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**Intelligente Transportsysteme –
Kooperative ITS –
Verzeichnis von Datenstrukturen fahrzeuginterner Informationen (IVI)
(ISO/TS 19321:2020);
Englische Fassung CEN ISO/TS 19321:2020**

Intelligent transport systems –
Cooperative ITS –
Dictionary of in-vehicle information (IVI) data structures (ISO/TS 19321:2020);
English version CEN ISO/TS 19321:2020

Systèmes intelligents de transport –
Coopérative STI –
Dictionnaire de structures de données d'informations dans les véhicules (IVI)
(ISO/TS 19321:2020);
Version anglaise CEN ISO/TS 19321:2020

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Nationales Vorwort

Dieses Dokument (CEN ISO/TS 19321:2020) wurde vom Technischen Komitee CEN/TC 278 „Intelligente Verkehrssysteme“ ausgearbeitet, dessen Sekretariat von NEN (Niederlande) gehalten wird.

Das zuständige deutsche Normungsgremium ist der Gemeinschaftsarbeitsausschuss NA 052-02-71 GA „Gemeinschaftsarbeitsausschuss NAAutomobil/DKE: Intelligente Verkehrssysteme“ des DIN-Normenausschusses Automobiltechnik.

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Diese technische Spezifikation unterstützt vorgeschriebene und empfehlende Straßenbeschilderungen, wie kontextuelle Geschwindigkeiten und Baustellenwarnungen. Fahrzeuginterne Informationen können mittels ITS-Station übertragen werden und korrespondieren mit festen oder variablen Straßenschildern oder Baustellen.

Die technische Spezifikation liefert außerdem einen Datencontainer fahrzeuginterner Informationselemente. Dieses Containerkonzept liefert eine Möglichkeit für eine ITS-Station relevante IVI zu steuern. Es liefert außerdem Details für die Anwendung von IVI. Die Datenelementbeschreibung umfasst Datensyntax und Semantiken, d.h. Definitionen des Datenformats und Inhalte, zusammen mit der Beschreibung zur Nutzung der Datenelemente.

Nutzer dieser technischen Spezifikation vor allem Straßenbetreiber sowie Hersteller von entsprechenden Systemen.

Erfahrungen mit dieser Technischen Spezifikation sind erbeten:

- vorzugsweise als Datei per E-Mail an eric.wern@vda.de in Form einer Tabelle. Die Vorlage dieser Tabelle kann im Internet unter <http://www.din.de/stellungnahme> abgerufen werden;
- oder in Papierform an den Normenausschuss Automobiltechnik, Behrenstr. 35, 10117 Berlin.

Aktuelle Informationen zu diesem Dokument können über die Internetseiten von DIN (www.din.de) durch eine Suche nach der Dokumentennummer aufgerufen werden.

Änderungen

Gegenüber DIN CEN ISO/TS 19321 (DIN SPEC 72002):2015-08 wurden folgende Änderungen vorgenommen:

- a) diverse Container wurden umbenannt oder neu eingeführt;
- b) ASN.1 Code in Anhang A wurde ausgelagert;
- c) der ehemalige Anhang B wurde durch neue visuelle Beispiele ersetzt;
- d) Dokumente von C-Roads und Eco-AT wurden in den Literaturhinweisen ergänzt.

Frühere Ausgaben

DIN CEN ISO/TS 19321 (DIN SPEC 72002): 2015-08

Nationaler Anhang NA (informativ)

Begriffe

Die Benummerung der folgenden Begriffe und Abkürzungen ist identisch mit der Benummerung in der englischen Fassung.

Für die Anwendung dieses Dokuments gelten die folgenden Begriffe.

ISO und IEC stellen terminologische Datenbanken für die Verwendung in der Normung unter den folgenden Adressen bereit:

- IEC Electropedia: verfügbar unter <http://www.electropedia.org/>
- ISO Online Browsing Platform: verfügbar unter <http://www.iso.org/obp>

3.1

Anwendungsdateneinheit, en: application data unit
Dateneinheit, die zwischen ITS-S Anwendungen ausgetauscht werden

3.2

Container, en: container
Gruppe von *Datenrahmen* (3.4) und *Datenelementen* (3.3), die semantisch an einem Ort der *fahrzeuginternen Informationsstruktur* (3.8) zusammengehören

3.3

Datenelement, en: data element
DE
Datentyp, der nur ein Datum enthält

[QUELLE: ETSI/TS 102 894-2 V1.3.1]

3.4

Datenrahmen, en: data frame
Datentyp, der mehr als ein *Datenelement* (3.3) in einer festgelegten Reihenfolge enthält

[QUELLE: ETSI/TS 102 894-2 V1.3.1]

3.5

Entdeckungsbereich, en: detection zone
Teil eines Straßennetzwerkes, das von einem Fahrzeug in Annäherung eines *Bereiches von Bedeutung* (3.17) passiert wird

3.6

Digitalkarten-Datenbank, en: digital map database
strukturierte Menge digitaler und alphanumerischer Daten, welche geographische Orte und Beziehungen von örtlichen Eigenschaften abbilden

[QUELLE: ISO 17572-1:2015, 2.1.10, modifiziert — Anmerkung zum Begriff wurde gelöscht]

3.7**Fahrer Bewusstseinsbereich**, en: driver awareness zone

Teile eines Straßennetzwerks, in dem eine Botschaft dargestellt wird, die den Fahrer über aufkommende Situationen informiert

3.8**fahrzeuginterne Informationen**, en: in-vehicle information

Informationen, die in fahrzeuginternen Informationsdatenstrukturen beinhaltet sind und von verschiedenen intelligenten Verkehrssystem-Diensten benötigt werden

3.9**fahrzeuginterne Darstellung der Beschilderung**, en: in-vehicle signage

intelligenter Verkehrssystem-Dienst, der sowohl statische als auch dynamische Straßen und Informationsschilder dem Fahrer liefert

3.10**Kreuzung**, en: intersection

Kreuzung und/oder Verbindung von zwei oder mehrerer *Straßen* (3.14)

[QUELLE: ISO 17572-1:2015, 2.1.17, modifiziert — Anmerkungen zum Begriff wurden gelöscht]

3.11**Verbindung**, en: link

direkte topographische Verbindung zwischen zwei Knoten, die einen eindeutigen Verbindungsbezeichner (3.12) in einer vorhandenen digitalen Kartendatenbank hat

[QUELLE: ISO 17572-1:2015, 2.1.20, modifiziert — Zweiter Begriff „Grenze“ und Anmerkung zum Begriff wurden gelöscht]

3.12**Verbindungsbezeichner**, en: link identifier, link ID**Verbindungs-ID**

Bezeichner, der einer Verbindung eindeutig zugeordnet ist

[QUELLE: ISO 17572-1:2015, 2.1.21, modifiziert — Anmerkung zum Begriff wurde gelöscht]

3.13**minimales Verbreitungsgebiet**, en: minimal dissemination area

Teile eines Straßennetzwerks, in dem IVI-Botschaften von potentiellen Zielfahrzeugen empfangen werden können

3.14**Straße**, en: road

Teil eines Straßennetzwerkes, welches im Allgemeinen als Ganzes betrachtet wird und durch eine einzige Bezeichnung, wie z. B. einen Straßennamen oder Straßenummer durchgehend adressiert werden kann

[QUELLE: ISO 17572-1:2015, 2.1.39, modifiziert — Anmerkungen zum Begriff wurden gelöscht]

3.15**Straßenabschnitt**, en: road section

Straßensegment (3.16), welches durch zwei Kreuzungen begrenzt ist und durchgehend dieselben Attribute aufweist

[QUELLE: ISO 17572-1:2015, 2.1.42, modifiziert — Anmerkung zum Begriff wurde gelöscht]

3.16

Straßensegment, en: road segment

Teil einer Straße (3.14), welches seinen Anfang und sein Ende entlang dieser Straße hat

[QUELLE: ISO 17572-1:2015, 2.1.43, modifiziert — Anmerkung zum Begriff wurde gelöscht]

3.17

Bereich von Bedeutung, en: relevance zone

Teile eines Straßennetzwerks, in dem die Information in einem Anwendungscontainer gültig ist

3.18

Baustellenwarnung, en: road works warning

Warnungen an Straßennutzer, Baustellen und/oder Straßenreparaturbereiche zu umfahren

3.19

variables Anzeigeschild, en: variable message sign

elektronisches Schild, auf dem Text, Symbole, oder eine Kombination aus beidem, dargestellt wird

English Version

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Systèmes intelligents de transport - Coopérative STI -
Dictionnaire de structures de données d'informations
dans les véhicules (IVI) (ISO/TS 19321:2020)

Intelligente Transportsysteme - Kooperative ITS -
Verzeichnis von Datenstrukturen fahrzeuginterner
Informationen (IVI) (ISO/TS 19321:2020)

This Technical Specification (CEN/TS) was approved by CEN on 18 May 2020 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

This document (CEN ISO/TS 19321:2020) has been prepared by Technical Committee ISO/TC 204 "Intelligent transport systems" in collaboration with Technical Committee CEN/TC 278 "Intelligent transport systems" the secretariat of which is held by NEN.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes CEN ISO/TS 19321:2015.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Endorsement notice

The text of ISO/TS 19321:2020 has been approved by CEN as CEN ISO/TS 19321:2020 without any modification.

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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).

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).

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 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 278, *Intelligent transport systems (ITS)*, in collaboration with Technical Committee ISO/TC 204, *Intelligent transport systems*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO/TS 19321:2015) which has been technically revised.

The main changes compared to the previous edition are as follows.

- The Scope has been edited.
- Several containers have been renamed or newly introduced and an "Automated Vehicle Container" has been added to better manage automated vehicles.
- The abstract syntax notation one (ASN.1) code in Annex A has been captured separately. This edition is backwards compatible with the previous edition in that it adds information elements (e.g. data elements and data frames) to the IVI Structure by using ASN.1 extensions. The ASN.1 extension feature ensures that implementations of the previous edition can correctly parse IVI Structures compliant with this edition and process the information specified in the previous edition without needing knowledge about the extensions.
- The former Annex B has been replaced with new visual examples.
- C-Roads and Eco-AT documents have been added to the Bibliography.
- Data types are imported from ISO 14823 which are backwards compatible with the first edition of this document.
- Data types are imported from updated editions of ISO 14906, ISO 17419 and ETSI/TS 102 894-2, which are backwards compatible with the first edition of this document.

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.

Introduction

In a Cooperative Intelligent Transport System (C-ITS), presenting information related to the traffic situation or regulation of a road to the driver of a vehicle is an important component of road operations. The road operators are responsible for road setup, operation, signage, and maintenance for traffic management and road safety, and in some countries, also for the enforcement of road laws. For road operators, efficient transport of vehicles on roadways ensures a safe and predictable trip for all road users. Road operators, together with equipment manufacturers, whether of vehicles or of roadside equipment, contribute to how road information is properly presented to drivers.

So far, one defined C-ITS method for notifying road users of road and/or traffic situations and events is by transmission of messages such as Cooperative Awareness Messages (CAM), Decentralized Environment Notification Messages (DENM), or Basic Safety Messages (BSM).

This document supports mandatory and advisory road signage such as contextual speeds and road works warnings. In-vehicle information can be sent by an ITS Station (ITS-S) and either corresponds to physical road signs such as static or variable road signs or does not correspond to physical road signs (a virtual sign) or corresponds to road works. In-vehicle information (IVI) does not include identification of road events as already provided by DENM.

This document provides a toolbox of information elements for IVI. It can be used to fulfil the requirements of the service provider considering the needs of receiving ITS-S. The container concept provides a way for an ITS-S to manage the relevant IVI information, determine where the IVI is relevant, and to provide details for the application of IVI. The description of data elements encompasses the data syntax and semantics, i.e. a definition of data format and content, together with a description of how to use those data elements.

This document is of an enabling nature. It does not specify which information is necessary for a certain service, but it supports those IVI information elements that can be necessary to be transmitted to a receiving ITS-S to carry out a certain service. Usage of the IVI information elements depends on the specific context and application of IVI for a specific service and usage is established as mandatory or optional only for messaging purposes, not for application purposes. The IVI Structure is intended to be profiled to fulfil the requirements of a specific service.

This document refers to ISO 14823 as one system of standardized codes for existing road signs codes.

NOTE ISO 14823 does not contain codes for specific national or regional signs that are not commonly used, and it does not represent a catalogue of road sign pictograms for all applicable nations.

Intelligent transport systems — Cooperative ITS — Dictionary of in-vehicle information (IVI) data structures

1 Scope

This document specifies the in-vehicle information (IVI) data structures that are required by different intelligent transport system (ITS) services for exchanging information between ITS Stations (ITS-S). A general, extensible data structure is specified, which is split into structures called containers to accommodate current-day information. Transmitted information includes IVI such as contextual speed, road works warnings, vehicle restrictions, lane restrictions, road hazard warnings, location-based services, re-routing. The information in the containers is organized in sub-structures called data frames and data elements, which are described in terms of its content and its syntax.

The data structures are specified as communications agnostic. This document does not provide the communication protocols. This document provides scenarios for usage of the data structure, e.g. in case of real time, short-range communications.

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 639-1:2002, *Codes for the representation of names of languages — Part 1: Alpha-2 code*

ISO 14823:2017, *Intelligent transport systems — Graphic data dictionary*

ISO 14906:2018, *Electronic fee collection — Application interface definition for dedicated short-range communication*

ISO/TS 19091:2019, *Intelligent transport systems — Cooperative ITS — Using V2I and I2V communications for applications related to signalized intersections*

ISO 24534-3:2016, *Intelligent transport systems — Automatic vehicle and equipment identification — Electronic registration identification (ERI) for vehicles — Part 3: Vehicle data*

ETSI/TS 102 894-2 V1.3.1 (2018-08), *Intelligent Transport Systems (ITS); Users and applications requirements; Part 2: Applications and facilities layer common data dictionary*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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

application data unit

data unit exchanged between ITS Station applications

3.2

container

group of *data frames* (3.4) and *data elements* (3.3) semantically belonging together in one place in the *in-vehicle information* (3.8) structure

3.3

data element

DE

data type that contains one single data

[SOURCE: ETSI/TS 102 894-2 V1.3.1]

3.4

data frame

data type that contains more than one *data element* (3.3) in a predefined order

[SOURCE: ETSI/TS 102 894-2 V1.3.1]

3.5

detection zone

part of the road network that is passed by a vehicle in approach of the *relevance zone* (3.17)

3.6

digital map database

structured set of digital and alphanumeric data portraying geographic locations and relationships of spatial features

[SOURCE: ISO 17572-1:2015, 2.1.10, modified — Note to entry has been deleted.]

3.7

driver awareness zone

parts of the road network on which a message is presented to inform drivers about upcoming situations

3.8

in-vehicle information

information contained in the in-vehicle information data structure that is required by different intelligent transport system services

3.9

in-vehicle signage

intelligent transport system service that provides static, as well as dynamic, road sign and message sign information to drivers

3.10

intersection

crossing and/or connection of two or more *roads* (3.14)

[SOURCE: ISO 17572-1:2015, 2.1.17, modified — Notes to entry have been deleted.]

3.11

link

direct topological connection between two nodes that has a unique *link ID* (3.12) in a given *digital map database* (3.6)

[SOURCE: ISO 17572-1:2015, 2.1.20, modified — Second term “edge” and Note to entry have been deleted.]

3.12

link identifier

link ID

identifier that is uniquely assigned to a *link* (3.11)

[SOURCE: ISO 17572-1:2015, 2.1.21, modified — Note to entry has been deleted.]

3.13

minimum dissemination area

parts of the road network where the in-vehicle signage message can be received by the potentially targeted vehicles

3.14

road

part of the road network which is generally considered as a whole and which can be addressed by a single identification like a road name or road number throughout

[SOURCE: ISO 17572-1:2015, 2.1.39, modified — Notes to entry have been deleted.]

3.15

road section

road segment (3.16) that is bounded by two *intersections* (3.10) and has the same attributes throughout

[SOURCE: ISO 17572-1:2015, 2.1.42, modified — Note to entry has been deleted.]

3.16

road segment

part of a *road* (3.14), having its start and end along that road

[SOURCE: ISO 17572-1:2015, 2.1.43, modified — Note to entry has been deleted.]

3.17

relevance zone

parts of the road network for which the information in an Application Container is valid

3.18

road works warning

alerts for routing road users around road construction and/or road repair

3.19

variable message sign

electronic sign board presenting text, symbols, or a combination of them

4 Abbreviated terms

ASN.1	Abstract Syntax Notation One
C-ITS	Cooperative Intelligent Transport System
DE	Data Element
DENM	Decentralized Environmental Notification Message
DF	Data Frame
GLC	Geographic Location Container
ID	Identification
ITS	Intelligent Transport Systems

ITS-S	ITS Station
IVI	In-Vehicle Information
IVS	In-Vehicle Signage
MAP	Map Data Message
MLC	Map Location Container
RWW	Road Works Warning

5 In-vehicle information data structure

5.1 Structural model

5.1.1 General model

The in-vehicle information (IVI) structure represents the Application Data Unit to be transmitted and received by an ITS Station (ITS-S). The IVI Structure shall comply with the syntax defined in Annex A as the data type `IviStructure`. This means that it shall be composed of Containers defined in this document and follow the form depicted in Figure 1.

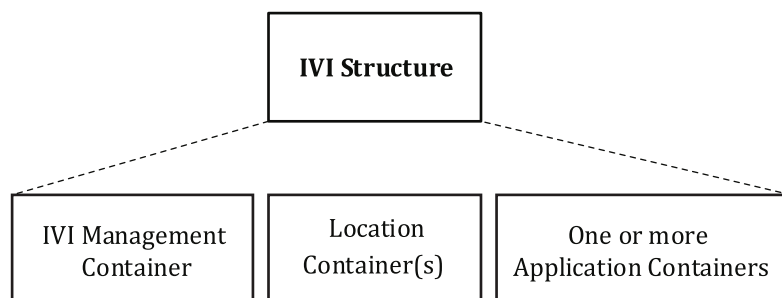


Figure 1 — IVI Structure

The IVI Structure is extensible and other containers can be added in the future.

The IVI Structure is intended to be encapsulated in a message with the appropriate ITS Common Header, for example, the `ItsPduHeader` of ETSI/TS 102 894-2. The header structure and contents are out of the scope of this document and are for example specified in ETSI/TS 103 301.

The IVI Structure shall contain a Management Container. The information in the IVI Management Container is applicable to the entire IVI Structure. This Container is mandatory to be present and provides a receiving ITS-S with enough information to handle the IVI Structure and decide on its further processing.

The IVI Structure can contain one or more Location Container(s). The Location Container describes the essential information for applications in the receiving ITS-S. Applications can use the location information to understand how to apply information provided by IVI Application Containers. Location Containers can carry information relevant for different IVI Application Containers or carry the same content but expressed in different forms (see 5.2). This enables a receiving ITS-S to choose the appropriate location referencing system that the ITS-S supports.

The IVI Structure can contain one or more IVI Application Container(s). The IVI Application Container provides IVI information for use by an application. Application information is self-contained and refers to the location information for its spatial validity. Application information of the same type shall not

refer to overlapping Reference Zones. Each Application Container refers to zones defined in the Location Container identified by their identifications (IDs) for the following usage:

- a) Detection Zone,
- b) Relevance Zone, and
- c) Driver Awareness Zone.

An Application Container may optionally provide information about the minimum awareness time, that is, the minimum time that the IVI should be available before the vehicle enters the Relevance Zone. This MinimumAwarenessTime information can be used by the receiving ITS-S to determine the appropriate Driver Awareness Zone.

5.1.2 Conceptual zones

When an ITS-S receives the IVI Structure, the ITS-S can interpret the application information in the context of the appropriate location information. Principally, there are four conceptual zones:

- a) Minimum Dissemination Area;
- b) Detection Zone;
- c) Driver Awareness Zone;
- d) Relevance Zone.

The Minimum Dissemination Area refers to the minimum area where the IVI Structure is disseminated by an ITS-S based on application requirements. The Minimum Dissemination Area is defined in the relevant application standards or specification(s) and is therefore out of scope of this document.

In some situations, a vehicle ITS-S needs to be able to detect whether or not it is approaching a Relevance Zone at a certain minimum time before it enters the Relevance Zone. This is, for example, to guarantee that the Relevance Zone is detected immediately at its entry (e.g. in case of a very small Relevance Zone) or to guarantee that the Relevance Zone is correctly detected (in case it is near to other road segments, e.g. parallel or on different altitude level). Therefore, a Detection Zone occurs in approach to a Relevance Zone. If a receiving ITS-S moves through the Detection Zone, then the received IVI will be enabled for further usage in the receiving ITS-S.

The IVI can be used to inform drivers about upcoming situations in the Driver Awareness Zone. The Driver Awareness Zone can be determined by the receiving ITS-S because the Driver Awareness Zone can be based on the dynamic status of the receiving ITS-S and can depend on the presence of other higher priority information to be presented. Alternatively, the Driver Awareness Zone can be provided by the sending ITS-S for usage by the receiving ITS-S.

The Relevance Zone covers the area where the IVI is applicable.

Examples of the Detection and Relevance Zones for the spatial validity of the IVI Structure are illustrated in Figure 2. In traffic direction East (right-hand traffic), the figure shows a Detection Zone and a Relevance Zone for the entire carriageway. The Driver Awareness Zone can be physically overlapping with the Detection Zone (but is not necessarily equal in size). In traffic direction West, the figure shows lane specific Detection and Relevance Zones.