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Road vehicles — Diagnostic communication over Internet Protocol (DoIP) —

Part 2: Transport protocol and network layer services

Véhicules routiers — Communication de diagnostic au travers du protocole internet (DoIP) —

Partie 2: Protocole de transport et services de la couche réseau

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

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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).

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

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 22, *Road vehicles*, Subcommittee SC 31, *Data communication*.

This second edition cancels and replaces the first edition (ISO 13400-2:2012), which has been technically revised.

The main changes compared to the previous edition are as follows:

— addition of TLS (Transport Layer Security);

— major restructuring of document content.

A list of all parts in the ISO 13400 series can be found on the ISO website.

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.

Introduction

Vehicle diagnostic communication has been developed starting with the introduction of the first legislated emissions-related diagnostics and has evolved over the years, now covering various use cases ranging from emission-related diagnostics to vehicle-manufacturer-specific applications like calibration or electronic component software updates.

With the introduction of new in-vehicle network communication technologies, the interface between the vehicle's servers and the client DoIP entity has been adapted several times to address the specific characteristics of each new network communication technology requiring optimized data link layer definitions and transport protocol developments in order to make the new in-vehicle networks usable for diagnostic communication.

With increasing memory size of servers, the demand to update this increasing amount of software and an increasing number of functions provided by these control units, technology of the connecting network and buses has been driven to a level of complexity and speed similar to computer networks. Various applications (x-by-wire, infotainment) require high band-width and real-time networks (like FlexRay, MOST), which cannot be adapted to provide the direct interface to a vehicle. This requires gateways to route and convert messages between the in-vehicle networks and the vehicle interface to client DoIP entity.

All parts of ISO 13400 are applicable to vehicle diagnostic systems implemented on an IP communication network.

The ISO 13400 series has been established in order to define common requirements for vehicle diagnostic systems implemented on an IP communication link.

Although primarily intended for diagnostic systems, ISO 13400 has been developed to also meet requirements from other IP-based systems needing a transport protocol and network layer services.

The intent of the ISO 13400 series is to describe a standardized vehicle interface which

— separates in-vehicle network technology from the client DoIP entity vehicle interface requirements to allow for a long-term stable external vehicle communication interface,

— utilizes existing industry standards to define a long-term stable state-of-the-art communication standard usable for legislated diagnostic communication as well as for manufacturer-specific use cases,

— can easily be adapted to new physical and data link layers, including wired and wireless connections, by using existing adaptation layers, and

— allows connections of vehicle-internal and vehicle-external DoIP entities.

To achieve this, it is based on the Open Systems Interconnection (OSI) Basic Reference Model specified in ISO/IEC 7498-1 and ISO/IEC 10731[1], which structures communication systems into seven layers.

Figure 1 illustrates an overview of communication frameworks beyond the scope of this document including related standards:

— Vehicle diagnostic communication framework, which is composed of ISO 14229-1[3], ISO 14229-2[4], and ISO 14229-5[5].

— Presentation layer standards, for example vehicle manufacturer- (VM-) specific or ISO 22901 ODX[6].

— OSI lower layers framework, which is composed of ISO 13400-3 and ISO 13400-4[2].

The ISO 13400 series and ISO 14229-5[5] are based on the conventions specified in the OSI Service Conventions (ISO/IEC 10731)[1] as they apply for all layers and the diagnostic services.

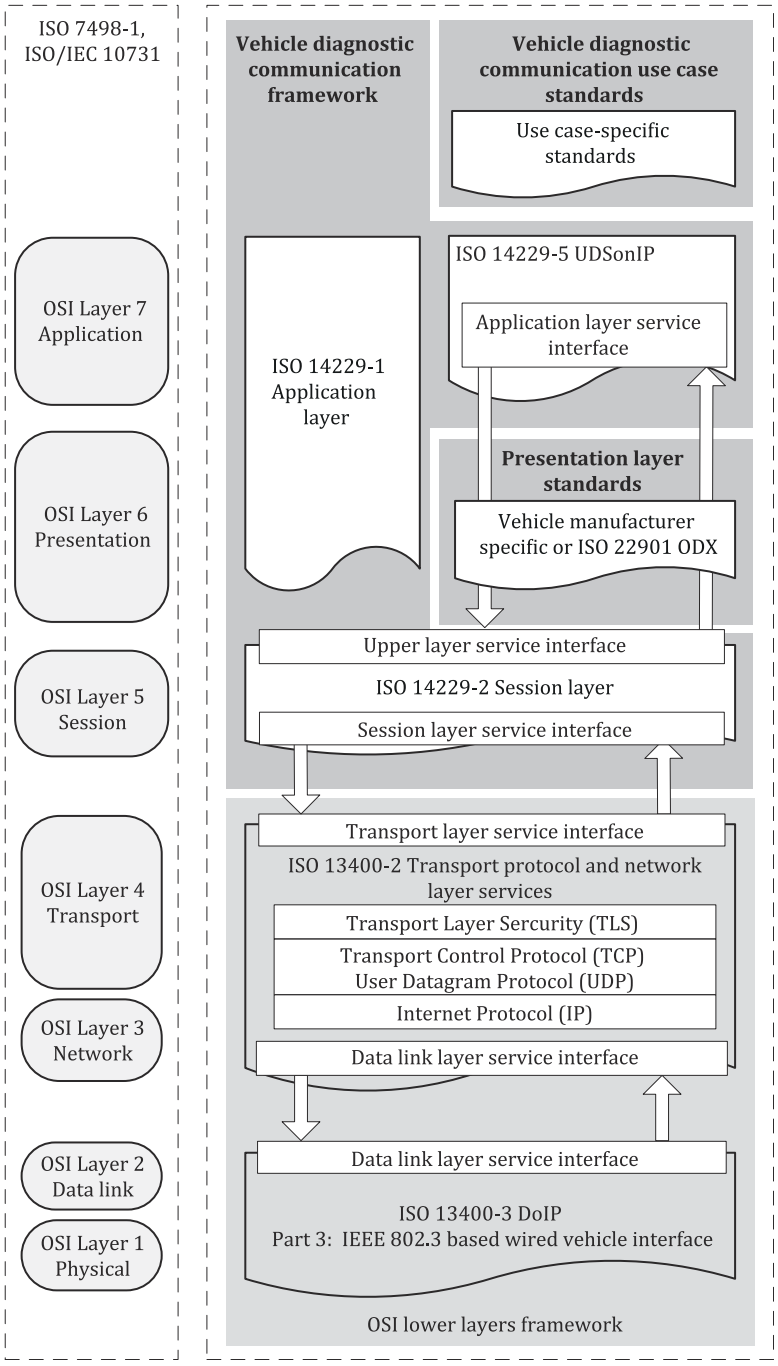

Figure 1 — DoIP document reference according to OSI model

Figure 2 illustrates vehicle network architecture schematics from a functional viewpoint.

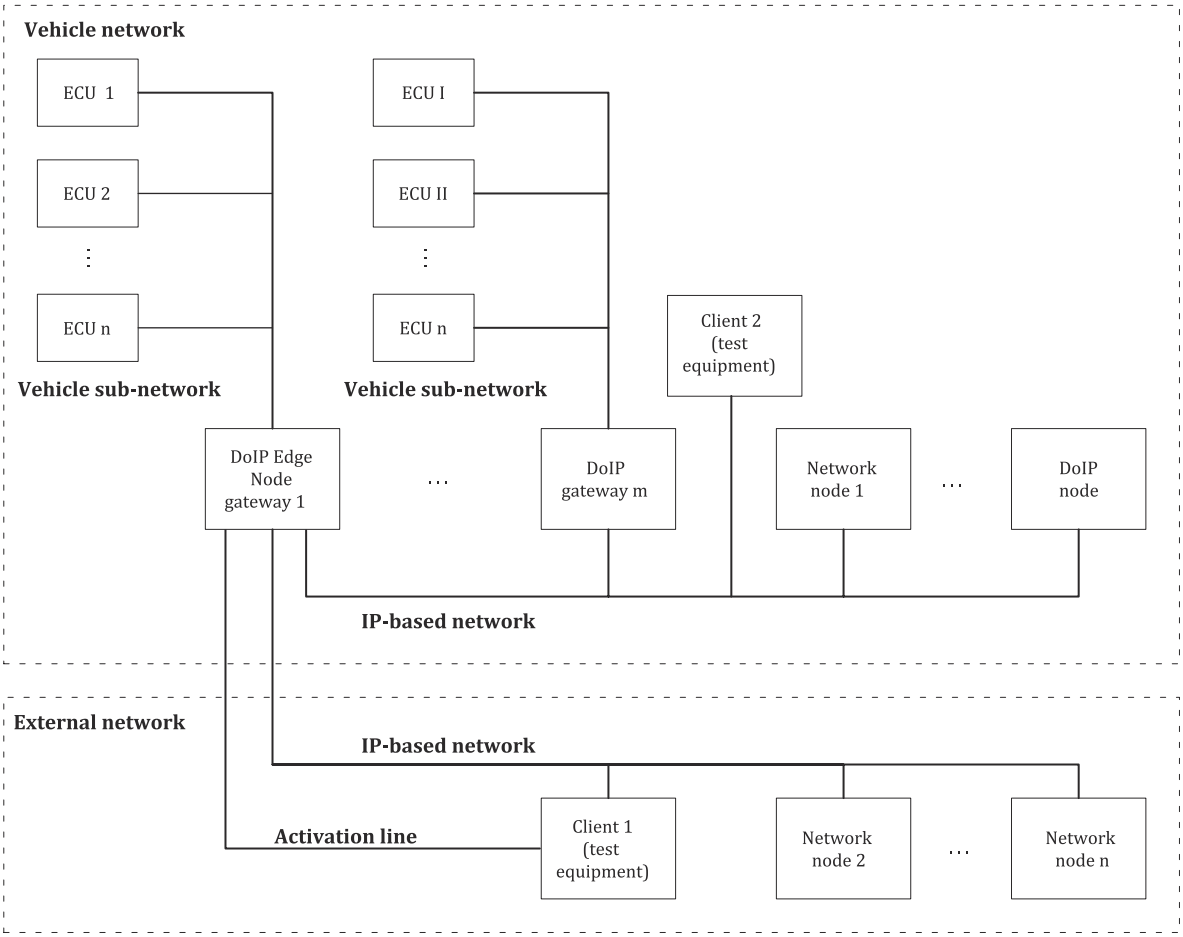

Figure 2 — Vehicle network architecture schematics (functional view)

This protocol standard is implemented by one or more DoIP entities, depending on the vehicle's network architecture. Figure 2 illustrates a client 1 (external client), which is connected to the DoIP edge node and a client 2 (internal client) in the vehicle's internal network. If not stated otherwise, the DoIP client entities are assumed to behave the same regardless to which network they are connected.

If necessary, this document distinguishes between an "internal client" and "external client" to apply a requirement or statement.

In this document, the requirements are assigned a unique number of the form "**X.DoIP-yyy**", allowing for easier requirement tracking and reference.

— X = OSI layer number; and

— DoIP-yyy = requirement number; and

— xL = x = OSI layer abbrevation[8 = APP, 7 = AL, 6 = PL, 5 = SL, 4 = TL, 3 = NL, 2 = DLL, 1 = PHY, 0 = SPP].

NOTE Requirements in this document are not numbered sequentially because the order of individual requirements changed during document development.

Requirements formulated as "The vehicle shall implement …" imply that this is a requirement for all DoIP entities to implement the required functionality if not explicitly stated otherwise. If multiple DoIP entities are present on a vehicle network, implementation details may differ slightly for each DoIP entity (e.g. for identification purposes), so that the client DoIP entity is able to identify the individual DoIP gateways that support this protocol standard.

Where reference is made to RFC documents, note that the forms “shall/shall not” are used to express requirements in these documents.