
**Intelligent transport systems —
Cooperative systems — Contextual
speeds**

*Systèmes intelligents de transport — Systèmes coopératifs — Vitesses
contextuelles*

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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).

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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*.

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Introduction

Traditional fixed speed limits have, in general, been set as the maximum mandatory speed that a vehicle or a category of vehicles can travel at. Such speed limits are defined by the competent authority. Some national authorities moderate mandatory speed limits when road or environment conditions change. When road or environmental conditions change, the decision as to the most appropriate speed a driver or rider should travel is, in general, left up to the individual vehicle driver. With the advent of Cooperative Intelligent Transport Systems (ITS), it has become possible to provide better guidance to vehicle drivers on what speed they should travel at when road, traffic, or environmental conditions are less than ideal. This function is known as Contextual Speed Information Service.

Delivering Contextual Speed information to road users can improve road safety, support traffic management, and reduce greenhouse gas emissions.

In a Cooperative ITS environment, Contextual Speeds are context-dependent (e.g. changed due to weather conditions), as well as time-specific and road section-specific speeds. Subject to local regulations, they can be mandatory speed limits or advisory speeds.

All Cooperative ITS Services follow the same abstract structure of detection (of an event) including pre-processing of the detected content, execution of the Service algorithm (processing of detected content) and presentation or utilization of the Service result. Figure 1 summarizes and further illustrates this process.

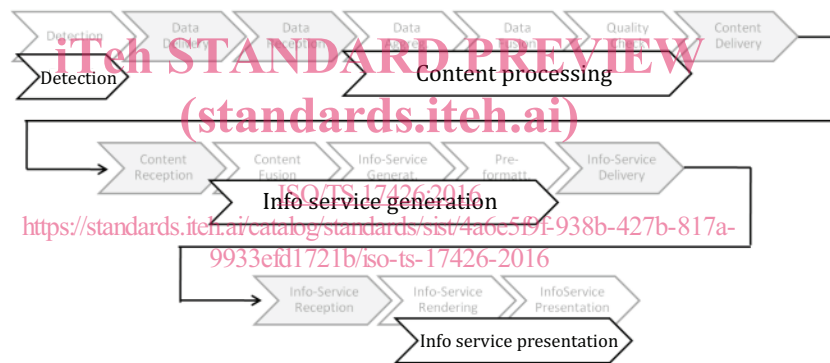


Figure 1 — General Cooperative ITS Service process (from ISO/TS 17427:2014, Figure A.6)

Based on this abstract process description, for any Cooperative ITS Service, a similar process description applies to the Contextual Speed Information Service. Every single step in the process chain can be executed by different actors or stakeholders. Execution of process elements by different stakeholders results in a large number of possible potential scenarios. Additionally, the involvement of stakeholders can be distinguished by spatial geography.

Assuming that there are two main stakeholder groups in Cooperative ITS, namely the Infrastructure and the Vehicle, multiple combinations are possible, as every step can be delivered by a different stakeholder group (see Figure 2).

	CONTENT	SERVICE	PRESENTATION		CONTENT	SERVICE	PRESENTATION
1	Vehicle	Vehicle	Vehicle	5	Infrastructure	Vehicle	Vehicle
2	Vehicle	Vehicle	Infrastructure	6	Infrastructure	Vehicle	Infrastructure
3	Vehicle	Infrastructure	Vehicle	7	Infrastructure	Infrastructure	Vehicle
4	Vehicle	Infrastructure	Infrastructure	8	Infrastructure	Infrastructure	Infrastructure

Figure 2 — Possible scenarios — Simple

The scenarios address different combinations; the basis for every scenario is one specific combination. This Technical Specification addresses the scenario where detection, content pre-processing, and information service generation is the responsibility of the infrastructure stakeholder. The direct presentation of Contextual Speed information on the driver interface of the vehicle is out of the scope of this Technical Specification. This Technical Specification therefore addresses only part of the whole process (Scenario 7).

Within the context of Scenario 7, this Technical Specification addresses Use Case 1 “Provision of mandatory speed limit information into vehicle – for driver awareness purposes” and Use Case 2 “Provision of advisory speed information into vehicle – for driver awareness purposes”.

This does not preclude other Use Cases or deployment models in later Technical Specification(s).

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Intelligent transport systems — Cooperative systems — Contextual speeds

1 Scope

This Technical Specification

- specifies the Contextual Speed Information Service, namely the general requirements regarding the provision of the Contextual Speed Information Service, the data flow supporting the service, and the presentation of the service result,
- specifies the requirements to be fulfilled by the Contextual Speed Information Service,
- specifies the ITS Station (ITS-S) application processes of the vehicle ITS station, roadside ITS station, central ITS station, and personal ITS station that are required to instantiate the Contextual Speed Information Service,
- specifies sets of communication requirements and objectives (profiles) using the methods defined in ISO 17423 to select the level of performance (best effort or real-time, etc.), confidence and security (authentication, encryption, etc.) for each Contextual Speed Information Service communication flow between ITS stations,
- selects relevant functions and procedures provided by the ITS station facilities layer (see ISO 17429), and
- specifies messages, messages sets structure, content, and syntax to be used by the Contextual Speed Information Service.

This Technical Specification considers the scenario for the transmission of Contextual Speed information from the infrastructure/roadside to the vehicle, for onward presentation to the vehicle's driver. This scenario foresees that the calculation of Contextual Speed information is performed on the Infrastructure side, not within the vehicle.

Mandatory speed limits or advisory speed recommendations are output of the Contextual Speed Information Service which (in the scenario considered in this Technical Specification) is run by the Road Operator in its Traffic Control Centre or comparable infrastructure (e.g. Roadside ITS Station). To transfer this information to the vehicle (and therefore the driver) over the air (wireless communication), defined messages are required. These messages are specified in this Technical Specification.

When Contextual Speed information arrives in the vehicle, further pre-processing might be necessary before the Contextual Speed information, and, if available, additional explanations on speed limits or recommendations, can be presented to the driver. This Technical Specification specifies the requirements that need to be fulfilled when processing the messages. It does not specify how the vehicle handles the incoming messages.

The production of information supporting this application, its qualification and its relevance are out of the scope of this Technical Specification.

This Technical Specification addresses Use Case 1 "Provision of mandatory speed limit information into vehicle – for driver awareness purposes" and Use Case 2 "Provision of advisory speed information into vehicle – for driver awareness purposes".

2 Conformance

To claim conformance to this Technical Specification, all mandatory requirements shall be fulfilled by the implementation under test.

NOTE 1 Conformance testing may be different for different roles/actors. This Technical Specification identifies the requirements for a number of Protocol Implementation Conformance Statements (PICS) proforma, allowing to claim conformance to defined subsets of ISO/TS 17426 requirements.

NOTE 2 This Technical Specification adopts the ISO/IEC 9646-7 approach for conformance testing specifications (i.e. development of PICS proforma, TSS&TP, ATS, and PIXIT).

3 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

ISO 24102-3, *Intelligent transport systems — Communications access for land mobiles (CALM) — ITS station management — Part 3: Service access points*

ISO 24102-6¹⁾, *Intelligent transport systems — Communications access for land mobiles (CALM) — ITS station management — Part 6: Path and flow management*

ISO/TS 17419, *Intelligent transport systems — Cooperative systems — Classification and management of ITS applications in a global context*

ISO/TS 17423, *Intelligent transport systems — Cooperative systems — ITS application requirements and objectives for selection of communication profiles*

ISO/TS 17425, *Intelligent transport systems — Cooperative systems — Data exchange specification for in-vehicle presentation of external road and traffic related data*

ISO/TS 17427, *Intelligent transport systems — Cooperative systems — Roles and responsibilities in the context of cooperative ITS based on architecture(s) for cooperative systems*

ISO/TS 17429²⁾, *Intelligent transport systems — Cooperative ITS — ITS station facilities for the transfer of information between ITS stations*

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

ISO/TS 19321, *Intelligent transport systems — Cooperative ITS — Dictionary of in-vehicle information (IVI) data structures*

4 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 21217, ISO 24102-3, ISO 24102-6, ISO/TS 17419, ISO/TS 17423, ISO/TS 17425, ISO/TS 17427, ISO/TS 17429 and the following apply.

4.1 advisory speed

speed set by an authority which it considers appropriate to the road, traffic, or environmental conditions being experienced

1) To be published.

2) To be published.

4.2**advisory speed information**

set of C-ITS data elements related to an advisory speed

4.3**C-ITS authority data set**

set of C-ITS data elements describing policies or regulations

4.4**contextual speed**

context-dependent (e.g. weather conditions), as well as time-specific and road section-specific speed

Note 1 to entry: Subject to local regulations, a Contextual Speed may be a mandatory speed limit or an advisory speed.

4.5**contextual speed information**

set of C-ITS data elements related to a Contextual Speed

4.6**mandatory speed information**

set of C-ITS data elements related to a *mandatory speed limit* (4.7)

4.7**mandatory speed limit**

legally defined, maximum or minimum, speed limit for specific types or classes of vehicles or all vehicles on a defined section of road

4.8**relevance zone**

parts of the road network for which the *contextual speed* is valid

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5 Symbols and abbreviated terms

ADU	Application Data Unit
ATS	Abstract Test Suite
BSMD	Bounded Secured Managed Domain
C-ITS	Cooperative ITS
CSM	Contextual Speed Message
HMI	Human Machine Interface
ICT	Information Communications Technologies
ITS	Intelligent Transport Systems
ITS-AID	ITS Application Identifier
ITS-S	ITS Station
ITS-SCU	ITS-S Communication Unit
ITS-SU	ITS-S Unit
LDM	Local Dynamic Map
n.a.	not applicable
OEM	Original Equipment Manufacturer
PDU	Protocol Data Unit
PICS	Protocol Implementation Conformance Statement
PIXIT	Protocol Implementation eXtra Information for Testing
TSS&TP	Test Suite Structure and Test Purposes

6 Contextual Speeds: Architecture

The architecture of the ITS station (ITS-S) specified in ISO 21217 is illustrated in [Figure 3](#).

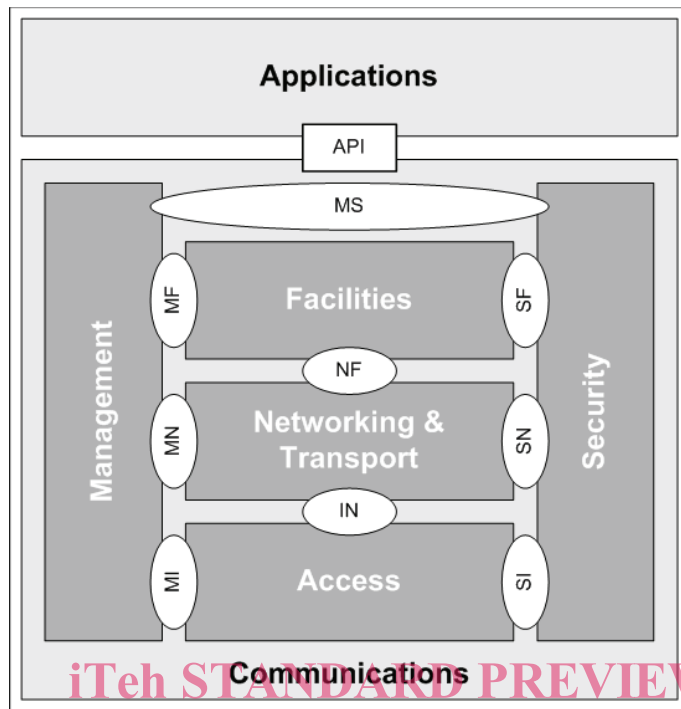


Figure 3 — Simplified ITS-S reference architecture (from ISO 21217)

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The Contextual Speed Information Service is provided to users by execution of the Contextual Speed Application. The Contextual Speed Application is an instantiation of the Contextual Speed Information Service that involves the association of complementary ITS-S application processes.

In order to be able to install and execute these ITS-S application processes in an ITS station unit (ITS-SU) operated as a Bounded Secured Managed Domain (BSMD) specified in ISO 21217, registration procedures identified in ISO/TS 17419 shall be applied.

The Contextual Speed Application requires communications between these ITS-S application processes residing in ITS station units. Such communications include the exchange of Contextual Speed Messages (CSM).

In order to enable communications between ITS-S application processes residing in different ITS Station Communication Units (ITS-SCU) prior to transmission of application data units (ADUs), each ITS-S application process has to register at the ITS-S management and present its communication requirements as specified in ISO/TS 17423. Required values to be presented for the ITS-S application processes of the Contextual Speed Application are specified in [Clause 11](#).

Upon this registration and presentation of communication requirements, the ITS-S management will identify the most appropriate communication profile for each source of data and assign a “FlowID” to it as specified in ISO 24102-6.

Communications requires features of the ITS-S facilities layer both for transmission and for reception of ADUs as specified in ISO/TS 17429.

The Contextual Speed Application requires that their related ITS-S application processes provide received geo-referenced and time-stamped information to a Local Dynamic Map (LDM) specified in ISO/TS 18750. The LDM is the key element to enable cooperative behaviour in an ITS-SU, i.e. the sharing of data between applications.

The Contextual Speed Application requires retrieving LDM data elements either by a subscription mechanism or by a query mechanism.

The Contextual Speed Application is uniquely identified by the registered “ITS Application Identifier” (ITS-AID) specified in ISO/TS 17419.

NOTE Contextual Speed Application uses predefined messages from the ITS Message Set as uniquely identified by the registered “ITS Message Set Identifier” (ITS-MsgSetID) specified in ISO/TS 17419. The values of ITS-AID and ITS-MsgSetID will be assigned by the respective registration authority. The numbering of messages in this ITS Message Set is as uniquely defined for this ITS Message Set.

7 Contextual speeds: Use cases

7.1 General

The Contextual Speed Information Service is provided to users by execution of the Contextual Speed Application. The Contextual Speed Application provides information from a sending ITS station to an ITS station in a vehicle. The sending ITS station is typically a roadside or a central ITS station. The ITS station in a vehicle may either be a vehicle ITS station or a personal ITS station. The information supported by the Contextual Speed Application concerns either static or dynamic advisory speed guidance or mandatory speed limits. This information is typically provided by road/traffic managers or authorized service providers to drivers in order to improve the road safety, reduce environmental impact, and enhance the traffic flow.

NOTE 1 Traditionally, much of this information is available on fixed plate road traffic signs or variable displays at the roadside or mounted above or to the side of specific lanes.

As an element of the Contextual Speed Information Service is the ability to transfer and use information from an external environment into the vehicle for subsequent presentation, it is essential that the service provides stable, robust, and reproducible results given a specified input condition especially in respect of mandatory speed limits.

Furthermore, some basic safety and legal constraints are necessary, such that advisory speed outputs shall never exceed the maximum mandatory speed limit (for the vehicle class, driver qualifications and other legally enforceable conditions that may apply) for defined identifiable sections of road. Similarly, the advisory speed shall never be less than a minimum mandatory speed limit (for legally enforceable conditions).

Both mandatory and advisory speed outputs shall relate to defined, repeatable, resolvable locations.

Where the Contextual Speed Information Service is used to convey mandatory speed limits, the application service provider shall ensure robust recording of mandatory speed limit information disseminated.

NOTE 2 Advisory speed may be provided for eco-driving (ecologic and economic) with the objective to reduce pollution and energy consumption costs.

The use cases identified are the following:

- Use case 1: Provision of mandatory speed limit information into vehicle – for driver awareness purposes;
- Use case 2: Provision of advisory speed information into vehicle – for driver awareness purposes.

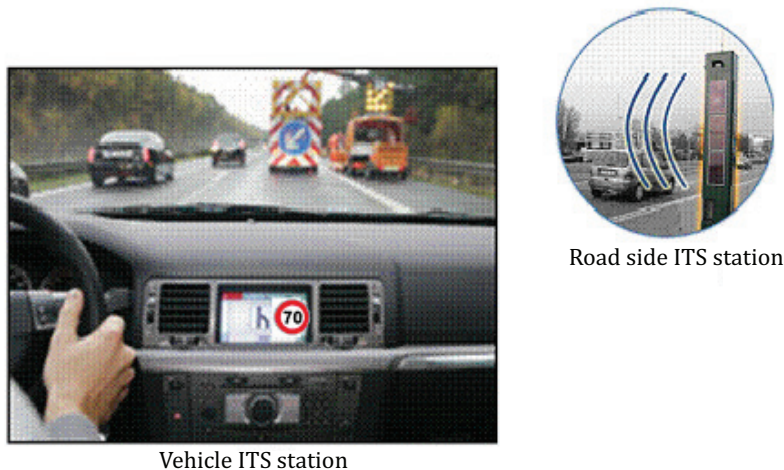


Figure 4 — Display of Contextual Speed information (courtesy Renault)

7.2 Use case 1: Provision of mandatory speed limit information into vehicle – for driver awareness purposes

Table 1 gives details of the Use case 1 for provision of mandatory speed limit information into vehicle – for driver awareness purposes.

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Table 1 — Use Case 1: Provision of mandatory speed limit information into vehicle – for driver awareness purposes

Use case name	Provision of mandatory speed limit information into vehicle – for driver awareness purposes
Use case description	<p>This use case foresees the Contextual Speed Information Service providing information from a sending ITS station (typically a roadside or central ITS station) to an ITS station in a vehicle (typically a vehicle ITS station or a personal ITS station) concerning either static or dynamic mandatory speed limits.</p> <p>This information is presented through the vehicle’s machine to human interface (HMI) to warn the vehicle’s driver if a maximum speed limit is being exceeded (with user defined buffer) or that a minimum speed limit is not being achieved (with user defined buffer).</p> <p>This information shall be provided by an OEM or Content Service Provider (see Clause 8) as an authorized source. This source may often be road/traffic managers or authorized service providers. The Contextual Speed information is presented to drivers in order to improve the road safety, reduce environmental impact, and enhance the traffic flow.</p>
Use case scope	<p>The scope of this Use Case is the definition of the exchange from an ITS station (roadside or central ITS station) to an ITS station in a vehicle – for the provision of information concerning mandatory speed limit(s) into the vehicle – for driver awareness purposes.</p> <p>It does not include the exchanges of data between the sending ITS station and any other source systems, or vice versa; the mechanism for production of the Contextual Speed Message; or any actions taken by the vehicle’s systems on receipt of the Contextual Speed Message.</p>
Target system release	Cooperative ITS – Infrastructure-to-Vehicle applications
Generality/abstraction level	High-level abstract