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Intelligent transport systems — Framework architecture for plug and play (PnP) functionality in vehicles utilizing nomadic devices

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Contents

Page

Foreword ..... **iv**
Introduction ..... **v**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Abbreviated terms **2**
5 Conventions **2**
6 Technical information **2**
6.1 General descriptions 2
6.2 Framework architecture for in-vehicle PnP 3
6.3 Information transmission logic 3
6.4 Information from a PNP vehicle to occupants 4
6.4.1 General 4
6.4.2 Sensor related information 4
6.4.3 Communication related information 5
6.4.4 Mechanical related information 5
6.5 Information from occupant to PnP vehicle 5
6.5.1 General 5
6.5.2 Occupants' information 5
7 Use case scenario **5**
7.1 Use case 1 — Acceptance and denial of service usage 6
7.1.1 Overview 6
7.1.2 Description 6
7.1.3 Example 6
7.2 Use case 2 — Ownership exchanging 7
7.2.1 Overview 7
7.2.2 Description 7
7.2.3 Example 8
7.3 Use case 3 — Suggestion of optimum functional package 8
7.3.1 Overview 8
7.3.2 Description 8
7.3.3 Example 8
7.4 Use case 4 — Mandatory operation of functional package 8
7.4.1 Overview 8
7.4.2 Description 8
7.4.3 Example 9
Bibliography **10**

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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).

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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*.

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

This document specifies framework architecture for plug and play (PnP) functionality in vehicles and identifies the issues related to exchanging information between occupants (users) and PnP functions. The connection between PnP vehicles and occupants is established by nomadic devices and the exchanging information is bidirectional. The main purpose of architecture is to utilize the PnP vehicle information and enhance the safety state and improve the convenience of occupants in PnP vehicles by adopting various pieces of information of PnP functionality in vehicles including sensors, mechanical equipment, and communication devices.

This document covers subjects related to representation of the status of a PnP vehicle and occupant. The status of a PnP vehicle and occupant is represented as a safety state/availability state and driver information, respectively. Therefore, information exchange between a PnP vehicle and occupants is mandatory.

This system is based on the following assumptions:

— A PnP vehicle is equipped with several sensors such as radar, lidar, camera, vehicle mechanical information such as steering, acceleration/brake, ECU, and communication devices such as WLAN, Bluetooth. In addition, more sensors or devices can be extensible with the advance of technology, and a PnP vehicle can adapt these devices.

— Occupants have a nomadic device such as smart phone, or wearable which can be used to exchange information with a PnP vehicle. The health information of occupants may be delivered to a PnP vehicle.

— The major use case is to inform the status of a PnP vehicle and occupants using the information between a PnP vehicle and occupants.

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Intelligent transport systems — Framework architecture for plug and play (PnP) functionality in vehicles utilizing nomadic devices

1 Scope

This document defines framework architecture for plug and play (PnP) vehicles and identifies the issues related to exchanging information between occupants (users) and PnP vehicles with nomadic devices. The purpose of architecture is to enhance PnP vehicles and the occupants' safety state by exchanging the information/availability from PnP vehicles and occupants' information/status.

The function of frame architecture is to define message follows and its effect on safety state between a PnP vehicle and the occupants. This document specifies the framework of safety state representation between the PnP vehicle and the occupants. The state of the PnP vehicle depending on the PnP vehicle's equipment informs the occupants, and the status of the occupants is also transmitted to the PnP vehicle where status information is delivered by nomadic devices.

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

ISO 17423, *Intelligent transport systems — Cooperative systems — Application requirements and objectives*

ISO 21217, *Intelligent transport systems — Communications access for land mobiles (CALM) — Architecture*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 17419, ISO 17423 and ISO 21217 and the following apply.

ISO and IEC maintain terminological 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
plug and play
PnP
vehicle which allows attaching, switching and detaching devices, e.g. sensors, actuators or communication devices, in the vehicle at both before and after market, and then the various applications can be implemented using a specific function

Note 1 to entry: Plug and play is a next generation ITS concept.

Note 2 to entry: The information from the PnP function can be monitored and controlled by nomadic devices. It could be a chance to produce small and special batches by small manufacturers, and to keep continuous value improvement of the vehicle by switching devices to improved ones as modern desktop computers do.

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3.2
plug and play vehicle
PnP vehicle
vehicle which has PnP functionality

Note 1 to entry: Since PnP vehicles vary in the combination of devices and functionalities in each model even though they have a similar appearance, occupants can recognize the current PnP status of their vehicle.

4 Abbreviated terms

ACC	Adaptive Cruise Control
ADAS	Advanced Driver Assistance System
AVM	Around View Monitoring
Lidar	Light Detection and Ranging
OSI	open systems interconnection
PnP	Plug and Play
RADAR	Radio Detection and Ranging
V2X	Vehicle-to-Everything
WAVE	Wireless Access in Vehicular Environments
CAM	Camera

5 Conventions

This document is based on the conventions discussed in the OSI Service Conventions ISO/IEC 10731 as they apply for communication services. The vehicle data transfer protocol is applicable to OSI layers 5, 6 and 7.

6 Technical information

6.1 General descriptions

Information exchange occurs between a PnP vehicle and a nomadic device of occupants. Depending on the device type and amount of information, the number of information representations is different which also affects the safety state of a PnP vehicle. For information transmission, the environment which is described as follows is assumed.

— A PnP vehicle can detect all information from devices which are connected to a vehicle. Devices include sensors, communication devices, and mechanical equipment. A PnP vehicle can update to a new driver and software when a new device is attached or the existing device is changed or modified. The PnP gateway handles updating, modifying, and managing of all connected devices.

— An occupant has a nomadic device which can communicate with a PnP vehicle. A nomadic device has to install an application to express and exchange information with a PnP vehicle.

A device and PnP gateway which are attached and connected to a PnP vehicle can be regarded as a part of an “extended vehicle”.

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