# TECHNICAL SPECIFICATION

First edition 2012-12-15

## Intelligent transport systems — Eventbased probe vehicle data

*Systèmes intelligents de transport — Données de sonde du véhicule basées sur les événements* 

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ISO/TS 29284:2012 https://standards.iteh.ai/catalog/standards/sist/63c9fab6-c2da-450b-a510d3f0ea059271/iso-ts-29284-2012



Reference number ISO/TS 29284:2012(E)

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Published in Switzerland

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## Foreword

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of document:

- an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;
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ISO/TS 29284 was prepared by Technical Committee ISO/TC 204, Intelligent transport systems.

### Introduction

Probe vehicle systems are being investigated and deployed throughout the world. It is expected that the number of practical systems will grow steadily over the next few years. In TC 204/SWG 16.3, probe vehicle systems and probe data have been examined, and it is concluded that in many cases communications airtime will be a scarce and expensive commodity, and therefore efficient probe data reporting systems which rely on techniques to use airtime efficiently and economically are essential. One way to accomplish this is to shift data aggregation tasks in to the probe vehicle itself. Vehicles that feature this advanced form of on board probe data processing will report information based on the occurrence of actual events as opposed to delivering a constant stream of raw vehicle probe data. Event-based probe data reporting will allow economic use of communication capacity.

As probe vehicle systems have to collect and manage probe data from a variety of vehicles from different vehicle manufacturers, the standardization of these event-based messages is essential. To do this, a common framework for event-based probe vehicle message reporting is also required.

The purpose of this project is to develop (1) a reference architecture for event-based probe data reporting within an architecture which encompasses both this function and standard probe data reporting defined in ISO 22837; (2) the basic data framework for defining event-based probe data messages; and (3) the concrete definition of these messages.

The benefits of this standardization include:

- It helps system developers and operators to specify efficient probe data collection and processing systems. It also promotes communication and mutual understanding among the developers and the operators of probe systems.
- It helps system developers who are developing probe vehicle systems to define a key tool for communications-efficient probe data systems, i.e. event-based probe data reporting.
- Probe data may be collected from various vehicles of different vehicle manufacturers. It provides a common framework for handling event based probe data.

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# Intelligent transport systems — Event-based probe vehicle data

#### 1 Scope

This Technical Specification specifies:

- reference architecture for event-based probe vehicles which encompasses event-based probe data and standard probe data elements (ISO 22837:2009);
- basic data framework of event-based probe data reporting, based on ISO 22837:2009;
- the definition of an initial set of event-based probe data elements. These elements will be commonly used in typical event-based probe data enabled application domains, such as traffic, weather, and safety. Standardizing these event-based probe data elements facilitates the development of probe vehicle systems and the distribution of probe data. This is not intended to be an exhaustive listing of event-based probe data elements.

This Technical Report provides a common framework for defining event-based probe data messages to facilitate the specification and design of probe vehicle systems.

It provides concrete definitions of event-based probe data elements.

It serves as a supplement to ISO 22837.2009, and specifies additional normative data (probe data elements) that are delivered by an event-based probe data system.

2 Normative references d3f0ea059271/iso-ts-29284-2012

The following referenced documents are indispensable for the application 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 22837:2009, Vehicle probe data for wide area communications

#### 3 Terms and definitions

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

#### 3.1

#### probe vehicle system

system consisting of vehicles which collect and transmit probe data and land-based centres which collate and process data from many vehicles to build an accurate understanding of the overall roadway and driving environment

[ISO 22837:2009, 4.1]

#### 3.2

#### vehicle sensor

device within a vehicle that senses conditions inside and/or outside the vehicle or that detects actions that the driver takes

[ISO 22837:2009, 4.2]

#### 3.3

#### probe data

vehicle sensor information formatted as probe data elements and/or probe messages that is processed, formatted, and transmitted to a land-based centre for processing to create a good understanding of the driving environment

[ISO 22837:2009. 4.3]

#### 3.4

#### event-based probe message

stuctured collation of probe data elements that represents occurrence of a defined event for transmission to a land-based centre

Note 1 to entry: An event-based probe data message is sent only when a specific incident or event occurs. It is not transmitted in a periodic manner. The transmission of an event-based probe message itself indicates that an event has occurred. An event-based probe message is defined as a probe message that is not triggered by a periodically occurring condition (i.e. time or distance). A typical trigger is the detection of a different situation by the vehicle on board system (i.e. low visibility or traffic jam entry). An event may be defined as a simple incident, such as a change in status of a standard probe data element (i.e. fog light switching state), or can refer to a complex incident detected by a detection algorithm (i.e. traffic jam entry).

#### 3.5

#### probe data element

data item included in a probe message

[ISO 22837:2009, 4.4]

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# 3.6

## event-based probe data element (standards.iteh.ai)

item of data included in an event-based probe message, typically describing the event that has triggered the transmission of the message ISO/TS 29284:2012

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#### core data element

probe data element which appears in all probe messages

[ISO 22837:2009, 4.5]

#### 3.8

#### probe message

structured collation of data elements suitable to be delivered to the onboard communication device for transmission to a land-based centre

Note 1 to entry: It is emphasized that a probe message should not contain any information that identifies the particular vehicle from which it originated or any of the vehicle's occupants, directly or indirectly. In delivering a probe message to be transmitted by the onboard communication device, the onboard data collection system will request that the message be packaged and transmitted without any vehicle or occupant identifying information. [ISO 22837:2009, 4.6]

#### 3.9

#### processed probe data

data from probe data messages which has been collated and analysed in combination with other data

[ISO 22837:2009, 4.7]

#### **Reference architecture** 4

#### 4.1 Reference architecture for probe vehicle systems

The reference architecture for probe vehicle systems presents the initial categorization of system components and their relationships from a conceptual point of view. A component is depicted as a

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UML class and represents an encapsulation of functions and data that is conceptually considered as an individual entity in the probe vehicle system. A relationship is depicted as a UML association and represents potential control and/or data flow among components.



#### ISO/TS 29284:2012 Figure 1 — Overall structure of the reference architecture for probe vehicle systems d3f0ea059271/iso-ts-29284-2012

The followings are the components of this reference architecture.

• **Onboard data source** (from ISO 22837:2009). The onboard data source provides original data that will become a probe data element. Original data may be raw sensor data or data from other onboard applications. Onboard data sources may be (various types of) sensors, onboard systems, etc.

• **Probe data element generation** (from ISO 22837:2009). Probe data element generation creates probe data elements from original data. All of the following cases are included: 1) no processing (probe data element is identical to original data), 2) normalize original data (probe data element is the result of performing a calculation or transformation on original data), and 3) process original data to generate new type of data (multiple items of original data are processed, possibly over a time period, to produce the probe data element, e.g. "traffic jam detected").

• **Event-based probe data element generation.** Event-based probe data element generation creates from probe data elements that represents occurrence of a defined event.

• **Probe message generation** (from ISO 22837:2009). Probe message generation creates and formats probe messages from probe data elements and sends them to probe collection. Here, "send" is at the application layer, not the communication layer. Probe message generation manages the timing of sending messages as an application issue. Actual message transmission out the vehicle is left to the communication layer. Probe message generation may refer to stored reference data, to assist with data transformation or to help determine whether a probe message should be sent.

• **Event-based probe message generation.** Event-based probe message generation is a special type of probe message generation that creates and formats event-based probe messages from event-based probe data elements and sends them to probe collection when the event is detected.