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Inteligentni transportni sistemi - Mestni ITS - Komunikacijski vmesniki in profili za upravljanje prometa

Intelligent transport systems - Urban ITS - Communication interfaces and profiles for traffic management

Intelligente Verkehrssysteme - Verkehrsmanagement-Systeme - TM-Schnittstellen und Informationen

Systèmes de transport intelligents - Systèmes de gestion du trafic - Interfaces et informations sur la MT

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Systèmes de transport intelligents - Systèmes de gestion du trafic - Interfaces et informations sur la MT

Intelligente Verkehrssysteme - Verkehrsmanagement-Systeme - TM-Schnittstellen und Informationen

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European foreword

This document (CEN/TS 17466:2020) has been prepared by Technical Committee CEN/TC 278 “Intelligent transport systems”, the secretariat of which is held by NEN.

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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 the Directive 2010/40/EU [3] of the European Parliament. ITS means “applying information technology and communications technology (ICT) 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. U-ITS standards will complement those for cooperative ITS (C-ITS) developed under the European Commission's mandate M/453, see [4].

NOTE Basic ITS technologies applied for U-ITS can be the same as those applied for C-ITS.

Provisioning of ITS services typically may require communications between ITS station units (ITS-SU) specified in ISO 21217:2014. 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 and communications protocols for localized communications and networked communications together with the capability of handover, specified in a series of standards, e.g. ISO 21217:2014, ISO 21218 [30], EN ISO 17423 [20], ISO 24102-6 [31], ISO 21215 [29], ISO 17515-3 [22], ISO 21210 [28], ISO 29281-1 [32], and others.

A major characteristic 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).

Although there are differences between U-ITS and C-ITS with respect of target service domains (data and procedures necessary for the provisioning of dedicated urban ITS services), data and procedures developed for C-ITS might also be beneficially applied in U-ITS.

Whilst C-ITS currently largely focuses 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 removing barriers for implementing U-ITS, see CEN/TR 17143 [1].

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], and the work on data and message specifications performed under the name of DATEX for data exchange between central stations and between a central station and a service provider.

The present document was developed by project team PT1710 funded by the European Commission under grant agreement SA/CEN/GROW/EFTA/546/2016-10 'Urban ITS Traffic Management data

models' (M/546 [2]). The scope of the present document results from the High Level Recommendation "1701-HLRd Traffic Management Data Models and interfaces" identified in CEN/TR 17143 [1].

The present document is about communications interfaces and profiles applicable for U-ITS with a focus on communications between central stations, i.e. Central ITS-SUs (C-ITS-SUs). Such C-ITS-SUs can be part of e.g. central traffic management centres, centres from authorities, centres from service providers. The communication profile definitions presented in this document are based on the methodology being specified in ISO/TS 21185.

Data definitions are outside the scope of this document and are developed within other PTs funded under M/546 [2].

1 Scope

This document identifies traffic management interfaces between central stations and specifies related ITS communication profiles enabling standardized data exchange over these communication interfaces, applicable for a variety of platforms including ITS station units (ITS-SUs) compliant with ISO 21217:2014. This document further specifies requirements on encoding of data.

These traffic management interfaces enable

— the provision of appropriate and relevant traffic information, e.g. congestion and travel times, to users across a variety of platforms;

— exchange of data such as:

  — network performance data, e.g. traffic conditions, travel times, and

  — planned and unplanned events and incidents, e.g.

    — roadworks,

    — closures of roads, bridges, and tunnels,

    — bad weather,

    — road surface conditions.

This document recognizes specifications from DATEX II in order to avoid duplicate specifications. In doing so, this document aligns with existing products of CEN/TC 278/WG 8 and the additional work being undertaken within the DATEX community.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/TS 21177, *Intelligent transport systems — ITS station security services for secure session establishment and authentication between trusted devices*

ISO/TS 21185, *Intelligent transport systems — Communication profiles for secure connections between trusted devices*

ISO 21217:2014, *Intelligent transport systems — Communications access for land mobiles (CALM) — Architecture*

EN 16157-1:2018, *Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part 1: Context and framework*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp/ui

— IEC Electropedia: available at http://www.electropedia.org/

3.1
interface
point of demarcation between two entities through which information flows from one entity to the other entity based on a given specification of technical details

3.2
logical interface
interface where the semantic, syntactic, and symbolic attributes of information flows is defined

3.3
physical interface
interface where the physical characteristics of signals used to represent information and the physical characteristics of channels used to carry the signals are defined

3.4
service interface
interface where the set of interactions provided by an entity for participation with another entity for some purpose along with constraints on how they can occur are defined

3.5
management service interface
service interface that exposes management functions of a service function contained in a component for use by service consumers

[SOURCE: ISO 18202:2015, 1.4.7 - modified]

3.6
user interface
interface between a user and an interactive system that provides information and controls for the user to accomplish specific tasks with the interactive system

[SOURCE: ISO/IEC 25063:2014, 3.18 - modified]

3.7
ITS service
functionality provided to users of intelligent transport systems designed e.g. to increase safety, sustainability, efficiency, or comfort

[SOURCE: ISO 21217:2014, definition 3.11]

3.8
ITS application
instantiation of an ITS service that involves an association of two or more complementary ITS-S application processes

[SOURCE: ISO 21217:2014, definition 3.9]

3.9
ITS-S application process
element in an ITS station that performs information processing for a particular application and uses ITS-S services to transmit and receive information

[SOURCE: ISO 21217:2014, definition 3.19]

3.10
ITS-S service
communication functionality of an ITS-S that provides the capability to connect to other nodes

[SOURCE: ISO 21217:2014, definition 3.37]

3.11
ITS station
functional entity comprised of an ITS-S facilities layer, ITS-S networking and transport layer, ITS-S access layer, ITS-S management entity, ITS-S security entity, and ITS-S applications entity providing ITS services

Note 1 to entry: From an abstract point of view, the term "ITS station" refers to a set of functionalities. The term is often used to refer to an instantiation of these functionalities in a physical unit. Often, the appropriate interpretation is obvious from the context. The proper name of the physical instantiation of an ITS-S is ITS station unit (ITS-SU).

[SOURCE: ISO 21217:2014, definition 3.12]

3.12
ITS-S-secured
secured in compliance with ISO 21217:2014

4 Symbols and abbreviations

AMQP	advanced message queuing protocol
ANPR	automatic number plate recognition
API	application programming interface
ASN	abstract syntax notation
CAM	cooperative awareness message
CCTV	closed circuit television
C-ITS	cooperative ITS
C-ITS-SU	central ITS-SU
DATEX	data exchange
DENM	decentralized environmental notification message
DIASER	dialogue standard pour les équipements de régulation

DSRC	dedicated short range communications NOTE 1 DSRC as specified in EN 12253 (5,8 GHz backscatter technology) NOTE 2 In the United States of America, the term DSRC is used for IEEE 802.11 OCB communications at 5,9 GHz. In order to distinguish both technologies, the US understanding is referred to as US-DSRC.
DTS	draft TS
EN	European norm
EU	European Union
HARTS	harmonized architecture reference for technical standards
HTTP	hypertext transfer protocol
ICT	information and communication technology
IP	Internet protocol
IPv6	IP version 6
IR	infrared
ITS	intelligent transport systems
ITS-S	ITS station
ITS-SCP	ITS-S communication profile
ITS-SCPS	ITS-S communication protocol stack
ITS-SU	ITS station unit
JSON	Java script object notation
LAN	local area network
LoS	Level of Service
MQTT	message queuing telemetry transport
NTCIP	national transportation communications for ITS protocol
OCIT	open communication interface for road traffic control systems
OCIT-C	OCIT centre to centre
OCIT-O	OCIT outstations
OID	object identifier
PER	packed encoding rules
PT	project team
REST	representational state transfer
RESTful	REST implemented by using HTTP
RFC	request for comments
SIRI	service interface for real-time information
SNMP	simple network management protocol
SOAP	simple object access protocol
SPaT	signal phase and timing

TCP	transmission control protocol
TM	traffic management
TMC	TM centre
TMDD	TM data dictionary
TC	technical committee
TLS	transport layer security
TR	technical report
TS	technical specification
UML	unified modelling language
UPER	unaligned PER
URL	uniform resource locator
UTC	urban traffic control
UTMC	urban traffic management and control
U-ITS	urban ITS
VMS	variable message sign
WG	working group
WWW	world wide web
XSD	XML schema definition
XDR	external data representation
XML	extensible markup language

5 Traffic management interfaces

5.1 Basics on traffic management

"Traffic management" (TM), in the context of this document, is a term pointing to a class of ITS services that aim on managing road traffic, including urban areas, including not just vehicles, motor-cycles, and bicycles but also e.g. pedestrians and rail vehicles such as trams. TM interfaces exist between these actors in TM. TM interfaces are needed for the purpose to manage the operation of TM services.

5.2 Basics on interfaces

The term "interface" has the generic meaning of a "point of demarcation between two entities", although originally it comes from natural science with a different meaning.

In the context of information and communications technologies (ICT), many complementary definitions exist, distinguished by a qualifier added to the term, e.g. "physical interface", "communications protocol interface", "application interface". The communications protocol interface and the application interface are examples of logical interfaces. The physical interface together with the communications protocol interface define an ITS-S Communication Protocol Stack (ITS-SCPS).

NOTE 1 Typically, an ITS-SCPS includes, as a minimum, protocols from the ISO/OSI layers one through four (ITS-S access layer and ITS-S networking and transport layer specified in ISO 21217:2014), optionally also the layers five through seven (ITS-S facilities layer specified in ISO 21217:2014); see also the definition of ITS-SCPS in ISO 17423 [20].