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Road vehicles — Unified diagnostic services (UDS) —

Part 1: Application layer

Véhicules routiers — Services de diagnostic unifiés (SDU) —

Partie 1: Couche application

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

This fourth edition cancels and replaces the third edition (ISO 14229-1:2020), which has been technically revised. It also incorporates the Amendment ISO 14229-1:2020/Amd 1:2022.

The main changes are as follows:

— corrections related to the service "responseOnEvent".

A list of all parts in the ISO 14229 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.

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Introduction

The ISO 14229 series has been established in order to define common requirements for diagnostic systems, whatever the serial data link is.

To achieve this, the ISO 14229 series is based on the Open Systems Interconnection (OSI) Basic Reference Model in accordance with ISO/IEC 7498-1 [1] and ISO/IEC 10731 [2], which structures communication systems into seven layers in accordance with Figure 1.

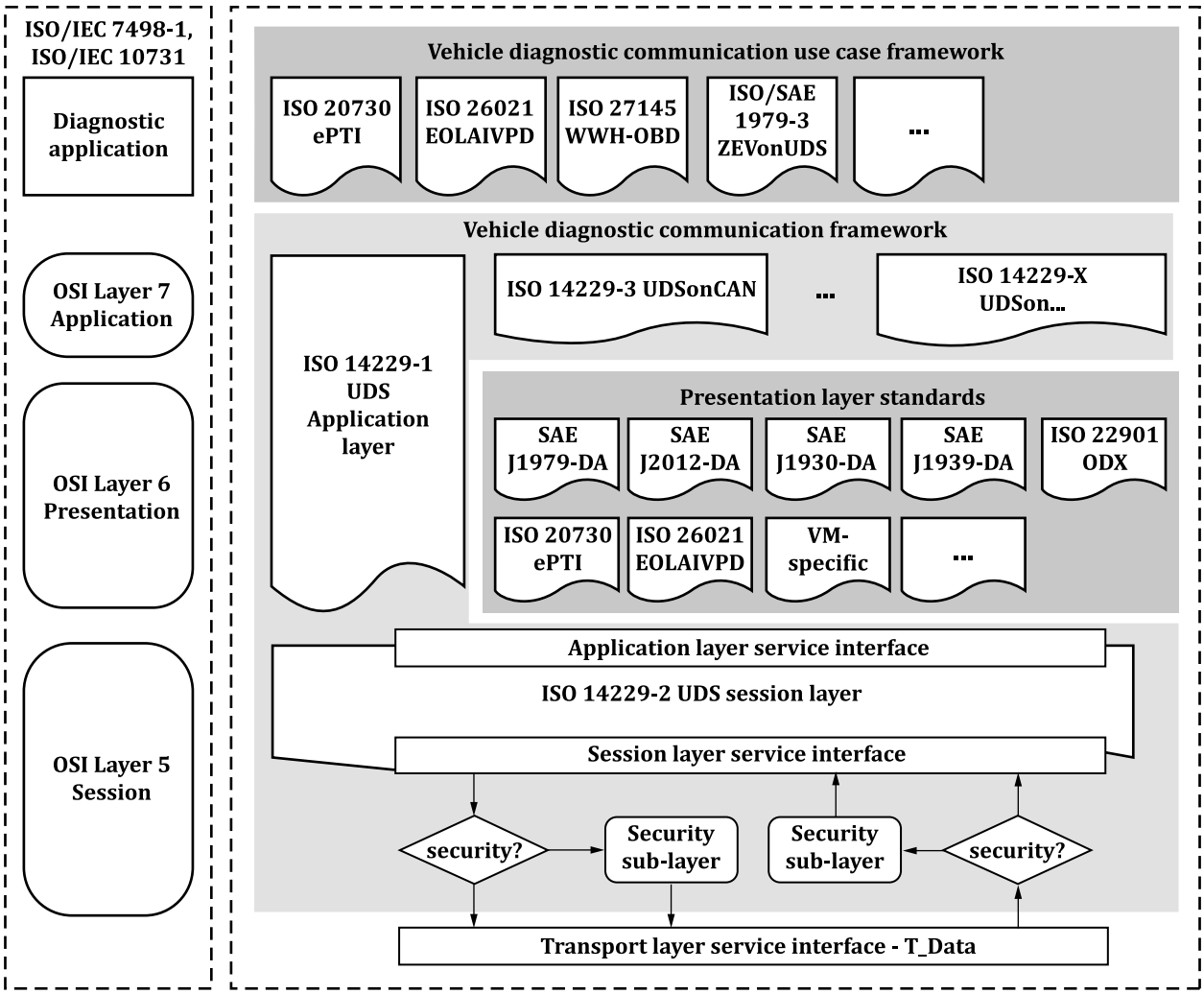


Figure 1 — UDS-based vehicle diagnostic communication framework according to OSI model

When mapped on the OSI model, the services used by a diagnostic tester (client) and an Electronic Control Unit (ECU, server) are broken into the following layers:

— Application layer (layer 7): unified diagnostic services specified in this document, ISO 14229-3 [3] UDSonCAN to ISO 14229-X UDSon... , ISO 20730-1 [4] ePTI, ISO 26021-1 [5] EOLAIVPD, ISO 27145-3 [6] WWH-OBD, ISO/SAE AWI 1979-3 [7] ZEonUDS, and further standards;

— Presentation layer (layer 6): vehicle manufacturer specific, SAE J1979-DA [8], SAE J2012-DA [9], SAE J1939-DA [10], SAE J1930-DA [11], ISO 22901 [12] ODX, ISO 20730-3 [13] ePTI, and ISO 26021-3 [14] EOLAIVPD;

— Session layer services (layer 5): specified in ISO 14229-2.

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NOTE The diagnostic services in this document are implemented in various applications, e.g. road vehicles – tachograph systems, road vehicles – interchange of digital information on electrical connections between towing and towed vehicles, road vehicles – diagnostic systems. Future modifications to this document provide long-term backward compatibility with the implementation standards as described above.

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Road vehicles — Unified diagnostic services (UDS) —

Part 1: Application layer

1 Scope

This document specifies data link independent requirements of diagnostic communication services. These allow a diagnostic tester (client) to control diagnostic functions in an in-vehicle electronic control unit (ECU, server) such as an electronic fuel injection, automatic gearbox, anti-lock braking system, etc. connected to a serial data link embedded in a road vehicle.

This document specifies diagnostic communication services, which allow the diagnostic tester (client) to stop or to resume non-diagnostic message transmission, to read vehicle identification data and real-time sensor data, read and clear diagnostic information, control actuators, start/stop routines, and many more functions to assist in diagnosing the vehicle's electronic systems.

This document does not apply to non-diagnostic message transmission on the vehicle's communication data link between two electronic control units. This document does not restrict an in-vehicle on-board tester (client) implementation in an ECU/server in order to utilize the diagnostic communication services on the vehicle's communication data link to perform bidirectional diagnostic data exchange.

This document does not specify any implementation requirements.

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/IEC 7816-8, *Identification cards — Integrated circuit cards — Part 8: Commands and mechanisms for security operations*

ISO/IEC 9594-8, *Information technology — Open systems interconnection — Part 8: The Directory: Public-key and attribute certificate frameworks*

ISO 14229-2, *Road vehicles — Unified diagnostic services (UDS) — Part 2: Session layer services*

IEEE 754-2008, *IEEE Standard for Floating-Point Arithmetic*

IEEE 1609.2, *Standard for Wireless Access in Vehicular Environments — Security Services for Applications and Management Messages*

ITU-T X.690, *Information technology – ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)*

RFC 5280, *Internet Engineering Task Force — Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile*

RFC 5755, *Internet Engineering Task Force — An Internet Attribute Certificate Profile for Authorization*

X.509, *Information technology — Open Systems Interconnection — The Directory: Public-key and attribute certificate frameworks*

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3 Terms and definitions

For the purposes of this document, the following terms and definitions 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 http://www.electropedia.org/

3.1
boot memory partition
area of the *server* (3.18) memory in which the *boot software* (3.2) is located

3.2
boot software
software which is executed in a special part of *server* (3.18) memory which is used primarily to boot the *ECU* (3.9) and perform *server* (3.18) programming

Note 1 to entry: This area of memory is not erased during a normal programming sequence and executes when the *server* (3.18) application is missing or otherwise deemed invalid to always ensure the capability to reprogram the *server* (3.18) .

Note 2 to entry: See 9.2.2 and Clause 16.

3.3
client
function that is part of the *tester* (3.20) and that makes use of the *diagnostic services* (3.6)

Note 1 to entry: A *tester* (3.20) normally makes use of other functions such as data base management, specific interpretation, human-machine interface.

3.4
diagnostic channel
dedicated transmission path from *client* (3.3) to *server* (3.18) for diagnostic communication

Note 1 to entry: Several simultaneously connected clients to one *server* (3.18) can be differentiated by an individual *tester* (3.20) source address.

3.5
diagnostic data
data that is located in the memory of an *electronic control unit* (3.9) which can be inspected and/or possibly modified by the *tester* (3.20)

Note 1 to entry: Diagnostic data includes analogue inputs and outputs, digital inputs and outputs, intermediate values and various status information.

Note 2 to entry: Examples of *diagnostic data* (3.5) are vehicle speed, throttle angle, mirror position, system status, etc. Three types of values are defined for diagnostic data:

— the current value: the value currently used by (or resulting from) the normal operation of the *electronic control unit* (3.9) ;

— a stored value: an internal copy of the current value made at specific moments (e.g. when a malfunction occurs or periodically); this copy is made under the control of the *electronic control unit* (3.9) ;

— a static value: e.g. VIN.

Note 3 to entry: The *server* (3.18) is not obliged to keep internal copies of its data for diagnostic purposes, in which case the *tester* (3.20) may only request the current value.

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