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

Part 22:

**OpenLR location referencing
(TPEG2-OLR)**

(<https://standards.iteh.ai>)

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

Partie 22: Référencement d'Emplacement OpenLR (TPEG2-OLR)
[ISO/TS 21219-22:2017](https://standards.iteh.ai/catalog/standards/iso/219855e-16cc-4259-91e5-09f6446f4b15/iso-ts-21219-22-2017)

<https://standards.iteh.ai/catalog/standards/iso/219855e-16cc-4259-91e5-09f6446f4b15/iso-ts-21219-22-2017>



Reference number
ISO/TS 21219-22:2017(E)

iTeh Standards

(<https://standards.iteh.ai>)

Document Preview

[ISO/TS 21219-22:2017](https://standards.iteh.ai/catalog/standards/iso/219855e-16cc-4259-91e5-096446f4b15/iso-ts-21219-22-2017)

<https://standards.iteh.ai/catalog/standards/iso/219855e-16cc-4259-91e5-096446f4b15/iso-ts-21219-22-2017>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2017, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

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

Contents

Page

| | |
|---|-----------|
| Foreword | v |
| Introduction | vi |
| 1 Scope | 1 |
| 2 Normative references | 1 |
| 3 Terms and definitions | 1 |
| 4 Abbreviated terms | 3 |
| 5 Toolkit specific constraints | 4 |
| 5.1 Version number signalling | 4 |
| 5.2 Extension | 4 |
| 6 OLR structure | 4 |
| 6.1 Location types | 4 |
| 6.1.1 Supported location types | 4 |
| 6.1.2 Linear locations | 5 |
| 6.1.3 Point locations | 6 |
| 6.1.4 Area locations | 8 |
| 6.2 Requirements | 11 |
| 6.2.1 General | 11 |
| 6.2.2 Map requirements | 11 |
| 6.2.3 Location properties | 12 |
| 6.3 Logical data format specification | 13 |
| 6.3.1 General | 13 |
| 6.3.2 Building blocks | 14 |
| 6.3.3 Additional data | 18 |
| 6.3.4 Location reference point | 20 |
| 6.4 Data format rules | 26 |
| 6.4.1 OpenLR™ rules | 26 |
| 6.4.2 Overview of the data format rules | 27 |
| 6.5 Physical representations of geo-coordinates | 28 |
| 6.5.1 General | 28 |
| 6.5.2 Absolute geo-coordinates | 28 |
| 6.5.3 Relative geo-coordinates | 28 |
| 7 OLR message components | 29 |
| 7.1 OpenLRLocationReference | 29 |
| 7.2 AbstractLocationReference | 29 |
| 7.3 LinearLocationReference | 30 |
| 7.4 GeoCoordinateLocationReference | 30 |
| 7.5 PointAlongLineLocationReference | 31 |
| 7.6 POIWithAccessPointLocationReference | 32 |
| 7.7 CircleLocationReference | 33 |
| 7.8 PolygonLocationReference | 34 |
| 7.9 RectangleLocationReference | 35 |
| 7.10 GridLocationReference | 35 |
| 7.11 ClosedLinearLocationReference | 36 |
| 7.12 LineProperties | 37 |
| 7.13 PathProperties | 38 |
| 7.14 LocationDescription | 38 |
| 7.15 AbstractShape | 38 |
| 7.16 Shape | 38 |
| 7.17 Path | 39 |
| 8 OLR datatypes | 39 |
| 8.1 AbsoluteGeoCoordinate | 39 |

| | | |
|---|---|-----------|
| 8.2 | RelativeGeoCoordinate | 39 |
| 8.3 | Bearing..... | 39 |
| 8.4 | DistanceMetresMax15000..... | 40 |
| 8.5 | FirstLocationReferencePoint..... | 40 |
| 8.6 | IntermediateLocationReferencePoint..... | 40 |
| 8.7 | LastLocationReferencePoint..... | 40 |
| 8.8 | PointLocationLineReferenceData..... | 41 |
| 8.9 | Rectangle..... | 41 |
| 9 | OLR tables..... | 41 |
| 9.1 | olr001:FunctionalRoadClass..... | 41 |
| 9.2 | olr002:FormOfWay..... | 42 |
| 9.3 | olr003:Orientation..... | 42 |
| 9.4 | olr004:SideOfRoad | 42 |
| Annex A (normative) TPEG application, TPEG-Binary Representation | | 43 |
| Annex B (normative) TPEG application, TPEG-ML Representation | | 51 |
| Bibliography..... | | 59 |

iTeh Standards

(<https://standards.iteh.ai>)

Document Preview

[ISO/TS 21219-22:2017](https://standards.iteh.ai/catalog/standards/iso/219855e-16cc-4259-91e5-09f6446f4b15/iso-ts-21219-22-2017)

<https://standards.iteh.ai/catalog/standards/iso/219855e-16cc-4259-91e5-09f6446f4b15/iso-ts-21219-22-2017>

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 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.

[ISO/TS 21219-22:2017](http://www.iso.org/iso/foreword.html)

<https://standards.iteh.ai/catalog/standards/iso/219855e-16cc-4259-91e5-09f6446f4b15/iso-ts-21219-22-2017>

Introduction

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.

<https://standards.iteh.ai/catalog/standards/iso/219855e-16cc-4259-91e5-09f6446f4b15/iso-ts-21219-22-2017>
The ISO/TS 18234 series has become known as TPEG Generation 1.

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-ULR (ISO/TS 21219-11¹⁾), TPEG2-GLR (ISO/TS 21219-21¹⁾), 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 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: SP14006/1.0/002.

Document Preview

[ISO/TS 21219-22:2017](https://standards.iteh.ai/catalog/standards/iso/219855e-16cc-4259-91e5-09f6446f4b15/iso-ts-21219-22-2017)

<https://standards.iteh.ai/catalog/standards/iso/219855e-16cc-4259-91e5-09f6446f4b15/iso-ts-21219-22-2017>

1) Under development.

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

Part 22: OpenLR location referencing (TPEG2-OLR)

1 Scope

This document specifies the logical data format of OpenLRTM location references and general requirements of the method in [Clause 6](#) and defines the structure of the TPEG toolkit for OpenLR location referencing (OLR) in [Clauses 7, 8](#) and [9](#). The toolkit is intended to be used in the TPEG location referencing container (TPEG-LRC).

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 information transferred can consist of the current traffic situation at a certain location, a traffic forecast or special alerts. 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, that is, the actual location references are generated dynamically not requiring use of pre-defined location references.

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 \(TPEG2-INV\)](https://www.iso.org/standard/63199/ISO_TS_21219-22_2017.html)

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:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

area

two-dimensional part of the surface of the earth which is bounded by a closed curve

Note 1 to entry: An area may cover parts of the road network, covering several roads or parts of roads.

3.2

decoder

software component which decodes a location code and finds the corresponding location back in a map

3.3

encoder

software component which generates a location code for a location in a map

3.4

intermediate/intermediate location reference point

internal location reference point (LRP) which is neither the start LRP nor the end LRP

3.5

line

one-dimensional representation of a road or part of road in a road network

Note 1 to entry: A line starts and ends at a node. It is directed. This means two-way traffic flows are represented by two (directed) lines, one per direction.

3.6

location

specification of the position on the earth surface of an object in a digital map

3.7

location reference

location code, created according to a specific set of rules, used to reference a location

3.8

location reference path

route in a road network in a digital map which is referenced by the location reference

Note 1 to entry: Note1 to entry: This path might be longer than the location itself.

3.9

location reference point

point representing a real-world point location

Note 1 to entry: Besides the position or line information, additional data may be used to further specify the character of a location.

<https://standards.iteh.ai/catalog/standards/iso/219855e-16cc-4259-91e5-09f6446f4b15/iso-ts-21219-22-2017>

3.10

map

geospatial representation of an area on the earth surface

3.11

node

zero-dimensional object in the road network acting as start and end for lines

3.12

offset

specification of a position along a referenced path to indicate the start or the end of a location

3.13

orientation

describes the relationship between a point of interest and the direction of a referenced line

Note 1 to entry: The point may be directed in the same direction as the line, against that direction, in both directions, or the direction of the point might be unknown.

3.14

point

zero-dimensional element that specifies a spatial location by a coordinate pair

3.15**route**

collection of line objects in a digital map connecting a departure location and a destination location, defined according to certain criteria which might include time distance or cost

3.16**side of road**

relationship between a point of interest and a referenced line

Note 1 to entry: The point can be on the right side of the reference line, on the left side of the reference line, on both sides of the reference line or directly on the reference line, in the position direction of the reference line.

4 Abbreviated terms

ADD against driving direction

BEAR bearing

CEN Comité Européen de Normalisation

COORD coordinates

DESC location description

DNP distance to next point

FOW form of way

FRC functional road class

FUZ fuzzy area

lat latitude

[ISO/TS 21219-22:2017](https://standards.iteh.ai/iso/TS/21219-22:2017)

<https://standards.iteh.ai/catalo...lowest functional road class to next point> <https://standards.iteh.ai/iso/TS/21219-22:2017>

lon longitude

LRP location reference point

LRC location reference container

n.a. not available

NCOLS number of columns

NOFF negative offset

NROWS number of rows

ORI orientation

POFF positive offset

POI point of interest

RAD radius

SFW TPEG service framework: modelling and conversion rules

| | |
|------|--|
| SHP | shape |
| SOR | side of road |
| SRBL | side road bearing left |
| SRBR | side road bearing right |
| TISA | Traveller Information Services Association |
| TPEG | Transport Protocol Expert Group |
| TTI | traffic and travel information |
| UML | Unified Modelling Language |
| XML | eXtensible Markup Language |

5 Toolkit specific constraints

5.1 Version number signalling

Version numbering is used to track the separate versions of a toolkit 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 signalling the OLR version in use within this toolkit's top level component (see [7.1](#)) and within TPEG-ML.

Table 1 — Current version number for signalling of OLR

| | |
|----------------------|---|
| Major version number | 1 |
| Minor version number | 0 |

5.2 Extension

Future toolkit extensions may insert new components without losing backward compatibility. That means an OLR decoder shall be able to detect and skip unknown components.

6 OLR structure

6.1 Location types

6.1.1 Supported location types

OpenLR™ supports several types of locations. [Table 2](#) lists the supported types and also provides a link to the clause where the specific type is explained in detail.

Table 2 — Supported location types

| Name | Category | Details |
|-----------------|-----------------|-----------------------------|
| Linear location | Linear location | See 6.1.2 |
| Geo-Coordinate | Point location | See 6.1.3.2 |
| PointAlongLine | Point location | See 6.1.3.3 |

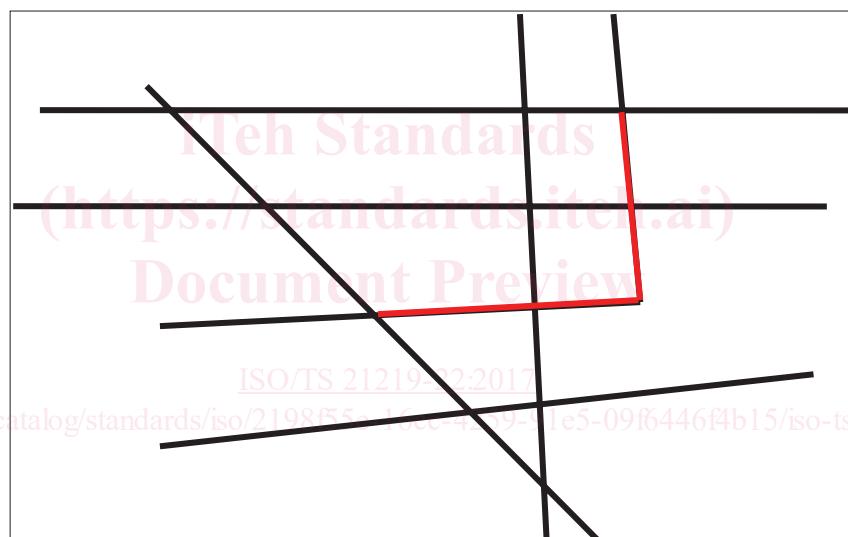
Table 2 (continued)

| Name | Category | Details |
|--------------------|----------------|-----------------------------|
| PoiWithAccessPoint | Point location | See 6.1.3.4 |
| Circle | Area location | See 6.1.4.2 |
| Rectangle | Area location | See 6.1.4.3 |
| Grid | Area location | See 6.1.4.4 |
| Polygon | Area location | See 6.1.4.5 |
| ClosedLinear | Area location | See 6.1.4.6 |

6.1.2 Linear locations

A linear location is a one-dimensional singular continuous path through a road network, from one start point location to one end point location. Offsets may be used to identify locations which do not start or end exactly at a network node.

NOTE Examples of linear locations are jams, (temporary) speed limits and (calculated) routes. [Figure 1](#) and [Figure 2](#) show different types of linear locations where the location is marked and the position of the offsets are shown as dots.

**Figure 1 — Linear location without offsets**

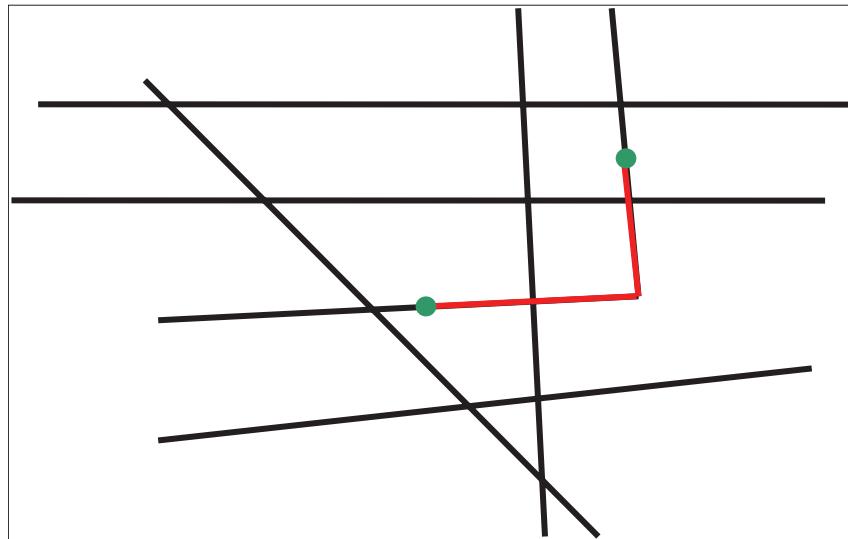


Figure 2 — Linear location with offsets

6.1.3 Point locations

6.1.3.1 General

A point location is a zero-dimensional element that specifies a spatial location by a coordinate pair. One coordinate pair specifies the point location. The following clauses outline different point location types when seen in combination with a (road) network and their real-world examples. The types differ in how the coordinate pair is related to the (road) network.

6.1.3.2 Geo-coordinate

A geo-coordinate pair is a position in a map defined by its longitude and latitude coordinate values. This type of point location may or may not be bound to the network and can be everywhere on the surface. [Figure 3](#) shows an example of such a point location (filled circle).

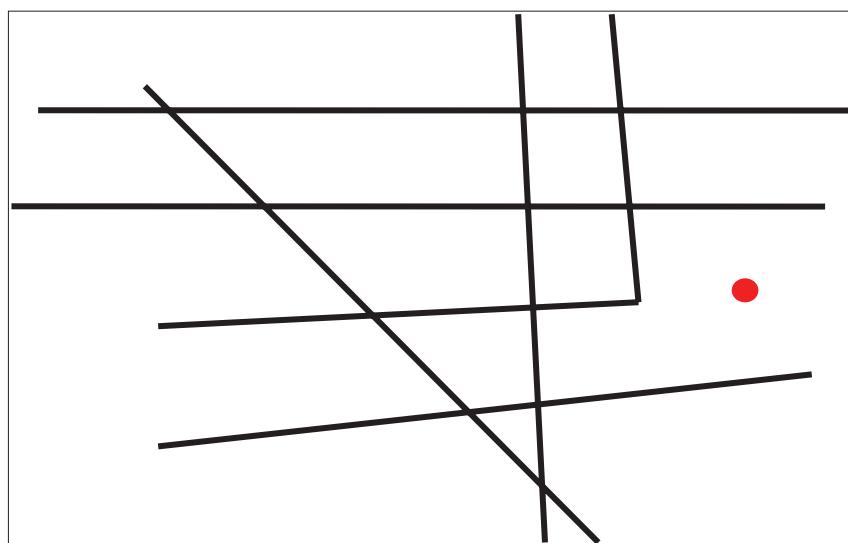


Figure 3 — Example — Geo-coordinate