DD CEN/TS 16157-2:2011

BSI Standards Publication

Intelligent transport systems — DATEX II data exchange specifications for traffic management and information

Part 2: Location referencing

bsi.

...making excellence a habit.™

National foreword

This Draft for Development is the UK implementation of CEN/TS 16157-2:2011. DD ENV 13106:2000 and DD ENV 13777:2000 were withdrawn in 2007 as ENV 13106:2000 and ENV 13777:2000 expired without producing an EN standard.

DATEX II is founded on a single UML model which is made available in a useable format to all through the website, http://www.datex2.eu/.

This publication is not to be regarded as a British Standard.

It is being issued in the Draft for Development series of publications and is of a provisional nature. It should be applied on this provisional basis, so that information and experience of its practical application can be obtained.

Comments arising from the use of this Draft for Development are requested so that UK experience can be reported to the international organization responsible for its conversion to an international standard. A review of this publication will be initiated not later than 3 years after its publication by the international organization so that a decision can be taken on its status. Notification of the start of the review period will be made in an announcement in the appropriate issue of *Update Standards.*

According to the replies received by the end of the review period, the responsible BSI Committee will decide whether to support the conversion into an international Standard, to extend the life of the Technical Specification or to withdraw it. Comments should be sent to the Secretary of the responsible BSI Technical Committee at British Standards House, 389 Chiswick High Road, London W4 4AL.

The UK participation in its preparation was entrusted to Technical Committee EPL/278, Road transport informatics.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

ISBN 978 0 580 72443 5

ICS 35.240.60

Compliance with a British Standard cannot confer immunity from legal obligations.

This Draft for Development was published under the authority of the Standards Policy and Strategy Committee on 31 October 2011.

Amendments issued since publication

Date	Text affected

TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

TECHNISCHE SPEZIFIKATION

CEN/TS 16157-2

October 2011

ICS 35.240.60

Supersedes ENV 13106:2000, ENV 13777:2000

English Version

Intelligent transport systems - DATEX II data exchange specifications for traffic management and information - Part 2: Location referencing

Systèmes de transport intelligents - Spécifications DATEX II d'échange de données pour la gestion du trafic et l'information routière - Partie 2: Localisation

Intelligente Transportsysteme - DATEX II Datenaustausch Spezifikationen für Verkehrsmanagement und Informationen - Teil 2: Positionsreferenz

This Technical Specification (CEN/TS) was approved by CEN on 10 April 2011 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.

CEN members are required to announce the existence of this CEN/TS in the same way as for an EN and to make the CEN/TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the CEN/TS) until the final decision about the possible conversion of the CEN/TS into an EN is reached.

CEN members are the national standards bodies of 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, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. CEN/TS 16157-2:2011: E

Contents

Page

Foreword

This document (CEN/TS 16157-2:2011) has been prepared by Technical Committee CEN/TC 278 “Road transport and traffic telematcis”, 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 [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes ENV 13777:2000, ENV 13106:2000.

As a user of the standard, attention is drawn to the resources of www.datex2.eu. This web site contains related software tools and software resources that aid the implementation of CEN/TS 16157 DATEX II.

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, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

This Technical Specification defines a common set of data exchange specifications to support the vision of a seamless interoperable exchange of traffic and travel information across boundaries, including national, urban, interurban, road administrations, infrastructure providers and service providers. Standardisation in this context is a vital constituent to ensure interoperability, reduction of risk, reduction of the cost base, promotion of open marketplaces and many social, economic and community benefits to be gained from more informed travellers, network managers and transport operators.

Delivering European Transport Policy in line with the White Paper issued by the European Commission requires co-ordination of traffic management and development of seamless pan European services. With the aim to support sustainable mobility in Europe, the European Commission has been supporting the development of information exchange mainly between the actors of the road traffic management domain for a number of years. In the road sector, DATEX II has been long in fruition, with the European Commission being fundamental to its development through an initial contract and subsequent co-funding through the Euro-Regional projects. With this standardisation of DATEX II, there is a real basis for common exchange between the actors of the traffic and travel information sector.

This Technical Specification includes the framework and context for exchanges, the modelling approach, data content, data structure and relationships, communications specification.

This Technical Specification supports a methodology that is extensible.

This Part, Part 2 of this Technical Specification, deals with DATEX II location referencing. It references existing location referencing Standards or Technical Specifications.

The European Committee for Standardisation (CEN) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent concerning procedures, methods and/or formats given in this document.

CEN takes no position concerning the evidence, validity and scope of patent rights.

1 Scope

This Technical Specification (CEN/TS 16157-2) specifies and defines component facets supporting the exchange and shared use of data and information in the field of traffic and travel.

The component facets include the framework and context for exchanges, the modelling approach, data content, data structure and relationships, communications specification.

This Technical Specification is applicable to:

— traffic and travel information which is of relevance to road networks (non urban and urban);

— public transport information that is of direct relevance to the use of a road network (e.g. road link via train or ferry service).

This Technical Specification establishes specifications for data exchange between any two instances of the following actors:

— Traffic Information Centres (TICs);

— Traffic Control Centres (TCCs);

— Service Providers (SPs).

Use of this Technical Specification may be applicable for use by other actors.

This Technical Specification covers, at least, the following types of informational content:

— road traffic event information – planned and unplanned occurrences both on the road network and in the surrounding environment;

— operator initiated actions;

— road traffic measurement data, status data, and travel time data;

— travel information relevant to road users, including weather and environmental information;

— road traffic management information and instructions relating to use of the road network.

This part of the CEN/TS 16157 specifies the informational structures, relationships, roles, attributes and associated data types, for the implementation of the location referencing systems used in association with the different publications defined in the Datex II framework. It also defines a DATEX II publication for exchanging predefined locations. This is part of the DATEX II platform independent data model.

2 Conformance

The DATEX II platform independent data model of which the location referencing packages as well as Predefined Locations Publication sub-model are parts, corresponds to the Level A model as defined in CEN/TS 16157-1.

Conformance with this Part shall require platform independent models from which platform specific models are generated to comply with the UML modelling rules defined in CEN/TS 16157-1 and with the following requirements of this sub-model which are expressed in this Part:

— comply with all stipulated minimum and maximum multiplicity requirements for UML elements and relationships;

— comply with all definitions, types and ordering;

— employ optional elements as specified;

— comply with all expressed constraints.

It should be noted that conformance of a publication service with all the structural requirements stated above does not necessarily ensure that the informational content of that service will be semantically comprehensible.

3 Normative references

The following referenced documents are indispensable for the application 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.

CEN/TS 16157-1:2011, *Intelligent Transport Systems — DATEX II data exchange specifications for traffic management and information — Part 1: Context and framework*

CEN ISO/TS 18234-6:2006, *Traffic and Travel Information (TTI) — TTI via Transport Protocol Expert Group (TPEG) data-streams — Part 6: Location Referencing application (TPEG-Loc) (ISO/TS 18234-6:2006)*

CEN ISO/TS 24530-2:2006, *Traffic and Travel Information (TTI) — TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) — Part 2: tpeg-locML (ISO/TS 24530-2:2006)*

EN ISO 14819-3:2004, *Traffic and Travel Information (TTI) — TTI messages via traffic message coding — Part 3: Location referencing for ALERT-C (ISO 14819-3:2004)*

prEN ISO 19148, *Geographic Information — Linear Referencing (ISO/DIS 19148:2009)*

4 Terms and definitions

For the purposes of this document, the terms and definitions given in CEN/TS 16157-1:2011 and the following apply.

4.1
area
two-dimensional, geographical region on the surface of the Earth

[ISO 17572-1:2008]

4.2
descriptor
characteristic of a geographic object, usually stored in an attribute

EXAMPLE Road names or road numbers.

4.3
destination
specification of the end point of a defined route or itinerary

NOTE This may be either a location on a network or an area location.

4.4
european terrestrial reference system 89
ETRS89
recommended terrestrial reference system for Europe and coincident with ITRS at the epoch 1989.0

NOTE Unlike ITRS, ETRS is centred on the stable part of the European plate and not subject to change due to continental drift in most of Europe.

4.5
geodetic coordinate
one of the sequences of two (or three) numbers designating the position of a point, expressed in geodetic latitude, geodetic longitude and (in the three-dimensional case) ellipsoidal height

[ISO 19111:2007]

4.6
ILOC descriptor
one of the three descriptors associated to an ILOC reference

4.7
international terrestrial reference system
ITRS
reference system for the earth derived from precise and accurate space geodesy measurements, not restricted to GPS Doppler measurements, which is periodically tracked and revised by the International Earth Rotation Service (I.E.R.S.)

[ISO 17572-1:2008]

4.8
itinerary
group of one or more physically separate locations arranged as an ordered set that defines a route

4.9
latitude
geodetic latitude
angle from the equatorial plane to the perpendicular to the Earth through a given point, northwards treated as positive

NOTE adapted from ISO 19111:2007

4.10
linear
having a one-dimensional character

[ISO 17572-1:2008]

4.11
linear referencing
specification of a location relative to a linear element as a measurement along that element

[prEN ISO 19148]

4.12
location
identifiable geographic place

[EN ISO 19112:2005]

NOTE It is either on a network (as a point or a linear location) or an area. This may be provided in one or more referencing systems.

4.13
location code
tabular address of the pre-stored location details in the location table used by the information provider

[EN ISO 14819-3:2004]

4.14
location reference
reference
data set assigned to a location

NOTE A reference shall define unambiguously and exactly one location in the location referencing system. The reference is the set of data which is passed between different implementations using the same location referencing system to identify the location.

4.15
location referencing system
LRS
referencing system
complete system by which location references are generated, according to a location referencing method, and communicated, including standards, definitions, software, hardware, and databases

[ISO 17572-1:2008]

4.16
longitude
geodetic longitude
angle from the prime meridian plane to the meridian plane of a given point, eastward treated as positive

[ISO 19111:2007]

4.17
primary point
point met at the end of a linear road section when it is travelled according to the location direction

NOTE In case of an affected area with an event it generally pinpoints the origin of the event

[EN ISO 14819-3:2004]

4.18
point
zero-dimensional element that specifies a geometric location

[ISO 17572-1:2008]

4.19
predefined location
location using a unique identifier (reference) that is agreed upon in both sender and receiver system to select a location from a set of locations already exchanged

[ISO 17572-1:2008]

4.20
referent
known location from which relative measurement are made along a linear element

[prEN ISO 19148]

4.21
secondary point
point met first when a linear road section is travelled according to the location direction

5 Symbols and abbreviations

For the purpose of this document, the following abbreviations apply throughout the document unless otherwise specified.

ALERT-C Alert and problem Location for European Road Traffic, version C

GIS Geographic Information System

GPS Global Positioning System

ILOC Intersection Location

NOTE It is the basis of a dynamic referencing system named “ILOC referencing system”, subsequently adopted by TPEG as “TPEG-Loc”.

LR Linear Referencing

LRM Linear Referencing Method

TPEG Transport Protocol Expert Group

6 UML Notation

The UML notation used in these Technical Specifications shall be as described in ISO/IEC 19501:2005. A short summary explaining the notation used in this Technical Specification is provided in Annex A of CEN/TS 16157-1.

7 The DATEX II location referencing model

7.1 General

Normative Annex A provides the data dictionary i.e. a comprehensive view of the different classes, attributes and association roles for each package. Each subclause corresponds to a package.

The types of attribute and the enumerations specific to this part are defined in normative Annex A.

The XML subschema corresponding to this part of CEN/TS 16157 is provided in normative Annex B.

Informative Annex C provides some explanations about the location referencing methods that are relevant for this part of CEN/TS 16157, some of them being drawn from approved standards like those on linear referencing or on ALERT-C.

7.1.1 The package “GroupOfLocations”

7.1.1.1 The overall model

The package “GroupOfLocations” supplies classes and attributes to the definition of a location locating a traffic object e.g. a situation record in a situation publication. It is pictured including the relationships between the classes in Figure 1.

This contributes important information in the different publications defined in Part 1 of CEN/TS 16157, bringing information on “where” in each case.

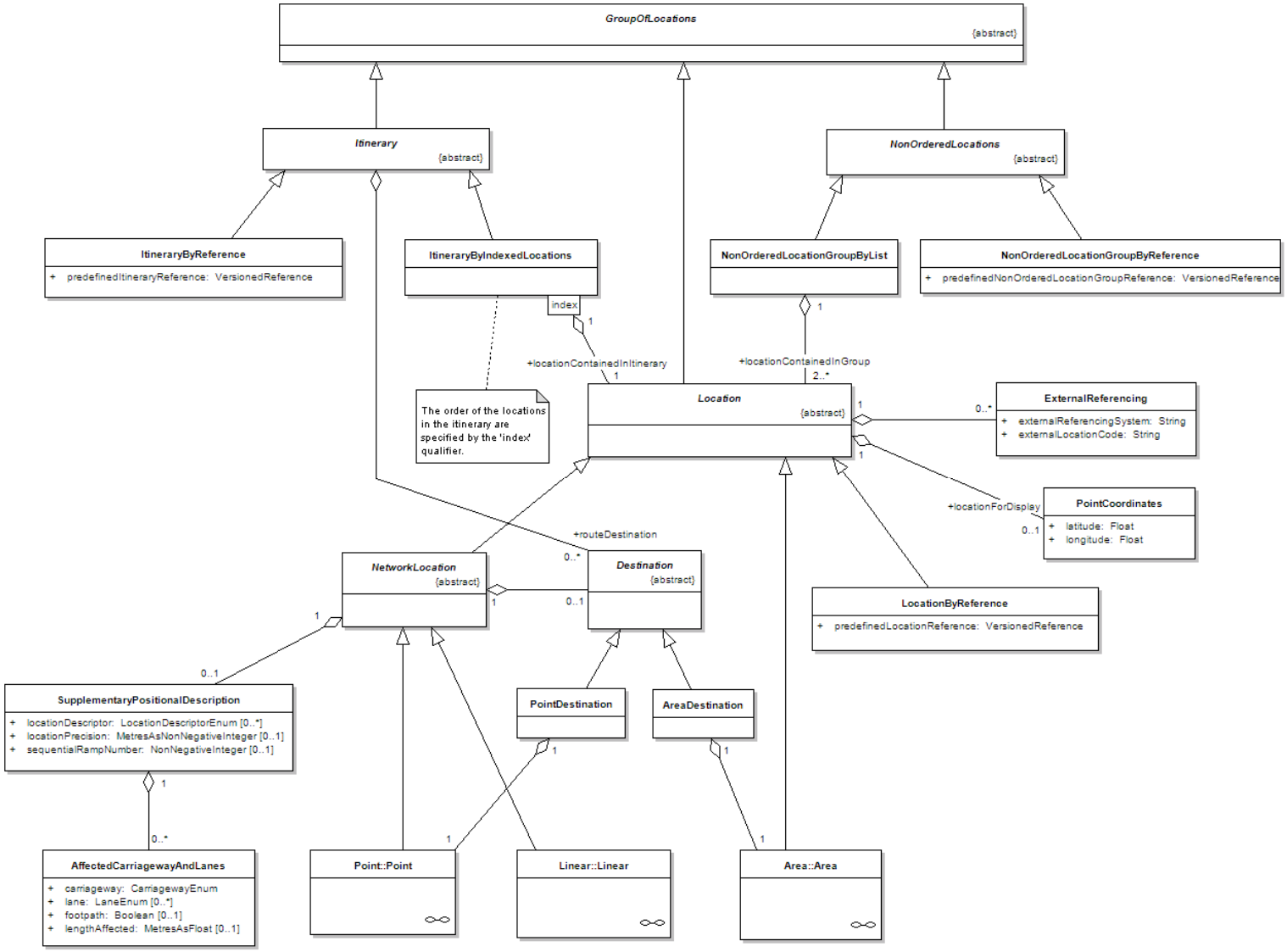


Figure 1 — DATEX II location referencing model

7.1.1.2 Semantics

The most generic concept, group of locations, is a set of one or several locations and is depicted by the abstract class “GroupOfLocations” that is the main entry point of the corresponding package to carry the corresponding locations.

This group of locations can be either used as a set of locations that can be seen independently one from another and without any order (class “NonOrderedLocations”) or as an itinerary (or route) (class “Itinerary”). In case of an itinerary the different sections defining it have to be defined following a specific order or linkage or a single location (depicted by the class “Location”), which is the atomic locating unit.

Any group of locations (i.e. an itinerary or a group of non ordered locations or single location) can be predefined i.e. previously defined, identified and exchanged and then be used through its reference (respectively class “ItineraryByReference”, class “NonOrderedGroupOfLocationsByReference” and class “LocationByReference”).

A group of non-ordered locations has at least two locations whereas an itinerary belongs at least one location.

A location can be either:

— a road network element (class “NetworkLocation”),

— an area (class “Area”).

A road network location can be either a linear or a point location (respectively classes “Linear” and “Point”). The possible description of them is realised in the corresponding packages. The area description is realised in the “Area” package.

In case of an itinerary destination(s) may be added to it through occurrence(s) of the class “Destination”. A destination can be delineated either as a point on the road network (class “PointDestination” defined from the class “Point”) or as an area (class “AreaDestination” defined from the class “Area”).

To help the location to be displayed on a map, geodetic coordinates (in term of geodetic longitude and geodetic latitude) may be added (class “PointCoordinates”). Geodetic coordinates are defined according to the European Terrestrial Reference System of 1989 (ETRS89) which was coincident with the International Terrestrial Reference System (ITRS) in 1989. This is the European implementation of ITRS, but unlike ITRS it is fixed to the stable part of the Eurasian Plate. The coordinates and maps in Europe based on ETRS89 are not subject to change due to the continental drift. ETRS89 is the EU-recommended frame of reference for geodetic data in Europe.

External references may be added to locations if there is a need to add a reference to an external/other referencing system (class “ExternalReferencing”). The given reference code provided shall be accompanied with the name of the external referencing system in use. For example, this feature may be used to extend the present model according to CEN/TS 16157-1.

7.1.1.3 Semantics of supplementary positional information

Supplementary positional information may be added to a road network element for describing the transversal position of the element to be located on the road (class “SupplementaryPositionalDescription”). Therefore, it is possible to globally define the sequential ramp number the minimum accuracy (in metres) which may qualify the corresponding location or to textually qualify this location (e.g. “on bridge”).

Besides it may be completed by transverse positional information (class “AffectedCarriagewayAndLanes”) with the exact carriageway(s), with for each the corresponding lane(s) and the affected length.

7.1.2 The package “TpegDescriptor”

7.1.2.1 The class model

The package “TpegDescriptor” supplies classes and attributes to the definition of a descriptor in TPEG which delineates the descriptive part of a TPEG location besides geodetic coordinates. It is pictured including the relationships between the classes in Figure 2.

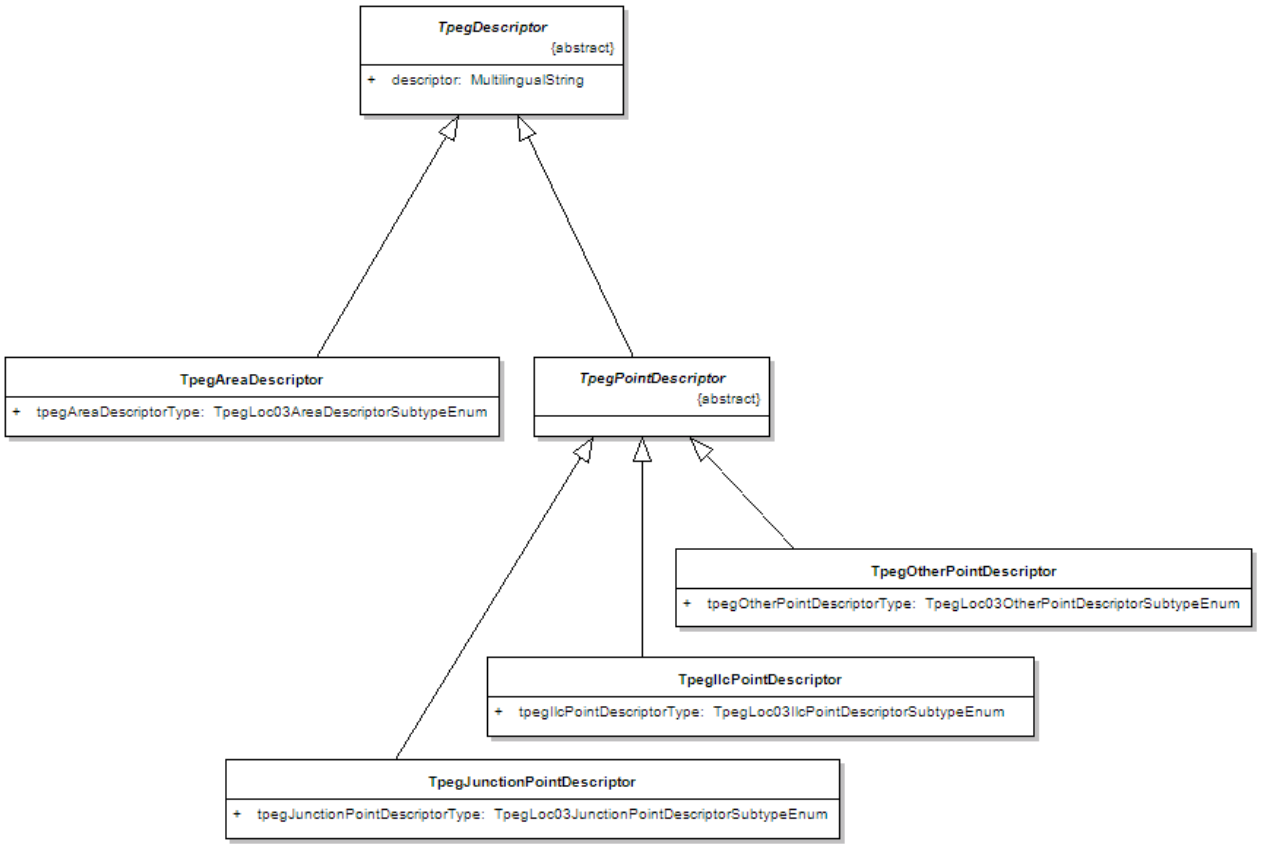


Figure 2 — The TpegDescriptor package class model

7.1.2.2 Semantics

A descriptor is a TPEG-originated word representing any textual description and shall be composed of a descriptor type, a text string and a language code. The latter two elements shall be embedded in a “MultingualString” structure.

Different descriptors are provided for areas and for points. The corresponding descriptor types are defined in different enumeration in A.4.

7.2 Point locations

7.2.1 The package “Point”

7.2.1.1 The class model

The package “Point” supplies classes and attributes to the definition of a point location which specialises a location of a traffic object. It is pictured including the relationships between the classes in Figure 3.

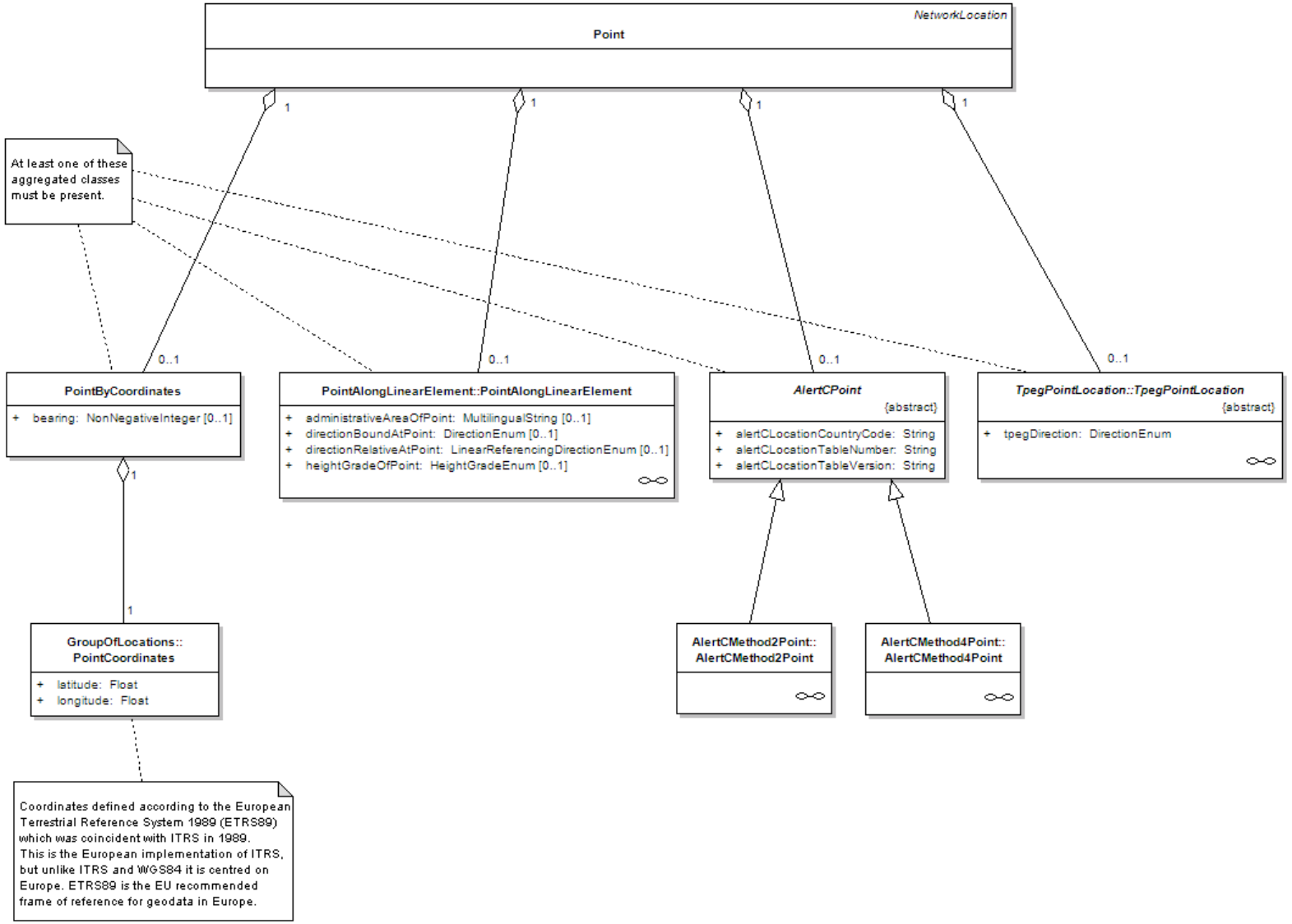


Figure 3 — The Point package class model

7.2.1.2 Semantics

A point network element (class “Point”) represents a single geospatial point on a road. It shall be referenced using one of the following four methods without being exclusive:

— the ALERT-C location referencing methods (class “AlertCPoint”);

— the TPEG-Loc location referencing method (class “TpegPointLocation”). This method is defined in 7.2.4 below;

— the linear referencing method (class “PointAlongLinearElement”). This method is defined in 7.2.5;

— A geographic point defined with a geodetic coordinate pair. It may include a bearing (class “PointByCoordinates”).

There are two methods based on ALERT-C. If AlertCPoint is chosen the method shall be one of:

— a point simply defined by a reference in a ALERT-C location table (class “AlertCMethod2Point”);

— a point defined by a reference in a ALERT-C location table with a distance between the ALERT-C point and the actual point (class “AlertCMethod4Point”).

Each of them shall have an associated direction of traffic flow. These methods are respectively defined in 7.2.2 and in 7.2.3.

7.2.2 The package “AlertCMethod2Point”

7.2.2.1 The class model

The package “AlertCMethod2Point” supplies classes and attributes to the definition of a point location using the method 2 as explained in EN ISO 14819-3:2004, Annex C. It is pictured including the relationships between the classes in Figure 4.

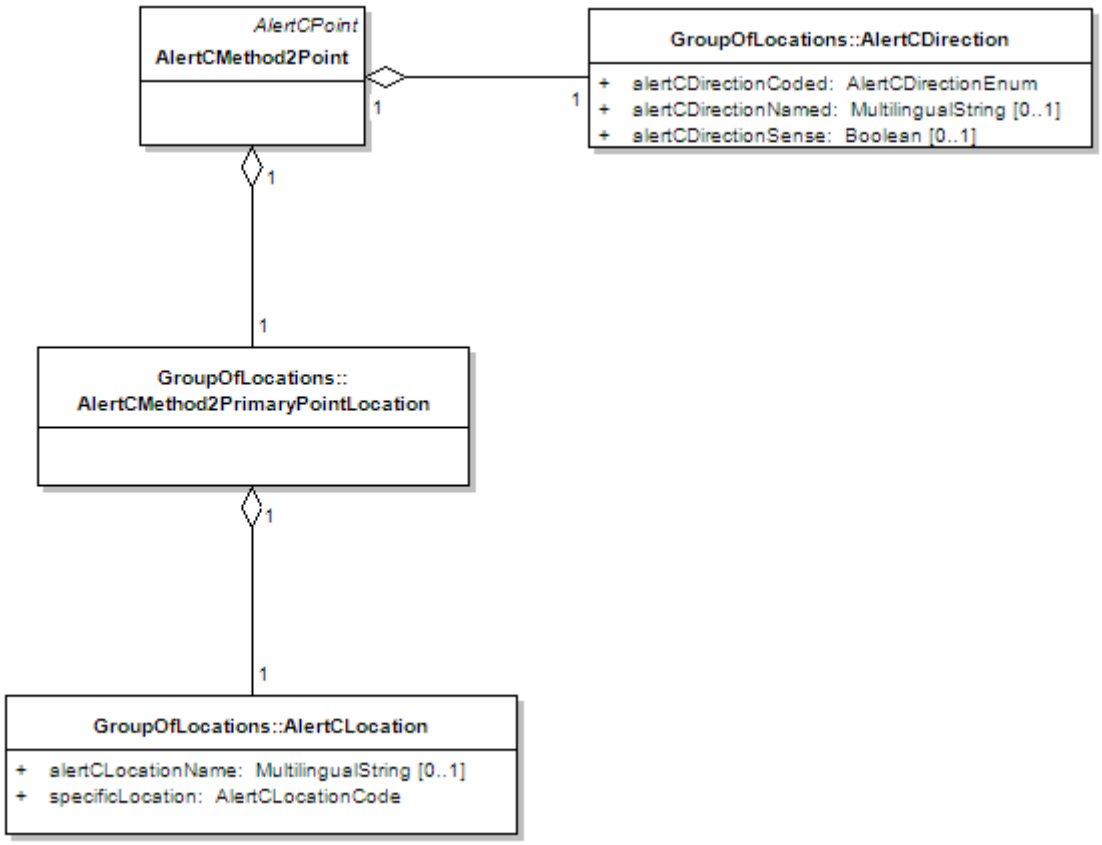


Figure 4 — The AlertCMethod2Point package class model

7.2.2.2 Semantics

An ALERT-C point using method 2 (class “AlertCMethod2Point”) represents a single point on the road network defined by reference to a point in a pre-defined ALERT-C location table (class “AlertCMethod2PrimaryPointLocation”). This point is called primary point. It also has an associated direction of traffic flow representing the direction of traffic flow along the road to which the information relates (class “AlertCDirection”).

The ALERT-C point location is given an ALERT-C direction using a set of predefined values with a code. A name may also be added to complete the direction definition. In case of a ring road the sense in which navigation should be made is not ambiguous and therefore the sense need not be given.

7.2.3 The package “AlertCMethod4Point”

7.2.3.1 The class model

The package “AlertCMethod2Point” supplies classes and attributes to the definition of a point location using the method 4 as explained in EN ISO 14819-3:2004, Annex C. It is pictured including the relationships between the classes in Figure 5.

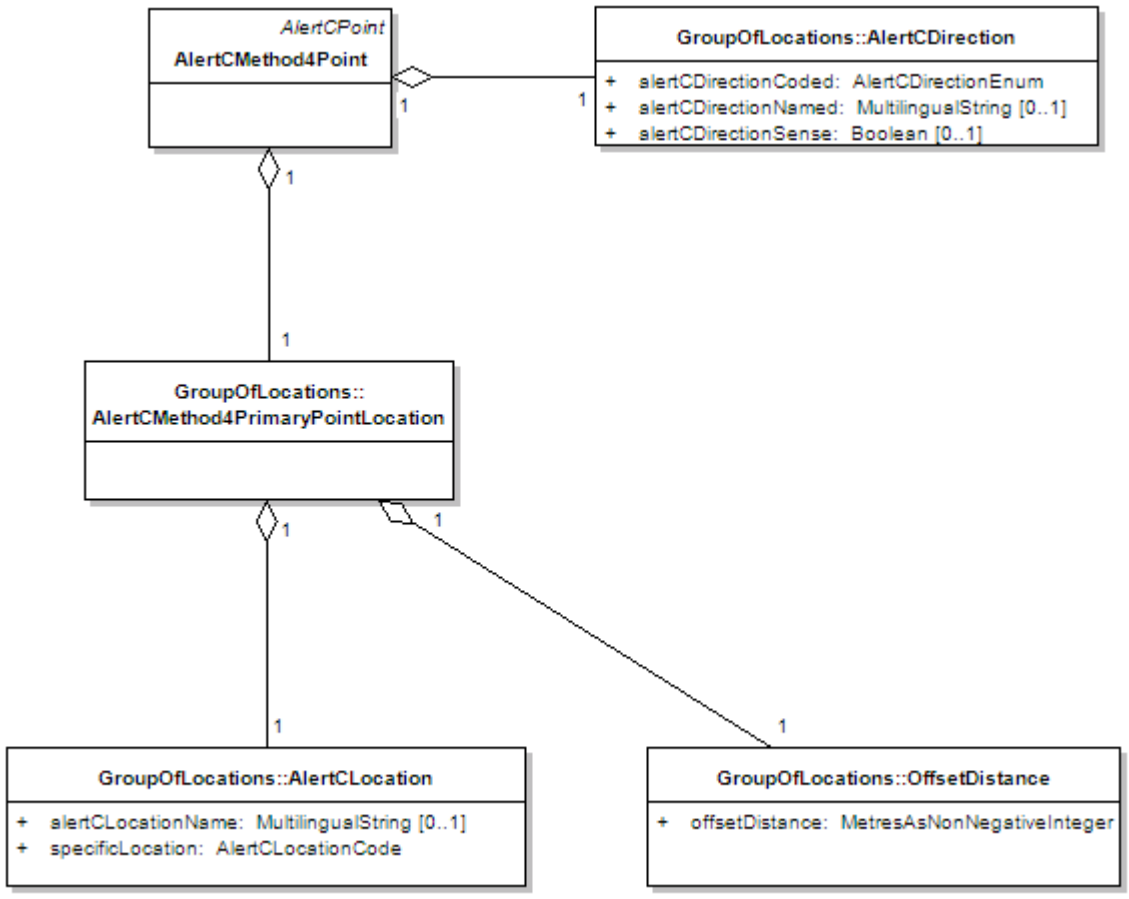


Figure 5 — The AlertCMethod4Point package class model

7.2.3.2 Semantics

An ALERT-C point using method 4 (class “AlertCMethod4Point”) represents a single point on the road network defined by reference to a point in a pre-defined ALERT-C location table (class “AlertCMethod2PrimaryPointLocation”). It shall be augmented with the non-negative distance in metres between the ALERT-C point and the actual referenced point (class “OffsetDistance”). This point is called primary point. It also has an associated direction of traffic flow representing the direction of traffic flow along the road to which the information relates (class “AlertCDirection”).

The ALERT-C point location is given an ALERT-C direction using a set of predefined values with a code. A name may also be added to complete the direction definition. In case of a ring road the sense in which navigation should be made is not ambiguous and therefore the sense need not be given.

7.2.4 The package “TpegPointLocation”

7.2.4.1 The class model

The package “TpegPointLocation” supplies classes and attributes to the definition of a point location using the methods described in CEN ISO/TS 18234-6:2006 and CEN ISO/TS 24530-2:2006. It is pictured including the relationships between the classes in Figure 6.

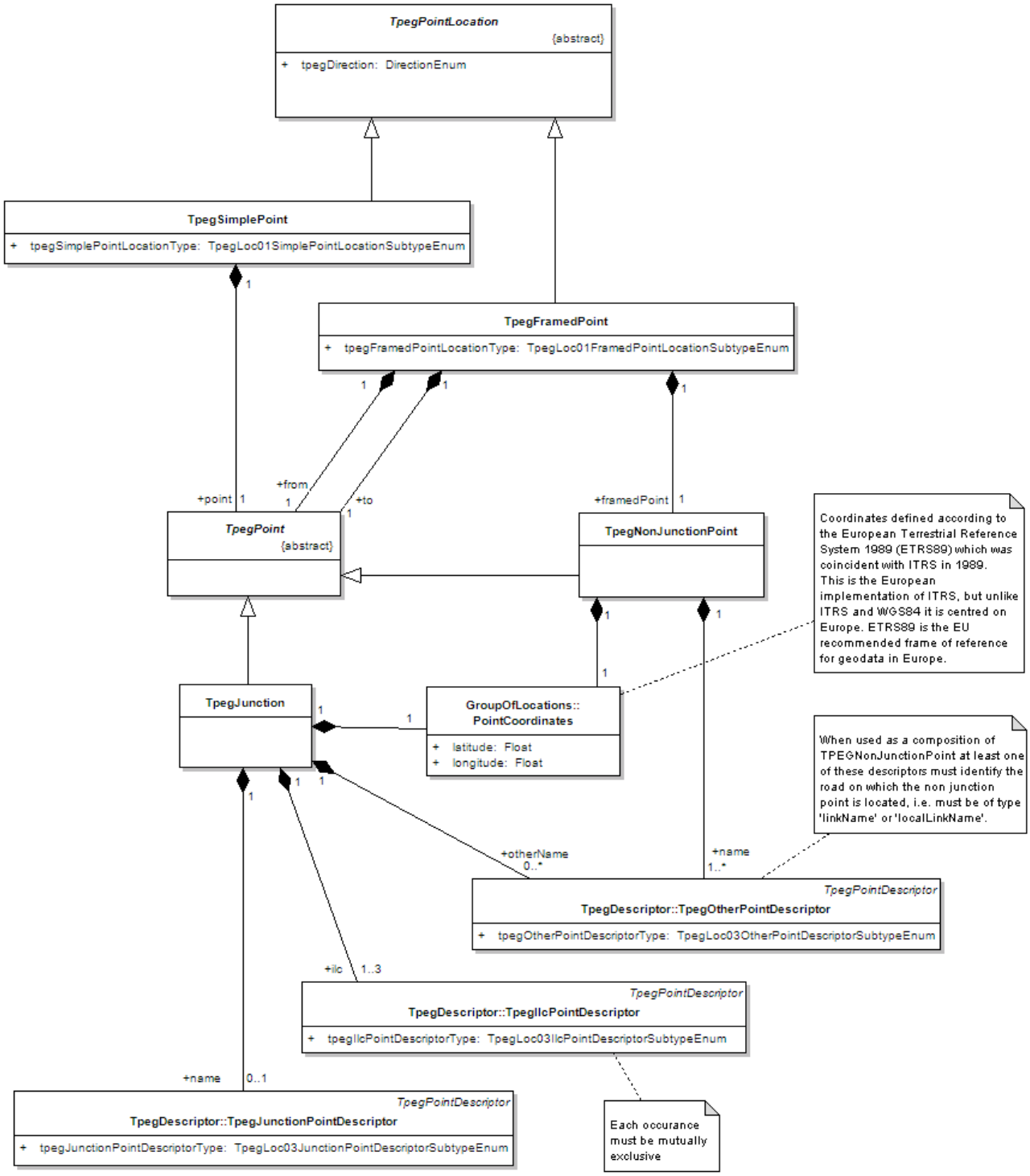


Figure 6 — The TpegPointLocation package class model

7.2.4.2 Semantics

A TPEG point represents a single point on the road network defined by a TPEG-Loc structure and shall have a direction of traffic flow. It shall be realised as:

— A simple point (class “TpegSimplePoint”) i.e. a point on the road network not bounded by any other points on the road network, or

— A framed point (class “TpegFramedPoint”) i.e. represents a point on the road network framed (or bracketed) between two other points on the same roadIt can be used when the location is not at a junction and is a point without a predefined name. The two points at either side are used to frame the location with known points.

Points of one type or of the other have the common characteristics of all of TPEG points (class “TpegPoint”). They can be either located at a road junction (class “TpegJunction”) or located outside any road junction (class “TpegNonJunctionPoint”). They also include a geodetic coordinate pair as already defined in 7.1.1.2.

When a TPEG point is at a junction it shall be defined with one to three ILOC descriptors (class “TpegILCPointDescriptor”). It may also be described with a junction descriptor (class “TpegJunctionPointDescriptor”) and/or with other point descriptors (class “TpegOtherPointDescriptor”). Regarding ILOC descriptor the different values of this descriptor shall be mutually exclusive.

When a TPEG point is not at a junction it shall be defined with at least one point descriptor (the class “TpegOtherPointDescriptor”). One of these descriptors shall identify the road or street on which the TPEG point is located. The corresponding descriptor type shall have either the value ‘linkName’ or the value ‘localLinkName’ (see in 7.1.2.2 and in A.4.17).

A TPEG framed point shall be defined by three TPEG points. In addition to the framed point that is not on a junction, it shall define other two points that frame the framed point.

The different descriptors are described in 7.1.2.2.

7.2.5 The package “PointIAlongLinearElement”

7.2.5.1 The class model

The package “PointAlongLinearElement” supplies classes and attributes to the definition of a point location using different linear referencing methods as described in prEN ISO 19148. It is pictured including the relationships between the classes in Figure 7.

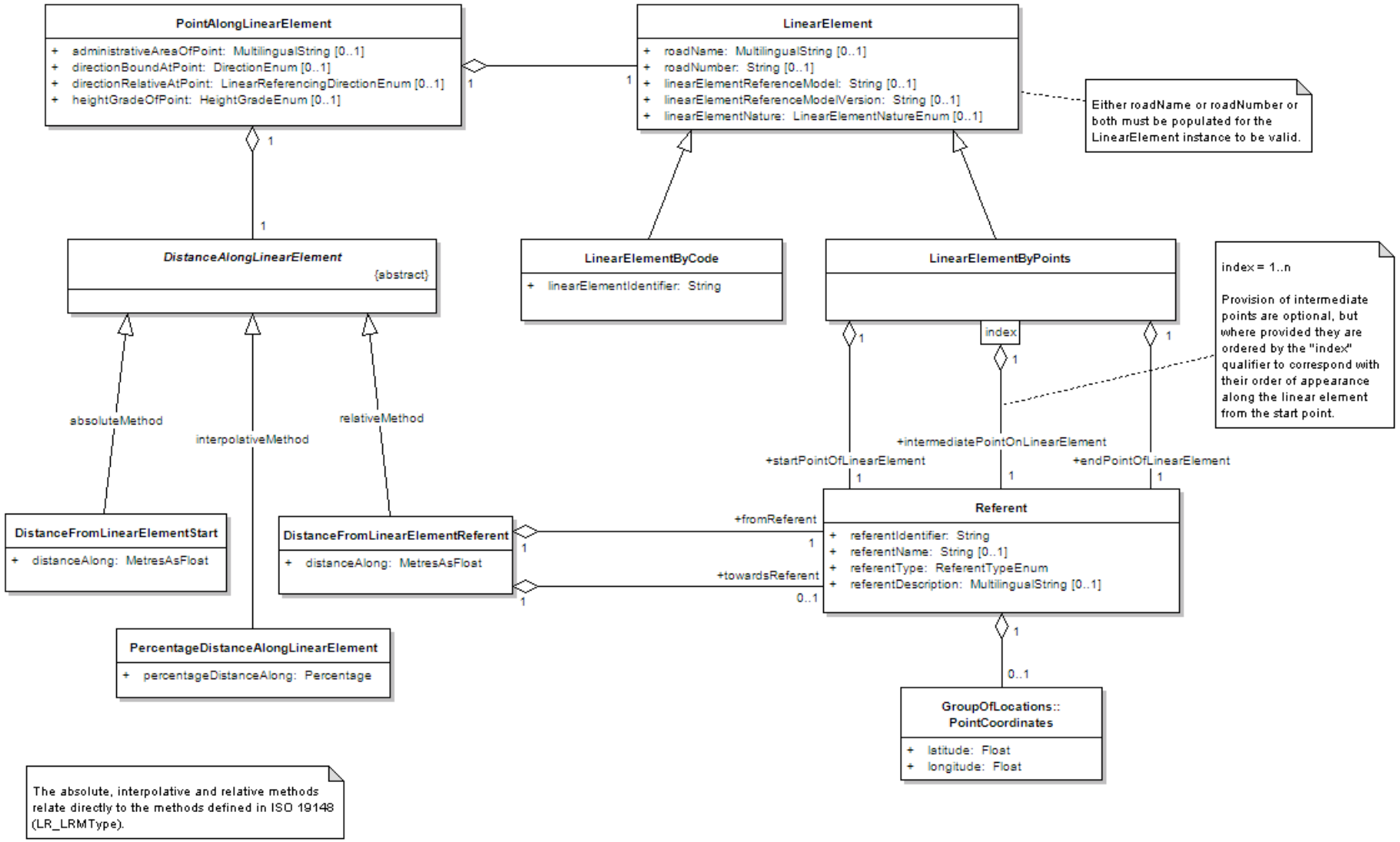


Figure 7 — The PointAlongLinearElement package class model

7.2.5.2 Semantics

A point defined by a linear reference represent a single point on a linear element, part of the road network. In addition to the linear location definition itself (class “PointAlongLinearElement”), which contains complementary elements like geographic direction, if the point is at-grade or below/above ground level, it shall be realised with two elements:

— the underlying linear element (class “LinearElement”);

— the distance expression between a given point on this linear element and the point itself (abstract class “DistanceAlongLinearElement”).

The distance expression shall be one of the following:

— an absolute distance expression i.e. a curvilinear measurement (in metres) starting from the origin point of the underlying linear element (class “DistanceFromLinearElementStart”);

— a percentage as distance expression i.e. the ratio between the absolute distance of the considered point from the starting point of the underlying linear element and the total length of this linear element (class “PercentageDistanceAlongLinearElement”);

— a relative distance expression i.e. a curvilinear measurement (in metres) starting from an identified point of the considered linear element considered as reference point (class “DistanceFromLinearElementReferent”). This reference point is named “Referent” (class “Referent”).

In case a referent is considered, it can be a distance marker (also named kilopost, kilometre-post or milepost), an area border (e.g. a county border), an intersection, a road node or a landmark. It is defined by a unique identifier. Two referents may be used to frame the considered point (notions of “from” referent and of “towards” referent), which explicitly defines the considered driving direction as going from the “from” referent to the “towards” referent and overrides the implicit direction defined by the underlying linear element direction. A referent may be given geodetic coordinates (class “PointCoordinates”). The linear element that underlies the point location is either defined by a reference (class “LinearElementByCode”), which implies it has previously been defined and exchanged through the ad-hoc publication (see Clause 8), or as an ordered sequence of referents including the starting point and the end point of this linear element (class “LinearElementByPoints”). In case the linear element is defined by referents, the sequence order provides the linear element direction. The linear element shall be given either a road number or a road name depending on what exists. It may be accompanied by other information depending on the road operator and may be typified i.e. defining whether it is a road, a road section or a slip road.

7.3 Linear locations

7.3.1 The package “Linear”

7.3.1.1 The class model

The package “Linear” supplies classes and attributes to the definition of a linear location which specialises a location of a traffic object. It is pictured including the relationships between the classes in Figure 8.

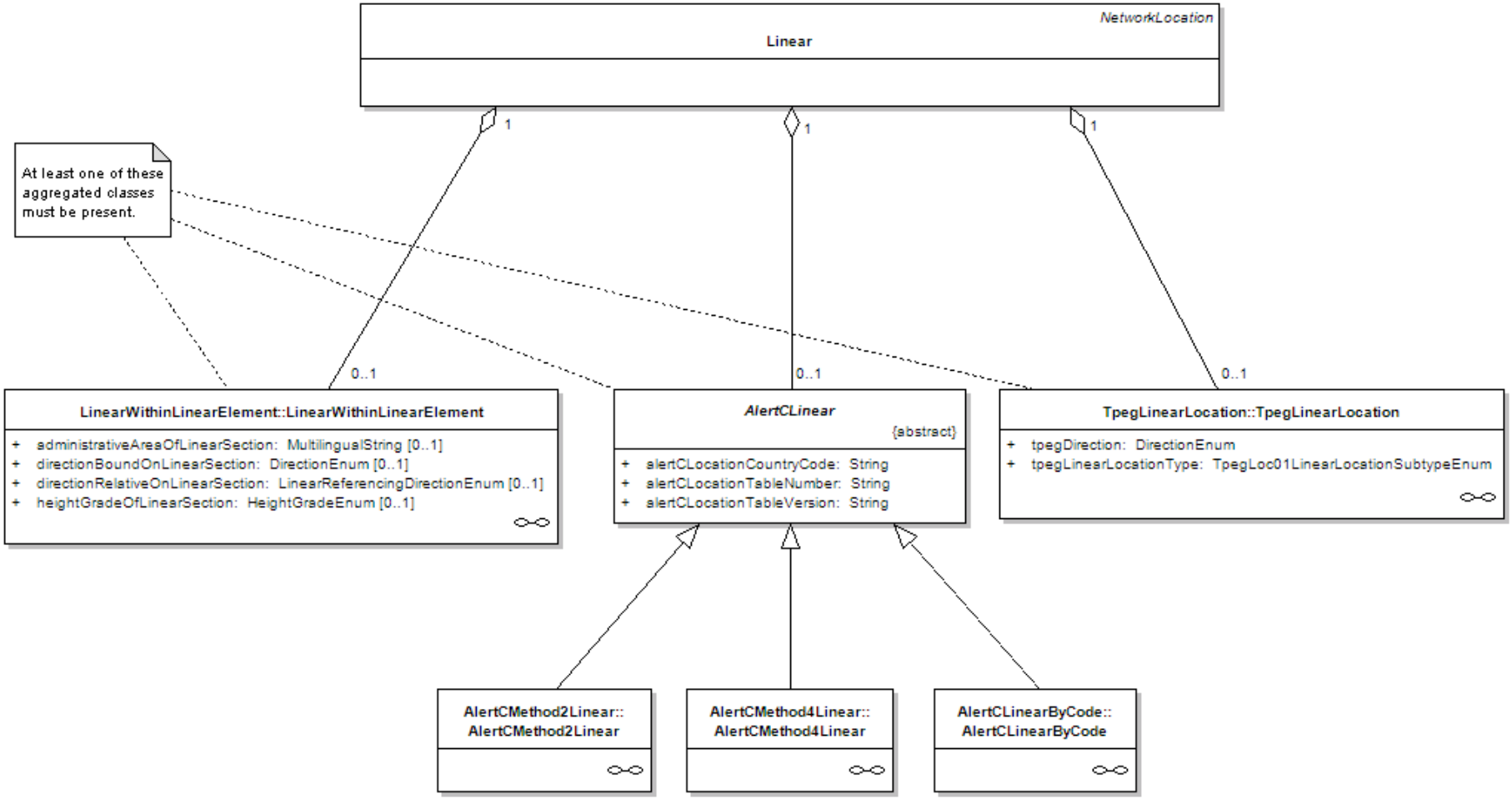


Figure 8 — The Linear package class model

7.3.1.2 Semantics

A linear network element (class “Linear”) is a part of the road network defined between two points on the same road. It may include an indication of direction. It shall be referenced using one of the following three methods without being exclusive:

— the ALERT-C location referencing methods (class “AlertCLinear”);

— the TPEG-Loc location referencing method (class “TpegLinearLocation”);

— the linear location referencing method (class “LinearWithinLinearElement”).

These latter two methods are respectively defined in 7.3.5 and 7.3.6.

There are three methods based on Alert-C. If AlertCLinear is chosen the method shall be one of:

— a ALERT-C linear entity defined as a reference in a ALERT-C location table (class “AlertCLinearByCode”);

— a linear section defined by two points defined by references in a ALERT-C location table (class “AlertCMethod2Linear”);

— a linear section defined by two points defined by references in a ALERT-C location table with a distance between the ALERT-C point and the corresponding start point / end point of the actual section (class “AlertCMethod4Linear”).

These methods are respectively defined in 7.3.4, 7.3.2 and 7.3.3.

7.3.2 The package “AlertCMethod2Linear”

7.3.2.1 The class model

The package “AlertCMethod2Linear” supplies classes and attributes to the definition of a linear location using the method 2 as explained in EN ISO 14819-3:2004, Annex C. It is pictured including the relationships between the classes in Figure 9.

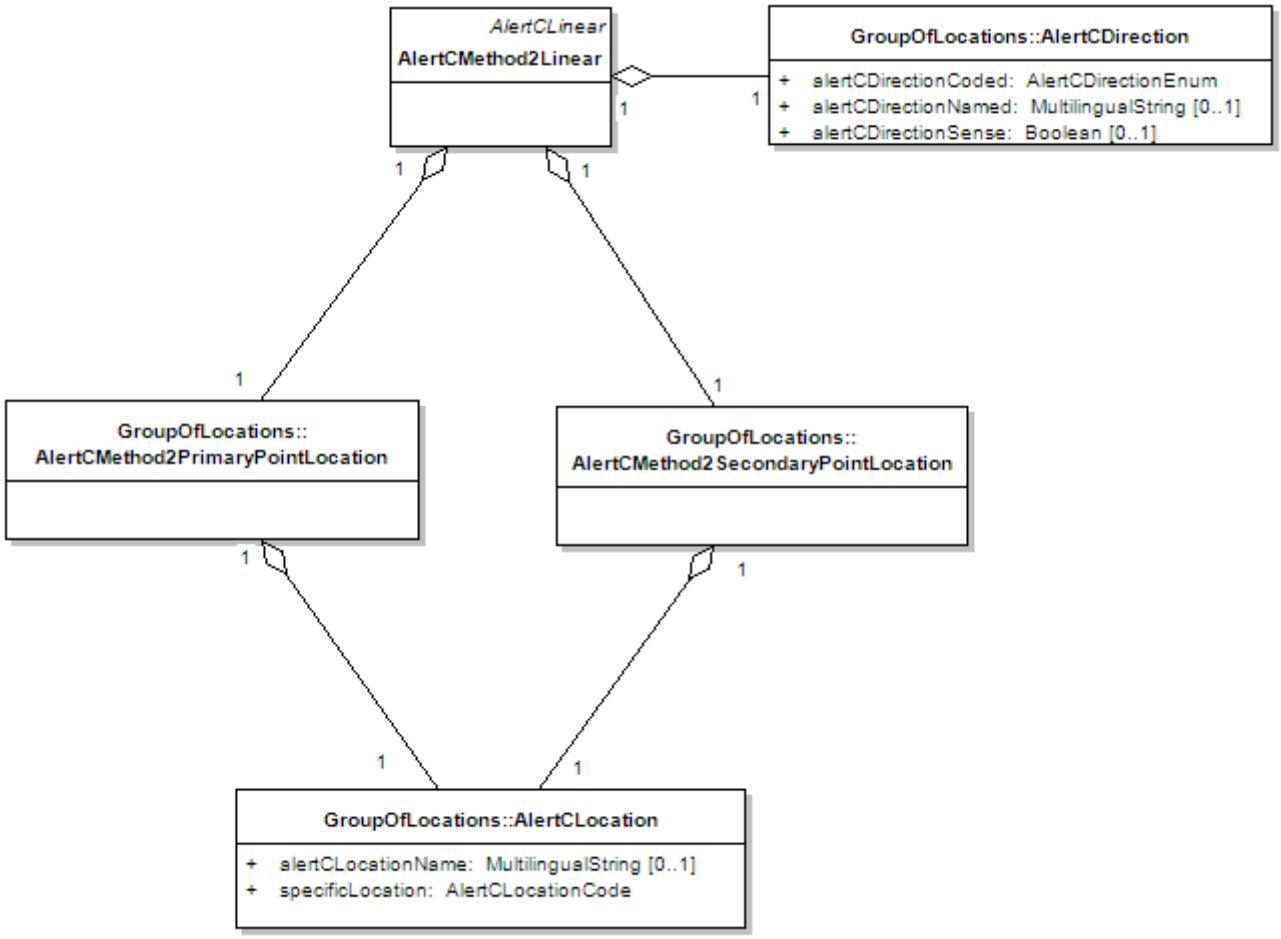


Figure 9 — The AlertCMethod2Linear package class model

7.3.2.2 Semantics

An ALERT-C linear location reference using method 2 (class “AlertCMethod2Linear”) represents a linear section along a road between two points, primary and secondary, which are pre-defined in an ALERT-C location table. Direction is from the secondary point (class “AlertCMethod2SecondaryPointLocation”) to the primary point (class “AlertCMethod2PrimaryPointLocation”), i.e. the secondary point is first met before the primary point when the road section is travelled in the location direction.

It shall have an associated direction of traffic flow representing the direction of traffic flow along the road to which the information relates (class “AlertCDirection”).

The ALERT-C linear location reference is given an ALERT-C direction using a set of predefined values with a code. A name may also be added to complete the direction definition and in case of a ring road, a Boolean indicates whether navigation is made from the primary location to the secondary location is made in the positive direction of the road/street or not, which avoids ambiguity.

7.3.3 The package “AlertCMethod4Linear”

7.3.3.1 The class model

The package “AlertCMethod4Linear” supplies classes and attributes to the definition of a linear location using the method 4 as explained in EN ISO 14819-3:2004, Annex C. It is pictured including the relationships between the classes in Figure 10.

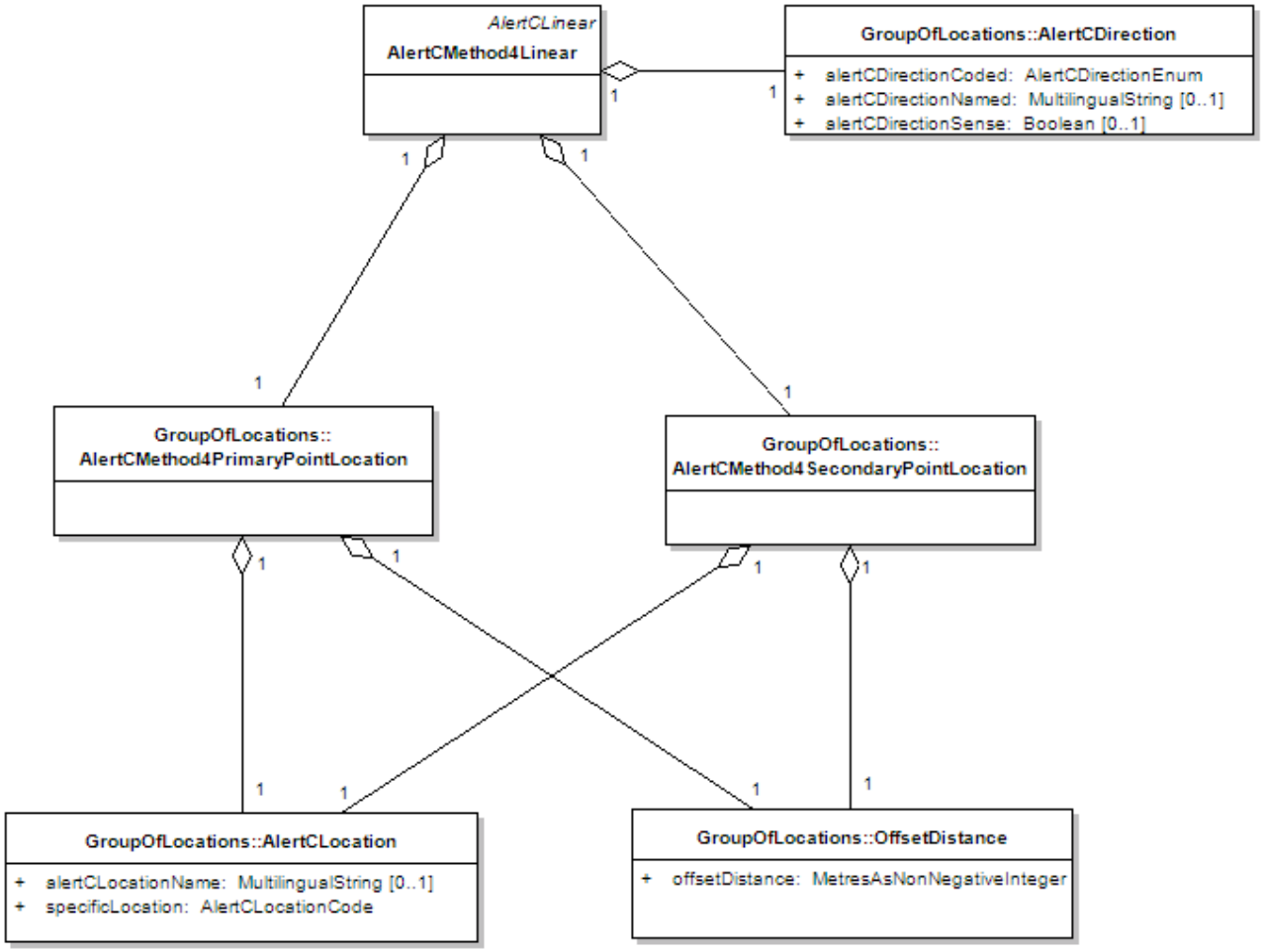


Figure 10 — The AlertCMethod4Linear package class model

7.3.3.2 Semantics

An ALERT-C linear location reference using method 4 (class “AlertCMethod4Linear”) represents a linear section along a road between two points, primary and secondary, which are pre-defined in an ALERT-C location table and distances. The distance is defined as being the non-negative distance in metres between the ALERT-C point and the actual referenced point (class “OffsetDistance”). Direction is from the secondary point (class “AlertCMethod2SecondaryPointLocation”) to the primary point (class “AlertCMethod2PrimaryPointLocation”), i.e. the secondary point is first met before the primary point when the road section is travelled in the location direction.

It shall have an associated direction of traffic flow representing the direction of traffic flow along the road to which the information relates (class “AlertCDirection”).

The ALERT-C linear location reference is given an ALERT-C direction using a set of predefined values with a code. A name may also be added to complete the direction definition and in case of a ring road, a Boolean indicates whether navigation is made from the primary location to the secondary location is made in the positive direction of the road/street or not, which avoids ambiguity.

7.3.4 The package “AlertCLinearByCode”

7.3.4.1 The class model

The package “AlertCLinearByCode” supplies classes and attributes to the definition of a linear location using a pre-defined ALERT-C linear location. It is pictured including the relationships between the classes in Figure 11.

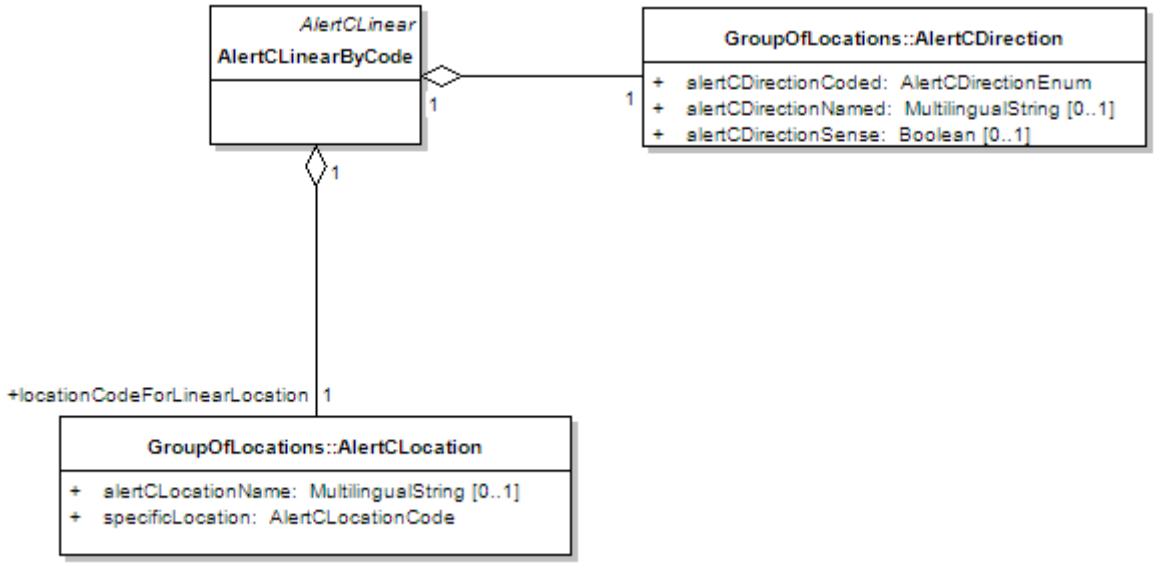


Figure 11 — The AlertCLinearByCode package class model

7.3.4.2 Semantics

An ALERT-C linear location reference by code using represents a linear section along a road defined by an ALERT-C code i.e. a tabular reference of linear location in an ALERT-C location table (class “AlertCLinearByCode”).

It shall have an associated direction of traffic flow representing the direction of traffic flow along the road to which the information relates (class “AlertCDirection”).

The ALERT-C linear location reference is given an ALERT-C direction using a set of predefined values with a code. A name may also be added to complete the direction definition. In case of a ring road the direction in which navigation may be made is not ambiguous and therefore the direction need not be given.

7.3.5 The package “TpegLinearLocation”

7.3.5.1 The class model

The package “TpegLinearLocation” supplies classes and attributes to the definition of a linear location using methods described in CEN ISO/TS 18234-6:2006 and CEN ISO/TS 24530-2:2006. It is pictured including the relationships between the classes in Figure 12.

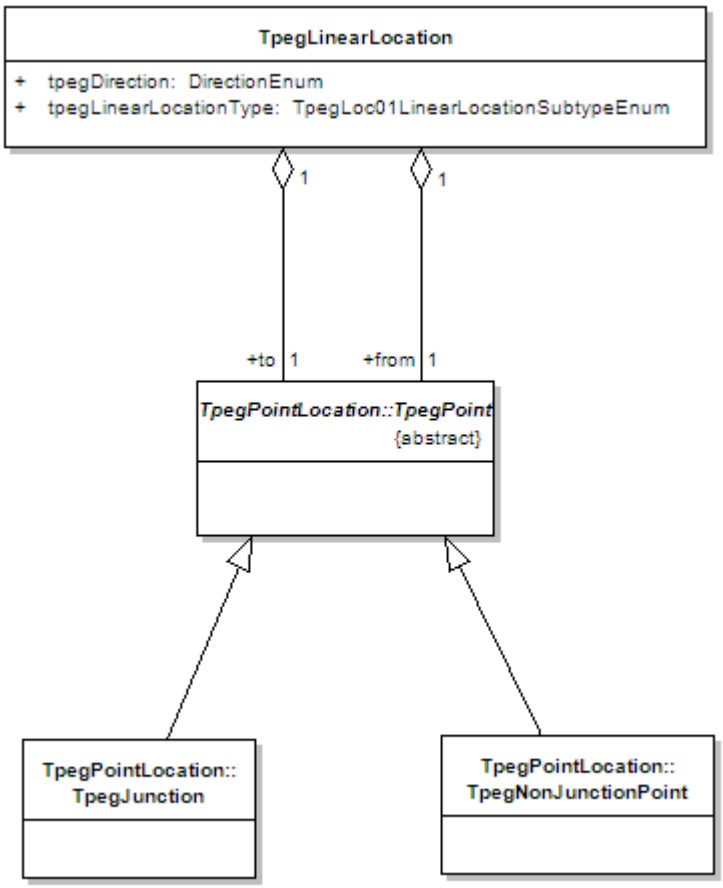


Figure 12 — The TpegLinearLocation package class model

7.3.5.2 Semantics

A TPEG linear location represents a linear section on the road network defined by TPEG-Loc structures (class “TpegLinearLocation”). It shall have a direction of traffic flow.

This linear section shall be bounded by a “from” point and a “to” point. Both points are defined by a TPEG point location as already defined in 7.2.4.2 (class “TpegPointLocation”).

7.3.6 The package “LinearWithinLinearElement”

7.3.6.1 The class model

The package “LinearWithinLinearElement” supplies classes and attributes to the definition of a linear location using different linear referencing methods (LRM) as described in prEN ISO 19148. It is pictured including the relationships between the classes in Figure 13.

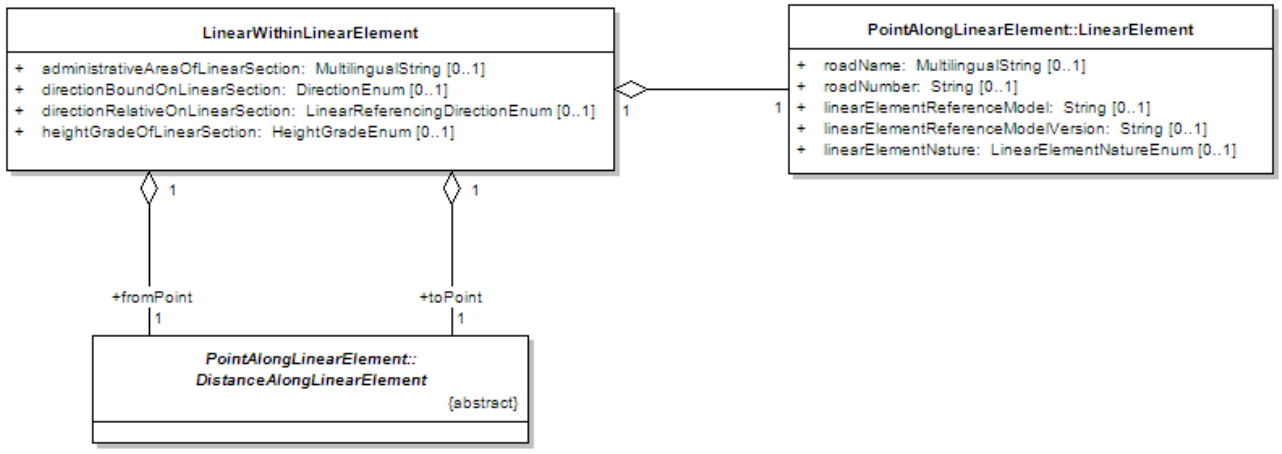


Figure 13 — The LinearWithinLinearElement package class model

7.3.6.2 Semantics

A linear location defined by a linear reference represent a linear section on a linear element, part of the road network. It shall be defined by two points belonging to the same road/street. In addition to the linear location definition itself (class “LinearWithinLinearElement”), which contains complementary elements like geographic direction, information if the point is at-grade or below/above ground level, it shall be realised with two elements:

— The underlying linear element (class “LinearElement”),

— Two distance expressions between a given point on this linear element and respectively the starting point named “from point” and the ending point named “to point”, framing the linear section (abstract class “DistanceAlongLinearElement”).

These elements are defined according to the rules in 7.2.5.2.

7.4 Area locations

7.4.1 The package “Area”

7.4.1.1 The class model

The package “Area” supplies classes and attributes to the definition of an area-typed location which specialises a location of a traffic object. It is pictured including the relationships between the classes in Figure 14.

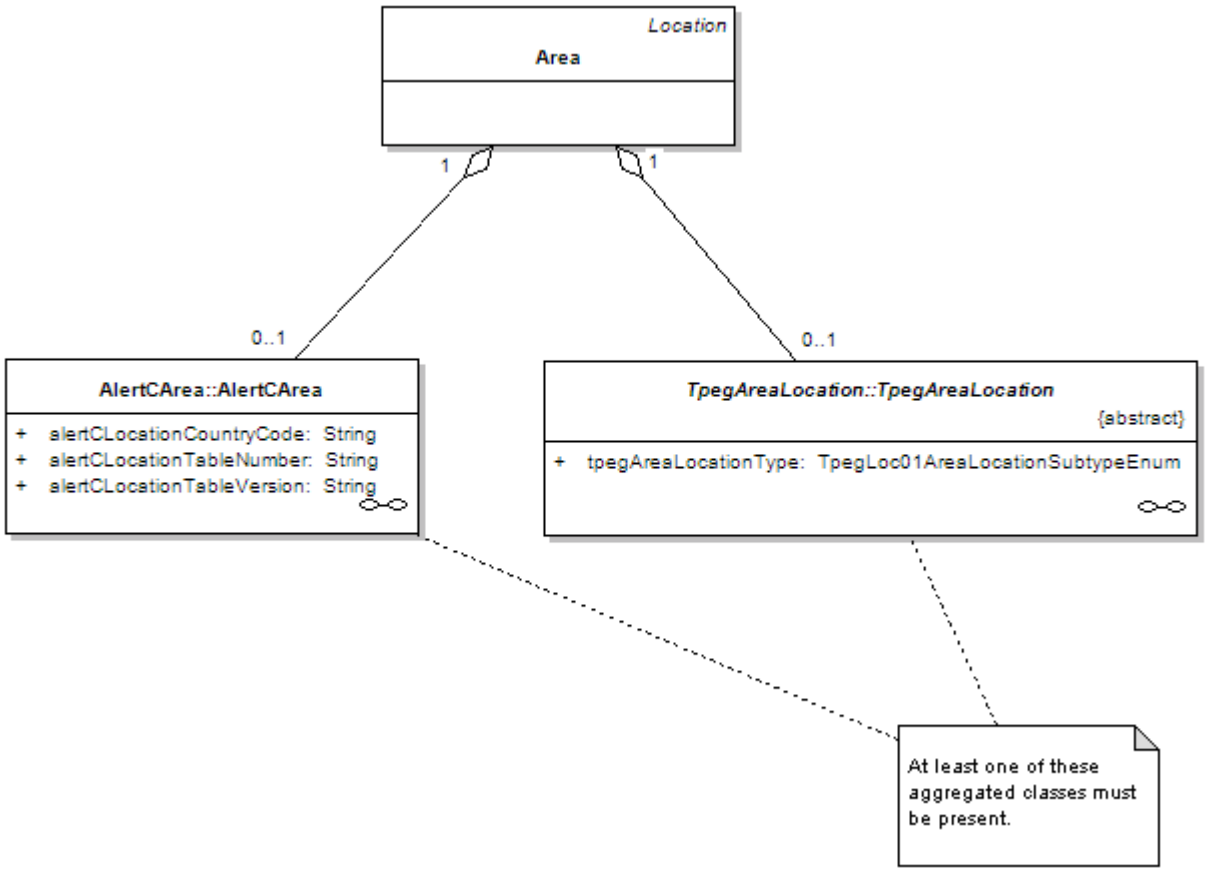


Figure 14 — The Area package class model

7.4.1.2 Semantics

An area (class “Area”) can be either a geographic or a geometric two-dimensioned feature. It may be qualified by height information to provide additional geospatial discrimination (e.g. for snow in an area but only above a certain height). It shall be referenced using one of the following two methods without being exclusive:

— the Alert-C location referencing method (class "AlertCArea");

— the TPEG-Loc location referencing method (class "TpegAreaLocation").

These two classes are respectively defined in 7.4.2 and 7.4.3.

7.4.2 The package “AlertCArea”

7.4.2.1 The class model

The package “AlertCArea” supplies classes and attributes to the definition of an area-typed location using a pre-defined ALERT-C area location. It is pictured including the relationships between the classes in Figure 15.

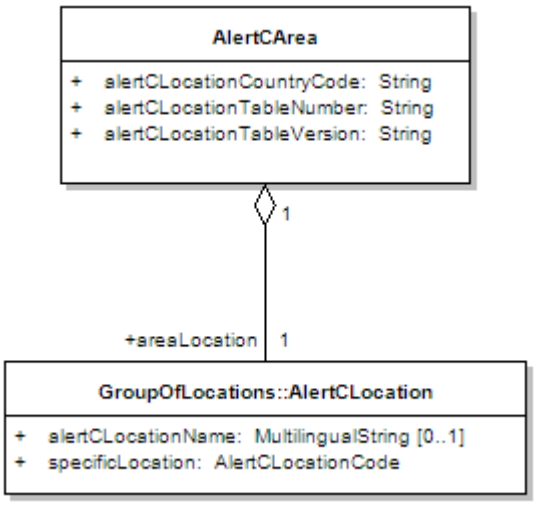


Figure 15 — The AlertCArea package class model

7.4.2.2 Semantics

An ALERT-C area (class “AlertCArea”) represents an area defined by reference to an area already defined in a pre-defined ALERT-C location table.

7.4.3 The package “TpegAreaLocation”

7.4.3.1 The class model

The package “TpegAreaLocation” supplies classes and attributes to the definition of an area-typed location locating a traffic object e.g. a situation record in a situation publication. It is pictured including the relationships between the classes in Figure 16.

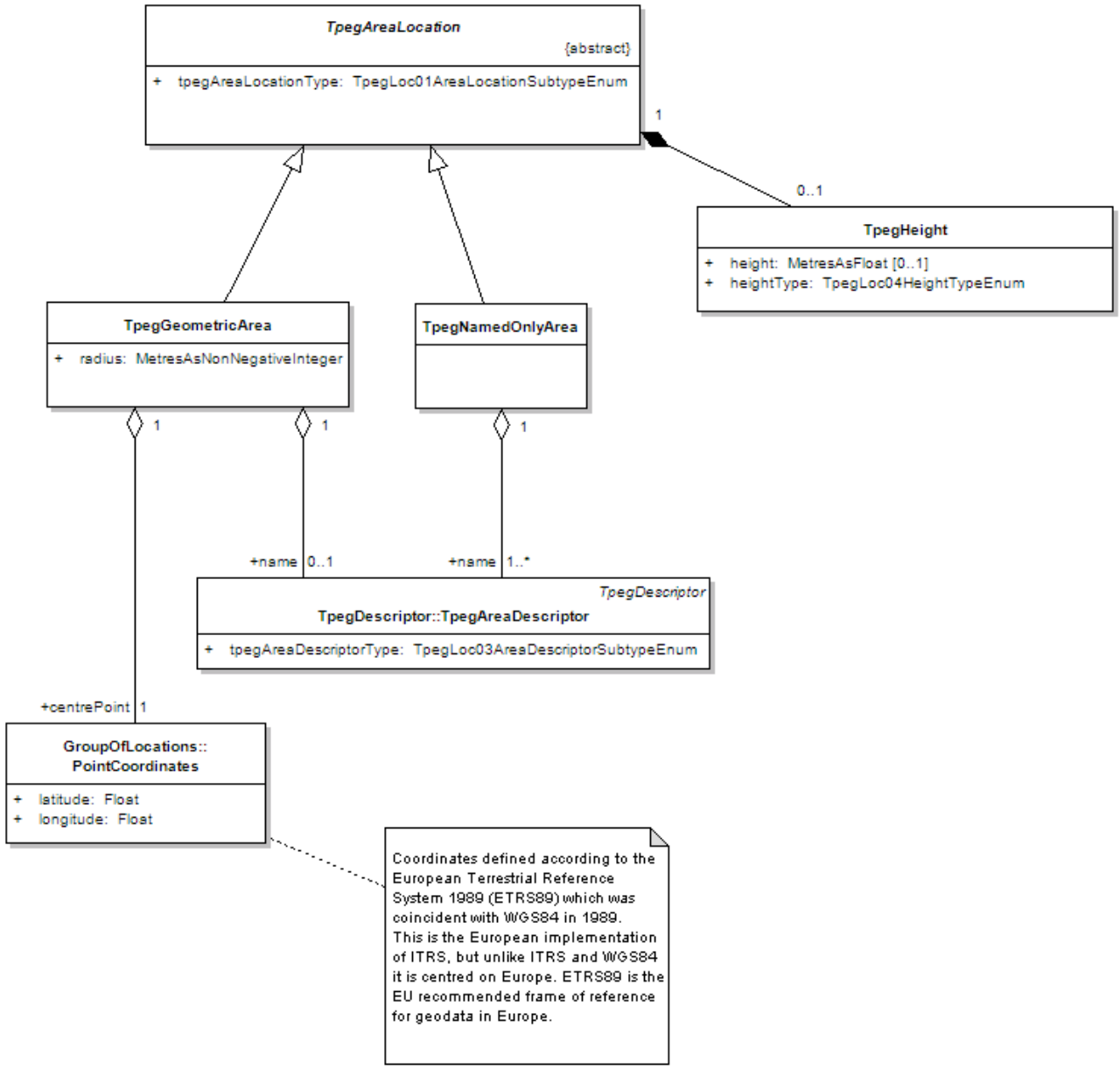


Figure 16 — The TpegAreaLocation package class model

7.4.3.2 Semantics

A TPEG area represents a geographic or geometric area defined by a TPEG-Loc structure which may include height information for additional geospatial discrimination. It shall be realised as:

— An area defined using a simple geometric shape (class “TpegGeometricArea”) i.e. a circle defined by a given point (centre) (through a coordinate pair) and its radius in metres. It may also be described by one or several area descriptors;

— An area without any geometric depiction defined by its only name (class “TpegNamedOnlyArea”) through one or several area descriptors.

These descriptors are described in 7.1.2.2.

8 The Predefined Locations publication

8.1 General

The package “PredefinedLocationsPublication” corresponds to the definition of a specific publication containing one or more containers of predefined locations. It is a convenient way to exchange information once about predefined locations or groups of locations whereas these (groups of) locations are used several times. A typical example is the “Itinerary” used for conveying travel time information. In this case, each new value of travel time is systematically associated to the identifier of the predefined location that has previously been exchanged.

A predefined location is location reference using a unique versioned identifier defined in advance that is agreed upon in both sender and receiver system to select a location from a group of predefined locations.

The publication is depicted with only one package.

8.2 The package “PredefinedLocationsPublication”

8.2.1 The class model

The package “PredefinedLocationsPublication” supplies classes and attributes to the definition of a publication of group of predefined locations. It is pictured including the relationships between the classes in Figure 17.

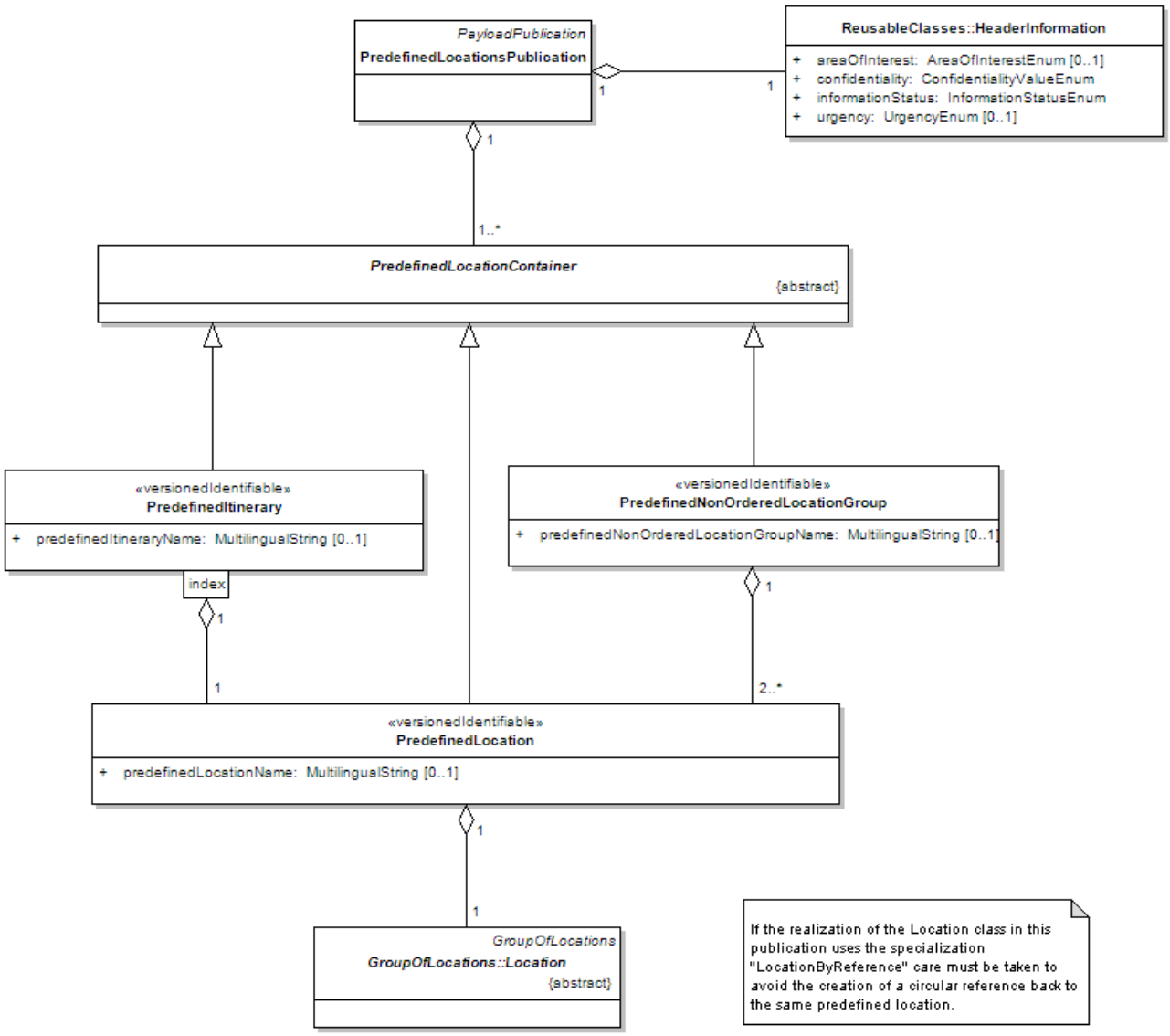


Figure 17 — The PredefinedLocationsPublication class model

8.2.2 Semantics

The predefined locations publication (class “PredefinedLocationsPublication”) is a utilitarian publication aiming at facilitating the use of frequently used locations. Since a location is frequently used for e.g. measured data or elaborated data, it should be quicker and safer to define and to exchange it once, then to reuse afterwards through its only reference.

As for the other publications, some general-interest information is provided like e.g. area of interest or information status (class “HeaderInformation”).

The basic element conveyed by this publication is the location container (abstract class “PredefinedLocationContainer”). This location container shall be one of the possible types:

— a single predefined location (class “PredefinedLocation”);

— a predefined unordered group of predefined locations (class “PredefinedNonOrderedLocationGroup”);

— a predefined itinerary composed of an ordered set of predefined locations (class “PredefinedItinerary”).

Each type of location container is said predefined since it defined before being used instead of other locations defined during their use. This publication may convey several location containers. Each type is identified by a versioned reference and may be qualified with a name.

Containers of type “itinerary” or “group of locations” shall be composed of predefined locations, i.e. defined before its use. Like location containers, it includes a versioned reference, which allows reusing it independently from the location container it has been attached.

Beside these specificities, a predefined location is defined exactly like any other location (area, linear or point) (see Clause 7)

Annex A
(normative)

Data dictionary

A.1 Overview

This data dictionary describes the characteristics of the different classes, attributes and roles appearing in the data model defined in Clause 7. The dictionary is specified as a set of tables grouping classes, attributes and roles for each package as they are defined in Clause 7.

For each package are successively provided:

1) the class table,

2) the association role table.

3) the attribute table,

Each table of a given type has the same structure.

The data dictionary is categorised into sections following the different UML model packages as mentioned above. It defines for every package the entities and elements corresponding.

The table columns have the following meaning:

1) Columns **Name**: they provide the symbolic name (either in Lower or Upper Camel Case) given to the corresponding class, attribute or association role.

2) Column **Designation**: it provides the corresponding name in natural language of the corresponding class, attribute or role.

3) Column **Definition**: it provides a comprehensive definition detailing this class, attribute or association role.

Some columns are specific for one or two tables. The class tables include the following two columns:

4) Column **Identifiable**: it indicates if the corresponding class is identifiable (value “yes”) or not (value “no”). Identifiable classes are defined in B.3 of part 1 of the present specification.

5) Column **Abstract**: it indicates if the corresponding class is abstract (value “yes”) or concrete (value “no”). Abstract classes are defined in ISO/IEC 1501 and reminded in Annex A of Part 1 of the present specification.

The attribute tables and the association tables include the following column:

6) Column **Multiplicity**: it provides the number of occurrences a class may have when instantiating this association (resp. a class attribute may have when instantiating this class). The adopted syntax is the following: m..n where ‘m’ and ‘n’ respectively represent the minimum and the maximum value of multiplicity.

   For association roles, the possible value for ‘m’ are:

i) 0 in case of a optional participation of the corresponding class when instantiating the association;

ii) 1 in case of a mandatory participation of the corresponding class when instantiating the association;

iii) 2, 3, … in case a minimum number of participations of the corresponding class is explicitly defined when instantiating the association.

For association roles, the possible value for ‘n’ are:

i) 1 in case only one class instance is at most participating at the association instantiation;

ii) * in case several instances are allowed participating at the association instantiation;

iii) 2, 3, .. in case a maximum number participations of the corresponding class is explicitly defined when instantiating the association.

For attributes, the possible value for 'm' are:

i) 0 in case of a optional attribute;

ii) 1 in case of a mandatory association / attribute;

iii) 2, 3, … in case a minimum number of occurrences is explicitly defined.

For attributes, the possible value for 'n' are:

i) 1 in case only one attribute instance is allowed;

ii) * in case several instances are allowed for this attribute without being precised;

iii) 2, 3, .. in case a maximum number of occurrences is explicitly defined.

For the attribute tables, the following column has been added:

7) Column **Type**: it provides the class name used as data type. It is only provided for elements corresponding to class attributes. When the type name ends with 'Enum' this means it corresponds to an enumeration of accepted values defined in A.4.

For the association table, the following column has been added:

8) Column **Target**: it provides the class name appearing at the second end of the relationship, i.e. linked through the corresponding association.

A.2 Data Dictionary for “GroupOfLocations”

A.2.1 “AlertCArea” package

A.2.1.1 “AlertCArea” package classes

Table A.1— Classes of the “AlertCArea” package

Class name	Designation	Definition	Stereotype	Abstract
AlertCArea	ALERT-C area	An area defined by reference to a predefined ALERT-C location table.		no

A.2.1.2 “AlertCArea” package association roles

Table A.2— Associations of the “AlertCArea” package

Class name	Role name	Designation	Definition	Multiplicity	Target
AlertCArea	areaLocation	Area location	Area location defined by a specific Alert-C location.	1..1	AlertCLocation

A.2.1.3 “AlertCArea" package attributes

Table A.3— Attributes of the “AlertCArea” package

Class name	Attribute name	Designation	Definition	Multiplicity	Type
AlertCArea	alertCLocationCountryCode	ALERT-C location country code	EBU country code.	1..1	String
	alertCLocationTableNumber	ALERT-C location table number	Number allocated to an ALERT-C table in a country. Ref. EN ISO 14819-3 for the allocation of a location table number.	1..1	String
	alertCLocationTableVersion	ALERT-C location table version	Version number associated with an ALERT-C table reference.	1..1	String

A.2.2 “AlertCLinearByCode” package

A.2.2.1 “AlertCLinearByCode” package classes

Table A.4— Classes of the “AlertCLinearByCode” package

Class name	Designation	Definition	Stereotype	Abstract
AlertCLinearByCode	ALERT-C linear by code	A linear section along a road defined by reference to a linear section in a pre-defined ALERT-C location table.		no

A.2.2.2 “AlertCLinearByCode” package association roles

Table A.5— Associations of the “AlertCLinearByCode” package

Class name	Role name	Designation	Definition	Multiplicity	Target
AlertCLinearByCode	locationCodeForLinear Location	Location code for linear location	Linear location defined by a specific Alert-C location.	1..1	AlertCLocation

A.2.2.3 “AlertCLinearByCode” package attributes

There are no defined attributes in the “AlertCLinearByCode” package.

A.2.3 “AlertCMethod2Linear” package

A.2.3.1 “AlertCMethod2Linear” package classes

Table A.6— Classes of the “AlertCMethod2Linear” package

Class name	Designation	Definition	Stereotype	Abstract
AlertCMethod2Linear	ALERT-C method2 linear	A linear section along a road between two points, Primary and Secondary, which are pre-defined in an ALERT-C location table. Direction is FROM the Secondary point TO the Primary point, i.e. the Primary point is downstream of the Secondary point.		no

A.2.3.2 “AlertCMethod2Linear” package association roles

There are no defined association roles in the “AlertCMethod2Linear” package.

A.2.3.3 “AlertCMethod2Linear” package attributes

There are no defined attributes in the “AlertCMethod2Linear” package.

A.2.4 “AlertCMethod2Point” package

A.2.4.1 “AlertCMethod2Point” package classes

Table A.7— Classes of the “AlertCMethod2Point” package

Class name	Designation	Definition	Stereotype	Abstract
AlertCMethod2Point	ALERT-C method2 point	A single point on the road network defined by reference to a point in a pre-defined ALERT-C location table and which has an associated direction of traffic flow.		no

A.2.4.2 “AlertCMethod2Point” package association roles

There are no defined association roles in the “AlertCMethod2Point” package.

A.2.4.3 “AlertCMethod2Point” package attributes

There are no defined attributes in the “AlertCMethod2Point” package.

A.2.5 "AlertCMethod4Linear" package

A.2.5.1 "AlertCMethod4Linear" package classes

Table A.8— Classes of the "AlertCMethod4Linear" package

Class name	Designation	Definition	Stereotype	Abstract
AlertCMethod4Linear	ALERT-C method4 linear	A linear section along a road between two points, Primary and Secondary, which are pre-defined ALERT-C locations plus offset distance. Direction is FROM the Secondary point TO the Primary point, i.e. the Primary point is downstream of the Secondary point.		no

A.2.5.2 "AlertCMethod4Linear" package association roles

There are no defined association roles in the "AlertCMethod4Linear" package.

A.2.5.3 "AlertCMethod4Linear" package attributes

There are no defined attributes in the "AlertCMethod4Linear" package.

A.2.6 "AlertCMethod4Point" package

A.2.6.1 "AlertCMethod4Point" package classes

Table A.9— Classes of the "AlertCMethod4Point" package

Class name	Designation	Definition	Stereotype	Abstract
AlertCMethod4Point	ALERT-C method4 point	A single point on the road network defined by reference to a point in a pre-defined ALERT-C location table plus an offset distance and which has an associated direction of traffic flow.		no

A.2.6.2 “AlertCMethod4Point” package association roles

There are no defined association roles in the “AlertCMethod4Point” package.

A.2.6.3 “AlertCMethod4Point” package attributes

There are no defined attributes in the “AlertCMethod4Point” package.

A.2.7 “Area” package

A.2.7.1 “Area” package classes

Table A.10— Classes of the “Area” package

Class name	Designation	Definition	Stereotype	Abstract
Area	Area	A geographic or geometric defined area which may be qualified by height information to provide additional geospatial discrimination (e.g. for snow in an area but only above a certain altitude).		no

A.2.7.2 “Area” package association roles

There are no defined association roles in the “Area” package.

A.2.7.3 “Area” package attributes

There are no defined attributes in the “Area” package.

A.2.8 “GroupOfLocations” package

A.2.8.1 “GroupOfLocations” package classes

Table A.11— Classes of the “GroupOfLocations” package

Class name	Designation	Definition	Stereotype	Abstract
AffectedCarriagewayAndLanes	Affected carriageway and lanes	Supplementary positional information which details carriageway and lane locations. Several instances may exist where the element being described extends over more than one carriageway.		no
AlertCDirection	ALERT-C direction	The direction of traffic flow along the road to which the information relates.		no
AlertCLocation	ALERT-C location	Identification of a specific point, linear or area location in an ALERT-C location table.		no
AlertCMethod2PrimaryPointLocation	ALERT-C method2 primary point location	The point (called Primary point) which is either a single point or at the downstream end of a linear road section. The point is specified by a reference to a point in a pre-defined ALERT-C location table.		no
AlertCMethod2SecondaryPointLocation	ALERT-C method2 secondary point location	The point (called Secondary point) which is at the upstream end of a linear road section. The point is specified by a reference to a point in a pre-defined ALERT-C location table.		no
AlertCMethod4PrimaryPointLocation	ALERT-C method4 primary point location	The point (called Primary point) which is either a single point or at the downstream end of a linear road section. The point is specified by a reference to a point in a pre-defined ALERT-C location table plus a non-negative offset distance.		no
AlertCMethod4SecondaryPointLocation	ALERT-C method4 secondary point location	The point (called Secondary point) which is at the upstream end of a linear road section. The point is specified by a reference to a point in a pre-defined Alert-C location table plus a non-negative offset distance.		no
AreaDestination	Area destination	The specification of the destination of a defined route or itinerary which is an area.		no

Table A.11 *(continued)*

Class name	Designation	Definition	Stereotype	Abstract
Destination	Destination	The specification of the destination of a defined route or itinerary. This may be either a location on a network or an area location.		yes
ExternalReferencing	External referencing	A location defined by reference to an external/other referencing system.		no
GroupOfLocations	Group of locations	One or more physically separate locations. Multiple locations may be related, as in an itinerary (or route), or may be unrelated. It is not for identifying the same physical location using different referencing systems.		yes
Itinerary	Itinerary	Multiple (i.e. more than one) physically separate locations arranged as an ordered set that defines an itinerary or route.		yes
ItineraryByIndexedLocations	Itinerary by indexed locations	Multiple physically separate locations arranged as an ordered set that defines an itinerary or route. The index qualifier indicates the order.		no
ItineraryByReference	Itinerary by reference	Multiple (i.e. more than one) physically separate locations which are ordered that constitute an itinerary or route where they are defined by reference to a predefined itinerary.		no
Location	Location	The specification of a location either on a network (as a point or a linear location) or as an area. This may be provided in one or more referencing systems.		yes
LocationByReference	Location by reference	A location defined by reference to a predefined location.		no
NetworkLocation	Network location	The specification of a location on a network (as a point or a linear location).		yes
NonOrderedLocationGroupByList	Non ordered location group by list	A group of (i.e. more than one) physically separate locations which have no specific order and where each location is explicitly listed.		no
NonOrderedLocationGroupByReference	Non ordered location group by reference	A group of (i.e. more than one) physically separate locations which have no specific order that are defined by reference to a predefined non ordered location group.		no
NonOrderedLocations	Non ordered locations	Multiple (i.e. more than one) physically separate locations which have no specific order.		yes

Table A.11 *(continued)*

Class name	Designation	Definition	Stereotype	Abstract
OffsetDistance	Offset distance	The non negative offset distance from the ALERT-C referenced point to the actual point.		no
PointCoordinates	Point coordinates	A pair of coordinates defining the geodetic position of a single point using the European Terrestrial Reference System 1989 (ETRS89).		no
PointDestination	Point destination	The specification of the destination of a defined route or itinerary which is a point.		no
SupplementaryPositionalDescription	Supplementary positional description	A collection of supplementary positional information which improves the precision of the location.		no

A.2.8.2 "GroupOfLocations" package association roles

Table A.12— Associations of the "GroupOfLocations" package

Class name	Role name	Designation	Definition	Multiplicity	Target
Itinerary	routeDestination	Route destination	Destination of a route or final location in an itinerary.	0..*	Destination
ItineraryByIndexedLocations	locationContainedInItinerary	Location contained in itinerary	A location contained in an itinerary (i.e. an ordered set of locations defining a route or itinerary).	1..1	Location
Location	locationForDisplay	Location for display	A location which may be used by clients for visual display on user interfaces.	0..1	PointCoordinates
NonOrderedLocationGroupByList	locationContainedInGroup	Location contained in group	A location contained in a non ordered group of locations.	2..*	Location

A.2.8.3 “GroupOfLocations” package attributes

Table A.13— Attributes of the “GroupOfLocations” package

Class name	Attribute name	Designation	Definition	Multiplicity	Type
AffectedCarriagewayAndLanes	carriageway	Carriageway	Indicates the section of carriageway to which the location relates.	1..1	CarriagewayEnum
	footpath	Footpath	Indicates whether the pedestrian footpath is the subject or part of the subject of the location. (True = footpath is subject)	0..1	Boolean
	lane	Lane	Indicates the specific lane to which the location relates.	0..*	LaneEnum
	lengthAffected	Length affected	This indicates the length of road measured in metres affected by the associated traffic element.	0..1	MetresAsFloat
AlertCDirection	alertCDirectionCoded	ALERT-C direction coded	The direction of traffic flow to which the situation, traffic data or information is related. Positive is in the direction of coding of the road.	1..1	AlertCDirectionEnum
	alertCDirectionNamed	ALERT-C direction named	ALERT-C name of a direction e.g. Brussels -> Lille.	0..1	MultilingualString
	alertCDirectionSense	ALERT-C direction sense	Indicates for circular routes (i.e. valid only for ring roads) the sense in which navigation should be made from the primary location to the secondary location, to avoid ambiguity. TRUE indicates positive RDS direction, i.e. direction of coding of road.	0..1	Boolean
AlertCLocation	alertCLocationName	ALERT-C location name	Name of ALERT-C location.	0..1	MultilingualString
	specificLocation	Specific location	Unique code within the ALERT-C location table which identifies the specific point, linear or area location.	1..1	AlertCLocationCode

Table A.13 *(continued)*

Class name	Attribute name	Designation	Definition	Multiplicity	Type
ExternalReferencing	externalLocationCode	External location code	A code in the external referencing system which defines the location.	1..1	String
	externalReferencingSystem	External referencing system	Identification of the external/other location referencing system.	1..1	String
ItineraryByReference	predefinedItineraryReference	Predefined itinerary reference	A reference to a versioned instance of a predefined itinerary as specified in a PredefinedLocationsPublication.	1..1	VersionedReference
LocationByReference	predefinedLocationReference	Predefined location reference	A reference to a versioned predefined location.	1..1	VersionedReference
NonOrderedLocationGroupByReference	predefinedNonOrderedLocationGroupReference	Predefined non ordered location group reference	A reference to a versioned instance of a predefined non ordered location group as specified in a PredefinedLocationsPublication.	1..1	VersionedReference
OffsetDistance	offsetDistance	Offset distance	The non negative offset distance from the ALERT-C referenced point to the actual point. The ALERT-C locations in the Primary and Secondary locations must always encompass the linear section being specified, thus Offset Distance is towards the other point.	1..1	MetresAsNonNegativeInteger
PointCoordinates	latitude	Latitude	Latitude in decimal degrees using the European Terrestrial Reference System 1989 (ETRS89).	1..1	Float
	longitude	Longitude	Longitude in decimal degrees using the European Terrestrial Reference System 1989 (ETRS89).	1..1	Float

Table A.13 *(continued)*

Class name	Attribute name	Designation	Definition		
SupplementaryPositionalDescription	locationDescriptor	Location descriptor	Specifies a descriptor which helps to identify the specific location.	0..*	LocationDescriptorEnum
	locationPrecision	Location precision	Indicates that the location is given with a precision which is better than the stated value in metres.	0..1	MetresAsNonNegativeInteger
	sequentialRampNumber	Sequential ramp number	The sequential number of an exit/entrance ramp from a given location in a given direction (normally used to indicate a specific exit/entrance in a complex junction/intersection).	0..1	NonNegativeInteger

A.2.9 “Linear” package

A.2.9.1 “Linear” package classes

Table A.14— Classes of the “Linear” package

Class name	Designation	Definition	Stereotype	Abstract
AlertCLinear	ALERT-C linear	A linear section along a road defined between two points on the road by reference to a pre-defined ALERT-C location table.		yes
Linear	Linear	A linear section along a single road with optional directionality defined between two points on the same road.		no

A.2.9.2 “Linear” package association roles

There are no defined association roles in the “Linear” package.

A.2.9.3 "Linear" package attributes

Table A.15— Attributes of the "Linear" package

Class name	Attribute name	Designation	Definition	Multiplicity	Type
AlertCLinear	alertCLocationCountryCode	ALERT-C location country code	EBU country code.	1..1	String
	alertCLocationTableNumber	ALERT-C location table number	Number allocated to an ALERT-C table in a country. Ref. EN ISO 14819-3 for the allocation of a location table number.	1..1	String
	alertCLocationTableVersion	ALERT-C location table version	Version number associated with an ALERT-C table reference.	1..1	String

A.2.10 "LinearWithinLinearElement" package

A.2.10.1 "LinearWithinLinearElement" package classes

Table A.16— Classes of the "LinearWithinLinearElement" package

Class name	Designation	Definition	Stereotype	Abstract
LinearWithinLinearElement	Linear within linear element	A linear section along a linear element where the linear element is either a part of or the whole of a linear object (i.e. a road), consistent with prEN ISO 19148 definitions.		no

A.2.10.2 "LinearWithinLinearElement" package association roles

Table A.17— Associations of the "LinearWithinLinearElement" package

Class name	Role name	Designation	Definition	Multiplicity	Target
LinearWithinLinearElement	fromPoint	From point	A point on the linear element that defines the start node of the linear section.	1..1	DistanceAlongLinearElement
	toPoint	To point	A point on the linear element that defines the end node of the linear section.	1..1	DistanceAlongLinearElement

A.2.10.3 “LinearWithinLinearElement” package attributes

Table A.18— Attributes of the “LinearWithinLinearElement” package

Class name	Attribute name	Designation	Definition	Multiplicity	Type
LinearWithinLinearElement	administrativeAreaOfLinearSection	Administrative area of linear section	Identification of the road administration area which contains the specified linear section.	0..1	MultilingualString
	directionBoundOnLinearSection	Direction bound on linear section	The direction of traffic flow on the linear section in terms of general destination direction.	0..1	DirectionEnum
	directionRelativeOnLinearSection	Direction relative on linear section	The direction of traffic flow on the linear section relative to the direction in which the linear element is defined.	0..1	LinearReferencingDirectionEnum
	heightGradeOfLinearSection	Height grade of linear section	Identification of whether the linear section that is part of the linear element is at, above or below the normal elevation of a linear element of that type (e.g. road or road section) at that location, typically used to indicate "grade" separation.	0..1	HeightGradeEnum

A.2.11 “Point” package

A.2.11.1 “Point” package classes

Table A.19— Classes of the “Point” package

Class name	Designation	Definition	Stereotype	Abstract
AlertCPoint	ALERT-C point	A single point on the road network defined by reference to a pre-defined ALERT-C location table and which has an associated direction of traffic flow.		yes
Point	Point	A single geospatial point.		no
PointByCoordinates	Point by coordinates	A single point defined only by a coordinate set with an optional bearing direction.		no

A.2.11.2 “Point” package association roles

There are no defined association roles in the “Point” package.

A.2.11.3 “Point” package attributes

Table A.20— Attributes of the “Point” package

Class name	Attribute name	Designation	Definition	Multiplicity	Type
AlertCPoint	alertCLocationCountryCode	ALERT-C location country code	EBU country code.	1..1	String
	alertCLocationTableNumber	ALERT-C location table number	Number allocated to an ALERT-C table in a country. Ref. EN ISO 14819-3 for the allocation of a location table number.	1..1	String
	alertCLocationTableVersion	ALERT-C location table version	Version number associated with an ALERT-C table reference.	1..1	String
PointByCoordinates	bearing	Bearing	A bearing at the point measured in degrees (0 - 359).	0..1	NonNegativeInteger

A.2.12 “PointAlongLinearElement” package

A.2.12.1 “PointAlongLinearElement” package classes

Table A.21— Classes of the “PointAlongLinearElement” package

Class name	Designation	Definition	Stereotype	Abstract
DistanceAlongLinearElement	Distance along linear element	Distance of a point along a linear element either measured from the start node or a defined referent on that linear element, where the start node is relative to the element definition rather than the direction of traffic flow.		yes
DistanceFromLinearElementReferent	Distance from linear element referent	Distance of a point along a linear element measured from a “from referent” on the linear element, in the sense relative to the linear element definition rather than the direction of traffic flow or optionally towards a “towards referent”.		no
DistanceFromLinearElementStart	Distance from linear element start	Distance of a point along a linear element measured from the start node of the linear element, where start node is relative to the element definition rather than the direction of traffic flow.		no
LinearElement	Linear element	A linear element along a single linear object, consistent with prEN ISO 19148 definitions.		no
LinearElementByCode	Linear element by code	A linear element along a single linear object defined by its identifier or code in a road network reference model (specified in LinearElement class) which segments the road network according to specific business rules.		no
LinearElementByPoints	Linear element by points	A linear element along a single linear object defined by its start and end points.		no
PercentageDistanceAlongLinearElement	Percentage distance along linear element	Distance of a point along a linear element measured from the start node expressed as a percentage of the whole length of the linear element, where start node is relative to the element definition rather than the direction of traffic flow.		no

Table A.21 *(continued)*

Class name	Designation	Definition	Stereotype	Abstract
PointAlongLinearElement	Point along linear element	A point on a linear element where the linear element is either a part of or the whole of a linear object (i.e. a road), consistent with prEN ISO 19148 definitions.		no
Referent	Referent	A referent on a linear object that has a known location such as a node, a reference marker (e.g. a markerpost), an intersection etc.		no

A.2.12.2 "PointAlongLinearElement" package association roles

Table A.22— Associations of the "PointAlongLinearElement" package

Class name	Role name	Designation	Definition	Multiplicity	Target
DistanceFromLinearElementReferent	fromReferent	From referent	A known location along the linear element from which the distanceAlong is measured, termed the "fromReferent" in prEN ISO 19148.	1..1	Referent
	towardsReferent	Towards referent	A known location along the linear element towards which the distanceAlong is measured, termed the "towardsReferent" in prEN ISO 19148.	0..1	Referent
LinearElementByPoints	endPointOfLinearElement	End point of linear element	The referent at a known location on the linear object which defines the end of the linear element.	1..1	Referent
	intermediatePointOnLinearElement	Intermediate point on linear element	A referent at a known location on the linear object which is neither the start nor end of the linear element.	1..1	Referent
	startPointOfLinearElement	Start point of linear element	The referent at a known location on the linear object which defines the start of the linear element.	1..1	Referent

A.2.12.3 “PointAlongLinearElement” package attributes

Table A.23— Attributes of the “PointAlongLinearElement” package

Class name	Attribute name	Designation	Definition	Multiplicity	Type
DistanceFromLinearElementReferent	distanceAlong	Distance along	A measure of distance along a linear element.	1..1	MetresAsFloat
DistanceFromLinearElementStart	distanceAlong	Distance along	A measure of distance along a linear element.	1..1	MetresAsFloat
LinearElement	linearElementNature	Linear element nature	An indication of the nature of the linear element.	0..1	LinearElementNatureEnum
	linearElementReferenceModel	Linear element reference model	The identifier of a road network reference model which segments the road network according to specific business rules.	0..1	String
	linearElementReferenceModelVersion	Linear element reference model version	The version of the identified road network reference model.	0..1	String
	roadName	Road name	Name of the road of which the linear element forms a part.	0..1	MultilingualString
	roadNumber	Road number	Identifier/number of the road of which the linear element forms a part.	0..1	String
LinearElementByCode	linearElementIdentifier	Linear element identifier	An identifier or code of a linear element (or link) in the road network reference model that is specified in the LinearElement class.	1..1	String
PercentageDistanceAlongLinearElement	percentageDistanceAlong	Percentage distance along	A measure of distance along a linear element from the start of the element expressed as a percentage of the total length of the linear object.	1..1	Percentage
PointAlongLinearElement	administrativeAreaOfPoint	Administrative area of point	Identification of the road administration area which contains the specified point.	0..1	MultilingualString
	directionBoundAtPoint	Direction bound at point	The direction of traffic flow at the specified point in terms of general destination direction.	0..1	DirectionEnum

Table A.23 *(continued)*

Class name	Attribute name	Designation	Definition	Multiplicity	Type
	directionRelativeAtPoint	Direction relative at point	The direction of traffic flow at the specified point relative to the direction in which the linear element is defined.	0..1	LinearReferencingDirectionEnum
	heightGradeOfPoint	Height grade of point	Identification of whether the point on the linear element is at, above or below the normal elevation of a linear element of that type (e.g. road or road section) at that location, typically used to indicate "grade" separation.	0..1	HeightGradeEnum
Referent	referentDescription	Referent description	Description of the referent.	0..1	MultilingualString
	referentIdentifier	Referent identifier	The identifier of the referent, unique on the specified linear element (i.e. road or part of).	1..1	String
	referentName	Referent name	The name of the referent, e.g. a junction or intersection name.	0..1	String
	referentType	Referent type	The type of the referent.	1..1	ReferentTypeEnum

A.2.13 “TpegAreaLocation” package

A.2.13.1 “TpegAreaLocation” package classes

Table A.24— Classes of the “TpegAreaLocation” package

Class name	Designation	Definition	Stereotype	Abstract
TpegAreaLocation	TPEG area location	A geographic or geometric area defined by a TPEG-Loc structure which may include height information for additional geospatial discrimination.		yes
TpegGeometricArea	TPEG geometric area	A geometric area defined by a centre point and a radius.		no
TpegHeight	TPEG height	Height information which provides additional discrimination for the applicable area.		no
TpegNamedOnlyArea	TPEG named only area	An area defined by a well-known name.		no

A.2.13.2 “TpegAreaLocation” package association roles

Table A.25— Associations of the “TpegAreaLocation” package

Class name	Role name	Designation	Definition	Multiplicity	Target
TpegGeometricArea	centrePoint	Centre point	Centre point of a circular geometric area.	1..1	PointCoordinates
	name	Name	Name of area.	0..1	TpegAreaDescriptor
TpegNamedOnlyArea	name	Name	Name of area.	1..*	TpegAreaDescriptor

A.2.13.3 “TpegAreaLocation” package attributes

Table A.26— Attributes of the “TpegAreaLocation” package

Class name	Attribute name	Designation	Definition	Multiplicity	Type
TpegAreaLocation	tpegAreaLocationType	TPEG area location type	The type of TPEG location.	1..1	TpegLoc01AreaLocationSubtypeEnum
TpegGeometricArea	radius	Radius	The radius of the geometric area identified.	1..1	MetresAsNonNegativeInteger
TpegHeight	height	Height	A measurement of height using TPEG-Loc location referencing.	0..1	MetresAsFloat
	heightType	Height type	A descriptive identification of relative height using TPEG-Loc location referencing.	1..1	TpegLoc04HeightTypeEnum

A.2.14 “TpegDescriptor” package

A.2.14.1 “TpegDescriptor” package classes

Table A.27— Classes of the “TpegDescriptor” package

Class name	Designation	Definition	Stereotype	Abstract
TpegAreaDescriptor	TPEG area descriptor	A descriptor for describing an area location.		no
TpegDescriptor	TPEG descriptor	A collection of information providing descriptive references to locations using the TPEG-Loc location referencing approach.		yes
TpegIlcPointDescriptor	TPEG ILC point descriptor	A descriptor for describing a junction by defining the intersecting roads.		no
TpegJunctionPointDescriptor	TPEG junction point descriptor	A descriptor for describing a point at a junction on a road network.		no
TpegOtherPointDescriptor	TPEG other point descriptor	General descriptor for describing a point.		no
TpegPointDescriptor	TPEG point descriptor	A descriptor for describing a point location.		yes

A.2.14.2 “TpegDescriptor” package association roles

There are no defined association roles in the “TpegDescriptor” package.

A.2.14.3 “TpegDescriptor” package attributes

Table A.28— Attributes of the “TpegDescriptor” package

Class name	Attribute name	Designation	Definition	Multiplicity	Type
TpegAreaDescriptor	tpegAreaDescriptorType	TPEG area descriptor type	The nature of the descriptor used to define the location under consideration (derived from the TPEG Loc table 03).	1..1	TpegLoc03AreaDescriptorSubtypeEnum
TpegDescriptor	descriptor	Descriptor	A text string which describes or elaborates the location.	1..1	MultilingualString
TpegIlcPointDescriptor	tpegIlcPointDescriptorType	TPEG ILC point descriptor type	The nature of the descriptor used to define the location under consideration (derived from the TPEG Loc table 03).	1..1	TpegLoc03IlcPointDescriptorSubtypeEnum
TpegJunctionPointDescriptor	tpegJunctionPointDescriptorType	TPEG junction point descriptor type	The nature of the descriptor used to define the location under consideration (derived from the TPEG Loc table 03).	1..1	TpegLoc03JunctionPointDescriptorSubtypeEnum
TpegOtherPointDescriptor	tpegOtherPointDescriptorType	TPEG other point descriptor type	The nature of the descriptor used to define the location under consideration (derived from the TPEG Loc table 03).	1..1	TpegLoc03OtherPointDescriptorSubtypeEnum

A.2.15 “TpegLinearLocation” package

A.2.15.1 “TpegLinearLocation” package classes

Table A.29— Classes of the “TpegLinearLocation” package

Class name	Designation	Definition	Stereotype	Abstract
TpegLinearLocation	TPEG linear location	A linear section along a single road defined between two points on the same road by a TPEG-Loc structure.		no

A.2.15.2 "TpegLinearLocation" package association roles

Table A.30— Associations of the "TpegLinearLocation" package

Class name	Role name	Designation	Definition	Multiplicity	Target
TpegLinearLocation	from	From	The location at the up stream end of the linear section of road.	1..1	TpegPoint
	to	To	The location at the down stream end of the linear section of road.	1..1	TpegPoint

A.2.15.3 "TpegLinearLocation" package attributes

Table A.31— Attributes of the "TpegLinearLocation" package

Class name	Attribute name	Designation	Definition	Multiplicity	Type
TpegLinearLocation	tpegDirection	TPEG direction	The direction of traffic flow.	1..1	DirectionEnum
	tpegLinearLocationType	TPEG linear location type	The type of TPEG location.	1..1	TpegLoc01LinearLocationSubtypeEnum

A.2.16 “TpegPointLocation” package

A.2.16.1 “TpegPointLocation” package classes

Table A.32— Classes of the “TpegPointLocation” package

Class name	Designation	Definition	Stereotype	Abstract
TpegFramedPoint	TPEG framed point	A point on the road network which is framed between two other points on the same road.		no
TpegJunction	TPEG junction	A point on the road network which is a road junction point.		no
TpegNonJunctionPoint	TPEG non junction point	A point on the road network which is not a road junction point.		no
TpegPoint	TPEG point	A point on the road network which is either a junction point or a non junction point.		yes
TpegPointLocation	TPEG point location	A single point on the road network defined by a TPEG-Loc structure and which has an associated direction of traffic flow.		yes
TpegSimplePoint	TPEG simple point	A point on the road network which is not bounded by any other points on the road network.		no

A.2.16.2 “TpegPointLocation” package association roles

Table A.33— Associations of the “TpegPointLocation” package

Class name	Role name	Designation	Definition	Multiplicity	Target
TpegFramedPoint	framedPoint	Framed point	A single non junction point on the road network which is framed between two other specified points on the road network.	1..1	TpegNonJunctionPoint
	from	From	The location at the up stream end of the section of road which frames the TPEGFramedPoint.	1..1	TpegPoint
	to	To	The location at the down stream end of the section of road which frames the TPEGFramedPoint.	1..1	TpegPoint
TpegJunction	ilc	Ilc	A descriptor for describing a junction by identifying the intersecting roads at a road junction.	1..3	TpegIlcPointDescriptor
	name	Name	A name which identifies a junction point on the road network	0..1	TpegJunctionPointDescriptor
	otherName	Other name	A descriptive name which helps to identify the junction point.	0..*	TpegOtherPointDescriptor
TpegNonJunctionPoint	name	Name	A descriptive name which helps to identify the non junction point. At least one descriptor must identify the road on which the point is located, i.e. must be of type 'linkName' or 'localLinkName'.	1..*	TpegOtherPointDescriptor
TpegSimplePoint	point	Point	A single point defined by a coordinate set and TPEG decriptors.	1..1	TpegPoint

A.2.16.3 “TpegPointLocation” package attributes

Table A.34— Attributes of the “TpegPointLocation” package

Class name	Attribute name	Designation	Definition	Multiplicity	Type
TpegFramedPoint	tpegFramedPointLocationType	TPEG framed point location type	The type of TPEG location.	1..1	TpegLoc01FramedPointLocationSubtypeEnum
TpegPointLocation	tpegDirection	TPEG direction	The direction of traffic flow.	1..1	DirectionEnum
TpegSimplePoint	tpegSimplePointLocationType	TPEG simple point location type	The type of TPEG location.	1..1	TpegLoc01SimplePointLocationSubtypeEnum

A.3 Data Dictionary of <<datatypes>> for “GroupOfLocations”

This clause contains the definitions of all specific data types which are used in the “GroupOfLocations” package.

A.3.1 The <<datatype>> “AlertCLocationCode”

A positive integer number (between 1 and 63,487) which uniquely identifies a pre-defined ALERT-C location defined within an ALERT-C table.

A.3.2 The <<datatype>> “MetresAsFloat”

A measure of distance defined in metres in a floating-point format.

A.3.3 The <<datatype>> “MetresAsNonNegativeInteger”

A measure of distance defined in metres in a non-negative integer format.

A.3.4 The <<datatype>> “Percentage”

A measure of percentage.

A.4 Data Dictionary of <<enumerations>> for “GroupOfLocations”

This clause contains the definitions of all enumerations which are used in the “GroupOfLocations” package.

A.4.1 The <<enumeration>> “AlertCDirectionEnum”

The direction of traffic flow concerned by a situation or traffic data. In ALERT-C the positive (resp. negative) direction corresponds to the positive offset direction within the RDS location table.

Table A.35— Values contained in the enumeration “AlertCDirectionEnum”

Enumerated value name	Designation	Definition
both	Both	Indicates that both directions of traffic flow are affected by the situation or relate to the traffic data.
negative	Negative	The direction of traffic flow concerned by a situation or traffic data. In ALERT-C the negative direction corresponds to the negative offset direction within the RDS location table.
positive	Positive	The direction of traffic flow concerned by a situation or traffic data. In ALERT-C the positive direction corresponds to the positive offset direction within the RDS location table.
unknown	Unknown	Unknown direction.

A.4.2 The <<enumeration>> “CarriagewayEnum”

List of descriptors identifying specific carriageway details.

Table A.36— Values contained in the enumeration “CarriagewayEnum”

Enumerated value name	Designation	Definition
connectingCarriageway	Connecting carriageway	On the connecting carriageway.
entrySlipRoad	Entry slip road	On the entry slip road.
exitSlipRoad	Exit slip road	On the exit slip road.
flyover	Flyover	On the flyover, i.e. the section of road passing over another.
leftHandFeederRoad	Left hand feeder road	On the left hand feeder road.
leftHandParallelCarriageway	Left hand parallel carriageway	On the left hand parallel carriageway.
mainCarriageway	Main carriageway	On the main carriageway.
oppositeCarriageway	Opposite carriageway	On the opposite carriageway.
parallelCarriageway	Parallel carriageway	On the adjacent parallel carriageway.
rightHandFeederRoad	Right hand feeder road	On the right hand feeder road.
rightHandParallelCarriageway	Right hand parallel carriageway	On the right hand parallel carriageway.
roundabout	Roundabout	On the roundabout.
serviceRoad	Service road	On the adjacent service road.
slipRoads	Slip roads	On the slip roads.
underpass	Underpass	On the underpass, i.e. the section of road passing under another.

A.4.3 The <<enumeration>> “DirectionEnum”

List of directions of travel.

Table A.37— Values contained in the enumeration “DirectionEnum”

Enumerated value name	Designation	Definition
allDirections	All directions	All directions (where more than two are applicable) at this point on the road network.
anticlockwise	Anticlockwise	Anti-clockwise.
bothWays	Both ways	Both directions that are applicable at this point on the road network.
clockwise	Clockwise	Clockwise.
eastBound	East bound	East bound general direction.
inboundTowardsTown	Inbound towards town	Heading towards town centre direction of travel.
innerRing	Inner ring	Inner ring direction.
northBound	North bound	North bound general direction.
northEastBound	North east bound	North east bound general direction.
northWestBound	North west bound	North west bound general direction.
opposite	Opposite	Opposite direction to the normal direction of flow at this point on the road network.
other	Other	Other than as defined in this enumeration.
outboundFromTown	Outbound from town	Heading out of or away from the town centre direction of travel.
outerRing	Outer ring	Outer ring direction.
southBound	South bound	South bound general direction.
southEastBound	South east bound	South east bound general direction.

Table A.37 *(continued)*

Enumerated value name	Designation	Definition
southWestBound	South west bound	South west bound general direction.
unknown	Unknown	Direction is unknown.
westBound	West bound	West bound general direction.

A.4.4 The <<enumeration>> "HeightGradeEnum"

List of height or vertical gradings of road sections.

Table A.38— Values contained in the enumeration "HeightGradeEnum"

Enumerated value name	Designation	Definition
aboveGrade	Above grade	Above or over the normal road grade elevation.
atGrade	At grade	At the normal road grade elevation.
belowGrade	Below grade	Below or under the normal road grade elevation.

A.4.5 The <<enumeration>> “LaneEnum”

List of descriptors identifying specific lanes.

Table A.39— Values contained in the enumeration “LaneEnum”

Enumerated value name	Designation	Definition
allLanesCompleteCarriageway	All lanes complete carriageway	In all lanes of the carriageway.
busLane	Bus lane	In the bus lane.
busStop	Bus stop	In the bus stop lane.
carPoolLane	Car pool lane	In the carpool lane.
centralReservation	Central reservation	On the central median separating the two directional carriageways of the highway.
crawlerLane	Crawler lane	In the crawler lane.
emergencyLane	Emergency lane	In the emergency lane.
escapeLane	Escape lane	In the escape lane.
expressLane	Express lane	In the express lane.
hardShoulder	Hard shoulder	On the hard shoulder.
heavyVehicleLane	Heavy vehicle lane	In the heavy vehicle lane.
lane1	Lane1	In the first lane numbered from nearest the hard shoulder to central median.
lane2	Lane2	In the second lane numbered from nearest the hard shoulder to central median.
lane3	Lane3	In the third lane numbered from nearest the hard shoulder to central median.
lane4	Lane4	In the fourth lane numbered from nearest the hard shoulder to central median.
lane5	Lane5	In the fifth lane numbered from nearest the hard shoulder to central median.

Table A.39 *(continued)*

Enumerated value name	Designation	Definition
lane6	Lane6	In the sixth lane numbered from nearest the hard shoulder to central median.
lane7	Lane7	In the seventh lane numbered from nearest the hard shoulder to central median.
lane8	Lane8	In the eighth lane numbered from nearest the hard shoulder to central median.
lane9	Lane9	In the ninth lane numbered from nearest the hard shoulder to central median.
layBy	Lay by	In a lay-by.
leftHandTurningLane	Left hand turning lane	In the left hand turning lane.
leftLane	Left lane	In the left lane.
localTrafficLane	Local traffic lane	In the local traffic lane.
middleLane	Middle lane	In the middle lane.
opposingLanes	Opposing lanes	In the opposing lanes.
overtakingLane	Overtaking lane	In the overtaking lane.
rightHandTurningLane	Right hand turning lane	In the right hand turning lane.
rightLane	Right lane	In the right lane.
rushHourLane	Rush hour lane	In the lane dedicated for use during the rush (peak) hour.
setDownArea	Set down area	In the area/lane reserved for passenger pick-up or set-down.
slowVehicleLane	Slow vehicle lane	In the slow vehicle lane.
throughTrafficLane	Through traffic lane	In the through traffic lane.
tidalFlowLane	Tidal flow lane	In the lane dedicated for use as a tidal flow lane.
turningLane	Turning lane	In the turning lane.
verge	Verge	On the verge.

A.4.6 The <<enumeration>> “LinearElementNatureEnum”

List of indicative natures of linear elements.

Table A.40— Values contained in the enumeration “LinearElementNatureEnum”

Enumerated value name	Designation	Definition
other	Other	Other than as defined in this enumeration.
road	Road	The nature of the linear element is a road.
roadSection	Road section	The nature of the linear element is a section of a road.
slipRoad	Slip road	The nature of the linear element is a slip road.

A.4.7 The <<enumeration>> “LinearReferencingDirectionEnum”

Directions of traffic flow relative to the direction in which the linear element is defined.

Table A.41— Values contained in the enumeration “LinearReferencingDirectionEnum”

Enumerated value name	Designation	Definition
aligned	Aligned	Indicates that the direction of traffic flow affected by the situation or related to the traffic data is in the same sense as the direction in which the linear element is defined.
both	Both	Indicates that both directions of traffic flow are affected by the situation or relate to the traffic data.
opposite	Opposite	Indicates that the direction of traffic flow affected by the situation or related to the traffic data is in the opposite sense to the direction in which the linear element is defined.
unknown	Unknown	Indicates that the direction of traffic flow affected by the situation or related to the traffic data is unknown.

A.4.8 The <<enumeration>> “LocationDescriptorEnum”

List of descriptors to help to identify a specific location.

Table A.42— Values contained in the enumeration “LocationDescriptorEnum”

Enumerated value name	Designation	Definition
aroundABendInRoad	Around a bend in road	Around a bend in the road.
atMotorwayInterchange	At motorway interchange	At a motorway interchange.
atRestArea	At rest area	At rest area off the carriageway.
atServiceArea	At service area	At service area.
atTollPlaza	At toll plaza	At toll plaza.
atTunnelEntryOrExit	At tunnel entry or exit	At entry or exit of tunnel.
inbound	Inbound	On the carriageway or lane which is inbound towards the centre of the town or city.
inGallery	In gallery	In gallery.
inTheCentre	In the centre	In the centre of the roadway.
inTheOppositeDirection	In the opposite direction	In the opposite direction.
inTunnel	In tunnel	In tunnel.
onBorder	On border	On border crossing.
onBridge	On bridge	On bridge.
onConnector	On connector	On connecting carriageway between two different roads or road sections.
onElevatedSection	On elevated section	On elevated section of road.
onFlyover	On flyover	On flyover, i.e. on section of road over another road.
onIceRoad	On ice road	On ice road.

Table A.42 *(continued)*

Enumerated value name	Designation	Definition
onLevelCrossing	On level crossing	On level-crossing.
onLinkRoad	On link road	On road section linking two different roads.
onPass	On pass	On mountain pass.
onRoundabout	On roundabout	On roundabout.
onTheLeft	On the left	On the left of the roadway.
onTheRight	On the right	On the right of the roadway.
onTheRoadway	On the roadway	On the roadway.
onUndergroundSection	On underground section	On underground section of road.
onUnderpass	On underpass	On underpass, i.e. section of road which passes under another road.
outbound	Outbound	On the carriageway or lane which is outbound from the centre of the town or city.
overCrestOfHill	Over crest of hill	Over the crest of a hill.
withinJunction	Within junction	On the main carriageway within a junction between exit slip road and entry slip road.

A.4.9 The <<enumeration>> “ReferentTypeEnum”

A set of types of known points along a linear object such as a road.

Table A.43— Values contained in the enumeration “ReferentTypeEnum”

Enumerated value name	Designation	Definition
boundary	Boundary	A boundary between two jurisdictional or administrative areas. These may be legal boundaries such as between counties or countries, maintenance responsibility boundaries or control boundaries.
intersection	Intersection	A crossing of two or more roads where the precise point of intersection is defined according to specific business rules.
landmark	Landmark	A visible identifiable physical landmark either alongside or close to the linear object.
referenceMarker	Reference marker	A marker which is usually but not necessarily physical that is one of a sequence which are spaced out along the linear object (road) to provide a location reference. The spacing of markers is not necessarily even.
roadNode	Road node	A topological node defined on a road network. Such nodes may delineate the segmentation of the road network according to defined business rules or may constitute a purely topological representation of a road network.

A.4.10 The <<enumeration>> “TpegLoc01AreaLocationSubtypeEnum”

Types of area.

Table A.44— Values contained in the enumeration “TpegLoc01AreaLocationSubtypeEnum”

Enumerated value name	Designation	Definition
largeArea	Large area	A geographic or geometric large area.
other	Other	Other than as defined in this enumeration.

A.4.11 The <<enumeration>> “TpegLoc01FramedPointLocationSubtypeEnum”

Types of points on the road network framed by two other points on the same road.

Table A.45— Values contained in the enumeration “TpegLoc01FramedPointLocationSubtypeEnum”

Enumerated value name	Designation	Definition
framedPoint	Framed point	A point on the road network framed by two other points on the same road.

A.4.12 The <<enumeration>> “TpegLoc01LinearLocationSubtypeEnum”

Types of linear location.

Table A.46— Values contained in the enumeration “TpegLoc01LinearLocationSubtypeEnum”

Enumerated value name	Designation	Definition
segment	Segment	A segment (or link) of the road network corresponding to the way in which the road operator has segmented the network.

A.4.13 The <<enumeration>> “TpegLoc01SimplePointLocationSubtypeEnum”

Types of simple point.

Table A.47— Values contained in the enumeration “TpegLoc01SimplePointLocationSubtypeEnum”

Enumerated value name	Designation	Definition
intersection	Intersection	An point on the road network at which one or more roads intersect.
nonLinkedPoint	Non linked point	A point on the road network which is not at a junction or intersection.

A.4.14 The <<enumeration>> “TpegLoc03AreaDescriptorSubtypeEnum”

Descriptors for describing area locations.

Table A.48— Values contained in the enumeration “TpegLoc03AreaDescriptorSubtypeEnum”

Enumerated value name	Designation	Definition
administrativeAreaName	Administrative area name	Name of an administrative area.
administrativeReferenceName	Administrative reference name	Reference name by which administrative area is known.
areaName	Area name	Name of an area.
countyName	County name	Name of a county (administrative sub-division).
lakeName	Lake name	Name of a lake.
nationName	Nation name	Name of a nation (e.g. Wales) which is a sub-division of a ISO recognised country.
other	Other	Other than as defined in this enumeration.
policeForceControlAreaName	Police force control area name	Name of a police force control area.
regionName	Region name	Name of a geographic region.
seaName	Sea name	Name of a sea.
townName	Town name	Name of a town.

A.4.15 The <<enumeration>> “TpegLoc03IlcPointDescriptorSubtypeEnum”

Descriptors for describing a junction by identifying the intersecting roads at a road junction.

Table A.49— Values contained in the enumeration “TpegLoc03IlcPointDescriptorSubtypeEnum”

Enumerated value name	Designation	Definition
tpegIlcName1	TPEG ILC name1	The name of the road on which the junction point is located.
tpegIlcName2	TPEG ILC name2	The name of the first intersecting road at the junction.
tpegIlcName3	TPEG ILC name3	The name of the second intersecting road (if one exists) at the junction.

A.4.16 The <<enumeration>> “TpegLoc03JunctionPointDescriptorSubtypeEnum”

Descriptors for describing a point at a road junction.

Table A.50— Values contained in the enumeration “TpegLoc03JunctionPointDescriptorSubtypeEnum”

Enumerated value name	Designation	Definition
junctionName	Junction name	Name of a road network junction where two or more roads join.

A.4.17 The <<enumeration>> “TpegLoc03OtherPointDescriptorSubtypeEnum”

Descriptors other than junction names and road descriptors which can help to identify the location of points on the road network.

Table A.51— Values contained in the enumeration “TpegLoc03OtherPointDescriptorSubtypeEnum”

Enumerated value name	Designation	Definition
administrativeAreaName	Administrative area name	Name of an administrative area.
administrativeReferenceName	Administrative reference name	Reference name by which an administrative area is known.
airportName	Airport name	Name of an airport.
areaName	Area name	Name of an area.
buildingName	Building name	Name of a building.
busStopIdentifier	Bus stop identifier	Identifier of a bus stop on the road network.
busStopName	Bus stop name	Name of a bus stop on the road network.
canalName	Canal name	Name of a canal.
countyName	County name	Name of a county (administrative sub-division).
ferryPortName	Ferry port name	Name of a ferry port.
intersectionName	Intersection name	Name of a road network intersection.
lakeName	Lake name	Name of a lake.
linkName	Link name	Name of a road link.
localLinkName	Local link name	Local name of a road link.
metroStationName	Metro station name	Name of a metro/underground station.
nationName	Nation name	Name of a nation (e.g. Wales) which is a sub-division of a ISO recognised country.
nonLinkedPointName	Non linked point name	Name of a point on the road network which is not at a junction or intersection.

Table A.51 *(continued)*

Enumerated value name	Designation	Definition
other	Other	Other than as defined in this enumeration.
parkingFacilityName	Parking facility name	Name of a parking facility.
pointName	Point name	Name of a specific point.
pointOfInterestName	Point of interest name	Name of a general point of interest.
railwayStation	Railway station	Name of a railway station.
regionName	Region name	Name of a geographic region.
riverName	River name	Name of a river.
seaName	Sea name	Name of a sea.
serviceAreaName	Service area name	Name of a service area on a road network.
tidalRiverName	Tidal river name	Name of a river which is of a tidal nature.
townName	Town name	Name of a town.

A.4.18 The <<enumeration>> “TpegLoc04HeightTypeEnum”

Types of height.

Table A.52— Values contained in the enumeration “TpegLoc04HeightTypeEnum”

Enumerated value name	Designation	Definition
above	Above	Height above specified location.
aboveSeaLevel	Above sea level	Height above mean sea high water level.
aboveStreetLevel	Above street level	Height above street level.
at	At	At height of specified location.
atSeaLevel	At sea level	At mean sea high water level.
atStreetLevel	At street level	At street level.
below	Below	Height below specified location.
belowSeaLevel	Below sea level	Height below mean sea high water level.
belowStreetLevel	Below street level	Height below street level.
other	Other	Other than as defined in this enumeration.
undefined	Undefined	Undefined height reference.
unknown	Unknown	Unknown height reference.

A.5 Data Dictionary for “PredefinedLocationsPublication”

A.5.1 “PredefinedLocationsPublication” package

A.5.1.1 “PredefinedLocationsPublication” package classes

Table A.53— Classes of the “PredefinedLocationsPublication” package

Class name	Designation	Definition	Stereotype	Abstract
PredefinedItinerary	Predefined itinerary	An identifiable versioned instance of a predefined itinerary.	versionedIdentifiable	no
PredefinedLocation	Predefined location	An identifiable versioned instance of a single predefined location.	versionedIdentifiable	no
PredefinedLocationContainer	Predefined location container	A container which may comprise the definition of a predefined itinerary, non ordered group of locations or single location.		yes
PredefinedLocationsPublication	Predefined locations publication	A publication containing one or more groups of predefined locations organised either as litineraries, non ordered groups or as individual locations.		no
PredefinedNonOrderedLocationGroup	Predefined non ordered location group	An identifiable versioned instance of a predefined group of non ordered locations (i.e. more than one).	versionedIdentifiable	no

A.5.1.2 “PredefinedLocationsPublication” package association roles

There are no defined association roles in the “PredefinedLocationsPublication” package.

A.5.1.3 “PredefinedLocationsPublication” package attributes

Table A.54— Attributes of the “PredefinedLocationsPublication” package

Class name	Attribute name	Designation	Definition	Multiplicity	Type
PredefinedItinerary	predefinedItineraryName	Predefined itinerary name	A name assigned to the predefined itinerary.	0..1	MultilingualString
PredefinedLocation	predefinedLocationName	Predefined location name	A name assigned to the predefined location (e.g. extracted out of the network operator's gazetteer).	0..1	MultilingualString
PredefinedNonOrderedLocationGroup	predefinedNonOrderedLocationGroupName	Predefined non ordered location group name	A name assigned to the predefined group of non ordered locations.	0..1	MultilingualString

A.6 Data Dictionary of <<datatypes>> for “PredefinedLocationsPublication”

There are no defined data types in the “PredefinedLocationsPublication” package.

A.7 Data Dictionary of <<enumerations>> for “PredefinedLocationsPublication”

There are no defined enumerations in the “PredefinedLocationsPublication”.

Annex B
(normative)

Referenced XML schemas

B.1 Overview

The following clauses include the actual subschemas of the DATEX II XML Schema Definition (XSD) file that relate to both topics covered by the present part of CEN/TS 16157. This Annex shall be used when using an XML encoding.

As specified in Part 1 these schemas may be extended by use of Extensions. Such extension must be done in a manner conformant to the requirements specified in Part 1 - Clause 9 and Annex D.

Supplied data claiming conformance to this Part and specifically this Annex shall positively validate against the schemas specified in this Annex including any permissible Level B extensions.

B.2 The GroupOfLocations subschema

```
<?xml version="1.0" encoding="utf-8" standalone="no"?>

<xs:schema elementFormDefault="qualified" attributeFormDefault="unqualified"
xmlns:D2LogicalModel="http://datex2.eu/schema/2/2_0"
targetNamespace="http://datex2.eu/schema/2/2_0"
xmlns:xs="http://www.w3.org/2001/XMLSchema" version="2.0">

  <xs:complexType name="_ExtensionType">

    <xs:sequence>

      <xs:any namespace="##any" processContents="lax" minOccurs="0"
maxOccurs="unbounded" />

    </xs:sequence>

  </xs:complexType>

  <xs:complexType name="_IntermediatePointOnLinearElement">

    <xs:sequence>

      <xs:element name="referent" type="D2LogicalModel:Referent" minOccurs="1"
maxOccurs="1" />

    </xs:sequence>

    <xs:attribute name="index" type="xs:int" use="required" />

  </xs:complexType>

  <xs:complexType name="_LocationContainedInItinerary">
```

```
    <xs:sequence>

      <xs:element name="location" type="D2LogicalModel:Location" minOccurs="1"
maxOccurs="1" />

    </xs:sequence>

    <xs:attribute name="index" type="xs:int" use="required" />

  </xs:complexType>

  <xs:complexType name="_PredefinedItineraryVersionedReference">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:VersionedReference">

        <xs:attribute name="targetClass" use="required"
fixed="PredefinedItinerary" />

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="_PredefinedLocationVersionedReference">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:VersionedReference">

        <xs:attribute name="targetClass" use="required"
fixed="PredefinedLocation" />

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="_PredefinedNonOrderedLocationGroupVersionedReference">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:VersionedReference">

        <xs:attribute name="targetClass" use="required"
fixed="PredefinedNonOrderedLocationGroup" />

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="AffectedCarriagewayAndLanes">
```

```
    <xs:sequence>

      <xs:element name="carriageway" type="D2LogicalModel:CarriagewayEnum"
minOccurs="1" maxOccurs="1" />

      <xs:element name="lane" type="D2LogicalModel:LaneEnum" minOccurs="0"
maxOccurs="unbounded" />

      <xs:element name="footpath" type="D2LogicalModel:Boolean" minOccurs="0"
maxOccurs="1" />

      <xs:element name="lengthAffected" type="D2LogicalModel:MetresAsFloat"
minOccurs="0" maxOccurs="1" />

      <xs:element name="affectedCarriagewayAndLanesExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

    </xs:sequence>

  </xs:complexType>

  <xs:complexType name="AlertCArea">

    <xs:sequence>

      <xs:element name="alertCLocationCountryCode" type="D2LogicalModel:String"
minOccurs="1" maxOccurs="1" />

      <xs:element name="alertCLocationTableNumber" type="D2LogicalModel:String"
minOccurs="1" maxOccurs="1" />

      <xs:element name="alertCLocationTableVersion" type="D2LogicalModel:String"
minOccurs="1" maxOccurs="1" />

      <xs:element name="areaLocation" type="D2LogicalModel:AlertCLocation" />

      <xs:element name="alertCAreaExtension" type="D2LogicalModel:_ExtensionType"
minOccurs="0" />

    </xs:sequence>

  </xs:complexType>

  <xs:complexType name="AlertCDirection">

    <xs:sequence>

      <xs:element name="alertCDirectionCoded"
type="D2LogicalModel:AlertCDirectionEnum" minOccurs="1" maxOccurs="1" />

      <xs:element name="alertCDirectionNamed"
type="D2LogicalModel:MultilingualString" minOccurs="0" maxOccurs="1" />

      <xs:element name="alertCDirectionSense" type="D2LogicalModel:Boolean"
minOccurs="0" maxOccurs="1" />

      <xs:element name="alertCDirectionExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />
```

```
    </xs:sequence>

  </xs:complexType>

  <xs:simpleType name="AlertCDirectionEnum">

    <xs:restriction base="xs:string">

      <xs:enumeration value="both" />

      <xs:enumeration value="negative" />

      <xs:enumeration value="positive" />

      <xs:enumeration value="unknown" />

    </xs:restriction>

  </xs:simpleType>

  <xs:complexType name="AlertCLinear" abstract="true">

    <xs:sequence>

      <xs:element name="alertCLocationCountryCode" type="D2LogicalModel:String"
minOccurs="1" maxOccurs="1" />

      <xs:element name="alertCLocationTableNumber" type="D2LogicalModel:String"
minOccurs="1" maxOccurs="1" />

      <xs:element name="alertCLocationTableVersion" type="D2LogicalModel:String"
minOccurs="1" maxOccurs="1" />

      <xs:element name="alertCLinearExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

    </xs:sequence>

  </xs:complexType>

  <xs:complexType name="AlertCLinearByCode">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:AlertCLinear">

        <xs:sequence>

          <xs:element name="alertCDirection"
type="D2LogicalModel:AlertCDirection" />

          <xs:element name="locationCodeForLinearLocation"
type="D2LogicalModel:AlertCLocation" />

          <xs:element name="alertCLinearByCodeExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>
```

```
      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="AlertCLocation">

    <xs:sequence>

      <xs:element name="alertCLocationName"
type="D2LogicalModel:MultilingualString" minOccurs="0" maxOccurs="1" />

      <xs:element name="specificLocation"
type="D2LogicalModel:AlertCLocationCode" minOccurs="1" maxOccurs="1" />

      <xs:element name="alertCLocationExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

    </xs:sequence>

  </xs:complexType>

  <xs:simpleType name="AlertCLocationCode">

    <xs:restriction base="D2LogicalModel:NonNegativeInteger" />

  </xs:simpleType>

  <xs:complexType name="AlertCMethod2Linear">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:AlertCLinear">

        <xs:sequence>

          <xs:element name="alertCDirection"
type="D2LogicalModel:AlertCDirection" />

          <xs:element name="alertCMethod2PrimaryPointLocation"
type="D2LogicalModel:AlertCMethod2PrimaryPointLocation" />

          <xs:element name="alertCMethod2SecondaryPointLocation"
type="D2LogicalModel:AlertCMethod2SecondaryPointLocation" />

          <xs:element name="alertCMethod2LinearExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="AlertCMethod2Point">
```

```
    <xs:complexContent>

      <xs:extension base="D2LogicalModel:AlertCPoint">

        <xs:sequence>

          <xs:element name="alertCDirection"
type="D2LogicalModel:AlertCDirection" />

          <xs:element name="alertCMethod2PrimaryPointLocation"
type="D2LogicalModel:AlertCMethod2PrimaryPointLocation" />

          <xs:element name="alertCMethod2PointExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="AlertCMethod2PrimaryPointLocation">

    <xs:sequence>

      <xs:element name="alertCLocation" type="D2LogicalModel:AlertCLocation" />

      <xs:element name="alertCMethod2PrimaryPointLocationExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

    </xs:sequence>

  </xs:complexType>

  <xs:complexType name="AlertCMethod2SecondaryPointLocation">

    <xs:sequence>

      <xs:element name="alertCLocation" type="D2LogicalModel:AlertCLocation" />

      <xs:element name="alertCMethod2SecondaryPointLocationExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

    </xs:sequence>

  </xs:complexType>

  <xs:complexType name="AlertCMethod4Linear">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:AlertCLinear">

        <xs:sequence>
```

```
          <xs:element name="alertCDirection"
type="D2LogicalModel:AlertCDirection" />

          <xs:element name="alertCMethod4PrimaryPointLocation"
type="D2LogicalModel:AlertCMethod4PrimaryPointLocation" />

          <xs:element name="alertCMethod4SecondaryPointLocation"
type="D2LogicalModel:AlertCMethod4SecondaryPointLocation" />

          <xs:element name="alertCMethod4LinearExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="AlertCMethod4Point">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:AlertCPoint">

        <xs:sequence>

          <xs:element name="alertCDirection"
type="D2LogicalModel:AlertCDirection" />

          <xs:element name="alertCMethod4PrimaryPointLocation"
type="D2LogicalModel:AlertCMethod4PrimaryPointLocation" />

          <xs:element name="alertCMethod4PointExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="AlertCMethod4PrimaryPointLocation">

    <xs:sequence>

      <xs:element name="alertCLocation" type="D2LogicalModel:AlertCLocation" />

      <xs:element name="offsetDistance" type="D2LogicalModel:OffsetDistance" />

      <xs:element name="alertCMethod4PrimaryPointLocationExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

    </xs:sequence>
```

```
  </xs:complexType>

  <xs:complexType name="AlertCMethod4SecondaryPointLocation">

    <xs:sequence>

      <xs:element name="alertCLocation" type="D2LogicalModel:AlertCLocation" />

      <xs:element name="offsetDistance" type="D2LogicalModel:OffsetDistance" />

      <xs:element name="alertCMethod4SecondaryPointLocationExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

    </xs:sequence>

  </xs:complexType>

  <xs:complexType name="AlertCPoint" abstract="true">

    <xs:sequence>

      <xs:element name="alertCLocationCountryCode" type="D2LogicalModel:String"
minOccurs="1" maxOccurs="1" />

      <xs:element name="alertCLocationTableNumber" type="D2LogicalModel:String"
minOccurs="1" maxOccurs="1" />

      <xs:element name="alertCLocationTableVersion" type="D2LogicalModel:String"
minOccurs="1" maxOccurs="1" />

      <xs:element name="alertCPointExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

    </xs:sequence>

  </xs:complexType>

  <xs:complexType name="Area">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:Location">

        <xs:sequence>

          <xs:element name="alertCArea" type="D2LogicalModel:AlertCArea"
minOccurs="0" />

          <xs:element name="tpegAreaLocation"
type="D2LogicalModel:TpegAreaLocation" minOccurs="0" />

          <xs:element name="areaExtension" type="D2LogicalModel:_ExtensionType"
minOccurs="0" />

        </xs:sequence>

      </xs:extension>
```

```
    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="AreaDestination">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:Destination">

        <xs:sequence>

          <xs:element name="area" type="D2LogicalModel:Area" />

          <xs:element name="areaDestinationExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:simpleType name="Boolean">

    <xs:restriction base="xs:boolean" />

  </xs:simpleType>

  <xs:simpleType name="CarriagewayEnum">

    <xs:restriction base="xs:string">

      <xs:enumeration value="connectingCarriageway" />

      <xs:enumeration value="entrySlipRoad" />

      <xs:enumeration value="exitSlipRoad" />

      <xs:enumeration value="flyover" />

      <xs:enumeration value="leftHandFeederRoad" />

      <xs:enumeration value="leftHandParallelCarriageway" />

      <xs:enumeration value="mainCarriageway" />

      <xs:enumeration value="oppositeCarriageway" />

      <xs:enumeration value="parallelCarriageway" />

      <xs:enumeration value="rightHandFeederRoad" />

      <xs:enumeration value="rightHandParallelCarriageway" />

      <xs:enumeration value="roundabout" />
```

```
      <xs:enumeration value="serviceRoad" />
      <xs:enumeration value="slipRoads" />
      <xs:enumeration value="underpass" />
    </xs:restriction>
  </xs:simpleType>
  <xs:complexType name="Destination" abstract="true">
    <xs:sequence>
      <xs:element name="destinationExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />
    </xs:sequence>
  </xs:complexType>
  <xs:simpleType name="DirectionEnum">
    <xs:restriction base="xs:string">
      <xs:enumeration value="allDirections" />
      <xs:enumeration value="bothWays" />
      <xs:enumeration value="clockwise" />
      <xs:enumeration value="anticlockwise" />
      <xs:enumeration value="innerRing" />
      <xs:enumeration value="outerRing" />
      <xs:enumeration value="northBound" />
      <xs:enumeration value="northEastBound" />
      <xs:enumeration value="eastBound" />
      <xs:enumeration value="southEastBound" />
      <xs:enumeration value="southBound" />
      <xs:enumeration value="southWestBound" />
      <xs:enumeration value="westBound" />
      <xs:enumeration value="northWestBound" />
      <xs:enumeration value="inboundTowardsTown" />
      <xs:enumeration value="outboundFromTown" />
      <xs:enumeration value="unknown" />
```

```
      <xs:enumeration value="opposite" />

      <xs:enumeration value="other" />

    </xs:restriction>

  </xs:simpleType>

  <xs:complexType name="DistanceAlongLinearElement" abstract="true">

    <xs:sequence>

      <xs:element name="distanceAlongLinearElementExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

    </xs:sequence>

  </xs:complexType>

  <xs:complexType name="DistanceFromLinearElementReferent">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:DistanceAlongLinearElement">

        <xs:sequence>

          <xs:element name="distanceAlong" type="D2LogicalModel:MetresAsFloat"
minOccurs="1" maxOccurs="1" />

          <xs:element name="fromReferent" type="D2LogicalModel:Referent" />

          <xs:element name="towardsReferent" type="D2LogicalModel:Referent"
minOccurs="0" />

          <xs:element name="distanceFromLinearElementReferentExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="DistanceFromLinearElementStart">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:DistanceAlongLinearElement">

        <xs:sequence>

          <xs:element name="distanceAlong" type="D2LogicalModel:MetresAsFloat"
minOccurs="1" maxOccurs="1" />
```

```
          <xs:element name="distanceFromLinearElementStartExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="ExternalReferencing">

    <xs:sequence>

      <xs:element name="externalLocationCode" type="D2LogicalModel:String"
minOccurs="1" maxOccurs="1" />

      <xs:element name="externalReferencingSystem" type="D2LogicalModel:String"
minOccurs="1" maxOccurs="1" />

      <xs:element name="externalReferencingExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

    </xs:sequence>

  </xs:complexType>

  <xs:simpleType name="Float">

    <xs:restriction base="xs:float" />

  </xs:simpleType>

  <xs:complexType name="GroupOfLocations" abstract="true">

    <xs:sequence>

      <xs:element name="groupOfLocationsExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

    </xs:sequence>

  </xs:complexType>

  <xs:simpleType name="HeightGradeEnum">

    <xs:restriction base="xs:string">

      <xs:enumeration value="aboveGrade" />

      <xs:enumeration value="atGrade" />

      <xs:enumeration value="belowGrade" />

    </xs:restriction>

  </xs:simpleType>
```

```
  <xs:complexType name="Itinerary" abstract="true">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:GroupOfLocations">

        <xs:sequence>

          <xs:element name="routeDestination" type="D2LogicalModel:Destination"
minOccurs="0" maxOccurs="unbounded" />

          <xs:element name="itineraryExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="ItineraryByIndexedLocations">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:Itinerary">

        <xs:sequence>

          <xs:element name="locationContainedInItinerary"
type="D2LogicalModel:_LocationContainedInItinerary" minOccurs="0"
maxOccurs="unbounded" />

          <xs:element name="itineraryByIndexedLocationsExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="ItineraryByReference">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:Itinerary">

        <xs:sequence>

          <xs:element name="predefinedItineraryReference"
type="D2LogicalModel:_PredefinedItineraryVersionedReference" minOccurs="1"
maxOccurs="1" />
```

```
          <xs:element name="itineraryByReferenceExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:simpleType name="LaneEnum">

    <xs:restriction base="xs:string">

      <xs:enumeration value="allLanesCompleteCarriageway" />

      <xs:enumeration value="busLane" />

      <xs:enumeration value="busStop" />

      <xs:enumeration value="carPoolLane" />

      <xs:enumeration value="centralReservation" />

      <xs:enumeration value="crawlerLane" />

      <xs:enumeration value="emergencyLane" />

      <xs:enumeration value="escapeLane" />

      <xs:enumeration value="expressLane" />

      <xs:enumeration value="hardShoulder" />

      <xs:enumeration value="heavyVehicleLane" />

      <xs:enumeration value="lane1" />

      <xs:enumeration value="lane2" />

      <xs:enumeration value="lane3" />

      <xs:enumeration value="lane4" />

      <xs:enumeration value="lane5" />

      <xs:enumeration value="lane6" />

      <xs:enumeration value="lane7" />

      <xs:enumeration value="lane8" />

      <xs:enumeration value="lane9" />

      <xs:enumeration value="layBy" />

      <xs:enumeration value="leftHandTurningLane" />
```

```
      <xs:enumeration value="leftLane" />
      <xs:enumeration value="localTrafficLane" />
      <xs:enumeration value="middleLane" />
      <xs:enumeration value="opposingLanes" />
      <xs:enumeration value="overtakingLane" />
      <xs:enumeration value="rightHandTurningLane" />
      <xs:enumeration value="rightLane" />
      <xs:enumeration value="rushHourLane" />
      <xs:enumeration value="setDownArea" />
      <xs:enumeration value="slowVehicleLane" />
      <xs:enumeration value="throughTrafficLane" />
      <xs:enumeration value="tidalFlowLane" />
      <xs:enumeration value="turningLane" />
      <xs:enumeration value="verge" />
    </xs:restriction>
  </xs:simpleType>
  <xs:complexType name="Linear">
    <xs:complexContent>
      <xs:extension base="D2LogicalModel:NetworkLocation">
        <xs:sequence>
          <xs:element name="tpegLinearLocation"
type="D2LogicalModel:TpegLinearLocation" minOccurs="0" />
          <xs:element name="alertCLinear" type="D2LogicalModel:AlertCLinear"
minOccurs="0" />
          <xs:element name="linearWithinLinearElement"
type="D2LogicalModel:LinearWithinLinearElement" minOccurs="0" />
          <xs:element name="linearExtension" type="D2LogicalModel:_ExtensionType"
minOccurs="0" />
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
```

```
  </xs:complexType>

  <xs:complexType name="LinearElement">

    <xs:sequence>

      <xs:element name="roadName" type="D2LogicalModel:MultilingualString"
minOccurs="0" maxOccurs="1" />

      <xs:element name="roadNumber" type="D2LogicalModel:String" minOccurs="0"
maxOccurs="1" />

      <xs:element name="linearElementReferenceModel" type="D2LogicalModel:String"
minOccurs="0" maxOccurs="1" />

      <xs:element name="linearElementReferenceModelVersion"
type="D2LogicalModel:String" minOccurs="0" maxOccurs="1" />

      <xs:element name="linearElementNature"
type="D2LogicalModel:LinearElementNatureEnum" minOccurs="0" maxOccurs="1" />

      <xs:element name="linearElementExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

    </xs:sequence>

  </xs:complexType>

  <xs:complexType name="LinearElementByCode">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:LinearElement">

        <xs:sequence>

          <xs:element name="linearElementIdentifier" type="D2LogicalModel:String"
minOccurs="1" maxOccurs="1" />

          <xs:element name="linearElementByCodeExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="LinearElementByPoints">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:LinearElement">

        <xs:sequence>
```

```
          <xs:element name="startPointOfLinearElement"
type="D2LogicalModel:Referent" />

          <xs:element name="intermediatePointOnLinearElement"
type="D2LogicalModel:_IntermediatePointOnLinearElement" minOccurs="0"
maxOccurs="unbounded" />

          <xs:element name="endPointOfLinearElement"
type="D2LogicalModel:Referent" />

          <xs:element name="linearElementByPointsExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:simpleType name="LinearElementNatureEnum">

    <xs:restriction base="xs:string">

      <xs:enumeration value="road" />

      <xs:enumeration value="roadSection" />

      <xs:enumeration value="slipRoad" />

      <xs:enumeration value="other" />

    </xs:restriction>

  </xs:simpleType>

  <xs:simpleType name="LinearReferencingDirectionEnum">

    <xs:restriction base="xs:string">

      <xs:enumeration value="both" />

      <xs:enumeration value="opposite" />

      <xs:enumeration value="aligned" />

      <xs:enumeration value="unknown" />

    </xs:restriction>

  </xs:simpleType>

  <xs:complexType name="LinearWithinLinearElement">

    <xs:sequence>
```

```
      <xs:element name="administrativeAreaOfLinearSection"
type="D2LogicalModel:MultilingualString" minOccurs="0" maxOccurs="1" />

      <xs:element name="directionBoundOnLinearSection"
type="D2LogicalModel:DirectionEnum" minOccurs="0" maxOccurs="1" />

      <xs:element name="directionRelativeOnLinearSection"
type="D2LogicalModel:LinearReferencingDirectionEnum" minOccurs="0" maxOccurs="1"
/>

      <xs:element name="heightGradeOfLinearSection"
type="D2LogicalModel:HeightGradeEnum" minOccurs="0" maxOccurs="1" />

      <xs:element name="linearElement" type="D2LogicalModel:LinearElement" />

      <xs:element name="fromPoint"
type="D2LogicalModel:DistanceAlongLinearElement" />

      <xs:element name="toPoint" type="D2LogicalModel:DistanceAlongLinearElement"
/>

      <xs:element name="linearWithinLinearElementExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

    </xs:sequence>

  </xs:complexType>

  <xs:complexType name="Location" abstract="true">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:GroupOfLocations">

        <xs:sequence>

          <xs:element name="externalReferencing"
type="D2LogicalModel:ExternalReferencing" minOccurs="0" maxOccurs="unbounded" />

          <xs:element name="locationForDisplay"
type="D2LogicalModel:PointCoordinates" minOccurs="0" />

          <xs:element name="locationExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="LocationByReference">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:Location">
```

```
        <xs:sequence>

          <xs:element name="predefinedLocationReference"
type="D2LogicalModel:_PredefinedLocationVersionedReference" minOccurs="1"
maxOccurs="1" />

          <xs:element name="locationByReferenceExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:simpleType name="LocationDescriptorEnum">

    <xs:restriction base="xs:string">

      <xs:enumeration value="aroundABendInRoad" />

      <xs:enumeration value="atMotorwayInterchange" />

      <xs:enumeration value="atRestArea" />

      <xs:enumeration value="atServiceArea" />

      <xs:enumeration value="atTollPlaza" />

      <xs:enumeration value="atTunnelEntryOrExit" />

      <xs:enumeration value="inbound" />

      <xs:enumeration value="inGallery" />

      <xs:enumeration value="inTheCentre" />

      <xs:enumeration value="inTheOppositeDirection" />

      <xs:enumeration value="inTunnel" />

      <xs:enumeration value="onBorder" />

      <xs:enumeration value="onBridge" />

      <xs:enumeration value="onConnector" />

      <xs:enumeration value="onElevatedSection" />

      <xs:enumeration value="onFlyover" />

      <xs:enumeration value="onIceRoad" />

      <xs:enumeration value="onLevelCrossing" />

      <xs:enumeration value="onLinkRoad" />
```

```
      <xs:enumeration value="onPass" />
      <xs:enumeration value="onRoundabout" />
      <xs:enumeration value="onTheLeft" />
      <xs:enumeration value="onTheRight" />
      <xs:enumeration value="onTheRoadway" />
      <xs:enumeration value="onUndergroundSection" />
      <xs:enumeration value="onUnderpass" />
      <xs:enumeration value="outbound" />
      <xs:enumeration value="overCrestOfHill" />
      <xs:enumeration value="withinJunction" />
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="MetresAsFloat">
    <xs:restriction base="D2LogicalModel:Float" />
  </xs:simpleType>
  <xs:simpleType name="MetresAsNonNegativeInteger">
    <xs:restriction base="D2LogicalModel:NonNegativeInteger" />
  </xs:simpleType>
  <xs:complexType name="MultilingualString">
    <xs:sequence>
      <xs:element name="values">
        <xs:complexType>
          <xs:sequence>
            <xs:element name="value"
type="D2LogicalModel:MultilingualStringValue" maxOccurs="unbounded" />
          </xs:sequence>
        </xs:complexType>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
```

```
  <xs:complexType name="MultilingualStringValue">

    <xs:simpleContent>

      <xs:extension base="D2LogicalModel:MultilingualStringValueType">

        <xs:attribute name="lang" type="xs:language" />

      </xs:extension>

    </xs:simpleContent>

  </xs:complexType>

  <xs:simpleType name="MultilingualStringValueType">

    <xs:restriction base="xs:string">

      <xs:maxLength value="1024" />

    </xs:restriction>

  </xs:simpleType>

  <xs:complexType name="NetworkLocation" abstract="true">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:Location">

        <xs:sequence>

          <xs:element name="supplementaryPositionalDescription"
type="D2LogicalModel:SupplementaryPositionalDescription" minOccurs="0" />

          <xs:element name="destination" type="D2LogicalModel:Destination"
minOccurs="0" />

          <xs:element name="networkLocationExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:simpleType name="NonNegativeInteger">

    <xs:restriction base="xs:nonNegativeInteger" />

  </xs:simpleType>

  <xs:complexType name="NonOrderedLocationGroupByList">

    <xs:complexContent>
```

```
      <xs:extension base="D2LogicalModel:NonOrderedLocations">

        <xs:sequence>

          <xs:element name="locationContainedInGroup"
type="D2LogicalModel:Location" minOccurs="2" maxOccurs="unbounded" />

          <xs:element name="nonOrderedLocationGroupByListExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="NonOrderedLocationGroupByReference">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:NonOrderedLocations">

        <xs:sequence>

          <xs:element name="predefinedNonOrderedLocationGroupReference"
type="D2LogicalModel:_PredefinedNonOrderedLocationGroupVersionedReference"
minOccurs="1" maxOccurs="1" />

          <xs:element name="nonOrderedLocationGroupByReferenceExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="NonOrderedLocations" abstract="true">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:GroupOfLocations">

        <xs:sequence>

          <xs:element name="nonOrderedLocationsExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>
```

```
  </xs:complexType>

  <xs:complexType name="OffsetDistance">

    <xs:sequence>

      <xs:element name="offsetDistance"
type="D2LogicalModel:MetresAsNonNegativeInteger" minOccurs="1" maxOccurs="1" />

      <xs:element name="offsetDistanceExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

    </xs:sequence>

  </xs:complexType>

  <xs:simpleType name="Percentage">

    <xs:restriction base="D2LogicalModel:Float" />

  </xs:simpleType>

  <xs:complexType name="PercentageDistanceAlongLinearElement">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:DistanceAlongLinearElement">

        <xs:sequence>

          <xs:element name="percentageDistanceAlong"
type="D2LogicalModel:Percentage" minOccurs="1" maxOccurs="1" />

          <xs:element name="percentageDistanceAlongLinearElementExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="Point">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:NetworkLocation">

        <xs:sequence>

          <xs:element name="tpegPointLocation"
type="D2LogicalModel:TpegPointLocation" minOccurs="0" />

          <xs:element name="alertCPoint" type="D2LogicalModel:AlertCPoint"
minOccurs="0" />
```

```
          <xs:element name="pointAlongLinearElement"
type="D2LogicalModel:PointAlongLinearElement" minOccurs="0" />

          <xs:element name="pointByCoordinates"
type="D2LogicalModel:PointByCoordinates" minOccurs="0" />

          <xs:element name="pointExtension" type="D2LogicalModel:_ExtensionType"
minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="PointAlongLinearElement">

    <xs:sequence>

      <xs:element name="administrativeAreaOfPoint"
type="D2LogicalModel:MultilingualString" minOccurs="0" maxOccurs="1" />

      <xs:element name="directionBoundAtPoint"
type="D2LogicalModel:DirectionEnum" minOccurs="0" maxOccurs="1" />

      <xs:element name="directionRelativeAtPoint"
type="D2LogicalModel:LinearReferencingDirectionEnum" minOccurs="0" maxOccurs="1"
/>

      <xs:element name="heightGradeOfPoint" type="D2LogicalModel:HeightGradeEnum"
minOccurs="0" maxOccurs="1" />

      <xs:element name="linearElement" type="D2LogicalModel:LinearElement" />

      <xs:element name="distanceAlongLinearElement"
type="D2LogicalModel:DistanceAlongLinearElement" />

      <xs:element name="pointAlongLinearElementExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

    </xs:sequence>

  </xs:complexType>

  <xs:complexType name="PointByCoordinates">

    <xs:sequence>

      <xs:element name="bearing" type="D2LogicalModel:NonNegativeInteger"
minOccurs="0" maxOccurs="1" />

      <xs:element name="pointCoordinates" type="D2LogicalModel:PointCoordinates"
/>

      <xs:element name="pointByCoordinatesExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />
```

```
    </xs:sequence>

  </xs:complexType>

  <xs:complexType name="PointCoordinates">

    <xs:sequence>

      <xs:element name="latitude" type="D2LogicalModel:Float" minOccurs="1"
maxOccurs="1" />

      <xs:element name="longitude" type="D2LogicalModel:Float" minOccurs="1"
maxOccurs="1" />

      <xs:element name="pointCoordinatesExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

    </xs:sequence>

  </xs:complexType>

  <xs:complexType name="PointDestination">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:Destination">

        <xs:sequence>

          <xs:element name="point" type="D2LogicalModel:Point" />

          <xs:element name="pointDestinationExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="Referent">

    <xs:sequence>

      <xs:element name="referentIdentifier" type="D2LogicalModel:String"
minOccurs="1" maxOccurs="1" />

      <xs:element name="referentName" type="D2LogicalModel:String" minOccurs="0"
maxOccurs="1" />

      <xs:element name="referentType" type="D2LogicalModel:ReferentTypeEnum"
minOccurs="1" maxOccurs="1" />

      <xs:element name="referentDescription"
type="D2LogicalModel:MultilingualString" minOccurs="0" maxOccurs="1" />
```

```
      <xs:element name="pointCoordinates" type="D2LogicalModel:PointCoordinates"
minOccurs="0" />

      <xs:element name="referentExtension" type="D2LogicalModel:_ExtensionType"
minOccurs="0" />

    </xs:sequence>

  </xs:complexType>

  <xs:simpleType name="ReferentTypeEnum">

    <xs:restriction base="xs:string">

      <xs:enumeration value="boundary" />

      <xs:enumeration value="intersection" />

      <xs:enumeration value="referenceMarker" />

      <xs:enumeration value="landmark" />

      <xs:enumeration value="roadNode" />

    </xs:restriction>

  </xs:simpleType>

  <xs:simpleType name="String">

    <xs:restriction base="xs:string">

      <xs:maxLength value="1024" />

    </xs:restriction>

  </xs:simpleType>

  <xs:complexType name="SupplementaryPositionalDescription">

    <xs:sequence>

      <xs:element name="locationDescriptor"
type="D2LogicalModel:LocationDescriptorEnum" minOccurs="0" maxOccurs="unbounded"
/>

      <xs:element name="sequentialRampNumber"
type="D2LogicalModel:NonNegativeInteger" minOccurs="0" maxOccurs="1" />

      <xs:element name="affectedCarriagewayAndLanes"
type="D2LogicalModel:AffectedCarriagewayAndLanes" minOccurs="0"
maxOccurs="unbounded" />

      <xs:element name="supplementaryPositionalDescriptionExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

    </xs:sequence>
```

```
    <xs:attribute name="locationPrecision"
type="D2LogicalModel:MetresAsNonNegativeInteger" use="optional" />

  </xs:complexType>

  <xs:complexType name="TpegAreaDescriptor">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:TpegDescriptor">

        <xs:sequence>

          <xs:element name="tpegAreaDescriptorType"
type="D2LogicalModel:TpegLoc03AreaDescriptorSubtypeEnum" minOccurs="1"
maxOccurs="1" />

          <xs:element name="tpegAreaDescriptorExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="TpegAreaLocation" abstract="true">

    <xs:sequence>

      <xs:element name="tpegAreaLocationType"
type="D2LogicalModel:TpegLoc01AreaLocationSubtypeEnum" minOccurs="1"
maxOccurs="1" />

      <xs:element name="tpegHeight" type="D2LogicalModel:TpegHeight"
minOccurs="0" />

      <xs:element name="tpegAreaLocationExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

    </xs:sequence>

  </xs:complexType>

  <xs:complexType name="TpegDescriptor" abstract="true">

    <xs:sequence>

      <xs:element name="descriptor" type="D2LogicalModel:MultilingualString"
minOccurs="1" maxOccurs="1" />

      <xs:element name="tpegDescriptorExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

    </xs:sequence>
```

```
  </xs:complexType>

  <xs:complexType name="TpegFramedPoint">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:TpegPointLocation">

        <xs:sequence>

          <xs:element name="tpegFramedPointLocationType"
type="D2LogicalModel:TpegLoc01FramedPointLocationSubtypeEnum" minOccurs="1"
maxOccurs="1" />

          <xs:element name="framedPoint"
type="D2LogicalModel:TpegNonJunctionPoint" />

          <xs:element name="to" type="D2LogicalModel:TpegPoint" />

          <xs:element name="from" type="D2LogicalModel:TpegPoint" />

          <xs:element name="tpegFramedPointExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="TpegGeometricArea">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:TpegAreaLocation">

        <xs:sequence>

          <xs:element name="radius"
type="D2LogicalModel:MetresAsNonNegativeInteger" minOccurs="1" maxOccurs="1" />

          <xs:element name="centrePoint" type="D2LogicalModel:PointCoordinates"
/>

          <xs:element name="name" type="D2LogicalModel:TpegAreaDescriptor"
minOccurs="0" />

          <xs:element name="tpegGeometricAreaExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>
```

```
  </xs:complexType>

  <xs:complexType name="TpegHeight">

    <xs:sequence>

      <xs:element name="height" type="D2LogicalModel:MetresAsFloat" minOccurs="0"
maxOccurs="1" />

      <xs:element name="heightType" type="D2LogicalModel:TpegLoc04HeightTypeEnum"
minOccurs="1" maxOccurs="1" />

      <xs:element name="tpegHeightExtension" type="D2LogicalModel:_ExtensionType"
minOccurs="0" />

    </xs:sequence>

  </xs:complexType>

  <xs:complexType name="TpegIlcPointDescriptor">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:TpegPointDescriptor">

        <xs:sequence>

          <xs:element name="tpegIlcPointDescriptorType"
type="D2LogicalModel:TpegLoc03IlcPointDescriptorSubtypeEnum" minOccurs="1"
maxOccurs="1" />

          <xs:element name="tpegIlcPointDescriptorExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="TpegJunction">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:TpegPoint">

        <xs:sequence>

          <xs:element name="pointCoordinates"
type="D2LogicalModel:PointCoordinates" />

          <xs:element name="name"
type="D2LogicalModel:TpegJunctionPointDescriptor" minOccurs="0" />

          <xs:element name="ilc" type="D2LogicalModel:TpegIlcPointDescriptor"
maxOccurs="3" />
```

```
          <xs:element name="otherName"
type="D2LogicalModel:TpegOtherPointDescriptor" minOccurs="0"
maxOccurs="unbounded" />

          <xs:element name="tpegJunctionExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="TpegJunctionPointDescriptor">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:TpegPointDescriptor">

        <xs:sequence>

          <xs:element name="tpegJunctionPointDescriptorType"
type="D2LogicalModel:TpegLoc03JunctionPointDescriptorSubtypeEnum" minOccurs="1"
maxOccurs="1" />

          <xs:element name="tpegJunctionPointDescriptorExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="TpegLinearLocation">

    <xs:sequence>

      <xs:element name="tpegDirection" type="D2LogicalModel:DirectionEnum"
minOccurs="1" maxOccurs="1" />

      <xs:element name="tpegLinearLocationType"
type="D2LogicalModel:TpegLoc01LinearLocationSubtypeEnum" minOccurs="1"
maxOccurs="1" />

      <xs:element name="to" type="D2LogicalModel:TpegPoint" />

      <xs:element name="from" type="D2LogicalModel:TpegPoint" />

      <xs:element name="tpegLinearLocationExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

    </xs:sequence>
```

```
  </xs:complexType>
  <xs:simpleType name="TpegLoc01AreaLocationSubtypeEnum">
    <xs:restriction base="xs:string">
      <xs:enumeration value="largeArea" />
      <xs:enumeration value="other" />
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="TpegLoc01FramedPointLocationSubtypeEnum">
    <xs:restriction base="xs:string">
      <xs:enumeration value="framedPoint" />
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="TpegLoc01LinearLocationSubtypeEnum">
    <xs:restriction base="xs:string">
      <xs:enumeration value="segment" />
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="TpegLoc01SimplePointLocationSubtypeEnum">
    <xs:restriction base="xs:string">
      <xs:enumeration value="intersection" />
      <xs:enumeration value="nonLinkedPoint" />
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="TpegLoc03AreaDescriptorSubtypeEnum">
    <xs:restriction base="xs:string">
      <xs:enumeration value="administrativeAreaName" />
      <xs:enumeration value="administrativeReferenceName" />
      <xs:enumeration value="areaName" />
      <xs:enumeration value="countyName" />
```

```
      <xs:enumeration value="lakeName" />
      <xs:enumeration value="nationName" />
      <xs:enumeration value="policeForceControlAreaName" />
      <xs:enumeration value="regionName" />
      <xs:enumeration value="seaName" />
      <xs:enumeration value="townName" />
      <xs:enumeration value="other" />
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="TpegLoc03IlcPointDescriptorSubtypeEnum">
    <xs:restriction base="xs:string">
      <xs:enumeration value="tpegIlcName1" />
      <xs:enumeration value="tpegIlcName2" />
      <xs:enumeration value="tpegIlcName3" />
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="TpegLoc03JunctionPointDescriptorSubtypeEnum">
    <xs:restriction base="xs:string">
      <xs:enumeration value="junctionName" />
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="TpegLoc03OtherPointDescriptorSubtypeEnum">
    <xs:restriction base="xs:string">
      <xs:enumeration value="administrativeAreaName" />
      <xs:enumeration value="administrativeReferenceName" />
      <xs:enumeration value="airportName" />
      <xs:enumeration value="areaName" />
      <xs:enumeration value="buildingName" />
      <xs:enumeration value="busStopIdentifier" />
```

```
      <xs:enumeration value="busStopName" />
      <xs:enumeration value="canalName" />
      <xs:enumeration value="countyName" />
      <xs:enumeration value="ferryPortName" />
      <xs:enumeration value="intersectionName" />
      <xs:enumeration value="lakeName" />
      <xs:enumeration value="linkName" />
      <xs:enumeration value="localLinkName" />
      <xs:enumeration value="metroStationName" />
      <xs:enumeration value="nationName" />
      <xs:enumeration value="nonLinkedPointName" />
      <xs:enumeration value="parkingFacilityName" />
      <xs:enumeration value="pointName" />
      <xs:enumeration value="pointOfInterestName" />
      <xs:enumeration value="railwayStation" />
      <xs:enumeration value="regionName" />
      <xs:enumeration value="riverName" />
      <xs:enumeration value="seaName" />
      <xs:enumeration value="serviceAreaName" />
      <xs:enumeration value="tidalRiverName" />
      <xs:enumeration value="townName" />
      <xs:enumeration value="other" />
    </xs:restriction>
  </xs:simpleType>
  <xs:simpleType name="TpegLoc04HeightTypeEnum">
    <xs:restriction base="xs:string">
      <xs:enumeration value="above" />
      <xs:enumeration value="aboveSeaLevel" />
      <xs:enumeration value="aboveStreetLevel" />
```

```
      <xs:enumeration value="at" />

      <xs:enumeration value="atSeaLevel" />

      <xs:enumeration value="atStreetLevel" />

      <xs:enumeration value="below" />

      <xs:enumeration value="belowSeaLevel" />

      <xs:enumeration value="belowStreetLevel" />

      <xs:enumeration value="undefined" />

      <xs:enumeration value="unknown" />

      <xs:enumeration value="other" />

    </xs:restriction>

  </xs:simpleType>

  <xs:complexType name="TpegNamedOnlyArea">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:TpegAreaLocation">

        <xs:sequence>

          <xs:element name="name" type="D2LogicalModel:TpegAreaDescriptor"
maxOccurs="unbounded" />

          <xs:element name="tpegNamedOnlyAreaExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="TpegNonJunctionPoint">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:TpegPoint">

        <xs:sequence>

          <xs:element name="pointCoordinates"
type="D2LogicalModel:PointCoordinates" />

          <xs:element name="name" type="D2LogicalModel:TpegOtherPointDescriptor"
maxOccurs="unbounded" />
```

```
          <xs:element name="tpegNonJunctionPointExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="TpegOtherPointDescriptor">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:TpegPointDescriptor">

        <xs:sequence>

          <xs:element name="tpegOtherPointDescriptorType"
type="D2LogicalModel:TpegLoc03OtherPointDescriptorSubtypeEnum" minOccurs="1"
maxOccurs="1" />

          <xs:element name="tpegOtherPointDescriptorExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="TpegPoint" abstract="true">

    <xs:sequence>

      <xs:element name="tpegPointExtension" type="D2LogicalModel:_ExtensionType"
minOccurs="0" />

    </xs:sequence>

  </xs:complexType>

  <xs:complexType name="TpegPointDescriptor" abstract="true">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:TpegDescriptor">

        <xs:sequence>

          <xs:element name="tpegPointDescriptorExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>
```

```
      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="TpegPointLocation" abstract="true">

    <xs:sequence>

      <xs:element name="tpegDirection" type="D2LogicalModel:DirectionEnum"
minOccurs="1" maxOccurs="1" />

      <xs:element name="tpegPointLocationExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

    </xs:sequence>

  </xs:complexType>

  <xs:complexType name="TpegSimplePoint">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:TpegPointLocation">

        <xs:sequence>

          <xs:element name="tpegSimplePointLocationType"
type="D2LogicalModel:TpegLoc01SimplePointLocationSubtypeEnum" minOccurs="1"
maxOccurs="1" />

          <xs:element name="point" type="D2LogicalModel:TpegPoint" />

          <xs:element name="tpegSimplePointExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="VersionedReference">

    <xs:attribute name="id" type="xs:string" use="required" />

    <xs:attribute name="version" type="xs:string" use="required" />

  </xs:complexType>

</xs:schema>
```

B.3 The PredefinedLocationsPublication subschema

```
?xml version="1.0" encoding="utf-8" standalone="no"?>

<xs:schema elementFormDefault="qualified" attributeFormDefault="unqualified"
xmlns:D2LogicalModel="http://datex2.eu/schema/2/2_0"
targetNamespace="http://datex2.eu/schema/2/2_0"
xmlns:xs="http://www.w3.org/2001/XMLSchema" version="2.0">

  <xs:complexType name="_ExtensionType">

    <xs:sequence>

      <xs:any namespace="##any" processContents="lax" minOccurs="0"
maxOccurs="unbounded" />

    </xs:sequence>

  </xs:complexType>

  <xs:complexType name="_PredefinedItineraryIndexPredefinedLocation">

    <xs:sequence>

      <xs:element name="predefinedLocation"
type="D2LogicalModel:PredefinedLocation" minOccurs="1" maxOccurs="1" />

    </xs:sequence>

    <xs:attribute name="index" type="xs:int" use="required" />

  </xs:complexType>

  <xs:simpleType name="AreaOfInterestEnum">

    <xs:restriction base="xs:string">

      <xs:enumeration value="continentWide" />

      <xs:enumeration value="national" />

      <xs:enumeration value="neighbouringCountries" />

      <xs:enumeration value="notSpecified" />

      <xs:enumeration value="regional" />

    </xs:restriction>

  </xs:simpleType>

  <xs:simpleType name="ConfidentialityValueEnum">

    <xs:restriction base="xs:string">

      <xs:enumeration value="internalUse" />

      <xs:enumeration value="noRestriction" />
```

```
      <xs:enumeration value="restrictedToAuthorities" />

      <xs:enumeration value="restrictedToAuthoritiesAndTrafficOperators" />

      <xs:enumeration
value="restrictedToAuthoritiesTrafficOperatorsAndPublishers" />

      <xs:enumeration value="restrictedToAuthoritiesTrafficOperatorsAndVms" />

    </xs:restriction>

  </xs:simpleType>

  <xs:complexType name="ExternalReferencing">

    <xs:sequence>

      <xs:element name="externalLocationCode" type="D2LogicalModel:String"
minOccurs="1" maxOccurs="1" />

      <xs:element name="externalReferencingSystem" type="D2LogicalModel:String"
minOccurs="1" maxOccurs="1" />

      <xs:element name="externalReferencingExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

    </xs:sequence>

  </xs:complexType>

  <xs:simpleType name="Float">

    <xs:restriction base="xs:float" />

  </xs:simpleType>

  <xs:complexType name="GroupOfLocations" abstract="true">

    <xs:sequence>

      <xs:element name="groupOfLocationsExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

    </xs:sequence>

  </xs:complexType>

  <xs:complexType name="HeaderInformation">

    <xs:sequence>

      <xs:element name="areaOfInterest" type="D2LogicalModel:AreaOfInterestEnum"
minOccurs="0" maxOccurs="1" />

      <xs:element name="confidentiality"
type="D2LogicalModel:ConfidentialityValueEnum" minOccurs="1" maxOccurs="1" />
```

```
      <xs:element name="informationStatus"
type="D2LogicalModel:InformationStatusEnum" minOccurs="1" maxOccurs="1" />

      <xs:element name="urgency" type="D2LogicalModel:UrgencyEnum" minOccurs="0"
maxOccurs="1" />

      <xs:element name="headerInformationExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

    </xs:sequence>

  </xs:complexType>

  <xs:simpleType name="InformationStatusEnum">

    <xs:restriction base="xs:string">

      <xs:enumeration value="real" />

      <xs:enumeration value="securityExercise" />

      <xs:enumeration value="technicalExercise" />

      <xs:enumeration value="test" />

    </xs:restriction>

  </xs:simpleType>

  <xs:complexType name="Location" abstract="true">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:GroupOfLocations">

        <xs:sequence>

          <xs:element name="externalReferencing"
type="D2LogicalModel:ExternalReferencing" minOccurs="0" maxOccurs="unbounded" />

          <xs:element name="locationForDisplay"
type="D2LogicalModel:PointCoordinates" minOccurs="0" />

          <xs:element name="locationExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="MultilingualString">

    <xs:sequence>
```

```
      <xs:element name="values">
        <xs:complexType>
          <xs:sequence>
            <xs:element name="value"
type="D2LogicalModel:MultilingualStringValue" maxOccurs="unbounded" />
          </xs:sequence>
        </xs:complexType>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="MultilingualStringValue">
    <xs:simpleContent>
      <xs:extension base="D2LogicalModel:MultilingualStringValueType">
        <xs:attribute name="lang" type="xs:language" />
      </xs:extension>
    </xs:simpleContent>
  </xs:complexType>
  <xs:simpleType name="MultilingualStringValueType">
    <xs:restriction base="xs:string">
      <xs:maxLength value="1024" />
    </xs:restriction>
  </xs:simpleType>
  <xs:complexType name="PayloadPublication" abstract="true">
    <xs:sequence>
      <xs:element name="payloadPublicationExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />
    </xs:sequence>
  </xs:complexType>
  <xs:complexType name="PointCoordinates">
    <xs:sequence>
```

```
      <xs:element name="latitude" type="D2LogicalModel:Float" minOccurs="1"
maxOccurs="1" />

      <xs:element name="longitude" type="D2LogicalModel:Float" minOccurs="1"
maxOccurs="1" />

      <xs:element name="pointCoordinatesExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

    </xs:sequence>

  </xs:complexType>

  <xs:complexType name="PredefinedItinerary">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:PredefinedLocationContainer">

        <xs:sequence>

          <xs:element name="predefinedItineraryName"
type="D2LogicalModel:MultilingualString" minOccurs="0" maxOccurs="1" />

          <xs:element name="predefinedLocation"
type="D2LogicalModel:_PredefinedItineraryIndexPredefinedLocation" minOccurs="0"
maxOccurs="unbounded" />

          <xs:element name="predefinedItineraryExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

        <xs:attribute name="id" type="xs:string" use="required" />

        <xs:attribute name="version" type="xs:string" use="required" />

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="PredefinedLocation">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:PredefinedLocationContainer">

        <xs:sequence>

          <xs:element name="predefinedLocationName"
type="D2LogicalModel:MultilingualString" minOccurs="0" maxOccurs="1" />

          <xs:element name="location" type="D2LogicalModel:Location" />

          <xs:element name="predefinedLocationExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />
```

```
        </xs:sequence>

        <xs:attribute name="id" type="xs:string" use="required" />

        <xs:attribute name="version" type="xs:string" use="required" />

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="PredefinedLocationContainer" abstract="true">

    <xs:sequence>

      <xs:element name="predefinedLocationContainerExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

    </xs:sequence>

  </xs:complexType>

  <xs:complexType name="PredefinedLocationsPublication">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:PayloadPublication">

        <xs:sequence>

          <xs:element name="headerInformation"
type="D2LogicalModel:HeaderInformation" />

          <xs:element name="predefinedLocationContainer"
type="D2LogicalModel:PredefinedLocationContainer" maxOccurs="unbounded" />

          <xs:element name="predefinedLocationsPublicationExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:complexType name="PredefinedNonOrderedLocationGroup">

    <xs:complexContent>

      <xs:extension base="D2LogicalModel:PredefinedLocationContainer">

        <xs:sequence>

          <xs:element name="predefinedNonOrderedLocationGroupName"
type="D2LogicalModel:MultilingualString" minOccurs="0" maxOccurs="1" />
```

```
          <xs:element name="predefinedLocation"
type="D2LogicalModel:PredefinedLocation" minOccurs="2" maxOccurs="unbounded" />

          <xs:element name="predefinedNonOrderedLocationGroupExtension"
type="D2LogicalModel:_ExtensionType" minOccurs="0" />

        </xs:sequence>

        <xs:attribute name="id" type="xs:string" use="required" />

        <xs:attribute name="version" type="xs:string" use="required" />

      </xs:extension>

    </xs:complexContent>

  </xs:complexType>

  <xs:simpleType name="String">

    <xs:restriction base="xs:string">

      <xs:maxLength value="1024" />

    </xs:restriction>

  </xs:simpleType>

  <xs:simpleType name="UrgencyEnum">

    <xs:restriction base="xs:string">

      <xs:enumeration value="extremelyUrgent" />

      <xs:enumeration value="urgent" />

      <xs:enumeration value="normalUrgency" />

    </xs:restriction>

  </xs:simpleType>

</xs:schema>
```

Annex C
(informative)

Locations referencing methods

C.1 Overall approach

C.1.1 General

Most traffic and travel messages contain location references, which define the “where” for these messages. Typically, these indicate:

— location of a traffic and travel situation described in the message;

— location of a route guidance link about which data is given;

— location of a public transport stop in a timetable;

— et cetera.

Traffic and travel messages support a wide variety of location referencing methods. This informative annex explains a variety of possible approaches. Some of these are currently used or possible in ALERT-C. Some are used by DATEX II. Others are just provided for information. The following explanations are drawn from EN ISO 14819-3:2004 or prEN ISO 19148. More detailed information can be found in these standards as well as in ISO 17572-1:2008

A location in traffic telematics terminology may be defined as a real world object that has a geographical position.

Examples of locations are parts of the road network (e.g. a road crossing, a road section), landmarks (e.g. a bridge) and points of interest (e.g. a petrol station). The technique to reference locations is called location referencing.

Several approaches to location referencing exist. Locations may be referenced by:

— location names

  Descriptive identifiers;
  Examples: names of cities, towns, and villages; street names; road numbers; public transport route numbers; junction names and numbers;

— distance marker systems

  Kilometre-post or milepost systems along transport routes;

— co-ordinates

  Longitude/latitude references, such as ETRS89, or rectangular grid references, such as UTM co-ordinates (Universal Transverse Mercator);

— hybrid references

  Use a combination of co-ordinates and (parts of) descriptive identifiers;

— pre-defined codes

In this approach locations are pre-defined and pre-coded. This approach is used in ALERT-C, and described in more detail in C.2.7.

C.1.2 Pre-defined locations

In many traffic applications, locations are pre-defined prior to use. Their details (i.e. location names, kilometre references, and/or co-ordinates) are stored in reference tables. Pre-defined locations are referenced by their location code, which is the tabular address of the pre-stored location details. Pre-defined locations are normally defined by the responsible agency in a country and standardised across all users.

C.1.3 GDF features

GDF (Geographic Data File) is an international standard [3] for representing geographic information in digital form. It provides an exchange format for proprietary digital maps. In principle, each geographic feature on a map has an equivalent representation in GDF format.

Many traffic and travel locations can be specified in terms of GDF features. However, traffic and travel messaging locations can be functionally distinct from GDF features.

C.1.4 Linear referencing systems

Linear Referencing Systems are in wide use in transport domain. They allow for the specification of positions along linear elements by using measured distances along (and optionally perpendicular to) the element. This is in contrast to using spatial positions which use two or three dimensional coordinates, consistent with a particular coordinate reference system.

Linearly referenced locations are significant for several reasons. First, a significant amount of information is currently held in huge databases from legacy systems which predated Geographic Information Systems (GIS). Second, in some situations, having a linearly referenced location along a known linear element is advantageous over knowing its spatial position. Consider a crash in need of emergency assistance. Knowing the linear element (e.g. “A86 intérieur”) and the approximate linear location is superior to having a potentially more precise spatial GPS location that is not of significant accuracy to know if it is on the outer ring or the inner ring of A86, especially when an impassable barrier separates the two carriageways.

C.2 Methods for ALERT-C

C.2.1 General

This section summarises several methods of referencing affected road sections (see Figure C.1) in traffic and travel messages with ALERT-C. Not all methods can be used in all types of messages.

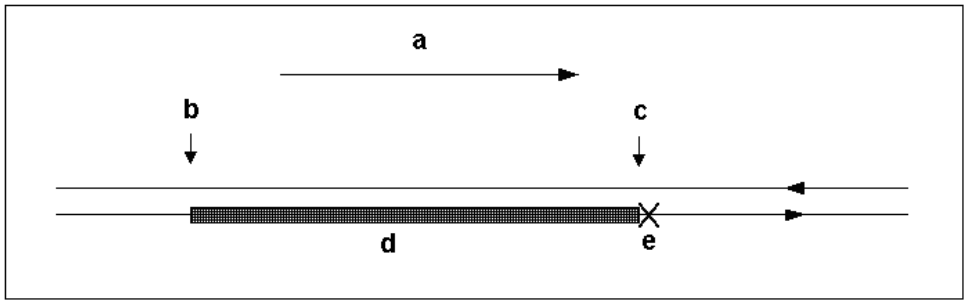
To avoid ambiguity, both primary and secondary location shall lie on the same road, i.e. can be connected by ‘stepping through’ the offsets in the location table (see C.2.2, C.2.8).

C.2.2 Primary and secondary locations

Many location references in traffic applications extend geographically through several adjacent sections of road. The concept of primary and secondary locations is used in ALERT-C to indicate the extremities of the affected sections, without having to list all the intervening places.

For example, if an accident occurs at point “xyz” on A10, and the resulting queue extends back to point “uvw”, the situation location can be defined as A10, point “xyz” – point “uvw” (Figure C.1).

Point “xyz” is defined as the primary location, and point “uvw” as the secondary location. For situation locations, by convention, the primary location is taken to mean the end where the cause of the problem can be found, whenever a cause can be pinpointed geographically.



Key
a positive direction
b secondary location
c primary location
d traffic queue
e accident

Figure C.1 — Primary and secondary locations

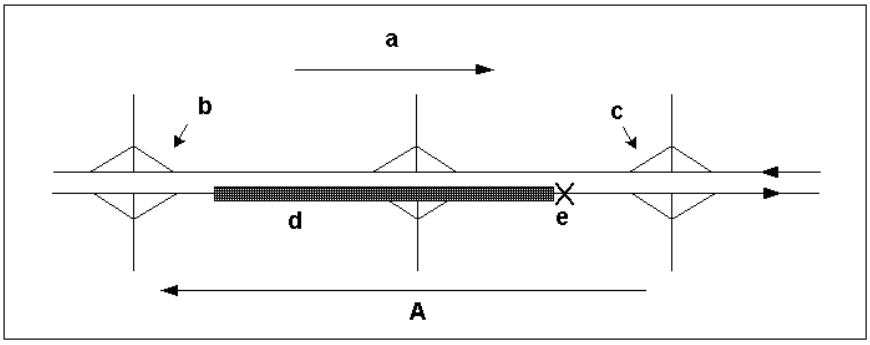
Thus, the primary location indicates the origin of the situation (e.g. the accident site). Where situations have no distinctive origin, either end of the location can be designated the primary location. The secondary location is at the other end of the affected length or area.

C.2.3 Pre-defined primary location + extent

This method requires a pre-defined hierarchical database of locations, including positive and negative offsets. These databases or tables can contain lists of text location names, distance marker references (i.e. road number and kilometre post), latitude/longitude references, and/or any other desired system of location referencing.

The primary location is indicated using the pre-defined location code of the nearest defined downstream location, measured in the direction of travel. The pre-defined secondary location is often indicated relative to the pre-defined primary location by means of an extent. Extent measures how far the situation spreads.

Extent is the number of steps along the road, from the pre-defined primary location, through other pre-defined locations, to reach the pre-defined secondary location. Extent data comprise a sign (+ or -) and a number of steps (Figure C.2).

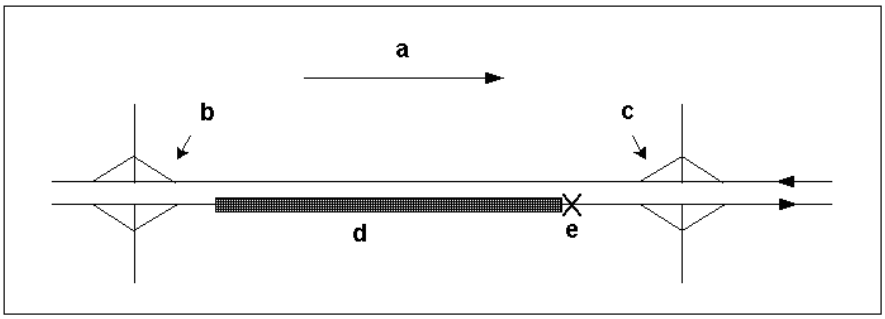


Key
a positive direction
b pre-defined secondary location
c pre-defined primary location
d traffic queue
e accident
A extent = -2

Figure C.2 — Pre-defined primary location + extent

C.2.4 Pre-defined primary and secondary locations

A variant of method C.2.2 uses primary and secondary location codes directly, instead of indicating the secondary location by means of extent (Figure C.2).



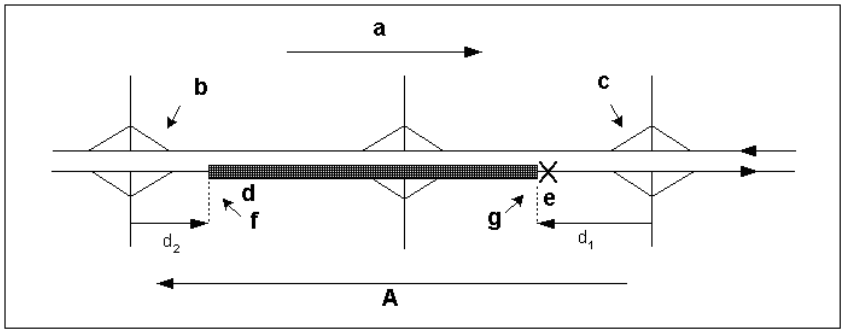
Key
a positive direction
b pre-defined secondary location
c pre-defined primary location
d traffic queue
e accident

Figure C.3 — Pre-defined primary and secondary locations

Where pre-defined locations are used in the ways as described in C.2.2 and C.2.3, situations may not occur exactly between pre-defined points. In this case, the pre-defined primary location is at the nearest pre-defined location downstream from the origin of the situation (measured in the direction of travel). The pre-defined secondary location lies beyond the furthest extent of the situation (e.g. the back of the queue). These pre-defined points entirely bracket (i.e. straddle; enclose) the actual situation on the ground (Figures C.2 and C.3).

C.2.5 Primary and secondary locations using pre-defined location, extent and distances

In this method, the pre-defined primary location is the nearest defined downstream location, the pre-defined secondary location is indicated in terms of extent. The predefined points entirely bracket the actual situation on the ground (Figure C.6). The primary and secondary locations are each given by the pre-defined location and a distance. For the primary location, the distance is measured from the pre-defined location in upstream direction. For the secondary location, the distance is measured from the pre-defined location in downstream direction.

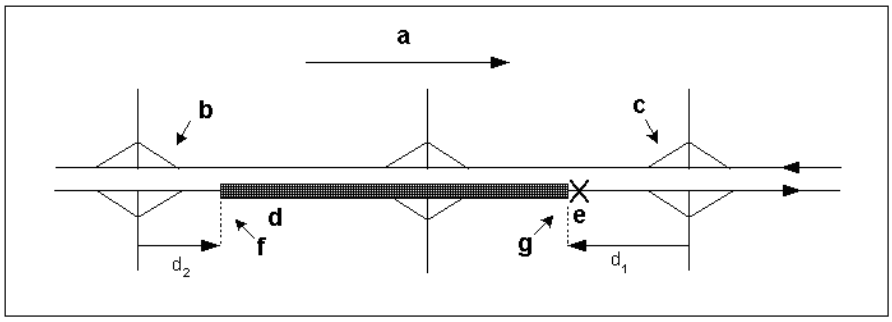


Key
a positive direction
b pre-defined secondary location
c pre-defined primary location
d traffic queue
e accident
f secondary location
g primary location
A extent = -2

Figure C.4 — Pre-defined location, extent and distances

C.2.6 Primary and secondary locations using Pre-defined locations + distances

This method is a variant of method C.2.6 in which the pre-defined secondary location is given directly, instead of indicating it by means of extent. The pre-defined secondary location is the nearest pre-defined location upstream of the situation (Figure C.7).



Key

a positive direction
b pre-defined secondary location
c pre-defined primary location
d traffic queue
e accident
f secondary location
g primary location

Figure C.5 — Pre-defined locations and distances

C.2.7 Explanation for ALERT-C

In many cases events affecting road traffic cover a number of locations, such as where an accident results in long tailbacks. The ALERT-C protocol defines such occurrences by the method described in C.2.2, using the direction and extent fields of the standard ALERT-C message.

These fields consist of four bits of information: 1 direction bit and 3 extent bits. The direction bit indicates the direction of queue growth, not the direction of traffic flow affected by the event. The interpretation of the direction bit is as follows:

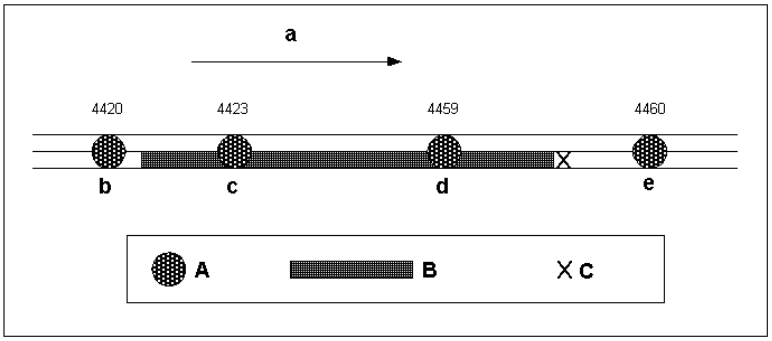
Direction bit = 0 (positive) Direction of queue growth is in the positive road direction, traffic driving in the negative road direction is affected, the positive offset column is to be used to execute the number of steps indicated by the extent.

Direction bit = 1 (negative) Direction of queue growth is in the negative road direction, traffic driving in the positive road direction is affected, the negative offset column is to be used to execute the number of steps indicated by the extent.

The extent bits identify the number of locations along the road that are affected by the problem with a maximum of 8 (primary location and 7 related locations). An extent of 1 would identify the secondary location (the end of the event's extent) as being the next location along the road from the primary location. An extent of 3 would force the receiver to search the database for the third location along the road from the primary location. This is illustrated in Table C.1 and Figure C.8.

Table C.1 — Coding example

location code	code of location (sub) type	road/ junction number	first name	second name	area ref..	linear ref.	negative offset	positive offset
2009	A6.2		Greater Neighbourhood		1			
949	L3.0	E1	X-town	Y-Town	2009		948	950
4420	P3.2		Bridge		2009	949	4456	4423
4423	P1.3	J1	Junction J1	N207	2009	949	4420	4459
4459	P3.3		Parking		2009	949	4423	4460
4460	P1.3	J2	Junction J2		2009	949	4459	4461



Key
a positive direction
b bridge
c junction J1
d parking
e junction J2
A location
B traffic queue
C accident

Figure C.6 — Accident on E1 showing extent

An accident occurring on the E1 between Parking and Junction J2 on the eastbound carriageway stops traffic in the positive road direction. The resulting queue of traffic therefore extends in the negative direction. The full description of the incident would be: E1, X-Town direction Y-Town, between Bridge (the first location which motorists will reach) and Junction J2 (the source of the problem), accident, stationary traffic. This would be coded as:

— Primary location 4460 (Junction J2)

— Direction bit 1 (negative)

— Extent 3 (3 steps to location 4420 - Bridge)

C.3 Linear Referencing Methods

C.3.1 Absolute Linear Referencing Methods

C.3.1.1 General

In accordance with absolute LRMs, measurements are made along the linear element from its start, in the direction of the linear element. Commonly used absolute LRMs include kilometre-point, milepoint, kilometre-point with offsets in metres and milepoint with offsets in feet.

C.3.1.2 Kilometre-point

Kilometre-point is perhaps the simplest and, together with its US analogue milepoint LRM, represents the most common LRM. Measurements are made in kilometres along the linear element from its start, in the direction of the linear element. This LRM may also be named kilopoint.

The LR Distance Expression is merely a distance along value in kilometres to point A in Figure C.7 below. A value of 0 (zero) represents a location at the start of the linear element. A value equal to the length of the linear element represents a location at the end of the linear element. The length of the linear element can be determined by its measurement operation.

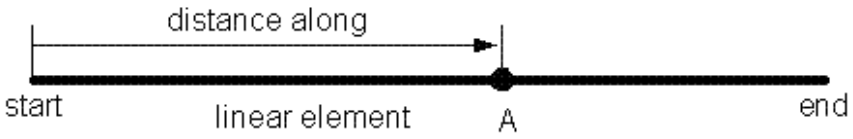


Figure C.7 — Linearly referenced location A with a kilometre-point LRM

C.3.1.3 Milepoint

The milepoint LRM is identical to the kilometre-point LRM except that the LRM unit is mile instead of kilometre and the distance along measured values are in decimal miles. This LRM may also be named true mileage.

C.3.1.4 Chainage

The chainage LRM is identical to the kilometre-point LRM except that the LRM unit is metre instead of kilometre. Though the original British definition of “chainage” might imply measuring in chains, “chainage” was adopted as a consensus term for this LRM by a team of European Road Authority representatives (including British) for EN ISO 14825 Geographic Data Files (GDF) [3].

C.3.1.5 Hectometre-point

The hectometre-point LRM is identical to the kilometre-point LRM except that the LRM unit is hectometre (100 metres) instead of kilometre and the distance along measured values are in hectometres.

C.3.1.6 Reverse kilopoint and milepoint

Similar to kilopoint and milepoint, respectively, except that measuring is done in a direction opposite of the direction of the linear element, that is, from the end of the linear element towards the start.

C.3.1.7 Link Offset

Many organizations establish a topological network of links and nodes and then specify linear locations along uniquely identified links as an absolute distance from the start of the link (the begin node location). What is typically referred to as “link offset” is actually the application of an absolute LRM (kilometre-point, milepoint) to link linear elements.

C.3.2 Relative Linear Referencing Methods

C.3.2.1 General

In accordance with relative LRMs, measurements are made along the linear element from a specified “from” referent location, usually in the direction of the linear element unless overridden by a “towards” referent, in which case the direction from the “from” referent towards the “towards” referent. Commonly used relative LRMs include kilopost (also known as kilometre-post), its US equivalent milepost, reference post, district kilopoint and street intersection.

C.3.2.2 Kilopost

Kilopost is perhaps the simplest relative type of LRM. Measurements are made in kilometres along the linear element from the closest, preceding kilopost. Measuring is done in the direction of increasing kilopost numbers which is usually the direction of the linear element. Kiloposts are one kilometre apart.

The Distance Expression specifies a distance along value measured in kilometres from a specified kilopost (from referent) to point B in Figure C.8. A value of 0 (zero) represents a location at the referent location.

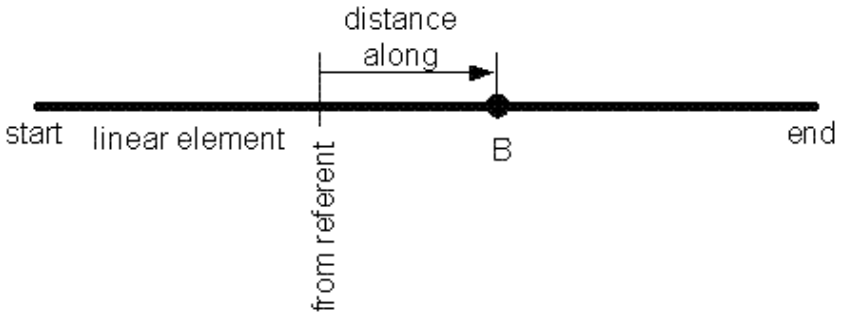


Figure C.8 — Linearly referenced location B with a kilopost LRM

C.3.2.3 Kilometre-post

Alternative name for kilopost LRM.

C.3.2.4 Milepost

The milepost LRM is similar to the kilopost LRM except that the LRM unit is mile instead of kilometre and the distance along measured values are in miles. Mileposts are exactly one mile apart. If not, it is actually a mile reference post LRM. Milepost locations would be specified by using a mileage LRM such as milepoint or milepost, or would be implicitly inferred by the milepost name.

C.3.2.5 Reference post

The reference post LRM is similar to the kilopost LRM except that the reference posts are not necessarily exactly one kilometre apart. It is therefore necessary to explicitly specify the location (or possibly position) of each reference post. This can be done with a kilopoint LRM, specifying their absolute distance along from the beginning of the underlying Feature. Alternatively, they can be located using a relative reference post LRM, locating each reference post a distance along from the previous LRM. Then, if reconstruction occurs, only those reference posts in the reconstruction area which are moved would have to have their distance along updated.

C.3.2.6 District kilopoint

The district kilopoint LRM allows the kilopoint value to be reset to zero when a road enters a new district. If the linear element along which locations are to be linearly referenced is a single road that traverses through many districts, then this LRM is used. Linearly referenced locations are specified as a distance in kilometres from where the road enters the district (the from referent).

C.3.2.7 Cross street

The cross street LRM allows a location to be specified at a distance along a linear element, measured in kilometres from the intersection of one street with the linear element in a direction towards the intersection of another street with the linear element.

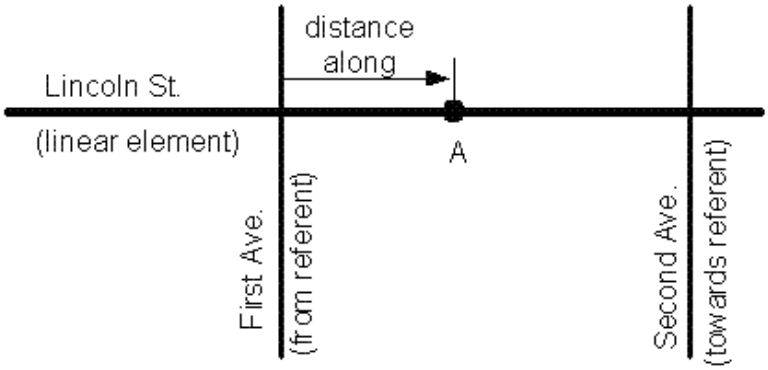


Figure C.9 — Linearly referenced location C with a street intersection LRM

C.3.3 Interpolative Linear Referencing Methods

C.3.3.1 General

In accordance with interpolative LRMs, measurements are interpolated in accordance with the default length of the linear element. Commonly used interpolative LRMs include percentage and normalised. Interpolative LRM are the only ones which are likely to be used for linear elements of type “geographic”.

C.3.3.2 Percentage

Percentage is another commonly used LRM. Measurements are made along the linear element from its start and are expressed as the percentage that this is of the total length of the linear element.

The Distance Expression is merely a distance along value expressed as the percentage that the distance from the start of the linear element to point A in Figure C.10 below is to the overall length of the linear element. A value of 0 (zero) represents a location at the start of the linear element. A value of 100 represents a location at the start of the linear element. The overall length of the linear element is returned by its measure operation.

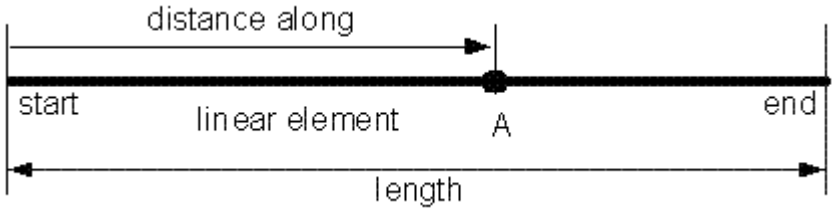


Figure C.10 — Linearly referenced location A with a percentage LRM

C.3.3.3 Normalised

The normalised LRM is identical to the percentage LRM except that the measured values range from 0 (zero) to 1 (one) instead of 0 to 100, where a measured value of 0 (zero) represents a location at the start of the linear element and 1 (one) represents a location at the end of the linear element.

Bibliography

[1] ISO 17572-1:2008, *Intelligent transport systems (ITS) — Location referencing for geographic databases — Part 1: General requirements and conceptual model*

[2] ISO 17572-2:2008, *Intelligent transport systems (ITS) — Location referencing for geographic databases — Part 2: Pre-coded location references (pre-coded profile)*

[3] EN ISO 14825:2004 — *Intelligent transport systems — Geographic Data Files (GDF) — Overall data specification (ISO 14825:2004)*

[4] EN ISO 3166-1:2006, *Codes for the representation of names of countries and their subdivisions — Part 1: Country codes (ISO 3166-1:2006)*

This page deliberately left blank

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.

...making excellence a habit.™