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

Part 7: Location referencing container (TPEG2-LRC)

Systèmes intelligents de transport — Informations sur le trafic et le tourisme via le groupe expert du protocole de transport, génération 2 (TPEG2) —

Partie 7: Conteneur de localisation (TPEG2-LRC)

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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 document 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*.

This first edition cancels and replaces the first edition of ISO/TS 21219-7:2017, which has been technically revised.

The main changes are as follows:

— the document status has been changed from Technical Specification (TS) to International Standard (IS).

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 can 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 of parts of the ISO 18234 series to provide location referencing.

The ISO 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 the 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 24530 series (now superseded) had a greater significance than previously foreseen, especially in the content-generation segment, and that keeping two physical formats synchronized, 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 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 21219-2, ISO 21219-3 and ISO 21219-4 and the conversion to two current physical formats: binary (see Annex A) and XML (see Annex B); others can 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 that forms the annex for each physical format.

TPEG2 has a three-container conceptual structure: message management (ISO 21219-6), application (several parts) and location referencing (ISO 21219-7 – this document). This structure has flexible capability and can

accommodate many differing use cases that have been proposed within the TTI sector and more broadly 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. Note that the list below is potentially incomplete, as it is possible that new TPEG2 parts will be introduced after the publication of this document.

— Toolkit parts: TPEG2-INV (ISO 21219-1), TPEG2-UML (ISO 21219-2), TPEG2-UBCR (ISO 21219-3), TPEG2-UXCR (ISO 21219-4), TPEG2-SFW (ISO 21219-5), TPEG2-MMC (ISO 21219-6), TPEG2-LRC (ISO 21219-7 – this document).

— Special applications: TPEG2-SNI (ISO 21219-9), TPEG2-CAI (ISO 21219-10), TPEG2-LTE (ISO/TS 21219-24).

— Location referencing: TPEG2-OLR (ISO/TS 21219-22), TPEG2-GLR (ISO 21219-21[1]), TPEG2-TLR (ISO 17572-2), TPEG2-DLR (ISO 17572-3).

— Applications: TPEG2-PKI (ISO 21219-14), TPEG2-TEC (ISO 21219-15), TPEG2-FPI (ISO 21219-16), TPEG2-SPI (ISO 21219-17), TPEG2-TFP (ISO 21219-18), TPEG2-WEA (ISO 21219-19), TPEG2-RMR (ISO/TS 21219-23), TPEG2-EMI (ISO 21219-25[2]), TPEG2-VLI (ISO/TS 21219-26).

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 with 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:

SP19001 _3.0_001

1) Under preparation. Stage at the time of publication: ISO/DIS 21219-21:2024.

2) Under preparation. Stage at the time of publication: ISO/PRF 21219-25:2024.

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

Part 7: Location referencing container (TPEG2-LRC)

1 Scope

This document establishes the method of signalling the specific location referencing used by all TPEG2 applications that require detailed location information to be delivered to client devices. This document describes the TPEG2-Location Referencing Container (TPEG2-LRC) and shows how it is used to signal which specific location referencing method is in use for a particular TPEG message. It is able to handle location referencing methods that are external to the ISO 21219 series and the internal location referencing methods defined as parts of this series.

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 17572-2, *Intelligent transport systems (ITS) — Location referencing for geographic databases — Part 2: Pre-coded location references (pre-coded profile)*

ISO 17572-3, *Intelligent transport systems (ITS) — Location referencing for geographic databases — Part 3: Dynamic location references (dynamic profile)*

ISO 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 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)*

ISO 21219-14, *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) — Part 14: Parking information (TPEG2-PKI)*

ISO 21219-15, *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) — Part 15: Traffic event compact (TPEG2-TEC)*

ISO 21219-21:—[3)], *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) — Part 21: Geographic location referencing (TPEG-GLR)*

ISO/TS 21219-22, *Intelligent transport systems — Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) — Part 22: OpenLR location referencing (TPEG2-OLR)*

3 Terms and definitions

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

3) Under preparation. Stage at the time of publication: ISO/DIS 21219-21:2024.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

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

3.1
TPEG client
end user's device, usually consisting of a bearer level tuner/receiver, a TPEG decoder and a human machine interface

3.2
dynamic location reference
location reference generated on the fly based on geographic properties in a digital map database

3.3
location referencing
means to provide information that allows a system to accurately identify a location

Note 1 to entry: The content of a location reference allows the location to be presented in a plain-language manner directly to the end-user (i.e. text, speech or icons) or to be used for navigational purposes, for example, for map-based systems.

3.4
location referencing container
concept applied to the grouping of all the location referencing elements, of a TPEG-Message, together in one place

Note 1 to entry: Many TPEG applications are designed to deliver TPEG messages, which consist of three high level containers, each with one or more elements. These containers are for: message management, application specific information and location referencing information. Some special application messages do not include a location referencing container, such as a cancellation message. Each container does not necessarily have all possible lower-level elements included.

Note 2 to entry: Figure 1 shows the "container view" structure used, for example, when a TPEG2-TEC (ISO 21219-15) application message is generated to describe a road event and location references need to be given to the end-user.

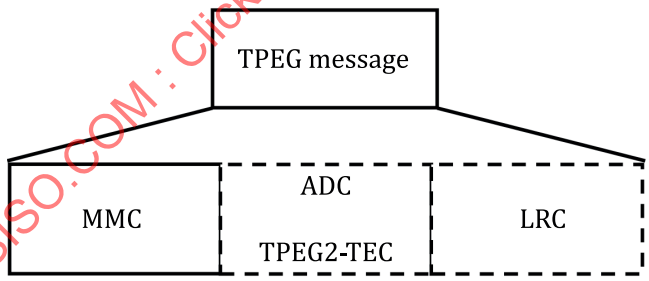

Figure 1 — The "container view" of a TPEG message

Note 3 to entry: The main purpose of the location referencing container is to provide both human-understandable and machine-readable elements to appropriate client decoders. It may be delivered to a "thin client", which for example is only able to convey limited location referencing information to the end user or it may be delivered to a "thick client" using a considerable number of elements and using considerable processing power to filter the information for a comprehensive display to an end user.

3.5
message
collection of coherent information sent through the information channel describing an event, a collection of related events, or status information, for example, and including message management information

3.6
pre-coded location reference
location reference using a unique identifier that is agreed upon in both sender and receiver systems to select a location from a set of agreed locations

3.7
TPEG server
functionality used by the service provider to distribute or deliver the TPEG data to TPEG client devices

4 Abbreviated terms

For the purposes of this document, the abbreviated terms given in ISO 21219-1, ISO 21219-9, ISO 21219-14, ISO 21219-15, and the following apply.

DLR	dynamic location referencing
DLR1	DLR method as defined in ISO 17572-3
ETL	extended TMC location reference
NDS	navigation data standard
ULR	universal location referencing
VICS	vehicle information and communication system – Japanese-developed real-time road traffic information system providing congestion and regulation information

5 Toolkit specific constraints

5.1 Application identification

TPEG applications are described by the TPEG specifications in the ISO 21219 series and are placed at the highest layers of the OSI protocol stack, ISO/IEC 7498-1. Each TPEG application (e.g. TPEG2-TEC) is assigned a unique number, called the application identity (AID). In this respect, the TPEG2-LRC is not an application, but it is an essential constituent part of all TPEG messages requiring location referencing.

5.2 Version number signalling

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

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

Table 1 shows the current version numbers for signalling LRC versions within the SNI application.

Table 1 — Current version numbers for signalling of LRC

Major version number	3
Minor version number	0

5.3 Extendibility

The requirement of a fixed component order does not affect the extension of TPEG2-LRC. Future toolkit extensions may insert new components or may replace existing components by new ones without losing backward compatibility. This means that a TPEG2-LRC decoder shall be able to detect and skip unknown components.

6 LRC toolkit structure

The LRC toolkit structure is shown in Figure 2. The binary format and XML format of the TPEG2-LRC for use in transmission shall be in accordance with Annexes A and B, respectively.

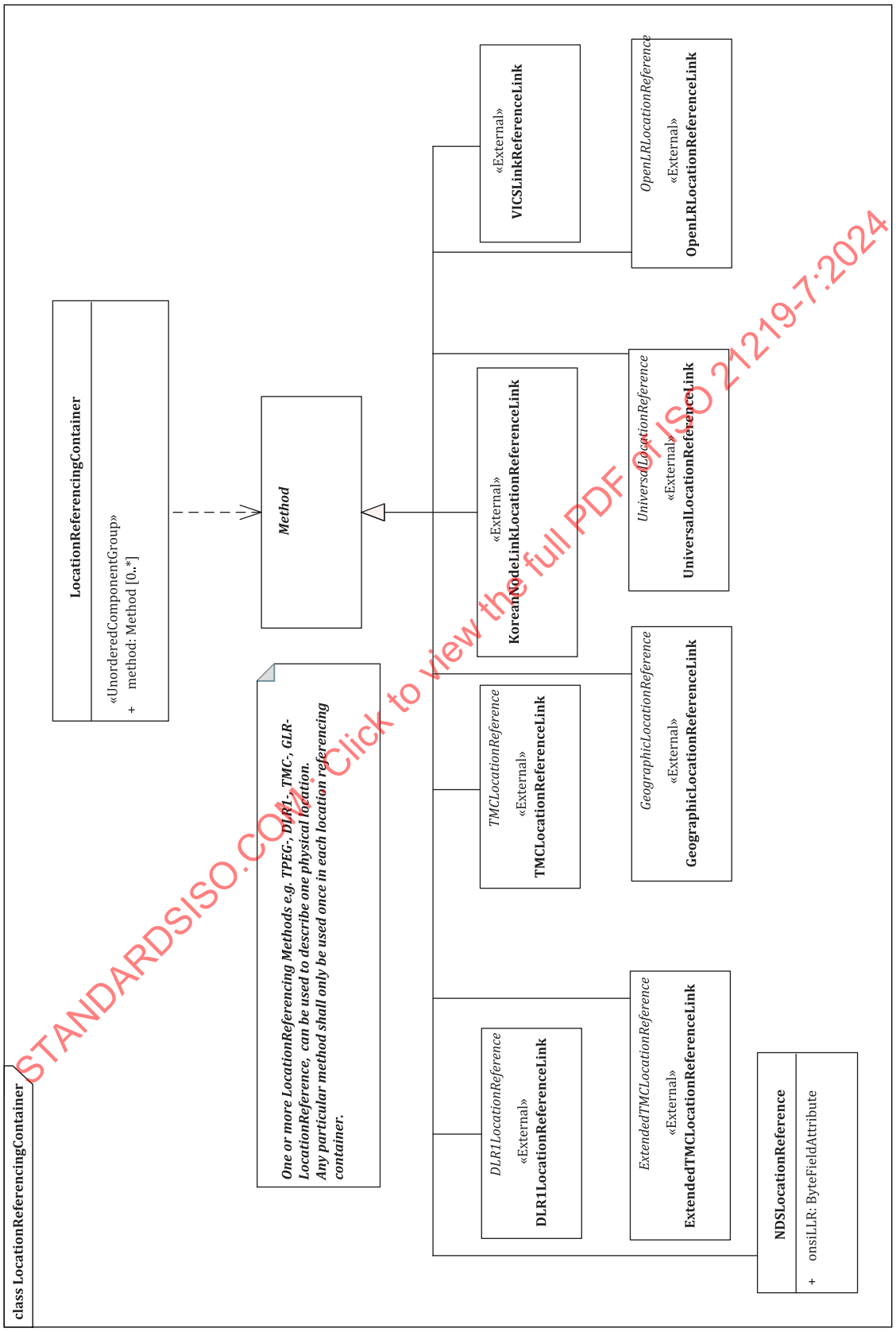

Figure 2 — LRC toolkit structure

To satisfy the principles of the TPEG technology, location referencing requires the transmission of data that will allow a TPEG client to present such detail to a human directly as text, speech, graphics or a combination of these, to recreate a comprehensible representation of a real-world location.

Location referencing may come in three distinct types:

— pre-coded, where a number of locations are fixed in a list and the same list needs to be used by the service provider (TPEG server) as well as by the client device decoder;

— dynamic, where locations are encoded on-the-fly and decoded by the client device with no specific prior knowledge;

— hybrid, a mixture of pre-coded and dynamic.

The TPEG2-LRC allows embedding of any location referencing method which is defined in this document.

The TPEG2-LRC is defined so that it can be extended to incorporate other location referencing methods in subsequent versions of TPEG2-LRC (see ISO 21219-2).

A service provider (TPEG server) may use any one or more location references per TPEG Message. The choice will depend upon market driven factors and thus there is full service provision choice for both transitional and long-term location referencing requirements.

Nine specific “standard” location referencing methods have been identified as suitable for use within TPEG2-LRC. In alphabetical order they are:

— DLR1 (see ISO 17572-3);

— Extended TMC Location Reference (see ISO 17572-2);

— Geographic Location Reference (see ISO 21219-21);

— Korean Node Link ID System (see ISO 17572-2);

— NDS Location Reference;[8]

— OpenLR™ (see ISO/TS 21219-22);[4)]

— TMC location reference (see ISO 17572-2);

— universal location reference;[9]

— VICS Link Location (see ISO 17572-2).

These location referencing methods are detailed in other standards (see Clause 2 and Bibliography) and they may be used by inserting the location data, encoded according to their specification, into the TPEG2-LRC.

The LRC ensures a stable way of identifying the method in use and thus allows TPEG client decoder(s) to identify which location referencing method(s) are present in the message.

The structure of the LRC toolkit is shown in Figure 2.

7 LRC Toolkit components

7.1 LocationReferencingContainer

The generic LocationReferencingContainer can contain a pre-coded or a dynamic location reference.

4) OpenLR™ is the trademark of a product supplied by TomTom International BV. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.

One or more location referencing method (e.g. DLR1 location, TMC location, VICS link location, Korean node link location, ETL location, NDS location or GLR location) can be used to describe one physical location. Any particular method shall be used only once in any LocationReferencingContainer.

Table 2 defines the LocationReferencingContainer component.

Table 2 — LocationReferencingContainer

Name	Type	Multiplicity	Description
Unordered components			
method	Method	0..*	n.a.

7.2 Method

This component is a placeholder for the actual location reference containers.

Any particular method shall be used only once in any LocationReferencingContainer.

7.3 DLR1LocationReferenceLink

The DLR1 location referencing method is a dynamic location referencing method developed by ISO/TC 204.

The method is designed to provide compact location references that allow accurate location referencing for 100 % of the road network. DLR1 location references are machine-readable and are primarily aimed at dynamic route guidance navigation systems. The DLR1 method and the TPEG2 conformant structure of TPEG2-DLR shall be as specified in ISO 17572-3.

7.4 TMCLocationReferenceLink

The RDS-TMC protocol (i.e. ALERT-C protocol) is specified in the ISO 14819 series. This protocol is designed to provide pre-coded information messages using pre-coded location references to end-users on inter-urban road networks. The TMC system, developed for FM transmission in the RDS sub-channel, is limited to a code-base of < 64 000 locations per location table.

The TMC location reference method for embedding ALERT-C location references in the TPEG2 conformal structure of TPEG2-TMC is specified in ISO 17572-2:2018, Annexes B, C and D.

7.5 KoreanNodeLinkLocationReferenceLink

This element shall be as defined by ISO 17572-2.

The content of this component is defined in ISO 17572-2:2018, 8.4. The purpose of this class definition is to assign a unique identifier to the component.

7.6 VICSLinkReferenceLink

VICS link location is a pre-coded location referencing method designed for the Japanese road network. The VICS link location reference method shall be as defined by ISO 17572-2.

The content of this component is defined in ISO 17572-2:2018, 8.2. The purpose of this class definition is to assign a unique identifier to the component.

7.7 ExtendedTMCLocationReferenceLink

The RDS-TMC protocol (i.e. ALERT-C protocol) is specified in ISO 14819-1. This protocol is designed to provide pre-coded information messages using pre-coded location references to end-users on interurban road networks. Both messages and locations are required to be stored in all client devices. The TMC system, developed for FM transmission in the RDS sub-channel, is limited to a code-base of < 64 000 locations per location table. Some events in the RDS-TMC protocol address only the exits and entries of the point location

defined by the location code. To allow addressing of these exits and entries in the location reference (and not in the TPEG application), additional information next to the location code has to be supplied in the location container. The extended TMC location reference extends the ALERT-C location referencing defined in ISO 17572-2 to allow, additionally, specification of exits and entry roads of a defined TMC-point location.

The ETL location reference method for embedding extended TMC location references in the TPEG-LRC is specified in ISO 17572-2:2018, Annexes E, F, and G.

7.8 GeographicLocationReferenceLink

The GLR location referencing method is a simple geographic location referencing method.

The method is designed to provide compact, dynamic location references for geographic features, e.g. geographic point, line and area locations. GLR location references are machine-readable. The GLR method is primarily aimed at geo-oriented (i.e. not road-network-related) applications such as weather reports, safety alerts and emergency warnings. The GLR method shall be as specified in ISO/TS 21219-21.

7.9 UniversalLocationReferenceLink

The ULR location referencing method is a dynamic location referencing method (universal location referencing) which aims to overcome the limits of TPEG-LOC (in terms of efficiency and accuracy) based on an open, royalty-free method. ULR offers a flexible method to fulfil the needs of content providers and users in relevant domains. It aims to be truly "universal", designed for human-centred assistance-devices as well as map-related devices like navigation systems. Therefore, it supports human-understandable representations such as text as well as machine-processable coding for the map-matching process on on-board digital maps. The ULR method shall be as specified in TISA specification SP13008.[9]

7.10 OpenLRLocationReferenceLink

OpenLR™ has been designed for the use case of transferring traffic information from a centre to in-vehicle systems, built-in or used as an add-on (PND, smart phone). The corresponding locations are roads, a list of connected roads, points of interest or areas.

In order to transmit location information from a sending to a receiving side, the OpenLRTM method defines rules for generating map-independent location references, i.e. the actual location references are generated dynamically, not incorporating any pre-coding steps. The OLR method shall be as specified in ISO/TS 21219-22.

7.11 NDSLocationReference

This component defines the NDS location reference for referencing locations based on NDS[10] maps. The component structure of this NDS location reference follows the TPEG component structure, yet it contains as binary data a link location reference in NDS format.

Table 3 defines the NDSLocationReference component.

Table 3 — NDSLocationReference

Name	Type	Multiplicity	Description
onsiLLR	ByteFieldAttribute	1	Link location reference specified by the NDS association Open NDS Service Interface specification.[8] This link location reference is carried in TPEG as binary data.

Annex A
(normative)

TPEG application, TPEG-binary representation

A.1 Message components

A.1.1 List of generic component Ids

The list of the generic component IDs is shown in Table A.1.

Table A.1 — List of generic component IDs

Name	Id
LocationReferencingContainer	x (this ID is assigned in the TPEG application)
DLR1LocationReferenceLink	1
TMCLocationReferenceLink	2
KoreanNodeLinkLocationReferenceLink	3
VICSLinkReferenceLink	4
ExtendedTMCLocationReferenceLink	5
GeographicLocationReferenceLink	6
UniversalLocationReferenceLink	7
OpenLRLocationReferenceLink	8
NDSLocationReference	9

A.1.2 LocationReferencingContainer

The structure of the LocationReferencingContainer is shown in Table A.2.

Table A.2 — LocationReferencingContainer

<LocationReferencingContainer(x)>:=	
<IntUnTi>(x),	Id of this component.
<IntUnLoMB>(lengthComp),	Number of bytes in component, excluding the Id and lengthComp indicator.
<IntUnLoMB>(lengthAttr),	Number of bytes in attributes.
unordered {	
n ***<Method>**(method)	
};	

A.1.3 Method

The structure of the Method is shown in Table A.3.

Table A.3 — Method

<Method(x)>:=	
<IntUnTi>(x),	Id of this component.
<IntUnLoMB>(lengthComp),	Number of bytes in component, excluding the ID and lengthComp indicator.
<IntUnLoMB>(lengthAttr);	Number of bytes in attributes.

A.1.4 DLR1LocationReferenceLink

The structure of the DLR1LocationReferenceLink is shown in Table A.4.

Table A.4 — DLR1LocationReferenceLink

<DLR1LocationReferenceLink(1)<Method()>>:=	
External**<DLR1LocationReference(1)>**;	See DLR1LocationReference specification.

A.1.5 TMCLocationReferenceLink

The structure of the TMCLocationReferenceLink is shown in Table A.5.

Table A.5 — TMCLocationReferenceLink

<TMCLocationReferenceLink(2)<Method()>>:=	
External**<TMCLocationReference(2)>**;	See TMCLocationReference specification.

A.1.6 KoreanNodeLinkLocationReferenceLink

The structure of the KoreanNodeLinkLocationReferenceLink is shown in Table A.6.

Table A.6 — KoreanNodeLinkLocationReferenceLink

<KoreanNodeLinkLocationReferenceLink(3)<Method()>>:=	
External**<UndefinedPackage(3)>**;	External package is not defined.

A.1.7 VICSLinkReferenceLink

The structure of the VICSLocationReferenceLink is shown in Table A.7.

Table A.7 — VICSLocationReferenceLink

<VICSLinkReferenceLink(4)<Method()>>:=	
External**<UndefinedPackage(4)>**;	External package is not defined.

A.1.8 ExtendedTMCLocationReferenceLink

The structure of the ExtendedTMCLocationReferenceLink is shown in Table A.8

Table A.8 — ExtendedTMCLocationReferenceLink

<ExtendedTMCLocationReferenceLink(5)<Method()>>:=	
External**<ExtendedTMCLocationReference(5)>**;	See ExtendedTMCLocationReference specification.

A.1.9 GeographicLocationReferenceLink

The structure of the GeographicLocationReferenceLink is shown in Table A.9.

Table A.9 — GeographicLocationReferenceLink

<GeographicLocationReferenceLink(6)<Method()>>:=	
External**<GeographicLocationReference(6)>**;	See GeographicLocationReference specification.

A.1.10 UniversalLocationReferenceLink

The structure of the UniversalLocationReferenceLink is shown in Table A.10.

Table A.10 — UniversalLocationReferenceLink

<UniversalLocationReferenceLink(7)<Method()>>:=	
External**<UniversalLocationReference(7)>**;	See UniversalLocationReference specification.

A.1.11 OpenLRLocationReferenceLink

The structure of the OpenLRLocationReferenceLink is shown in Table A.11.

Table A.11 — OpenLRLocationReferenceLink

<OpenLRLocationReferenceLink(8)<Method()>>:=	
External**<OpenLRLocationReference(8)>**;	See OpenLRLocationReference specification.

A.1.12 NDSLocationReference

The structure of the NDSLocationReference is shown in Table A.12.

Table A.12 — NDSLocationReference

<NDSLocationReference(9)<Method(9)>>:=	
<IntUnTi>(9),	Id of this component.
<IntUnLoMB>(lengthComp),	Number of bytes in component, excluding the Id and lengthComp indicator.
<IntUnLoMB>(lengthAttr),	Number of bytes in attributes.
<ByteFieldAttribute>(onsiLLR);	Link location reference specified by the NDS association Open NDS Service Interface specification (see specification NDS2.X_ONSI-LLR). This link location reference is carried in TPEG as binary data.

A.2 LRC data types

No specific data types are defined in this document.

Annex B
(normative)

TPEG application, tpegML representation

B.1 Message Components

B.1.1 LocationReferencingContainer

```
<xs:element name="LocationReferencingContainer" type="LocationReferencingContainer"/>
<xs:complexType name="LocationReferencingContainer">
 <xs:complexContent>
 <xs:extension base="tsf:ApplicationRootMessageML">
 <xs:sequence>
 <xs:choice maxOccurs="unbounded">
 <xs:element name="method" type="Method" minOccurs="0" maxOccurs="unbounded"/>
 </xs:choice>
 </xs:sequence>
 </xs:extension>
 </xs:complexContent>
</xs:complexType>
```

B.1.2 Method

```
<xs:complexType name="Method">
 <xs:sequence>
 <xs:choice minOccurs="1" maxOccurs="1">
 <xs:element name="optionDLR1LocationReferenceLink" type="dlr:DLR1LocationReferen
ce" minOccurs="1" maxOccurs="1"/>
 <xs:element name="optionTMCLocationReferenceLi
nk" type="tlr:TMCLocationReference" minOccurs="1" maxOccurs="1"/>
 <xs:element name="optionKoreanNodeLinkLocationReferenceLi
nk" type="xs:base64Binary" minOccurs="1" maxOccurs="1"/>
 <xs:element name="optionVICSLinkReferenceLi
nk" type="xs:base64Binary" minOccurs="1" maxOccurs="1"/>
 <xs:element name="optionExtendedTMCLocationReferenceLink" type="etl:ExtendedTMCLocationRefere
nce" minOccurs="1" maxOccurs="1"/>
 <xs:element name="optionGeographicLocationReferenceLink" type="glr:GeographicLocationReferen
ce" minOccurs="1" maxOccurs="1"/>
 <xs:element name="optionUniversalLocationReferenceLink" type="ulr:UniversalLocationReferen
ce" minOccurs="1" maxOccurs="1"/>
 <xs:element name="optionOpenLRLocationReferenceLink" type="olr:OpenLRLocationReferen
ce" minOccurs="1" maxOccurs="1"/>
 <xs:element name="optionNDSLocationReference" type="NDSLocationReference" minOccurs="1" maxOc
curs="1"/>
 </xs:choice>
 </xs:sequence>
```