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Intelligent transport systems — Traffic and travel information via transport protocol experts group, generation 2 (TPEG2) —

Part 26: Vigilance location information (TPEG2-VLI)

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

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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 of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

A list of all parts in the ISO 21219 series can be found on the ISO website.

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

0.1 History

TPEG technology was originally proposed by the European Broadcasting Union (EBU) Broadcast Management Committee, who established the B/TPEG project group in the autumn of 1997 with a brief to develop, as soon as possible, a new protocol for broadcasting traffic and travel-related information in the multimedia environment. TPEG technology, its applications and service features were designed to enable travel-related messages to be coded, decoded, filtered and understood by humans (visually and/or audibly in the user's language) and by agent systems. Originally, a byte-oriented data stream format, which may be carried on almost any digital bearer with an appropriate adaptation layer, was developed. Hierarchically structured TPEG messages from service providers to end-users were designed to transfer information from the service provider database to an end-user's equipment.

One year later, in December 1998, the B/TPEG group produced its first EBU specifications. Two documents were released. Part 2 (TPEG-SSF, which became ISO/TS 18234-2) described the syntax, semantics and framing structure, which was used for all TPEG applications. Meanwhile, Part 4 (TPEG-RTM, which became ISO/TS 18234-4) described the first application for road traffic messages.

Subsequently, in March 1999, CEN/TC 278, in conjunction with ISO/TC 204, established a group comprising members of the former EBU B/TPEG and this working group continued development work. Further parts were developed to make the initial set of four parts, enabling the implementation of a consistent service. Part 3 (TPEG-SNI, ISO/TS 18234-3) described the service and network information application used by all service implementations to ensure appropriate referencing from one service source to another.

Part 1 (TPEG-INV, ISO/TS 18234-1) completed the series by describing the other parts and their relationship; it also contained the application IDs used within the other parts. Additionally, Part 5, the public transport information application (TPEG-PTI, ISO/TS 18234-5), was developed. The so-called TPEG-LOC location referencing method, which enabled both map-based TPEG-decoders and non-map-based ones to deliver either map-based location referencing or human readable text information, was issued as ISO/TS 18234-6 to be used in association with the other applications parts of the ISO/TS 18234 series to provide location referencing.

The ISO/TS 18234 series has become known as TPEG Generation 1.

0.2 TPEG Generation 2

When the Traveller Information Services Association (TISA), derived from former forums, was inaugurated in December 2007, TPEG development was taken over by TISA and continued in the TPEG applications working group.

It was about this time that the (then) new Unified Modelling Language (UML) was seen as having major advantages for the development of new TPEG applications in communities who would not necessarily have binary physical format skills required to extend the original TPEG TS work. It was also realized that the XML format for TPEG described within the ISO/TS 24530 series (now superseded) had a greater significance than previously foreseen, especially in the content-generation segment and that keeping two physical formats in synchronism, in different standards series, would be rather difficult.

As a result, TISA set about the development of a new TPEG structure that would be UML based. This has subsequently become known as TPEG Generation 2.

TPEG2 is embodied in the ISO/TS 21219 series and it comprises many parts that cover introduction, rules, toolkit and application components. TPEG2 is built around UML modelling and has a core of rules that contain the modelling strategy covered in ISO/TS 21219-2, ISO/TS 21219-3 and ISO/TS 21219-4 and the conversion to two current physical formats: binary and XML; others could be added in the future. TISA uses an automated tool to convert from the agreed UML model XMI file directly into an MS Word document file, to minimize drafting errors, that forms the annex for each physical format.

TPEG2 has a three container conceptual structure: message management (ISO/TS 21219-6), application (several parts) and location referencing (ISO/TS 21219-7). This structure has flexible capability and can accommodate many differing use cases that have been proposed within the TTI sector and wider for hierarchical message content.

TPEG2 also has many location referencing options as required by the service provider community, any of which may be delivered by vectoring data included in the location referencing container.

The following classification provides a helpful grouping of the different TPEG2 parts according to their intended purpose.

— Toolkit parts: TPEG2-INV (ISO/TS 21219-1), TPEG2-UML (ISO/TS 21219-2), TPEG2-UBCR (ISO/TS 21219-3), TPEG2-UXCR (ISO/TS 21219-4), TPEG2-SFW (ISO/TS 21219-5), TPEG2-MMC (ISO/TS 21219-6), TPEG2-LRC (ISO/TS 21219-7), TPEG2-LTE (ISO/TS 21219-24).

— Special applications: TPEG2-SNI (ISO/TS 21219-9), TPEG2-CAI (ISO/TS 21219-10).

— Location referencing: TPEG2-GLR (ISO/TS 21219-21), TPEG2-OLR (ISO/TS 21219-22).

— Applications: TPEG2-PKI (ISO/TS 21219-14), TPEG2-TEC (ISO/TS 21219-15), TPEG2-FPI (ISO/TS 21219-16), TPEG2-TFP (ISO/TS 21219-18), TPEG2-WEA (ISO/TS 21219-19), TPEG2-RMR (ISO/TS 21219-23), TPEG2-EMI (ISO/TS 21219-25), TPEG2-VLI (ISO/TS 21219-26 this document).

TPEG2 has been developed to be broadly (but not totally) backward compatible with TPEG1 to assist in transitions from earlier implementations, while not hindering the TPEG2 innovative approach and being able to support many new features, such as dealing with applications having both long-term, unchanging content and highly dynamic content, such as parking information.

This document is based on the TISA specification technical/editorial version reference: SP17003/1.0/002.

Intelligent transport systems — Traffic and travel information via transport protocol experts group, generation 2 (TPEG2) —

Part 26: Vigilance location information (TPEG2-VLI)

1 Scope

This document defines the application for Vigilance Location Information (VLI).

Vigilance messages are intended for in-car applications to inform drivers when they should pay extra attention to their driving behaviour because of dangerous road stretches, traffic enforcement cameras or other hazardous locations, requiring increased driver vigilance. The warnings can be presented visually, audibly, or with the spoken voice, or as a combination of all three.

The presentation of such messages to the drivers allows them to drive relaxed, in the knowledge that they will be warned when necessary. The situation where a vigilance message makes sense can be very different. For example speed cameras are usually placed in areas where vigilance is required; the information about those locations promote safe driving and also more safety for other road users and outside traffic participants. Another example for areas requiring high driver attention are roads close-by a school.

The information can be categorized in two ways:

Fixed or mobile locations:

— Fixed locations refer to locations which are fixed of nature, such as the presence of known accident black-spots.

— Mobile locations refer to locations which are transient in nature, such as the presence of a mobile speed camera.

Spot locations or zones:

— Spot locations refer to single points on a road network where the warning is located, with an indication of which direction of traffic is affected by the vigilance information.

— Zones refer to stretches of road network which represent a continuous area of warning affecting only one traffic direction.

The local regulations regarding the signalling of speed measurement systems, e.g. fixed speed cameras, or mobile speed radar locations can vary depending on the country or region. The signalling of speed measurement systems is encouraged by local authorities in certain markets whereas it can be punishable by law in other markets.

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/TS 21219-1, *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) — Part 1: Introduction, numbering and versions (TPEG2-INV)*

ISO/TS 21219-3, *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) — Part 3: UML to binary conversion rules*

ISO/TS 21219-4, *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) — Part 4: UML to XML conversion rules*

ISO/TS 21219-5, *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) — Part 5: Service framework (TPEG2-SFW)*

ISO/TS 21219-9, *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) — Part 9: Service and network information (TPEG2-SNI)*

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 http://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
vigilance information
information for a driver to pay additional attention to

3.2
location
logical position where special attention is needed

EXAMPLE The position on the road where a speed check is placed which is not necessarily the physical location of the camera.

3.3
spot location
exact points on a road network where the attention is needed, with an indication of which direction of traffic is affected by the alert

3.4
zone
stretches of road network which represent a continuous area of warning affecting only one traffic direction

3.5
stop time
date and time when the vigilance information expires and is no longer valid

3.6
confidence level
optional indication of the correctness and accuracy of the attributes of the vigilance information

Note 1 to entry: The exact definition of the levels strongly depends on the offer of the vendor as well as the needs of the customer and hence is a matter of negotiation.

3.7
speed limit
regulation defining maximum (which may be variable) speeds allowed

Note 1 to entry: Speed limits are commonly set by the legislative bodies of nations or provincial governments.

3.8
hard shoulder
hardened strip alongside a motorway for stopping on in an emergency

4 Abbreviated terms

ACID	application and content identifier
ADC	application data container
CEN	Comité Européen de Normalisation
EBU	European Broadcasting Union
LRC	location reference container
MMC	message management container
n.a.	not available
OSI	Open Systems Interconnection
TISA	Traveller Information Services Association
TPEG	Transport Protocol Expert Group
TTI	traffic and travel information
UML	Unified Modelling Language

5 Application specific constraints

5.1 Application identification

The word 'application' is used in the TPEG specifications to describe specific subsets of the TPEG structure. An application defines a limited vocabulary for a certain type of messages, e.g. parking information or road traffic information. Each TPEG application is assigned a unique number, called the Application IDentification (AID). An AID is defined whenever a new application is developed and these are all listed in ISO/TS 21219-1.

The application identification number is used within the TPEG-SNI application ISO/TS 21219-9 to indicate how to process TPEG content and facilitates the routing of information to the appropriate application decoder.

5.2 Version number signaling

Version numbering is used to track the separate versions of an application through its development and deployment. The differences between these versions may have an impact on client devices.

The version numbering principle is defined in ISO/TS 21219-1.

Table 1 shows the current version numbers for signaling VLI within the SNI application:

Table 1 — Current version numbers for signalling of VLI

major version number	1
minor version number	0

5.3 Ordered components

TPEG2-VLI requires a fixed order of TPEG components. The order for the VLI message component is shown in Figure 1; the first component shall be the *Message Management Container.* This shall be the only component if the message is a cancellation message. Otherwise, the MMC component shall be followed by the one or more *Application Data Container* component(s) which includes the application-specific information.

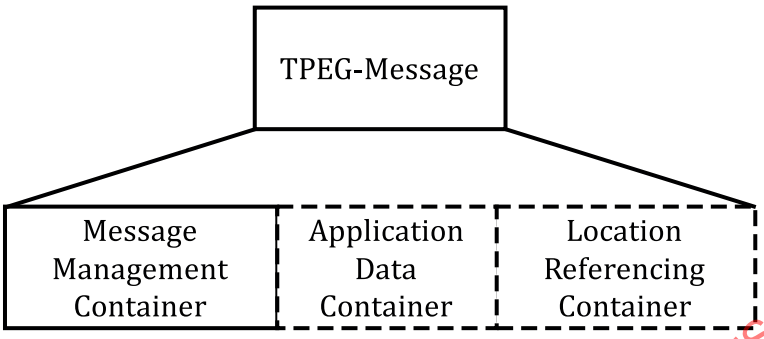

Figure 1 — Composition of TPEG messages

5.4 Extendibility

The requirement of a fixed component order does not affect the extension of TPEG2-VLI. Future application extensions may insert new components or may replace existing components by new ones without losing backward compatibility, i.e. a TPEG2-VLI decoder shall be able to detect and skip unknown components.

5.5 TPEG Service Component Frame

TPEG2-VLI makes use of the "Service Component Frame with dataCRC and messageCount" according to ISO/TS 21219-5.

6 VLI Structure

The structure of VLI messages is shown in Figure 2.

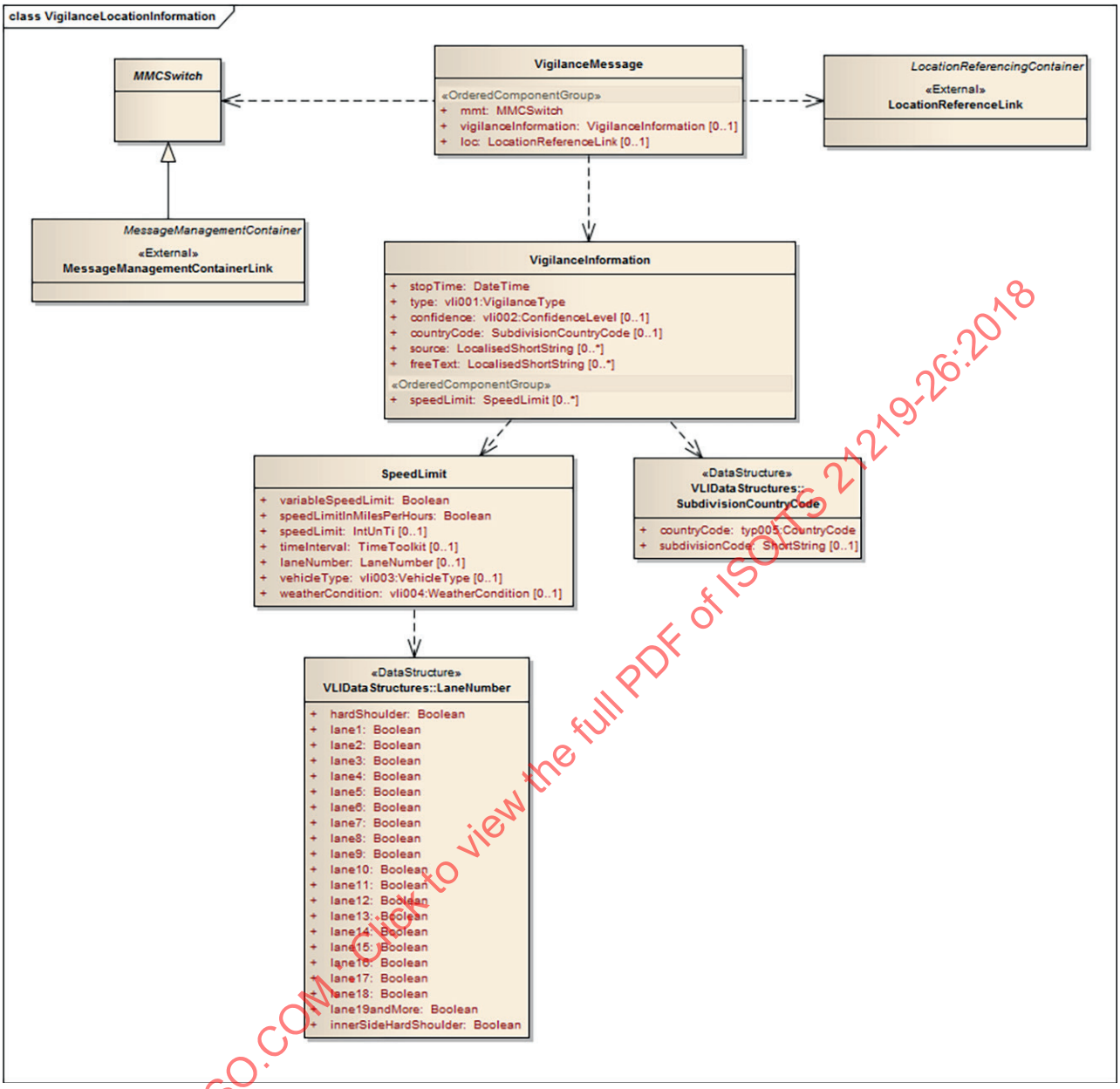

Figure 2 — VLI message structure

7 VLI Message components

7.1 LocationReferenceLink

The LocationReferenceLink component is a placeholder for the LocationReferencingContainer (LRC). It assigns the VLI application specific local component ID for the LRC container. All component IDs within the LRC container are local to the LRC toolkit.

7.2 MessageManagementContainerLink

The MessageManagementContainerLink component is a placeholder for the MessageManagementContainer.

7.3 VigilanceMessage

The VigilianceMessage is the data component of TPEG2-VLI.

Table 2 defines the VigilanceMessage component.

Table 2 — VigilanceMessage

Name	Type	Multiplicity	Description
Ordered Components			
mmt	MMCSwitch	1	The message management information.
vigilanceInformation	VigilanceInformation	0..1	The vigilance information.
loc	LocationReferenceLink	0..1	The location reference.

7.4 MMCSwitch

The MMCSwitch is an abstract container included for formal reasons, to allow future extension of the MMC.

7.5 VigilanceInformation

The VigilanceInformation component describes a vigilance information.

Table 3 defines the VigilanceInformation component.

Table 3 — VigilanceInformation

Name	Type	Multiplicity	Description
stopTime	DateTime	1	The date and time when the vigilance information expires and is no longer valid.
type	vli001:VigilanceType	1	The type of the vigilance information.
confidence	vli002:ConfidenceLevel	0..1	A confidence value for this message.
countryCode	SubdivisionCountryCode	0..1	The subdivision country code to further specify the region for which this method is valid for.
source	LocalisedShortString	0..*	The source of the information.
freeText	LocalisedShortString	0..*	This field may be used to provide additional information (e.g. human readable position description)
Ordered Components			
speedLimit	SpeedLimit	0..*	If the vigilance information contains speed limit information this is provided in the SpeedLimit component.

7.6 SpeedLimit

The component SpeedLimit contains fields to describe a speed limit and add restrictions to it. The timeInterval, laneNumber, vehicleType and weatherCondition, if set, restrict the validity of the speed limit.

Table 4 defines the SpeedLimit component.

Table 4 — SpeedLimit

Name	Type	Multiplicity	Description
variableSpeedLimit	Boolean	1	The speed limit changes within short time periods (e.g. managed via a traffic control centre). The provided speed limit might not match with the current real speed limit.
speedLimitInMilesPerHours	Boolean	1	Needs to be set to true in case the speed limit unit is miles per hour (mph). The default (false) is kilometre per hour (kph).
speedLimit	IntUnTi	0..1	A speed limit applicable for the vigilance type.
timeInterval	TimeToolkit	0..1	The time interval may be used to restrict the period the speed limit is active.
laneNumber	LaneNumber	0..1	The lane number for which this speed limit is valid.
vehicleType	vli003:VehicleType	0..1	The vehicle type for which this speed limit is valid.
weatherCondition	vli004:WeatherCondition	0..1	The weather conditions for which this speed limit is valid.

8 VLI Datatypes

8.1 LaneNumber

Lanes are numbered from the curb to the middle of the road. Right hand traffic lanes are therefore numbered from the right to the left relating to the driving direction. Left hand traffic lanes are numbered from left to right relating to the driving direction. The first lane has the number 0.

The lane numbering should follow these rules:

— hard shoulder is always number 0:

  — leftmost lane in case of left hand driving (if exists);

  — rightmost lane in case of right hand driving (if exists);

  — additional hard shoulders are numbered consecutively (also applicable for hard shoulders next to the divider);

— first drivable lane for vehicles is number 1;

— all lanes which are physically available count;

— lanes which are temporarily closed also count;

— numbering is consecutive.

If physical layout changes then a split of the location is recommended.

Table 5 defines the LaneNumber datatype.

Table 5 — LaneNumber

Name	Type	Multiplicity	Description
hardShoulder	Boolean	1	true, if the hard shoulder exists and is selected
lane1	Boolean	1	true, if the lane is selected
lane2	Boolean	1	true, if the lane is selected
lane3	Boolean	1	true, if the lane is selected
lane4	Boolean	1	true, if the lane is selected
lane5	Boolean	1	true, if the lane is selected
lane6	Boolean	1	true, if the lane is selected
lane7	Boolean	1	true, if the lane is selected
lane8	Boolean	1	true, if the lane is selected
lane9	Boolean	1	true, if the lane is selected
lane10	Boolean	1	true, if the lane is selected
lane11	Boolean	1	true, if the lane is selected
lane12	Boolean	1	true, if the lane is selected
lane13	Boolean	1	true, if the lane is selected
lane14	Boolean	1	true, if the lane is selected
lane15	Boolean	1	true, if the lane is selected
lane16	Boolean	1	true, if the lane is selected
lane17	Boolean	1	true, if the lane is selected
lane18	Boolean	1	true, if the lane is selected
lane19andMore	Boolean	1	true, if the lane and potential further lanes are selected
innerSideHardShoulder	Boolean	1	true, if an inner side hard shoulder exists and is selected

8.2 SubdivisionCountryCode

The SubdivisionCountryCode contains fields to represent the country and one subdivision.

Example: countryCode US, subdivisionCode MA describes Massachusetts, USA.

Table 6 defines the SubdivisionCountryCode datatype.

Table 6 — SubdivisionCountryCode

Name	Type	Multiplicity	Description
countryCode	typ005:CountryCode	1	2 letter country code; see ISO 3166-1
subdivisionCode	ShortString	0..1	2 letter subdivision code; see ISO 3166-1

9 VLI Tables

9.1 vli001:VigilanceType

Table 7 enumerates the possible values for type vli001:VigilanceType.

Table 7 — vli001:VigilanceType

Code	Reference-English 'word'	Comment	Example
0	unknown		
1	fixed speed camera	Camera on a permanent location that activates when the legal speed limit is exceeded.	
2	red light speed camera	Camera on a permanent location that activates when a red traffic light is passed or the legal speed limit is exceeded.	
3	red light camera	Camera on a permanent location that activates when a red traffic light is passed.	
4	mobile speed camera	Camera on a temporary location that activates the legal speed limit is exceeded.	
5	average speed camera	Road stretch in which the average speed of a vehicle is measured. A camera activates when the average speed exceeds the legal speed.	
6	mobile camera hot spot	Location with an increased probability of a mobile speed camera being present.	
7	speed enforcement zone	Road stretch with multiple fixed speed cameras where at least one camera is active.	
8	restricted areas camera	Camera on a permanent location that activates when a restricted area is accessed without permission.	
9	accident black spot	Location with an increased probability of accidents.	
10	railway crossing	Location of a gated or ungated railway crossing.	
11	automatic numberplate recognition camera	Camera that automatically scans for the number plate.	
12	bus lane camera	Camera on a permanent location that activates when detecting non authorized vehicles on a bus lane.	
13	congestion charge camera	Camera on a permanent location that activates when detecting a vehicle illegally entering a congestion charge area.	
14	high-occupancy vehicle lane camera	Camera on a permanent location that activates when detecting a vehicle illegally using the HOV lane.	
15	inter-vehicle distance camera	Camera on a permanent location that activates when detecting a vehicle whose distance is less than the required distance between vehicles.	
16	left turn camera	Camera on a permanent location that activates when detecting a vehicle illegally turning left.	
17	right turn camera	Camera on a permanent location that activates when detecting a vehicle illegally turning right.	

Table 7 *(continued)*

Code	Reference-English 'word'	Comment	Example
18	u turn camera	Camera on a permanent location that activates when detecting a vehicle illegally performing a U-turn.	
19	red light and u turn camera	Camera on a permanent location that activates when a red traffic light is passed or detecting a vehicle illegally performing a U-turn.	
20	parking camera	Camera on a permanent location that monitors places where you are not allowed to park.	
21	stop sign camera	Camera on a permanent location that activates when detecting a vehicle passing a stop sign without stopping.	
22	toll booth camera	Camera on a permanent location that activates when detecting a vehicle illegally using a toll road.	
23	weight limit camera	Camera on a permanent location that activates when the legal weight limit is exceeded.	
24	speed bump	A speed bump is a traffic calming feature of road design used to slow traffic, or reduce through traffic, via vertical deflection.	
25	risk zone	Road stretch which is temporarily active, with dangerous areas and potentially including mobile speed camera locations.	
26	danger zone	Road stretch with dangerous areas, potentially including permanent camera locations.	
27	school zone	Road stretch with a school close-by.	
28	noise pollution camera	Camera on a permanent location that activates when detecting noise pollution.	
100	test code	Code to be used for test purposes.	
101	use free text	Code to indicate that the free text field should be used.	
255	vigilance zone	A general vigilance zone.	

9.2 vli002:ConfidenceLevel

The confidence level is an indication of the confidence in the correctness and accuracy of the attributes. The exact definition of the levels strongly depends on the offer of the vendor as well as the needs of the customer and hence is a matter of negotiation.

Table 8 enumerates the possible values for type vli002:ConfidenceLevel.

Table 8 — vli002:ConfidenceLevel

Code	Reference-English 'word'	Comment	Example
0	low	Low confidence level, e.g. The amount of input date allows only guessing if the alert is substantial.	
1	medium	Medium confidence level, e.g. The amount of input data available allows estimation of the attributes.	
2	high	High confidence level, e.g. The amount of input data available allows significant estimation of the attributes.	
3	best	Best confidence level, e.g. The amount of input data available allows significant estimation of the attributes. The alert was reviewed by a human.	

9.3 vli003:VehicleType

VehicleType is used to further specify for which kind of vehicle the speed limit is valid.

Table 9 enumerates the possible values for type vli003:VehicleType.

Table 9 — vli003:VehicleType

Code	Reference-English 'word'	Comment	Example
0	bus		
1	car		
2	caravan		
3	high sided vehicle		
4	truck		
5	motorcycle		
6	other		

9.4 vli004:WeatherCondition

WeatherCondition is used to further specify for which weather condition a speed limit is valid.

Table 10 enumerates the possible values for type vli004:WeatherCondition.

Table 10 — vli004:WeatherCondition

Code	Reference-English 'word'	Comment	Example
0	fog		
1	high winds		
2	ice		
3	rain		
4	snow		
5	other		

Annex A
(normative)

TPEG application, TPEG-Binary Representation

A.1 Introduction

This annex provides the TPEG binary representation derived via application of the UML to binary conversion rules specified in ISO/TS 21219-3.

A.2 Message components

A.2.1 List of generic component Ids

Table 11 lists the generic component Ids

Table A.1 — List of generic component Ids

Name	Id
VigilanceMessage	0
MessageManagementContainerLink	1
LocationReferenceLink	2
VigilanceInformation	3
SpeedLimit	4

A.2.2 LocationReferenceLink

<LocationReferenceLink(2)>:=	
External <LocationReferencingContainer(2)>;	: see LocationReferencingContainer specification

A.2.3 MessageManagementContainerLink

<MessageManagementContainerLink(1)<MMCSwitch()>>:=	
External <MessageManagementContainer(1)>;	: see MessageManagementContainer specification

A.2.4 VigilanceMessage

<VigilanceMessage(0)>:=	
<IntUnTi>(0),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
ordered {	
<MMCSwitch>(mmt),	: The message management information.

n * <VigilanceInformation>(vigilanceInformation)[0..1],	: The vigilance information.
n * <LocationReferenceLink>(loc)[0..1]	: The location reference.
};	

A.2.5 MMCSwitch

<MMCSwitch(x)>:=	
<IntUnTi>(x),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr);	: number of bytes in attributes

A.2.6 VigilanceInformation

<VigilanceInformation(3)>:=	
<IntUnTi>(3),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
<DateTime>(stopTime),	: The date and time when the vigilance information expires and is no longer valid.
<vli001:VigilanceType>(type),	: The type of the vigilance information.
BitArray(selector),	
if (bit 0 of selector is set)	
<vli002:ConfidenceLevel>(confidence),	: A confidence value for this message.
if (bit 1 of selector is set)	
<SubdivisionCountryCode>(countryCode),	: The subdivision country code to further specify the region for which this method is valid for.
if (bit 2 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <LocalisedShortString>(source),	: The source of the information.
}	
if (bit 3 of selector is set)	
{	
<IntUnLoMB>(n),	
n * <LocalisedShortString>(freeText),	: This field may be used to provide additional information (e.g. human readable position description)
}	
ordered {	
n * <SpeedLimit>(speedLimit)	: If the vigilance information contains speed limit information this is provided in the SpeedLimit component.
};	

A.2.7 SpeedLimit

<SpeedLimit(4)>:=	
<IntUnTi>(4),	: id of this component
<IntUnLoMB>(lengthComp),	: number of bytes in component
<IntUnLoMB>(lengthAttr),	: number of bytes in attributes
BitArray(selector),	
if (bit 0 of selector is set)	
<Boolean>(variableSpeedLimit),	: The speed limit changes within short time periods (e.g. managed via a traffic control centre). The provided speed limit might not match with the current real speed limit.
if (bit 1 of selector is set)	
<Boolean>(speedLimitInMilesPerHours),	: Needs to be set to true in case the speed limit unit is miles per hour (mph). The default (false) is kilometre per hour (kph).
if (bit 2 of selector is set)	
<IntUnTi>(speedLimit),	: A speed limit applicable for the vigilance type.
if (bit 3 of selector is set)	
<TimeToolkit>(timeInterval),	: The time interval may be used to restrict the period the speed limit is active.
if (bit 4 of selector is set)	
<LaneNumber>(laneNumber),	: The lane number for which this speed limit is valid.
if (bit 5 of selector is set)	
<vli003:VehicleType>(vehicleType),	: The vehicle type for which this speed limit is valid.
if (bit 6 of selector is set)	
<vli004:WeatherCondition>(weatherCondition);	: The weather conditions for which this speed limit is valid.

A.3 VLI Datatypes

A.3.1 LaneNumber

<LaneNumber>:=	
BitArray(selector),	
if (bit 0 of selector is set)	
<Boolean>(hardShoulder),	: true, if the hard shoulder exists and is selected
if (bit 1 of selector is set)	
<Boolean>(lane1),	: true, if the lane is selected
if (bit 2 of selector is set)	
<Boolean>(lane2),	: true, if the lane is selected
if (bit 3 of selector is set)	
<Boolean>(lane3),	: true, if the lane is selected
if (bit 4 of selector is set)	
<Boolean>(lane4),	: true, if the lane is selected

if (bit 5 of selector is set)	
<Boolean>(lane5),	: true, if the lane is selected
if (bit 6 of selector is set)	
<Boolean>(lane6),	: true, if the lane is selected
if (bit 7 of selector is set)	
<Boolean>(lane7),	: true, if the lane is selected
if (bit 8 of selector is set)	
<Boolean>(lane8),	: true, if the lane is selected
if (bit 9 of selector is set)	
<Boolean>(lane9),	: true, if the lane is selected
if (bit 10 of selector is set)	
<Boolean>(lane10),	: true, if the lane is selected
if (bit 11 of selector is set)	
<Boolean>(lane11),	: true, if the lane is selected
if (bit 12 of selector is set)	
<Boolean>(lane12),	: true, if the lane is selected
if (bit 13 of selector is set)	
<Boolean>(lane13),	: true, if the lane is selected
if (bit 14 of selector is set)	
<Boolean>(lane14),	: true, if the lane is selected
if (bit 15 of selector is set)	
<Boolean>(lane15),	: true, if the lane is selected
if (bit 16 of selector is set)	
<Boolean>(lane16),	: true, if the lane is selected
if (bit 17 of selector is set)	
<Boolean>(lane17),	: true, if the lane is selected
if (bit 18 of selector is set)	
<Boolean>(lane18),	: true, if the lane is selected
if (bit 19 of selector is set)	
<Boolean>(lane19andMore),	: true, if the lane and potential further lanes are selected
if (bit 20 of selector is set)	
<Boolean>(innerSideHardShoulder);	: true, if an inner side hard shoulder exists and is selected

A.3.2 SubdivisionCountryCode

<SubdivisionCountryCode>:=	
<typ005:CountryCode>(countryCode),	: 2 letter country code; see ISO 3166-1
BitArray(selector),	
if (bit 0 of selector is set)	
<ShortString>(subdivisionCode);	: 2 letter subdivision code; see ISO 3166-1

Annex B
(normative)

TPEG application, TPEG-ML Representation

B.1 Introduction

This annex provides the tpegML representation derived via application of the UML to XML conversion rules specified in TS21219-4.

B.2 Message components

B.2.1 VigilanceMessage

```
<xs:element name="VigilanceMessage" type="VigilanceMessage"/>
<xs:complexType name="VigilanceMessage">
 <xs:complexContent>
 <xs:extension base="tsf:ApplicationRootMessageML">
 <xs:sequence>
 <xs:element name="mmt" type="MMCSwitch"/>
 <xs:element name="vigilanceInformation" type="VigilanceInformation" minOccurs="0"/>
 <xs:element name="loc" type="lrc:LocationReferencingContainer" minOccurs="0"/>
 </xs:sequence>
 </xs:extension>
 </xs:complexContent>
</xs:complexType>
```

B.2.2 MMCSwitch

```
<xs:complexType name="MMCSwitch">
 <xs:sequence>
 <xs:choice minOccurs="1" maxOccurs="1">
 <xs:element name="optionMessageManagementContainerLink" type="mmc:MessageManagementContain
er" minOccurs="1" maxOccurs="1"/>
 </xs:choice>
 </xs:sequence>
</xs:complexType>
```

B.2.3 VigilanceInformation

```
<xs:complexType name="VigilanceInformation">
 <xs:sequence>
 <xs:element name="stopTime" type="tdt:DateTime"/>
 <xs:element name="type" type="vli001_VigilanceType"/>
 <xs:element name="confidence" type="vli002_ConfidenceLevel" minOccurs="0"/>
 <xs:element name="countryCode" type="SubdivisionCountryCode" minOccurs="0"/>
 <xs:element name="source" type="tdt:LocalisedShortString" minOccurs="0" maxOccurs="unbounded"/>
 <xs:element name="freeText" type="tdt:LocalisedShortString" minOccurs="0" maxOccurs="unbounded"/>
 <xs:element name="speedLimit" type="SpeedLimit" minOccurs="0" maxOccurs="unbounded"/>
 </xs:sequence>
</xs:complexType>
```

B.2.4 SpeedLimit

```
<xs:complexType name="SpeedLimit">
 <xs:sequence>
 <xs:element name="variableSpeedLimit" type="tdt:Boolean"/>
 <xs:element name="speedLimitInMilesPerHours" type="tdt:Boolean"/>
 <xs:element name="speedLimit" type="tdt:IntUnTi" minOccurs="0"/>
 <xs:element name="timeInterval" type="tdt:TimeToolkit" minOccurs="0"/>
 <xs:element name="laneNumber" type="LaneNumber" minOccurs="0"/>
 <xs:element name="vehicleType" type="vli003_VehicleType" minOccurs="0"/>
 <xs:element name="weatherCondition" type="vli004_WeatherCondition" minOccurs="0"/>
 </xs:sequence>
</xs:complexType>
```

B.3 Datatypes

B.3.1 LaneNumber

```
<xs:complexType name="LaneNumber">
 <xs:sequence>
 <xs:element name="hardShoulder" type="tdt:Boolean"/>
 <xs:element name="lane1" type="tdt:Boolean"/>
 <xs:element name="lane2" type="tdt:Boolean"/>
 <xs:element name="lane3" type="tdt:Boolean"/>
 <xs:element name="lane4" type="tdt:Boolean"/>
 <xs:element name="lane5" type="tdt:Boolean"/>
 <xs:element name="lane6" type="tdt:Boolean"/>
 <xs:element name="lane7" type="tdt:Boolean"/>
 <xs:element name="lane8" type="tdt:Boolean"/>
 <xs:element name="lane9" type="tdt:Boolean"/>
```

```
 <xs:element name="lane10" type="tdt:Boolean"/>
 <xs:element name="lane11" type="tdt:Boolean"/>
 <xs:element name="lane12" type="tdt:Boolean"/>
 <xs:element name="lane13" type="tdt:Boolean"/>
 <xs:element name="lane14" type="tdt:Boolean"/>
 <xs:element name="lane15" type="tdt:Boolean"/>
 <xs:element name="lane16" type="tdt:Boolean"/>
 <xs:element name="lane17" type="tdt:Boolean"/>
 <xs:element name="lane18" type="tdt:Boolean"/>
 <xs:element name="lane19andMore" type="tdt:Boolean"/>
 <xs:element name="innerSideHardShoulder" type="tdt:Boolean"/>
 </xs:sequence>
</xs:complexType>
```

B.3.2 SubdivisionCountryCode

```
<xs:complexType name="SubdivisionCountryCode">
 <xs:sequence>
 <xs:element name="countryCode" type="tdt:typ005_CountryCode"/>
 <xs:element name="subdivisionCode" type="tdt:ShortString" minOccurs="0"/>
 </xs:sequence>
</xs:complexType>
```

B.4 Full VLI Schema Definition

```
<?xml version="1.0" encoding="UTF-8"?>
<!-- This XML schema is generated with tpegUMLconverter V3.1 -->
<xs:schema xmlns="http://www.tisa.org/TPEG/VLI_1_0"
   targetNamespace="http://www.tisa.org/TPEG/VLI_1_0"
   xmlns:xs="http://www.w3.org/2001/XMLSchema"
   xmlns:tsf="http://www.tisa.org/TPEG/SFW_1_1"
   xmlns:tdt="http://www.tisa.org/TPEG/TPEGDataTypes_2_0"
   xmlns:lrc="http://www.tisa.org/TPEG/LRC_2_1"
   xmlns:mmc="http://www.tisa.org/TPEG/MMC_1_1"
   elementFormDefault="qualified"
   attributeFormDefault="qualified">
   <xs:import namespace="http://www.tisa.org/TPEG/SFW_1_1" schemaLocation="SFW_1_1.xsd"/>
   <xs:import namespace="http://www.tisa.org/TPEG/TPEGDataTypes_2_0" schemaLocation="TDT_2_0.xsd"/>
   <xs:import namespace="http://www.tisa.org/TPEG/LRC_2_1" schemaLocation="LRC_2_1.xsd"/>
   <xs:import namespace="http://www.tisa.org/TPEG/MMC_1_1" schemaLocation="MMC_1_1.xsd"/>
   <xs:element name="VigilanceMessage" type="VigilanceMessage"/>
   <xs:complexType name="VigilanceMessage">
      <xs:complexContent>
```