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Road vehicles — Video communication interface for cameras (VCIC) —

Part 2: Service discovery and control

Véhicules routiers — Interface de communication vidéo pour caméras (ICVC)

Reference number
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Foreword

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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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 22, *Road vehicles*, Subcommittee SC 3, *Electric and electronic equipment*.

ISO 17215 consists of the following parts, under the general title *Road vehicles — Video communication interface for cameras (VCIC)*:

— *Part 1: General information and use case definition*

— *Part 2: Service discovery and control*

— *Part 3: Camera message dictionary*

— *Part 4: Implementation of communication requirements*

Introduction

Driver assistance systems are more and more common in road vehicles. From the beginning, cameras were part of this trend. Analogue cameras were used in the beginning, because of lower complexity of the first systems. With increasing demand for more advanced functionality, digital image processing has been introduced. So-called one box design cameras (combining a digital image sensor and a processing unit) appeared in the vehicles.

Currently, the market demands such systems with multiple functions. Even different viewing directions are in use. It seems to be common sense that 6 up to 12 cameras in a single vehicle will be seen in the next future. Out of this and the limitation in size, power consumption, etc. it will lead to designs where the cameras are separated from the processing unit. Therefore, a high performance digital interface between camera and processing unit is necessary.

This International Standard has been established in order to define the use cases, the communication protocol, and the physical layer requirements of a video communication interface for cameras which covers the needs of driver assistance applications.

The video communication interface for cameras

— incorporates the needs of the whole life cycle of an automotive grade digital camera,

— utilizes existing standards to define a long-term stable state-of-art video communication interface for cameras usable for operating and diagnosis purpose,

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

— is compatible with AUTOSAR.

This part of ISO 17215 is related to the general information and use case definition. This is a general overview document which is not related to the OSI model.

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 which structures communication systems into seven layers. When mapped on this model, the protocol and physical layer requirements specified by this International Standard, in accordance with Table 1, are broken into following layers:

— application (layer 7), specified in ISO 17215-3;

— presentation layer (layer 6), specified in ISO 17215-2;

— session layer (layer 5), specified in ISO 17215-2;

— transport protocol (layer 4), specified in ISO 17215-4, ISO 13400-2;

— network layer (layer 3), specified in ISO 17215-4, ISO 13400-2;

— data link layer (layer 2), specified in ISO 17215-4, ISO 13400-3;

— physical layer (layer 1), specified in ISO 17215-4, ISO 13400-3.

Table 1 — Specifications applicable to the OSI layers

Applicability	OSI 7 layers	Video communication interface for cameras		Camera diagnostics
Seven layers according to ISO 7498-1 and ISO/IEC 10731	Application (layer 7)	ISO 17215-3		
	Presentation (layer 6)	ISO 17215-2		
	Session (layer 5)	ISO 17215-2		
	Transport (layer 4)	ISO 17215-4	Other future interface standards	ISO 13400-2
	Network (layer 3)			
	Data link (layer 2)	ISO 17215-4		ISO 13400-3
	Physical (layer 1)			

ISO 17215-1 has been established in order to define the use cases for vehicle communication systems implemented on a video communication interface for cameras; it is an overall document not related to the OSI model.

ISO 17215-3 covers the application layer implementation of the video communication interface for cameras; it includes the API.

ISO 17215-2 covers the session and presentation layer implementation of the video communication interface for cameras.

ISO 17215-4, being the common standard for the OSI layers 1 to 4 for video communication interface for cameras, complements ISO 13400-2 and ISO 13400-3 and adds the requirement for video transmission over Ethernet.

ISO 17215-2 and ISO 17215-3 (OSI layer 5 to 7) services have been defined to be independent of the ISO 17215-4 (OSI layer 1 to 4) implementation. Therefore ISO 17215-4 could be replaced by other future communication standards.

Road vehicles — Video communication interface for cameras (VCIC) —

Part 2: Service discovery and control

1 Scope

This part of ISO 17215 specifies how services can be discovered and controlled. This functionality is located mainly in layer 5 of the OSI model. Both discovery and control are implemented using the scalable service oriented middlewire over IP (SOME/IP). Figure 1 shows a diagram of these aspects and their relation to other parts of this International Standard.

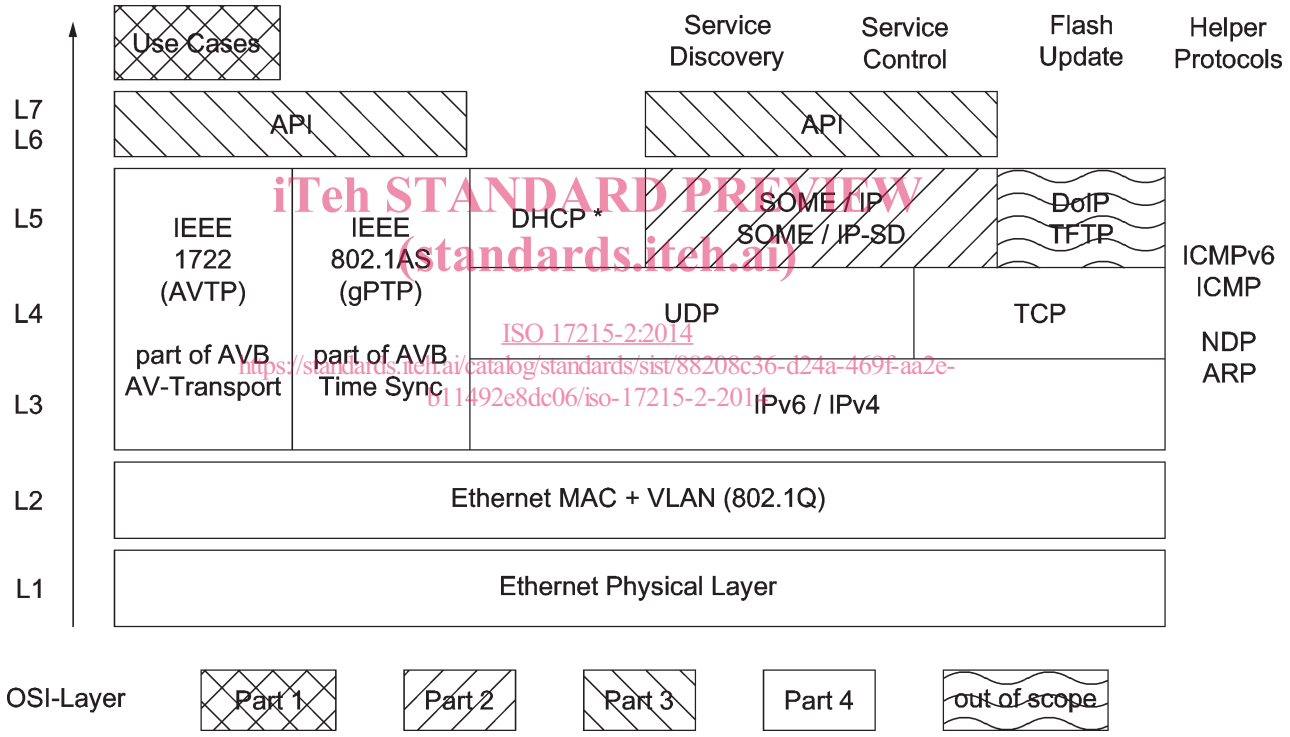

Figure 1 — Overview of ISO 17215

The general terminology defined in ISO 17215-1 is also used in this part of ISO 17215.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 7498-1, *Information processing systems — Open Systems Interconnection — Basic Reference Model: The Basic Model — Part 1*

ISO/IEC 10731, *Information technology — Open Systems Interconnection — Basic Reference Model — Conventions for the definition of OSI services*

ISO 17215 (all parts), *Road vehicles — Video communication interface for cameras (VCIC)*

NOTE The keywords shall, should, etc. as defined in [IETF RFC 2119] are used in this part of ISO 17215 to indicate requirement levels. Capitalization of those keywords is not required.

If an RFC referenced by this part of ISO 17215 has been updated by one or several RFCs, the update is fully applicable for the purpose of implementing this International Standard. This presumes the additional document describes an implementation which is compatible with implementation described by document referred to herein.

If one or more errata for an RFC referenced by this part of ISO 17215 have been published, all of these errata documents are fully applicable for the purpose of implementing this International Standard.

It is assumed that future implementations of this International Standard will use the most recent versions of the referenced RFCs, but maintain backward compatibility to existing implementations.

3 Terms, definitions, and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 17215-1 and the following apply.

3.1.1
AUTOSAR
open and standardized automotive software architecture, jointly developed by automobile manufacturers, suppliers, and tool developers

3.1.2
client
software component that uses a service instance, e.g. by invoking a method

3.1.3
event
fire and forget message invoked on changes or cyclic and sent from server to client

3.1.4
event group
logical grouping of events or notifications within a service in order to ease subscription

3.1.5
field
representation of a remote property which has up to one getter, up to one setter, and up to one notifier

Note 1 to entry: A getter/setter is a method to get/set the value of a field.

3.1.6
fire and forget communication
RPC call that consists only of a request message

3.1.7
interface definition
concrete specification of a service interface (e.g. in IDL or PDU notation)

Note 1 to entry: In the case of ISO 17215, the interface definition is contained in ISO 17215-3.

3.1.8
method
procedure, function, or subroutine that can be called by a client

3.1.9
notification
fire and forget message that is sent on defined status changes or periodically by the notifier of an event or a field

Note 1 to entry: Field messages cannot be distinguished from an event message; therefore, when referring to an event message, this shall also be true for the messages of notifiers of fields.

3.1.10
parameters
input, output, or input/output arguments of a method

3.1.11
remote procedure call
method call between two processes that is transmitted using messages

3.1.12
request
message from the client to the server invoking a method

3.1.13
request/response communication
RPC that consists of a request and a response

3.1.14
response
message from the server to the client transporting results of a method invocation

3.1.15
server
software component that offers a service instance, e.g. by providing a method

3.1.16
service
logical combination of zero or more methods, zero or more fields, and zero or more events

3.1.17
service instance
instantiation of the service interface, which can exist more than once in the vehicle or on an ECU

3.1.18
service interface
abstract specification of a service including its methods, events, and fields

3.1.19
union
data structure that can dynamically assume different data types (also known as variant)

3.2 Abbreviated terms

Term	Description
OSI	Open Systems Interconnection
PDU	Protocol Data Unit
RPC	Remote Procedure Call
ECU	Electronic Control Unit
IDL	Interface Description Language
AUTOSAR	AUTomotive Open System ARchitecture

4 Conventions

ISO 17215 is based on the conventions specified in the OSI service conventions (ISO/IEC 10731) as they apply for physical layer, protocol, network and transport protocol, and diagnostic services.

5 Overview

5.1 General

ISO 17215 has been established in order to implement a standardized video communication interface for cameras in vehicles.

The focus of ISO 17215 is using existing protocols.

Figure 1 specifies the relation to the other parts of the standard.

Figure 2 specifies the relation of ISO 17215 to existing protocols.

5.2 Document overview and structure

This International Standard consists of a set of four sub-documents, which provide all references and requirements to support the implementation of a video communication interface for cameras according to the standard at hand.

— ISO 17215-1:. This part provides an overview of the document set and structure along with use case definitions and a common set of resources (definitions, references) for use by all subsequent parts.

— ISO 17215-2:. This part specifies the discovery and control of services provided by a VCIC camera.

— ISO 17215-3:. This part specifies the standardized camera messages and data types used by an VCIC camera (OSI layer 7).

— ISO 17215-4:. This part specifies standardized low-level communication requirements for implementation of the physical layer, data link layer, network layer, and transport layer (OSI layers 1 to 4).

5.3 Open Systems Interconnection (OSI) model

This International Standard is based on the Open Systems Interconnection (OSI) basic reference model as specified in ISO/IEC 7498 which structures communication systems into seven layers.

All parts of this International Standard are guided by the OSI service conventions as specified in ISO/IEC 10731 to the extent that they are applicable to diagnostic services. These conventions define the interaction between the service user and the service provider through service primitives.

The aim of this subclause is to give an overview of the OSI model and show how it has been used as a guideline for this part of ISO 17215. It also shows how the OSI service conventions have been applied to this International Standard.

The OSI model structures data communication into seven layers called (from top to bottom) the application layer (layer 7), presentation layer, session layer, transport layer, network layer, data link layer, and physical layer (layer 1). A subset of these layers is used in ISO 17215.

The purpose of each layer is to provide services to the layer above. The active parts of each layer, implemented in software, hardware or any combination of software and hardware, are called *entities*. In the OSI model, communication takes place between entities of the same layer in different nodes. Such communicating entities of the same layer are called peer entities.

The services provided by one layer are available at the Service Access Point (SAP) of that layer. The layer above can use them by exchanging data parameters.

This International Standard distinguishes between the services provided by a layer to the layer above it and the protocol used by the layer to send a message between the peer entities of that layer. The reason for this distinction is to make the services, especially the application layer services and the transport layer services, reusable also for other types of networks than the video communication interface for cameras. In this way, the protocol is hidden from the service user and it is possible to change the protocol if demanded by special system requirements.

5.4 Document reference according to OSI model

Figure 2 illustrates the document references.

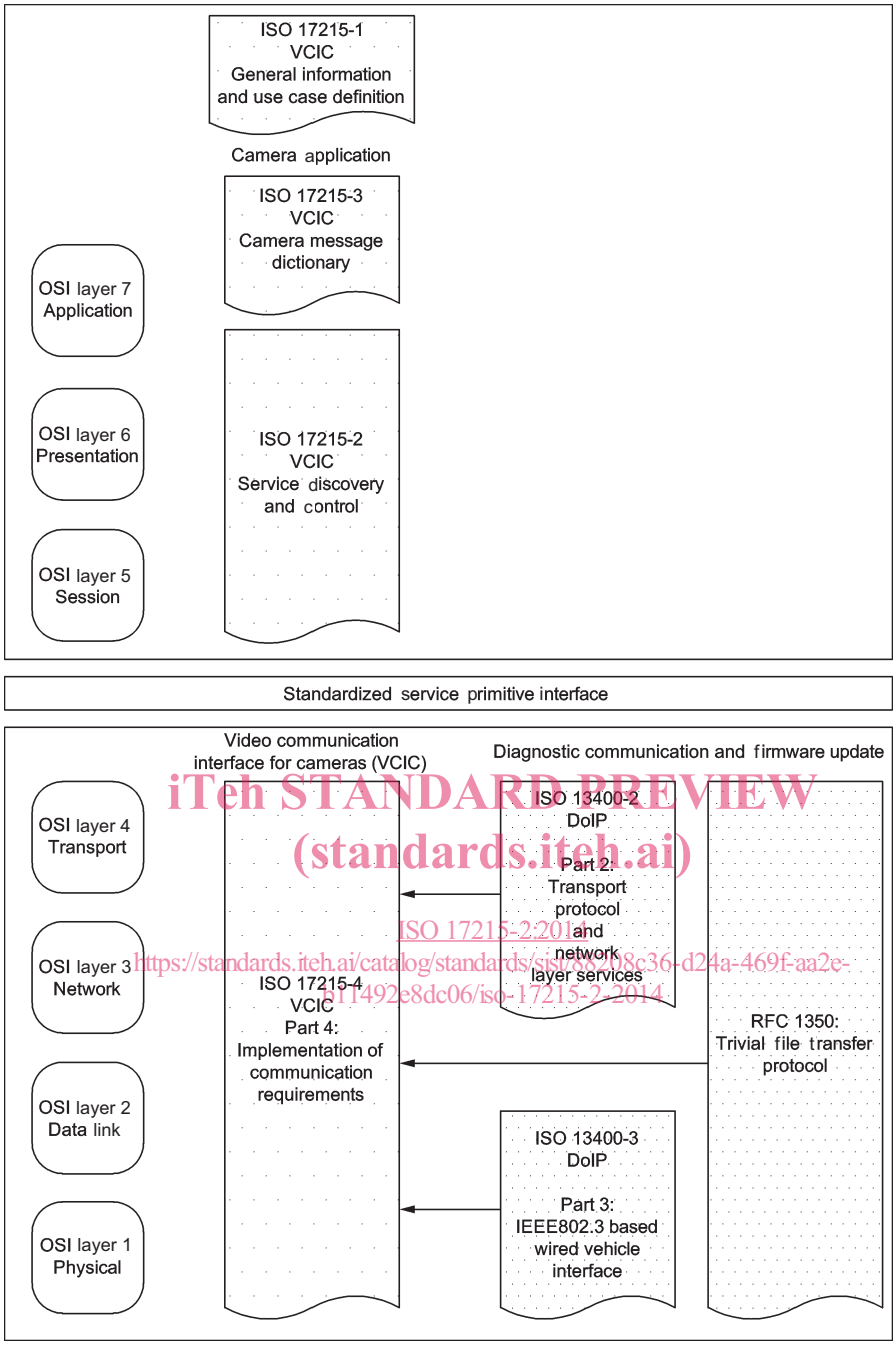

Figure 2 — Video communication interface for camera's document reference according to OSI model

6 SOME/IP

6.1 General

Service discovery as well as command and control is performed using the Scalable service-Oriented MiddlewarE over IP. SOME/IP is a lightweight RPC protocol that defines an AUTOSAR-compatible method for describing interfaces and marshalling data over automotive Ethernet and IP networks. The basic feature set of the SOME/IP wire format is already supported by AUTOSAR. This allows AUTOSAR to parse the RPC PDUs and transport the signals to the application.

6.2 Header

This subclause defines the header structure.

For interoperability reasons, the header layout shall be identical for all implementations of SOME/IP and is shown in Figure 3.

— The header-fields are presented in transmission order; i.e. the header-fields on the top left are transmitted first. In the following sections, the different header-fields and their usage is being described.

— All RPC header fields shall use network byte order (big endian) [IETF RFC 791].

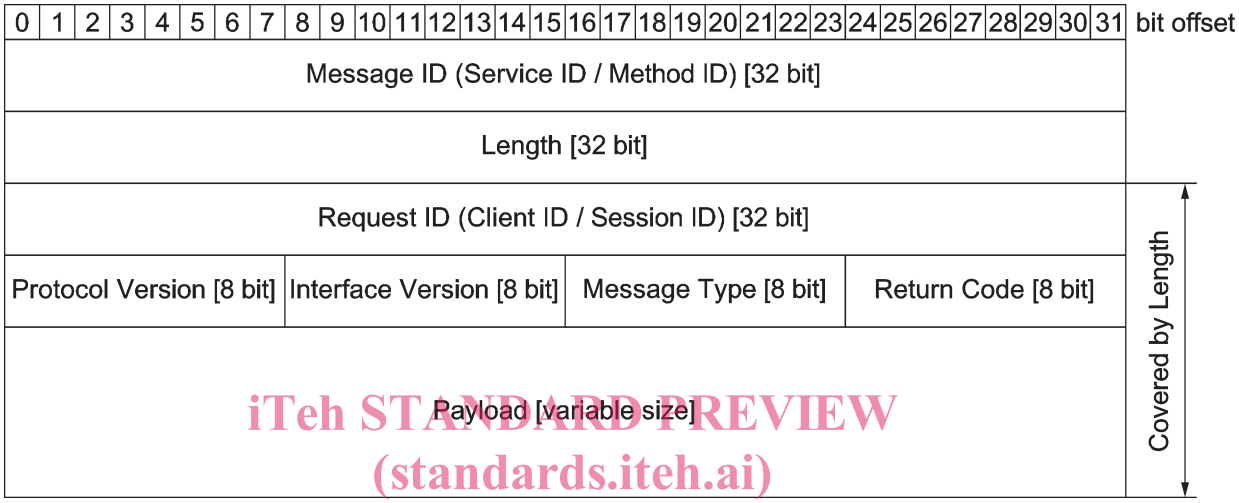

Figure 3 — General SOME/IP header layout

6.2.1 Message ID [32-bit]

The Message ID is a 32-bit identifier that is used to dispatch the RPC call to the method of an application and to identify an event.

The assignment of the Message ID is up to the user. The next section describes how to structure the Message IDs in order to ease the organization of Message IDs.

— The Message ID shall uniquely identify a method or an event and the format of its associated PDUs.

In order to structure the different methods and events, they are clustered into services. Services have a set of methods and events as well as a Service ID, which is used for exactly one service. Events are in addition clustered into event groups, which simplify the subscription for multiple events.

— The message ID for RPC calls shall consist of a 16-bit Service ID (high bytes) and a 16-bit Method ID (low bytes).

— The Service ID and the Method ID shall be defined in the interface specification.

— The highest bit of the Event ID shall always be one.

This scheme allows for up to 65 536 services with up to 32 767 methods and 32767 events each.

— The message ID for events shall consist of a 16-bit Service ID (high bytes) and a 16-bit Notification ID (low bytes).

— The Eventgroup ID and Event ID shall be specified in the interface specification.

— The highest bit of the Eventgroup ID shall always be one.