
**Intelligent transport systems — Probe
data reporting management (PDRM)**

*Systèmes intelligents de transport — Management de rapport de
données de sonde (PDRM)*

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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.

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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.
- an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

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An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

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.

ISO/TS 25114 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. Since communications airtime will always be a scarce and expensive commodity, efficient probe data reporting systems must rely on techniques to use airtime efficiently and economically. One way to accomplish this is to have the probe processing center guide the economic collection of necessary probe information by sending reporting management instructions to probe vehicles, that is probe data reporting management (PDRM).

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

This Technical Specification

- 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 vehicle systems, and
- helps system developers who are developing probe vehicle systems to define a key tool for communications-efficient probe vehicle systems, i.e. PDRM.

This Technical Specification also provides [standards.iteh.ai](https://standards.iteh.ai/catalog/standards/sist/73622d42-f0ca-48d2-bb1f-2535eb4510e/iso-ts-25114-2010)

- a) a reference architecture for PDRM within an architecture which encompasses both this function and PDRM defined in ISO 22837,
- b) the basic data framework for defining PDRM instructions, and
- c) the concrete definition of these instructions.

PDRM enables a landside probe processing center to issue requests to probe vehicles to optimize probe data reporting. A preliminary set of management instructions for PDRM are defined which support selective probe data reporting and the efficient use of communications airtime.

A reference model is provided which incorporates the reference model of ISO 22837, vehicle probe data for wide area communications, and also encompasses PDRM aspects.

Intelligent transport systems — Probe data reporting management (PDRM)

1 Scope

This Technical Specification provides a common framework for defining probe data reporting management (PDRM) messages to facilitate the specification and design of probe vehicle systems and gives concrete definitions of PDRM messages.

This Technical Specification specifies

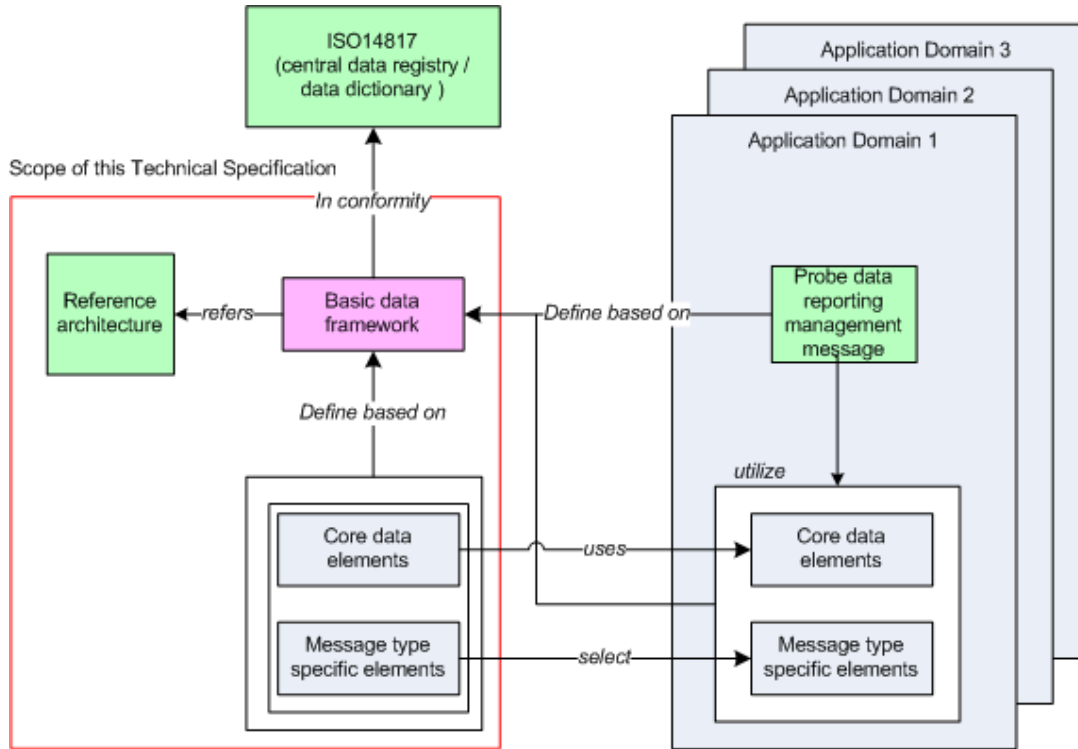
- a) reference architecture for probe vehicle systems and probe data which incorporates PDRM based on the reference architecture for ISO 22837, and
- b) basic data framework for PDRM instructions, which defines specifically
 - 1) necessary conditions for PDRM instructions, and
 - 2) notations of these instructions (in XML).

This Technical Specification also provides the rules for using PDRM instructions.

Different types of PDRM messages are also identified and defined, such as

- a) PDRM messages consisting of individual instructions which define reporting aspects or requirements for probe vehicle systems,
- b) start/stop all probe data reporting,
- c) start/stop probe data reporting of specific probe data elements, and
- d) generic scheme for conveying criteria for reporting specific probe data elements.

PDRM instructions may be structured in terms of a time period in which they are valid (duration), geographic region, and roadway heading to which the instruction applies.



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Figure 1 — Scope of this Technical Specification
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2 Normative references

[ISO/TS 25114:2010](#)

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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 14817, *Transport information and control systems — Requirements for an ITS/TICS central Data Registry and ITS/TICS Data Dictionaries*

ISO 22837:2009, *Vehicle probe data for wide area communications*

ISO 1000, *SI units and recommendations for the use of their multiples and of certain other units*

ISO/IEC 8824-1:2008, *Information technology — Abstract Syntax Notation One (ASN. 1): Specification of basic notation*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 22837 and the following apply.

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

3.2 probe data element
 data item included in a probe message

3.3**probe message**

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

NOTE 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.

3.4**PDRM commands**

commands sent within probe vehicle systems to manage the content and transmission of probe messages

EXAMPLES

- Selectively enable or disable various levels of probe data reporting
- Selectively enable or disable reporting of particular types of probe data
- Adjust the criteria for probe data reporting for specific probe data elements (for example, do not report a smaller than ± 3 degree difference in air temperature)
- Adjust the criteria for probe data reporting for specific probe data elements based on the delta value

NOTE These PDRM commands can be structured with time and/or geographic information to define a context in which they are valid.

3.5**PDRM common data element**

one of several data elements that are included in all PDRMs

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3.6**PDRM instruction type-specific elements**

elements particular to the PDRM instruction type

NOTE The instruction types are data capture, threshold and delta.

3.7**PDRM messages**

message containing one or more PDRM instructions within a message structure

3.8**probe vehicle system**

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

3.9**processed probe data**

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

3.10**vehicle sensor**

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

4 Reference architecture

4.1 General

Meta-architecture encompassing PDRM messages and also probe data reporting is specified in ISO 22837.

The reference architecture for PDRM presents the initial categorization of system components and their relationships from a conceptual point of view. A component is depicted as a UML class and represents an encapsulation of functions and data that is conceptually considered as an individual entity in the PDRM instructions. A relationship is depicted as a UML association and represents potential control and/or data flow among components.

Figure 2 shows the overall structure of the reference architecture for PDRM instructions.

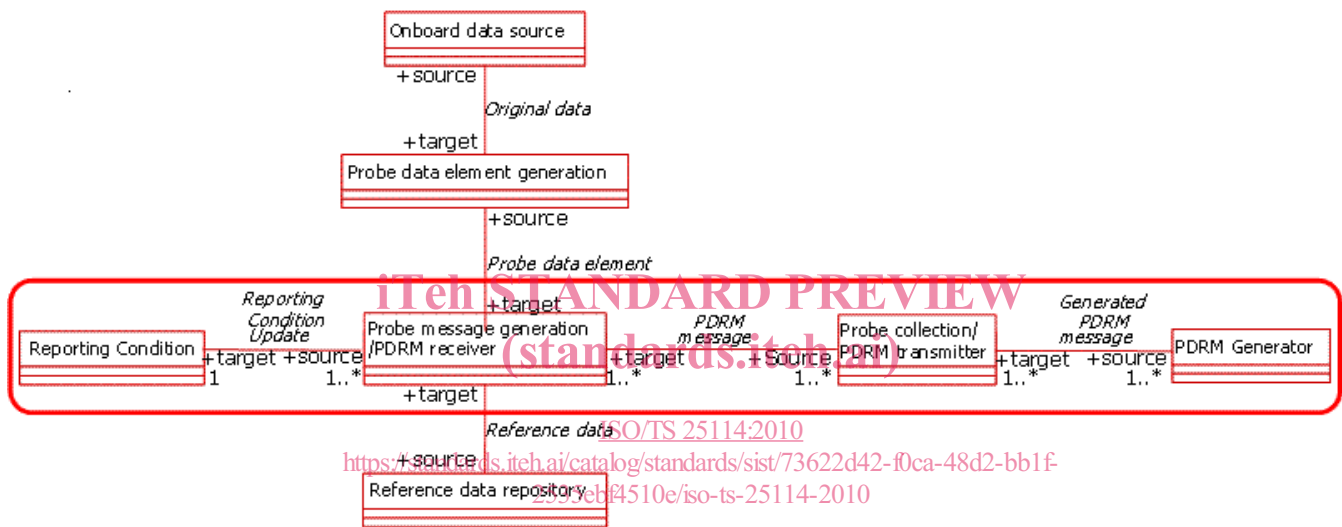


Figure 2 — Reference architecture for PDRM

The components of this reference architecture are specified in 4.2 and 4.3.

4.2 Referenced data repository

Referenced data repository holds data for reference by the probe message generator.

4.3 Onboard data source

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 or onboard systems.

4.4 PDRM generator

Landside provides the mechanism that creates the PDRM message as specified by the probe processing center.

4.5 Probe data element generation

Probe data element generation describes a process for creating probe data elements from original data, including

- a) no processing (probe data element is identical to original data),
- b) normalizing original data (probe data element is the result of performing a calculation or transformation on original data), and
- c) processing 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").

4.6 Probe collection

Probe collection describes a process a landside activity undertakes that receives probe messages sent by vehicles and extracts probe data from these messages.

4.7 PDRM transmitter

The PDRM transmitter functionality sends PDRM messages as described by the PDRM generator.

4.8 Reporting condition

The probe data reporting condition of a probe message is determined by a PDRM message. This Technical Specification expects on-board devices utilizing this Technical Specification to possess the ability to process PDRM messages based on the availability of the probe data elements to the on-board device or vehicle.

4.9 PDRM message

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A PDRM message is a message in a probe vehicle system that contains commands for controlling probe data collection and transmission. Commands include

- a) selectively enabling or disabling various levels of probe data reporting,
- b) selectively enabling or disabling reporting of particular types of probe data,
- c) adjusting the criteria for probe data reporting for specific probe data elements (for example, do not report a smaller than ± 3 degree difference in air temperature), or
- d) adjusting the criteria for probe data reporting for specific data elements based on the delta value. These messages can be structured with time and/or geographic information which define windows/regions within which to apply the instructions.

4.10 Probe message generation

Describes a process by which probe messages are created. This may involve commands in PDRM messages and other criteria not specifically contained in a PDRM message.

4.11 PDRM receiver

Describes the process a probe vehicle system follows to provide a filtering functionality based on received PDRM messages. The PDRM receiver receives PDRM messages and processes for relevance to vehicle location, heading and time.

5 Basic data framework

5.1 General

The basic data framework describes the way to define PDRM instructions. Each message is specified in accordance with ISO 14817. As the PDRM message is based on the probe messages described in ISO 22837, the probe data elements and probe message formats shall conform to the data framework therein.

5.2 PDRM data element

The following are the requirements for specifying a PDRM data element.

- a) A PDRM data element shall consist of a (property of a class, value) pair, e.g. ObjectClassTerm.propertyTerm:value-domain-term.
- b) Each PDRM data element should have the following meta attributes:
 - 1) **descriptive name:** A name in the form of the PDRM data element "ObjectClassTerm.propertyTerm:value-domain-term". Descriptive name is used for the identification of PDRM data element.
 - 2) **ASN.1 name:** The ASN.1 name shall be the name of a data concept expressed as a valid "typereference" as defined in 12.2 of ISO/IEC 8824-1:2008.
 - 3) **ASN.1 object identifier:** A unique ASN.1 object identifier in accordance with ISO/IEC 8824-1.
 - 4) **definition:** A statement in natural-language text that expresses the essential meaning of the PDRM data element and assists humans in differentiating the data element from all other data elements.
 - 5) **descriptive name context:** A designation of the ITS/TICS functional area within which the descriptive name is relevant. The descriptive name context for each PDRM data element is "PDRM".
 - 6) **data concept type:** A categorization of the kind of data concept. The data context type of each PDRM data element is "PDRM data element".
 - 7) **standard:** The alphanumeric designation of the standard, or other reference, that defines and describes the PDRM data element, typically the functional Data Dictionary standard that defines the PDRM data element.
 - 8) **data type:** The logical representation of the PDRM data element as expressed as a valid data concept instance of an ASN.1 data type.
 - 9) **format:** A natural language description of the logical layout of the data concept to facilitate interchange of data.
 - 10) **unit of measure:** Units shall be defined in accordance with ISO 1000. For units of enumeration, such as equipment or units of issue, the standard measure shall be defined using this meta attribute.
 - 11) **valid value rule:** A natural-language text definition of the rule(s) by which permissible legal instances of a PDRM data element are identified.
 - 12) **data quality:** Specifies the details of data quality for a PDRM data element. Multiple items may be required to describe data quality, with some items being qualitative and others quantitative.

NOTE These basic meta attributes are specified either as mandatory or as optional in ISO 14817, but are mandatory for PDRM data elements.

- c) When a probe data dictionary is registered to the data registry, it should comply with ISO 14817; administrative meta attributes which are mandatory should be described.