

TECHNICAL REPORT



Infotainment Services for Public Vehicles (PVIS) – Part 1: General

IECNORM.COM : Click to view the full PDF of IEC TR 63479-1:2023



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2023 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IECNORM.COM : Click to view the full PDF of IEC 60347-1:2023

TECHNICAL REPORT



Infotainment Services for Public Vehicles (PVIS) – Part 1: General

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 43.040.15

ISBN 978-2-8322-7884-0

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms, definitions and abbreviated terms	7
3.1 Abbreviated terms.....	7
4 Comparison of private and public vehicles	7
5 System model.....	8
5.1 Functional entities.....	8
5.1.1 General	8
5.1.2 Content provider.....	8
5.1.3 PVIS master	8
5.1.4 PVIS agent	8
5.1.5 PVIS device.....	8
5.1.6 Passenger device	8
5.2 Network environment	9
5.2.1 General	9
5.2.2 Small-scale public vehicles.....	9
5.2.3 Large-scale public vehicles.....	9
5.3 Functional services	10
5.3.1 General	10
5.3.2 Device management services.....	10
5.3.3 Content delivery services.....	11
6 Example services	11
6.1 General.....	11
6.2 Device management services in small-scale public vehicle	12
6.3 Content delivery services in large-scale public vehicle	14
Annex A (informative) Gap analysis with the existing relevant standards.....	16
Bibliography.....	22
Figure 1 – Small-scale PVIS environment (e.g. bus)	9
Figure 2 – Large-scale PVIS environment (e.g. train).....	10
Figure 3 – General service flow for PVIS.....	12
Figure 4 – Overview of device management services in small-scale environment.....	13
Figure 5 – Operation flows for device management in small-scale environment	14
Figure 6 – Overview of content delivery in the large-scale public vehicle	14
Figure 7 – Operation flows for content delivery in large-scale public vehicle	15
Figure A.1 – Overview of relevant standards.....	16
Figure A.2 – Standards on devices of public vehicles.....	17
Table 1 – Comparison of private vehicles and public vehicles	7
Table 2 – Example scenarios of PVIS services	12
Table A.1 – Standards for vehicle systems.....	17
Table A.2 – Standards for communication interfaces.....	18

Table A.3 – Standards for in-vehicle devices 19
Table A.4 – Standards for vehicle-related service 20

IECNORM.COM : Click to view the full PDF of IEC TR 63479-1:2023

INTERNATIONAL ELECTROTECHNICAL COMMISSION

INFOTAINMENT SERVICES FOR PUBLIC VEHICLES (PVIS) –

Part 1: General

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

IEC TR 63479-1 has been prepared by technical area 17: multimedia systems and equipment for vehicles, of IEC technical committee 100: audio, video and multimedia systems and equipment. It is a Technical Report.

The text of this Technical Report is based on the following documents:

Draft	Report on voting
100/4032/DTR	100/4066/RVDTR

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Report is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 63479 series, published under the general title *Infotainment services for public vehicles (PVIS)*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

IECNORM.COM : Click to view the full PDF of IEC TR 63479-1:2023

INTRODUCTION

It is noted that the markets and industries on infotainment services for vehicles (as known as in-vehicle infotainment services) have been growing rapidly. It is envisioned that a variety of infotainment (or multimedia) devices and services will be newly developed for personal and public vehicles in the future. Such devices include navigation systems, cameras, speakers, headrest displays, air-conditioners, thermometers and heated seats, and lights.

IEC TC100 have so far developed a set of standards on Configurable Car Infotainment Services (CCIS) with the IEC 63246 series. However, the CCIS standards have been basically designed for personal users, such as car owners. In the meantime, there is also a crucial need to provide a variety of infotainment services for public vehicles (PVIS), such as buses or trains.

PVISs have different requirements and features from CCISs. For user type, CCIS is targeted for one or two users (such as car owner), whereas PVIS is for a large number of guests or passengers within the public vehicle. For device type, CCIS deals with the personal devices (property or belonging) in the car, whereas PVIS will be targeted for a variety of public devices that are contained in a public vehicle. Some PVIS services can be provisioned by interworking with the external networks, as shown in the bus information service. For service duration, CCIS usually provide long-term services, whereas PVISs are intended to provide short-term service during which a guest stays within a public vehicle.

From these observations, it is noted that there are many different features and requirements between CCIS and PVIS. Accordingly, there is a need of standardization on PVISs. In particular, PVISs needs to employ a set of agents to effectively manage a large number of users or devices.

The PVIS series (IEC 63479) describes infotainment (multimedia) services for terrestrial public vehicles, such as buses, trains, or underground railways. It is not applicable to public vehicles, such as aeroplanes or ships. For this purpose, the following issues are addressed:

- 1) identification of a variety of functional requirements for provisioning of PVISs;
- 2) designing of the PVIS framework, based on the identified requirements.

The PVIS standards are expected to provide guidelines on PVIS services for a large number of users/devices, and to encourage development of new (enhanced) PVIS services (possibly by interworking with the external systems).

The IEC 63479 series consists of the following parts:

- Part 1: General,
- Part 2: Requirements, and
- Part 3: Framework.

IEC 63479-1 (this document, Technical Report) describes general considerations and system model for PVIS, with some examples of PVIS services.

IEC 63479-2 (International Standard) describes the functional requirements for PVISs.

IEC 63479-3 (International Standard) describes the framework, including the functional information flows between functional entities.

INFOTAINMENT SERVICES FOR PUBLIC VEHICLES (PVIS) –

Part 1: General

1 Scope

This Technical Report describes general considerations and system model for infotainment services for public vehicles (PVIS), with the relevant service examples.

2 Normative references

There are no normative references in this document.

3 Terms, definitions and abbreviated terms

No terms and definitions are listed in this document.

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

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1 Abbreviated terms

PVIS infotainment services for public vehicles

4 Comparison of private and public vehicles

Table 1 shows the comparison of private vehicles and public vehicles.

Table 1 – Comparison of private vehicles and public vehicles

Category	Private vehicle	Public vehicle
Users	Private users (owner)	Public users (passengers)
Examples	Car, van	Bus, train, tram, subway
Number of users	(Usually) less than 20	20 (bus) to 1,000 (train)
Device type	Personal devices (properties, belongings)	Public devices (shared by many users)
Service duration	(Usually) long-term	(Usually) short-term
Security/privacy	Moderate	Crucial

Public vehicles for PVIS (e.g. bus, train) have different requirements and features from private vehicles (e.g. car, van). A private vehicle is usually for a small number of users, whereas a public vehicle is targeted for a large number of guests or passengers. For device type, a private vehicle deals with the personal devices (property or belonging), whereas a public vehicle is targeted for a variety of public devices that can be shared by many users in the public vehicle. Some public services can be provisioned by interworking with the external networks, as shown in bus information service. For service duration, the private vehicle usually provides long-term services, whereas the public vehicle tends to provide short-term services during which guests stay within the public vehicle. Security or privacy requirements are also strictly applied to the public vehicle, compared to the private vehicle.

As shown in Annex A of this document, most of the existing relevant standards have focused on the personal vehicle. The multimedia services for public vehicles have not been addressed so far. In particular, this document describes the system model to be considered to effectively provide the PVIS services, which includes the target environment and functional entities. Some examples of PVISs are also described.

5 System model

5.1 Functional entities

5.1.1 General

PVIS functional entities are classified into the five types: content provider, PVIS master, PVIS agent, PVIS device, and passenger device.

5.1.2 Content provider

The content provider represents an external server or entity to provide multimedia infotainment services for PVIS passengers, such as multimedia on-line game or over-the-top (OTT) services. Content providers may deploy their contents as PVIS services with an appropriate negotiation. Such contents include a variety of applications, such as games, utility programs, or media files for OTT services. For this purpose, a content provider may give an interworking function with the PVIS system for enhanced PVIS service provisioning.

5.1.3 PVIS master

The PVIS master performs overall management and control for PVIS system and services. In initialization, the PVIS master needs to identify a set of PVIS functional entities within the public vehicle, such as PVIS agents, PVIS devices and passenger devices. For service duration, the PVIS master monitors these PVIS functional entities. The PVIS master is also responsible for content delivery from the content provider to many passengers in the public vehicle.

5.1.4 PVIS agent

The PVIS agent is additionally employed for large-scale public vehicles, such as trains, to provide scalable and effective PVIS services between the PVIS master and a large number of passengers. It is expected that a PVIS agent is employed for each carriage in a large-scale public vehicle. The PVIS agent is responsible for the management of PVIS devices in its carriage. The PVIS agent is also responsible for service provisioning to PVIS passengers who are in its carriage. For this purpose, the PVIS agent may temporally store multimedia contents for passengers during communication between the PVIS master and passengers.

5.1.5 PVIS device

The PVIS device represents a device that is attached and dedicated to the public vehicle, such as air conditioning, speakers, displays, lights, and sensors. The PVIS devices are used for a variety of PVIS services. Each PVIS device needs to be controlled and managed by a PVIS master or agent. PVIS devices support the interaction of users with the PVIS agent or PVIS master.

5.1.6 Passenger device

A passenger device is a user device for PVIS services, such as a smartphone, for which passengers use PVIS services via the passenger device. By using such a passenger device, a passenger can request PVIS services to the PVIS device, PVIS agent, and further to the PVIS master. How to implement the passenger device is outside the scope of this document.

5.2 Network environment

5.2.1 General

For description of PVIS services, the two types of public vehicles are considered: small-scale public vehicles (e.g. buses), and large-scale public vehicles (e.g. trains).

It is expected that the communications between functional entities within a public vehicle (e.g. PVIS master, PVIS device, passenger device) are performed by using wireless personal area network (WPAN) technology, such as Bluetooth or Wi-Fi. In the meantime, the communications between a content provider outside the public vehicle and the PVIS master within the public vehicle can be done by using a mobile communication technology, such as 5G or 6G.

5.2.2 Small-scale public vehicles

Figure 1 shows a network model of a small-scale public vehicle environment, such as a bus. The small-scale public vehicle consists of a PVIS master and a set of PVIS devices and passenger devices. For PVIS service provisioning, all PVIS devices and passenger devices need to be registered with the PVIS master. Passengers can control PVIS devices and enjoy PVIS service through the associated passenger devices.

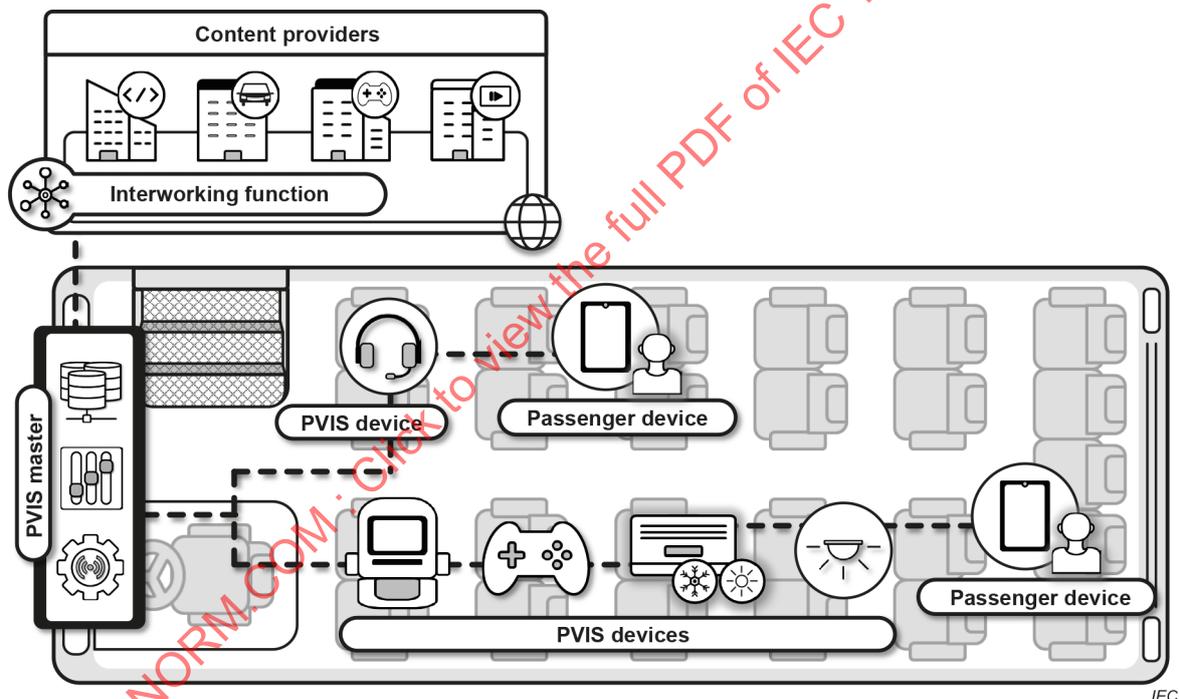


Figure 1 – Small-scale PVIS environment (e.g. bus)

5.2.3 Large-scale public vehicles

Figure 2 shows a network model of a large-scale public vehicle environment, such as a train. In this case, a PVIS agent is employed for each carriage in the public vehicle. For PVIS service provisioning, all PVIS agents, PVIS devices and passenger devices in the vehicle need to be registered with the PVIS master.

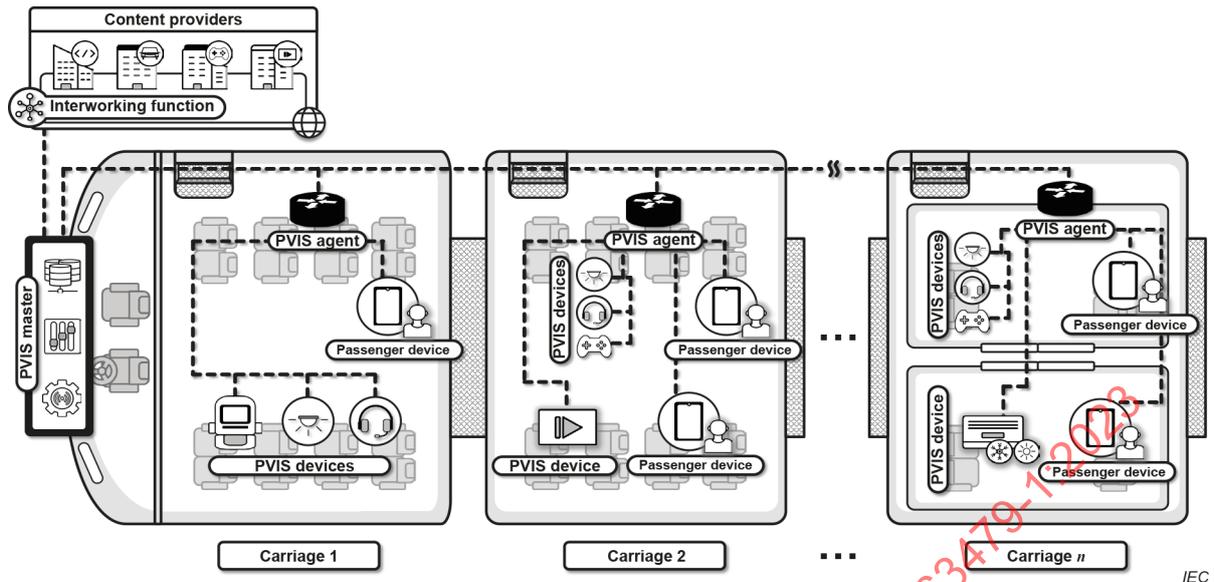


Figure 2 – Large-scale PVIS environment (e.g. train)

5.3 Functional services

5.3.1 General

PVIS provides a variety of functional services, which are grouped into device management services and content delivery services.

5.3.2 Device management services

The PVIS device management services include the following functional service operations:

- Initialization with registration and authentication

For PVIS service provisioning, all passenger devices, PVIS devices, and PVIS agents in the public vehicle are registered with the PVIS master. In the initialization phase, each functional entity may initiate a registration operation with the PVIS master. In a certain case, the PVIS master may initiate the device discovery operation toward the PVIS devices and agents.

The registration operation is performed with an appropriate authentication process. In particular, passenger devices, such as smartphones, need to be authenticated by the PVIS master during the registration operation.

- Query of available PVIS device list

To exploit PVIS services, a passenger might want to get the list of PVIS devices available in the public vehicle. In this case, a passenger device can request the list of available PVIS devices from the PVIS master, possibly via the PVIS agent. In response to this request, the PVIS master gives the available PVIS device list, based on the seat location of the concerned passenger in the public vehicle.

- Control of PVIS devices

Based on the available PVIS device list, a passenger might want to control a specific PVIS device by adjusting its associated parameters (e.g. temperature control of air conditioning device, light control, display control, etc). In this case, the passenger device sends the corresponding request to the PVIS master.

- Monitoring of PVIS devices and PVIS agents

The PVIS master needs to monitor the status of PVIS devices and agents in the public vehicle. This monitoring operation may be performed periodically or triggered by specific event (e.g. detection of abnormal event)

5.3.3 Content delivery services

The PVIS content delivery services include the following functional service operations:

- Interworking with content providers

To provide a variety of multimedia infotainment services for passengers, the PVIS master is connected to and interoperates with one or more external content providers. How to interoperate with external content providers is outside the scope of this document.

- Content management

There are many ways of communication between content providers and the PVIS master, such as real-time communication or file download. The contents that are received from a content provider may be stored and managed by the PVIS master over a certain period. These contents are intended to be delivered to one or more passengers in the public vehicle.

- Query of available content list

A passenger who wants to exploit the contents will send a query to PVIS master so as to identify the list of contents available in the public vehicle.

- Content delivery

Based on the available content list, a passenger device may request specific content from the PVIS master. In response to this request, the PVIS master delivers the relevant contents to the passenger device.

6 Example services

6.1 General

PVIS provides device management and content delivery services. The device management is performed between the PVIS master and PVIS devices, whereas the content delivery is performed among the content provider, the PVIS master, and passenger devices. PVIS agents are used for large-scale public vehicles.

Figure 3 shows general service flows for content delivery services among the PVIS functional entities in the large-scale public vehicle. The detailed description of each step is as follows.

- 1) For provisioning of multimedia content, the PVIS master interoperates with one or more external content providers. The content providers release their service contents or a list of service contents to the PVIS master via negotiation or contract.
- 2) To exploit PVIS services, a passenger device gets a list of multimedia contents available in the public vehicle from the PVIS master, possibly via a PVIS agent.
- 3) Based on the received available list, a passenger chooses specific contents to play. Then, the corresponding passenger device requests content delivery to the PVIS master via the PVIS agent.
- 4) The PVIS master sends the metadata of the requested content to the PVIS agent.
- 5) The PVIS agent downloads the corresponding content from the content provider.
- 6) The PVIS agent delivers the downloaded content to the PVIS device. Then, the PVIS device plays the downloaded content for the associated passenger.

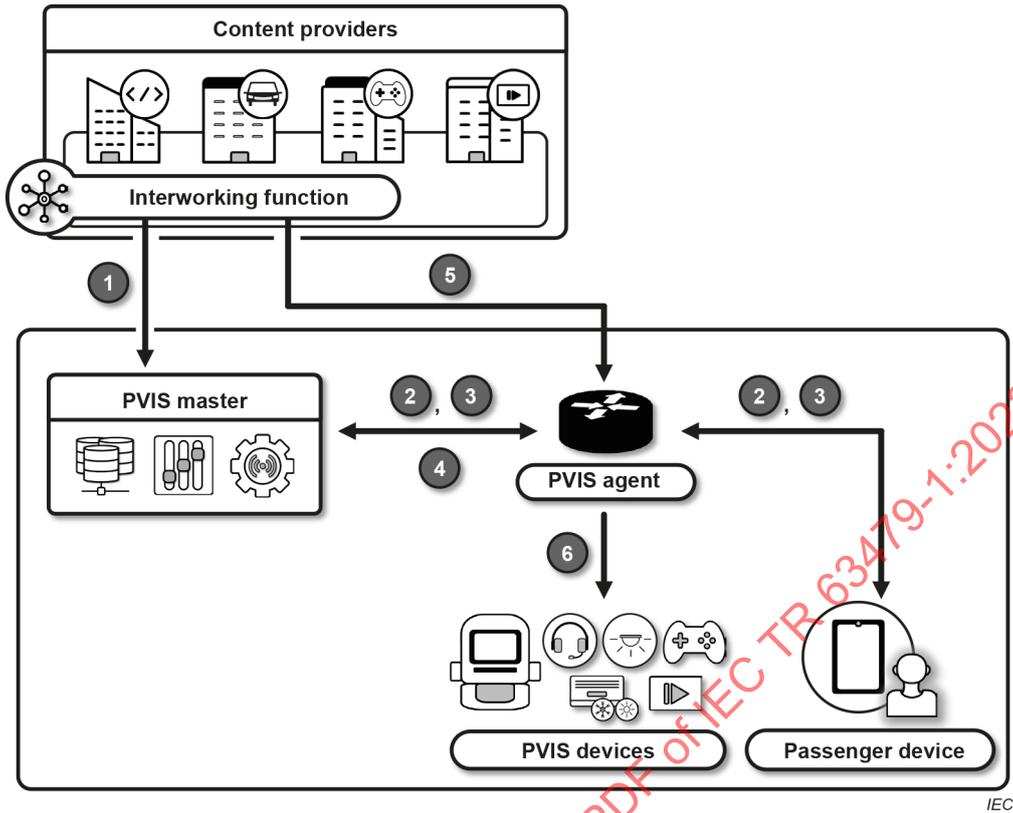


Figure 3 – General service flow for PVIS

Table 2 describes the four example scenarios of PVIS services that can be provided in public vehicles. As shown in the table, the device management and content delivery services are described for small-scale public vehicles and large-scale public vehicles. In the large-vehicle case, a PVIS agent is employed for each carriage.

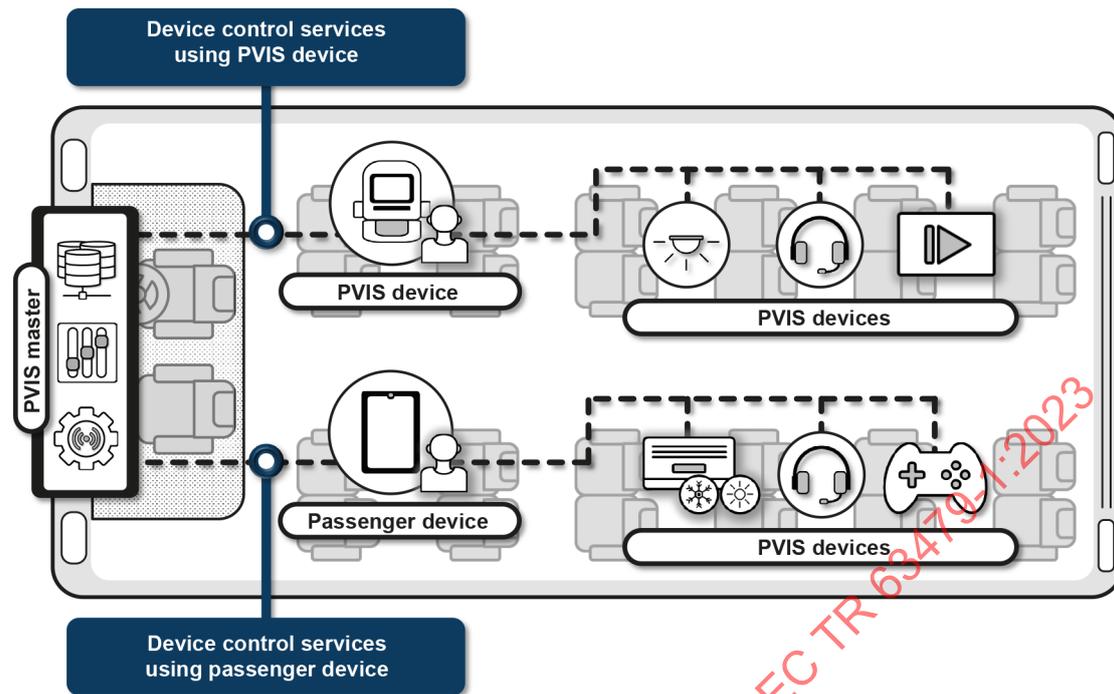
Table 2 – Example scenarios of PVIS services

Classification	Device management	Content delivery
Small-scale public vehicle	Device management services in small-scale public vehicle	Content delivery services in small-scale public vehicle
Large-scale public vehicle	Device management services in large-scale public vehicle	Content delivery services in large-scale public vehicle

In the subsequent subclauses, the two examples of these PVIS services are described in detail: device management in small-scale public vehicle and content delivery in large-scale public vehicle.

6.2 Device management services in small-scale public vehicle

In small-scale public vehicles, each passenger uses device management services through the PVIS master. Figure 4 shows the device management services in the small-scale public vehicle, in which a passenger uses the device control service for PVIS devices by using a PVIS device or a passenger device.



IEC

Figure 4 – Overview of device management services in small-scale environment

In this example, all PVIS devices are registered with the PVIS master, before PVIS services begin. Each passenger device also needs to be registered with the PVIS master, when the corresponding passenger wants to use PVIS services in the registration process.

To control a PVIS device, the passenger device first obtains the list of PVIS devices available in the public vehicle. Based on the available PVIS device list, the passenger tries to control the PVIS device by contacting the PVIS master.

During the PVIS service, the PVIS master will perform the status monitoring for all PVIS devices. For this purpose, each PVIS device may send periodic status report to PVIS master. The status report may be notified to the passenger device, if necessary.

Figure 5 shows the operation flows for device management service in small-scale public vehicles.

- 1) All PVIS devices are registered with the PVIS master before the PVIS service begins.
- 2) When a passenger is connected to the vehicle, its passenger device is registered.
- 3) The passenger device requests the list of available PVIS devices from the PVIS master.
- 4) The PVIS master responds with the list of PVIS devices available in the public vehicle.
- 5) Based on the list, the passenger device can request PVIS device control from the PVIS master.
- 6) Based on the request, the PVIS master activates the corresponding PVIS device.
- 7) During the service, each PVIS device sends a status report to the PVIS master.
- 8) The PVIS master notifies the status change of the PVIS device, if any, to the passenger device.

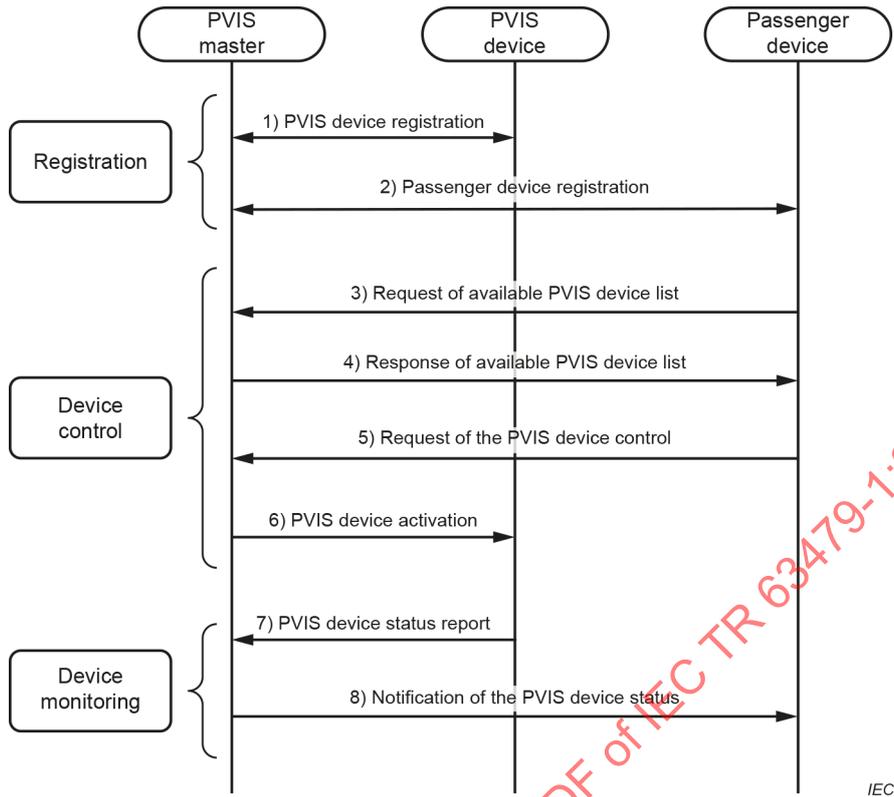


Figure 5 – Operation flows for device management in small-scale environment

6.3 Content delivery services in large-scale public vehicle

In large-scale public vehicles, a PVIS agent is employed for each carriage of the public vehicle. The content delivery is performed by the PVIS agent. Figure 6 shows an overview of content delivery service scenarios in the large-scale public vehicle.

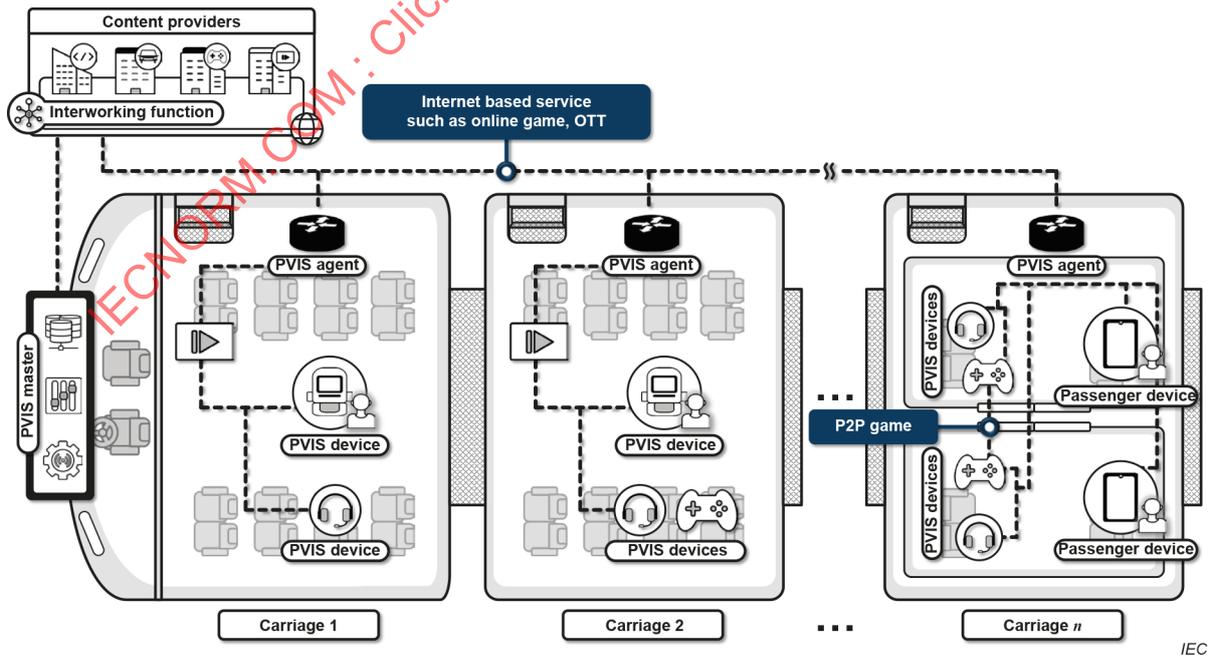


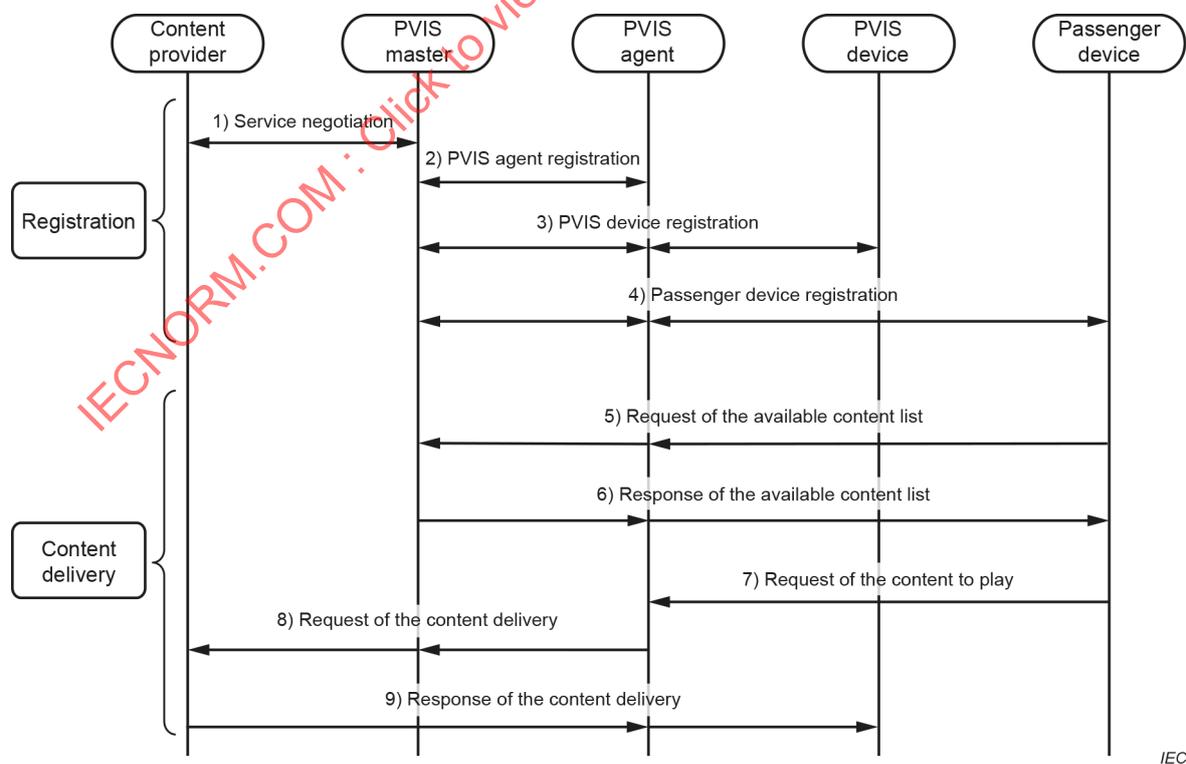
Figure 6 – Overview of content delivery in the large-scale public vehicle

In this example, it is assumed that the PVIS master has already established a service contract or negotiation with the associated content provider for Internet-based services, such as online games or over-the-top (OTT) services.

For service provisioning, all PVIS agents are registered with the PVIS master. In addition, all PVIS devices and passenger devices are also registered with the PVIS master via the associated PVIS agent. For content delivery service, a passenger device first obtains the list of multimedia contents available in the public vehicle from the PVIS master via the PVIS agent. Based on the available content list, the passenger will request the content from the PVIS agent. Then, the PVIS agent will try to download the content from the PVIS master or the content provider.

Figure 7 shows the operation flows for content delivery through a PVIS agent.

- 1) The PVIS master has a service contract or negotiation with an external content provider.
- 2) All PVIS agents are registered with the PVIS master, before the service begins.
- 3) All PVIS devices are also registered with the PVIS master via the PVIS agent.
- 4) Each passenger device is registered with the PVIS master via the PVIS agent, when it is connected.
- 5) The passenger device requests the list of available contents from the PVIS master.
- 6) The PVIS master responds with the list of available contents to passenger device via the PVIS agent.
- 7) Based on the list, the passenger device can select a specific content to play, and it requests the content from the PVIS agent.
- 8) Based on the request, the PVIS agent requests the corresponding content from the content provider via the PVIS master.
- 9) The PVIS agent tries to download the contents from the content provider and deliver them to the passenger device.



IEC

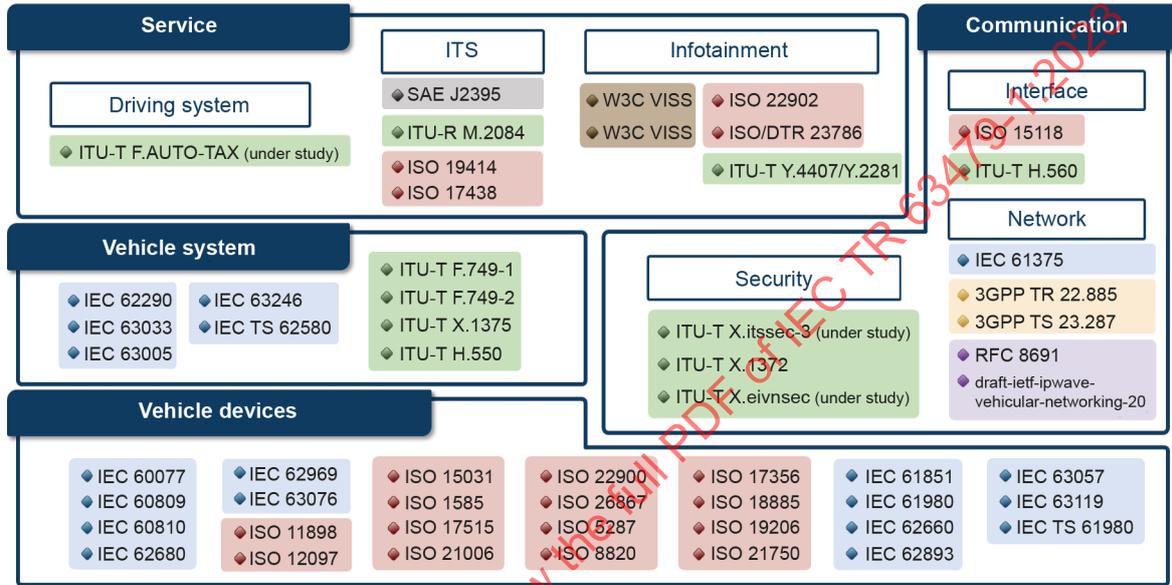
Figure 7 – Operation flows for content delivery in large-scale public vehicle

Annex A (informative)

Gap analysis with the existing relevant standards

This annex describes the gap analysis between existing relevant standards and this document.

Figure A.1 shows the categorization of the existing relevant stands into service, communication, vehicle system, and vehicle devices.



IEC

Figure A.1 – Overview of relevant standards

Figure A.2 shows the classification of the relevant standards on public vehicle devices. Many standards related to vehicle devices have focused on driving-related devices or batteries. In the meantime, the standards for multimedia services for public vehicles have not been established.

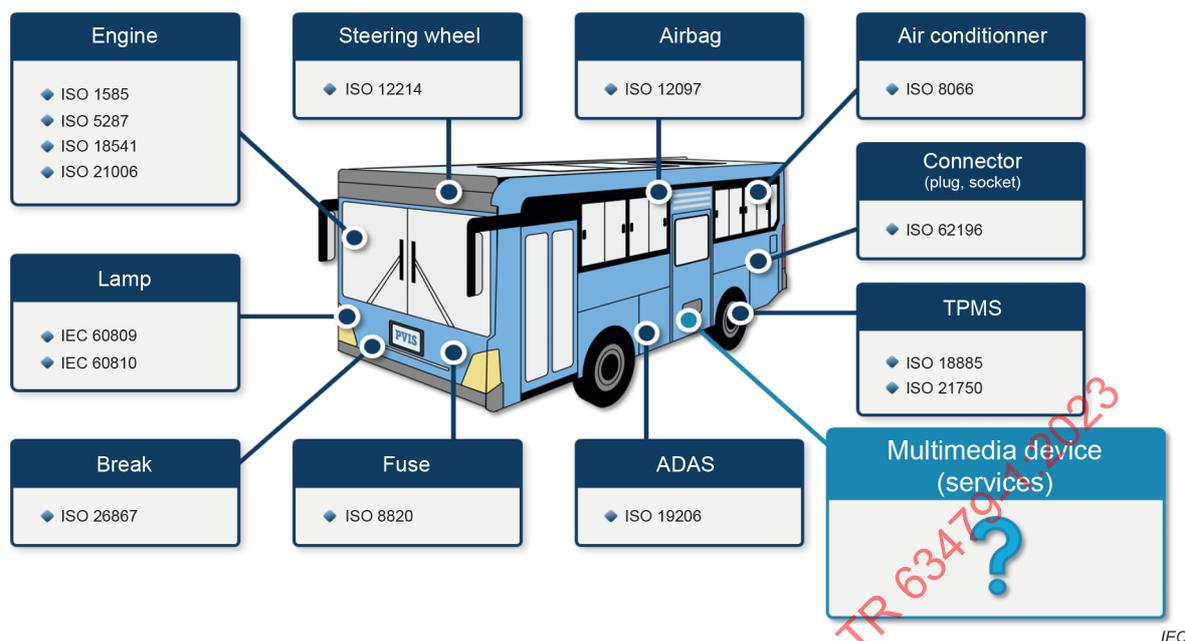


Figure A.2 – Standards on devices of public vehicles

Table A.1 shows the standards for vehicle systems. There are some standards on the management of vehicle systems in the personal vehicle environment. However, there is no work on multimedia services in public vehicles.

Table A.1 – Standards for vehicle systems

SDO	Technical committee	Standard	Title
IEC	TC 9	IEC 62847	Railway applications – Urban guided transport management and command/control systems
IEC	TC 9	IEC TS 62580	Electronic railway equipment – On-board multimedia and telematic subsystems for railways
IEC	TC 100 / TA 17	IEC 63033-1	Surround view system Part 1: General
IEC	TC 100 / TA 17	IEC 63033-2	Surround view system Part 2: Recording methods of the surround view system
IEC	TC 100 / TA 17	IEC 63033-3	Surround view system Part 3: Measurement methods
IEC	TC 100 / TA 17	IEC 63033-4	Surround view system Part 4: Application for Camera Monitor Systems
IEC	TC 100 / TA 17	IEC 63005-1	Event video data recorder for road vehicle accidents Part 1: Basic requirements
IEC	TC 100 / TA 17	IEC 63005-2	Event video data recorder for road vehicle accidents Part 2: Test methods for evaluating the performance of basic functions
IEC	TC 100 / TA 17	IEC 63246-1	Configurable Car Infotainment Service (CCIS) – Part 1: General
IEC	TC 100 / TA 17	IEC 63246-2	Configurable Car Infotainment Service (CCIS) – Part 2: Requirements
IEC	TC 100 / TA 17	IEC 63246-3	Configurable Car Infotainment Service (CCIS) – Part 3: Framework
IEC	TC 100 / TA 17	IEC TR 63246-4	Configurable Car Infotainment Service (CCIS) – Part 4: Protocol
ITU	ITU-T SG 16	ITU-T F749.1	Functional requirements for vehicle gateways
ITU	ITU-T SG 16	ITU-T F749.2	Service requirements for vehicle gateway platforms
ITU	ITU-T SG 17	ITU-T X.1375	Methodologies for intrusion detection system on in-vehicle systems
ITU	ITU-T SG 16	ITU-T H.550	Architecture and functional entities of vehicle gateway platforms

Table A.2 shows the standards for communication interface. There are various communication-related standards. However, the communication issues for infotainment services have not been addressed.

Table A.2 – Standards for communication interfaces

SDO	Technical committee	Standard	Title
IEC	TC 69	ISO 15118	Road vehicles – Vehicle to grid communication interface
ITU	ITU-T SG 16	ITU-T H.560	Communications interface between external applications and a vehicle gateway platform
ISO	TC 22	ISO 17356-1	Open interface for embedded automotive applications – Part 1: General structure and terms, definitions and abbreviated terms
ISO	TC 22	ISO 17356-2	Open interface for embedded automotive applications – Part 2: OSEK/VDX specifications for binding OS, COM and NM
ISO	TC 22	ISO 17356-3	Open interface for embedded automotive applications – Part 3: OSEK/VDX Operating System (OS)
ISO	TC 22	ISO 17356-4	Open interface for embedded automotive applications – Part 4: OSEK/VDX Communication (COM)
ISO	TC 22	ISO 22900-1	Modular vehicle communication interface (MVCi) – Part 1: Hardware design requirements
ISO	TC 22	ISO 22900-2	Modular vehicle communication interface (MVCi) – Part 2: Diagnostic protocol data unit (D-PDU API)
ISO	TC 22	ISO 22900-3	Modular vehicle communication interface (MVCi) – Part 3: Diagnostic server application programming interface (D-Server API)
ISO	TC 22	ISO 22901-1	Open diagnostic data exchange (ODX) – Part 1: Data model specification
ISO	TC 22	ISO 22901-2	Open diagnostic data exchange (ODX) – Part 2: Emissions-related diagnostic data
ISO	TC 22	ISO 22901-3	Open diagnostic data exchange (ODX) – Part 3: Fault symptom exchange description (FXD)
ITU	ITU-T SG 17	ITU-T X.1372	Security guidelines for Vehicle-to-Everything (V2X) communication
IEC	TC 9	IEC.61375	Electronic railway equipment – Train communication network (TCN)
3GPP	3GPP	3GPP TR 22.885	Study on LTE support for Vehicle-to-Everything (V2X) services
3GPP	3GPP	3GPP TS 23.287	Architecture enhancements for 5G System (5GS) to support Vehicle-to-Everything (V2X) services
ISO	TC 204	ISO 15628	Intelligent transport systems – Dedicated short range communication (DSRC) -- DSRC application layer
ISO	TC 204	ISO/TS 16785	Electronic Fee Collection (EFC) – Application interface definition between DSRC-OBE and external in-vehicle devices
ISO	TC 204	ISO 17515-1	Communications access for land mobiles (CALM) – Evolved universal terrestrial radio access network (E-UTRAN) – Part 1: General usage
ISO	TC 204	ISO 17515-2	Evolved universal terrestrial radio access network (E-UTRAN) – Part 2: Device to device communications (D2D)
ISO	TC 204	ISO 17515-3	Evolved-universal terrestrial radio access network – Part 3: LTE-V2X
ISO	TC 22	ISO 17458-1	FlexRay communications system – Part 1: General information and use case definition
ISO	TC 22	ISO 17458-2	FlexRay communications system – Part 2: Data link layer specification
ISO	TC 22	ISO 17458-3	FlexRay communications system – Part 3: Data link layer conformance test specification