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

Part 4:  
**Implementation of communication  
requirements**

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

*Partie 4: Mise en oeuvre d'exigences de communication*

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# Contents

Page

<b>Foreword</b> .....	<b>iv</b>
<b>Introduction</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms, definitions, symbols, and abbreviated terms</b> .....	<b>3</b>
3.1 Terms and definitions.....	3
3.2 Abbreviated terms.....	3
<b>4 Conventions</b> .....	<b>4</b>
<b>5 Overview</b> .....	<b>4</b>
5.1 General.....	4
5.2 Document overview and structure.....	4
5.3 Open Systems Interconnection (OSI) model.....	5
5.4 Document reference according to OSI model.....	5
<b>6 Physical layer</b> .....	<b>6</b>
<b>7 Data link layer</b> .....	<b>7</b>
7.1 General.....	7
7.2 Configuration.....	7
<b>8 Network layer</b> .....	<b>7</b>
8.1 General.....	7
8.2 Audio Video Transport Protocol (AVTP).....	7
8.3 IPv6.....	8
8.4 IPv4.....	10
8.5 Address allocation process.....	11
<b>9 Transport layer</b> .....	<b>11</b>
9.1 General.....	11
9.2 User Datagram Protocol (UDP).....	12
9.3 Transmission Control Protocol (TCP).....	12

## 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](http://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](http://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 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, *Electrical 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 International Standard 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:

- 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 International Standard 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 is the common International Standard for the OSI layers 1 to 4 for the video communication interface for cameras. It 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.

[ISO 17215-4:2014](https://standards.iteh.ai/standards/iso-17215-4-2014)

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

## Part 4: Implementation of communication requirements

### 1 Scope

This part of ISO 17215 specifies the communication requirements for video camera interfaces. It is concerned mainly with layers 1 through 4 of the ISO/OSI basic reference model. These layers are the physical layer, the link layer, the network layer, and the transport layer. [Figure 1](#) presents the communication protocols specified in this part of ISO 17215 in relation to the ISO/OSI layers as well as the content of the other parts of ISO 17215.

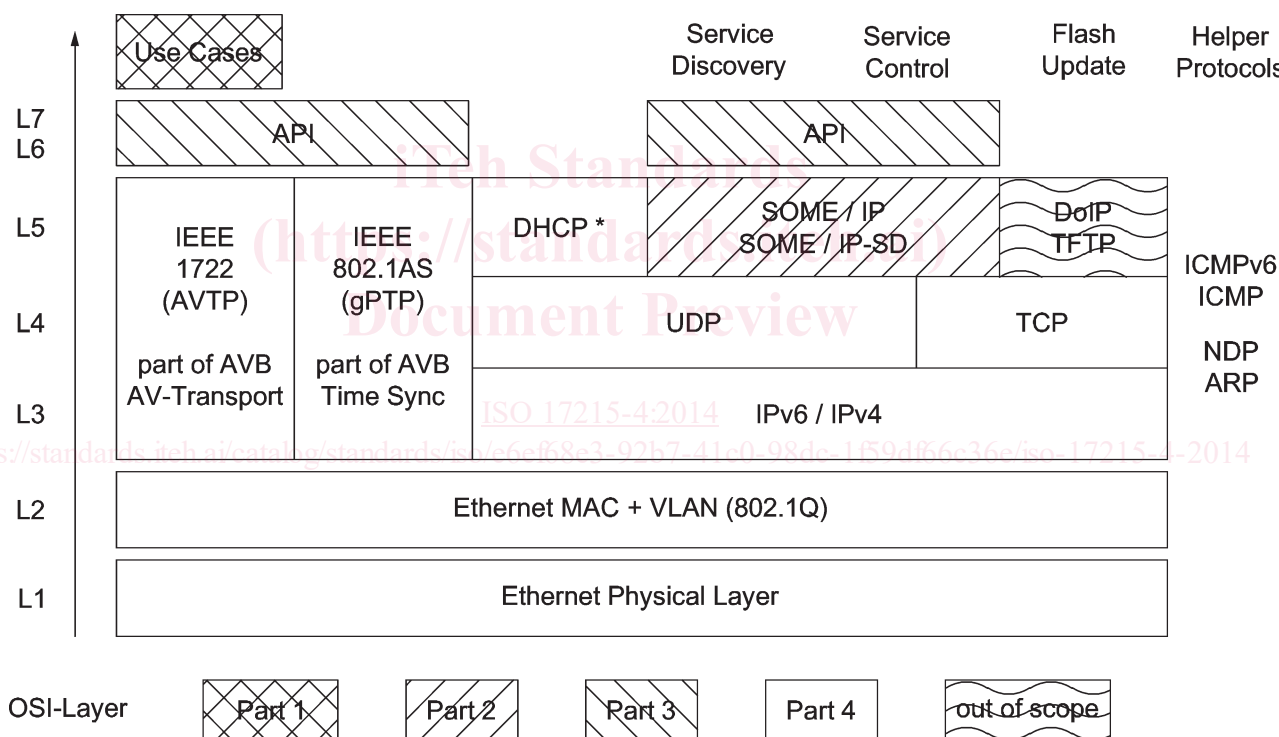


Figure 1 — Overview of ISO 17215

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*

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

## ISO 17215-4:2014(E)

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

IEEE 802.3-2012, *Standard for Ethernet*

IEEE 802.1Q, *IEEE Standard for Local and Metropolitan Area Networks — Media Access Control (MAC) Bridges and Virtual Bridged Local Area Networks*

IEEE 802.1AS, *Timing and Synchronization for Time-Sensitive Applications in Bridged Local Area Networks*

IEEE 1722, *Layer 2 Transport Protocol for Time-Sensitive Applications in a Bridged Local Area Network*  
IETF RFC 826, *Ethernet Address Resolution Protocol: Or Converting Network Protocol Addresses to 48-bit Ethernet Address for Transmission on Ethernet Hardware*

IETF RFC 768, *User Datagram Protocol*

IETF RFC 791, *Internet Protocol*

IETF RFC 792, *Internet Control Message Protocol*

IETF RFC 793, *Transmission Control Protocol*

IETF RFC 896, *Congestion Control in IP/TCP Internetworks*

IETF RFC 1122, *Requirements for Internet Hosts — Communication Layers*

IETF RFC 1323, *TCP Extensions for High Performance*

IETF RFC 1624, *Computation of the Internet Checksum via Incremental Update*

IETF RFC 1878, *Variable Length Subnet Table For IPv4*

IETF RFC 1981, *Path MTU Discovery for IP version 6*

IETF RFC 2018, *TCP Selective Acknowledgment Options*

IETF RFC 2131, *Dynamic Host Configuration Protocol*

IETF RFC 2132, *DHCP Options and BOOTP Vendor Extensions*

IETF RFC 2460, *Internet Protocol, Version 6 (IPv6) Specification*

IETF RFC 2464, *Transmission of IPv6 Packets over Ethernet Networks*

IETF RFC 2988, *Computing TCP's Retransmission Timer*

IETF RFC 3122, *Extensions to IPv6 Neighbor Discovery for Inverse Discovery Specification*

IETF RFC 3203, *DHCP reconfigure extension*

IETF RFC 3315, *Dynamic Host Configuration Protocol for IPv6 (DHCPv6)*

IETF RFC 3390, *Increasing TCP's Initial Window*

IETF RFC 3484, *Default Address Selection for Internet Protocol version 6 (IPv6)*

IETF RFC 3782, *The NewReno Modification to TCP's Fast Recovery Algorithm*

IETF RFC 4286, *Multicast routing discovery*

IETF RFC 4291, *IP Version 6 Addressing Architecture*

IETF RFC 4294, *IPv6 Node Requirements*

IETF RFC 4443, *Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification*



IETF RFC 4861, *Neighbor Discovery for IP version 6 (IPv6)*

IETF RFC 4862, *IPv6 Stateless Address Autoconfiguration*

IETF RFC 4884, *Extended ICMP to Support Multi-Part Messages*

IETF RFC 5095, *Deprecation of Type 0 Routing Headers in IPv6*

IETF RFC 5220, *Problem Statement for Default Address Selection in Multi-Prefix Environments: Operational Issues of RFC 3484 Default Rules*

IETF RFC 5405, *Unicast UDP Usage Guidelines for Application Designers*

IETF RFC 5482, *TCP User Timeout Option*

IETF RFC 5681, *TCP Congestion Control*

IETF RFC 5722, *Handling of Overlapping IPv6 Fragments*

IETF RFC 5871, *IANA Allocation Guidelines for the IPv6 Routing Header*

IETF RFC 1042, *Standard for the transmission of IP datagrams over IEEE 802 networks*

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 part of ISO 17215. 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 part of ISO 17215.

It is assumed that future implementations of this part of ISO 17215 will use the most recent versions of the referenced RFCs but maintain backward compatibility to existing implementations.

<https://standards.iso.org/iso-17215-4-2014>

<http://www.iso.org/iso/59df66c36e/iso-17215-4-2014>

### 3 Terms, definitions, symbols, and abbreviated terms

#### 3.1 Terms and definitions

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

#### 3.2 Abbreviated terms

Term	Description
API	Application Programming Interface
ARP	Address Resolution Protocol
AVB	Audio Video Broadcast
AVTP	Audio Video Transport Protocol
DHCP	Dynamic Host Configuration Protocol
DoIP	Diagnosis over IP
EMC	Electromagnetic Compatibility
gPTP	Generalized Precision Time Protocol

## ISO 17215-4:2014(E)

ICMP	Internet Control Message Protocol
LLC	Logical Link Control
MAC	Media Access Control
MII	Media Independent Interface
NDP	Neighbour Discovery Protocol
OSI	Open Systems Interconnection
PDU	Protocol Data Unit
PHY	Physical Layer
POE	Power over Ethernet
TCP	Transmission Control Protocol
TFTP	Trivial File Transfer Protocol
UDP	User Datagram Protocol
VLAN	Virtual Local Area Network

### 4 Conventions

This International Standard is based on the conventions specified in the OSI service conventions (ISO/IEC<sup>o</sup>10731) as they apply for physical layer, protocol, network and transport protocol, and diagnostic services.

### 5 Overview

[ISO 17215-4:2014](https://standards.iteh.ai/iso-17215-4-2014)

<https://standards.iteh.ai/catalog/standards/iso/e6ef68e3-92b7-41c0-98dc-1f59df66c36e/iso-17215-4-2014>

#### 5.1 General

This International Standard has been established in order to implement a standardized Video Communication Interface for Cameras in vehicles.

The focus of this International Standard is using existing protocols.

[Figure 1](#) specifies the relation to the other parts of this International Standard.

[Figure 2](#) specifies the relation of this International Standard 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 provides an overview of the document set and structure along with the use case definitions and a common set of resources (definitions, references) for use by all subsequent parts.
- ISO 17215-2 specifies the discovery and control of services provided by a VCIC camera.
- ISO 17215-3 specifies the standardized camera messages and data types used by a VCIC camera (OSI Layer 7).