

English Version

Intelligent transport systems - Traffic management systems - Status, fault and quality requirements

Intelligente Verkehrssysteme -
Verkehrsmanagementsysteme - Status-, Fehler- und
Qualitätsanforderungen

This Technical Specification (CEN/TS) was approved by CEN on 14 January 2019 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

CEN members are required to announce the existence of this CEN/TS in the same way as for an EN and to make the CEN/TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the CEN/TS) until the final decision about the possible conversion of the CEN/TS into an EN is reached.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents

Page

European foreword.....	5
Introduction	6
1 Scope	8
2 Normative references	8
3 Terms and definitions	8
4 Symbols and abbreviations	9
5 Quality and performance criteria	10
5.1 Quality: fitness for purpose	10
5.2 System quality	11
5.2.1 Availability and uptime.....	11
5.2.2 System compatibility and integration	14
5.2.3 Configurability of systems	14
5.2.4 Security	15
5.2.5 Continuity of service and future proofing.....	16
5.3 Device quality	17
5.3.1 Physical robustness.....	17
5.3.2 Failure modes.....	17
5.3.3 Reliability and maintainability	18
5.4 Functional quality	19
5.4.1 Stated requirements and compliance.....	19
5.4.2 Functional effectiveness	19
5.4.3 Functional integration.....	20
5.4.4 Usability	21
5.5 Data quality	21
5.5.1 Accuracy and related concepts.....	21
5.5.2 Timeliness and granularity	23
5.5.3 Spatio-temporal granularity	23
5.5.4 System data	24
5.6 Quality and performance management	25
5.6.1 Lifecycle quality	25
5.6.2 Quality evaluation.....	27
5.6.3 Risk management.....	28
6 System status and faults data model.....	29
6.1 Overview	29
6.2 General requirements	29
6.3 Modelling principles	30
6.3.1 Technical modelling principles.....	30
6.3.2 Semantic modelling principles.....	30
6.4 «D2Package» DevicePublication	30
6.4.1 Overview	30
6.4.2 Semantics	31
6.5 «D2Package» StatusPublication	32
6.5.1 Overview	32
6.5.2 Semantics	33

6.6	«D2Package» FaultPublication	34
6.6.1	Overview	34
6.6.2	Semantics.....	36
6.7	«D2Package» Classes.....	37
6.7.1	Overview	37
6.7.2	Semantics.....	39
6.8	«D2Package» DataTypes	39
Annex A (normative) Status and fault data dictionary.....		41
A.1	Disclaimer	41
A.2	Overview	41
A.3	Data dictionary of «D2Class» for “FaultAndStatus”	42
A.3.1	“Classes” package.....	42
A.3.1.1	Location of the “Classes” package	42
A.3.1.2	“Classes” package classes.....	43
A.3.1.3	“Classes” package association roles.....	43
A.3.1.4	“Classes” package attributes.....	44
A.3.2	“DevicePublication” package.....	44
A.3.2.1	Location of “DevicePublication” package.....	44
A.3.2.2	“DevicePublication” package classes.....	45
A.3.2.3	“DevicePublication” package association roles	45
A.3.2.4	“DevicePublication” package attributes.....	46
A.3.3	“FaultPublication” package.....	46
A.3.3.1	Location of “FaultPublication” package.....	46
A.3.3.2	“FaultPublication” package classes	47
A.3.3.3	“FaultPublication” package association roles	47
A.3.3.4	“FaultPublication” package attributes.....	48
A.3.4	“StatusPublication” package.....	48
A.3.4.1	Location of the “StatusPublication” package	48
A.3.4.2	“StatusPublication” package classes.....	49
A.3.4.3	“StatusPublication” package association roles	49
A.3.4.4	“StatusPublication” package attributes.....	50
A.4	Data Dictionary of «D2Datatype» for “FaultAndStatus”	50
A.4.1	General	50
A.4.2	The «D2Datatype» “ObjectIdentifier”.....	50
A.5	Data Dictionary of «D2Enumeration» for “FaultAndStatus”	51
A.5.1	General	51
A.5.2	The «D2Enumeration» “DeviceOrSystemTypeEnum”	51
A.5.3	The «D2Enumeration» “FaultImpactOnDataEnum”	51

A.5.4	The «D2Enumeration» “FaultSeverityEnum”	52
A.5.5	The «D2Enumeration» “FaultTypeEnum”	52
A.5.6	The «D2Enumeration» “FaultUrgencyEnum”	53
A.5.7	The «D2Enumeration» “GeneralDeviceStatusEnum”	53
A.5.8	The «D2Enumeration» “OperationalDeviceStateEnum”	54
Annex B (normative) ASN.1 specifications.....		56
B.1	Introduction	56
B.1.1	General.....	56
B.1.2	Automatic creation of ASN.1 code from xsd code	56
B.1.3	ASN.1 module TmsStatusFault	56
B.1.4	ASN.1 module PointLocation.....	57
B.1.5	ASN.1 module DatexCommon	57
B.1.6	ASN.1 module XSD.....	57
B.1.7	ASN.1 module TmsMessageSet.....	57
Annex C (normative) Management of electronic traffic regulations		59
C.1	Justification	59
C.2	Status and faults	59
Annex D (normative) Electronic attachment		60
Annex E (informative) Example use case.....		61
E.1	Introduction	61
E.2	Scenario “tunnel project”	61
E.3	Use case “tunnel project”	61
E.3.1	Challenge.....	61
E.3.2	Response	61
E.3.3	Mechanisms.....	62
E.3.3.1	System Quality.....	62
E.3.3.1.1	Availability and Uptime.....	62
E.3.3.1.2	System Compatibility and Integration	62
E.3.3.1.3	Configuration of system.....	63
E.3.3.1.4	Security.....	63
E.3.3.1.5	Continuity of service and future proofing.....	63
E.3.3.2	Device Quality.....	63
E.3.3.2.1	Physical Robustness.....	63
E.3.3.2.2	Failure Modes.....	64
E.3.3.2.3	Reliability and Maintainability	64
Bibliography.....		65

European foreword

This document (CEN/TS 17241:2019) has been prepared by Technical Committee CEN/TC 278 “Intelligent transport systems”, the secretariat of which is held by NEN.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

General deployment of Intelligent Transport Systems (ITS) in the field of road transport and for interfaces with other modes of transport is demanded by Directive 2010/40/EU [3] of the European Parliament. ITS means “applying information technology and communications technology for improving traffic, especially road traffic”.

Urban Intelligent Transport Systems (U-ITS) is a term indicating the provisioning of ITS services applying ITS technologies in an urban context. Development of standards dedicated to U-ITS is supported by the European Commission's mandate M/546 [2] with technical details identified in the final report [1] of project team PT1701 funded under M/456. U-ITS standards will complement those for cooperative ITS (C-ITS) developed under the European Commission's mandate M/453, see [4]. Thus the basic ITS technologies applied for U-ITS are the same as those applied for C-ITS.

Provisioning of ITS services typically may require communications between ITS station units (ITS-SU) [20]. Diverging requirements for communications and limitations of capabilities of available communication channels led to the concept of Hybrid Communications providing multiple communication protocol stacks with different access technologies for localized communications and networked communications together with the capability of handover, specified in a series of standards, ISO 21217 [20], ISO 21218 [21], EN ISO 17423 [14], ISO 24102-6 [24], ISO 21215 [19], ISO 17515-3 [16], ISO 21210 [18], ISO 29281-1, and others.

A major characteristics of C-ITS is the sharing of data between ITS applications in the same ITS-SU and in different ITS-SUs. A major service domain of C-ITS is the domain of road safety and traffic efficiency, with a certain focus on wireless communications between ITS-SUs installed in vehicles, also referred to as Vehicle ITS-SU (V-ITS-SU), and wireless communications between V-ITS-SUs and ITS-SUs installed at the roadside, also referred to as Roadside ITS-SU (R-ITS-SU).

Major differences between U-ITS and C-ITS are the data and procedures necessary for the provisioning of dedicated urban ITS services, although data and procedures developed for C-ITS might also be beneficially applied in U-ITS.

Whilst C-ITS focused on the road safety domain, U-ITS deals with the ITS service domains

- Multimodal Information Systems;
- Traffic Management;
- Urban Logistics;

see [1].

A major goal to be achieved with U-ITS standards is to assist urban administration to implement U-ITS, and by this removing barriers for implementing U-ITS [1]:

- 1) Awareness of what is available;
- 2) Location referencing;
- 3) Vendor lock-in;
- 4) Standards for “new modes” and “new measures”;
- 5) Data exchange / data management;
- 6) Immaturity of some concepts.

A precise definition of the borderline between U-ITS and ITS for other target domains, e.g. ITS on highways, is impossible. However, this document aims on identifying and specifying ITS issues that are relevant for urban administrations. It is important to understand that ITS issues developed for urban areas also may be applicable outside of urban areas.

Development of standards for U-ITS has to consider automated and autonomous vehicles [1].

This document was developed by project team PT1704 funded by the European Commission under grant agreement SA/CEN/GROW/EFTA/546/2016-08 'Urban ITS - Traffic management systems' (M/546 [2]). The scope of this document results from the High Level Recommendation "1701-HLRd Traffic Management System status, fault and quality standards" identified in Bibliographical Entry [1]. This document is about quality and performance criteria:

- applied for the operation of traffic management systems,
- considering the effective integration of field and centre
 - devices and
 - services,
- and approaches to evaluate them.

PT1704 acknowledges the help of

OSS Nokalva, Inc.
300 Atrium Drive, Suite 402
Somerset, New Jersey 08873
USA

to develop the ASN.1 equivalent code from the XSD code produced by the UML design tool (Enterprise Architect [39]). OSS voluntarily processed the XSD files provided by PT1704 with their *XSD- > ASN.1 Translator* tool [38].

Clause 5 is arranged as a text book, introducing and explaining quality and performance criteria, and approaches to their evaluation, for the operation of traffic management systems, including factors affecting the effective integration of field and centre systems and services. Where appropriate, it refers to the data model specified in Clause 6. Normative requirements are avoided in order not to impose requirements on urban administrations on how to perform their work.

Clause 6 specifies a data model for system status and faults of components of traffic management systems using UML and being based on DATEX II. The design is flexible, i.e. supporting communications between central stations, i.e. the original usage of DATEX II, but also communications between a field device and a central station. Further on it introduces the concept of "catalogues" allowing vendors and urban administrators defining their own data sets.

The informative Annex E illustrates the general findings of Clause 5 using a use-case "tunnel project". To a large extent there is a one-to-one mapping of subclauses from Clause 5 with subclauses from Annex E.

The normative Annex A specifies a status and fault dictionary.

The normative Annex B provides an ASN.1 module for the data specified in Annex A.

The normative Annex C provides a contribution to the CEN work item on management of electronic traffic rules (METR).

The normative Annex D provides information about the existence and the content of an electronic attachment to this document.