm/ss >>	ss	The eventual character of a multibearer connection will be determined during bandwidth negotiation phase when the type of the connection may be modified.
<< connection type >>	Advanced	

Table 52: Values used within the MAC_CON-cfm primitive

Parameter	Information within the parameter	Normative action/comment
<< MCEI >>	MAC Connection Endpoint Identifier	Refer to EN 300 175-4 [4] clause 10.2.4.4.
<< Connection type >>	Advanced	The type of the established connection.
<< ECN >>	All relevant	Refer to EN 300 175-4 [4] clause 10.2.4.2.

The receiving side shall be informed about the action that has taken place in case it was successful by a MAC_CON-ind primitive.

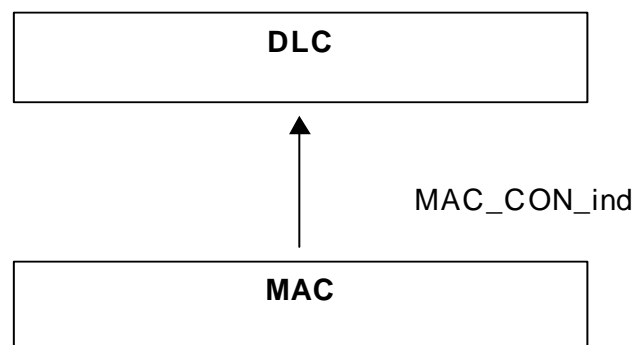
**Figure 13: Establishment of a MAC connection, receiving side**

Table 53: Values used within the MAC_CON-ind primitive

Parameter	Information within the parameter	Normative action/comment
<< MCEI >>	MAC Connection Endpoint Identifier	Refer to EN 300 175-4 [4] clause 10.2.4.4.
<< PMID >>	PMID	
<< CHO flag >>	Y/N	Y - if the connection is required for Connection handover.
<< C _F required >>	0, 1	C _F is optional.
<< Slot type >>	Full slot	
<< Service type >>	I _p _error_detection	
	I _p _error_correction	Optional.
	I _{pq} _error_detection	Optional, for modulation scheme 1a and 1b; mandatory, for modulation schemes 2 and 3.
	I _{pq} _error_correction	Optional.
<< up/down/sm/ss >>	ss	The eventual character of a multibearer connection will be determined during bandwidth negotiation phase when the type of the connection may be modified.
<< Connection type >>	Advanced	
<< ECN >>	All relevant	Refer to EN 300 175-4 [4] clause 10.2.4.2.

The successful setup of the advanced connection may be followed by a connection modification, as defined in EN 300 175-4 [4] clause 10.2.3, case B.

11.3.2 Class A acknowledged information transfer

The procedure shall be performed as defined in EN 300 444 [8] clause 9.2, with the exception identified in this clause.

Both PT or FT shall be able to handle NWK layer messages longer than 63 octets, e.g. the CC-SETUP message may be of up to and more than 80 octets. Longer than 63 octets messages shall be segmented in DLC an sending side and re-assembled in DLC receiving side as specified in EN 300 175-4 [4] clause 7.7.2.

11.3.3 Class A link release

The procedure shall be performed as defined in EN 300 444 [8] clause 9.3.

11.3.4 Class A link re-establishment

The procedure shall be performed as defined in EN 300 444 [8] clause 9.4.

11.4 Class U operation

For class U operation only the U-format is used in the control field defined in EN 300 175-4 [4] clause 7.4, with contents as defined below.

Table 54: Values used within DLC command

DLC command	Field within the command	Standard values within the command	Normative action/comment
<< U-command >>			
	< U U U >	0 0 0	
	< P/F >	0	
	< U U >	0 0	
	1 1	1 1	

11.4.1 Class U use of LLN for unacknowledged information transfer

The procedure shall be performed as defined in EN 300 175-4 [4] clause 9.3.1.

11.4.2 Class U link establishment

The procedure shall be performed as defined in EN 300 175-4 [4] clause 9.3.2.

11.4.3 Class U unacknowledged information transfer

The procedure shall be performed as defined in EN 300 175-4 [4] clause 9.3.3.

11.4.4 Class U unacknowledged release

The procedure shall be performed as defined in EN 300 175-4 [4] clause 9.3.4.

11.5 Lc frame delimiting and sequencing service

11.5.1 C_S-channel fragmentation and recombination

The procedure shall be performed as defined in EN 300 175-4 [4] clauses 6.1.2, 6.1.3 and 6.1.4, 6.1.4.2. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

The complete frame shall be fragmented into 5 octet fragments.

11.5.2 C_F-channel fragmentation and recombination

The C_F-channel shall be operated according to the procedures defined in EN 300 175-4 [4] clauses 6.1.2, 6.1.3, 6.1.4 and 6.1.4.1. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

The complete frame shall be fragmented into 8 octet fragments.

11.5.3 Selection of logical channels (C_S and C_F)

The selection of the C_F instead of the C_S-channel for Lc operation, shall be done according to the conditions defined in EN 300 175-4 [4] clause 10.2.5.

If both sides have indicated that they support C_F-channel (see 10.3.2.2.1 for the FT and 12.3 for the PT) all C-plane transmission shall take place on the C_F-channel.

11.6 Broadcast Lb service

11.6.1 Normal broadcast

The procedure shall be performed as defined in EN 300 175-4 [4] clauses 6.2.1, 8.3.3.1, 9.4.1.1 and 9.4.1.2 and EN 300 175-3 [3] clause 8.2.1. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

Short frame format (frame length = 3) and long frame format (frame length = 5) are required to be supported.

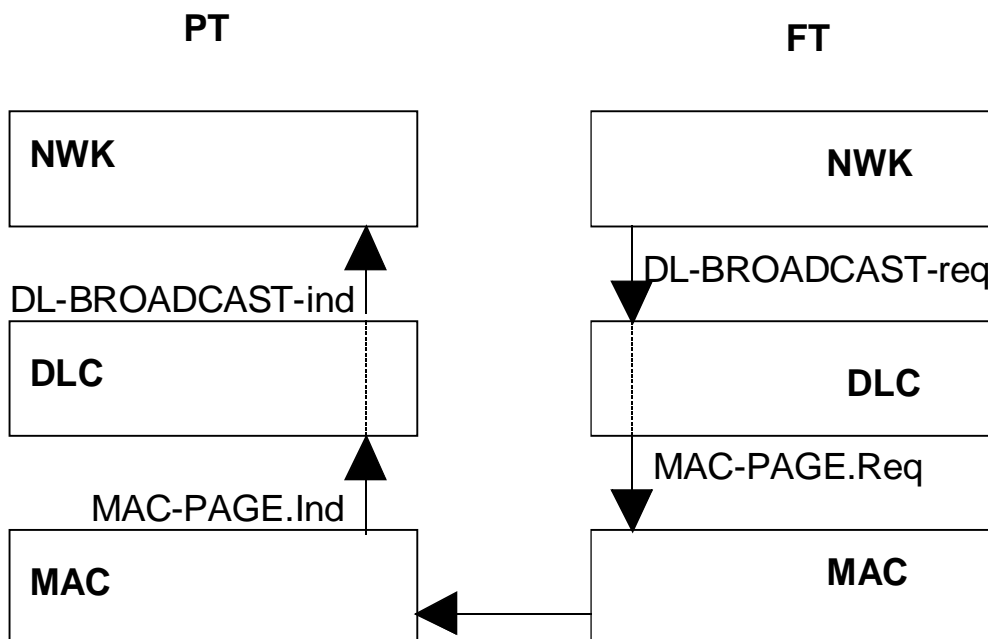


Figure 14: Normal broadcast

Table 55: Information used within the DL-BROADCAST-req primitive

Parameter	Information within the parameter	Normative action/comment
<< Cluster address list >>	All cluster/an integer	
<< Message unit length >>	3, 5 octets	Short and long frame format (if FT supports DPRS N.19, LCE Resume Paging) are required to be supported
<< Message unit >>	From the NWK layer	

Table 56: Information used within the MAC_PAGE.Req primitive

Parameter	Information within the parameter	Normative action/comment
<< cluster ID >>	All clusters/an integer	
<< page type >>	Normal	
<< length of page field >>	0, 20 or 36	36 is required only if FT supports DPRS N.19, LCE Resume Paging
<< long flag >>	Long	Is only relevant if length of page field = 36.
<< SDU >>	The data from the << Message unit >> received in the DL-BROADCAST-req primitive.	

Table 57: Information used within the MAC_PAGE.Ind primitive

Parameter	Information within the parameter	Normative action/comment
<< length of page field >>	20 or 36	
<< long flag >>	Long	Is only relevant if length of page field = 36.
<< SDU >>		

Table 58: Information used within the DL-BROADCAST-ind primitive

Parameter	Information within the parameter	Normative action/comment
<< Message unit length >>	3, 5 octets	
<< Message unit >>	The data from the << SDU >> from the MAC_PAGE.Ind primitive.	

11.6.2 Expedited broadcast

The procedure shall be performed as defined in EN 300 175-4 [4] clauses 6.2.1, 8.3.3.1, 9.4.2.1 and 9.4.2.2 and EN 300 175-3 [3] clause 8.2.1. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

The primitive exchange and their contents are similar to the Normal Broadcast except that the DL_EXPEDITED primitives are used instead of the DL_BROADCAST and the type of broadcast is identified as "fast". Short frame format (frame length = 3) and long frame format (frame length = 5) are required to be supported.

Table 59: Information used within the DL-EXPEDITED-req primitive

Parameter	Information within the parameter	Normative action/comment
<< Cluster address list >>	All cluster/an integer	
<< Message unit length >>	3, 5 octets	Short and long frame format are required to be supported
<< Message unit >>	From the NWK layer	

Table 60: Information used within the MAC_PAGE.Req primitive

Parameter	Information within the parameter	Normative action/comment
<< cluster ID >>	All clusters/an integer	
<< page type >>	Fast	
<< length of page field >>	20 or 36	
<< long flag >>	Long	Is only relevant if length of page field = 36.
<< SDU >>	The data from the << Message unit >> received in the DL-EXPEDITED-req primitive.	

Table 61: Information used within the MAC_PAGE.Ind primitive

Parameter	Information within the parameter	Normative action/comment
<< length of page field >>	20 or 36	
<< long flag >>	Long	Is only relevant if length of page field = 36.
<< SDU >>		

Table 62: Information used within the DL-EXPEDITED-ind primitive

Parameter	Information within the parameter	Normative action/comment
<< Message unit length >>	3, 5 octets	
<< Message unit >>	The data from the << SDU >> from the MAC_PAGE.Ind primitive.	

11.7 Connection handover

11.7.1 Class A connection handover

For single bearer connections the procedure shall be performed according to EN 300 444 [8] clause 9.7.

For multi-bearer connections the procedure shall be performed as defined in EN 300 175-4 [4] clauses 9.2.7.3, 9.2.7.3.1, 9.2.7.3.3, 10.5 and 9.2.7.1.2. The following clauses define the mandatory requirements with regard to the present document.

If FP receives a connection handover request and this is executed successfully, then the FP shall release the old MAC Logical Connection (MBC) if this is still in suspend state.

11.7.1.1 Voluntary handover

As a result of continued poor quality of service from the MAC layer, the LLME in the PT shall inform the PT LAPC entity, the LAPC entity shall enter the Handover pending condition, timer < DL.05 > is not needed to be started, a new MAC connection shall be requested to be established.

The establishment of a new MAC connection shall be achieved by the LLME connection setup procedure according to clause 10.5, immediately followed by a connection modification procedure (see EN 300 175-4 [4] clause 10.2.3 case B) in case of multibearer connections to restore the attributes of the old connection.

If a new MAC connection is successfully established the LAPC entity shall leave the Handover pending condition, and one of the two MAC connections shall be released by the PT using the LLME MAC connection release procedure (see EN 300 175-4 [4] clause 9.3.1.2).

This implies that in case of unsuccessful handover the associated links shall not be released since the connection is still operational (even with bad quality).

NOTE 1: Any time an unexpected upward MAC_DIS-ind primitive is received, the receiver of this primitive may assume that the connection and the far side of the link have been released.

NOTE 2: For multibearer connections the handover may be done by downgrading the bandwidth either to 1 or to 0 bearers.

11.7.1.2 Associated procedure

11.7.1.2.1 LLME connection handover management

The procedure shall be performed as defined in EN 300 175-4 [4] clause 10.5. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

Timer < DL.06 > shall be started either after the connection handover is successfully completed or immediately after N251 successive "unsuccessful" connection handover attempts.

It shall be stopped upon an initiation of a link release "abnormal" (see EN 300 444 [8] clause 8.38) or release indication from MAC layer (see EN 300 444 [8] clause 9.3).

As long as < DL.06 > is running, no connection handover attempts shall be initiated.

11.7.1.3 Exceptional case

11.7.1.3.1 Receipt of a request for link release

If while in the connection handover pending condition a link release request has been received from the own NWK layer the handover pending condition shall be cleared and class A link release procedure (see EN 300 444 [8] clause 9.3) shall be performed.

The associated connection and the connection for which establishment is in progress shall also be released using the LLME release of the MAC connection procedures (see EN 300 175-4 [4] clause 9.3.1.2).

11.8 Connection modification

The procedure shall be performed as defined in EN 300 175-4 [4] clause 10.2.3. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

During the establishment of advanced connections, whenever the MAC_CON-req primitive has specified a multi-bearer connection or the connection type as "unknown" a MAC_MOD-req primitive shall be sent to identify the exact connection attributes. The primitive shall not be sent immediately after the MAC_CON-req primitive instead it shall be delayed in order to allow some higher layer exchanges to occur using a C_S only MAC service. These higher layer exchanges shall be used to agree the wanted service, which shall then be invoked at the MAC layer using the MAC_MOD primitives.

Connection modification may be used to modify service attributes of established advanced connections of known service type. This may be used by the LLME to optimize the use of the resources by changing the bandwidth of existing connections (including the complete reversal of unidirectional connections) in response to service demands or it may be used in response to a NWK layer request for changing the connection characteristics (i.e. slot type, service type). C_F service data integrity shall always be preserved during connection modification. If the "minimum bearers" parameter is changed to a value greater than the actual bandwidth, the physical connection will be released if the MAC cannot achieve the new requirement.

Connection modification may occur during connection handover as well.

Table 63: Values used within the MAC_MOD-req primitive

Parameter	Information within the parameter	Normative action/comment
<< MCEI >>	MAC Connection Endpoint Identifier	Refer to EN 300 175-4 [4] clause 10.2.4.4.
<< ECN >>	All	Refer to EN 300 175-4 [4] clause 10.2.4.4.
<< Slot type >>	Full slot	
<< switching >>	Non	
<< Service type >>	I _p _error_detection	
	I _p _error_correction	Optional.
	I _{pq} _error_detection	Optional, for modulation scheme 1a and 1b; mandatory, for modulation schemes 2 and 3.
	I _{pq} _error_correction	Optional.
Target number of uplink simplex bearers.	All	In the range agreed by the higher layers.
Target number of downlink simplex bearers.	All	In the range agreed by the higher layers.
Minimum acceptable uplink simplex bearers.	All	In the range agreed by the higher layers.
Minimum acceptable downlink simplex bearers.	All	In the range agreed by the higher layers.

Table 64: Values used within the MAC_MOD-ind primitive

Parameter	Information within the parameter	Normative action/comment
<< MCEI >>	MAC Connection Endpoint Identifier	Refer to EN 300 175-4 [4] clause 10.2.4.4.
<< ECN >>	All	Refer to EN 300 175-4 [4] clause 10.2.4.4.
<< Slot type >>	Full slot	
<< switching >>	Non	
<< Service type >>	I _p _error_detection	
	I _p _error_correction	Optional.
	I _{pq} _error_detection	Optional, for modulation scheme 1a and 1b; mandatory, for modulation schemes 2 and 3.
	I _{pq} _error_correction	Optional.
<< Max lifetime >>	All	As agreed by the higher layers.
Result	Accept/reject	

Table 65: Values used within the MAC_MOD-cfm primitive

Parameter	Information within the parameter	Normative action/comment
<< MCEI >>	MAC Connection Endpoint Identifier	Refer to EN 300 175-4 [4] clause 10.2.4.4.
<< ECN >>		Refer to EN 300 175-4 [4] clause 10.2.4.4.
Result	Accept/reject	

11.9 Encryption switching

The procedure shall be performed as defined in EN 300 175-4 [4] clause 10.6, EN 300 175-7 [7] clauses 6.5.3 and 6.4.6 and EN 300 175-3 [3] clause 6.2.3. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

The procedure for encryption deactivation is not required to be supported since a new connection is always established in clear mode. Therefore any connection or link release implies encryption deactivation.

11.9.1 Associated procedure

11.9.1.1 Providing Encryption key to the MAC layer

On receipt of the DCK in a DL-ENC_KEY-req primitive the DLC shall transmit it to the MAC layer.

A record shall be kept for the active (the one used for the current encryption) DCK for use in case of connection handover.

11.9.2 Exceptional cases

11.9.2.1 Encryption fails

An encryption attempt which fails means the desired "Crypted" mode is not achieved. If the MAC fails to switch from clear to encrypted mode the connection is released and the DLC layer is informed by a MAC_DIS.Ind primitive. At the peer side this indication shall arrive as a result of the connection release.

11.9.2.2 Connection handover of ciphered connections

During a connection handover the new connection shall always be established in clear (encryption disabled). If the status of the old connection was "Crypted" then the LLME at the PT side shall command the DLC layer to enable ciphering on the new connection as soon as it is established by issuing a MAC_ENC_KEY-req primitive to the MAC layer (to provide the cipher key) followed by a MAC_ENC_EKS-req primitive with the flag set to "Go Crypted".

NOTE: If during the time that data has been encrypted a new DCK has been produced and stored when a connection handover of ciphered connection is performed the new key is not available at the DLC layer. Therefore the ciphering is performed using the old DCK.

Notification of successful encryption of the new connection shall be indicated by receipt of a MAC_ENC_EKS-cfm at the initiating side and a MAC_ENC_EKS-ind at the peer side. In this event no indication shall be issued to the NWK layer.

If the encryption of the new connection fails, the connection is released and the DLC layer is informed using the MAC_DIS-ind primitive. No indication with a MAC_ENC_EKS-ind or a MAC_ENC_EKS-cfm primitive shall be provided.

11.10 Connectionless point-to-multipoint transmission

For the transmission of point-to-multipoint U-plane data the MAC SI_p channel shall be used which is a connectionless channel that do not provide error corrections via retransmission of PDUs.

The submitted to DLC for connectionless transmission SDU shall be fragmented following the rules of the FU10a frame operation as specified in clause 11.2. Though no acknowledgement shall be provided the PDU shall be numbered to provide correct assembly at the receiving side and error detection. For assigning the numbers modulo 256 shall be used.

The resulted PDUs shall be submitted to SI_p channel on MAC request preserving the order of SDU fragmentation and the PDU should be removed from the transmitting window if such is applied.

NOTE: There may be terminals that do not listen to connectionless bearers when involved in a connection; for such terminals the information transmitted over the SI_p channel is expected to be transmitted as normal U-plane data over the existing connection.

12 NWK layer procedures

The following clauses define the process mandatory procedures which are in the scope of the DPRS. Some of these procedures introduce modifications to procedures described in EN 300 444 [8], or, EN 300 824 [9].

All protocol elements listed in the following clauses are process mandatory i.e. the FT and PT depending on their role in the procedure shall send or shall receive and process the relevant protocol elements as listed in the respective tables if not explicitly stated as being optional.

The primitives used in procedure descriptions are defined only for the purpose of describing layer-to-layer interactions. The primitives are defined as an abstract list of parameters, and their concrete realization may vary between implementations. No formal testing of primitives is intended. The primitive definitions have no normative significance.

This profile does not prevent any PT or FT from transmitting or receiving and processing any other NWK layer message or information element not specified in the profile. A PT or FT receiving an unsupported NWK layer message or information element which it does not recognize shall ignore it, as specified in EN 300 175-5 [5] clause 17. Deviations from this rule, if any, will be explicitly stated.

12.1 Outgoing call request

The procedure shall be performed as defined in EN 300 444 [8] clause 8.2 with the following modification:

Table 66: Values used within the {CC-SET-UP} message

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
<< Basic service >>			
	< Basic service >	1111	For the additional information elements needed to identify the required service/parameters see DPRS-N.2 Service Negotiation feature.

12.2 Incoming call request

The procedure shall be performed as defined in EN 300 444 [8] clause 8.12. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

Table 67: Values used within the {CC-SET-UP} message

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
<< Basic service >>			
	< Basic service >	1111	For the additional information elements needed to identify the required service/parameters see DPRS-N.2 Service Negotiation feature.

12.3 Terminal capability indication

The procedure shall be performed as defined in EN 300 444 [8] clause 8.17. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

In addition the following fields need to be supported in regard to the particular DPRS application supported, see annexes B and C.

Table 68: Values used within the << TERMINAL CAPABILITY >> information element

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
<< Terminal capability >>			
	< ext3 >	1,0	
	< Tone capability >	All	DPRS doesn't support tone capability. PT shall set it according to its capabilities; the FT is not required to understand it.
	< Display Capability >	All	PT shall set it according to its capabilities; the FT is not required to understand it if the FT does not provide DECT display services.
	< Echo parameter >		See note 3.
	< N-REJ >		See note 3.
	< A-VOL >		See note 3.
	< ext4 >	0	
	< Profile indicator_1 >	"xxxxx1x"B	(I) - Out of scope for DPRS, need not to be supported.
		"x1xxxxx"B	DPRS Stream support (see note 1).
		"1xxxxxx"B	Asymmetric bearer .
	< ext4a >	0	
	< Profile indicator_2 >	"xxxxxx1"B	DPRS FREL support (see note 1).
	< ext4b >	0	
	< Profile indicator_3 >	"x1xxxxx"B	Ethernet support (see note 2).
		"1xxxxxx"B	Token Ring support (see note 2) .
	< ext4c >	0	
	< Profile indicator_4 >	"xxxxxx1"B	I _p support (see note 2).
		"xxxxx1x"B	PPP support (see note 2).
		"xxx1xx"B	V.24 [15] support (see note 2).
		"xxx1xxx"B	C _F supported. The support of the C _F is optional.
		"xx1xxxx"B	I _{pq} services supported. Optional for 2-level modulation scheme.
	< ext4d >	1	See note 5.
	< Profile indicator_5 >	x x x x x 1	2-level modulation scheme supported (B + Z field).
		x x x x x 1 x	4-level modulation scheme supported (B + Z field) - Optional.
		x x x x 1 x x	8-level modulation scheme supported (B + Z field) - Optional.
		x x 1 x x x x	2-level modulation scheme supported (A field).

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
	< Control codes >	All	PT shall set it according to its capabilities; the FT is not required to understand it if the FT does not provide DECT display services or does not support control codes.
	< ext6 >	0,1	
	< Blind slot indication >	All	PT shall set the value according to its support; FT shall understand all values in order to be able to setup bearers. Value "11" shall be used to indicate that the FT shall read the following SPx fields in order to establish the exact PT limitations (see note 4).
	< SP0 > to < SP4 >	All	PT shall set the value according to its support; FT shall understand all values in order to be able to setup bearers (see note 4).
	< ext6a >	1	
	< SP5 > to < SP11 >		PT shall set the value according to its support; FT shall understand all values in order to be able to setup bearers (see note 4).
<p>NOTE 1: At least one of these bit maps shall contain 1.</p> <p>NOTE 2: At least one of these bit maps shall contain 1.</p> <p>NOTE 3: All this values are out of the scope of the DPRS and need not to be included; however, if an application wished to indicate Display capabilities including octets from Octet 3d onwards, these fields may be set to "Not applicable".</p> <p>NOTE 4: PTs that have limitations shall always indicate them. However, as this requirement for indication of the PT blind slots has been introduced to DPRS after version 1.1.1, some PTs developed before this change may still have limitation but will not be able to indicate them to the FT. Therefore, a FT supporting fast setup should be aware that failure of the setup may be due to PT limitations which has not been announced. Some examples of possible limitations could be inability of the PT to receive setup on slots adjacent to the slot on which the PT is locked or currently transmitting, or PT is able to receive only on every second slot odd or even. In such situation the FT should repeat the setup on different slot expecting possible limitations.</p> <p>NOTE 5: All Profile indicators fields shall be included and set according to the support of the particular item. For backwards compatibility, if Profile_indicator5 is not included it shall be understood that the PT supports only 2-level modulation scheme.</p>			

12.4 Internal call keypad

The procedure shall be performed as defined in EN 300 444 [8] clause 8.19. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

This type of internal calls cannot negotiate service parameters at establishment phase, the negotiated for the existing call service parameters can only be used. If new call service parameters are required the procedures related to feature "In call service change" shall be used.

12.5 Call Resources/Parameters negotiation

The procedure relates to feature Service Negotiation [DPRS-N.34] and shall be performed as defined in EN 300 175-5 [5] clauses 9.3.1.3, 9.3.2.3, 15.2.4 and 15.2.5. The following text together with the associated clauses defines the mandatory requirements with regard to the present document. The procedure introduces modification to the Outgoing call request and Incoming call request procedures as defined in EN 300 444 [8] clauses 8.2 and 8.12 respectively, and to the External Handover Setup as defined in EN 300 824 [9]. The procedure introduces as well modification to the Overlap Sending, Outgoing Call connection and Incoming call confirmation procedures as defined in EN 300 444 [8] clauses 8.3, 8.6 and 8.13 respectively. All modifications constitute information elements that need to be provided in addition to the already specified elements in other clauses.

To indicate/negotiate the exact parameters of the requested service the initiating side shall include into the {CC-SETUP} message:

- a << IWU ATTRIBUTES >> information element used to indicate the type/characteristics of the service requested;
- a << CALL ATTRIBUTES >> information element;
- a << CONNECTION ATTRIBUTES >> information element;
- a << TRANSIT DELAY >> information element;
- a << WINDOW SIZE >> information element.

Table 69: Values used within the {CC-SETUP} message

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
<< IWU attributes >>			
	< Coding standard >	01	Profile defined coding.
	< Profile >	00000 00001	FREL support Stream support.
	< Negotiation Indicator >	000, 010	- Negotiation not possible (see note 1) - Peer attribute negotiation.
	< Profile Subtype >	All	The required for support value and the complete structure of the IWU attributes relevant to the present document are defined in the relevant Interworking annexes of the present document.
<< Call attributes >>			DPRS requires for support only one set of Call attributes. If this information element is not included, default values shall be assumed (see clause 12.5.1).
	< Coding standard >	00	
	< NWK layer attributes >	00010	DPRS.
	< C-plane class >	010	Class A shared is only mandatory, rest are optional and need not be supported by the peer side.
	< C-plane routing >	0000, 0100	C _S only; C _F only ; Support of C _F is optional.
	< ext5 >	1	
	< U-plane symmetry >	00	Symmetric (see note 6).
	< LU identification >	01010	LU10.
	< ext6 >	1	
	< U-plane class >	101	Class 2; SElective.
	< U-plane frame type >	1010 1011	FU10a/c mandatory for support. FU10b optional, allowed only in symmetric connections - can only be used if both sides indicate the support of FU10b, FU10a shall be used otherwise.
<< Connection attributes >>			Signifies the maximum capabilities of the sender for the requested call. If not included the default value shall be assumed (see clause 12.5.1).
	< Symmetry >	001, 010	Symmetric Asymmetric FT-to-PT OR PT-to-FT with at least 1 duplex bearer (see note 4).
	< Connection identity >	0000	Not yet numbered.
	ext4	0, 1	If 1 is indicated, the octets 4a, 4b and 4c shall not be included and their values shall be understood to be equal to the value set in < Target bearers (P = > F direction) >.
	< Target bearers (P = > F direction) >	00nnnn nnnn = 1 to 23	If "Symmetric" has been indicated max. value that needs to be supported is 12.
	ext4a	0, 1	If 1 is indicated, the octets 4b and 4c shall not be included and their values shall be understood to be equal to the values set in octets 4 and 4a respectively.
	< Minimum bearers (P = > F direction) >	01nnnn nnnn = 0 to 23	
	ext4b	0, 1	If 1 is indicated, the octets 4c shall not be included and its value shall be understood to be equal to the value set in octet 4b.
	< Target bearers (F = > P direction) >	00nnnn nnnn = 1 to 23	

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
	ext4c	1	
	< Minimum bearers (F => P direction) >	01nnnn nnnn = 0 to 23	
	< ext5 >	0, 1	If 1 is indicated, octet 5a shall not be included and its value shall be understood to be equal to the value set in octet 5.
	< MAC slot size >	100	Full slot.
	< MAC service P => F >	0010, 0011, 0110, 0111	I _P ; detect only I _P ; Mod-2 correct I _{PQ} ; detect only I _{PQ} ; Mod-2 correct Support of "I _P ; Mod-2 correct" is optional For the support of I _{PQ} services (see clause 10.13).
	< ext5a >	1	
	< spare >	000	
	< MAC service F => P >	0010, 0011, 0110, 0111	I _P ; detect only I _P ; Mod-2 correct I _{PQ} ; detect only I _{PQ} ; Mod-2 correct Support of "I _P ; Mod-2 correct" is optional For the support of I _{PQ} services (see clause 10.13).
	< Ext6 >	1, 0	If 1 is indicated, octet 6a shall not be included and its value shall be understood to be equal to the value set in octet 6.
	< C _F -channel attributes P => F >	000, 010	C _F never (C _S only) C _F Demand/1 bearer (interrupting) Support of C _F is optional.
	< MAC packet life time P => F >	0 to 7	Values > 0 only for I _{P_error_correct} .
	< Ext6a >	1	
	< C _F -channel attributes F => P >	000, 010 (check all other tables, if this value is corrected)	C _F never (C _S only) C _F Demand/1 bearer (interrupting) Support of C _F is optional.
	< MAC packet life time F => P >	0 to 7	Values >0 only for I _{P_error_correct} or I _{Pq_error_correct} .
	< Ext7 >	1	See note 5.
	< A-attributes >	000	2-level modulation scheme
	< B-attributes >	000, 001, 010	2-level modulation scheme 4-level modulation scheme 8-level modulation scheme The support of 4 and 8 level modulation scheme is optional.
<< Transit delay >>			For the default value in case it is not included see clause 12.5.1.
	< Forward Delay >	0 All	Infinite - Mandatory for support Rest - optional.
	< Backward Delay >	0 All	It is not required to support different values in Backwards direction.
<< Window size >>			(see note 2) For the default values if not included see clause 12.5.1.
	ext3	0	

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
	< Window size value (forward) >	All	The value shall be placed in both 3 and 3a octets as defined in EN 300 175-5 [5], clause 7.7.43 (see clause 11.1.1). Maximum allowed for this profile value = 256. (see note 3)
	ext3a	1	
	< Window size value (forward) continue >	All	
	ext4	0	
	< Window size value (backward) >	All	The value shall be placed in both 3 and 3a octets as defined in EN 300 175-5 [5], clause 7.7.43 (see clause 11.1.1). Maximum allowed for this profile value = 256.
	ext4a	1	
	< Window size value (backward) continue >	All	
<p>NOTE 1: This value may only be used if all other parameters have values equal to the default values (see clause 12.5.1).</p> <p>NOTE 2: If octet group 4 (i.e. 4, 4a, 4b) is omitted the values defined in Octet group 3 apply for both directions.</p> <p>NOTE 3: The values introduced in 11.1.1 need to be respected in all window-size fields.</p> <p>NOTE 4: The direction of the connection downlink (FT-to-PT) or up-link (PT-to-FT) will be dynamically negotiated at MAC layer.</p> <p>NOTE 5: For backwards compatibility, if octet 7 is not included support of 2-level modulation scheme for both A- and B-field shall be assumed.</p> <p>NOTE 6: If "Symmetric" is indicated octets 4b, 4c, 5a and 6a need not to be included.</p>			

If the parameters as indicated in the {CC-SETUP} message are not acceptable and support of negotiation is indicated in the << IWU-ATTRIBUTES >> the receiving side shall attempt negotiation if different services are possible, otherwise the call shall be rejected using the Abnormal call release procedure as defined in EN 300 444 [8] clause 8.7.

For negotiation of << IWU-ATTRIBUTES >> and << CONNECTION ATTRIBUTES >> the Peer attribute negotiation procedure as defined in EN 300 175-5 [5] clause 15.2.5, shall be used. For negotiation of the << TRANSIT DELAY >> and the << WINDOW SIZE >> the Operating parameter negotiation procedure as defined in EN 300 175-5 [5] clause 15.2.4 shall be used. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

If some of the proposed services in the {CC-SETUP} message are not acceptable the peer entity shall continue the call set-up procedure by including one alternative service description returning the appropriate << CONNECTION ATTRIBUTES >> and/or << CALL ATTRIBUTES >> and/or << IWU-ATTRIBUTES >> and/or << WINDOW SIZE >> and/or << TRANSIT DELAY >> elements in the first response message (i.e. {CC-SETUP-ACK} or {CC-CONNECT} for FT, {CC-ALERTING} for PT).

If one or more of the values are acceptable the receiving side shall return unmodified parameters as formal acceptance of these unmodified values.

In the case related to the number of bearers to be used the peer side shall only return a value less than or equal to the initial offer; in all other cases, the allowed answer in case of acceptance of the call is indicated in table 53. If the initiating side has suggested values lower than the default values indicated in clause 12.5.1, the responding side may reject the call using the abnormal NWK release procedure.

Table 70: Values used within the response message

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
<< IWU attributes >>			
	< Coding standard >	The same as in the request	
	< Profile >	The same as in the request	
	< Negotiation Indicator >	000, 010	- Negotiation not possible (see note 1); - Peer attribute negotiation.
	< Profile Subtype >	The same as in the request	The required for support value and the complete structure of the IWU attributes in regard to the present document are defined in the relevant Interworking annexes of the present document.
<< Call attributes >>			
	< Coding standard >	00	
	< NWK layer attributes >	00010	DPRS.
	< C-plane class >	010	
	< C-plane routing >	0000, 0100	C _S only; C _F only (see note 3); Support of C _F is optional.
	< ext5 >	1	
	< U-plane symmetry >	00	Symmetric.
	< LU identification >	01010	LU10.
	< ext6 >	1	
	< U-plane class >	101	Class 2; SElective.
	< U-plane frame type >	1010	FU10a/c mandatory for support.
		1011	FU10b optional, allowed only in symmetric connections - can only be used if both sides indicate the support of FU10b, FU10a shall be used otherwise. (see note 4)
<< Connection attributes >>			
	< Symmetry >	001, 010	Signifies the maximum capabilities of the sender for the requested call. Symmetric (see note 11) Asymmetric FT-to-PT OR PT-to-FT with at least 1 duplex bearer (see notes 5 and 9).
	< Connection identity >	0000	Not yet numbered.
	ext4	0, 1	If 1 is indicated, the octets 4a, 4b and 4c shall not be included and their values shall be understood to be equal to the value set in < Target bearers (P => F direction) >.
	< Target bearers (P => F direction) >	00nnnnn nnnnn = 1 to 23	If "Symmetric" has been indicated max. value that need to be supported is 12
	ext4a	0, 1	If 1 is indicated, the octets 4b and 4c shall not be included and their values shall be understood to be equal to the values set in octets 4 and 4a respectively.
	< Minimum bearers (P => F direction) >	00nnnnn nnnnn = 0 to 23	
	ext4b	0, 1	If 1 is indicated, the octets 4c shall not be included and its value shall be understood to be equal to the value set in octet 4b.
	< Target bearers (F => P direction) >	00nnnnn nnnnn = 1 to 23	
	ext4c	1	

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
	< Minimum bearers (F => P direction) >	00nnnnn nnnnn = 0 to 23	
	< ext5 >	0, 1	If 1 is indicated, octet 5a shall not be included and its value shall be understood to be equal to the value set in octet 5.
	< MAC slot size >	100	Full slot.
	< MAC service P => F >	0010, 0011, 0110, 0111	I _P ; detect only I _P ; Mod-2 correct (see note 6) I _{PQ} ; detect only I _{PQ} ; Mod-2 correct Support of "I _P ; Mod-2 correct" is optional For the support of I _{PQ} services (see clause 10.13).
	< ext5a >	1	
	< spare >	000	
	< MAC service F => P >	0010, 0011, 0110, 0111	I _P ; detect only I _P ; Mod-2 correct (see note 6) I _{PQ} ; detect only I _{PQ} ; Mod-2 correct Support of "I _P ; Mod-2 correct" is optional For the support of I _{PQ} services (see clause 10.13).
	< Ext6 >	1, 0	If 1 is indicated, octet 6a shall not be included and its value shall be understood to be equal to the value set in octet 6
	< C _F -channel attributes P => F >	000, 010	C _F never (C _S only) C _F Demand/1 bearer (interrupting) (see note 7) Support of C _F is optional.
	< MAC packet life time P => F >	0 to 7	values > 0 only for I _{P_error_correct} .
	< Ext6a >	1	
	< C _F -channel attributes F => P >	000, 010	C _F never (C _S only) C _F Demand/1 bearer (interrupting) (see note 7) Support of C _F is optional.
	< MAC packet life time F => P >	0 to 7	values > 0 only for I _{P_error_correct} or I _{Pq_error_correct} .
	< Ext7 >	1	See note 10.
	< A-attributes >	000	2-level modulation scheme.
	< B-attributes >	000, 001, 010	2-level modulation scheme 4-level modulation scheme 8-level modulation scheme The support of 4 and 8 level modulation scheme is optional.
<< Transit delay >>			For the default value in case it is not included (see 12.5.1).
	< Forward Delay >	0 All	Infinite - Mandatory for support Rest - optional (see note 8).
	< Backward Delay >	0 All	It is not required to support different values in Backwards direction (see note 8)
<< Window size >>			For the default values if not included (see 12.5.1).
	ext3	0	

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
	< Window size value (forward) >	All	The value shall be placed in both 3 and 3a octets as defined in EN 300 175-5 [5] clause 7.7.43 (see clause 11.1.1). Maximum allowed for this profile value = 256.
	ext3a	1	
	< Window size value (forward) continue >	All	
	ext4	0	
	< Window size value (backward) >	All	The value shall be placed in both 3 and 3a octets as defined in EN 300 175-5 [5] clause 7.7.43, see clause 11.1.1. Maximum allowed for this profile value = 256.
	ext4a	1	
	< Window size value (backward) continue >	All	
<p>NOTE 1: This value may only be used if all other parameters have values equal to the default values (see clause 12.5.1).</p> <p>NOTE 2: If octet group 4 (i.e. 4, 4a, 4b) is omitted the values defined in Octet group 3 apply for both directions.</p> <p>NOTE 3: If C_s has been requested then the responding side is not allowed to answer with any value that includes C_F support.</p> <p>NOTE 4: IF FU10a/c has been requested then the responding side is not allowed to answer with FU10b.</p> <p>NOTE 5: If Symmetric was requested then the responding side is not allowed to answer with Asymmetric.</p> <p>NOTE 6: If I_p-error_detect was requested then the responding side is not allow to respond with I_p-error_correct</p> <p>NOTE 7: If C_F never (C_s only) has been requested then the responding side is not allow to suggest C_F Demand</p> <p>NOTE 8: If Infinite has been requested then the responding side shall accept it if any other value has been requested the responding side may answer with Infinite, with the value requested, or, with any value that it can support. If the call has been already released because of failure of the negotiation see additional requirements in this clause.</p> <p>NOTE 9: The direction of the connection downlink (FT-to-PT) or up-link (PT-to-FT) will be dynamically negotiated at MAC layer.</p> <p>NOTE 10: For backwards compatibility, if octet 7 is not included support of 2-level modulation scheme for both A- and B-field shall be assumed. The responding side shall either accept the values send by the initiating side or may respond with support of 2-level modulation form both A- and B-field.</p> <p>NOTE 11: If "Symmetric" is indicated octets 4b, 4c, 5a and 6a need not to be included.</p>			

The initiating side shall accept any reduced value if it does not fell below the default values for the particular parameter, and may but is not required to accept values lower than the default values indicated in clause 12.5.1. The initiating entity shall indicate its acceptance of these new attributes by proceeding with the normal call set-up procedures. For the behaviour in case the negotiation fails see clause 12.5.2.

The negotiation of the lower resources is performed at higher layers where exchange of NWK layer messages is involved. The resources assignment is done at the lower layers. To provide proper functioning the LLME shall ensure that all responsible for the implementation of the agreed parameters layers and processes are informed in time for the result from the NWK layer procedures and specially before a resources allocation/modification is to be made at the lower layers.

The bandwidth negotiation at MAC may fail due to one of the sides being yet not informed for the negotiated values. This shall not lead to release of the call, the procedure shall be repeated.

An example for information exchange sequence is given in figure 15.

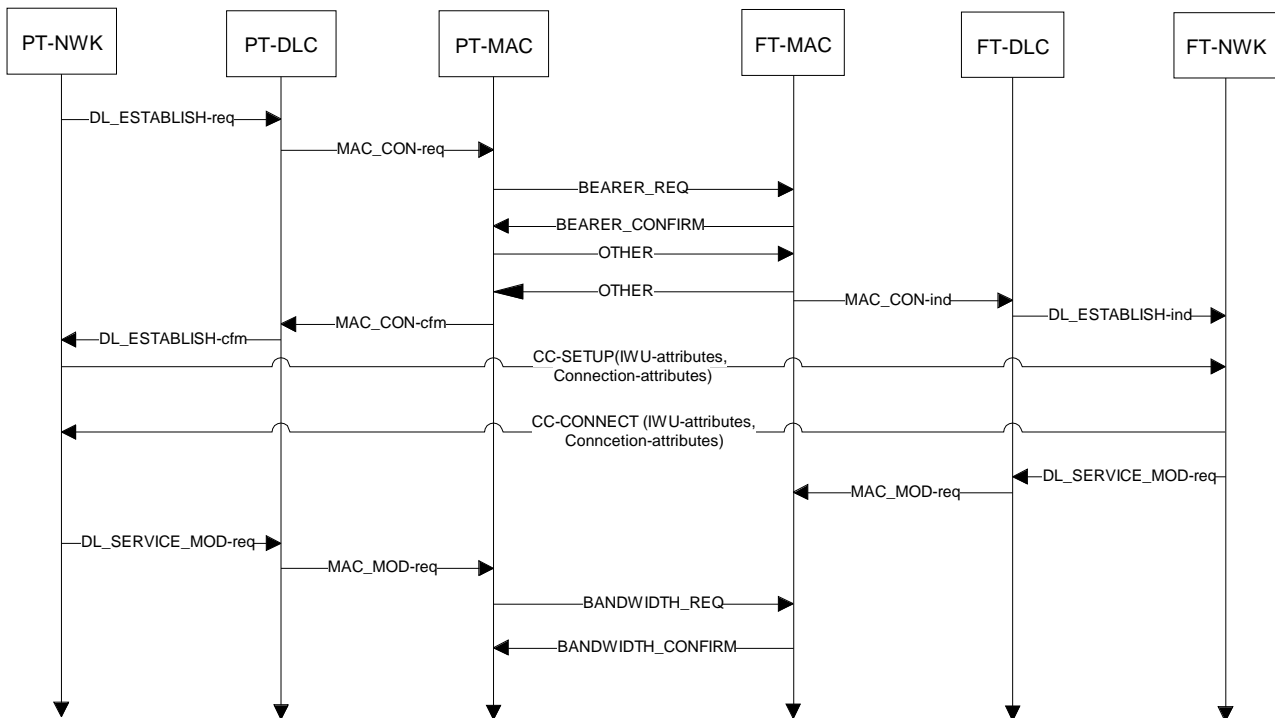


Figure 15: Service/parameters negotiation interlayer exchange

NOTE: The transmission of CC-SETUP and CC-CONNECT throughout the layers is not shown. Full contents of messages and primitives are not shown. Primitives are informative.

12.5.1 Default values

When an information element as listed below is not included the specified in this clause default values shall be assumed. In any case, in order to avoid misunderstanding the responding side shall always include the relevant information elements, even if the default values are supported.

Table 71: Default values for << Call attributes >> in the "request" message

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
<< Call attributes >>			
	< Coding standard >	00	
	< NWK layer attributes >	00010	DPRS
	< C-plane class >	010	
	< C-plane routing >	0000	C _S only
	< ext5 >	1	
	< U-plane symmetry >	00	Symmetric
	< LU identification >	01010	LU10
	< ext6 >	1	
	< U-plane class >	101	Class 2; SElective
	< U-plane frame type >	1010	FU10a

Table 72: Default values for << Connection attributes >> in the "request" message

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
<< Connection attributes >>			Signifies the maximum capabilities of the sender for the requested call. If not included the default value shall be assumed, see below.
	< Symmetry >	001	Symmetric.
	< Connection identity >	0000	Not yet numbered.
	ext4	1	
	< Target bearers both direction) >	1	
	< ext5 >	1	
	< MAC slot size >	100	Full slot.
	< MAC service both directions >	0010	I _P ; detect only.
	< Ext6 >	1	
	< C _F -channel attributes P => F >	000	C _F never (C _S only) Both directions.
	< MAC packet life time P => F >	0 (I _P -error-detect) 4 (I _P -error-correct)	OK.
	< Ext7 >	1	
	< A-attributes >	000	2-level modulation scheme.
	< B-attributes >	000	2-level modulation scheme.

Table 73: Default values for << Transit Delay >> in the "request" message

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
<< Transit delay >>			
	< Forward Delay >	0	Infinite
	< Backward Delay >	0	Infinite

Table 74: Default values for << Window size >> in the "request" message

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
<< Window size >>			
	ext3	0	
	< Window size value (forward) >	0000001	The value shall be placed in both 3 and 3a octets as defined in EN 300 175-5 [5] clause 7.7.43 Default value = 32.
	ext3a	1	
	< Window size value (forward) continue >	0000000	
	ext4	0	
	< Window size value (backward) >	0000001	The value shall be placed in both 3 and 3a octets as defined in EN 300 175-5 [5] clause 7.7.43 Default value = 32.
	ext4a	1	
	< Window size value (backward) continue >	0000000	

12.5.2 Exceptional cases

If the negotiation fails, e.g. a side has suggested values lower than the default values or service that is not supported, the call shall be released using the abnormal NWK layer release procedure. An alternative set of values shall be suggested.

The {CC-RELEASE-COM} message shall be used:

Table 75: Values used within the {CC-RELEASE-COM} message

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
<< Release Reason >>			
	< Reason >	0B	Negotiation failed.
<< IWU attributes >>		See clause 12.5	Shall be included if the negotiation failed due to unacceptable services indicated in the received << IWU attributes >> suggesting an alternative proposal.
<< Connection attributes >>		See clause 12.5	Shall be included if the negotiation failed due to unacceptable services indicated in the received << Connection attributes >> suggesting an alternative proposal.

12.6 Bandwidth Change

The procedure relates to feature In Call Service Change [DPRS N.35] and shall be performed as defined in EN 300 175-5 [5] clauses 9.6.1 and 9.6.2. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

Bandwidth changes shall be defined as changes that may be realized by modification of the existing MAC connection. The << CONNECTION-ATTRIBUTES >> element shall always be included to define the new connection bandwidths.

Table 76: Values used within the {CC-SERVICE-CHANGE} message

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
<< Portable identity >>			
	< Type >	0	International Portable User Identity (IPUI).
	< PUT >	All	Area dependent.
	< PUN >	All	Area dependent.
<< Service Change Info >>			
	< Ext3 >	1	
	< Coding standard >	00	DECT standard coding.
	< M >	0/1	Initiating/Receiving side is master.
	< Change Mode >	0010	Bandwidth change.
<< Connection attributes >>			Signifies the maximum capabilities of the sender for the requested call.
	< Symmetry >	001, 010	Symmetric Asymmetric FT-to-PT OR PT-to-FT with at least 1 duplex bearer (see note).
	< Connection identity >	0000	Not yet numbered.
	ext4	0, 1	If 1 is indicated, the octets 4a, 4b and 4c shall not be included and their values shall be understood to be equal to the value set in < Target bearers (P => F direction) >.
	< Target bearers (P => F direction) >	00nnnn nnnn = 1 to 23	If "Symmetric" has been indicated max. value that needs to be supported is 12.
	ext4a	0, 1	If 1 is indicated, the octets 4b and 4c shall not be included and their values shall be understood to be equal to the values set in octets 4 and 4a respectively.
	< Minimum bearers (P => F direction) >	00nnnn nnnn = 0 to 23	
	ext4b	0,1	If 1 is indicated, the octets 4c shall not be included and its value shall be understood to be equal to the value set in octet 4b.
	< Target bearers (F => P direction) >	00nnnn nnnn = 1 to 23	
	ext4c	1	
	< Minimum bearers (F => P direction) >	00nnnn nnnn = 0 to 23	
	< ext5 >	0, 1	If 1 is indicated, octet 5a shall not be included and its value shall be understood to be equal to the value set in octet 5.
	< MAC slot size >	100	Full slot.
	< MAC service P => F >	0010, 0011, 0110, 0111	I _P ; detect only I _P ; Mod-2 correct I _{PQ} ; detect only I _{PQ} ; Mod-2 correct Support of " I _P ; Mod-2 correct" is optional For the support of I _{PQ} services see 10.13
	< ext5a >	1	
	< spare >	1000	

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
	< MAC service F = > P >	0010, 0011, 0110, 0111	I _P ; detect only I _P ; Mod-2 correct I _{PQ} ; detect only I _{PQ} ; Mod-2 correct Support of " I _P ; Mod-2 correct" is optional For the support of I _{PQ} services see 10.13
	< Ext6 >	1, 0	If 1 is indicated, octet 6a shall not be included and its value shall be understood to be equal to the value set in octet 6
	< C _F -channel attributes P = > F >	000, 010	C _F never (C _S only) C _F Demand/1 bearer (interrupting) Support of C _F is optional.
	< MAC packet life time P = > F >	0 to 7	Values > 0 only for I _{P_error_correct} .
	< Ext6a >	1	
	< C _F -channel attributes F = > P >	000, 010	C _F never (C _S only) C _F Demand/1 bearer (interrupting) Support of C _F is optional.
	< MAC packet life time F = > P >	0 to 7	Values > 0 only for I _{P_error_correct} .
	< Ext 7 >	1	See note 2
	< A-attributes >	000	2-level modulation scheme
	< B-attributes >	000, 001, 010	2-level modulation scheme 4-level modulation scheme 8-level modulation scheme The support of 4 and 8 level modulation scheme is optional.
NOTE 1: The direction of the connection downlink (FT-to-PT) or up-link (PT-to-FT) will be dynamically negotiated at MAC layer.			
NOTE 2: For backwards compatibility, if octet 7 is not included support of 2-level modulation scheme for both A- and B-field shall be assumed.			

Table 77: Values used within the {CC-SERVICE-ACCEPT} message

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
			All optional - The receiving side is not allowed to suggest back different to the requested settings.

12.6.1 Associated procedures

12.6.1.1 Timer F/P < CC_service > management

< CC_service >: Service Change timer;

Value: 20 seconds;

Start: {CC-SERVICE-CHANGE} message is sent;

Stop: An indication for link release from the DLC is received; A {CC-SERVICE-ACCEPT} or a {CC-SERVICE-REJECT} message is received; {CC-RELEASE}, {CC-RELEASE-COM} messages are sent or received.

12.6.2 Exceptional cases

12.6.2.1 Service change request is rejected

If the receiving side is not able to handle the requested service change it shall reject it.

Table 78: Values used within the {CC-SERVICE-REJECT} message

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
			All optional.

12.6.3 Examples

The modification of the lower resources is initiated from the higher layers where exchange of NWK layer messages is involved. The resources assignment is done at the lower layers. To provide proper functioning the LLME shall ensure that all responsible layers and processes are informed in time for the result from the NWK layer procedures before a resources allocation/modification is to be made at the lower layers.

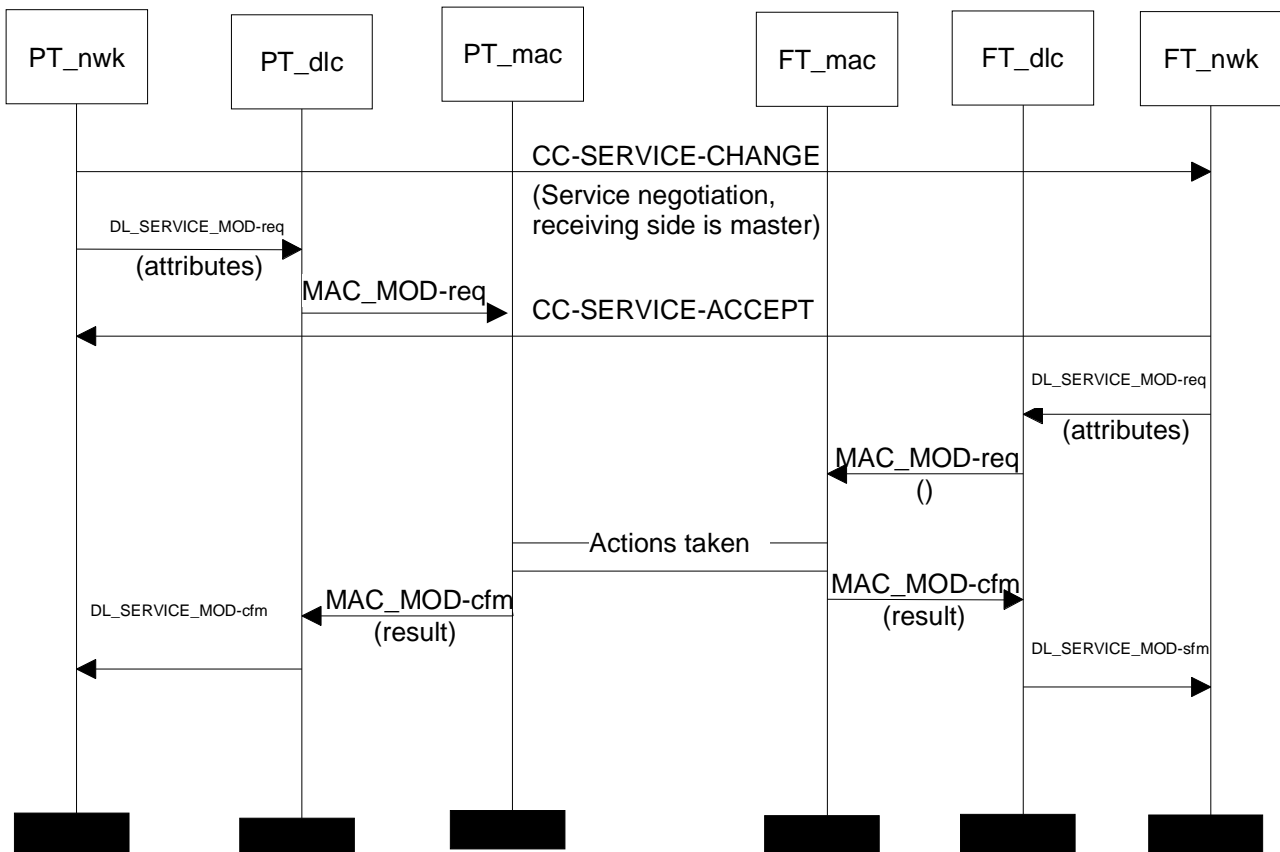


Figure 16: Example of service change with the receiving side initiating the resources allocation

12.7 IWU-attributes change

The procedure relates to feature In Call Service Change [DPRS-N.35] and is similar to the Bandwidth change procedure as described in clause 10.7.1 and in EN 300 175-5 [5] clauses 9.6.1 and 9.6.2. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

The IWU- attributes change shall be defined as changes that may be realized by modification of the existing MAC connection. The << IWU-ATTRIBUTES >> element shall always be included to define the new strings.

For the {CC-SERVICE-CHANGE}, {CC-SERVICE-ACCEPT} and {CC-SERVICE-REJECT} the requirements from clause 12.6 apply with the following modification.

Table 79: Values used within the {CC-SERVICE-CHANGE} message

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
<< IWU attributes >>			
	< Coding standard >	01	
	< Profile >	00001	Stream support.
		00000	FREL support.
	< Negotiation Indicator >	000, 010	Shall be as set during the call establishment.
	< Profile Subtype >	0000	Ethernet (WLAN).
		1000	Interworking to V.24 [15] circuits (RS232).
		0001	ISO/IEC 8802-5 [11] (clause B.5).
		0010	Internet Protocol (Ip) (clause B.6).
		0100	Point-to-Point Protocol (clause B.7).
<< Service Change Info >>			
	< Ext3 >	1	
	< Change Mode >	1100	IWU attribute change.

12.8 Dynamic Parameters Allocation

The procedure is related to feature DPRS-N.33, Dynamic parameters allocation. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

For proper functioning of the DPRS protocol it is necessary a number of dynamic parameters to be allocated beforehand. For this purpose exchange of information included in << SETUP-CAPABILITY >> information element is necessary. As this parameters are used in MAC or elsewhere operation for the related behaviour and requirements clauses 9, 10 or 11 may be relevant as well.

Bit:	8	7	6	5	4	3	2	1	Octet:
0	<< SETUP-CAPABILITY >>								1
	Length of Contents (L)								2
1	0	0	1	Setup		Page			3
0/1	Service settings_1								4
0/1
1	Service settings_n								4n-1
	Parameters settings_1								5
	T903								5a
	T904								5b
	T905								5c
	T909								5d
	T910								5e
	Bearers number								5f

Figure 17: SETUP-CAPABILITY information element for DPRS

Service settings (octet group 4):

This is a bit mapped octet group. A "1" indicates support for the specified service setting. Reserved bits shall be set to zero and need not be checked in the receiver.

Service_settings_1 Coding (Octet 4):**Bits 7 6 5 4 3 2 1 Meaning**

x x x x x 1	I _p _error_correct supported
x x x x x 1 x	Allow suppression of bearer quality messages for asymmetric connection (EN 300 175-3 [3] clause 7.3.5.4) only if all Q2 bits are = 1
x x x x 1 x x	Allow suppression of bearer quality messages for asymmetric connection (EN 300 175-3 [3] clause 7.3.5.4) in any case.
x x x 1 x x x	Q1 bit is used (I _p _error_detect only).

All the rest reserved for further standardization.

Service_settings_n Coding (Octet 4n-1):

This is provided in case of demands for further DPRS standardization.

Parameters_settings_1 (octet group 5):

This is a bit mapped octet group. A "1" indicates that value for the particular parameter is provided otherwise the default value for this parameter shall be assumed. Reserved bits shall be set to zero and need not be checked in the receiver.

Bits 8 7 6 5 4 3 2 1 Meaning

x x x x x x 1	Timer T903 value is provided
x x x x x 1 x	Timer T904 value is provided
x x x x 1 x x	Timer T905 value is provided
x x x 1 x x x	Timer T909 value is provided
x x x 1 x x x x	Timer T910 value is provided
x x 1 x x x x x	Bearers number provided

All the rest reserved for further standardization.

When number of values are provided they shall be provided in the order indicated here. For example, if only T905 and T910 values are included octets 5, 5c and 5e need to be included in this order.

More Parameters may be added in future standardization by including of octet 6 and following 6a, ...6n.

Timer T903 value (octet 5a):

The value shall be binary coded with 1 unit = 2 frames; the value "1111111" is reserved and shall not be used.

Timer T904 value (octet 5b):

The value shall be binary coded with 1 unit = 1 frame; the value "1111111" is reserved and shall not be used.

Timer T905 value (octet 5c):

The value shall be binary coded with 1 unit = 1 frame; the value "1111111" is reserved and shall not be used.

Timer T909 value (octet 5d):

The value shall be binary coded with 1 unit = 1 multi frame ; the value "1111111" shall be understood as "infinite"; If the < Setup capability coding > value indicates "01" this value (if included) shall be set to "0".

Timer T910 value (octet 5e):

The value shall be binary coded with 1 unit = 4 multi frames ; the value "1111111" shall be understood as "infinite".

Bearers number value (octet 5f):

The value shall be binary coded with LSB placed on bit 0.

It shall identify the max number of bearers that can be supported per connection.

For the DPRS profile the << SETUP-CAPABILITY >> information element as defined in EN 300 175-5 [5] clause 7.7.40 shall apply with the following additions/modifications:

Table 80: Values used within the << SETUP-CAPABILITY >> information element

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
<< Set-up capability >>			
	< ext3 >	1	
	< Protocol discriminator >	001	DPRS.
	< Set-up >	01, 10	Setting and support depends on the relevant capability. Fast setup is optional for support for PT and mandatory for FT.
	< Page >	01, 10	Setting and support depends on the relevant capability. Fast paging is optional for support for PT and mandatory for FT.
	< ext4 >	1	
	< Service_settings_1 >	0000000	Default value - mandatory for support.
		xxxxxx1	I _p _error_correct supported - optional for support.
		xxxxx1x	Allow suppression of bearer quality messages for asymmetric connection (EN 300 175-3 [3] clause 7.3.4.4) only if all Q2 bits are = 1 optional for support.
		xxxx1xx	Allow suppression of bearer quality messages for asymmetric connection (EN 300 175-3 [3] clause 7.3.4.4) in any case. Optional for support.
		xxx1xxx	Q1 bit is used (I _p _error_detect only). optional for support
	< Parameter_settings_1 >	As relevant	If a bit is set to "0" the default values as indicated in annex A clauses 1.3.1 and 1.3.2 shall be assumed.
	T903	For the allowed values see A.1.3.1	If indicated in < Parameter_settings_1 > that value for this is included (i.e. xxxxxxx1).
	T904	For the allowed values see A.1.3.1	If indicated in < Parameter_settings_1 > that value for this is included (i.e. xxxxxx1x).
	T905	For the allowed values see A.1.3.1	If indicated in < Parameter_settings_1 > that value for this is included (i.e. xxxxx1xx).
	T909	For the allowed values see A.1.3.2	If indicated in < Parameter_settings_1 > that value for this is included (i.e. xxxx1xxx).
	T910	For the allowed values see A.1.3.1	If indicated in < Parameter_settings_1 > that value for this is included (i.e. xxx1xxxx).
	Bearer number	1 to 24	If indicated in < Parameter_settings_1 > that value for this is included (i.e. xx1xxxx).

A PT shall include the << SETUP-CAPABILITY >> information element in the {ACCESS-RIGHTS-REQUEST} and {LOCATE-REQUEST} messages.

A FT shall include the << Set-up capability >> information element in the {ACCESS-RIGHTS-ACCEPT} and {LOCATE-ACCEPT} messages. In addition the FT may include the << SETUP-CAPABILITY >> in a {MM-INFO-SUGGEST} message or in a {CLMS-FIXED} message.

Both sides are required to understand and react properly upon receipt of a << SETUP-CAPABILITY >> information element as described in this clause.

In regard to the service support indicated in the < service settings > both sides are allowed to use a particular setting only if both sides have indicated support of this service.

In regard to the values indicated in the < Parameters settings > see clauses A.1.3.1 and A.1.3.2. For the T910 parameter the lower indicated value by either side shall be considered as the agreed value and used afterwards even if this is lower than the default value as indicated in clause A.1.3.2. In all cases if a side does not provide setting for a particular parameter the default values as indicated in clauses A.1.3.1 and A.1.3.2 shall be assumed as being indicated.

For the complete contents of {ACCESS-RIGHTS-REQUEST} and {ACCESS-RIGHTS-ACCEPT} the requirements of EN 300 444 [8] clause 8.30 shall apply.

For the complete contents of {LOCATE-REQUEST} and {LOCATE-ACCEPT} the requirements of EN 300 444 [8] clause 8.28 shall apply.

For the transmission of the {MM-INFO-SUGGEST} message the Procedure for parameter retrieval initiated by the FT as specified in EN 300 175-5 [5] clause 13.7 shall apply.

For the contents of {MM-INFO-SUGGEST} the following requirements apply:

Table 81: Values used within the {MM-INFO-SUGGEST} message

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
<< Info type >>			
	< Parameter type >	0000110	Dynamic parameters allocation.
<< Set-up capability >>			For the allowed values see table 78.

For the transmission of the {CLMS-FIXED} message the CLMS message transmission procedure initiated by the FT as specified in EN 300 175-5 [5] clause 12.3.1 shall apply with the following clarifications.

For the contents of {CLMS-FIXED} EN 300 175-5 [5] clause 8.3 shall apply with the following modification/clarifications:

Table 82: Values used within the {CLMS-FIXED} message address section

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
< A >		1	Address section.
< CLMS header >		100	Bit stream - multi-section.
< Address >			2 octets of CLMS TPUI.
Protocol Discriminator		00000001	DECT Information Element coding.
Length Indicator		Any	

Table 83: Values used within the {CLMS-FIXED} message data section

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
< A >		0	Data section.
< CLMS header >		n n n	Data section number.
< Data/Fill >		See table 63	A complete << Set-up capability >> information element shall be included - more than 1 CLMS fixed data sections may be needed.
< Data/Fill (cont) >		See table 63	-
< Data/Fill (cont) >		See table 63	-
< Data/Fill (cont) >		See table 63	-

12.8.1 Default Dynamic Parameters Allocation

A terminal is allowed to omit the << Setup capability >> information element if this terminal would like to indicate only default values. If the << Setup capability information element is not found the receiving side shall react as this has been received with all fields set to the default values as indicated in the tables below.

Table 84: Default values assumed within the PT << SETUP-CAPABILITY >> if not included

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
<< Set-up capability >>			
	< ext3 >	0	
	< Protocol discriminator >	001	DPRS.
	< Set-up >	01	Normal setup.
	< Page >	01	Normal paging.
	< ext4 >	1	
	< Service_settings_1 >	0000000	Default value - mandatory for support.
		xxxxxx0	I _{p_error_correct} not supported.
		xxxxx0x	Does not allow suppression of bearer quality messages for asymmetric connection (EN 300 175-3 [3] clause 7.3.5.4) only if all Q2 bits are = 1.
		xxxx0xx	Does not allow suppression of bearer quality messages for asymmetric connection (EN 300 175-3 [3] clause 7.3.5.4) in any case.
		xxx0xxx	Q1 bit is NOT used (I _{p_error_detect} only).
	< Parameter_settings_1 >	00110000	The default value A.1.3.2 shall be assumed.
	T910	32	
	Bearer number	2	

12.9 Cipher-switching initiated by PT

The procedure shall be performed as defined in EN 300 444 [8] clause 8.34. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

As this procedure is likely to be used during call establishment in order to avoid delay in the call initiation a FT that do not support ciphering shall not ignore the {CIPHER-SUGGEST} message and shall respond with a {CIPHER-REJECT} message.

Table 85: Standard values used within the {CIPHER-REJECT} message

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
<< Reject reason >>			
	< Reject reason code >	17	No cipher algorithm

12.10 Temporary Identity Assign

The procedure shall be performed as defined in EN 300 175-5 [5] clause 13.2.2. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

This procedure shall not be used for assignment of an individual assigned TPUI - the location registration procedure as described in EN 300 444 [8] shall be used instead. Whenever other TPUIs need to be assigned this procedure shall be used.

Table 86: Values used within the {TEMPORARY-IDENTITY-ASSIGN} message

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
<< Portable-identity >>			
	< Type >	0100000	TPUI.
	< Length of id value >	20	
	< Identity-value >	Values in EN 300 175-6 [6] clause 6.3.1 are allowed	Individual TPUIs are not allowed to be assigned with this procedure.
<< Duration >>			Inclusion of this information element is optional and PT is not required to understand it.
	< Lock limits >	111 (binary)	No limits.
		101 (binary)	Temporary user limit 2.
		110 (binary)	Temporary user limit 1.
	< Time limits >	1	Defined time limit 1.
		2	Defined time limit 2.
		15	Infinite.
	< Time duration >	All	

Table 87: Values used within the {TEMPORARY-IDENTITY-ASSIGN-ACK} message

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
			All optional.

12.10.1 Associated procedures

12.10.1.1 Timer F-< MM_ident.1 > management

< MM_ident.1 >: TPUI assignment timer;

Value: Refer to EN 300 175-5 [5] annex A;

Start: {TEMPORARY-IDENTITY-ASSIGN} message assigning a TPUI is sent or an interrupting higher priority transaction is completed;

Stop: An indication for link release from the DLC is received.
A {TEMPORARY-IDENTITY-ASSIGN-ACK} or a {TEMPORARY-IDENTITY-ASSIGN-REJECT} message is received, or, interrupting higher priority transaction begins.

12.10.2 Exceptional cases

12.10.2.1 PT rejects the identity assignment

If the PT is not able to handle the requested Temporary Identity assignment it should reject it.

Table 88: Values used within the {TEMPORARY-IDENTITY_ASSIGN-REJECT} message

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
			All optional.

12.11 Indirect FT initiated link establishment

The procedure shall be performed as defined in EN 300 444 [8] clause 8.35. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

FT and PT shall only support short format for the {LCE-REQUEST-PAGE} message.

Table 89: Values used within the {LCE-REQUEST-PAGE} message

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
<< LCE Header >>			
	< W >	All	For the relation between this field and the < LDE-header > field see EN 300 175-5 [5] clause 8.2.1.
	< LCE-header >	"110"	I _p -error-detect - mandatory.
		"111"	I _p -error-correct - optional.
		"011"	Unknown.
		"001"	Unknown (MAC service type) & Ringing only relevant for collective/group ringing.
<< Short address >>			
	< TPUI Address >	All	Part of the actual TPUI value or/and Ringing information see EN 300 175-5 [5] clause 8.2.1.

The message shall be inserted in a DL_BROADCAST-req primitive:

Table 90: DL_BROADCAST-req primitive

Parameter	Information within the parameter	Normative action/comment
<< Cluster address list >>		FT needs to have knowledge as where (in which cluster) the intended PT is located. Alternatively paging may be sent in the whole system.
	Data Link Endpoint Identifier	See EN 300 175-4 [4] clause 7.3.6.
<< Message unit >>		
	LCE-PAGE-REQUEST	
<< Message unit length >>		
	3 Octets	Short paging format.
<< Extended message flag >>		Related to the "long" in MAC paging primitives.
	Off	
<< Error flag >>		Usually needed for the "ind" primitive.
	Off	

12.12 Fast paging

In the case that the PP or the FP are capable of supporting fast paging, this shall be signalled to the FP (PP) by the appropriate coding of the << Set-up - capabilities >> information element, which shall be transmitted in the {ACCESS-RIGHTS-REQUEST} and {LOCATE-REQUEST} messages, see clause 12.8.

If the PT and the FT support fast paging and when the FT in accordance to the FT call establishment management procedures wants to perform a fast paging, see clause 9, the FP shall transmit the {LCE-REQUEST-PAGE} to DLC included into a DL_EXPEDITED_req primitive. At the receiving side the event shall be indicated to the LCE respectively with a DL_EXPEDITED_ind primitive. For the possible contents of the related primitives see the contents of DL_BROADCAST primitive as defined in clause 12.11.

12.13 Collective and Group Ringing

The procedure shall be performed as defined in EN 300 175-5 [5] clause 14.4 with following modifications in regard to the paging message to be used.

For collective and Group ringing in regard to data calls, the long paging format shall be used as defined in EN 300 175-5 [5] clause 8.2.2 with the following modifications:

Table 91: Values used within the {LCE-REQUEST-PAGE} message

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
<< LCE Header >>			
	< W >	1	
	< LCE-header >	010	Escape.
<< discriminator >>		0010	Collective and group ringing with defined MAC services.
<< Short address >>			
	< TPUI Address - MS nibble >	1001 0001	Ring pattern & group mask Ring pattern & assigned group TPUI (12 LSB) or CBI (see note).
		All	Depends on the value indicated in field < TPUI Address - MS nibble > (see note).
<< Information >>	< Spare >	0000	
	< IWU identification >	0001	Ethernet.
		0010	Token Ring.
		0011	Ip.
		0100	PPP.
		0101	V.24 [15].
NOTE: Depending on the indication the contents of the < TPUI Address > field shall be differently interpreted. The interpretation shall be as in the case of collective and group ringing with short page format, see EN 300 175-5 [5] clause 8.2.1.			

The PT shall examine the IWU Identification field and shall alert the corresponding application. If the user (or the application) answers the outgoing call shall be initiated in accordance to the settings of this application, including service/parameters related values, see clause 12.5.

12.14 Direct FT initiated link establishment

The procedure shall be performed as defined in EN 300 175-5 [5] clause 14.2.4. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

The FT shall indicate to the PT whether it supports this procedure by submitting <<Setup capability>> information element as described in clause 12.8. The FT shall only use this procedure if the relevant PT has indicated in its <<Set-up capability>>, see clause 12.8, that it supports "Fast Set-up". In this procedure there shall be no peer-to-peer NWK layers message exchange.

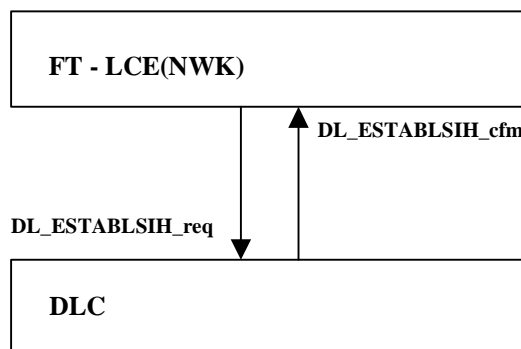
**Figure 18: Direct FT initiated link establishment, initiating side**

Table 92: Values used within the DL-ESTABLISH-req primitive

Parameter	Information within the parameter	Normative action/comment
<< DLEI >>	Data Link Endpoint Identifier	See EN 300 175-4 [4] clause 7.3.6.
<< Establish mode >>	Class A operation	
<< Radio Fixed Part (RFP) number >>		FT needs to have knowledge as where (at which RFP) the intended PT is located.

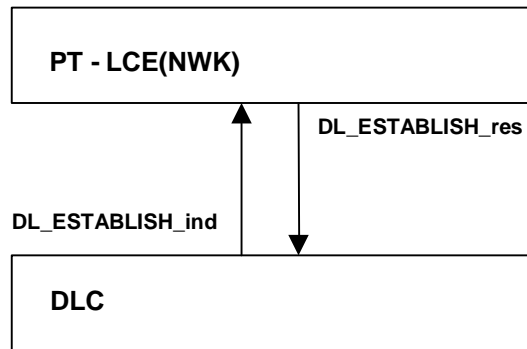


Figure 19: Direct FT initiated link establishment, receiving side

Table 93: Values used within the DL-ESTABLISH-ind primitive

Parameter	Information within the parameter	Normative action/comment
<< DLEI >>	Data Link Endpoint Identifier	See EN 300 175-4 [4] clause 7.3.6.
<< Establish mode >>	Class A operation	

12.14.1 Exceptional case

12.14.1.1 Link establishment failure

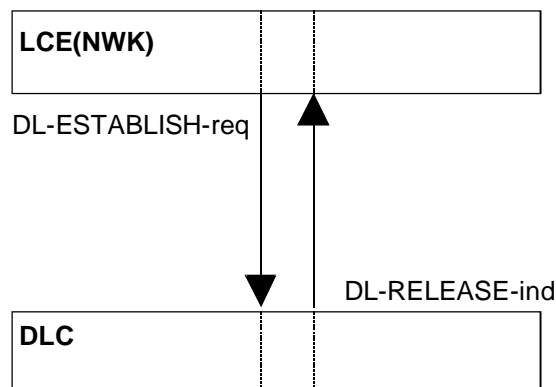


Figure 20: Direct FT initiated link establishment failure

Table 94: Values used within the DL-RELEASE-ind primitive

Parameter	Information within the parameter	Normative action/comment
<< DLEI >>		
	Data Link Endpoint Identifier	See EN 300 175-4 [4] clause 7.3.6.
<< Release mode >>		
	Abnormal	

On receipt of indication for link establishment failure the FT-LCE shall not inform the higher entities requesting the use of the link that the link establishment has failed, shall enter "LINK-RELEASED" state, and shall attempt Indirect Link establishment procedure in accordance to the Call establishment management requirements as specified in clause 9.

12.15 LCE Resume Paging

The procedure shall be described as defined in EN 300 175-5 [5] clause 14.5 with following clarification:

If MAC layer paging fails (e.g. PP has moved to another cluster) the FT LLME shall request the FT-NWK LCE for initiating a LCE resumption providing the ECN of the related link.

As result the LCE shall construct a Long Page message as defined in EN 300 175-5 [5] clause 8.2.2 with the following modifications:

Table 95: Values used within the {LCE-REQUEST-PAGE} message

Information element	Field within the information element	Standard values within the field/information element	Normative action/comment
<< LCE Header >>			
	< W >	1	
	< LCE-header >	010	Escape.
<< discriminator >>		0001	Resume paging.
<< Short address >>			
	< TPUI Address >	All	Complete TPUI address.
	< spare >	0000	
	< Connection id >	All	The Connection identity of the connection due to resume.

NOTE: Connection identity is used in DPRS resume page messages. It contains the NWK layer "connection identity", that equals to the MAC advanced connection LCN.

The message shall be inserted in a DL_BROADCAST or DL_EXPEDITED primitive as follows:

Table 96: DL_BROADCAST or DL_EXPEDITED primitive content

Parameter	Information within the parameter	Normative action/comment
<< Cluster address list >>		FT needs to have knowledge as where (in which cluster) the intended PT is located. Alternatively paging may be sent in the whole system.
	Data Link Endpoint Identifier	See EN 300 175-4 [4] clause 7.3.6.
<< Message unit >>		
	LCE-PAGE-REQUEST	
<< Message unit length >>		
	5 Octets	Long paging format - handled as full paging at MAC.
<< Extended message flag >>		Related to the "long" in MAC paging primitives.
	Off	
<< Error flag >>		Usually needed for the "ind" primitive.
	Off	

12.16 Broadcast attributes management

RFPs belonging to the same LA shall broadcast the same values of higher layer attributes (see EN 300 175-5 [5] annex F) at any given time.

The Extended Higher Layer Fixed Part Information field shall be used with bit a46 and a45 indicating the support for DPRS frame relay and character oriented service.

In the case that the FP is capable of supporting encryption, this shall use the DECT standard algorithm and shall be signalled to the PP by the setting of the MAC Q-channel Higher Layer Information message bit a37.

The DPRS PP shall be capable to read and interpret at least the following broadcast attributes codings during locking procedure. In the locked state the PP may assume them as static.

Table 97: Higher Layer Capabilities interpretation by the PP

BIT Number	Attribute	Value	Note
a34	Non-voice circuit switched service	1	
a35	Non-voice packet switched service	0	
a36	Standard authentication required	All	
a37	Standard ciphering supported	All	
a38	Location registration supported	All	See location update procedure as an exception.
a40	Non-static FP	All	A FP which is mounted on a moving vehicle.
a42	CLMS service available	All	FT may send this and PT need to understand it if FT supports CLMS services at NWK layer
a44	Access Rights requests supported	All	The FP can toggle this bit to enable or disable on air subscription.
a45	External handover supported	All	FT may send this and PT need to understand it if DPRS-N.38 is supported.
a46	Connection handover supported	All	

Table 98: Extended Higher Layer Capabilities interpretation by the PP

BIT Number	Attribute	Value	Note
a29	Ethernet	All	Depends on the actual service supported by the terminal (see note 1).
a30	Token Ring	All	Depends on the actual service supported by the terminal (see note 1).
a31	IP	All	Depends on the actual service supported by the terminal (see note 1).
a32	PPP	All	Depends on the actual service supported by the terminal (see note 1).
a33	V.24 [15]	All	Depends on the actual service supported by the terminal (see note 1).
a41	Asymmetric Bearers Supported	All	Depends on the actual service supported by the terminal.
a45	DPRS Stream support	All	Depends on the actual service supported by the terminal (see note 2).
a46	DPRS FREL support	All	Depends on the actual service supported by the terminal (see note 2).

NOTE 1: At least one of these bits shall be set to "1".
 NOTE 2: At least one of these bits shall be set to "1".

12.17 U-plane handling

Data calls include service negotiation and as such may have different requirements for connection of the U-plane after some CC-plane data exchange. In any case it shall be kept in mind that there may be service negotiation phase at MAC layer following the negotiation at NWK layer which may require some delay in connection of the U-plane.

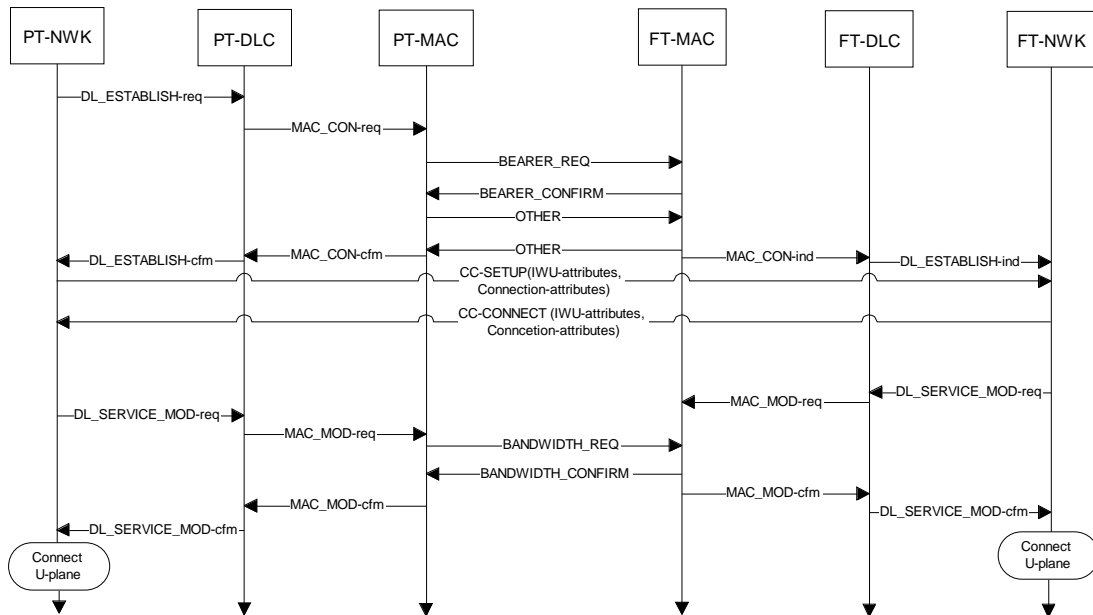


Figure 21: Example of connection of the U-plane in case of Service negotiation

NOTE: The transmission of CC-SETUP and CC-CONNECT throughout the layers is not shown. Full contents of messages and primitives are not shown.

12.18 Management of MM procedures

The procedure shall be performed as defined in EN 300 444 [8] clauses 6.9.6 and 13.1. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

The following table describes whether an MM procedure is supported in any CC state or whether a restriction applies. The restriction has been made in order to limit the complexity of the receiving side so that it is not mandated to understand MM messages in all CC states for the purpose of achieving inter-operability. This table shall be considered in addition to the table included in EN 300 444 [8] clause 6.9.5.

Table 99: Support of MM procedures in CC states

Procedure	Mandatory support in CC state
Detach	F(T)-00
Temporary Identity Assign	F(T)-00

12.19 Management - PMID

The procedure shall be performed as defined in EN 300 444 [8] clause 13.4. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

The arbitrary PMID shall be recalculated for every new logical connection setup attempt.

12.20 Length of NWK layer messages

Both PT and FT, may use and shall be able to receive and process NWK layer message of up to 126 octets of length (mapped in 2 DLC segments, see clause 11.3.2).

12.21 Identities

For the structure of the FT and PT identities the requirements in EN 300 175-6 [6] apply.

Unless otherwise stated in the present document, the FT may chose to assign any type of identities according to its implementation requirements and the recommendations of EN 300 175-6 [6]. A PT shall accept the assignment of any type of IPUi and/or PARK

13 Distributed Communications

13.1 Void

13.2 General Requirements

13.2.1 DCDL-net

The requirements as specified in EN 300 175-5 [5] clause I.2.1 shall apply. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

Requirements as which terminal from a DCDL-net shall be assigned as MASTER are not defined. The user should be given the freedom to decide in accordance to his needs and network setting circumstances.

If the MASTER is to be "disconnected" from the DCDL-net it should assign a new MASTER. Manual assignment, i.e. desubscription and subscription to a new MASTER is allowed as well.

The DCDL-net System Control Bearer shall be a connectionless bearer.

13.2.2 Subscription

The requirements as specified in EN 300 175-5 [5] clause I.2.2 shall apply. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

The basic ARI assigned to a particular DCDL-net shall be the ARI of the MASTER.

HyP terminals shall be capable of extracting the DCDL-net specific TPUIs, HyP's RFPIs and IdN from the provided by the MASTER during subscription IPUI and RFPI and shall be capable of overwriting them if the MASTER assigns its own preferable values.

13.2.3 Communication

The requirements as specified in EN 300 175-5 [5] clause I.2.3 shall apply.

13.3 Procedure description

13.3.1 HyP Identities

The requirements as specified in EN 300 175-5 [5] clause I.3.1 shall apply. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

The RFPI of the HyP as assigned by the manufacturer shall be used by the HyP for the DCDL-net ARI if a new DCDL-net is to be established and this HyP is been allocated by the user (or by the old MASTER) to be the MASTER.

13.3.2 Membership Access Rights Allocation

The requirements as specified in EN 300 175-5 [5] clause I.3.2 shall apply.

13.3.3 Re-initialization of membership access rights

The requirements as specified in EN 300 175-5 [5] clause I.3.3 shall apply.

13.3.4 Members Data Transfer

The requirements as specified in EN 300 175-5 [5] clause I.3.4 shall apply. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

Whenever a change in the DCDL-net relevant information of a member occurs, the MASTER shall inform all members for the change using the MASTER initiated Members Data Transfer procedure.

13.3.5 Presence/Absence Indication

The requirements as specified in EN 300 175-5 [5] clause I.3.5 shall apply.

13.3.6 Bandwidth management

The requirements as specified in EN 300 175-5 [5] clause I.3.6 shall apply.

13.3.7 Direct Link Establishment

The requirements as specified in EN 300 175-5 [5] clause I.3.7 shall apply. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

At any time an active member may initiate direct link establishment to another active DCDL-net member. If the link is to be to the MASTER, the PT direct link establishment and all related NWK, DLC and MAC layer procedures shall be used; in all other cases the FT initiated direct link establishment (i.e. fast setup) and all related NWK, DLC and MAC layer procedures shall be used.

During the existence of a link the roles of the involved terminals shall be as allocated at the beginning of the link establishment. For example in the case of communication between two HyPs, the initiating HyP shall be recognized and use its FMID behaving as a FT; the responding HyP shall be recognized and use its PMID behaving as a PT.

A terminal shall not attempt bearer establishment with a member that is not indicated as being currently active.

A bearer establishment may fail even the called terminal has been indicated as currently active, e.g. the called terminal is in low duty cycle mode. In such case the Indirect DCDL-net Link Establishment procedure shall be used as described in EN 300 175-5 [5] clause I.3.8.

As it may happen that though 2 terminals have registered to the MASTER they still cannot establish direct communication, e.g. due to range problems when both are at opposite sides of the MASTER, the requesting communication terminal after few failures of direct communication shall attempt of communication through the MASTER (internal call).

13.3.8 Indirect Link Establishment

The requirements as specified in EN 300 175-5 [5] clause I.3.8 shall apply. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

If a terminal is not capable of establishing direct communication with another terminal it shall request assistance from the MASTER. It may repeat the procedure max 3 times and in case of all 3 attempts have failed the terminal shall attempt connection via the MASTER (internal call).

If a terminal is indicated by the MASTER that another terminal wishes to directly communicate with it, the called terminal shall initiate direct link establishment to the desiring communication calling terminal.

13.3.9 MASTER management

13.3.9.1 MASTER assign

The requirements as specified in EN 300 175-5 [5] clause I.3.9.1 shall apply.

14.3.9.2 MASTER Change

The requirements as specified in EN 300 175-5 [5] clause I.3.9.2 shall apply.

13.3.9.3 DCDL-net System bearer management

The requirements as specified in EN 300 175-5 [5] clause I.3.9.3 shall apply.

13.3.10 Common Subscription Database management

The requirements as specified in EN 300 175-5 [5] clause I.3.10 shall apply.

13.3.11 Handover issues

The requirements as specified in EN 300 175-5 [5] clause I.3.11 shall apply. The following text together with the associated clauses defines the mandatory requirements with regard to the present document.

For packet data transmission the bearer replacement procedure shall be used to handle overlapping of the position of the System Control Bearer and an active bearer.

13.4 Elements of Messages/Information Elements

The requirements as specified in EN 300 175-5 [5] clause I.4 shall apply.

13.5 Usage of PPs or FPs in DCDL-net

The requirements as specified in EN 300 175-5 [5] clause I.6 shall apply.

Annex A (normative): Operating parameters

A.1 ME operating parameters

A.1.1 Constants (applicable to class 1 and class 2 devices)

Table A.1: Timers T906 and T908

Timer	Description	value	unit
T906	Time that the real number of bearers have to be lower than the "minimum number of bearers parameter in the "MAC BANDWIDTH" command to consider it a violation of bandwidth.	2	Seconds
T908	Timer that the PP or FP will wait after the unnoticed loss of all bearers received from other side to pass to suspend state.	10	DECT Frames

A.1.2 Equations

A.1.2.1 Waiting time for collision avoidance (WtA)

Formula for waiting time after the end (transition 1- > 0) of RFP-busy-for data flag (EN 300 175-3 [3] clause 7.2.4.3.9) to prevent access collisions.

A.1.2.1.1 Description

If the RFP had activated the RFP-busy-for-data flag in RFP status (EN 300 175-3 [3] clause 7.2.4.3.9), after the deactivation of this flag, the PT shall wait a random interval WtA before initiating any bearer setup procedure, to prevent access collisions. In case of access collision during the following PT initiated setup procedure (clause 10.10.1.1), the PT shall wait a random interval WtA before repeating the access request attempt. In case of successive collisions, formula will be applied with successive increment in the spreading range.

A.1.2.1.2 Formula

First time (after the first failure):

$$WtA (1) = R_n \times T905$$

Successive attempts: $1 < N \leq 6$

$$WtA (N) = R_n \times T905 \times 2^{(N-1)}$$

Successive attempts $N > 6$

$$WtA (N) = R_n \times T905 \times 2^5$$

Where N is the number of failures, and R_n is a pseudo-random number in the range 0 to 1, calculated by the PT.

A.1.2.2 Waiting time for congestion avoidance (WtB)

Formula for waiting time after a bandwidth modification request, either successful or not.

A.1.2.2.1 Description

During a PT resume procedure if the FP responds indicating "bandwidth zero", the PT shall release the pilot bearer and wait an interval WtB before repeat the resume procedure. Timer WtB shall be also applied when a PT requests a bandwidth modification that involves increasing the number of bearers, and it is refused by the FT. In such a case, the PT shall not repeat the request of bandwidth extension during an interval WtB.

NOTE: The PT may request bandwidth modification reducing number of bearers at any time.

WtB is composed of a fixed part and a random component identical to WtA. In case of successive refusals, formula will be applied with successive increment in the spreading range.

A.1.2.2.2 Formula

First time:

$$WtB(1) = T904 + R_n \times T905$$

Successive attempts: $1 < N \leq 6$

$$WtB(N) = T904 + R_n \times T905 \times 2^{N-1}$$

Successive attempts $N > 6$

$$WtB(N) = T904 + R_n \times T905 \times 2^5$$

Where N is the number of failures, and R_n is a pseudo-random number in the range 0-1, calculated by the PT.

A.1.3 Variable parameters (class 2 systems only)

A.1.3.1 Parameters set by the FP (class 2 systems only)

Table A.2: Timers T903, T904, T905 and T910

Timer	Description	Unit	Minimum value	Maximum value	Default value
T903	Indicates the Maximum time that a PP could wait without having data for transmission in up-link direction (U-plane data or C-plane messages) after which the PT shall request suspension of the logical connection.	2 DECT Frames = 20ms	0	250 (= 500 frames)	5 (= 10 frames)
T904	The Fixed part of the waiting time WtB (N) that a PT shall wait after the PT has requested connection resumption and the FT has rejected it. See clause A.1.2.2.	1 DECT Frame = 10ms	0	31	10
T905	Component of the Random part of the waiting time WtB (N) that a PT shall wait after the PT has requested connection resumption and the FT has rejected it (see clause A.1.2.2), or, after the deactivation of RFP-busy-for-data flag (see clause A.1.2.1).	1 DECT Frames = 10ms	0	31	10
T910	Time after which a suspended Logical connection (and respectively Virtual Call and its associated resources) shall be released if there has not been any successful handshake (stay-alive) procedure completed between the PT and the FT (see clause 9.4.2.5).	4 DECT MF's = 640ms	5	254 + infinite coded 255 (= 1 016 MF = 162,56 s)	32 (= 128 MF's = 20,48 s)

In class 2 systems, T903, T904, T905 and T910 are chosen by the FP and communicated to the PP's by means of the << SETUP CAPABILITY >> network layer information element, see clause 12.8. Any PP shall accept any value in the range between the minimum and the maximum value as indicated in the table above.

If the << Setup capability >> information element has not been sent the default value shall be used.

A.1.3.2 Negotiable parameters between FP and PP (class 2 systems only)

Table A.3: Timer T909

Timer	Description	Unit	Minimum value	Maximum value	Default value
T909	Time during which a PT shall keep its receiver active, i.e. listening for fast set-up attempts after a logical connection has been suspended.	1 DECT MF (= 160 ms)	0	254 + infinite coded 255. (40,64 s + infinite)	31 (4,96 sec)

A.1.3.2.1 Conditions of negotiation

If a PT supports fast setup, the value of the T909 may be negotiated with the FT by means of the << SETUP_CAPABILITY >> network layer information element. Any PT shall accept any value between and including 0 and 4,96 seconds. A PT may but need not to support higher values.

For the negotiation the PT may suggest any value equal or higher than 4,96 seconds, the FT is allowed to respond with any value lower than the value suggested by the PT and this shall be the value used/assumed after the negotiation and before a new negotiation takes place.

If the PT indicates support of Fast setup and does not provide value for the T909 the FT shall assume that the PT has suggested 4,96 as value.

A.2 Configuration capabilities for class 1 devices

In order to assure reliable inter-working between devices complying with this profile in mobility class 1, it shall be possible to install the following parameters in the FPs and/or PPs of the system. The values of parameters referring to the PP shall be clearly indicated in the documentation of the PP, and means shall be provided in FPs for such values to be registered. The values of parameters referring to the FP shall be clearly indicated in the documentation of the FP, and means shall be provided in PP for such values to be registered.

Table A.4: Configuration capabilities for class 1 devices

Parameter	Value	Configurable in: Fixed(F)/Portable(P)
Service associated with identity	FREL or Stream,	F, P
Data frames	Ethernet, Token Ring, I _p , PPP, V.24 [15]	F, P
IPII	Unique value within local environment	F, P
PARK	Unique value within local environment	P
Maximum supported SDU size	Number of octets	F, P
Multi-bearer capability	1 to 23	F, P
Asymmetric capability	Yes/No	F, P
Diversity capability	Yes/No	F, P
Fast paging available	Yes/No	F, P
Connectionless downlink supported	Yes/No	F, P
Encryption capability	Yes	F, P
Static cipher key	64 bits	F, P
T903 Resume timer	(0 to 250) x 2 DECT Frames, default = 5	F, P
T904 Wait timer. Fixed part	0 to 31 DECT Frames, default = 10	F, P
T905 Wait timer. Random part	0 to 31 DECT Frames, default = 10	F, P
T909 Setup detection timer	0 to 254 DECT Multiframes + infinite coded as 255, default = 31	F, P
T910 Handshake procedure timer	(5 to 254) x 4 DECT Multiframes + infinite coded as 255, default = 32	F, P

Annex B (normative): Interworking conventions for the Frame Relay (FREL) service

B.1 Scope of this annex

This annex defines the Interworking conventions for Frame Relay (FREL) service. DPRS Frame Relay service may be used for the transport of the following protocols:

- ISO/IEC 8802-3 [10]/Ethernet;
- ISO/IEC 8802-5 [11] (Token Ring);
- Internet Protocol (I_p);
- Point-to-Point Protocol (PPP).

Clauses B.1, B.2 and B.3 define a set of conventions applicable to the Frame Relay service in general, and clauses B.4 to B.7 define the specific conventions for each one of the transported protocols.

B.1.1 Typical configuration for the Frame Relay service

The typical configuration for Frame Relay service is shown in the following figure.

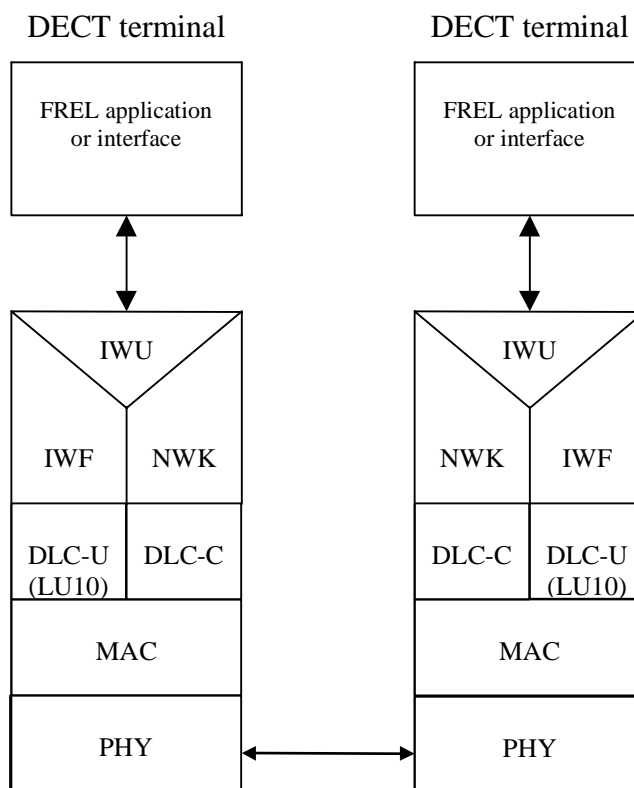


Figure B.1: Reference configuration for Frame Relay (FREL) service, including interworking to connection-oriented or connectionless networks

Mobility class 2 equipment provides a full DECT C-plane, while for mobility class 1 equipment, the C-plane is replaced by a Closed User Group administration.

The specific encapsulation interworking functions are defined in the other clauses of this annex, and are depending on the transported connectionless or connection-oriented protocol. The implementation of the external network used to transport the service protocol outside the DECT system is outside the scope of this profile.

B.2 Specific codings for mobility class 2

B.2.1 IWU-ATTRIBUTES information element coding

Mobility class 2 equipment, implementing the Interworking Units described in this annex, shall use the following IWU-ATTRIBUTES information element coding:

Bit:	8	7	6	5	4	3	2	1	Octet:
	0	<< IWU-ATTRIBUTES >>							1
	Length of Contents (L)								2
	1	CodeStd			Profile				3
		0	1	0	0	0	0	0	
	1	Negotiation indicator			Profile subtype				4
	0	Maximum SDU size (Most significant 7 bits)							5
	1	Maximum SDU size (Least significant 7 bits)							5a
	1	Profile subtype attributes							6 (optional)

Figure B.2: IWU-ATTRIBUTES information element coding

Code std (octet 3):

Bits 7 6 Meaning
0 1 Profile defined code

Profile (octet 3):

Bits 5 4 3 2 1 Meaning
0 0 0 0 DPRS: Frame Relay services

Negotiation indicator (octet 4):

Bits 7 6 5 Meaning
0 0 0 Negotiation not possible;
0 1 0 Peer attribute negotiation;
1 0 0 Exchanged attribute negotiation;
1 1 0 Exchanged attribute negotiation and Peer attribute negotiation;
All other values are reserved.

Profile subtype (octet 4):

Bits 4 3 2 1 Meaning
0 0 0 0 ISO/IEC 8802-3 [10]/Ethernet (clause B.4);
0 0 0 1 ISO/IEC 8802-5 [11] (clause B.5);
0 0 1 0 Internet Protocol (I_p) (clause B.6);
0 1 0 0 Point-to-Point Protocol (clause B.7);
All other values are reserved.

Maximum SDU size (octets 5 and 5a):

This 14-bit word represents the natural binary coding of the maximum SDU length in units of eight octets used for data transmission, with the least significant bit in position 1 of octet 5a.

B.2.1.1 Profile subtype attributes (octet 6) of IWU-ATTRIBUTES information element

The octet 6 of IWU-ATTRIBUTES information element shall have a profile subtype specific meaning.

The profile subtype attributes octet group is optional. If it is not present, its assumed state is as if all assigned fields where set to zero.

B.2.1.1.1 ISO/IEC 8802-3/Ethernet

Bit:	8	7	6	5	4	3	2	1	Octet: 6 (optional)
	1	Sl _P	0	0	0	0	0	0	
Spare									

Figure B.3: Ethernet

Sl_P bit:

This bit indicates if the connectionless downlink service Sl_P is being used (clause B.4.2.1).

Bit 7 Meaning

- 1 Sl_P connectionless downlink is being used;
- 0 Sl_P connectionless downlink not used.

B.2.1.1.2 ISO/IEC 8802-5 (Token-Ring)

Bit:	8	7	6	5	4	3	2	1	Octet: 6 (optional)
	1	Sl _P	0	0	0	0	0	0	
Spare									

Figure B.4: Token Ring

Sl_P bit (bit 7 of octet 6):

This bit indicates if the connectionless downlink service Sl_P is being used (clause B.5.2.2).

Bit 7 Meaning

- 1 Sl_P connectionless downlink is being used;
- 0 Sl_P connectionless downlink not used.

B.2.2 IWU attributes implemented

Table B.1: IWU-ATTRIBUTES information element support status

Field no.	Name of fields	Supported parameters		Values	
		Ref.	Support	Allowed	Supported
1	ID of IWU attributes of variable length		M	18	
2	Length of Contents (L)		M	0 to 255	4,5
3	Coding standard		M	1	
3	Profile		M	0	
4	Negotiation indicator		M	0,2,4,6	0,2
4	Profile subtype	B.2.1	M	0 to 15	0, 1, 2,4
5,5a	Maximum SDU size	B.2.1	M	0 to 16 383	1 528 to 16 383
6	Sl _P Service	B.2.1.1	C.B11	0, 1	0,1
C.B11: 0 if profile subtype is ISO 8802-3/Ethernet or ISO 8802-5 (Token-Ring), else X.					

B.3 Generic Frame Relay service interworking conventions

The provisions of this clause shall apply to all applications of the Frame Relay service.

B.3.1 DLC U-plane service

The Frame Relay service shall be transported by DLC LU10 (Enhanced Frame Relay service).

B.3.2 Transmission bit order

All data frames shall always be transmitted as DECT DLC layer SDUs. The Most Significant Bit (MSB) of each octet shall be transmitted first and the Least Significant Bit (LSB) last.

NOTE: The implementer of a FREL interworking needs to bare in mind that some application protocols may submit octets being part of their packets of data to the IWF in reverse order, e.g. the transmission requirements for an Ethernet packet as stated in ISO/IEC 8802-3 [10]/Ethernet. LAN standards are LSB first.

B.3.3 Support of SDU size

Any DECT equipment supporting any of the DPRS Frame Relay services defined in this annex shall be capable of supporting LU10 SDU frames of at least 1 528 octets. The equipment may optionally support larger SDUs.

B.3.4 SI_p connectionless downlink

If the connectionless downlink service (SI_p) is used, point-to-multipoint and broadcast packets may be transmitted by the connectionless downlink service (SI_p). These packets may also be transmitted by DECT connection-oriented connections. If the service is not used, all traffic shall be transported by DECT connection-oriented connections.

B.4 ISO/IEC 8802-3/Ethernet

The provisions of this clause shall apply if interworking to ISO/IEC 8802-3 [10]/Ethernet. LANs is provided.

B.4.1 Typical configuration

The typical configuration for this specific interworking convention shall be as defined in clause B.1, figure B.1 where the transported protocol is conform to ISO/IEC 8802-3 [10] or Ethernet.

B.4.1.1 Examples of implementation of the external transport network

Implementation of the external network used to transport the ISO/IEC 8802-3 [10] or Ethernet frames outside the DECT system is out of the scope of the present document. Typical implementation will be the physical interface of the own ISO/IEC 8802-3 [10] or Ethernet. However, alternative implementations are also possible. Some examples of possible implementation and the associated interworking function are given in table B.2.

Table B.2: External network implementation examples

DPRS Service	External transport network	Referenced standards	IWU Function	Remarks
ISO/IEC 8802-3 [10] Ethernet (see annex D)	ISO/IEC 8802-3 [10], Ethernet (see annex D) (any PHY interface)	ISO/IEC 8802-3 [10]/ Ethernet (see annex D)	Bridge	Bridging in IWU.
ISO/IEC 8802-3 [10] Ethernet (see annex D)	Frame Relay	ITU-T Recommendation Q.922, RFC 1490	Bridge	Bridging function (Ethernet switch) in IWU. ISO/IEC 8802-3 [10]/Ethernet (see annex D) over FR as RFC 1490, bridged mode.
ISO/IEC 8802-3 [10] Ethernet (see annex D)	Frame Relay	ITU-T Recommendation Q.922, RFC 1490.	Switch.	Transparent mapping between each DECT terminal and each FR VC (multiple DLCI's in FR). ISO/IEC 8802-3 [10]/Ethernet (see annex D) over FR as RFC 1490, bridged mode.
ISO/IEC 8802-3 [10] Ethernet (see annex D)	USB	ISO/IEC 8802-3 [10], Ethernet (see annex D), ITU-T Recommendation Q.922, RFC 1490	Bridge	A virtual ISO/IEC 8802-3 [10]/Ethernet interface is transported over a USB interface to an application system.

B.4.2 Specific interworking conventions

The conditions of clause B.3 shall be adhered to in addition to the following:

- the ISO/IEC 8802-3 [10]/Ethernet (see annex D). MAC frame shall be transmitted as a single SDU beginning with the Destination Address up to (but not including) the FCS field, (see figure B.5);
- for ISO/IEC 8802-3 [10] MAC frames which contain Information fields of less than 46 octets and therefore have added PAD fields, the PAD fields shall not be transmitted, (see figure B.5);
- Ethernet MAC frames do not contain a Length field and do not provide sufficient information to establish the exact length of the Information field; therefore for Ethernet MAC frames which contain Information field with length of 46 octets the trailing octets containing all zeros shall not be transmitted (see figure B.5). Because removing of trailing octets with zeros may lead to removal parts of the information field as well, at the receiving side, on reception trailing octets with zeroes shall be added to sum up the Information field to 46 octets in length.

NOTE 1: At the receiving side recovery of any stripped-off fields not explicitly mandated to be recovered is an implementation issue.

NOTE 2: The requirements above do not impose any restriction on the IWF implementation. For example a designer may implement such Ethernet-to-IWF interworking where FCS bits are never calculated.

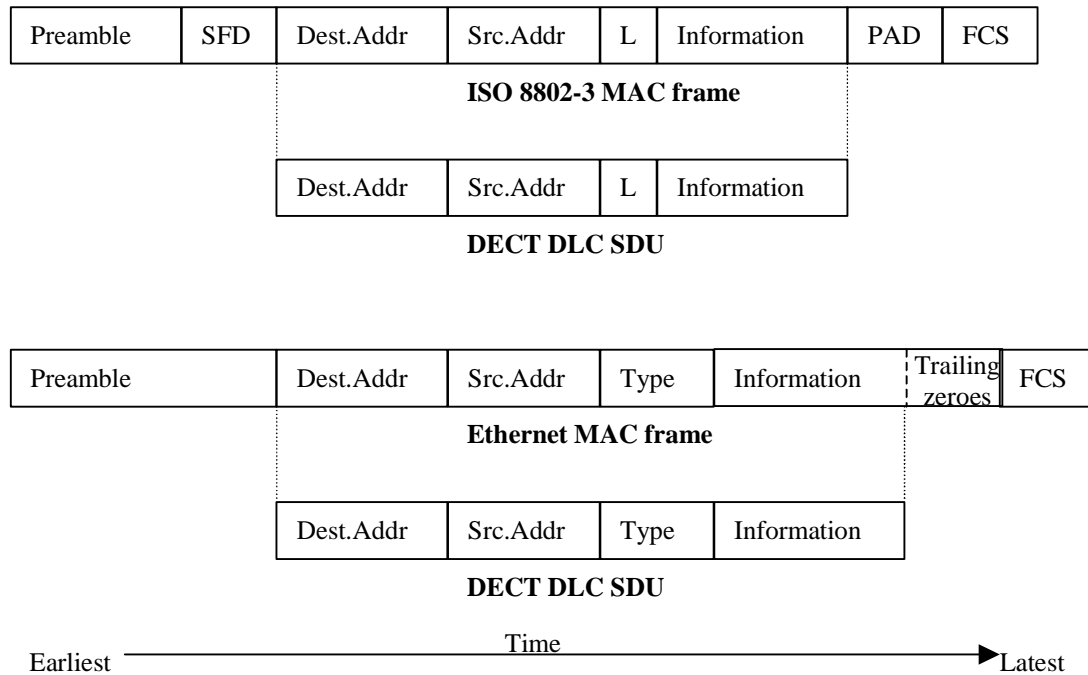


Figure B.5: Mapping of ISO/IEC 8802-3 [10] and Ethernet MAC frames into DECT DLC SDU

NOTE 1: Removal of the PAD and the Trailing zeroes is relevant only to frames with minimal size (Information + PAD/trailing zeroes = 46 octets).

NOTE 2: Although the ISO/IEC 8802-3 [10] standard chooses to define an < SFD > field there is no practical difference between the < Preamble > field of the Ethernet standard and the < Preamble + SFD > field of the ISO/IEC 8802-3 [10] standard - the pattern of the bits used for the coding of these fields is identical.

B.4.2.1 Use of the connectionless downlink S_{IP} service

The Connectionless downlink S_{IP} service may be used when transporting the ISO/IEC 8802-3 [10]/Ethernet service. The use of this service is indicated by the S_{IP} field of the profile subtype attributes as shown in clause B.2.1.1.1. If the connectionless downlink service S_{IP} is used, the FP is allowed to transmit multicast and broadcast Ethernet packets by the connectionless downlink service (S_{IP}). The FP may also transmit these types of packets by the DECT connection-oriented connections.

If the service is not used, all traffic shall be transported by DECT connection-oriented connections.

B.4.2.2 Special conventions for mobility class 1 systems

In mobility class 1 equipment IPUIs of type O shall be used, where the full ISO/IEC 8802-3 [10]/Ethernet. MAC address shall be mapped into the type O IPUI with the Least Significant Bit (LSB) of the ISO/IEC 8802-3 [10]/Ethernet. MAC address corresponding to the LSB of the IPUI.

B.5 ISO/IEC 8802-5 (Token Ring)

The provisions of this clause shall apply if interworking to ISO/IEC 8802-5 [11] (token ring) LANs is provided.

B.5.1 Typical configuration

The typical configuration for this specific interworking convention shall be as defined in clause B.1, figure B.1 where the transported protocol is conform to ISO/IEC 8802-5 [11].

B.5.1.1 Examples of implementation of the external transport network

Implementation of the external network used to transport the ISO/IEC 8802-5 [11] frames outside the DECT system is out of the scope of the present document. Typical implementation will be the physical interface of the own ISO/IEC 8802-5 [11]. However, alternative implementations are also possible. Some examples of possible implementation and the associated interworking function are given in the following table.

Table B.3: Examples of external network implementations

DPRS Service	External transport network	Referenced standards	IWU Function	Remarks
ISO/IEC 8802-5 [11]	ISO/IEC 8802-5 [11]	ISO/IEC 8802-5 [11]	Bridge	Bridging function in IWU.
ISO/IEC 8802-5 [11]	Frame Relay	ITU-T Recommendation Q.922, RFC 1490	Bridge	Bridging function in IWU. ISO/IEC 8802-5 [11] over FR.
ISO/IEC 8802-5 [11]	Frame Relay	ITU-T Recommendation Q.922, RFC 1490	Switch	Transparent mapping between each DECT terminal and each FR VC. Multiple DLCI's in FR.
ISO/IEC 8802-5 [11]	USB	ISO/IEC 8802-5 [11], ITU-T Recommendation Q.922, RFC 1490	Bridge	A virtual ISO/IEC 8802-5 [11] interface is transported over a USB interface to an application system.

B.5.2 Specific interworking conventions

The conditions of clause B.3 shall be adhered to in addition to the following:

- the ISO/IEC 8802-5 [11] MAC frame shall be transmitted as a single SDU beginning with the ISO/IEC 8802-5 [11] MAC Frame Control (FC) field and ending with the MAC Information field, (see figure B.6). At the receiving side recovery of the stripped-off fields is implementation issue;
- the token ring MAC Control frames as identified by the FC byte shall not be sent and shall be correctly inter worked with the token ring network. The Frame Status (FS) byte shall not be sent, (see figure B.6).

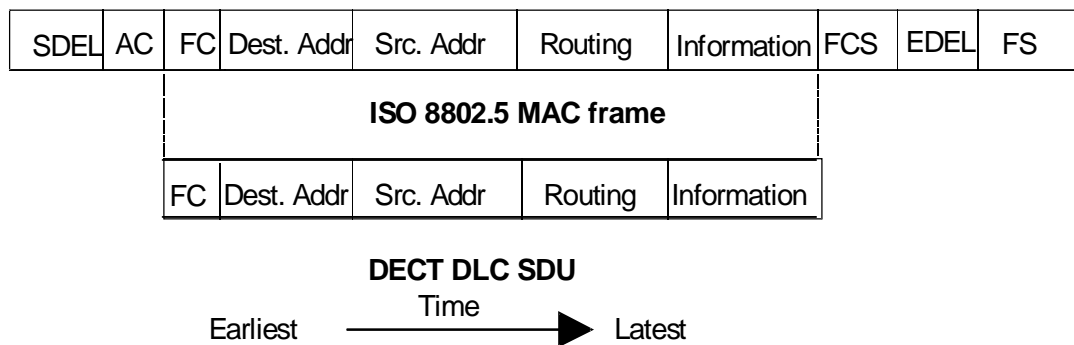


Figure B.6: Mapping of ISO/IEC 8802-5 MAC frames into DECT DLC SDU

B.5.2.1 Special conventions for mobility class 1 systems

In mobility class 1 equipment IPUIs of type O shall be used, where the full ISO/IEC 8802-5 [11] MAC address shall be mapped into the type O IPUI with the LSB of the ISO/IEC 8802-5 [11] MAC address corresponding to the LSB of the IPUI.

B.5.2.2 Use of the connectionless downlink SI_p service

The Connectionless downlink SI_p service may be used when transporting the ISO/IEC 8802-5 [11] (Token-Ring) service. The use of this service is indicated by Bit 7 of Octet 6 of << IWU-ATTRIBUTES >> shown in clause B.2.1.1.2. If the connectionless downlink service SI_p is used, the FP is allowed to transmit point-to-multipoint and broadcast packets by the connectionless downlink service (SI_p). The FP may also transmit these types of packets by the DECT connection-oriented connections.

If the service is not used, all traffic shall be transported by DECT connection-oriented connections.

B.6 Internet protocol

The provisions of this clause shall apply if interworking to Internet Protocol (I_p) version 4 (RFC 791 [12]) or higher is provided.

B.6.1 Typical configuration

The typical configuration for this specific interworking convention shall be as defined in clause B.1, figure B.1 where the transport protocol is Internet Protocol version 4 (RFC 791 [12]), or higher.

B.6.1.1 Examples of implementation of the external transport network

Implementation of the external network used to transport the Internet Protocol outside the DECT system is out of the scope of the present document. Some examples of possible implementations and the associated Interworking function are given in table B.4.

Table B.4: Examples of external network implementations

DPRS Service	External transport network	Referenced standards	IWU Function	Remarks
I_p	Connectionless LAN	ISO/IEC 8802-3 [10], ISO/IEC 8802-x	Router	I_p Routing function in IWU.
I_p	Frame Relay	ITU-T Recommendation Q.922, RFC 1490	Router	I_p Routing function in IWU. I_p over FR as RFC 1490, routed links.
I_p	Frame Relay	ITU-T Recommendation Q.922, RFC 1490	Switch	Transparent mapping between each DECT terminal and a FR VC. Multiple DLCI's in FR. I_p over FR as RFC 1490, routed links.
I_p	ATM	RFC 1483	Router	I_p over ATM Adaptation Layer 5
I_p	Serial line	PPP RFC 1661 [13], RFC 1662 [14]	Router	I_p Routing function in IWU. PPP used only in external transport network.

B.6.2 Specific interworking conventions

The conditions of clause B.3 shall be adhered to in addition to the following:

- I_p datagrams shall be transmitted as a single SDU. The SDU contains the I_p header followed immediately by the I_p data. Since LU10 SDUs can be an arbitrarily short length there are no requirements for adding fill fields or padding.

B.6.2.1 Special conventions for mobility class 1 systems

In Mobility class 1 equipment IPIUs of type O shall be used.

B.7 Point-to-Point Protocol

The provisions of this clause shall apply to transport data encapsulated using the Point-to-Point Protocol (PPP), as defined in RFC 1661 [13].

B.7.1 Typical configuration

The typical configuration for this specific interworking convention shall be as defined in clause B.1, figure B.1. In this configuration the FP interworking transparently maps any PPP packet coming from a given DECT air interface packet-mode connection to a fixed virtual circuit at the Network interface.

B.7.1.1 Examples of implementation of the external transport network

Implementation of the external network used to transport the PPP outside the DECT system is out of the scope of the present document. Some examples of possible implementation are in table B.5.

Table B.5: Examples of external network implementations

DPRS Service	External transport network	Referenced standards	IWU Function	Remarks
PPP	Modem/PSTN	RFC 1662 [14]	Switch	Mapping of C-plane signalling between DECT and PSTN possible
PPP	ISDN (circuit-switch)	RFC 1618	Switch	Mapping of C-plane signalling between DECT and ISDN possible
PPP	Frame Relay	RFC 1973	Switch	PPP over FR.
PPP	ATM	RFC 2364	Switch	PPP over ATM AAL 5
PPP	Tunnel over I _P network	L2TP (or PPTP)	Switch	Mapping of C-plane signalling between DECT and L2TP possible

B.7.2 Specific interworking conventions

The conditions of clause B.3 shall be adhered to in addition to the following:

- the PPP packets, as defined in RFC 1661 [13] shall be transmitted directly as a single U-plane DLC layer SDU. The SDU contains the PPP "protocol field" header followed by the PPP data. The PPP framing, if used (e.g. the one defined in RFC 1662 [14] or other), shall not be transmitted over the DECT air interface;
- the maximum SDU packet size shall be 1 528 octets.

NOTE: At the receiving side recovery of any stripped-off fields is an implementation issue.

B.7.2.1 Special conventions for mobility class 1 systems

In Mobility class 1 equipment IPIUs of type O shall be used.

Annex C (normative): Interworking conventions character-oriented services

C.1 Scope of this annex

This clause specifies the wireless V.24 [15] service conventions applicable for a V.24 [15] service implementation based on the DPRS. The V.24 [15] interface is described in ITU-T Recommendation V.24 [15].

To enhance readability of the present document, the signals are named using their unofficial "street- names" (e.g. TXD, RXD) instead of the official V.24 [15] circuit names (e.g. circuit 103, circuit 104). Clause C.4.1 defines this translation.

To enhance usability of this interworking, flow control based on practical implementations are implemented instead of the flow control as described in the V.24 [15] interface. This practical type of flow control is defined in clause C.4.3.

The reference configuration for this interworking is shown in figure C.1a.

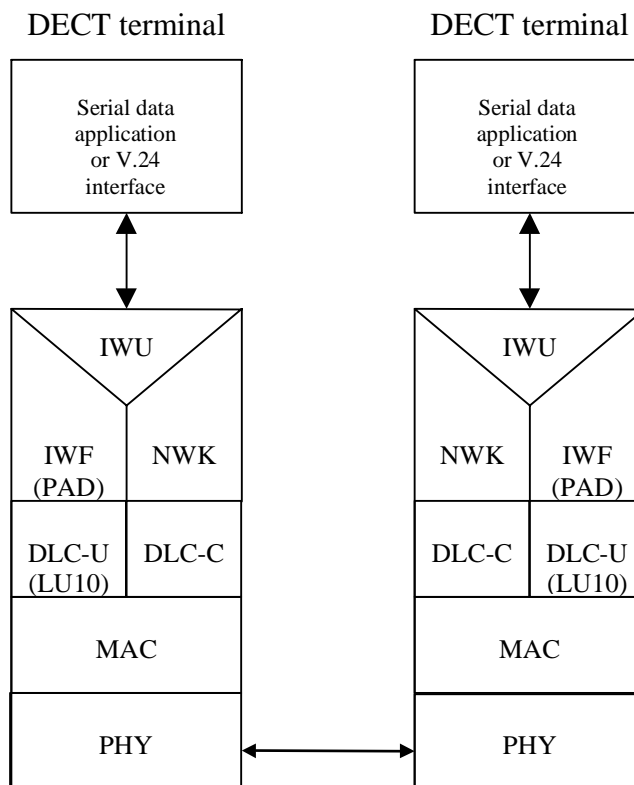


Figure C.1a: Reference configuration showing the DPRS V.24

NOTE 1: The PP and/or the FP do not necessary have to implement a physical V.24 [15] interface. The V.24 [15] data could directly go into/come from an application program or to a virtual V.24 [15] interface transported over an other interface like a USB connection.

User (and user control) data to be transmitted over the U-plane of the packet mode data profiles is only guaranteed to be protected if passed through the entire U-plane protocol.

After a packet (user or user control data) has been passed to the protection mechanism (LU10) a modification of the content is in general not possible any more as parts of the SDU may already be transmitted over the CI. An expedition of user control frames can only be achieved within the queue on top of the LU10.

NOTE 2: To distinguish user data and user control data, different SAPs including SAP identifiers may be introduced.

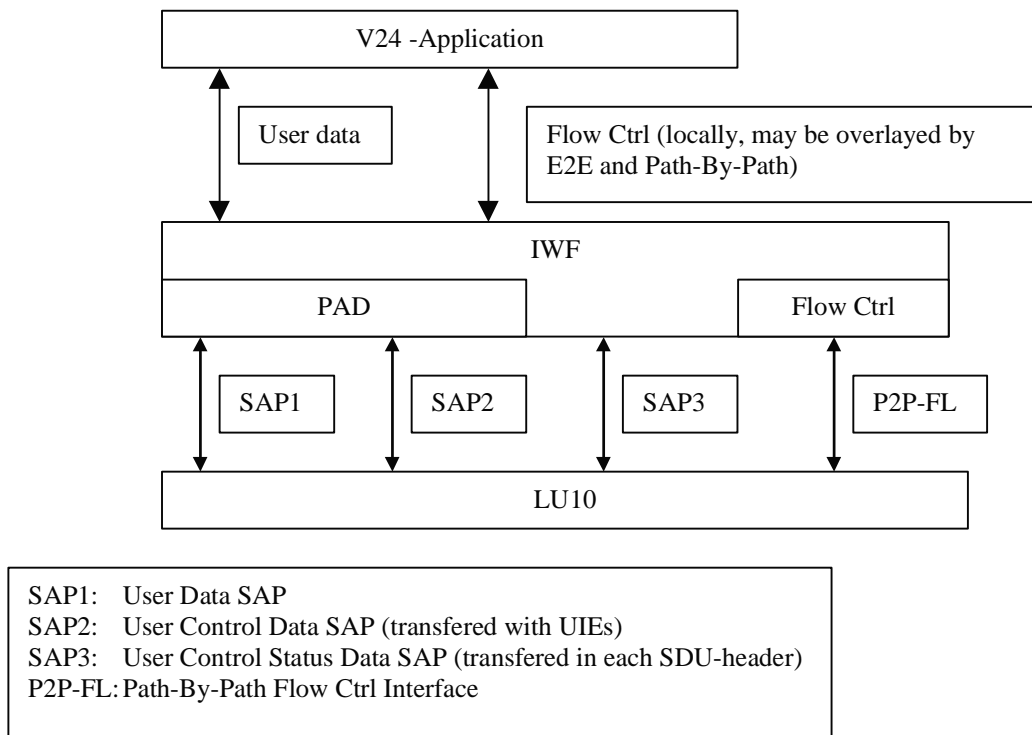


Figure C.1b: SDU Data Flow

The following two scenarios describe different types of V.24 [15] -connections. Scenario A shows the normal configuration such as DTE <--> DCE (e.g. computer <--> modem). Scenario B shows a configuration such as DTE <--> DTE (e.g. computer <--> computer). Scenario B is called nullmodem-connection.

DTE: Data Terminal Equipment (e.g. computer).

DCE: Data Circuit-terminating Equipment (e.g. modem, ISDN-TA).

C.1.1 Scenario A

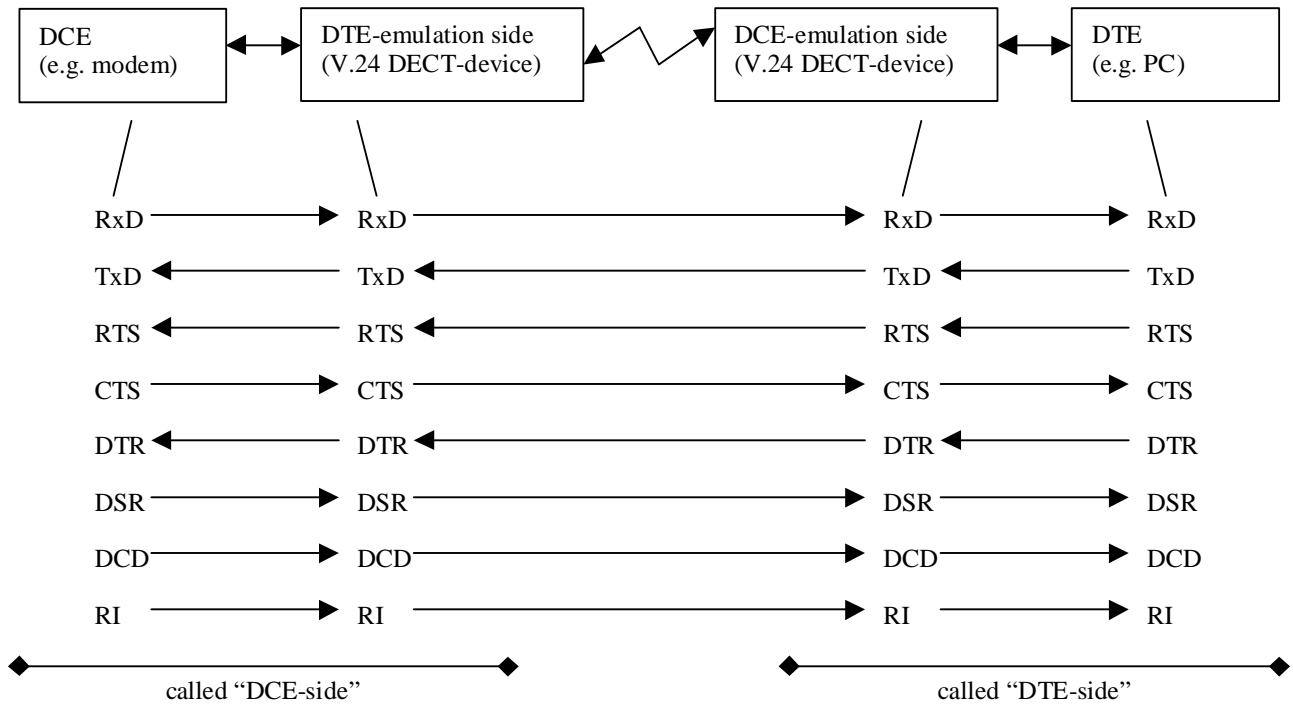


Figure C.1c: Scenario A showing a normal DCE <--> DTE configuration

C.1.2 Scenario B

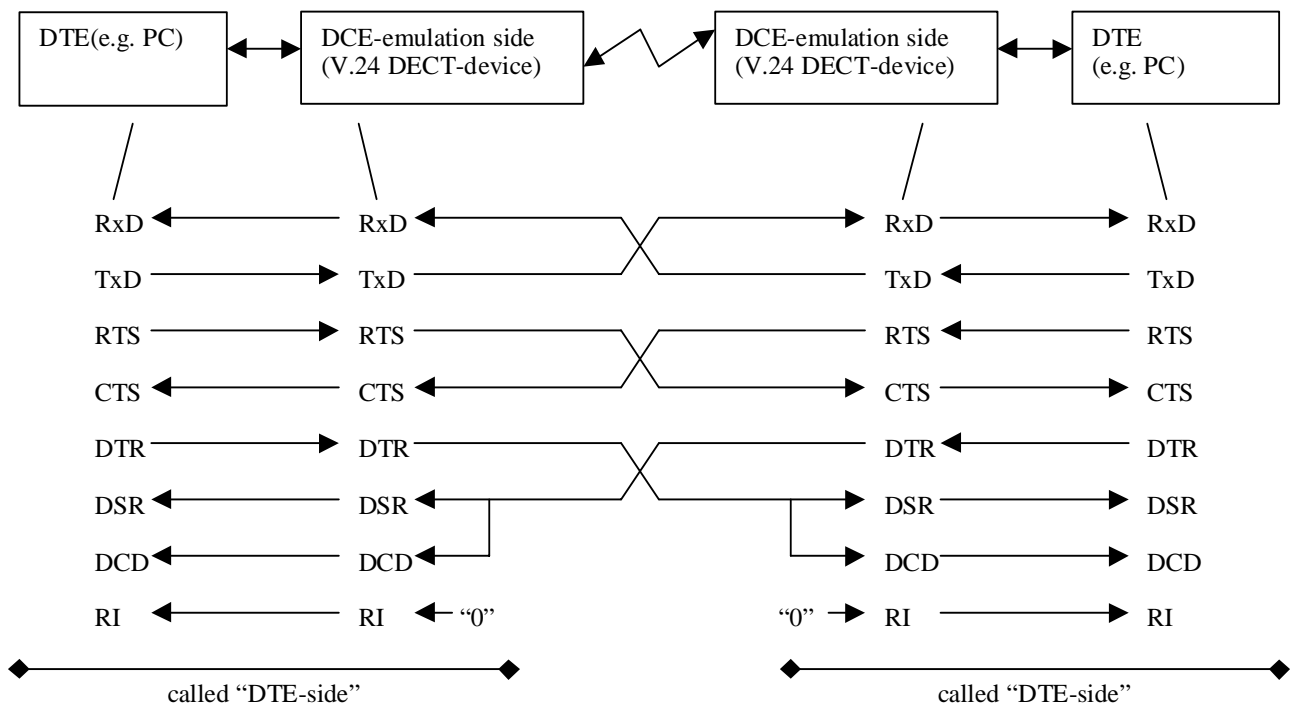


Figure C.1d: Scenario B showing NULL-MODEM configuration

C.2 Specific coding for mobility class 2

C.2.1 IWU-Attribute coding

Devices implementing the Interworking Units described in this annex shall use the following IWU-Attribute coding:

Bit:	8	7	6	5	4	3	2	1	Octet:
0	<< IWU-ATTRIBUTES >>								1
	Length of Contents (L)								2
1	CodeStd			Profile					3
1	Negotiation indicator			Profile subtype					4
0/1	Stop bits		Data bits		Parity				5
0/1	Data rate								5a
1	B	F	Baudrate mode		Flow Control				5b
0	Maximum SDU length (Most significant 7 bits)								6
1	Maximum SDU length (Least significant 7 bits)								6a

Figure C.2: IWU Attribute coding

CodeStd (octet 3):

Bits 7 6 **Meaning**
 0 1 Profile defined code.

Profile (octet 3):

Bits 5 4 3 2 1 **Meaning**
 0 0 0 0 1 DPRS: character oriented or bit oriented services.

Negotiation indicator (octet 4):

Bits 7 6 5 **Meaning**
 0 0 0 Negotiation not possible;
 0 1 0 Peer attribute negotiation;
 1 0 0 Exchanged attribute negotiation;
 1 1 0 Exchanged attribute negotiation and Peer attribute negotiation;
 All other values are reserved.

Profile sub-type (octet 4):

Bits 4 3 2 1 **Meaning**
 0 0 0 0 V.24 [15].

Stop bits coding (octet 5):

Bits 7 6 **Meaning**
 0 0 Not specified;
 0 1 1 bit;
 1 0 1,5 bits;
 1 1 2 bits.

Data bits/Parity coding (octet 5):

Bits	5 4 3 2 1	Meaning
	0 0 x x x	5 bits;
	0 1 x x x	6 bits;
	1 0 x x x	7 bits;
	1 1 x x x	8 bits;
	x x 0 0 0	Odd;
	x x 0 1 0	Even;
	x x 0 1 1	None;
	x x 1 0 0	Forced to 0;
	x x 1 0 1	Forced to 1;
	1 1 1 1 1	Not specified;
		All other values reserved.

NOTE 1: In some implementations the values for the V.24 [15] parameters Data bits and Parity are strongly related. For example, it is possible to support even or none Parity and 7 or 8 data bits, but not in all permutations. Normally you support 8 data bit with no parity and 7 data bits with even or odd parity. So you have always 8 Bit information.

Examples for Stop bits/Data bits/Parity coding:

Bits	7 6 5 4 3 2 1	Meaning
	0 1 1 1 0 1 1	8N1;
	0 1 1 0 0 1 0	7E1;
	0 1 1 0 0 0 0	7O1.

Data rate (octet 5a):

Bits	7 6 5 4 3 2 1	Meaning
	0 0 0 0 0 0 0	Not specified;
	0 0 0 0 1 x x	$(x \times x + 1) \times 50$ bit/s (50 bit/s to 200 bit/s.);
	0 0 0 1 x x x	$(x \times x \times x + 1) \times 300$ bit/s (300 bit/s to 2 400 bit/s.);
	0 0 1 x x x x	$(x \times x \times x + 2) \times 2 400$ bit/s (4 800 bit/s to 40 800 bit/s.);
	0 1 x x x x x	$(x \times x \times x \times x + 1) \times 8 000$ bit/s (8 000 bit/s to 256 000 bit/s.) (see note 1);
	1 0 x x x x x	$(x \times x \times x \times x + 6) \times 9 600$ bit/s (57 600 bit/s to 35 520 bit/s.) (see note 1);
	1 1 0 x x x x	$(x \times x \times x + 11) \times 24 000$ bit/s (264 000 bit/s to 624 000 bit/s.) (see note 1);
	1 1 1 0 0 0 0	75 bit/s;
	1 1 1 0 0 0 1	110 bit/s;
	1 1 1 0 0 1 0	134,5 bit/s;
	1 1 1 0 0 1 1	75 bit/s to 1 200 bit/s (see note 2);
	1 1 1 0 1 0 0	1 200 bit/s to 75 bit/s (see note 2);
		All other values reserved.

NOTE 2: Some bit rates (24 000, 96 000, 144 000, 192 000, 240 000, 288 000, and 336 000 bit/s.) are codeable in several different ways. The different codings are all valid.

NOTE 3: The first rate is the transmit rate in forward direction of the call. The second rate is the transmit rate in backward direction of the call.

Examples for Data rate:

Bits	7 6 5 4 3 2 1	Meaning
	0 0 0 0 1 0 0	50 bit/s;
	0 0 0 0 1 0 1	100 bit/s;
	0 0 0 0 1 1 0	150 bit/s;
	0 0 0 0 1 1 1	200 bit/s;
	0 0 0 1 0 0 0	300 bit/s;
	0 0 0 1 0 0 1	600 bit/s;
	0 0 0 1 0 1 1	1 200 bit/s;
	0 0 0 1 1 1 1	2 400 bit/s;
	0 0 1 0 0 0 0	4 800 bit/s;
	0 1 0 0 0 0 0	8 000 bit/s;

0 0 1 0 0 1 0	9 600 bit/s;
0 0 1 0 0 1 1	12 000 bit/s;
0 0 1 0 1 0 0	14 400 bit/s;
0 1 0 0 0 0 1	16 000 bit/s;
0 0 1 0 1 1 0	19 200 bit/s;
0 0 1 1 0 0 0	24 000 bit/s;
0 0 1 1 0 1 0	28 800 bit/s;
0 1 0 0 0 1 1	32 000 bit/s;
0 0 1 1 1 1 0	38 400 bit/s;
0 1 0 0 1 0 1	48 000 bit/s;
0 1 0 0 1 1 0	56 000 bit/s;
1 0 0 0 0 0 0	57 600 bit/s;
0 1 0 0 1 1 1	64 000 bit/s;
1 0 0 0 0 0 1	67 200 bit/s;
1 0 0 0 0 1 0	76 800 bit/s;
0 1 0 1 0 0 0	72 000 bit/s;
0 1 0 1 0 1 1	96 000 bit/s;
1 0 0 0 1 1 0	115 200 bit/s;
0 1 0 1 1 1 0	120 000 bit/s;
0 1 0 1 1 1 1	128 000 bit/s;
1 0 0 1 0 0 1	144 000 bit/s;
1 1 0 1 0 1 0	552 000 bit/s.

B (bit 7 Octet 5b)

- | | |
|---|---|
| 0 | The value indicated in the "Baudrate mode" field shall be understood as request; the responding side shall either accept it or return the default value otherwise; |
| 1 | The value indicated in the "Baudrate mode" field shall be understood as suggestion; the responding side may respond with any value and the initiating side shall accept it. |

F (bit 6 Octet 5b)

- | | |
|---|--|
| 0 | The value indicated in the "Flow control" field shall be understood as request; the responding side shall either accept it or return the default value otherwise; |
| 1 | The value indicated in the "Flow control" field shall be understood as suggestion; the responding side may respond with any value and the initiating side shall accept it. |

Baudrate mode (octet 5b)

Bits	5 4	Meaning
	0 0	Nodynamic detection;
	0 1	Dynamic detection at FP;
	1 0	Dynamic detection at PP;
	1 1	Reserved.

Flow control (octet 5b)

Bits	3 2 1	Meaning
	0 0 0	No Data Flow Control;
	x x 1	Hardware Data Flow Control (RTS/CTS);
	x 1 x	Hardware Data Flow Control (DTR/DSR);
	1 x x	Software Data Flow Control (Xon/Xoff).

NOTE 4: It is not recommended to use a combination of flow controls.

Maximum SDU size (octets 6 and 6a):

This 14-bit word represents the natural binary coding of the maximum SDU length in octets used for data transmission, with the least significant bit in position 1 of octet 6a.

C.2.2 Default-values

It is necessary to have default-values for the V.24 [15] parameters, which can be easily supported by all V.24 [15] [15]-devices:

Stop bits:	1
Data bits:	8
Parity:	N
Data rate:	19 200 bit/s
Baudrate mode:	no dynamic detection
Flow control:	no

If dynamic data rate detection is supported the device shall support all data rates of the following list up to and including the negotiated data rate.

300, 600, 1 200, 2 400, 4 800, 9 600, 19 200, 38 400, 57 600, 115 200.

C.2.3 Negotiation of the V.24-parameters

Each V.24 [15] parameter is negotiated separately. The V.24 [15] parameters shall be negotiated call-by-call.

If octets 6 and 6a need to be included at least Octet 5 shall be included as well and consequently values for < Stop bits >, < Data bits > and < Parity > shall be indicated, in this case octets 5a and 5b can still be omitted if the default values of the fields as indicated in clause C.2.2 are suggested. If octets 6 and 6a are omitted (the default value for the SDU max size implies as being suggested), octets 5, 5a and 5b can be omitted as well (all defaults values imply as being suggested).

For negotiation of V.24 [15] parameters the following rules shall apply:

Stop Bits:	The initiating side may suggest any valid value for this V.24 [15] parameter. The receiving shall either accept the suggested value by returning the same value in the response OR return the default value if the suggested value is not acceptable. The negotiated value shall be the value returned by the responding side (when complying with the rules above).
Data bits:	Same as "Stop bits".
Parity:	Same as "Stop bits".
Data rate:	The initiating side may request any data rate. The receiving side shall either accept the suggested value by returning the same value in the response OR return values lower than the suggested, OR, the default value specified in C.2.2. The negotiated value shall be the value returned by the responding side (when complying with the rules above).
Baudrate mode:	Same as "Stop bits".
Flow control:	Same as "Stop bits".

NOTE: The aim of this negotiation is, to negotiate the highest common data rate of both sides as fast as possible. So the "algorithm" is optimized for this aim.

If the initiating side indicates for any value "Not specified" or the bits B and F are set, the responding side may return back any value.

If negotiation fails, to avoid endless attempt for negotiation new call set up should be initiated with default values.

C.3 Generic interworking conventions

C.3.1 PAD functionality

This clause describes the Packet Assembly/Disassembly unit (PAD) functionality for interworking to character oriented (asynchronous) protocols.

C.3.1.1 Character formatting

Information is transferred between PAD entities using LU10 frames. The LU10 frame Service Data Unit (SDU) has variable length of 1- 1 024 octets. The octets within the LU10 SDU are numbered 0 to n-1, octet 0 is transmitted first. The bits within the octets are numbered 1 to 8, bit 1 is transmitted first. The PAD functions as follows:

Characters are coded into octets in the following way:

- the first bit of the character received/transmitted over the upper PAD interface corresponds to bit position 1 in the octet. The second bit-to-bit 2, and the eighth bit-to-bit 8;
- 8 bit characters are transmitted with no padding. Where parity is used it is generated/removed locally;
- 7 bit characters are padded with a "0" in bit position 8. Where parity is used it is inserted in bit position 8;
- 6 bit characters are padded with a "0" in bit positions 7 and 8. Where parity is used it is inserted in bit position 7;
- 5 bit characters are padded with a "0" in bits positions 6, 7 and 8 if no parity is used. Where parity is used it is inserted in bit position 6;
- all start/stop bits are generated/removed locally by the application;
- the character configuration (length, start, stop and parity, etc.) information is conveyed between PAD entities in the {CC-SETUP} message in the << IWU-ATTRIBUTES >> information element during the call establishment phase;
- characters are inserted into the PAD-buffer in order of transmission in octets 0 to n-1.

C.3.2 Support of SDU size

All implementations shall support a SDU size of at least the result of the following formula, which depends on the negotiated data rate and other V.24 [15] parameters and shall be calculated at each side. A different value can be negotiated.

The formula:

$$SDU_size = MAX(29, \frac{data_rate * (data_bits + parity_bits)}{((data_bits + parity_bits) + (2 * stop_bits)) * 8} * t_{TDMA-frame} * (1 + security_offset) + 1)$$

security_offset = 7 %

The result of this calculation shall be rounded up to the nearest integer.

A security offset is necessary because of jitter-effects on V.24 [15]-interfaces. The value for the security offset is a result of practical experiences.

Table C.1: values for common data rates and V.24 [15] parameters

Data rate	Data bits/Parity/Stop bits	Max. supported SDU size
1 200	8N1, 7E1, 7O1	29
2 400	8N1, 7E1, 7O1	29
4 800	8N1, 7E1, 7O1	29
9 600	8N1, 7E1, 7O1	29
19 200	8N1, 7E1, 7O1	29
38 400	8N1, 7E1, 7O1	43
57 600	8N1, 7E1, 7O1	63
115 200	8N1, 7E1, 7O1	125

C.4 V.24 circuits

C.4.1 General

The V.24 [15] interworking supports the V.24 [15] circuits as given in table C.2. This table also relates the official V.24 [15] circuit names to the more practical names as used in DPRS.

Table C.2: IWU V.24 support

V.24 [15] Circuit	V.24 [15] Meaning	DPRS name	Direction
103	Transmitted data	TXD (Transmit Data)	To DCE
104	Received data	RXD (Receive Data)	From DCE
105	Request to send	RTS (Request To Send)	To DCE
106	Ready for sending	CTS (Clear To Send)	From DCE
107	Data set ready	DSR (Data Set Ready)	From DCE
108/2	Data terminal ready	DTR (Data Terminal Ready)	To DCE
109	Data channel received line signal detector	DCD (Data Carrier Detect)	From DCE
125	Calling indicator	RI (Ring Indicator)	From DCE

Additional functionalities are:

- Xon, Xoff;
- Break and Pause.

NOTE: Indication of break and pause conditions are not foreseen as they are not required for proper operation in nearly all cases.

If supported, the break and pause conditions shall be optional and therefore be transmitted within an optional user control information element as described above.

The V.24 [15] connection establishment shall not influence DECT call control. The call control is only necessary to establish the connection and configure the serial port such as data coding, data rate, etc.

All information (signalling- and user data) of the V.24 [15] connection is transferred via an encapsulation protocol.

C.4.2 Encapsulation

C.4.2.1 Description

For transmission a one-octet header is inserted to multiplex signal-, control- or user data on the same DECT-data link.

C.4.2.2 Framing

The framing format is defined as below:

First octet	Following octets
Header	Data

Figure C.3: Framing of encapsulation

C.4.2.3 Coding of encapsulation

Bit:	8	7	6	5	4	3	2	1
	E	DCD	RI	DTR/DSR	RTS/CTS	Reserved	Reserved	Reserved

Figure C.4: Header of encapsulation

The DTR/DSR or RTS/CTS bit respectively indicates that the peer side is not able to receive further data and therefore allows end-to-end flow control (depends on the negotiated type of Dataflow-control). It may be set with respect to the real status of the line and/or by the implementation e.g. due to the buffer status respectively.

NOTE: On the DCE-emulation side is no incoming DCD- or RI-signal from the DTE-device. Therefore the following default values should be set:

RI = 0

DCD = DSR

With these values a proper DCE/DCE-connection (nullmodem) can be guaranteed.

The two bits DTR/DSR and RTS/CTS in the Headerbyte are ambiguous. Therefore we need a rule how the Header shall be interpreted exactly.

C.4.2.3.1 DCE-emulation side interpretation

The DCE-emulation side (connected to a DTE) shall interpret received header-bits as follows:

DCD: DCD

RI: RI

DTR/DSR: DSR

RTS/CTS: CTS

C.4.2.3.2 DTE-emulation side interpretation

The DTE-emulation side (connected to a DCE) shall interpret the header-bits as follows:

DCD: Ignored

RI: Ignored

DTR/DSR: DTR

RTS/CTS: RTS

C.4.2.4 SDU Structure

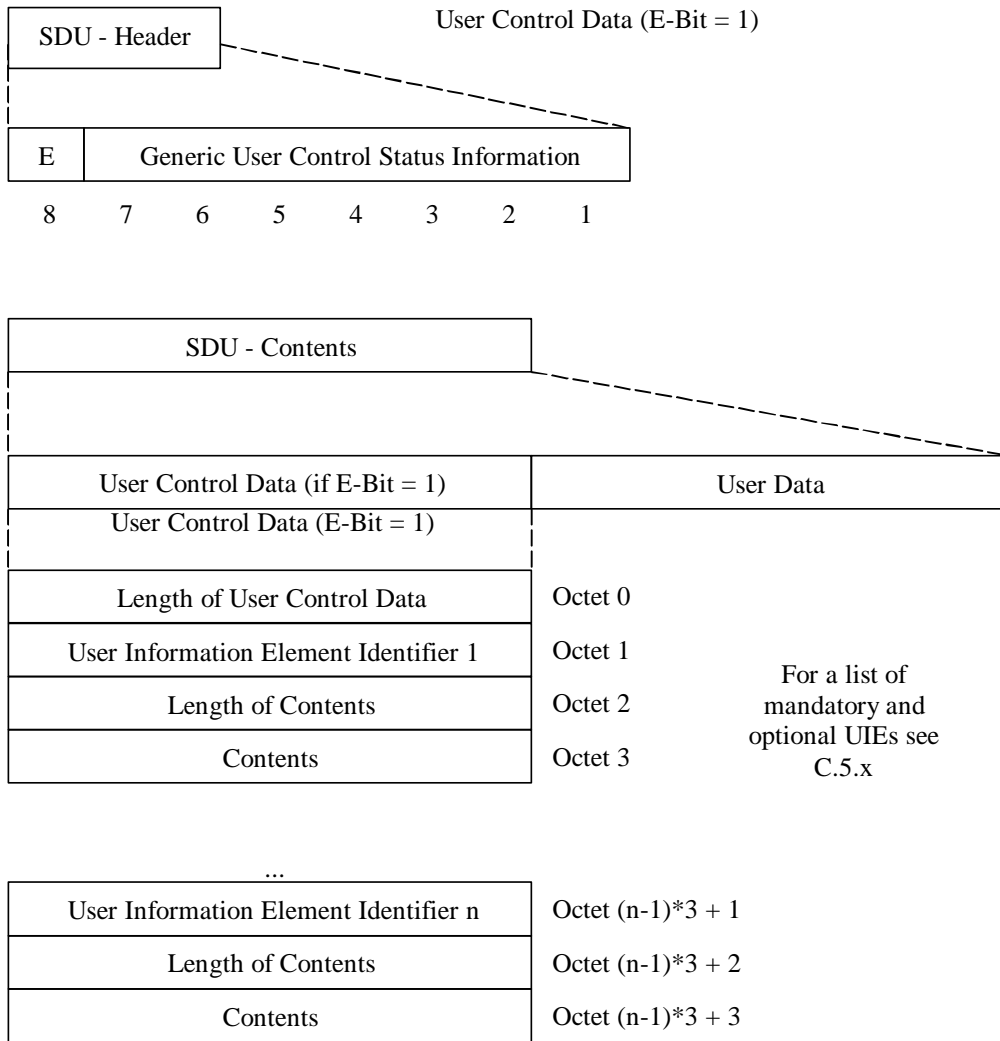


Figure C.5: Extended field (data) of encapsulation

The user data is transmitted transparent, but stop and start bits shall not be assembled. These bits shall be generated locally by the application. For 8 bit characters with an additional parity bit, the parity bit shall also be generated locally.

By resetting the extended bit (E = 0), the entire SDU-Contents are equal to the user data.

If the extended bit is set, both user control and user data may be inserted into the extended information field.

The first byte identifies length of directly following user control data. This byte is applied to reroute the user control and user data into the corresponding SAPs (see figure C.1b).

C.4.3 Interworking procedures and conventions

C.4.3.1 General

C.4.3.1.1 Data forwarding conditions

User data and signalling data shall be assembled until one or more of the following conditions are met:

- a timer expires at any time;
- the SDU is forwarded to U-plane service entity.

C.4.3.1.2 Dataflow Control

The dataflow shall take action local but shall be overlaid by Path-By Path or End-2-End Flow Control. Exception: It is not allowed to overlay an active local flow control with an inactive Path-By-Path or End-2-End flow control. The control information shall be generated by U-plane service or set over V.24 [15] interface.

C.4.3.1.2.1 Software dataflow control

If the IWU notifies that the U-plane service is not ready to transfer data, it shall generate an Xoff. If the U-plane service indicates the data should be transmitted once again the IWU shall generate an Xon.

If the IWU notifies that an Xoff is received by V.24 [15] interface, the IWU shall stop to transmit data over V.24 [15] interface.

If the Xon identify is received at V.24 [15] interface the IWU start to transmit once again.

C.4.3.1.2.2 Hardware dataflow control

The flow control condition indication shall be performed using circuits RTS/CTS or circuits DTR/DSR, in these cases:

At DCE-emulation side IWU interface (connected to a DTE):

- a DCE-emulation side IWU not-ready condition, initiated U-plane service, shall be indicated by turning circuit 106 (CTS) or 107 (DSR) OFF and cleared by turning circuit 106(CTS) or 107(DSR) ON;
- a DTE not ready condition shall be recognized by an ON-OFF transition and cleared by an OFF-ON transition of circuit 105 (RTS) or 108 (DTR).

At DTE-emulation side IWU interface (connected to a DCE):

- a DTE-emulation side IWU not-ready condition, initiated U-plane service, shall be indicated by turning circuit 105 (RTS) or 108 (DTR) OFF and cleared by turning circuit 105 (RTS) or 108 (DTR) ON;
- a DCE not ready condition shall be recognized by an ON-OFF transition and cleared by an OFF-ON transition of circuit 106(CTS) or 107(DSR).

NOTE: On running system, either DTR/DSR or RTS/CTS mode is available. This is set in the IWU-Attribute.

C.4.3.1.3 Transmission of U-plane data procedure

If the SDU is forwarded to U-plane service entity, the actual line states of V.24 [15] are inserted into the header (done by the application).

C.4.3.1.4 Receive of U-plane data procedure

The header is to compare if line states of V.24 [15] connection have been changed.

C.4.3.1.5 V.24 signalling

The circuits 106 (CTS)/105 (RTS) or 107 (DSR)/108 (DTR) shall be generated locally and maybe overlaid by Path-By-Path or End-2-End flow control.

C.4.3.1.6 Configuration a V.24 interface during a Connection

The initiating side:

The IWU shall stop the user data transmission by using the dataflow control, it sends also the remaining data into transmit buffers and shall issue MNCC_MODIFY.req, specifying the configuration of serial interface and link, and shall await a MNCC_MODIFY.cfm primitive. If this primitive notifies failure, it shall enter the release-procedure, otherwise the dataflow control enable the data flow.

The destination side:

If the IWU receives a MNCC_MODIFY.ind, it shall stop the data transmission by using the dataflow control, afterwards the buffer shall be cleared, the serial port shall be configure and shall await incoming data of the initiating side.

NOTE: It is not necessary in all MNCC_MODIFY-events to stop the data transmission etc. (for example: bandwidth-modification).

C.4.3.2 Fall back procedure

If the DECT-Link breaks off, the DCE-emulation side IWU shall clear the buffer and turn circuit 107 (DSR)/106 (CTS), circuit 125 (RI) and circuit 109 (DCD) off, the DTE-emulation side IWU shall clear the buffer and turn circuit 108 (DTR) and circuit 105 (RTS) off.

C.4.3.3 Procedure at the DCE-emulation side IWU

The IWU shall emulate a DCE. Received Data (from the air-interface) shall be forwarded via the circuit RxD to the DTE and V.24 [15] data shall be received via the circuit TxD from the DTE (see figure C.1c for details).

NOTE: The dataflow control is not special notified. It is defined in clause C.4.3.1.2.

C.4.3.3.1 DTE- initiated VC establishment

If no V.24 [15] call is established, then the IWU shall monitor the value of all state-lines. If DTR line goes ON, the IWU shall monitor the activity of the circuit TxD. The circuit TxD shall also be monitored, if no dataflow mode is negotiated. If data is detected on the circuit TxD line or a state on the state-lines is changed, then the IWU shall issue an MNCC_SETUP.req primitive and change the state to "V.24 [15] call Requested".

In the "V.24 [15] call Requested" state, if the IWU receives a MNCC_REJECT.ind primitive, it shall clear the buffer and set DSR-, CTS-, RI- and DCD-line OFF and shall return to the "No V.24 [15] call" state. Its subsequent action shall be locally determined on the basis of the release reason contained in the primitive.

In the "V.24 [15] call Requested" state, if the IWU receives an MNCC_CONNECT.ind primitive it shall enter a "V.24 [15] call Active" state. Other primitives might be received before MNCC_CONNECT.

C.4.3.3.2 DCE-initiated VC establishment

Upon the receipt of a MNCC_SETUP.ind primitive, the IWU shall determine that the service requested may be offered, and if so it will issue a MNCC_CONNECT.ind primitive and enter the "V.24 [15] call Active" state. Other primitives might be sent before MNCC_CONNECT.

If the service cannot be supported, it will issue a MNCC_REJECT.req, indicating a release reason, and will return to the "No V.24 [15] call" state.

C.4.3.3.3 V.24 call release

The application shall decide in which cases the V.24 [15] call should be released. The V.24 [15] call release shall be done using the NWK Call release procedure (see GAP).

C.4.3.4 Procedure at the DTE-emulation side IWU

The IWU shall emulate a DTE. Received data (from the air-interface) shall be forwarded via the circuit TxD to the DCE and V.24 [15] data shall be received via the circuit RxD from the DCE (see figure C.1c for details).

C.4.3.4.1 DCE-initiated VC establishment

If no V.24 [15] call is established, then the IWU shall monitor the value of all state-lines. If the DSR line goes ON, then the IWU shall monitor the activity of the circuit RxD. The circuit RxD shall also be monitored, if no dataflow mode is negotiated. If data is then detected on the circuit RxD line, or any state line is changed, then the IWU shall issue an MNCC_SETUP.req primitive and shall enter the "V.24 [15] Call Requested" state.

In this state, if the IWU receives a MNCC_REJECT.ind primitive, it shall clear the buffer and shall return to the "No V.24 [15] Call" state. Its subsequent action shall be locally determined on the basis of the release reason contained in the primitive.

In the "V.24 [15] Call Requested" state, if the IWU receives an MNCC_CONNECT.ind primitive it shall enter a "V.24 [15] Call Active" state. Other primitives might be received before MNCC_CONNECT.

C.4.3.4.2 DTE-initiated VC establishment

Upon the receipt of a MNCC_SETUP.ind primitive, the IWU shall determine that the service requested may be offered, and if so it will issue a MNCC_CONNECT.ind primitive and enter the "V.24 [15] Call Active" state. Other primitives might be sent before MNCC_CONNECT.

Once in this state, it shall set the value of the DTR line to the value communicated to it by U-plane service. If the service cannot be supported, it will issue a MNCC_REJECT.req, indicating a release reason, and will return to the "No V.24 [15] Call" state.

C.4.3.4.3 V.24 call release

The application shall decide in which cases the V.24 [15] Call should be released. The V.24 [15] call release shall be done using the NWK Call release procedure (see EN 300 444 [8]).

C.5 Definition of User Control Information Elements

UIEs can be send within each SDU. It is allowed to send user data and UIEs in one SDU (see clause C.4.2.4).

C.5.1 Mandatory UIEs

No mandatory UIEs at this time.

C.5.2 Optional UIEs

A device can send the UIE < release_reason > at any time. If a device receives this UIE it can decide how to react.

UIE_RELEASE_REASON:

Field	Code	Comment
Tag	UIE_RELEASE_REASON	Release Reason
Length	1	1 byte following
Value	Bits 8 7 6 5 4 3 2 1 0 x x x x x x x 1 0 0 0 0 0 0 0 All other values reserved.	Proprietary reasons Reason not known

Some operating systems (e.g. Unix) sometimes use a special behaviour of the start- and stop-bit. To support this behaviour, the following two UIEs are necessary.

BREAK_CONDITION:

Field	Code	Comment
Tag	UIE_BREAK_CONDITION	Break Condition
Length	1	1 byte following
Value	0 to 255	Unit: 10 milliseconds

PAUSE_CONDITION:

Field	Code	Comment
Tag	UIE_PAUSE_CONDITION	Pause Condition
Length	1	1 byte following
Value	0 to 255	Unit: 10 milliseconds

C.5.3 Information Element Identifier

Information Element Identifier (Tag):

Bits	8 7 6 5 4 3 2 1	Meaning
	0 x x x x x x x	proprietary UIEs;
	1 0 0 0 0 0 0 1	UIE_BREAK_CONDITION;
	1 0 0 0 0 0 1 0	UIE_PAUSE_CONDITION;
	1 0 0 0 0 0 1 1	UIE_RELEASE_REASON.

All other values reserved.

Annex D (informative): Bibliography

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History

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