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DRM-TMC (Traffic Message Channel)

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Contents

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Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**may not**", "**need**", "**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).

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Introduction

The need for traffic and traveller information is rising in our society. The Traffic Message Channel (TMC) is a specific application which delivers road driver information in an efficient way. TMC messages are intended for dedicated decoders, which perform a selection of the relevant messages and transform them to human-intelligible output, e.g. by display or a speech synthesiser. TMC messages can be filtered so that only those relevant to the current journey are displayed, while a TMC-enabled navigation system can offer dynamic route guidance - alerting the driver of a problem on the planned route and calculating an alternative route to avoid the incident.

TMC is already available in Digital Audio Broadcasting (DAB) [2] and in FM-RDS [4]. To increase the availability of TMC, the DRM system [1] provides a suitable broadcast system. The huge coverage areas of DRM enable the distribution of nationwide and trans-national traffic messages. Therefore the present document allows the use of several TMC services originating from different sources to cover huge traffic areas combined within one DRM data application service.

1 Scope

The present document gives information how to transport the Traffic Message Channel (TMC) in the Digital Radio Mondiale (DRM) system and provides the references to the associated specifications.

2 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 reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

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

2.1 Normative references

The following referenced documents are necessary for the application of the present document.

[1] ETSI ES 201 980: "Digital Radio Mondiale (DRM); System specification".

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

[3] ETSI TS 101 968: "Digital Radio Mondiale (DRM); Data applications directory".

[4] 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".

[5] ISO 14819-1: "Intelligent transport systems--Traffic and travel information messages via traffic message coding -- Part 1: Coding protocol for Radio Data System -- Traffic Message Channel (RDS-TMC) using ALERT-C".

[6] ISO 14819-6: "Traffic and Traveller Information (TTI) -- TTI Messages via traffic message coding -- Part 6: Encryption and conditional access for the Radio Data System -- Traffic Message Channel ALERT C coding".

[7] ISO 14819-3: "Intelligent transport systems--Traffic and travel information messages via traffic message coding -- Part 3: Location referencing for Radio Data System -- Traffic Message Channel (RDS-TMC) using ALERT-C".

2.2 Informative references

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.

Not applicable.

3 Definitions and abbreviations

3.1 Definitions

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

DRM-TMC system message: 16 bit field comprising a part of TMC system information

DRM-TMC user message: 37 bit field comprising either a TMC user message, TMC tuning information, an Encryption Administration Group (EAG) or future TMC applications conveyed in ODA groups requiring 37 bits mapping

Fast Access Channel (FAC): channel of the multiplex data stream which contains the information that is necessary to find services and begin to decode the multiplex

Main Service Channel (MSC): channel of the multiplex data stream which occupies the major part of the transmission frame and which carries all the digital audio services, together with possible supporting and additional data services

reserved for future addition (rfa): bits with this designation are set to zero

NOTE: Receivers need not decode these bits.

reserved for future use (rfu): bits with this designation are set to zero

NOTE: Receivers need to check that these bits in order to determine the valid status of the other fields in the same scope.

Service Description Channel (SDC): channel of the multiplex data stream which gives information to decode the services included in the multiplex

NOTE: The SDC also provides additional information to enable a receiver to find alternative sources of the same data.

TMC multi-group messages: sequences of between two and five TMC single group messages that constitute a detailed TMC message

TMC system information: information that enables a TMC product to decode and evaluate essential data, which describes the transmission, being received e.g. AID, LTN, SID, MGS

TMC system message: message comprising either TMC system information or TMC tuning information

TMC tuning information: information that a TMC product needs to change from one transmitter to another if the signal becomes weak

TMC user message: message comprising parameters of the actual traffic message such as the Location code and the Event code

3.2 Abbreviations

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

AID	Application Identification
ALERT-C	Advice and problem Location for European Road Traffic, Version C
BER	Bit Error RAte
CC	Country Code (TMC)
CRC	Cyclic Redundancy Check
DRM	Digital Radio Mondiale
EAG	Encryption Administration Group
ECC	Extended Country Code
FAC	Fast Access Channel
FM	Frequency Modulation
hdr	Header

ID	IDentifier
LTN	Location Table Number (TMC)
LTO	Local Time Offset
MGS	Message Geographical Scope (TMC)
MSb	Most significant bit
MSC	Main Service Channel
ODA	Open Data Application (RDS)
PAD	Program Associated Data
RDS	Radio Data System
rfa	reserved for future addition
rfu	reserved for future use
SDC	Service Description Channel
SID	Service IDentifier (TMC)
TMC	Traffic Message Channel
TMCHI	Traffic Message Channel Header Indicator
UA	User Application
UTC	Co-ordinated Universal Time

4 General

DRM has been designed to provide transport mechanisms for data applications which are complimentary to the audio service(s) carried or which stand alone. [3] gives the data application identifiers needed for DRM.

4.1 TMC description

Traffic messages are coded in Events, Locations and Extents. All over Europe the same protocols are used. A TMC decoder in the receiver should be able to perform a selection of the relevant messages. The output can be by display, speech synthesizer or forwarded to the navigation system for automatic traffic incidents avoidance.

TMC is split into:

- TMC user messages carrying traffic data, being made known to the driver or a navigation system.
- TMC system messages carrying meta data such as table numbers, being of use to the TMC decoder for management purpose.

5 TMC data transport

DRM enables the distribution of nationwide and trans-national traffic messages. The collection of several TMC services originating from different sources can be combined within one DRM data application service. Each TMC service can be transmitted in its own application format and with its own parameters (e.g. local time offset). The different TMC services shall use different unique TMC Short IDs.

DRM provides different mechanisms to transport data. For the transmission of the TMC data a DRM packet mode stream with DRM data units shall be used. This mode is advantageous for this application because it supports variable bit rates and provides error control and synchronisation mechanisms. A further advantage of this mechanism is the flexibility. If other applications using packet mode are in use the capacity of the service can be shared dynamically.

TMC multi-group messages, i.e. several corresponding DRM-TMC user messages shall be within one data unit. Up to 7 padding bits may be included at the end of the data unit to achieve byte alignment. The length of the data units shall be equal to or less than 128 bytes.

The DRM-TMC system messages and DRM-TMC user messages are packed into DRM data units, whereby the content of the data unit is defined as follows:

- TMCHI 1 bit
- rfu 1 bit

- TMC Short ID 4 bits

when **TMCHI** = 1:

- the DRM-TMC header shall be transmitted:
  - rfa 1 bit
  - TMC UA flag 1 bit
- When TMC UA flag is = 1 an additional field is sent:
  - TMC UA data 16 bits
- number of TMC Services 4 bits
- Country ID 4 bits
- ECC (Extended Country Code) 8 bits
- TMC LTO 6 bits
- number of DRM-TMC system messages, *m* (*m* > 0) 2 bits
- *m* DRM-TMC system messages *m* × 16 bits
- and additional TMC user messages could be transmitted:
  - *n* DRM-TMC user messages *n* × 37 bits
  - Paddingbits variable length
  - CRC 16 bits

when **TMCHI** = 0:

- *n* DRM-TMC user messages (*n* > 0) *n* × 37 bits
- Paddingbits variable length
- CRC 16 bit

The following definitions apply:

TMCHI: this TMC header indicator bit shall indicate the presence of the TMC header which consists of the following first fields.

rfu: this bit is reserved for future use of the remainder of the parameter field and shall be set to zero for the currently specified definition of this field.

TMC Short ID: this field contains the short ID for the TMC service concerned. It is unique for a combination of Country ID, ECC, SID and LTN for the current radio programme.

rfa: this bit is reserved for future additions and shall be set to zero until they are defined.

TMC UA flag (User Application flag)**:** this bit indicates if the User Application data field is present (flag=1), otherwise the TMC AID is CD46hex (ALERT-C).

TMC UA data (User Application data)**:** This 16-bit field, when present, shall contain the TMC Application Identifier as defined in [5].

NOTE: When the TMC UA data is absent the AID = CD46hex is valid.

number of TMC Services: this field coded as a 4 bit unsigned binary number indicates the number of TMC short IDs in the range 0 to 15.

Country Id: this field is defined as Country Code (CC) in [7].

ECC (Extended Country Code): this field shall be used in combination with the Country Id field to identify a geographical area over which the TMC is valid. The ECC coding shall be as defined in IEC 62106 [4].

TMC LTO: these 6 bits define the local time offset for the present TMC service according to clause 8.1. The TMC LTO for the service is expressed in multiples of half hours in the range -15,5 hours to +15,5 hours. The MSb coded as "0" shall give a positive offset (East of zero degree longitude), the MSb coded as "1" shall give a negative offset (West of zero degrees longitude). TMC LTO shall be transmitted for the target area for which the TMC service is valid.

number TMC of system messages: this field, coded as a 2 bit unsigned binary number, specifies the number of system messages in the range 0 to 3.

DRM-TMC system message: 16 bit field comprising a part of TMC system information as defined in ISO 14819-1 [5].

DRM-TMC user message: 37 bit field comprising either a TMC User message, TMC tuning information, an Encryption Administration Group (EAG) or future TMC applications conveyed in RDS-ODA groups requiring 37 bits mapping. The TMC information shall be used according to ISO 14819-1 [5] and ISO 14819-6 [6]. Multi-group messages shall be contained in a single data unit. Restrictions for *n* can be derived from the data unit length.

Paddingbits: this field of variable length shall contain 0 to 7 bits to make up the length to an integral number of bytes for the packet. The padding bits shall be set to "0".

CRC: this 16-bit CRC shall be calculated on all bits in the data unit before the CRC value, including Paddingbits if present. It shall use the generator polynomial $G(x) = x^{16} + x^{12} + x^5 + 1$. Details are defined in [1].

6 Mapping of TMC messages

Figures 1 and 2 show how the TMC information is mapped to the DRM data unit which is transported using one or several DRM packets.

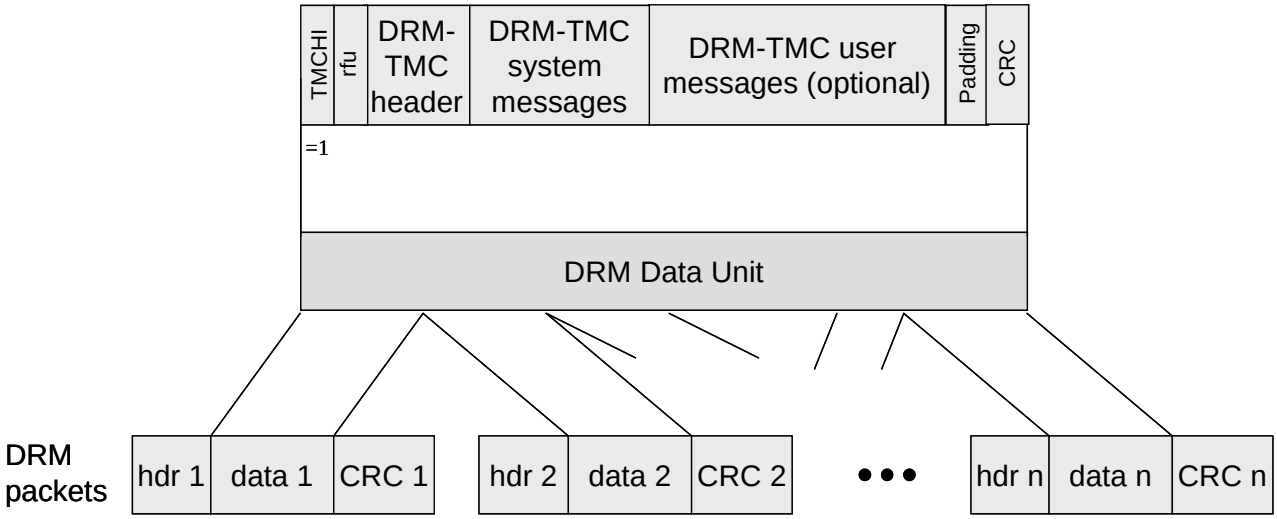

Figure 1: Mapping of TMC information to the DRM data unit when TMCHI = 1

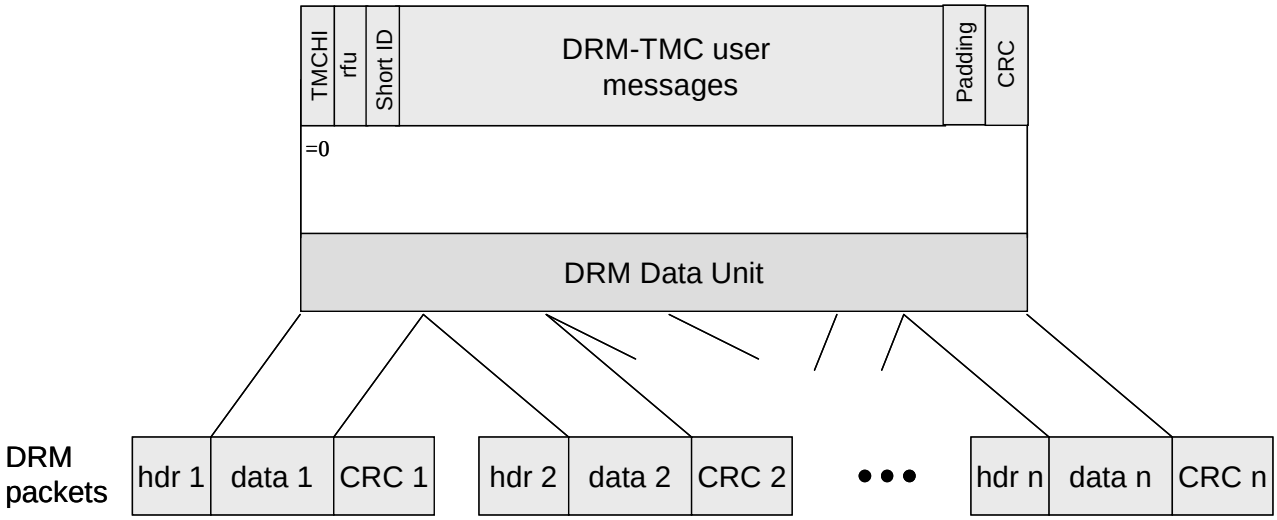

Figure 2: Mapping of TMC information to the DRM data unit when TMCHI = 0

7 Signalling and transport in DRM

The TMC application can be signalled as a stand alone data service and/or as the data part of an audio service (PAD, Program Associated Data).

7.1 Signalling in the FAC

If broadcast as stand-alone DRM data service, the TMC application shall be signalled in the FAC with the use of the application identifier defined for TMC. The application identifier is provided in [3]. The application identifier provided in the FAC can be evaluated by a receiver to quickly scan for available TMC services.

7.2 Signalling in the SDC

The TMC application shall be signalled using SDC data entity type 5 ("Application information"). The Packet mode indicator and Data unit indicator shall be set according to [3] to indicate the use of packet mode and the use of DRM data units. The Application domain field shall indicate a DRM application. The user application identifier shall be set according to [3]. The application data field has zero length for athe present document.

7.2.1 Service following

To allow TMC service following the Frequency SDC data entity type 3 and/or data entity type 11 should be provided.

To support the TMC service the Region definition SDC data entity type 7 and/or 13 [1] should be provided.

To support the TMC service the Schedule definition SDC data entity type 4 [1] should be provided.

7.3 DRM data unit considerations

A DRM data unit carrying TMC information shall have a minimum length of 8 bytes and a maximum length of 128 bytes. The minimum length can be derived from clause 5 when adding all fields. The maximum length should help the receiver in planning memory considerations.

The number of DRM-TMC user messages per DRM data unit can be chosen by the DRM-TMC Encoder. TMC multi-group message shall be within one DRM data unit. The repetition rate for user and system messages should be chosen according to [5].

7.4 DRM packet mode considerations

To prevent the waste of capacity in DRM packet mode, the DRM-TMC encoder should synchronize with the DRM Multiplex encoder and then create DRM data units with a length that is a multitude of the current DRM packet mode data length.

8 DRM-TMC encoder requirements

8.1 Date and time

Since DRM transmissions could provide huge coverage areas several time zones may be within the coverage areas. To understand the mechanism one has to distinguish between three different time zones: UTC, the time zone of the receiver location (local time) and the time zone of the target area of the TMC service. For the presentation of traffic information to the driver local time shall be used.

Date and time has to be known at the receiver. SDC data entity type 8 shall therefore be provided. The LTO field of the SDC data entity type 8 may be provided but is not required.

Since DRM-TMC can carry multiple TMC services within one DRM service component, each TMC service can signal its individual TMC LTO (as part of the TMC header). This allows for an easy re-broadcast of pre-encoded TMC information from various target areas.

In smaller coverage areas the local time and the target area time agree. The receiver can calculate from UTC and TMC LTO the local time of TMC information to present it to the driver.

In huge coverage areas the local time and the target area time can differ. The receiver has to determine the difference in time between local time and UTC or the target area time. This calculation can be done with the help of a navigation system including maps with time zones. Other calculation possibilities may use a car internal clock with local time, or other ways to derive a valid local time offset.

8.2 Country

To address the relevant TMC tables the relevant country for each TMC service has to be known, i.e. according to the target country for which the TMC application is intended for. Therefore Country ID and ECC shall be set within the TMC header.

8.3 TMC Application ID (AID)

The TMC Application ID (AID) shall be transmitted to allow the use of different TMC protocols.

The following protocols are in use:

- 0xCD46: Alert-C protocol.
- 0x0D45: Test mode for Alert-C.

Other possible Application IDs shall be used according to [5].

9 Other operational requirements

The following operational requirements have to be considered:

- The repetition time for system messages should be less than 3 minutes.
- Besides the CRC evaluation of the DRM packets the receiver should consider the BER after viterbi decoding to guarantee error free TMC decoding. CRC calculations can not guarantee error detection if the BER is higher than a limit.

- If TMC information for several countries is transmitted it shall be guaranteed that for each TMC service a different TMC Short ID is used.
- For encrypted TMC services the encryption is carried out at the TMC not DRM layer.
- The direct repetition of DRM-TMC messages (used in RDS for error detection) is not needed in DRM. For efficient use of bandwidth and to shorten the cycle time it is recommended to transmit DRM-TMC messages in DRM without repetition.

Annex A (informative): Bibliography

- EN ISO 14819-2: "Traffic and Traveller Information (TTI) - TTI Messages via traffic message coding - Part 2: Event and information codes for Radio Data System - Traffic Message Channel (RDS-TMC)".

History

Document history		
V1.1.1	April 2009	Publication
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