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Digital Audio Broadcasting (DAB); Guide to DAB standards

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Contents

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Foreword

This Technical Report (TR) has been produced by Joint Technical Committee (JTC) Broadcast of the European Broadcasting Union (EBU), Comité Européen de Normalisation ELECtrotechnique (CENELEC) and the European Telecommunications Standards Institute (ETSI).

NOTE 1: The EBU/ETSI JTC Broadcast was established in 1990 to co-ordinate the drafting of standards in the specific field of broadcasting and related fields. Since 1995 the JTC Broadcast became a tripartite body by including in the Memorandum of Understanding also CENELEC, which is responsible for the standardization of radio and television receivers. The EBU is a professional association of broadcasting organizations whose work includes the co-ordination of its members' activities in the technical, legal, programme-making and programme-exchange domains. The EBU has active members in about 60 countries in the European broadcasting area; its headquarters is in Geneva.

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The Eureka Project 147 was established in 1987, with funding from the European Commission, to develop a system for the broadcasting of audio and data to fixed, portable or mobile receivers. Their work resulted in the publication of European Standard, ETSI EN 300 401 [i.1], for DAB (note 2) which now has world-wide acceptance.

NOTE 2: DAB is a registered trademark owned by one of the Eureka Project 147 partners.

The DAB family of standards is supported by WorldDAB, an organization with members drawn from broadcasting organizations and telecommunication providers together with companies from the professional and consumer electronics industry.

Modal verbs terminology

In the present document "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

1 Scope

The present document provides brief explanations about the many different standards and guidelines for Digital Audio Broadcasting (DAB), what they cover and how they interrelate. The present document seeks to provide a useful guide to allow implementers to determine which aspects of the DAB system are in common use, and which are more specialized, for both consumer and professional equipment. Those specifications that are no longer considered to be in mainstream use (and are identified as "Historical" in the ETSI Work Programme) are also detailed.

2 References

2.1 Normative references

Normative references are not applicable in the present document.

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI EN 300 401: "Radio broadcasting systems; Digital Audio Broadcasting (DAB) to mobile, portable and fixed receivers".

[i.2] ETSI TS 101 756: "Digital Audio Broadcasting (DAB); Registered Tables".

[i.3] ETSI TS 103 176: "Digital Audio Broadcasting (DAB); Rules of implementation; Service information features".

[i.4] ETSI TS 102 367: "Digital Audio Broadcasting (DAB); Conditional Access".

[i.5] ETSI TS 102 563: "Digital Audio Broadcasting (DAB); DAB+ audio coding (MPEG HE-AACv2)".

[i.6] ETSI TS 103 466: "Digital Audio Broadcasting (DAB); DAB Audio Coding (MPEG layer II)".

[i.7] ETSI TS 101 757: "Digital Audio Broadcasting (DAB) Conformance testing for DAB Audio".

[i.8] ETSI EN 301 234: "Digital Audio Broadcasting (DAB); Multimedia Object Transfer (MOT) protocol".

[i.9] ETSI TS 101 759: "Digital Audio Broadcasting (DAB); Data Broadcasting - Transparent Data Channel (TDC)".

[i.10] ETSI TS 102 427: "Digital Audio Broadcasting (DAB); Data Broadcasting - MPEG-2 TS streaming".

[i.11] ETSI EN 300 797: "Digital Audio Broadcasting (DAB); Distribution interfaces; Service Transport Interface (STI)".

[i.12] ETSI TS 101 860: "Digital Audio Broadcasting (DAB); Distribution interfaces; Service Transport Interface (STI); STI Levels".

[i.13] ETSI EN 300 798: "Digital Audio Broadcasting (DAB); Distribution interfaces; Digital baseband In-phase and Quadrature (DIQ) interface".

[i.14] ETSI ETS 300 799: "Digital Audio Broadcasting (DAB); Distribution interfaces; Ensemble Transport Interface (ETI)".

[i.15] ETSI TS 102 693: "Digital Audio Broadcasting (DAB); Encapsulation of DAB Interfaces (EDI)".

[i.16] ETSI TS 102 821: "Digital Radio Mondiale (DRM); Distribution and Communications Protocol (DCP)".

[i.17] ETSI TS 101 499: "Hybrid Digital Radio (DAB, DRM, RadioDNS); SlideShow; User Application Specification".

[i.18] ETSI TS 102 818: " Hybrid Digital Radio (DAB, DRM, RadioDNS); XML Specification for Service and Programme Information (SPI)".

[i.19] ETSI TS 102 371: "Digital Audio Broadcasting (DAB); Digital Radio Mondiale (DRM); Transportation and Binary Encoding Specification for Service and Programme Information (SPI)".

[i.20] ETSI TS 103 177: "Digital Audio Broadcasting (DAB); Filecasting; User Application Specification".

[i.21] ETSI TS 102 980: "Digital Audio Broadcasting (DAB); Dynamic Label Plus (DL Plus); Application specification".

[i.22] ETSI TS 102 979: "Digital Audio Broadcasting (DAB); Journaline; User application specification".

[i.23] ETSI TS 102 428: "Digital Audio Broadcasting (DAB); DMB video service; User Application Specification".

[i.24] ETSI TS 103 551: "Digital Audio Broadcasting (DAB); Transport of TPEG services".

[i.25] ETSI TS 103 461: "Digital Audio Broadcasting (DAB); Domestic and in-vehicle digital radio receivers; Minimum requirements and Test specifications for technologies and products".

[i.26] ETSI TR 101 496 (all parts): "Digital Audio Broadcasting (DAB); Guidelines and rules for implementation and operation".

[i.27] ETSI TR 101 497: "Digital Audio Broadcasting (DAB); Rules of Operation for the Multimedia Object Transfer Protocol".

[i.28] ETSI TS 101 498 (all parts): "Digital Audio Broadcasting (DAB); Broadcast Website".

[i.29] ETSI TR 101 758: "Digital Audio Broadcasting (DAB); Signal strengths and receiver parameters; Targets for typical operation".

[i.30] ETSI TS 101 993: "Digital Audio Broadcasting (DAB); A Virtual Machine for DAB: DAB Java Specification".

[i.31] ETSI TS 102 368: "Digital Audio Broadcasting (DAB); DAB - TMC (Traffic Message Channel)".

[i.32] ETSI TS 102 632: "Digital Audio Broadcasting (DAB); Voice Applications".

[i.33] ETSI TS 102 635 (all parts): "Digital Audio Broadcasting (DAB); Middleware".

[i.34] ETSI TS 102 652: "Digital Audio Broadcasting (DAB); Intellitext; Application specification".

[i.35] ETSI TS 102 978: "Digital Audio Broadcasting (DAB); IPDC Services; Transport specification".

[i.36] ETSI ES 201 735: "Digital Audio Broadcasting (DAB); Internet Protocol (IP) Datagram Tunnelling".

[i.37] ETSI ES 201 736: "Digital Audio Broadcasting (DAB); Network Independent Protocols for Interactive Services".

[i.38] ETSI ES 201 737: "Digital Audio Broadcasting (DAB); Interaction channel through Global System for Mobile communications (GSM) the Public switched Telecommunications System (PSTN); Integrated Services Digital Network (ISDN) and Digital Enhanced Cordless Telecommunications (DECT)".

[i.39] ETSI EN 301 700: "Digital Audio Broadcasting (DAB); VHF/FM Broadcasting: cross-referencing to simulcast DAB services by RDS-ODA 147".

[i.40] IEC 62106: "Specification of the radio data system (RDS) for VHF/FM sound broadcasting in the frequency range from 87,5 to 108,0 MHz".

3 Abbreviations

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

API	Application Programming Interface
BWS	Broadcast WebSite
CA	Conditional Access
DAB	Digital Audio Broadcasting
DCP	Distribution and Communications Protocol
DECT	Digital Enhanced Cordless Telecommunications
DIQ	Digital baseband In-phase and Quadrature
DL	Dynamic Label
DMB	Digital Multimedia Broadcasting
DRM	Digital Radio Mondiale
EBU	European Broadcasting Union
EDI	Encapsulation of DAB Interfaces
EPG	Electronic Programme Guide
ETI	Ensemble Transport Interface
FIC	Fast Information Channel
FIDC	Fast Information Data Channel
FM	Frequency Modulation
FM-RDS	Frequency Modulation - Radio Data System
GHz	Giga (10^9) Hertz
GI	Group Information
GIO	Guidelines and rules for Implementation and Operation
GSM	Global System for Mobile communication
HE-AAC	High Efficiency - Advanced Audio Coding
HTML	Hyper Text Markup Language
IEC	International Electrotechnical Committee
IP	Internet Protocol
IPDC	Internet Protocol Data Channel
ISDN	Integrated Services Digital Network
JTC	Joint Technical Committee
LI	Logical Interface
Mbit/s	Mega (10^6) bits per second
MHEG	Multimedia and Hypermedia information coding Experts Group
MHz	Mega (10^6) Hertz
MOT	Multimedia Object Transfer
MPEG	Moving Pictures Expert Group
MSC	Main Service Channel
MTU	Maximum Transfer Unit
ODA	Open Data Application
OFDM	Orthogonal Frequency Division Multiplexing
PAD	Programme Associated Data
PFT	Protection, Fragmentation and Transport
PI	Programme Information
PSI/SI	Programme Specific Information/Service Information
PSSC	Personal DAB Service Session Control
PSTN	Public Switched Telecommunications System

RDI	Receiver Data Interface
RDS	Radio Data System
RDS-ODA	RDS Open Data Application
RF	Radio Frequency
RTP	Real-time Transport Protocol
SAT	Sub-channel Assignment Table
SFN	Single Frequency Network
SI	Service Information
SPI	Service and Programme Information
STI	Service Transport Interface
STI-C	Service Transport Interface - Control
STI-D	Service Transport Interface - Data
T-DAB	Terrestrial DAB
TDC	Transparent Data Channel
TMC	Traffic Message Channel
TPEG	Transport Protocol Experts Group
XML	eXtensible Markup Language

4 Introduction

The DAB system originated as a European funded project known as Eureka 147. The members of the project team decided to standardize the system at ETSI and the system standard was first published in 1995. Since then the system has been modified in various ways and additional standards documents have also been created to facilitate additional features, interoperable equipment interfaces for contribution and distribution networks, additional transport modes, data applications and so on. The present document is designed to provide some background and guidance to those considering using the DAB system so that the appropriate standards documents are consulted.

DAB is primarily a system for digital radio and so the coding and modulation is designed to provide reliable mobile reception. This also allows non-audio services to be carried, including mobile video services, traffic data, and a host of other applications.

DAB is relatively wideband for a broadcast radio system and therefore carries several services, known as a multiplex. However, the multiplex is primarily a feature of the transmission system. One key benefit of digital radio is that it should be easy to use: therefore receiver makers should ensure that the user can understand the way to select services, and this is often best achieved with a flat list.

DAB is most widely used as a digital radio transmission system using DAB+ audio coding and text messages carried as dynamic labels. Additional data often accompanies the audio: visuals via the SlideShow application, and logos and programme information via the SPI application.

5 DAB system standards

5.1 Introduction

The DAB system is built around a core which defines the coding, modulation and transmission system parameters. Surrounding the core, two basic data mechanisms are provided: stream mode and packet mode. Also defined is the signalling channel that allows a receiver to make sense of the content of the multiplex.

Audio coding and data transport definitions are provided in separate documents, along with the enumeration of certain signalling parameters and the rules of operation for complex service information features.

This scheme is shown in figure 1.

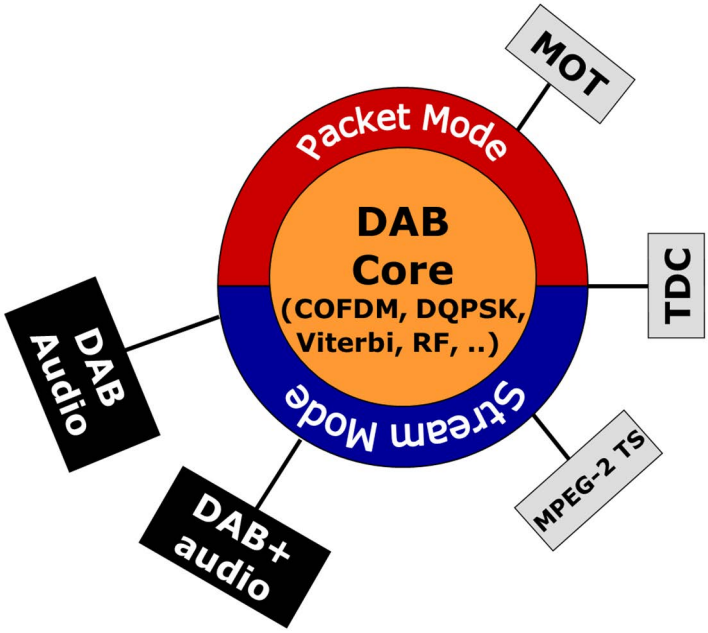

Figure 1: Building blocks of the DAB system

5.2 DAB system definition

5.2.1 DAB system standard

ETSI EN 300 401 [i.1] is the DAB system standard. It was first published in 1995. In 2016 the WorldDAB Technical Committee performed a detailed review of the standard and the way that it had been utilized during its 20 year lifetime. The conclusion of that work was a simplified and revised version of the standard published as V2.1.1 in 2017. It describes the DAB system, designed for delivery of high-quality digital audio programme and data services for mobile, portable and fixed reception from terrestrial transmitters in frequency bands from 30 MHz to 300 MHz. The DAB system is designed to provide spectrum and power efficient techniques in terrestrial transmitter network planning, known as the Single Frequency Network (SFN).

ETSI EN 300 401 [i.1] defines the DAB transmission signal. It includes the coding algorithms for multiplexing of audio programmes and data services, channel coding and modulation. Provision is also made for transmission of additional data services which may be programme related or not, within the limit of the total system capacity. ETSI EN 300 401 [i.1] provides information on the system configuration which includes information about the ensembles, services, service components and linking of them. ETSI EN 300 401 [i.1] describes the nominal characteristics of the emitted DAB signal.

5.2.2 Registered tables

To allow development of additional features and data services without the need to revise the DAB system standard, ETSI TS 101 756 [i.2] contains the enumeration of various parameters. It also contains the enumeration for certain parameters in the MOT standard, ETSI EN 301 234 [i.8].

The tables in ETSI TS 101 756 [i.2] are maintained by the WorldDAB Technical Committee. The procedure for registering a new value in an existing table or the registration of a new table is described in clause 4 of ETSI TS 101 756 [i.2].

Additionally there are annexes containing translations of Programme Type Codes and Announcement Type Codes and the definition of the Latin-based character set and its minimum representation on displays.

5.2.3 Rules of implementation

ETSI TS 103 176 [i.3] defines rules of implementation for certain service information features. These rules have been developed to provide a reliable and consistent experience for digital radio listeners; they provide implementation details for how the Fast Information Channel (FIC) signalling is used and how receivers will interpret and behave in response to receiving the FIC signalling. The rules define the requirements for service following and service lists, and these rules need to be followed in order to provide the expected behaviour of the features.

5.2.4 Conditional Access

ETSI TS 102 367 [i.4] describes the conditional access system that may be used for DAB service components. It allows for scrambling to be applied to stream mode audio, stream mode data and packet mode data service components. It specifies the framework for signalling and various configurations of content and access control data.

It should be noted that CA is optional. CA is not applied to free-to-air radio services carried over DAB.

5.3 Audio coding

5.3.1 Introduction

In the original DAB standard, audio coding was included. Later, with the development of more efficient audio coding methods, the DAB+ audio coding method was introduced and specified in a separate ETSI TS document. With the publication of ETSI EN 300 401 [i.1] V2.1.1, DAB audio coding was moved into a separate ETSI TS document in order to reflect that all introductions of the DAB system since the availability of DAB+ audio have been implemented using DAB+ audio for radio services and that many existing transmissions have been migrated from DAB audio to DAB+ audio.

5.3.2 DAB+ audio

ETSI TS 102 563 [i.5] defines the method to code and transmit audio services using the HE-AAC v2 audio coder. It details the necessary mandatory requirements for decoders, the permitted audio modes and the data protection and encapsulation. This audio coding scheme permits the full use of the PAD channel for carrying dynamic labels and user applications. DAB+ audio is recommended for all audio services as it provides a greater efficiency and enhanced robustness compared to the original DAB audio.

5.3.3 DAB audio

"ETSI TS 103 466 [i.6] defines the original method for coding audio services, using the MPEG layer 2 audio coder. The content is technically identical to that in ETSI EN 300 401 [i.1] V1.4.1. It is provided to ensure continued support for existing broadcasts that use DAB audio, but it is not recommended for new implementations since DAB+ audio provides greater efficiency. However, it should be noted that there are no IPR fees to pay when implementing DAB audio, either for transmission or reception."

5.3.4 DAB audio testing

ETSI TS 101 757 [i.7] specifies a test procedure for DAB audio and defines test bitstreams which can be used to verify whether bitstreams and decoders meet the requirements as specified in ETSI TS 103 466 [i.6]. These tests can be used for various purposes such as:

- manufacturers of encoders, and their customers, can use the tests to verify whether the encoder produces valid bitstreams;
- manufacturers of decoders and their customers can use the tests to verify whether the decoder meets the requirements specified in ETSI TS 103 466 [i.6] for the claimed decoder capabilities.

5.4 Data transport coding

5.4.1 Introduction

The DAB system provides two basic mechanisms for data transport - stream mode and packet mode. Building on these basic mechanisms, data transmission generally takes two forms - file based and stream based. The Multimedia Object Transfer (MOT) standard allows broadcasting of file based data. The Transparent Data Channel (TDC) standard allows broadcasting of synchronous and asynchronous streams. Mechanisms have also been provided to allow MPEG-2 transport stream based services to be carried over DAB.

The data applications using these data transport provisions are given in clause 7.

5.4.2 File transfer - MOT

ETSI EN 301 234 [i.8] describes the MOT protocol which allows broadcasting of various kinds of data using the DAB system. It is tailored to the needs of Multimedia services and the specific constraints given by the broadcasting characteristics of the DAB system. MOT ensures interoperability between different data services and application types as well as equipment from different manufacturers. It allows a flexible utilization of the data channels incorporated in the DAB system, as well as methods to manage and maintain a reliable transmission in a uni-directional broadcast environment.

5.4.3 Transparent Data Channel - TDC

ETSI TS 101 759 [i.9], defines the method to deliver synchronous or asynchronous data transparently within a DAB transmission, either in stream mode or packet mode.

5.4.4 MPEG-2 Transport Stream

ETSI TS 102 427 [i.10] specifies how MPEG-2 Transport Stream can be encapsulated within a DAB MSC stream data subchannel, including additional error protection. The error protection mechanism is composed of a Reed-Solomon coder and an interleaver.

6 DAB contribution, distribution and network standards

6.1 Introduction

These standards provide vendor independent broadcast networking interfaces for contribution and distribution networks. ETSI EN 300 797 [i.11] describes the Service Transport Interface (STI), ETSI EN 300 798 [i.13] describes the digital baseband in-phase and quadrature interface and ETSI ETS 300 799 [i.14] describes the Ensemble Transport Interface (ETI). ETSI TS 102 693 [i.15] provides a mechanism for the encapsulation of STI and ETI compliant data streams for distribution over IP networks.

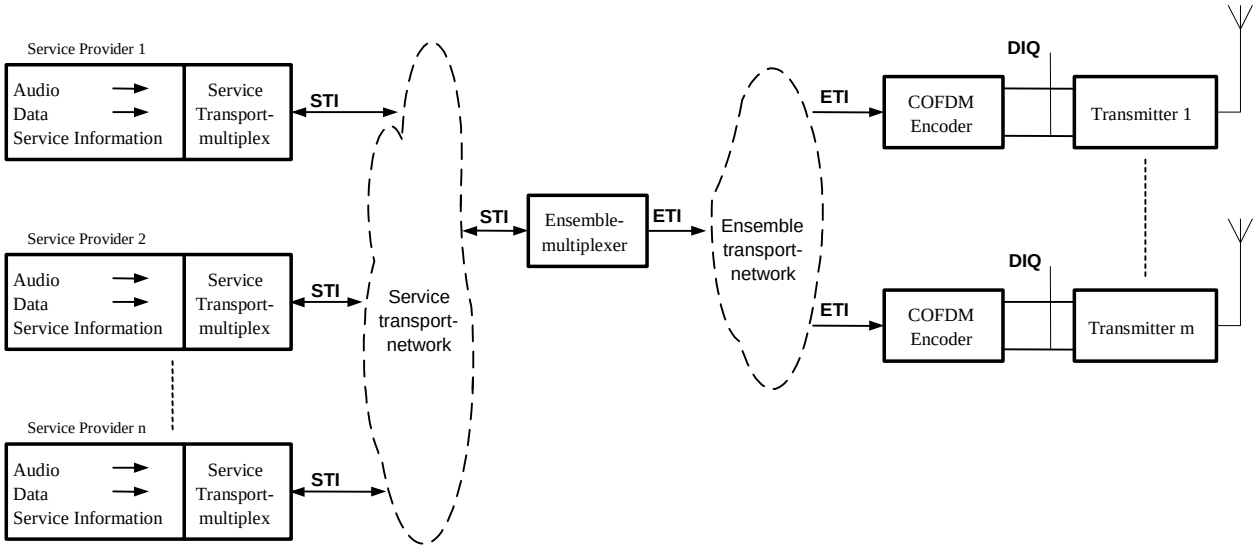

Figure 2: Conceptual DAB transmission network and related standards

6.2 Contribution networks - STI

ETSI EN 300 797 [i.11] provides a standardized way of transporting DAB service components, service information and control information in a DAB contribution network. The contribution network connects the studios of the various Service providers to the Ensemble provider's ensemble multiplexer.

The STI consists of two parts: the data part, STI-D, which carries data intended for broadcast, and the control part, STI-C, which carries data for control and monitoring purposes and is not intended for broadcast. STI-D is unidirectional in nature, whereas STI-C is bidirectional in nature. ETSI EN 300 797 [i.11] specifies first the logical interface for STI-D and STI-C, and then defines various physical implementations for them.

The STI interface is suitable for use on a number of different physical media and telecommunication networks. Provision is made for the inclusion of appropriate error detection and correction and for the management of network transit delay.

ETSI TS 101 860 [i.12] defines guidance in implementation and usage of the functionality described in the STI standard ETSI EN 300 797 [i.11]. Subsets of the STI standard are defined in order to make interoperable solutions possible for different suppliers of STI devices. The subsets are called STI Levels. Interoperability is ensured if the STI Logical Interface (LI) and STI Physical Interfaces (STI-PI, X) are the same for entities transporting DAB Service Components, Service Information and control messages in a DAB contribution network.

6.3 Transmission interface - DIQ

ETSI EN 300 798 [i.13] is applicable to DAB channel coding equipment typically located at each of the transmitter sites in a DAB SFN. The norm describes the characteristics of a suitable interface for the connection of the two major elements of the DAB OFDM generator; the baseband processing equipment and the RF modulator. The interface provides an interconnection between a single source (the baseband processor) and a single destination (the RF modulator). The standard does not cover the generation of the digital I/Q baseband signals since this is covered in ETSI EN 300 401 [i.1].

The digital baseband I/Q interface is unidirectional and does not cover the provision of status nor control information in the reverse direction (i.e. from the modulator back to the baseband processing section of the equipment).

6.4 Distribution networks - ETI

ETSI ETS 300 799 [i.14] establishes a method for the distribution of DAB signals between the ensemble multiplexer, and DAB modulation equipment located at the different transmission sites of an SFN. The data flow of the ETI is unidirectional by nature and the standard specifies first the logical interface the ETI, and then defines various physical implementations for it.

The interface is suitable for use on a number of different physical media including standard 2 Mbit/s switched telecommunication networks. Provision is made for the inclusion of appropriate error detection and correction and for the management of network transit delay. Limited capacity is also made available for signalling from the ensemble multiplexer to other equipment in the distribution network. ETSI ETS 300 799 [i.14] does not cover the provision of status nor control information in the reverse direction (i.e. from transmitters back to the Ensemble provider).

6.5 IP encapsulation - EDI

ETSI TS 102 693 [i.15] provides a mechanism for the encapsulation of STI-D (see ETSI EN 300 797 [i.11]) and ETI (see ETSI ETS 300 799 [i.14]) compliant data streams for distribution over IP networks. EDI is based on the existing Distribution and Communications Protocol (DCP - ETSI TS 102 821 [i.16]), and therefore a layered approach relevant to unique IP network designs can be implemented.

EDI is designed to distribute STI-D and ETI over varying conditions of IP networks, and ensure the robust delivery of STI-D and ETI compliant data over networks affected by congestion, jitter and limited packet loss. EDI can be configured to operate a re-send function, or re-construct missed packets at the receiver in times of packet loss. Once the EDI Packet has been passed to the DCP stage, Protection, Fragmentation and Transport (PFT) can add a further layer of Reed Solomon block coding and fragmentation if required; this is especially attractive for uni-directional or low Quality of Service (QoS) networks.

EDI utilizes open internet standards, and can be configured for operation over uni-directional unicast and multicast UDP/IP, and connection based TCP/IP, including MTU adaptations.

7 Data applications

7.1 Introduction

As a digital broadcast delivery platform, DAB is able to carry data services that may compliment the radio services or provide independent services. This clause 7 provides a guide to the most relevant data applications.

7.2 SlideShow

ETSI TS 101 499 [i.17] describes the techniques required to deliver a sequence of slides which carry information in the form of images. The main use for this user application will be in context with a programme service component. Examples are: news programme items complemented by photos from the reported events and programme items with popular songs accompanied by photographs of the performers or the covers of their issued CDs. Two modes are possible: on simpler devices, the Slide Show Application is service provider driven and does not require any interaction from the end-user of the corresponding service component: each slide appears automatically on the display and will be replaced under the control of the service provider according to the needs of his service. For other devices, a categorized SlideShow may be shown, which allows the user to select groups of images for interactive playback.

Hybrid radio provisions are included to allow a seamless experience for users when consuming radio services delivered by DAB or IP or a combination of both. The content may be created once by the service provider for delivery by both mechanisms and manufacturers may implement decoders with many common elements.

7.3 Service and Programme Information (SPI)

7.3.1 Introduction

The Service and Programme Information (SPI) is designed to allow for an enhanced radio experience. It may be implemented at various levels, since it is divided into service information (SI), programme information (PI) and group information (GI). The specification is written for hybrid radio (i.e. broadcast and/or IP delivery) and allows a broadcaster considerable flexibility in the provision of metadata.

7.3.2 SPI xml

ETSI TS 102 818 [i.18] defines the XML schema data model for the hybrid SPI, covering Digital Audio Broadcasting (DAB), Digital Radio Mondiale (DRM) and RadioDNS. It can be used for transmitting station logos and other service information, programme schedule data and grouping to EPG applications on receivers, and for exchanging such information between broadcasters, network operators and content providers.

7.3.3 SPI binary

ETSI TS 102 371 [i.19] describes the process to compress the SPI data for transmission over a DAB transmission channel to reduce the transmitted bit-rate and to profile the data for a range of different receiver capabilities.

7.4 Filecasting

ETSI TS 103 177 [i.20] specifies the Filecasting user application which permits the non-linear delivery of multimedia content using DAB. Whilst the main focus is the delivery of audio files over a broadcast network, it is also applicable to other media formats too, such as video files and documents which may contain a mixture of formatted text and graphics, for example in pdf format.

Filecasting can be used by broadcasters with existing DAB linear audio services to deliver additional content associated (but not necessarily directly linked) with these audio services. Equally it can be used to create standalone Filecast services. This content could be an entire programme (podcast), additional short-form content relating to a linear radio programme, or news, weather or traffic bulletins.

7.5 Text applications

7.5.1 DL Plus

ETSI TS 102 980 [i.21] describes an extension to the DAB Dynamic Label X-PAD application (see ETSI EN 300 401 [i.1]) to allow listeners to select the kind of textual information they are interested in. For that purpose DL messages are complemented by tags which identify specific content of the DL message by a content type. Users can select the content types of information to be presented; they do not need to read, or even be aware of, the complete stream of DL messages. DL Plus is a backwards compatible extension of the DL feature: the transmitted tags are not visible in the DL message so that listeners with receivers without a DL Plus decoder still view the DL messages as before. For the broadcaster, the additional data rate (for tag transmission) is significantly less than the data rate necessary for text.

7.5.2 Journaline

ETSI TS 102 979 [i.22] describes a text based information service for digital radio, optimized for simple data aggregation and re-use, which is highly efficient in broadcast transmission. It supports the widest range of receiver types, from low-cost solutions with a small text display up to high-end receivers with graphical user interfaces and optional text-to-speech playback. The radio user can access the information provided by the radio station which is comparable to teletext for TV.

7.6 DMB

ETSI TS 102 428 [i.23] specifies the user application for video services carried via DAB. It also includes profile definitions for the application. It defines the components of the video services; the content compression, the synchronization mechanism and multiplexing mechanism, allowing video services to be delivered to suitably equipped terminals.

ETSI TS 102 428 [i.23] also specifies the way that DMB may be used to deliver radio services, and although such services were envisaged and trialled, this usage has not continued due to the better technical performance of DAB+ audio. The use of DMB for radio services is strongly discouraged.

7.7 TPEG

ETSI TS 103 551 [i.24] specifies the standardised method to transport TPEG services over DAB.

8 Receiver specifications

8.1 Introduction

The DAB standards originally specified only the process to generate the signal on the air, but as the implementation has rolled out, it became clear that aspects of receiver behaviour needed to be specified. Almost all the DAB standards include provisions to specify the correct interpretation of the signalling provided in a received DAB ensemble without being prescriptive about how the implementation is made.

8.2 Minimum requirements

ETSI TS 103 461 [i.25] describes the minimum requirements for digital radios, both domestic and in-vehicle, and the necessary test methods that lead to compliance with the requirements. It may be used as the technical basis for a Digital Radio Certification Mark scheme. A Digital Radio Certification Mark is designed to be used on product packaging and provides an easily recognized mark to correspond to public information campaigns on the necessary requirements for consumers to make a switch to digital radio. Manufacturers are, of course, free to include additional features or increased performance compared to the minimum requirements specified.

9 Historical DAB specifications

9.1 Introduction

The DAB system has been developed extensively during its lifetime and many ideas were considered and standardised but later were superceded or otherwise found to be of limited value. For completeness, this clause 9 describes those documents since they are still publically available. However, implementations according to these specifications are largely historical and limited to trial and experimental broadcasts and equipment. The specifications in this clause 9 have been marked as "Historical" in the ETSI Work Programme.

9.2 Guidelines for Implementation and Operation

ETSI TR 101 496 [i.26] was developed by the Eureka Project 147 as the major companion document to ETSI EN 300 401 [i.1]. ETSI TR 101 496 [i.26] was developed in three parts, covering: Outline and Features; System Features; and Broadcast Network, giving considerable detail and explanations to help to implement DAB systems and develop conformant equipment.

ETSI TR 101 496 [i.26] is now of only historical interest, since it corresponds to ETSI EN 300 401(V1.3.3) [i.1] published in 2001, and so does not reflect the current status and should not be used to understand the present requirements of DAB equipment and services.

9.3 Rules of operation for MOT

ETSI TR 101 497 [i.27] provides guidance on the use of V1.1.1 and V1.2.1 of the MOT specification [i.8]. It is not relevant to V2.1.1 and later versions of the MOT specification [i.8].

9.4 Broadcast Web Site

ETSI TS 101 498 [i.28] describes the Broadcast Web Site application which gives the opportunity to use HTML as a content format to support information services. This concept allows a service provider to deliver an entire web site to a receiver using only the broadcast channel of DAB and without the need for any form of return channel. The idea was considered to be of interest when published, but the widespread availability of mobile IP connectivity, and the necessity for a back-channel for most web based services has rendered the BWS obsolete.

9.5 Service planning

ETSI TR 101 758 [i.29] describes the general principles for deriving the necessary field strength and compatible receiver sensitivity for satisfactory operation of a DAB system. It has not been maintained, since such planning guidance is more generally provided by regulatory authorities, often referencing the work of the European Broadcasting Union (EBU).

9.6 Java

ETSI TS 101 993 [i.30] specifies a DAB related API for Java. This API enables the download of Java programs via DAB and the control of their execution. Additionally, it provides an interface to the functionality of DAB. A DAB extension to the Java API has been designed to provide the software framework for designing, implementing and executing portable applications specifically targeted to the DAB system. The DAB Java Framework is divided in three basic modules or packages: a DAB specific extension of the Java API, a runtime support for the DAB applications execution environment, and a DAB I/O package for signalling the DAB Java extension over the DAB signal. The idea was considered to be of interest when published, but the widespread availability of mobile IP connectivity, and the necessity for a back-channel for most web based services has rendered DAB Java obsolete.

9.7 TMC

ETSI TS 102 368 [i.31], developed by the TMC Forum in collaboration with the WorldDAB Forum, describes the mapping required to deliver TMC data via DAB transmission. However, the development and deployment of TPEG, which includes the encapsulation of TMC services, has rendered this specification obsolete.

9.8 Voice applications

ETSI TS 102 632 [i.32] builds upon the BWS specification by providing the capabilities to allow a voice interface. This is especially useful to some mobility cases where the user is doing other things while using the system such as driving a car or crossing the street. The specification, like BWS, is now obsolete.

9.9 Middleware

ETSI TS 102 635 [i.33] establishes a standard for a platform-independent environment, where executable applications can be signalled and transferred to a receiver via a broadcasting network and executed on the receiver. It does not suppose the exclusive use of a specific broadcast network but defines the commonly-required specifications among diverse broadcast networks. It includes the definitions of basic data formats, protocols to deliver data, to signal downloadable applications and to download them, ways to denote resources on broadcast networks, and detailed interfaces among receiver platform, broadcast and communication networks, and the applications. This is specified in part 1 of [i.33].

In order to apply the present document to a target broadcast network, it is required to map abstract interfaces to concrete entities of the network and to add additional definitions specific to the network. This is specified in part 2 for DAB.

Similar to the reasons for the demise of DAB Java, the Middleware specification is now obsolete.

9.10 Intellitext

ETSI TS 102 652 [i.34] describes an extension to the DAB Dynamic Label X-PAD application (see ETSI EN 300 401 [i.1]) to enable hierarchical-menu-driven text services on a compatible receiver. The data is compiled into a simple Teletext-like database of information which the user of any DAB radio equipped with this application can browse on demand. Intellitext messages are a special form of DL messages, formatted in such a way that receivers not supporting Intellitext will continue to function normally. The Intellitext system provides a means for broadcasters to control the lifetime and basic formatting of broadcast information, while the display of information is user-driven.

Intellitext was used on-air for some years and implemented in some receivers. However, the specification is now unused and obsolete.

9.11 IPDC services

ETSI TS 102 978 [i.35] specifies the transport of IPDC services using the MSC stream mode of DAB (ETSI EN 300 401 [i.1]) including additional error protection (ETSI TS 102 427 [i.10]). IPDC services, e.g. audio and video services, are packetized and synchronized using RTP and appropriate RTP payload format specifications. For efficiency, some appropriate restrictions to MPEG-2 TS and an efficient transmission method for PSI/SI and SAT sections are specified. ETSI TS 102 978 [i.35] also specifies methods of macro and micro time slicing for power-efficient transmission of IPDC Services in DAB systems. The methods for sub-channel synchronization and data arrangement are specified. The development of IPDC services has generally required the use of a back-channel. This specification is now obsolete.

9.12 Mobile internet

9.12.1 IP tunnelling

ETSI ES 201 735 [i.36], developed by the Eureka Project 147, describes how to transport Internet Protocol (IP) datagrams in a Digital Audio Broadcasting (DAB) packet mode service component, a technique described as "IP tunnelling".

The use of IP tunnelling provides DAB with a mechanism for the adaptation of Internet services to DAB and is also a key component for DAB services using two-way interaction with personal DAB. The use of IP tunnelling enables the use of IP as a common network layer protocol, end-to-end, for DAB data services. IP tunnelling through DAB is unidirectional. The tunnel is created from the packet mode encoder on the transmitting side, to the packet mode decoder on the receiving side, of the DAB system.

The idea was considered to be of interest when published, but the widespread availability of mobile IP connectivity, and the necessity for a back-channel for most web based services has rendered IP tunnelling, and the associated protocols and interaction channel specifications obsolete.

9.12.2 Protocols

ETSI ES 201 736 [i.37], developed by the Eureka Project 147, describes the protocol stacks to be used for the different types of services that are defined, as local interactive, one-way interactive and two-way interactive service. The specification also defines a protocol PSSC (Personal DAB Service Session Control) which allows the set up of personal DAB service sessions and functionalities like handover between DAB cells, etc. It also defines the message format to be used and allows for further future extensions.

9.12.3 Interaction channel

ETSI ES 201 737 [i.38], developed by the Eureka Project 147, describes the Interaction Channels through Global System for Mobile communication (GSM), the Public Switched Telecommunications System (PSTN), Integrated Services Digital Network (ISDN), Digital Enhanced Cordless Telecommunications (DECT). It describes low level network management and basically references relevant telecommunication standards and describes how the implementation of low level interaction is handled.

9.13 RDS linkage

ETSI EN 301 700 [i.39] describes a standard method for signalling DAB service information to a receiver tuned to a FM-RDS service using the RDS Open Data Application (RDS-ODA) system, as specified in the RDS standard, IEC 62106 [i.40].

Since some DAB services are simulcasts of existing FM services, usually with RDS, it is possible for receivers able to receive both DAB and FM services to present the listener with the DAB service, but it can fall back to the FM service outside the DAB coverage area. DAB provides the signalling, through the service following information in the Fast Information Channel, to enable a receiver to find the equivalent service on FM. ETSI EN 301 700 [i.39] describes the characteristics of an RDS-ODA for providing frequency information for DAB ensembles. Additionally the ODA can signal various Service Information attributes of DAB services thus allowing a receiver to find an equivalent DAB service.

Despite the validity of this approach, RDS only receivers have no use of the data that could be signalled using ETSI EN 301 700 [i.39], and DAB/RDS receivers have access to all the information they require from the DAB tuner. Therefore this specification has not been implemented and it is now obsolete.

History

Document history		
V1.1.1	November 2000	Publication
V1.2.1	January 2005	Publication
V1.3.1	January 2006	Publication
V1.4.1	March 2012	Publication
V2.1.1	August 2017	Publication