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Terrestrial Trunked Radio (TETRA); Digital Advanced Wireless Service (DAWS);
Physical Layer (PHY) service description

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Technical Specification

Terrestrial Trunked Radio (TETRA); Digital Advanced Wireless Service (DAWS); Physical Layer (PHY) service description

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Contents

Intellectual Property Rights	4
Foreword	4
1 Scope	5
2 References	5
3 Definitions and abbreviations	5
3.1 Definitions	5
3.2 Abbreviations	6
4 Introduction	6
5 Link Management Services	7
5.1 Downlink MAC PDU transfers over the PHY	7
5.2 Uplink MAC PDU transfers over the PHY	8
6 Transport Services	8
7 Service Primitives	9
7.1 Primitive Definitions	9
7.1.1 PHY_transfer_request	9
7.1.2 PHY_transfer_confirm	9
7.1.3 PHY_transfer_indication	9
7.1.4 PHY_frame_indication	10
7.1.5 PHY_hunt_request	10
7.1.6 PHY_hunt_confirm	10
7.1.7 PHY_service_request	10
7.1.8 PHY_service_confirm	11
7.1.9 PHY_service_indication	11
7.1.10 PHY_frame_assignment_request	11
7.1.11 PHY_frame_assignment_confirm	11
7.2 Parameter Definitions	12
7.2.1 base_station_ID	12
7.2.2 block_condition_array	12
7.2.3 frame_assignment_result	12
7.2.4 frame_assignments	12
7.2.5 frame_number	12
7.2.6 hunt_result	12
7.2.7 MPDU	12
7.2.8 MPDU_length_blocks	12
7.2.9 service_result	12
7.2.10 transfer_receipt_ack	13
7.2.11 transfer_result	13
Bibliography	14
History	15

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Foreword

This Technical Specification (TS) has been produced by ETSI Project Terrestrial Trunked Radio (TETRA).

An overview of the requirements for DAWS can be found in TR 101 156.

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1 Scope

The present document specifies the service requirements for the Digital Advanced Wireless Service (DAWS) Physical (PHY) layer. The document describes the general service characteristics of a DAWS PHY layer which can interwork successfully with a DAWS MAC. Specific service details will be provided in a future version of the present document.

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, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, subsequent revisions do apply.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

- [1] TR 101 156: "Terrestrial Trunked Radio (TETRA); Technical requirements specification for Digital Advanced Wireless Service (DAWS)".
- [2] TS 101 659: "Digital Advanced Wireless Service (DAWS); Medium Access Control (MAC); service description".

3 Definitions and abbreviations

3.1 Definitions

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

base station: Piece of equipment providing simultaneous, bi-directional network access to mobile stations.

block: Fixed-length sequence of bytes from a MAC PDU.

downlink: General term meaning "from the base station to the mobile station".

mobile station: Piece of equipment able to create and consume data but only having network access via a base station.

frame: Minimum time period reserved for transmission by a single mobile station on a single frequency.

multiframe: Time period consisting of an integral number of frames between base station broadcasts specifying mobile station bandwidth assignments.

protocol data unit: Set of parameters and/or data passed from peer to peer by a protocol primitive.

protocol primitive: Request, response, or informative message sent from peer to peer.

service data unit: Set of parameters and/or data passed between adjacent layers by a service primitive.

service primitive: Request, response, or informative message sent between adjacent layers.

uplink: General term meaning "from the mobile station to the base station".

3.2 Abbreviations

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

BS	Base Station
DAWS	Digital Advanced Wireless Service
DL	Downlink
IP	Internet Protocol
LLC	Logical Link Control
MAC	Medium Access Control
MF	Multiframe
MPDU	MAC Protocol Data Unit
MS	Mobile Station
PDU	Protocol Data Unit
PHY	Physical Layer
PHY_LNK	PHY Link Management Service
PHY_TPT	PHY Transport Service
SAP	Service Access Point
SDU	Service Data Unit
UL	Uplink

4 Introduction

The DAWS protocol architecture is provided in TR 101 156 [1]. The Physical Layer (PHY) provides services to the Medium Access Control (MAC) TS 101 659 [2]. The present document provides the requirements the PHY service must satisfy to operate successfully within a Digital Advanced Wireless Service (DAWS) network. The requirements in the present document apply to the integrated DAWS subnet described in TR 101 156 [1].

The prefix PHY will be used when a requirement applies to both the BS and MS PHY layers. The prefix BS_PHY or MS_PHY will be used when a requirement applies only to the BS or MS PHY layers, respectively.

As shown in figure 1, the Medium Access Control (MAC) accesses PHY services via service access points (SAPs) A and B. PHY_SAP_A is for data transfer service primitives and PHY_SAP_B is for local control and status service primitives.

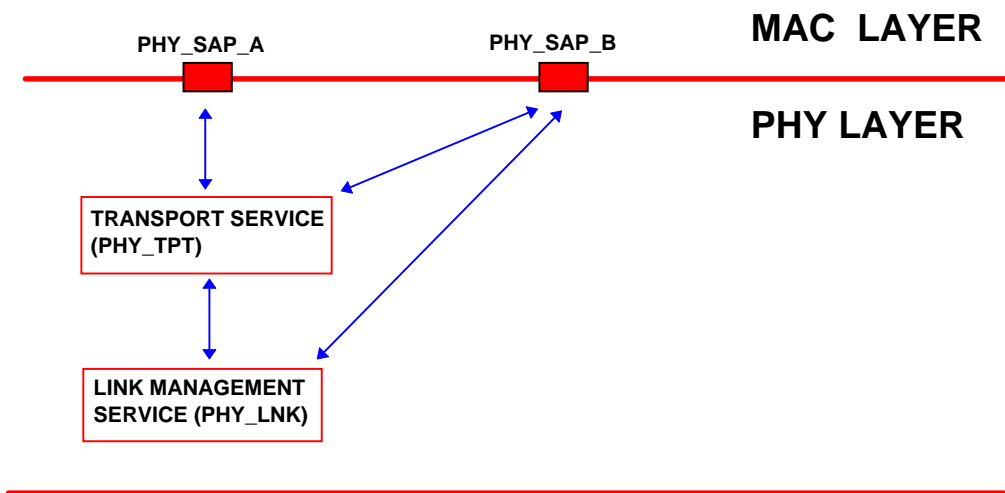


Figure 1: DAWS PHY Architecture

Requirements for the transport and link management services are provided in clauses 5 and 6. Service primitives and associated service data units are provided in clause 7.

5 Link Management Services

The PHY link management service (PHY_LNK) manages the wireless link between the BS and MS, including modulating and demodulating RF carriers with bit patterns (blocks) provided by PHY_TPT.

BS_PHY_LNK is responsible for generating and transmitting the synchronization block and for transmitting any downlink data blocks provided by BS_PHY_TPT. BS_PHY_LNK is also responsible for receiving uplink data blocks and transferring them to BS_PHY_TPT for uplink PDU reconstruction.

MS_PHY_LNK synchronizes with BS_PHY_LNK based on received timing information. MS_PHY_LNK is responsible for sending uplink blocks and receiving downlink blocks. MS_PHY_LNK transfers downlink blocks to MS_PHY_TPT for downlink PDU reconstruction. MS_PHY_LNK performs power management, including support for power-saving modes of operation. MS_PHY_LNK handles MAC hunt requests and cell service requests, and performs channel quality monitoring.

5.1 Downlink MAC PDU transfers over the PHY

Figure 2 provides a flow diagram illustrating the messages exchanged to transfer a downlink MAC PDU using dynamic bandwidth allocation. The message flow can be traced as follows:

- 1) BS_MAC sends a **PHY_frame_assignment_request** service primitive to BS_PHY during multiframe N containing frame assignments for multiframe N + 2. A frame assignment specifies whether the BS, a particular MS, or all MS are permitted to transmit in the frame;
- 2) BS_PHY sends the frame assignment information to the MS_PHY during frame 0 of multiframe N + 1. MS_PHY immediately transfers the frame assignment information to MS_MAC;
- 3) During multiframe N + 1, BS_MAC issues MAC PDU transfer request service primitives to BS_PHY to fill its assigned downlink frames during multiframe N + 2. BS_PHY performs MAC PDU block encoding and any other tasks necessary to prepare the PDU blocks for transfer during multiframe N + 2;
- 4) BS_PHY transfers PDU blocks to MS_PHY in its assigned frames during multiframe N + 2;
- 5) MS_PHY reassembles the downlink MAC PDU from the received blocks and sends the resulting MAC PDU to MS_MAC.

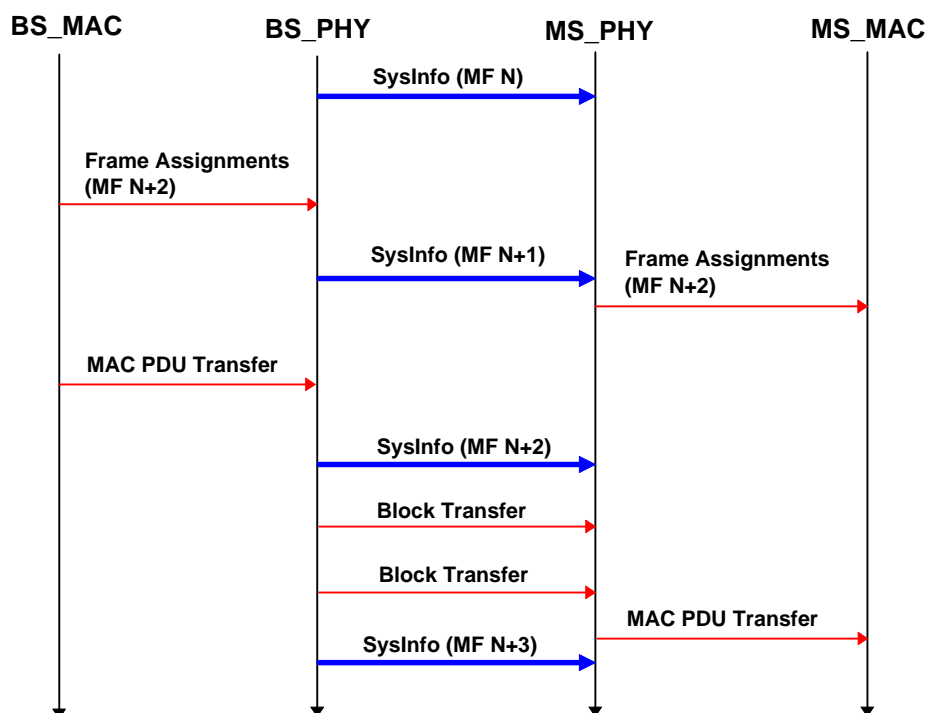


Figure 2: Downlink MAC PDU Transfers Using Dynamic Bandwidth Allocation