International Standard

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Intelligent transport systems — Definition of data elements and data frames between roadside modules and signal controllers for cooperative signal control

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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 document 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).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems.*

This first edition of ISO 19082 cancels and replaces the first edition of ISO/TS 19082:2020, which has been technically revised.

The main changes are as follows:

— ASN.1 modules have been specified;

— certain data elements have been imported from other documents and the related references have been clarified;

— an architecture reference model has been added.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

Signal controllers and traffic control centres optimize signal timings based on real-time traffic information for each approach. For example, signal controllers can extend the green time for an approach with a long queue.

The aim of this document is to define data elements and data frames that are useful for optimising local and coordinated signal operation.

ISO 22951, on the pre-emption and prioritization signal system for emergency and public transport vehicles (PRESTO), specifies the message sets for signal system pre-emption and priority for transit vehicles, including communications between roadside modules and signal controllers. This document complements ISO 22951 by defining message sets for traffic information that is useful for optimizing normal signal operations. Thus, signal controllers and traffic management centres can generate signal timings referring to the messages of ISO 22951 (PRESTO) and this document. The relationship between this document and ISO 22951 is shown in Annex C.

The arrows in Figure 1 illustrate message flows that are within scope of this document.

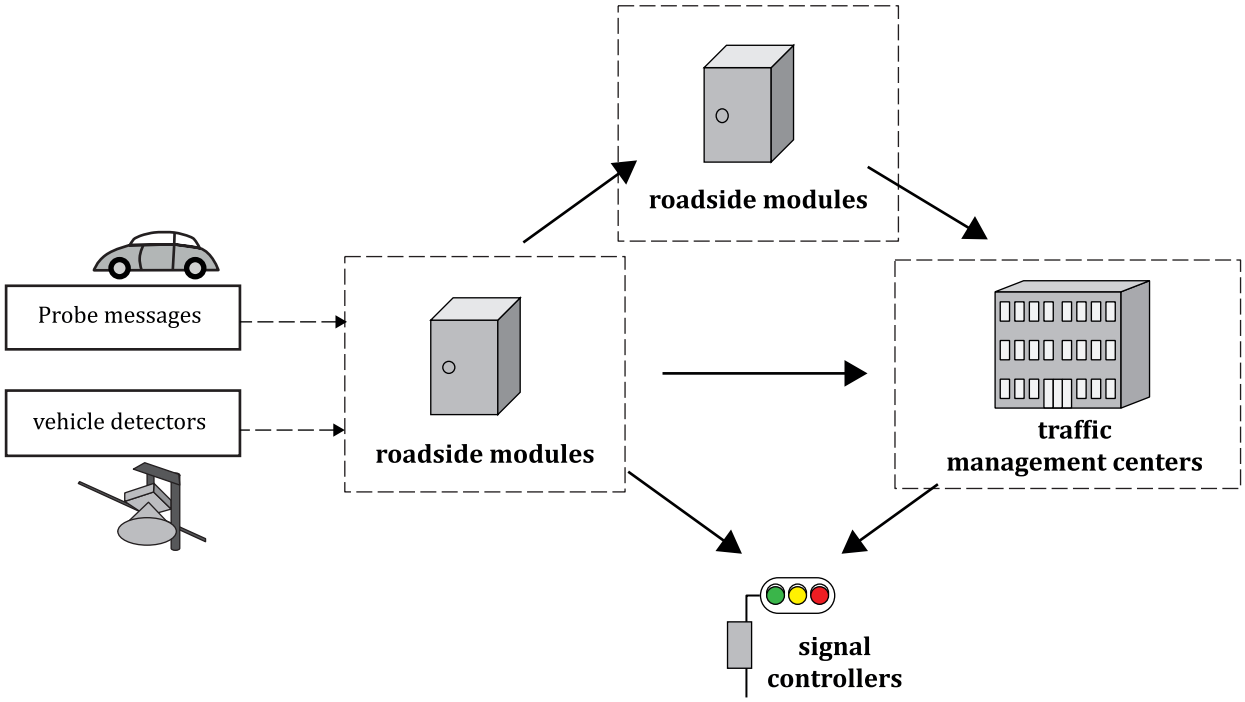


Figure 1 — Physical scope of this document

Figure 2 shows where this document is positioned within the ITS station architecture, as defined in ISO 21217.

This document (Application layer)		
Management	Facilities	Security (RFC4301, etc)
	Networking & Transport	
	Access	

Figure 2 — Architecture reference model

The messages specified in this document may be sent and received based on the facilities layer and lower layer of the ITS station architecture. When using the ITS station architecture, for communicating the data specified in this document, the communication profile can be appropriately selected using the process specified in ISO 17423. The lower layer communication services are provided by the communication profile

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hander (CPH) specified in ISO 17429. ITS station management and communications between ITS stations are specified in ISO 24102-6.

The data elements and data frames in this document are typically exchanged using well-known internet protocols, such as UDP/IP or TCP/IP. IPsec, DTLS and TLS can be used for security.

The data structure follows the framework specified in ISO 14817-1, and the data elements and data frames are described by description name, object identifier, definition, and data type following ISO 14817-1. The specifications of this document complement those from ISO/TS 19091 and other standards.

NOTE Roadside modules can generate data based on inputs from vehicle detectors and/or probe data transmitted by vehicles. This document does not address how the roadside module generates the data, it only addresses communication after receiving and processing raw data from one or more sources.

EXAMPLE A roadside module may calculate vehicle volume, average speed, and queue length by utilizing data from vehicle detectors and probe information.

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Intelligent transport systems — Definition of data elements and data frames between roadside modules and signal controllers for cooperative signal control

1 Scope

This document specifies data elements and data frames for messages

a) exchanged between roadside modules and:

   1) signal controllers;

   2) traffic management centres, and/or;

   3) other roadside modules.

b) exchanged between traffic management centres and signal controllers.

This document addresses the data in the application layer of the OSI (Open Systems Interconnection) reference model.

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 14817-1, *Intelligent transport systems — ITS central data dictionaries — Part 1: Requirements for ITS data definitions*

ISO 17419, *Intelligent transport systems — Globally unique identification*

ISO 10711, *Intelligent Transport Systems — Interface Protocol and Message Set Definition between Traffic Signal Controllers and Detectors*

SAE J2735, *Dedicated Short Range Communications (DSRC) Message Set Dictionary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14817-1 and the following apply.

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

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

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

3.1
adaptive signal control
signal control concept where vehicular traffic in a network is detected at one or more points upstream and/or downstream and algorithmically combined with other information to predictively optimize traffic signal operation

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3.2
conflicting turn
turn manoeuvre that conflicts with another manoeuvre at an intersection

3.3
cooperative signal control
signal control utilizing not only vehicle detector data but also V2I communication data

3.4
dilemma zone
area upstream of a traffic signal in which different drivers are likely to make different decisions on whether to continue through or stop at the signal as they see the signal indication change from green to yellow

Note 1 to entry: There are two types of dilemma zones. Type I occurs when yellow and red clearance times are too short for a driver to either stop or clear the intersection before the beginning of a conflicting phase. Type II, also known as an “Option Zone”, or “Indecision Zone”, occurs as the result of different drivers making different decisions on whether to go or stop, upon the change from a green to yellow indication.

3.5
flow rate
equivalent hourly rate at which vehicles, bicycles or persons pass a point on a lane, roadway, or other traffic way, computed as the number of vehicles, bicycles, or persons passing the point, divided by the time interval (usually less than 1 h) in which they pass

Note 1 to entry: It is expressed as vehicles, bicycles or persons per hour.

3.6
phase
signal controller timing unit associated with the control of one or more movements

3.7
probe data
vehicle sensor information, formatted as probe data elements and/or probe messages, that is processed, formatted, and transmitted to a roadside module to create a good understanding of the driving environment

3.8
queue
line of vehicles, bicycles, or persons waiting to be served by the system in which the flow rate from the front of the queue determines the average speed within the queue

Note 1 to entry: Slowly moving vehicles or people joining the rear of the queue are usually considered part of the queue. The internal queue dynamics can involve starts and stops. A faster-moving line of vehicles is often referred to as a moving queue or a platoon.

3.9
roadside module
group of components, or applications, installed at the roadside that can be controlled or monitored, or both, by a remote entity

3.10
signal controller
roadside module that manages the right-of-way at an intersection, typically by displaying green, yellow and red indications to the intersection’s various approach lanes

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