TECHNICAL REPORT

ISO/TR 17465-1

First edition
2014-10-15

Intelligent transport systems — Cooperative ITS —

Part 1: Terms and definitions

Systèmes intelligents de transport — Coopérative ITS —

Partie 1: Termes et définitions

Reference number
ISO/TR 17465-1:2014(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 204, *Intelligent transport systems*.

ISO/TR 17465 consists of the following parts, under the general title *Intelligent transport systems — Cooperative-ITS*:

— *Part 1: Terms and definitions*

— *Part 2: Guidelines for standards documents*

— *Part 3: Release procedures for standards documents*

Introduction

This part of ISO/TR 17465 provides the definition of the term “Cooperative-ITS” (or “C-ITS” in its abbreviated form), and contains descriptions of C-ITS from several perspectives. It is anticipated that “C-ITS” will replace “cooperative systems” in all relevant ITS standards published after September 2012.

Although the concept of cooperative-TS is easy to understand, its implementation can be complex because of the need to provide several services using many applications, all potentially communicating with each other and sharing data in a structured manner (cf. OSI data communication model). As such, the set of standards required to implement a service will beneficially be composed of several parts. In order that users can easily find the standards information that they require, ISO/TR 17465-2 provides the outline of the common structure to be used for these multi-part standards, and a detailed description of the reference standards to be used for the creation of each part and the content of each part. ISO/TR 17465-3 will describe the “release” procedure to be adopted for future Cooperative-ITS-related standards.

Intelligent transport systems — Cooperative ITS —

Part 1: Terms and definitions

1 Scope

This part of ISO/TR 17465 provides a definition of the term "Cooperative-ITS". It is anticipated that "Cooperative-ITS" will be used in place of "cooperative systems" in all relevant ISO/CEN standards in the intelligent transport systems (ITS) domain. This definition is consistent with and heavily relies on the concept of an "ITS station" as specified in ISO 21217.[1)]

2 Terms and definitions

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

2.1
cooperative-ITS
DEPRECATED: cooperative systems
subset of overall ITS that communicates and shares information between ITS stations and ITS applications to give advice or facilitate actions with the objective of improving safety, sustainability, efficiency, and comfort beyond the scope of stand-alone systems

Note 1 to entry: See 4.2 for further details.

Note 2 to entry: As an alternative to a "subset", Cooperative-ITS could be viewed as a "paradigm" in overall ITS.

2.2
cooperative-ITS environment
communications environment that enables ITS stations to communicate with other ITS stations supporting sharing of data between ITS applications using whatever communications networks are available at their current locations and, if necessary, to seamlessly switch between networks as their locations change

2.3
intelligent transport system
transport system in which advanced information, communication, sensor, and control technologies, including the Internet, are applied to increase safety, sustainability, efficiency, and comfort

2.4
ITS application
instantiation of an ITS service that involves an association of two or more complementary ITS-S application processes

Note 1 to entry: Fragments of an application can also reside in nodes that are not ITS stations.

[SOURCE: ISO 21217:2014, 3.9]

1) The same definition can also be found in EN 302 665.

2.5
ITS service
functionality provided to users of intelligent transport systems designed to increase safety, sustainability, efficiency, and/or comfort

[SOURCE: ISO 21217:2014, 3.11]

2.6
ITS station
functional entity comprised of an ITS-S facilities layer, ITS-S networking & 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, 3.12]

2.7
ITS-S application process
element in an ITS station that performs information processing for a particular application, and uses ITS-S service to transmit and receive information

[SOURCE: ISO 21217:2014, 3.19]

2.8
ITS-S service
communication functionality of an ITS-S that provides the capability to connect to other nodes

[SOURCE: ISO 21217:2014, 3.37]

2.9
local dynamic map
entity consisting of LDM data objects, services and interfaces for manipulating these LDM data objects

[SOURCE: ISO/TS 18750:—[2)], 3.3]

2.10
wireless communication platform
combination of hardware and software that provides facilities to enable data to be communicated by wireless transmission

2.11
wireless Internet platform
combination of hardware and software that provides facilities that enable devices to use wireless communications to access the Internet and the services available from it

2.12
bounded secured managed domain
ITS station providing elements of trust

3 Symbols and abbreviated terms

API	application programme interface
BSMD	bounded secured managed domain [SOURCE: ISO 21217:2014, Clause 4]

2) To be published.

C-ITS	cooperative-ITS
ITS	intelligent transport system
ITS-S	ITS station
LDM	local dynamic map
SDOs	standards development organizations
V2V	vehicle to vehicle communications
WCP	wireless communications platform
WIP	wireless Internet platform

4 Cooperative-ITS

4.1 General

Cooperative-ITS (C-ITS) is the terminology to be used in place of "cooperative systems" in new ITS-related standards produced by ISO, ETSI, CEN, and other ITS standards development organizations.

The definition of cooperative-ITS in Clause 3 was developed through collaboration between ISO, ETSI, CEN, and representatives from other standards development organizations, and can be found in a similar version in the "Joint CEN and ETSI Response to Mandate M/453" dated 15 April 2010.

C-ITS is a subset of ITS in which ITS station units applying the principles of a bounded secured managed domain (BSMD) communicate and share information with each other to assist or enable service provision, and station units used in ITS that do not apply these BSMD principles of trust provide information to each other in an interoperable manner to offer advice and/or facilitate actions. The objective of C-ITS is to improve safety, sustainability, efficiency, and comfort above and beyond that which can be achieved without C-ITS.

C-ITS is best described in terms of ITS services and ITS applications rather than the hardware or software used to instantiate them. Note that the ITS station architecture also supports download and execution of these ITS applications via different access technologies that will enable the provision of ITS services in a manner similar to that used in smart phones.

4.2 Cooperative-ITS attributes and features

An essential attribute of C-ITS is that information is shared between different ITS-S application processes providing ITS services in a single ITS station and between different ITS-S application processes running in different ITS stations.

Cooperative-ITS is typically characterized by the following:

— the collaboration in the activities needed to provide a service by two or more ITS-S application processes in one or more ITS stations so that they can interact with each other through communication networks;

— the sharing of information among ITS stations in various roles (e.g. located in vehicular, roadside, central, and/or personal ITS subsystems);

— the sharing of information between ITS-S application processes in a single ITS station;

— the sharing of resources (communication, positioning, security,…) by ITS-S application processes in an ITS station;

Cooperative-ITS takes into account the following implementation related issues:

— activities of ITS-S application processes in ITS station should not cause any increased hazard to the activities being carried out by ITS-S application processes in any other ITS station, or to any end user;

— compliance with the relevant national and/or regional privacy regulations;

— assignment by an ITS-S application process of a defined level of trust to the data or information it receives from any other ITS-S application process.

It is important to note that C-ITS is neither dependent upon nor tied to any specific communication medium or networking technology. The exchange and sharing of information between and among ITS-S application processes can be accomplished using any and all available media and networking technologies that meet the requirements of those ITS-S application processes.

4.3 Perspectives of cooperative-ITS

4.3.1 Overview

There are three perspectives from which cooperative-ITS can be viewed. They are

— communications network perspective,

— service perspective, and

— cooperative activity perspective.

A description of these three perspectives follows.

4.3.2 Communications network perspective

From a network perspective, cooperative-ITS is a network consisting of ITS stations linked together through communication networks.

Note that from a network perspective, there is no difference between ITS and cooperative-ITS. The differences are with respect to trust and cooperation.

Figure 1 illustrates networking between ITS stations applying the principle of a BSMD and other ITS stations including those with a station architecture different to the one specified in ISO 21217.

These networks enable ITS stations to share data in an optionally secure manner.

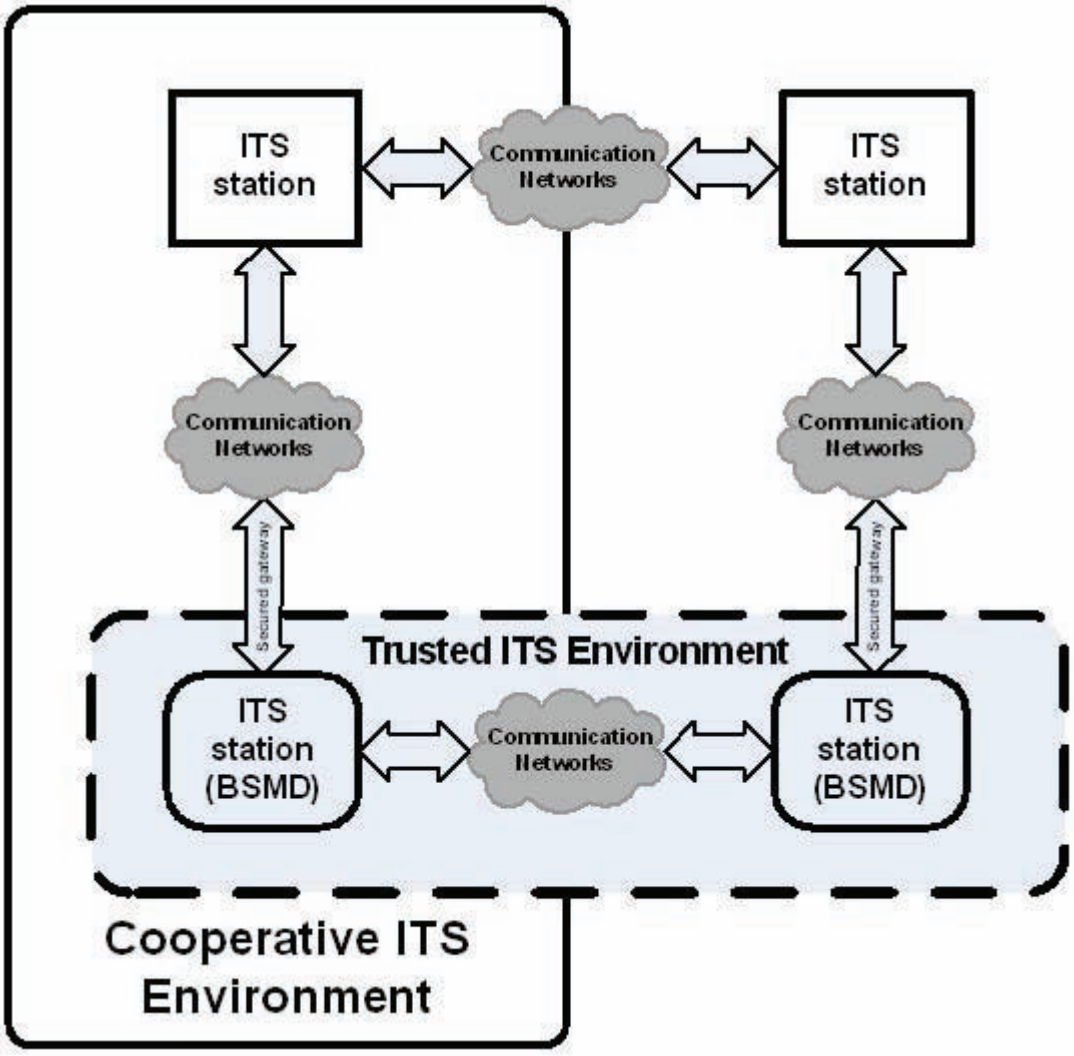

Figure 1 — Communications Network Perspective

The functionality that ITS stations are expected to provide and the way that they will communicate with each other within the cooperative-ITS environment is described in ISO 21217. ISO 14813-1 describes the ITS services that C-ITS can provide.

4.3.3 Service perspective

From an ITS service perspective, cooperative-ITS is part of an advanced form of ITS that shares data across ITS application areas. This sharing of data can be among ITS-S application processes inside of an ITS station, and also among ITS-S application processes in different ITS stations. For example, information generated by a safety ITS-S application process in an ITS station can be shared with traffic efficiency ITS-S application processes both inside and outside the ITS station.

4.3.4 Cooperative activity perspective

From an activity perspective, cooperative-ITS is the collaboration among ITS stations, interacting with each other through communication networks, to provide ITS services, where ITS-S application processes in these ITS stations engage in “cooperative-ITS activities”. Collaboration in a cooperative-ITS activity involves the sharing of information between and among ITS-S application processes in ITS stations. This sharing of information leads to the deployment of new and improved ITS services for increasing safety,

sustainability, efficiency, and comfort of transportation systems. Two examples of a cooperative-ITS activity are

— the transmission of safety-related information from devices delineating the boundaries of zones of road works (sometimes called “road cones”) to ITS stations in nearby vehicles where different ITS-S application processes make use of the information, and

— the exchange of real-time status information between ITS stations in public transport vehicles and ITS stations located in traffic signal controllers, to grant priority access to vehicles at intersections.

In cooperative-ITS, a service can involve more than one ITS-S application process. These ITS-S application processes will need to share data and can be located in one or more ITS stations. The data (information) provided through the activities of ITS-S application processes can be used to provide other ITS services, or to be disseminated through ITS-S application processes providing other ITS services. The exchange of data between ITS-S application processes in the same ITS station will be done via an LDM (described in ISO/TS 18750), where ITS-S application processes can store LDM data objects in it, and/or can query such objects. Sharing of data in an ITS station can also take place using the common ITS station facilities layer message handler (specified in ISO 17429), where received messages (in a common standardized format) from various ITS message sets are made available to those ITS-S application processes who have registered to receive them.

4.4 ITS station reference architecture

As illustrated in Figure 1, the ITS station is an important element of the cooperative-ITS environment. ITS stations are essentially communication platforms containing ITS-S application processes that provide ITS services. The ITS station reference architecture is defined in ISO 21217 and in ETSI EN 302 665. It is illustrated by the high-level view shown in Figure 2 and is a simplified copy of Figure 9 in ISO 21217.

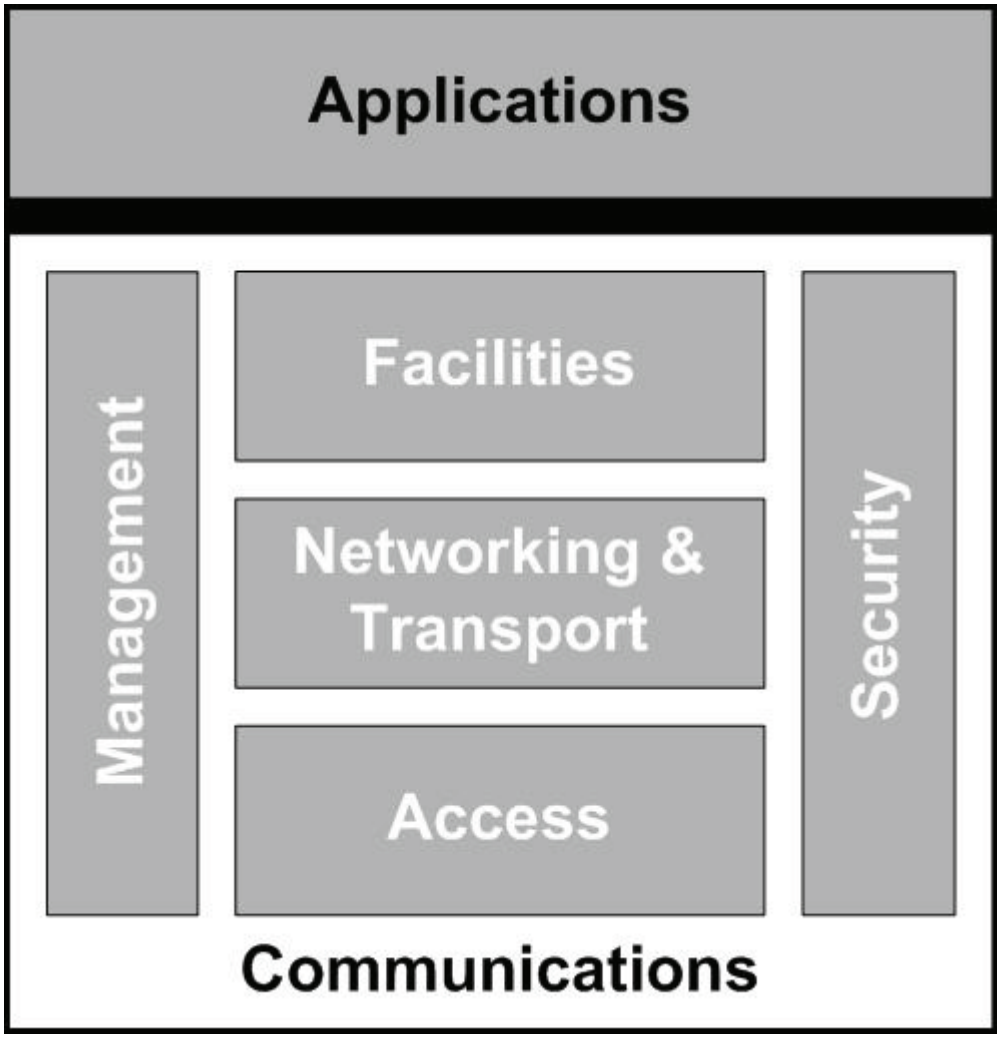

Figure 2 — ITS station reference architecture

ITS-S application processes can communicate and exchange data with other ITS-S application processes and do so in an ITS communication network as peers using the functionality in the "Communications" block shown in Figure 2. These peer-to-peer communications can take place using any available communications networks at the current physical location of the ITS station. If the physical location of the ITS station changes, then, discovery of and switching between available communications networks can be seamless so far as the ITS-S application processes that are exchanging data are concerned.

An ITS station can be implemented in different implementation contexts. The ITS stations can be in vehicles, in road-side furniture, in traffic control, management and service centres, hand-held units, etc.

EXAMPLE The four contexts illustrated in Figure 3, (which is a direct copy of Figure 25 in ISO 21217:2014).

There are no restrictions of implementation contexts that can be considered for any particular C-ITS implementation. It is also possible for the hand-held units to be smart phones, and for these to have a direct communication with the ITS station in a vehicle.

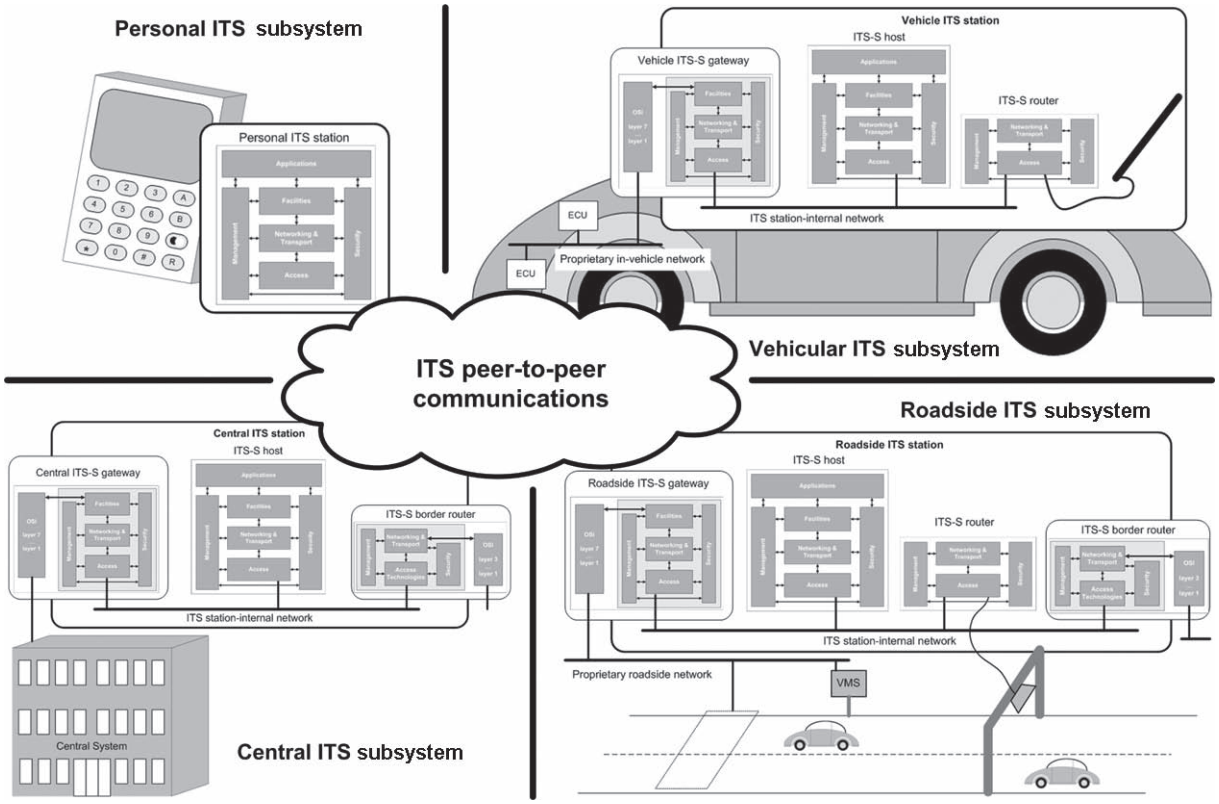

Figure 3 — ITS subsystems and peer-to-peer communications

Note that the ITS peer-to-peer communications represent one or more of the several and different communications networks that can be utilized to enable ITS stations to communicate and exchange data with each other.

4.5 Example of a vehicle based ITS station

C-ITS should not be considered as a different and new form of functionality. As an example, vehicle-based ITS stations cooperating in C-ITS should be seen as specialized instances of a “wireless communications platform” (WCP), and in most cases as an instance of a “wireless Internet platform” (WIP), much in the same way as we see this on a “smartphone” running multiple “apps” on a WIP. Where ITS stations in vehicles differ from any other WCP/WIP available instantiations is that

a) they can gain access to a large number of different communications media,

b) they can support communications sessions using multiple media (receiving using one wireless medium, and transmitting using another),

c) they will have the ability to permit specialized and fast communications exchanges for ITS services that use time-critical ITS applications (such as V2V collision avoidance) if required, and

d) they will have to be based on a defined information security concept that (amongst other things) regulates the availability of information, the access to information, and the usage of resources by ITS applications.

Similar features will need to apply to ITS stations that are in personal units and at the roadside. ITS stations that are in traffic control, management, and service centres will not necessarily need the ability to gain access to a large number of different communications media, since once set up, the media that they use will only change at infrequent intervals and in a managed way.

Bibliography

[1] ISO 14813-1:—[3], *Intelligent transport systems — Reference model architecture(s) for the ITS sector — Part 1: ITS service domains, service groups and services*

[2] ISO 17423:2014, *Intelligent transport systems — Cooperative ITS Classification and management of ITS applications in a global context — ITS application requirements for selection of communication profiles*

[3] ISO 17429, *Intelligent transport systems — Cooperative systems — Profiles for processing and transfer of information between ITS stations for applications related to transport infrastructure management, control and guidance*

[4] ISO 21210:2012, *Intelligent transport systems — Communications access for land mobiles (CALM) — IPv6 Networking*

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

[6] ISO 21218:2013, *Intelligent transport systems — Communications access for land mobiles (CALM) — Access technology support*

[7] ISO 24102:2010, *Intelligent transport systems — Communications access for land mobiles (CALM) — Management*

[8] ISO 29281-1:2013, *Intelligent transport systems — Communication access for land mobiles (CALM) — Non-IP networking — Part 1: Fast networking & transport layer protocol (FNTP)*

[9] ISO/TR 12859:2009, *Intelligent transport systems — System architecture — Privacy aspects in ITS standards and systems*

[10] ISO/IEC 10746:1998, *Information technology — Open Distributed Processing — Reference model: Overview*

[11] ISO/IEC 29100:2011, *Information technology — Security techniques — Privacy framework*

[12] ISO/TS 18750:—[4], *Intelligent transport systems — Cooperative systems — Definition of a global concept for Local Dynamic Maps*

[13] TR 102 863, *Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Local Dynamic Map (LDM) Specification*

[14] EN 302 665:2010-09, *Intelligent Transport Systems (ITS); Communications Architecture*

3) To be published.

4) To be published.

ICS 01.040.03;01.040.35;03.220.01;35.240.60

Price based on 9 pages