

# Explanatory of mapping between DENM and other message formats

CAR 2 CAR Communication Consortium



## About the C2C-CC

Enhancing road safety and traffic efficiency by means of Cooperative Intelligent Transport Systems and Services (C-ITS) is the dedicated goal of the CAR 2 CAR Communication Consortium. The industrial driven, non-commercial association was founded in 2002 by vehicle manufacturers affiliated with the idea of cooperative road traffic based on Vehicle-to-Vehicle Communications (V2V) and supported by Vehicle-to-Infrastructure Communications (V2I). The Consortium members represent worldwide major vehicle manufactures, equipment suppliers and research organisations.

Over the years, the CAR 2 CAR Communication Consortium has evolved to be one of the key players in preparing the initial deployment of C-ITS in Europe and the subsequent innovation phases. CAR 2 CAR members focus on wireless V2V communication applications based on ITS-G5 and concentrate all efforts on creating standards to ensure the interoperability of cooperative systems, spanning all vehicle classes across borders and brands. As a key contributor, the CAR 2 CAR Communication Consortium and its members work in close cooperation with the European and international standardisation organisations.

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## Document information

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**Table 1: Document information**

## Changes since last release

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2024-12-13	No changes	Release Management	Steering Committee
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**Table 2: Changes since last release**

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## Abbreviations

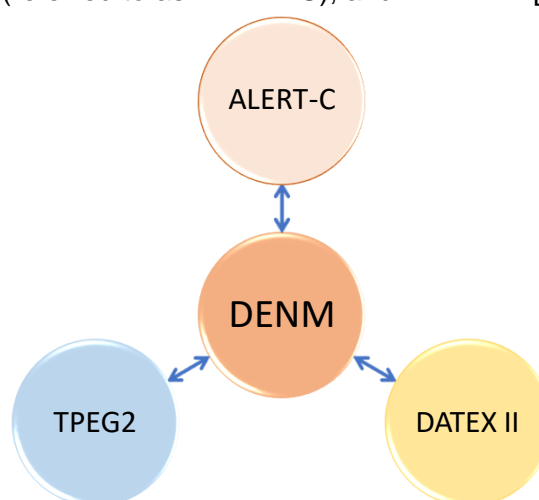
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DENM	Decentralized Environmental Notification Message
I2V	Infrastructure to Vehicle
TEC	Traffic Event Compact
TPEG	Transport Protocol Experts Group
TMC	Traffic Message Channel
TMF	Traffic Management Format
RDS	Radio Data System
V2I	Vehicle to Infrastructure
XML	Extended Meta Language

## 1 Introduction

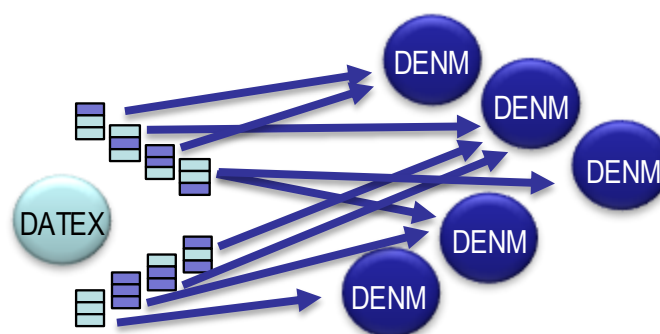
The present document includes guidance information to the DENM data format mapping tables. These tables contain a data format translation between DENMs [TS 102 894-2 V2.2.1] and the data formats used in traffic managements systems (referred to as TMF, Traffic Management Format). Since the purpose of the TMF differs from the purpose of DENMs, a one to one mapping between these data formats is usually not possible and for some codes there are even no translations possible.

Figure 1 shows the TMFs that are mapped in the present document to DENMs and vice versa. These TMFs are TPEG2-TEC [ISO 21219-15] (referred to as TPEG2), RDS-TMC using ALERT-C [ISO 14819-2] (referred to as ALERT-C), and DATEX II [EN 16157-3].



**Figure 1: Data format mapping.**

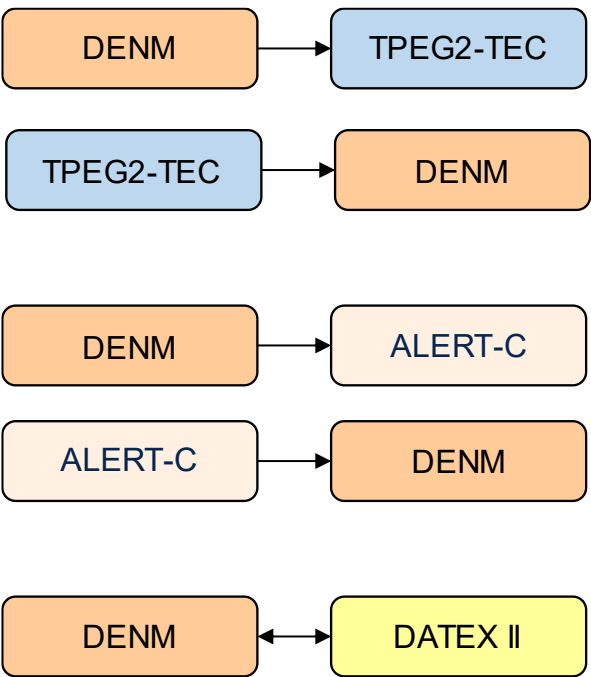
Still, most of the event codes can be mapped from DENMs to TMF and vice versa. To cope with the '1 to n' mapping issue, the translation tables contain always only one translation direction. Hence, except for DATEX II for each translation pair consisting of DENM and TMF two tables are provided. DATEX II is based on XML, and supports optional supplementary information for the event categories. This results in a complex mapping structure, since even for one event category the combinations of all options lead to a high number of mappings as illustrated in the example shown in Figure 2. Therefore, only a one to one mapping is provided for DATEX II.



**Figure 2: Figurative mapping of an event category with three optional supplementary elements.**

Unlike the outcome of the work of the SRTI group [ITSTF 20001], the tables are not designed to translate different TMFs between them, even if they could be used as foundation for such a

task. Figure 3 shows the translation tables and the translation direction provided by the present document (see also clause 2).



**Figure 3: Translation tables (for DATEX II only a one to one table is provided).**

The translation from DENM to TMF can be used to apply vehicle generated (V2I) DENMs as a data source in connected traffic management systems, in addition to traditional sources such as cameras and sensors. Since this is a receive-side application on infrastructure side, this application is not further specified elsewhere. The translation table provides guidance on how to convert the data from those DENMs in suitable data that can be used for traffic management purposes and can be applied by road operators deploying connected traffic management systems.

Empty rows in the translation table indicate that no reasonable mapping is possible. This can be because there are vehicle specific DENMs that cannot be mapped on traffic management relevant information like ‘collision risk’. Or that there is no event specific code available in a traffic management system, like a sharp bend of the street that is not seen as an event from the traffic management perspective since it is always there.

The translation table from TMF to DENM can be seen as a foundational specification that allows connected traffic management systems to generate infrastructure (I2V) DENMs for consumption by vehicle and personal ITS-stations. These DENMs are generated by infrastructure functions that are specified as services and use cases, including message profiles that specify the content of the DENM such as the applicable cause code and sub cause code. Many of these infrastructure use cases and message profiles have already been specified by C-ROADS [C-ITS Message Profile]. The translation table provided here is fully aligned with those use cases and message profiles and in case of discrepancy, the specification by C-ROADS takes precedence. This table can in particular provide guidance when new infrastructure use cases and message profiles need to be created by road operators and/or C-ROADS. The table also provides a valuable harmonization of the interface between traffic management systems and C-ITS systems: traffic events that are shared by road operators’ traffic management systems to content providers and subsequently to road users can also be broadcast consistently by road operators’ infrastructure to vehicles over C-ITS. The actual translation used by road operators may in practice differ if there is a need to support legacy vehicle implementations (see ‘legacy notes’ in C-ROADS [C-ITS Message Profile]).

## 2 Annexes

The translation tables depicted in Figure 3 are given in following annexes:

1. DENM\_to\_TPEG2-TEC.pdf
2. TPEG2-TEC\_to\_DENM.pdf
3. DENM\_to\_ALERT-C.pdf
4. ALERT-C\_to\_DENM.pdf
5. Bidirectional\_DATEX\_II\_Mapping.pdf