D. 5.2 TN-ITS Specifications (Maintenance)

June 30th 2021





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Abstract

This document reports upon the establishment of the TN-ITS official Technical Specification TS 17268:2018 and the change request procedure set-up for its maintenance. It presents



the interaction between the CEN TC278 W7 and the TN-ITS Working Group 2 (WG2) on Standards and Specifications led by the Norwegian Road Administration (NPRA). Since August 2020, the coordination of WG2 was in hands of ERTICO with support of the NPRA. These TN-ITS WG2 activity and results, are fully integrated in the TN-ITS GO activity 5 (Active TN-ITS expert community) for the total duration project period time.

| Proje | ect co-funded by the European Commission within Horizon 2020 | |
|-------|---|---|
| Diss | emination level | |
| PU | Public | X |
| PP | Restricted to other programme participants (including the GSA) | |
| RE | Restricted to a group specified by the consortium (including the GSA) | |
| CO | Confidential, only for members of the consortium (including the GSA) | |

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Terms & Acronyms

| CEN TS | Comité Européen de Normalisation: the European Committee for Standardization - Technical Specification |
|----------------|--|
| Code list | Code lists are predefined lists from which concepts take their |
| | values. These allow maintenance outside the official Technical |
| | Specifications |
| | An El Lipitiotivo to optiblich an infractructure for opatiol |
| INSFIRE | All EO Initiative to establish an initiastructure for spatial |
| | information in Europe that is geared to help to make spatial of |
| | geographical information more accessible and interoperable |
| | for a wide range of purposes supporting sustainable |
| | development. |
| JRC/EULF | Joint Research Center / European Union Location Framework |
| | (EULF), an EU-wide, cross-sector interoperability framework |
| | for the exchange and sharing of location data and services. |
| MDA | Model-driven architecture (MDA) is type of approach to |
| | software design, development and implementation based on |
| | models as a set of quidelines used in structuring design |
| | specifications |
| 0)4/4 | Open World Accumption |
| | Open wond Assumption. |
| (UNIL) Package | A package is a UNL construct that enables you to organize |
| | model elements, such as use cases or classes, into groups. |
| | Packages are depicted as file folders and can be applied on |
| | any UML diagram. |
| RDF | The Resource Description Framework (RDF) is a family of |
| | World Wide Web Consortium specifications originally designed |
| | as a metadata data model. See SPARQL. |
| ROSATTE | ROad Safety ATTributes exchange infrastructure in Europe. |
| | 7th Framework Programme – Specific Programme |
| | Cooperation Theme 3 "Information and Communication |
| | Technologies. |
| RTTI | Real-Time Traffic Information (Services) |
| SOAP | Simple Object Access Protocol An XML-based messaging |
| OOAI | protocol for exchanging information among computers |
| | is an application of the XML specification |
| | |
| SPARQL | An RDF query language is a computer language, specifically a |
| | query language for databases, able to retrieve and manipulate |
| | data stored in Resource Description Framework (RDF) format. |
| | SPARQL has emerged as the standard RDF query language, |
| | and in 2008 became a W3C recommendation. |
| TEN-T | The Trans-European Transport Network (TEN-T) is a |
| | European Commission policy directed towards the |
| | implementation and development of a Europe-wide network of |
| | roads, railway lines, inland waterways, maritime shipping |
| | routes, ports, airports and rail-road terminals. |
| TN-ITS | The name stands for "Transport Network – Intelligent |
| | Transportation Systems" and reflects both the ERTICO |
| | innovation platform and name of the CEN Tochnical |
| | Specification 172769-2019 |
| то | |
| 15 | I ecnnical Specification |



| GML, XML, XSD, XADL, WADL, UMLGeography Markup Language (GML) is the XML grammar defined by the Open Geospatial Consortium to express geographical features and serves as a modelling language for geographic systems as well as an open interchange format for geographic transactions on the Internet. eXtensible Markup Language - plays an important role in many different IT systems and is used for distributing data over the Internet. XSD or XML Schema Definition specifies how to formally describe the elements in an XML document. Architecture description language (ADL) for software and systems, xADL is defined as a set of XML schemas. Web Application Description Language is a machine-readable XML description of HTTP-based web services. Unified Modeling Language (UML) is a modeling language which helps to simility the process of software description | | |
|--|-----------------------------------|--|
| | GML, XML, XSD, XADL, WADL, UML | Geography Markup Language (GML) is the XML grammar defined by the Open Geospatial Consortium to express geographical features and serves as a modelling language for geographic systems as well as an open interchange format for geographic transactions on the Internet. eXtensible Markup Language - plays an important role in many different IT systems and is used for distributing data over the Internet. XSD or XML Schema Definition specifies how to formally describe the elements in an XML document. Architecture description language (ADL) for software and systems, xADL is defined as a set of XML schemas. Web Application Description Language is a machine-readable XML description of HTTP-based web services. Unified Modeling Language (UML) is a modeling language which helps to simplify the process of software design |



Preface

TN-ITS GO is a Programme Support Action (PSA) for the implementation and facilitation of seamless spatial data exchange which are essential for the deployment of ITS applications. The duration of the action is spread over 48 months in order to give time to six new Member States to carefully plan and implement their ITS spatial data supply chain strategy, establishing a road database and make it available to end-user via a TN-ITS interface.

The Action will capitalise on the pre-existing knowledge and expertise of the TN-ITS initiative which has already resulted in operational services in Sweden, Norway, Finland and Flanders. Other piloting efforts are ongoing in France, UK, and Ireland but not operationalised yet. Part of this Action invests in these past efforts in order to further consolidate the operational services covering increasing parts of the TEN-T with the most relevant ITS attributes and increased quality. Also, the most advanced services will now work on the feedback loop from map makers to road operators which has not been tested so far.

The action is focussing on realising operational exchange of operational data on the TEN-T network and its interface to other road networks but the exchange mechanisms put in place by the Member States should be scalable and extensible to the whole network.

The work of TN-ITS GO supports the Commission Delegated Regulation (EU) 2015/962 on RTTI, in particular the part of the Regulation that is concerned with static road data, i.e. data (and changes thereof) that will generally be included in digital maps for ITS, for which TN-ITS closely cooperates with DG MOVE of the European Commission.



1. Introduction

The activity 5 of the TN-ITS GO project also addresses the technical specification (TS) of the TN-ITS data & data sharing interface between road authorities as Data Providers and Map Providers. It describes how the current specifications were developed over time as well as the governance for its maintenance.

This deliverable, released by the end of June 2021 (M42), is the third release of Deliverable D5.2 Technical Specifications (Maintenance). For this edition it was opted not to fully reiterate what was described in the two previous releases but instead focus on the situation as-is and as well as on the (near) future situation related to the maintenance of the TS. Hence, the background on how the TN-ITS specifications came into place is skipped here. The interested reader is referred to D5.2 edition M24 to catch up on the origins in project ROSATTE [1], different pilots as the JRC/EULF Transportation Pilot [2] and the CEF EIP A4.7 project [3]. All these initiatives have played a key role in maturing the TN-ITS specifications. Nevertheless, we start with a first chapter which provides the origin of the TN-ITS technical specifications by briefly setting the scene showing the flow of geospatial information and presenting the ISO/TC 211 Model-Driven Architecture (MDA) and the Open World Assumption (OWA).

In 2018, a project team of international experts in Data and ITS have advanced the then latest ROSATTE specifications into a CEN TS (called CEN TS 17268:2018). As this TS reflects the actual TN-ITS base line, it was decided to keep the chapter on this subject in this version of D5.2, see figure 1.

Next, this deliverable presents the 2020 & 2021 work plan of the Work group 2 (WG 2) and its achievements. The WG 2 of the TN-ITS platform continues its role to maintain the CEN TS 17268:2018 governing the procedure for the TS change request, by its involvement in collecting and reviewing change requests from TN-ITS stakeholders, by being an active member of the CEN TC278 W7 and other relevant standardisation bodies, by governing the specification files as XML, XSD, WADL as well as the code list, and by providing documentation material as introduction texts, webinars, tutorials, in support of TN-ITS Work group 3. TN-ITS WG2 also deploys the related UML model representing the reference specification implementation.

Also, the liaison status with relevant standardisation bodies or organisations are given along with the point of contact.

This report concludes with presenting relevant upcoming standardisation activities for TN-ITS in the field of Linked Data and the anticipated European National Access Point programme.





Figure 1 TN-ITS standardisation early milestones

2. The context of the TN-ITS specifications

This chapter highlights the context of the TN-ITS TS. It first introduces a general view on the flow of geospatial information for ITS, pinpointing where TN-ITS fits (see figure 2), followed by an introduction to the technical context, introducing Model Driven Architecture and the Open World Assumption.

2.1 The flow of Geospatial Information for ITS

With TN-ITS, the focus is on authoritative information needed for legal and safe navigation as speed limits and driving warnings and restrictions. This "static" information is maintained by authorities at different administrative levels and mostly in systems from the application domain of Geographic Information Systems (GIS). The TN-ITS specification pinpoints the mechanisms for providing authoritative information from authorities to map & service providers in order to ensure information is available to road users, being humans or vehicle systems.

The TN-ITS specification is based on a generic and flexible model and prepared for implementation in different technologies. It combines concepts that are defined in standards both from the GIS world and the ITS world. It is modelled in UML according to the ISO TC211 rules from the GIS domain implemented in the GIS exchange format GML. The specifications describe location referencing based on standards from both the GIS and ITS world. Also, it incorporates models from DATEX II and ISO 14823 (traffic signs).





Figure 2 Parts of the flow of geospatial information in ITS, from Jetlund et al. 2019 [4]

2.2 TN-ITS technology context

A first important foundation for information modelling in GIS is Model Drivel Architecture (MDA), as illustrated in the figure below. In an ISO TC 211 MDA one develops models at different level of abstraction: from the meta models to the conceptual schemas and the implementation schemas. The conceptual schemas are independent of any implementation technology and can therefore be implemented in different technologies through conversion rules. The TN-ITS specification is developed as a conceptual schema and is technology independent. The model is based on the core abstract concepts from GIS standards e.g. for geometry and time. From the UML model were derived implementation schemas for GML through the conversion rules. This is essential for a MDA and especially other technologies can also be implemented. For example, the Web Ontology Language (OWL) implementation could be a relevant extension in the future, see next steps.

A second foundation for a specification is that in TN-ITS we acknowledge the need for an open classification of an evolving real world, which also relates to the semantic web and the linked data approach. The classification we use to describe the real world needs to be flexible as we do not know everything about a real world at any time. The information model presents only what is currently known in the given context. We need to follow an Open World Assumption (OWA) where we can have more classifications as we learn more and as the real world evolves.





Figure 3 The technological footprint of the TN-ITS specification [4].

3. The CEN TC278 W7 Project Team

In 2016, following the acceptance by the European Commission of a proposal from CEN, as prepared by the CEN/TC 278 Secretariat, funding was made available to establish a team of experts, to develop a CEN Technical Specification (TS) for the TN-ITS (Transport Network ITS Spatial Data) framework, for exchange of (updates of) ITS spatial road data, in the first place road network attributes, but in addition also road network geometry. Recruiting these experts was delegated by the CEN Secretary General to the secretariat of CEN/TC 278, held by Dutch National Standard Body NEN. By 2017, the team of experts was established.

3.1 Governance

CEN/TC 278 established a Project Team (PT) for producing the TN-ITS Technical Specifications. The work of the PT was monitored for its content by CEN/TC 278/WG 7 "Geographic Data Files". One of the PT experts will be given the role of the PT leader. Beyond the formal reporting tasks, the PT leader was responsible for moderating the work in the PT in order to achieve reasonable consensus inside the PT. The PT leader acted as interface to the parent body CEN/TC 278/WG 7. The work was carried out in close co-operation with the parent body of the PT, CEN/TC 278/WG 7, which acted as a steering committee for the PT. The convenor of CEN/TC 278/WG 7, assisted by the PT leader, reported to CEN/TC 278. Communications and liaisons with related SDOs were directly managed by the PT leader.



3.2 Actions & Tasks

The work plan had the following tasks, mostly carried out in 2017, and had an expert assigned to each individual task:

- Project management
- Transformation of ROSATTE specification to CEN TS
- Alignment with INSPIRE
- Review of information model
- Review of location referencing
- Review of physical exchange format
- Review of service specification
- Produce draft Technical Specification
- Comments resolution
- Interact with CEN/TC 278/WG 7
- Liaison with stakeholders and other relevant standards bodies
- Dissemination activities

3.3 Result

After a final quality checking process by CEN/TC 278 WG 7, the final version of the deliverables provided by the PT was forwarded to CEN/TC 278 for the respective approval and publication steps. As part of the dissemination activities, the PT presented its results to interested parties on the public website of CEN/TC 278, at <u>www.itsstandards.eu</u>. The Date of Availability was 2018-12-05, see figure 4. From December 2018, the TN-ITS Technical Specification TS 17268:2018 is available on the sites of the National Standard Bodies, see Chapter 3.4.



| 500 | | | <u>Contact us</u> |
|---|--|--|---|
| European Comm | ittee for Standardization | | |
| CEN COMMUNITY TECHNICA | L BODIES STANDARDS EVOLUTION AND FORECAST SEARCH S | TANDARDS | |
| Technical Bodies > CEN/TC 27 | <u>8</u> > CEN/TS 17268:2018 | | |
| CEN/TC 278 - Inte | elligent transport systems | | |
| General Structure Work prog | ramme Published Standards | | |
| | | | EN FR DE |
| Project | | Implementation Dates | |
| Reference | CEN/TS 17268:2018 | date of Ratification (DOR) (1) | 2018-07-29 |
| Title | Intelligent transport systems - ITS spatial data - Data exchange on changes in road attributes | date of Availability (DAV) (2) | 2018-12-05 |
| Work Item Number | 00278479 | date of Announcement (DOA) (3) | 2019-03-31 |
| | This document defines the content specification for the exchange of road-related spatial data, and especially updates | date of Publication (DOP) (4) | |
| thereof. Based on the content specification, this document defines also a physical exchange format (structure and encoding) for the actual data exchange. In addition, it defines web services that are needed to make the coded data on updates available. Exchange of dynamic information is not in the scope of this document. Although the focus of this document is on providing information on updates, the | | date of Withdrawal (DOW) (5) | |
| | | Relations | |
| Abstract/Scope | technology described in this document in principle also enables the exchange of full datasets, either concerning the whole road network in a coverage area, including all | Supersedes | |
| | geometry and all attributes, or a subset, concerning for instance all instances of one or more specific attributes. NOTE This specification does not support the provision of updates concerning geometry. The provision of geometry associated with attribution change is supported, in the context of providing the location of attribute change. | Date of ratification (dor) date Board notes the approval of an EI CENELEC), from which time the si be approved | when the Technical V (and HD for tandard may be said to |
| Status | Approved | (2) Date of availability (dav) date | when the definitive |
| Reference Document | | CEN/CENELEC publication is distri Secretariat | buted by the Central |
| date of Availability (DAV) | 2018-12-05 | | |

Figure 4 CEN website showing the progress of the TS 17268:2018



| SPÉ TEO ICS 31 | ÉCIFICATION TECHNIQUE CHNISCHE SPEZIFIKATION 5.240.60 Engli Intelligent transport syst | December 2018 |
|---------------------------|--|--|
| TEO ICS 3: Systè | 5.240.60 Engli Intelligent transport syst | December 2018 |
| ICS 3: Systè ST | 5.240.60 Engli Intelligent transport syst | |
| Systè ST | _{Engli} Intelligent transport syst | 1.17 |
| Systè S7 | Intelligent transport syst | sn version |
| Systè ST | | tems - ITS spatial data - Data |
| Systè S1 | exchange on chan | ges in road attributes |
| | mes de transport intelligents - Données spatiales TI - Échange de données sur les modifications d'attributs routiers | Intelligente Verkehrssysteme - Räumliche ITS-Daten Datenaustausch zu Änderungen von Straßenattribute |
| This T | Fechnical Specification (CEN/TS) was approved by CEN | on 29 July 2018 for provisional application. |
| The pe submi | eriod of validity of this CEN/TS is limited initially to thre it their comments, particularly on the question whether | ee years. After two years the members of CEN will be requested to the CEN/TS can be converted into a European Standard. |
| CEN n availa parall | nembers are required to announce the existence of this (ble promptly at national level in an appropriate form. It lel to the CEN/TS) until the final decision about the poss | CEN/TS in the same way as for an EN and to make the CEN/TS is permissible to keep conflicting national standards in force (in ible conversion of the CEN/TS into an EN is reached. |
| Linka Luxen Turke | nd, Former Yugoslav Republic of Macedona, France, Ger nbourg, Malta, Netherlands, Norway, Poland, Portugal, R y and United Kingdom. EUROPEAN COMMITTE COMITÉ EUROPÉSI EUROPÉSISCHES KO CEN-CENELEC Management Centre | many, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lituania, tomania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland. |
| © 201 | 18 CEN All rights of exploitation in any form and by any m | neans reserved Ref. No. CEN/TS 17268:2018 |

Figure 5 Cover page of CEN TS 17268:2018



4. The CEN Technical Specification (TS) 17268:2018

A CEN Technical Specification (TS) is a normative document established by a CEN Technical Body and approved through a weighted vote by the CEN national members. The TS shall be announced at national level. It may be adopted as a national standard, but conflicting national standards may continue to exist. A Technical Specification may however not conflict with a European Standard. If a conflicting EN is subsequently published, the TS is withdrawn. No time limit is specified for the lifetime of TSs, but the responsible Technical Body shall ensure that they are reviewed at intervals of not more than 3 years, starting from their date of publication by CEN-CENELEC Management Centre.

The TC278 W7 produced the first version of the Technical Specification TS 17268 which was approved by CEN on 29 July 2018 for provisional application. It was made available in December 2018. As CEN does not sell standards, the distribution of these standards/technical specifications is done via the European National Standard Bodies, affiliates, and partner standardization bodies. The overview of where the TS can be obtained is available on the TN-ITS standardization web site: https://tn-its.eu/standardisation.

The CEN TS17267:2018 document is typically provided via a National Standard Body and is available under a license on a personal title. The document (pdf) may only be used on a standalone PC. The use on a network is only allowed if an additional license agreement with the National Standard Body has been concluded.

4.1 Scope of the Technical Specification

The CEN TS17268:2018 document defines the content specifications for the exchange of road-related spatial data, especially the updates thereof. Based on the content specification, the document defines a physical exchange format for the actual data exchange. It defines web services that are needed to make the coded data upon updates available. The document does not address the exchange of dynamic information. The focus of the document is on providing information of updates, though the technology described also enables the exchange of full data sets, either concerning the whole road network in a coverage area, or a subset, concerning all instances of one or more specific road attributes. The provision of changes in road geometry is not supported, though the provision of geometry associated with road attribution changes is supported in the context of providing the (linear) location of the attribute change.

4.2 Main Chapters

The main chapters of the CEN TS 17268:2018 describe:

- The Data Content Specification
- The Physical Exchange Format
- The Service Specification



The annexes provide:

- Explanations of structure
- Enumerations
- Code lists
- XSD schemas
- GML file examples
- Alignment with EC Delegated Regulations & INSPIRE

4.3 TN-ITS: Changes over ROSATTE

The list below gives a short overview of the updates that were performed on the ROSATTE specifications that resulted in the new Technical Specification TS 17268:

- Changes to the name of some classes:
- GenericSafetyFeature to RoadFeature
- SafetyFeaturePropertyValue to GenericRoadFeatureProperty and RoadSignProperty
- One (no particular) location reference mandatory
- New model for linear referencing
- Additional methods for location referencing
- All code lists external
- Value can be given as references, not only as pure values
- New model for signs, harmonized with ISO 14823 Graphic Dictionary
- New models for validity and vehicle conditions, based on models from DATEX II

4.4 TN-ITS CEN TS 172678 Availability

CEN is maintaining a web page listing sales points of the TN-ITS CEN TS 17268:2018: see <u>standards.cen.eu</u>. Over 20 countries are mentioned in the catalogue of published standards for TS 17268:2018. These sales points are also referred to on the TN-ITS webpage on standardization (see: <u>https://tn-its.eu/standardisation</u>).

Remark: the CEN Project Manager indicated in June 2021 that this overview will be discontinued. The TN-ITS platform will publish the new URL link on its standardization section, as mentioned above, as the new overview becomes available to ensure access to and visibility of the TS.



| Country | National Organization | National Document Reference |
|-----------------------------|--------------------------|-----------------------------|
| Bulgaria | BDS | SD CEN/TS 17268:2019 |
| Cyprus | <u>CYS</u> | CYS CEN/TS 17268:2018 |
| Denmark | <u>DS</u> | DS/CEN/TS 17268:2018 |
| Estonia | EVS | CEN/TS 17268:2018 |
| Germany | DIN | DIN CEN/TS 17268 |
| Greece | NQIS/ELOT | ELOT CEN/TS 17268 |
| Iceland | <u>IST</u> | CEN/TS 17268:2018 |
| Ireland | <u>NSAI</u> | S.R. CEN/TS 17268:2018 |
| Italy | <u>UNI</u> | UNI CEN/TS 17268:2019 |
| Latvia | LVS | LVS CEN/TS 17268:2019 |
| Lithuania | <u>LST</u> | LST CEN/TS 17268:2019 |
| Malta | MCCAA | SM CEN/TS 17268:2018 |
| Moldova, Republic of | ISM | SM CEN/TS 17268:2019 |
| Netherlands | NEN | CEN/TS 17268:2018 |
| Republic of North Macedonia | <u>ISRSM</u> | MKTC CEN/TS 17268:2019 |
| Serbia | <u>ISS</u> | SRPS CEN/TS 17268:2019 |
| Slovakia | UNMS SR | STN P CEN/TS 17268 |
| Slovenia | <u>SIST</u> | SIST-TS CEN/TS 17268:2019 |
| Spain | <u>UNE</u> | UNE-CEN/TS 17268:2018 |
| Switzerland | SNV | CEN/TS 17268:2018 |
| Turkey | <u>TSE</u> | TSE CEN/TS 17268 |
| United Kingdom | BSI | PD CEN/TS 17268:2018 |

Table 1 Sales points for CEN TS 17268



5. TN-ITS Platform Work Group 2

5.1 Mission

The mission of the TN-ITS Platform WG 2 is the maintenance of the TN-ITS framework, consisting of the specification, code lists, change requests, data exchange format. It is responsible for maintaining liaisons and working towards consolidation of the specifications with other existing projects/documents (e.g. INSPIRE, TISA, DATEX II). The WG 2 is considered to coincide with the INSPIRE SDIC - "Transport Network ITS Spatial Data" and CEN/TC 278/WG 7 - "ITS Spatial Data". The links and collaboration with ISO, CEN, ETSI and JRC are important.

5.2 Governance

The WG 2, as one of the working groups of the TN-ITS platform, has been led by the Norwegian Public Road Administration (NPRA) since June 2013, when the platform was established at the ITS World Congress held in Dublin. The pool of experts within WG 2 has members from both the private and public sector to ensure the representation and participation of relevant user groups. The WG 2's main activity and focus has originally been to bring the ROSATTE specification through the formal CEN standardization process. The result was a published standard in December 2018.

Since August 2020, an ERTICO representative has taken the lead of WG 2, with technical support provided by the NPRA. The Working group leader reports out to the TN-ITS Board, which happens every month and presents the plans and status at the TN-ITS General Assembly.

5.3 Activities over the last years

The main activities conducted by the working group are:

- Support the Transportation Pilot by Joint Research Center (JRC)
- Established liaisons with relevant standardization bodies as INSPIRE, TISA, DATEX, CEN, Open AutoDrive Forum (OADF), SENSORIS, ADASIS
- Contribute to "harmonize" ISO/TC211 (Geographic information) and ISO/TC204 (Intelligent transport systems)
- Established taskforce which brought the ROSATTE specification to a formal CEN standard
- Formalize the maintenance of the TS
- Prepare the TS for use in broader context & different communities
- Support TN-ITS WG 3 Implementation Support



5.4 Action plan for WG 2 - 2019

The actions for the year 2019 included:

- Review of incoming request changes from external consumers (ref. Change request procedure),
- Finalising and establishing the Change Request Procedure,
- Two updates of the specification have been implemented since formalization of the standard (Dec 2018),
- Related schemas in the TN-ITS repository have been corrected and updated,
- The changes are minor corrections that have no impact on running services
 - Examples on such changes:
 - Datatype value in a schema is incorrect
 - Corrections in a related ISO schema that leads to error in validation of TN-ITS metadata schema
- Maintain the external code list of TS 17268,
- Joined and participating in CEN/TC 278/WG7 and contribute to the worldwide standardization efforts.

5.5 Action plan for WG 2 - 2020

The action plan for the year 2020 included:

- Maintain pool of experts within the workgroup,
- Review of incoming request changes from external consumers (ref. Change request procedure),
- Maintain the external code list of TS17268,
- Increase activities under CEN/TC 278/WG7 and contribute to the worldwide standardization efforts,
- Finalising and establishing the Change Request Procedure,
- Addressing the inconsistencies highlighted by the data analysis carried out by the Map Makers on the TN-ITS services from some countries (Sweden, Finland), and set up the process to solve the issue.

5.6 Action plan for WG 2 – 2021

The action plan for the year 2021 includes:

- Maintain a pool of experts within the workgroup,
- Review of incoming request changes from external consumers (ref. Change request procedure),



- Maintain the external code list of TS17268,
- Increase activities under CEN/TC 278/WG7 and contribute to the worldwide standardization efforts, including:
 - TN-ITS GO project becoming official CEN Liaison partner
 - Agreement with CEN on the hosting, distribution and ownership rights of the UML model in Enterprise Architect project file
- Support communication by organizing specifications dedicated webinar, publicly available on ERTICOs Youtube channel,
- Educate a wider audience than ITS on TN-ITS specifications, e.g. Open Data community and ICT/API community,
- Support other working groups, e.g. WG 3 by recording specifications dedicated video tutorial(s) and introduction document(s),
- Ensure TN-ITS is participating in a next European National Access Point programme.



Figure 6 TN-ITS TS milestones continuing from the CEN TS 17268 release in 2018



5.7 2020 – 2021: Realisations by the WG 2 - an update

5.7.1 TN-ITS Specification centric documentation & information

This section presents an overview of the new documentation related to the TN-ITS TS available for TN-ITS members, TN-ITS GO partners and the wider community.





| | On May 27 th 2021 TN-ITS (GO) organized a 1.5-hour webinar on the TN-ITS Technical Specifications. Carmela Canonico from ERTICO moderated this event. The platform's president, Christian Kleine, gave a high level introduction. The WG 2 leader Stephen T'Siobbel talked about the activities of the working group and was followed by Dr Knut Jetlund from NPRA who introduced the audience to the basics of the technical specifications. Dr Pieter Colpaert from UGhent Belgium spoke about the connection & opportunities for TN-ITS in the Linked (Open) Data world. Frank Daems from ERTICO concluded the webinar with a view on the next steps of the platform (e.g. the future National Access Points programme). Given the specific subject, the webinar was a success with 37 registrations representing industry, academia, authorities, etc. Dissemination level: Public Link: https://www.youtube.com/watch?v=DCcH3RZnB1U&t=9s | | |
|----------|--|--|--|
| Tutorial | How to Validate your TN-ITS XML 2 | | |
| | | | |
| | TN-ITS CEN Technical Specification 17268:2018 | | |
| | An XML file | | |
| | Tool: e.g. Notepad ++ | | |
| | Access to the XSD | | |
| | | | |
| | Surf to TN-ITS.EU/standardisation to see all links | | |
| | A short tutorial was recorded and released in June 2021 which explains how – based on the use of an open source tool – one can validate a TN-ITS XML file's compliance to the official CEN TS 17268 specification. | | |
| | Dissemination level: TN-ITS GO partners & TN-ITS members | | |
| | Link: shortcut to SharePoint here | | |
| Sandbox | ← → C △ O A ≓ http://rtobs.sharepoint.com/share | | |
| | TINHI TINHITIS Protegroep | | |
| | It by place K2 Jadem Start ↑ Nexuer ∨ ↑ Uploadem ∨ 目 Beventran in raterweergner U2 Datem ∿ Koppeling kopeline ··· □ Alle documenten ∨ ▽ ○ ·* | | |
| | C → Bogs TN-ITS GO > 6. Sandbox Ocuments | | |
| | Gedeel met ons Nam Gewlipigd × Gewlipigd × Gewlipigd store × + Kolom towoegen × Notifieldok TM-HTS Datasets 19 fotmail Brayless Trisled | | |
| | Pruferbak Tools 22 Menuari targhan Toolsel | | |
| | Teruptance nam de Vacionia weregiere van Soundvoor | | |
| | A TN-ITS GO SharePoint page was created which hosts a repository of TN-ITS GO datasets (to be validated, validated) to help developers of TN-ITS services to verify their TN-ITS XML files. The site also hosts software tools that are intended to help the XML validation (FME, Notepad++,) | | |



| | Link: SharePoint site | | | |
|-----------------|--|--|--|--|
| Website | ← → C △ ○ △ intput/television □ ∞ ◇ □ ≥ in □ = Faith our and target you belogiese for og & belogiese blander. □ ∧ den blanderinger | | | |
| | The PLATFORM | | | |
| | ABOUT SERVICES MEMBERSHIP NEWS LUBBARY CONTACT US | | | |
| | STANDARDISATION | | | |
| | The TN-FTS-CINTS 17:268 is a stechnical genefaction describing the exchange of of hange of or load attributes, with the emphasis on static read data. It is in mantained by the furneeses/Standardization O gaministicn CER, under that Technical Committee 228, Read Transport and Tarlife Telematics. This committee develope European standardiz in the disman of intelligent Transport Systems 1753. This TSC DN TS 17:264 finds its origin is a series of EU research, pails and development propriet disma from the distributes of EU attributes. This committee and the end provide the state of the end of the EU homosourisation and the maintenance of digraf may sensibility (TS series and attoined on systems. Ower the last decoder these specifications | | | |
| | The TH HT S duttions controls to solve its manuface the CPU ITS 127246. In the with this strategy, by collecting change requests from TN-115 stakeholders to support new histochandary is the area of their and multimodality of transport, automated driving, etc., by interacting with the CPU TC272W.22 and by converge this specification file. | | | |
| | Key volumentation for TN-ITS CEN ITS 127248 • Access to the official CEN document; transfer for serve • Access to TN-ITS CEN Statumes; special of the subdomains TN-ITS CEN Statumes; the sub-official serve in an anti-official serve in the object "Request for TN-ITS UML" • Access to the UML sage plasme contact info@file its av with the object "Request for TN-ITS UML" | | | |
| | | | | |
| | Early in 2021 the standardisation section of the TN-ITS webpage was redesigned. It offers comprehensible information on the TN-ITS TS and points to the relevant webpages of CEN and the TN-ITS repository of XSD and codelists. | | | |
| | Dissemination level: Public | | | |
| | Link: tn-its.eu/standardisation | | | |
| Social Media | The LinkedIn post of January 2021 on the newly designed TN-ITS Standardisation web page received over 1k views. | | | |
| | Dissemination level: Public | | | |
| | Link: https://www.linkedin.com/posts/stsiobbel_itsdirective-digitalinfrastructure-tnits- activity-6759453498112253952-TRU0 | | | |

Table 2 Overview of WG 2 actions in 2021 on documentation & information



5.7.2 Code list updates

The TN-ITS specifications are flexible and support the introduction of new data types by permitting the use of external code lists. This is the official repository for the code lists but local/bespoke version can exist. Of course, these versions need to be communicated to the TN-ITS data users to be useful.

From the TN-ITS partners a number of updates where proposed, e.g. reflecting: official road name, the road length, and lane count information. It is expected that more request or proposals will emerge during the final stage of the TN-ITS GO project, possibly also reflecting new advances in mobility use cases.



Figure 7 Examples of extensions to the RoadFeaturePropertyTypeCode.xml code list, as proposed by TN-ITS GO partners

5.7.3 The formal CEN TS 17268 maintenance

The WG 2 is in regular contact with the CEN/TC 278/W7 Convenor Mr. Loïc Blaive related to the maintenance of the official CEN 17268 Technical Specification. As a new Liaison Organisation TN-ITS GO representatives will attend the online W7 Plenary scheduled for 16th - 19th September 2021.

One item of discussion is the systematic review to be launched this year (2021), which agrees with the 3-year cycle for a TS (5 years for a full standard). A formal invitation for the review will be received from CEN. The possible actions to take are: 1) Confirm with "minor" changes are also valid, typos broken links, 2) Revise, 3) Withdraw and 4) upgrade to full standard (IN). The formal decision will be a topic at a next TN-ITS board / steering committee meeting.

Meanwhile, a document was created to collect the comments from the TN-ITS GO partners who have implemented the TS. At the time of the release of this deliverable, several issues were reported: typos, broken links, proposed name changes, proposal for extensions, etc.



5.7.4 CEN Liaison Organisation

The TN-ITS GO project successfully applied to become an official CEN Liaison Organisation. The candidacy was approved by CEN TC278 WG7 in June 2021. An ERTICO representative (Mr. Stephen T'Siobbel) was assigned as point of contact. This status comes at a yearly fee of around 500€ to cover administrative costs at CEN.

This cooperation will give TN-ITS GO access to relevant documentation from WG7 and representation at relevant meetings, e.g. the online plenary meeting in September 2021.

5.7.5 Liaison & Interactions with other organisations

Below is a non-exhaustive list of initiatives, platforms or projects with European or global scope which are relevant for TN-ITS as they operate in the data & mobility space and typically address technical specifications, strategic and deployment topics. Unlike the formal liaison with CEN TC278 W7, all these mentioned initiatives have informal connections to TN-ITS to discuss technical specifications, their extension and harmonisation.

SENSORIS – An ERTICO Innovation Platform focusing on the vehicle-to-cloud upload format and the cloud-to-cloud data exchange format, specifically for vehicle-based data and other data needed for mobility services. SENSORIS delivers and maintains technical specifications that define the format and content of vehicle sensors and campaign data. The Point of Contact for technical specifications is Jean-Charles Pandazis, Platform Coordinator.

ADASIS - An ERTICO Innovation Platform established as a Non-Profit International Association. It addresses the standardisation of the interface to map data in the vehicle (ADAS horizon) and all supportive related actions. The Point of Contact for technical specifications is Jean-Charles Pandazis, Platform Coordinator.

DATEX II – A community and EC Program Support Action (PSA) on the standardisation of the electronic language used in Europe for the exchange of traffic information and traffic data. The Point of Contact for technical specifications is Bard de Vries, Chairman of the DATEX II Technical Group.

OADF – The Open AutoDrive Forum (OADF) acts as open discussion platform for crossdomain topics in the area of autonomous driving and generates input for standardization in organized bodies. It connects authorities and the industry to streamline development efforts and acts as a platform for development in autonomous cars. The Point of Contact is Dr Markus Junker, OADF Project Office.

UVARBOX – An EU-funded project to enable the digitisation of urban vehicle access regulations (UVARs) across Europe to facilitate the private, public and commercial use of UVARs. The Point of Contact is Pedro Barradas, Project Manager.

DATA4PT – An EC project to advance how Public Transport (PT) data is treated and shared to further improve mobility services. The work includes technical and organisational activities to facilitate the development and deployment of the European public transport data standards



Transmodel, NeTEx and SIRI. The Point of Contact for technical matters is Christophe Duquesne.

5.7.6 The TN-ITS UML model

The TN-ITS UML model, available as an Enterprise Architect Project (EAP) file, is particularly useful for software developers and data analysts of TN-ITS data sharing services. The user must have an Enterprise Architect tool version installed in order to read the model and should be familiar with UML modelling. For viewing & analysis purposes, a free license of Enterprise Architect is available on the vendors' website.

The use of the TN-ITS UML (its hosting, access to, rights) has been a subject of investigation at CEN and ERTICO since 2020. In 2021, the TN-ITS board decided to provide access to the UML to any party who requested this, provided they can demonstrate that they have purchased a license to the TN-ITS CEN 17268 specification. It is argued that the TN-ITS platform is the appropriate organization to act as a repository for this UML model and abovementioned schema and code list files, especially as CEN does not have a usable platform and support option to take up this role. The TN-ITS platform keeps track of those organization who have applied for and have received the TN-ITS UML EAP file for statistics.

CEN/CENELEC, represented by their Project Manager Mobility - Standardization & Digital Solutions, and the TN-ITS platform are at the time of writing of this deliverable jointly working on an "a posteriori" agreement which defines the conditions for the access to and use of the UML model. It is expected that such agreement can be in place by Q4 2021.

5.7.7 Next Steps: Linked Data & OWL

Linked data is a set of design principles for sharing machine-readable data on the Web for use by public administrations, business and citizens [5]. The four design principles of Linked Data: 1. Use Uniform Resource Identifiers (URIs) as names for things. 2.Use HTTP URIs so that people can look up those names. 3.When someone looks up a URI, provide useful information, using the standards (RDF, SPARQL). 4.Include links to other URIs so that they can discover more things. In computing, linked data (often capitalized as Linked Data) is structured data which is interlinked with other data so it becomes more useful through semantic queries. Linked data may also be open data, in which case it is usually described as linked open data (LOD) [6].

A number of technological and societal advances have triggered the interest of TN-ITS WG 2 in exploring the Linked (Open) Data developments and to connect to its community of experts:

- More and more government data is made available as Linked (Open) Data [7]
- In W3C/OGC's Spatial Data on the Web Best Practices [8] is explained that abovementioned 4 principles are applicable to geo data
- TN-ITS related standardisation bodies as DATEX II have started to develop DATEX II vocabularies from the available DATEX II UML model



 The TN-ITS board supports the proliferation of TN-ITS data sharing services in Europe and encourages the consumption of TN-ITS data by map & service providers and other, commercial and non-commercial organisations. Hence extensions of the TN-ITS technical specifications to support Linked Data are of interest to the platform and first explorations are encouraged

A first draft of a Web Ontology Language (OWL) representation of the TN-ITS model, with code values as RDF individuals was created in June 2021 by Knut Jetlund from the NPRA. The following files were prepared for evaluation:

- tnits-owl.ttl (the ontology representing the core model)
- tn-its-codes.ttl (contains all standardized codelist values)
- *Code.ttl (* with individual code lists and values, 29 of them)

The next steps are to review the OWL representation with Linked Data experts, from outside and inside the TN-ITS GO partner community, and also to continue work on a script for collecting data from the Norwegian Road Database API (<u>https://api.vegdata.no/</u>) and use RDF query language SPARQL to convert to the TN-ITS model. The NPRA has conducted experiments earlier with a similar model. It is expected that it will be possible to provide example files in RDF according to the ontology. Based on the findings, the TN-ITS board will decide upon further actions.

At the time of writing, the TN-ITS Specification WG 2 is connecting with related standardisation bodies, as DATEX II and DATA4PT, to share information and align on ongoing, planned, or potential Linked (Open) Data actions and initiatives.

5.7.8 Next Steps:

5.7.8.1 NAPCORE

The TN-ITS platform supported the proposal for a National Access Point Coordination Organisation for Europe (NAPCORE). The general objective of this action is to empower the National Access Points (NAPs) as the backbone for ITS digital infrastructure. It will facilitate national & EU-wide operational coordination for the harmonization and implementation of the European specifications.

Its specific objectives are to create a coordinated European mechanism of national access points based on coordinated governance and architecture, interoperability, standards, and services. It is based on the position paper of the NAP and national bodies Harmonisation Group to strengthen the position and the role of NAP and to support steps towards the creation of European-wide solutions to facilitate the use of EU-wide data.

The proposed governance structure of the TN-ITS association and its relation to NAPCORE is shown in figure 8. TN-ITS association is the executing body for the NAPCORE project, under



the legal umbrella of ERTICO. The association itself organises its work in work groups. The several NAPCORE tasks are well fitted to the assignments of the workgroups. The NAPCORE project comprises tasks to be carried out with the help of the association's working groups.

NAPCORE provides the means to the association to further develop on specifications, disseminations and awareness creation, providing assessments and insights to Member States and road authorities for further future potential implementation within EU Member states (Implementation being outside the scope of the NAPCORE project), insights in how to ensure TN-ITS data access via NAP integration, and enhancing data related aspects (as quality & accuracy control methodologies, maintaining trust along the data sharing chain ,...).

However, the association also focusses on deployment and implementation of the services, including its implementation related necessary technical trainings and support. All activities carried out by the association, related to implementation of TN-ITS services are therefore out of scope of NAPCORE



Figure 8 TN-ITS governance and relation to NAPCORE



5.7.8.2 Potential specification research topics

Other topics that are in the WG2 interest to progress on next versions for the specification are

- TN-ITS and Linked (Open) Data data
- TN-ITS and High Definition (HD) maps
- Specifications in relation to support the end-to-end TN-ITS data chain (e.g. integrity, trust)
- All Safety and Automation related specification impacts
- TN-ITS enhancements to support cities data sharing requirements

6. ERTICOs Platform supporting TS 17268 files

From 2018 on, ERTICO is hosting the support files for CEN TS 17268 to support developers of TN-ITS data sharing services. These are the XSD, XADL and code list files. They are available on a TN-ITS website, the link is given in the TS 17268 pdf document. After an update of the standardization section of the TN-ITS website in 2021, the Schema Definitions and code lists are readily consultable via URL links too, see https://tn-its.eu/standardisation. Information on the UML model is given in the chapter above.

7. TN-ITS Specification maintenance: Change request procedure

This chapter is taken from the deliverable D5.2 Specifications (Maintenance) M24. It was decided to do so as the procedure continues an open activity for the TN-ITS TS.

7.1 Introduction

CEN/TC 278 is responsible for managing the preparation of standards in the field of Intelligent Transport Systems (ITS) in Europe. It serves as a platform for European stakeholders to exchange knowledge, information, best practices and experiences in ITS.TN-ITS is involved in the works of TC 278 WG7 regarding standardization of static geographic road network data (ITS spatial data).

The objective of the WG is to develop a set of standards for data exchange between public road authorities on one side and mapmakers and other users of such data on the other side.

The procedure is made to process incoming change requests. It is only relevant as an internal guideline for requested changes.

The request should be reported through one of the following channels:

- Direct communication with TN-ITS WG2
- Contact form at TN-ITS website
- By reporting a problem or submitting a change proposal to members of TN-ITS. In this case, the submitter has a responsibility to ensure that WG2 is notified of the requested change and/or problem identified as soon as possible



Description of terms

- WG2: TN-ITS Work Group 2 (Standardization and specification)
- TN-ITS Board: The board is set with members of the TN-ITS organization
- TN-ITS standard: Referring to the formal specification "Data exchange on changes in road attributes"

7.2 Steps in the Change Request procedure

The steps of the Change Request Procedure are described as:

Step 1 – User Initiation

Users wishing to:

- 1. request change/correction to the existing specification \rightarrow Configuration request
- 2. request an extension to the feature list \rightarrow Feature request

Step 2 – Logging and tracking the progress of the request

The WG2 shall assign a reference number to each request.

All submitted requests shall be logged, with a unique reference number. The UID should be sent to the requester. WG2 will maintain a log for all changes.

Step 3 – Seeking a solution

WG2 shall examine the issue raised and seek a suitable solution. The requests should be assigned in one of the following categories:

- 1. Configuration request: Requests to change the existing standard. This involves more principal changes and may result in a draft for a new work item proposal (NWIP). New work items have proposal cycles of 2-5 yrs.
- 2. Feature request: Adding/editing features in the external code list

Step 4 – Inform the TN-ITS Board

WG2 shall inform the TN-ITS board of issues raised and propose actions/solutions. The process of informing the TN-ITS Board may adapt to the severity of the issue raised.

Step 5 – Solution decision

The TN-ITS Board shall review the recommendations of WG2 and decide on the proposed changes

Step 6 – Revising requests

1. Configuration requests

In case of a Configuration requests (with approval from the board), WG2 shall transmit the necessary elements in order to initiate the modification process in the relevant standardization bodies.

2. Feature requests



With an agreement from Step 5, WG2 will undertake modifications to the code list and inform the requester.

Note: CEN/TC278 WG7 will (if necessary) prepare a new CEN Work Item Proposal (NWIP) for development of a new Standard or new Part to an existing Standard.



Figure 9 TS17268 Change Request Procedure flowchart



8. Conclusions

This report, Deliverable 5.2 Specification (Maintenance) M42, provides an update of earlier versions published in M12 and M24 of the TN-ITS GO project. For this edition it was decided not to repeat some of the chapters or paragraphs elaborating on how the TN-ITS Technical Specifications (TS) came into place, its origins in numerous EC research and pilot projects and initiatives focusing on the use and maintenance of digital maps for mobility services (route planning, navigation, ADAS, etc.). Instead, this edition focusses mostly on as-is situation and on the future developments related to the TS.

The context of the TN-ITS TS is presented first. Chapter 3 introduces a general view on the flow of geospatial information for ITS, pinpointing where TN-ITS fits. This is followed by an outline of the technical context, introducing Model Driven Architecture and the Open World Assumption.

In recognition of its major significance for the TN-ITS TS, the activities of the 2018 CEN project team leading to the official "TN-ITS" CEN TS 17268 were described in chapter 3.

A brief recap on the CEN TS 17268 – the TS implemented by member state authorities for their pilot TN-ITS services in the TN-ITS GO project - is given in chapter 4. An overview where the official license of the TS can be purchased is included.

The mission, governance and recent activities of the Work group (WG2) of the TN-ITS platform are presented in chapter 5. Along with the TS maintenance, documentation and promotion material/actions, the situation regarding the UML model, the formal and informal liaisons, future actions and involvements including Linked (Open) Data and NAPCORE, the federation of National Access Points program.

Chapter 6 mentions the files which are relevant for the TN-ITS TS and important for software engineers and data analyst (to prepare) to develop TN-ITS services.

The last chapter, chapter 7 elaborating upon the change request procedure, is repeated form release M24 of this report.



9. References

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