BS ISO 17572-2:2018

BSI Standards Publication

Intelligent transport systems (ITS) — Location referencing for geographic databases

Part 2: Pre-coded location references (pre-coded profile)

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National foreword

This British Standard is the UK implementation of ISO 17572-2:2018. It supersedes BS ISO 17572-2:2015, which is withdrawn.

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

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

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INTERNATIONAL STANDARD

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Third edition
2018-09

Intelligent transport systems (ITS) — Location referencing for geographic databases —

Part 2: Pre-coded location references (pre-coded profile)

Systèmes intelligents de transport (SIT) — Localisation pour bases de données géographiques —

Partie 2: Localisations précodées (profil précodé)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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

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

This third edition cancels and replaces the second edition (ISO 17572-2:2015), which has been technically revised.

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

— added the description of Extended TMC Location reference (Annex E, F & G).

A list of all parts in the ISO 17572 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

A Location Reference (LR) is a unique identification of a geographic object. In a digital world, a real-world geographic object can be represented by a feature in a geographic database. An example of a commonly known LR is a postal address of a house. Examples of object instances include a particular exit ramp on a particular motorway, a road junction or a hotel. For efficiency reasons, LRs are often coded. This is especially significant if the LR is used to define the location for information about various objects between different systems. For Intelligent Transport Systems (ITS), many different types of real-world objects are addressed. Amongst these, Location Referencing of the road network, or components thereof, is a particular focus.

Communication of an LR for specific geographic phenomena, corresponding to objects in geographic databases, in a standard and unambiguous manner is a vital part of an integrated ITS system in which different applications and sources of geographic data are used. Location Referencing Methods (LRM), methods of referencing object instances, differ by applications, by the data model used to create the database, or by the enforced object referencing imposed by the specific mapping system used to create and store the database. A standard LRM allows for a common and unambiguous identification of object instances representing the same geographic phenomena in different geographic databases produced by different vendors, for varied applications, and operating on multiple hardware/software platforms. If ITS applications using digital map databases are to become widespread, data reference across various applications and systems must be possible. Information prepared on one system, such as traffic messages, must be interpretable by all receiving systems. A standard method to refer to specific object instances is essential to achieving such objectives.

Japan, Korea, Australia, Canada, the US and European ITS bodies are all supporting activities of Location Referencing. Japan has developed a Link Specification for VICS. Japan has developed the Road Section Identification Data set (RSIDs) which uses road sections and reference points. In Europe, the RDS-TMC traffic messaging system has been developed. In addition, methods have been developed and refined in the EVIDENCE and AGORA projects based on intersections identified by geographic coordinates and other intersection descriptors. In the US, standards for Location Referencing have been developed to accommodate several different LRMs.

This document provides specifications for location referencing for ITS systems (although other committees or standardization bodies may subsequently consider extending it to a more generic context). This document is consistent with other International Standards such as ISO 14825.

In addition, this edition of this document does not deal with public transport location referencing; this issue will be dealt with in a later edition.

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Intelligent transport systems (ITS) — Location referencing for geographic databases —

Part 2:
Pre-coded location references (pre-coded profile)

1 Scope

The ISO 17572 series specifies LRMs that describe locations in the context of geographic databases and are used to locate transport-related phenomena in an encoder system as well as in the decoder side. The ISO 17572 series defines what is meant by such objects and describes the reference in detail, including whether or not components of the reference are mandatory or optional, and their characteristics.

The ISO 17572 series specifies two different LRMs:

— pre-coded location references (pre-coded profile);

— dynamic location references (dynamic profile).

The ISO 17572 series does not define a physical format for implementing the LRM. However, the requirements for physical formats are defined.

This document specifies the pre-coded LRM, comprising:

— specification of pre-coded location references (pre-coded profile);

— logical format for VICS link location (Annex A);

— TPEG physical format for ALERT-C (TMC) location references (Annex B, C & D);

— TPEG physical format for ETLs (Annex E, F & G);

— TPEG physical format for Korean node-link ID references (Annex H, I & J).

— logical format for Road Section Identification Data set (Annex K).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 17572-1 and the following apply.

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

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

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

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3.1
major link
directed link in a road network

4 Abbreviated terms

ALERT	Advice and Problem Location for European Road Traffic
DATEX	DATa EXchange (protocol for exchange of traffic and travel information between traffic centres)
ETL	Extended TMC Location reference
GCId	Generic Component Identifier
GDF	Geographic Data File
ID	Identifier
ITRF	International Terrestrial Reference Frame
LDB	Location DataBase
LI	Location Information
LR	Location Referencing (or Reference)
LRM	Location Referencing Method
LRS	Location Referencing System
LRP	Location Referencing Procedure
MOCT	Ministry of Construction and Transportation (Republic of Korea)
RDS	Radio Data System
RSIDs	Road Section Identification Data set
SOEI	System Operating and Exchanging Information
TMC	Traffic Message Channel
TPEG	Transport Protocol Expert Group
TLR	TMC Location Reference
TTI	Traffic and Traveller Information
UTM	Universal Transverse Mercator
VICS	Vehicle Information and Communication System

5 Requirements for a location referencing standard

For details, see ISO 17572-1:2008, Clause 4.

For an inventory of LRMs, see ISO 17572-1:2008, Annex A.

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6 Conceptual data model for LRMs

For details, see ISO 17572-1:2008, Clause 5.

For examples of conceptual data model use, see ISO 17572-1:2008, Annex B.

7 Specification of pre-coded location references

7.1 General concept

Pre-coded location referencing is a method which makes use of end-user client devices carrying an LDB that is exactly the same as the corresponding LDB used by a service provider of a particular message being exchanged. All pre-coded LRMs shall share the concept of defining a commonly used database of IDs. This concept has been developed in the past for technologies such as RDS-TMC and VICS to allow an (over-the-air) interface to be designed that uses compact code values (IDs) in the corresponding databases to express particular pre-coded locations of various types.

The LRM here is divided into three steps performed to implement the LRS. The first step is a process of defining the database of location IDs for a given area and the corresponding road network. In this step different service providers and systems provider agree on a defined database containing all locations to be codable (LDB creation). In the second step, this database is provisioned via various means into the service providers database as well as into all receiving systems (LDB provisioning). The third step is in real-time where a service provider can now make use of that database and reference to locations by using the newly-introduced IDs (LDB usage). Figure 1 illustrates this concept.

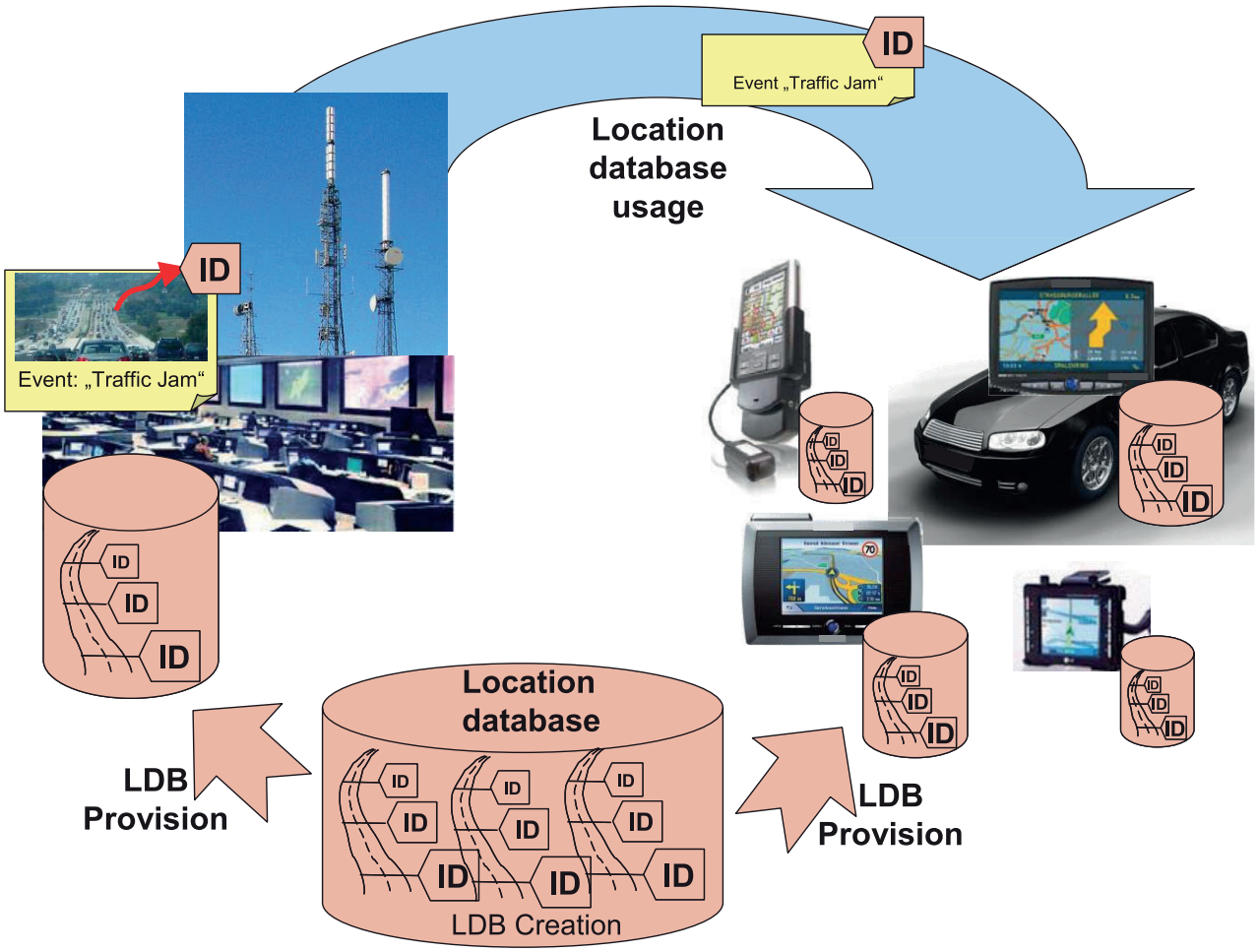

Figure 1 — General concept of pre-coded LRS

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7.2 LDB creation and updating

The different LRSs more or less support standardized ways to create a new release of a LDB. All of them share a conceptual model specifying how the different location categories specified in ISO 17572-1 are related to each other. This specification together with some guiding literature helps the community to create new releases of the LDB.

7.3 LDB provision

After the finalization of the creation process, the newly-created LDB is provisioned into the devices with maintenance service agreements. This is mostly done on a regular map release update. The LRS has to ensure that the encoding and the decoding entities are able to distinguish which release (version) of the database is in use, because no conclusion regarding the correctness of the location can be made based on the contents of the IDs alone.

7.4 LDB usage

A service provider, using the current release dataset, now creates messages with location references according to specified rules of a location reference method out of the list of location IDs available and may put additional attributes to it, to define more precisely which part of the road network is referred to. The location reference sent to the receiving system then consists of a list of one or more location IDs and some additional attributes. Presuming that the receiving system has the actual database available it seeks for the given location IDs and applies the additional attributes according to the location referencing specification. Doing so, the decoder provides the same location definition as requested by the service provider.

8 Implementations at present

8.1 General

Different implementations of pre-coded location referencing have been already specified for a while. Some of them are captured in another ISO standard and some of them need some more specification here. This clause provides a list of presently known pre-coded LRMs and introduces them shortly. It also refers to the different documents needed to fully apply the different implementations.

8.2 VICS

8.2.1 LDB creation

VICS specifies in Reference [2] a digital map database as the basis for other map providers to adopt the different map IDs into their own digital map. The digital base map consists of nodes and road elements which build up a complete street map on level zero. Figure 2 defines the conceptual data model for this map.

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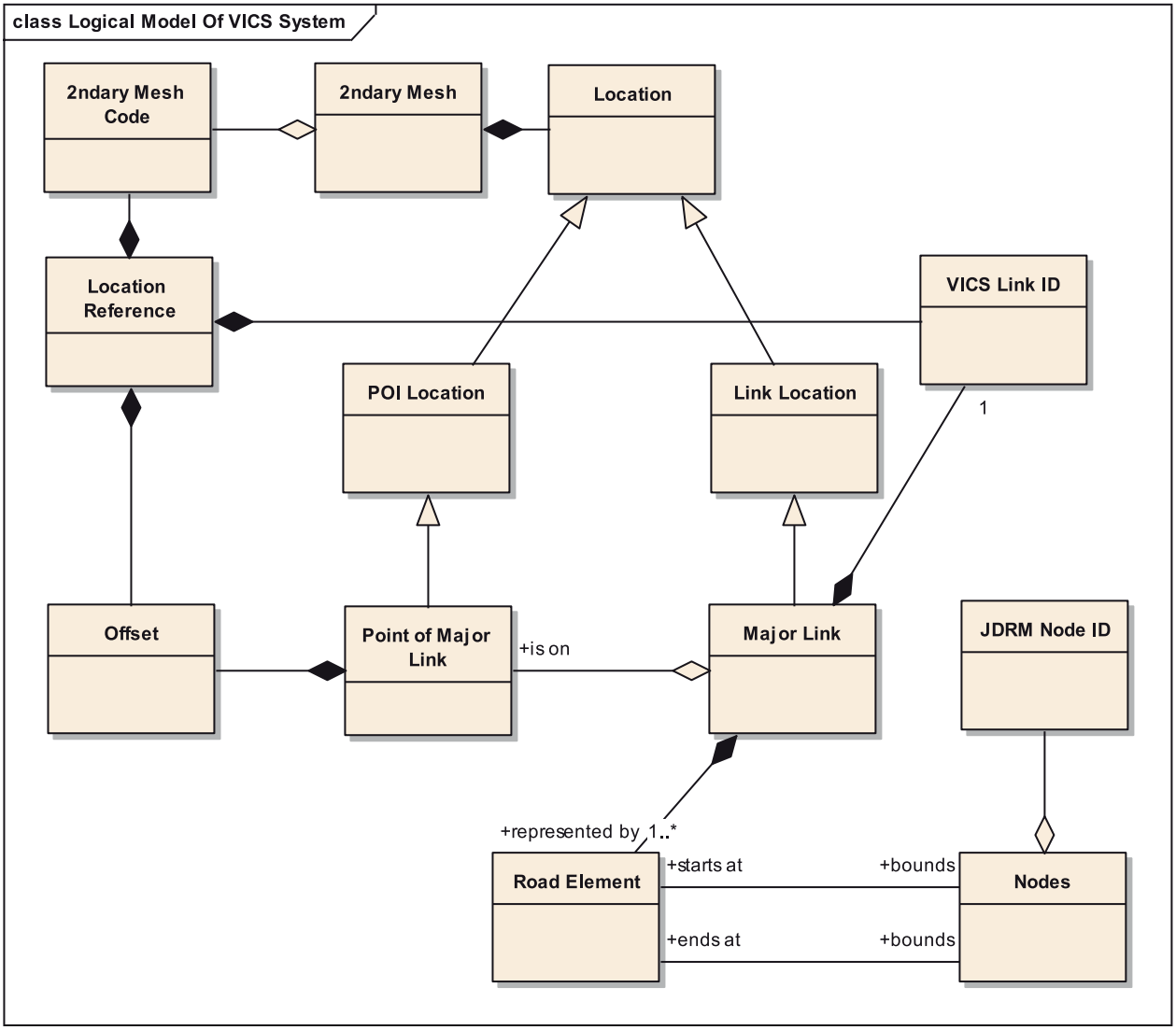

Figure 2 — Logical data model of VICS digital base map

8.2.2 LDB usage

All or any part of the specified digital map database can be referred to by a location reference consisting of VICS-Link-IDs, 2ndary-Mesh-Codes and offsets. The specification in Reference [1] defines how the digitized location IDs shall be coded to build up a more sophisticated location.

8.3 TMC/ALERT-C Specification

8.3.1 General

The location referencing rules defined in ISO 14819-3:2013[12] address the specific requirements of TMC systems, which use abbreviated coding formats to provide TTI messages over mobile bearers (e.g. GSM, DAB) or via exchange protocols like DATEX II. In particular, the rules address the RDS-TMC, a means of providing digitally-coded traffic and travel information to travellers using a silent data channel (RDS) on FM radio stations, based on the ALERT-C protocol[9].

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8.3.2 LDB creation

Location types and subtypes are required for language independence of the information given, and to tell the receiving system what data fields to expect.

At the highest level, locations fall into three categories:

1. area locations
2. linear locations
3. point locations

RDS-TMC location tables use a hierarchical structure of pre-defined locations. Locations are identified using a location ID. A system of pointers provides upward references to higher-level locations of which the specified location forms a part. As such, all point locations belong to linear locations and they refer to area locations. Point locations additionally refer to a succeeding and a preceding point location which builds up a connected network of point locations. Further information can be found in a coding hand book that has been written by the TMC forum[4].

8.3.3 LDB usage

A location ID in such a message refers and serves as a tabular "address" of the pre-stored location details in the LDB used by the service. A real world location may have more than one point location within the same location table, which can be expressed by one point location code and an additional attribute extent which counts the steps of succeeding point location to be added to the location. Another additional attribute direction allows to extend from a point location into positive or into negative direction according to the point location direction defined in the LDB.

8.4 Korean node link ID system

8.4.1 General

The MOCT of Korea has developed a standard Node-Link System for ITS in 2004 for effective exchange of real-time traffic information. The Node and Link ID is made up of 10 digits. Korean standard Node-Link ID is the standard location ID for TPEG-Loc services in Korea[3].

8.4.2 LDB creation

In principle, road authorities create and manage standard Node-Link IDs and digital base map for those standard Node/Link according to Reference [6] which was published by MOCT. MOCT verifies the IDs and digital base map, and then officially distributes them.

8.4.3 LDB usage

Any Node or Link ID can be served as location ID in LRS, but only Link ID is used in currently implemented systems.

8.5 RSIDs

8.5.1 General

The RSIDs was developed to enable exchanging various static/dynamic information on road network.

The location of the information is represented by an appropriate road section with a reference point and a distance from the reference point.

This document provides a profile of road section identification and reference point identification required in the RSIDs. Definition of each link and node corresponding to respective road maps is out of scope.

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As permanent ID set is specified in the system, RSIDs is independent from avoidable change caused by road map revisions.

8.5.2 LDB creation

RSIDs creates an authority table for section IDs and reference point IDs.

8.5.3 LDB usage

RSIDs is expected to use for exchanging various LI-related road between different players. For example, road authorities use this method to provide road information to private sectors.

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Annex A
(informative)

Logical format for VICS link location

A.1 Description of the logical structure

A.1.1 General

The subsequent clauses define data elements used for building up the VICS Link location reference (database usage). Different descriptions of the datastructure help to understand the concept. It consists of an LI Header and Location Content as shown in Figure A.1, with the latter further subdivided functionally into Coordinates, Descriptors and Offset information. Figure A.2 describes the structure of the LI main in the form of a UML Diagram. A.3 and A.4 define different views on a logical format.

All or any part of the LI may be omitted optionally if it is possible to refer to a location between databases without all or any part of LI content by defining unambiguous rules for a physical format and by establishing a management system.

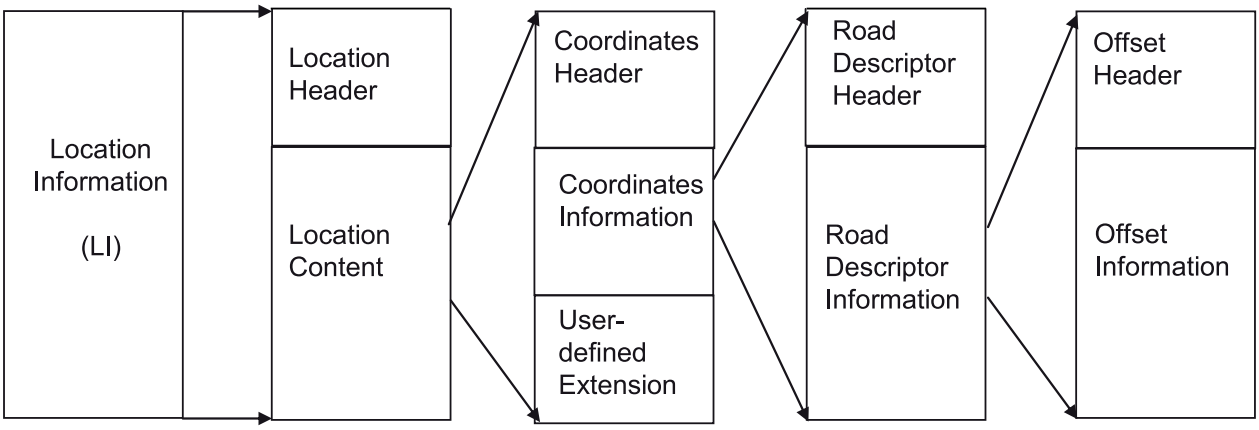

Figure A.1 — Outline diagram of the logical structure

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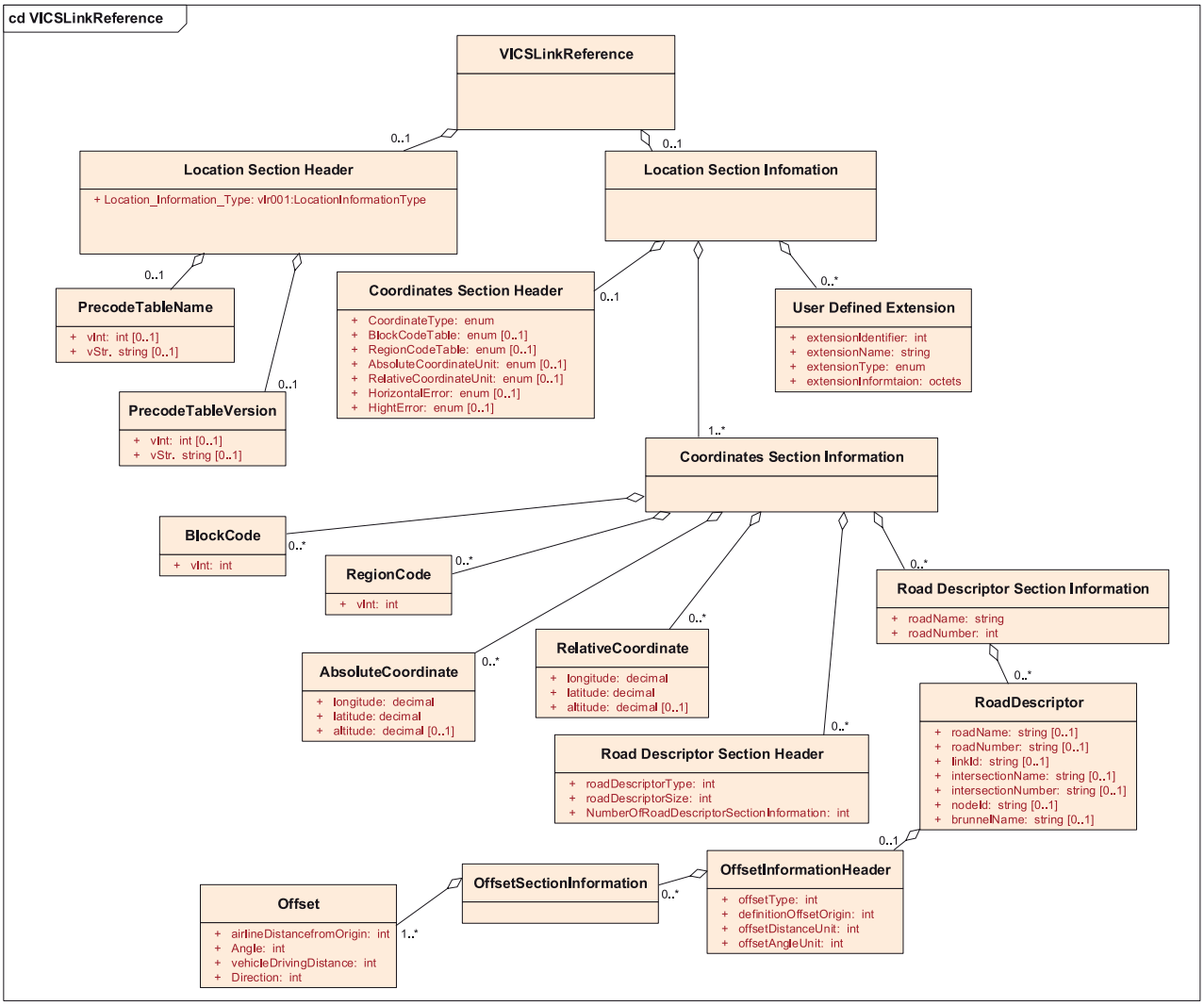

Figure A.2 — Outline diagram of the logical structure in UML

A.1.2 Data values

Table A.1 lists all the specific values of enumerations used in the Annex A location reference format.

Table A.1 — Enumerations used in the Annex A location reference format

Data value name	Definition
basemap1	A parameter specifying that the location is digitized on a map of 1/2 500~1/10 000 scale
basemap2	A parameter specifying that the location is digitized on a map of 1/25 000~1/50 000 scale
basemap3	A parameter specifying that the location is digitized on a map of more than 1/100 000 scale
ddmmss	A parameter specifying a coordinate is expressed using decimal integer value of degree, minute, and second
degree	A parameter specifying that a unit of coordinates is degree
error1	A parameter specifying that a height error is less than 1 m
error2	A parameter specifying that a height error is less than 10 m

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Table A.1 *(continued)*

Data value name	Definition
extensiontype1|2|...|n	The type of user-defined extension of which n different enumerated values are specified in the User-Defined Extension Header data frame
absolute	A parameter specifying that a coordinate system is absolute
relative	A parameter specifying that a coordinate system is relative
grid	A parameter specifying that the coordinate has a grid code
Relative_X	The horizontal X value of relative coordinates of a point
Relative_Y	The horizontal Y value of relative coordinates of a point
Relative_Z	The value of height in relative coordinates of a point
pgrid1	A parameter specifying that a coordinate has a private grid
rct1	A parameter specifying that region code table 1 is used
rct2	A parameter specifying that region code table 2 is used
rectc	A parameter specifying that a coordinate system is rectangular
second	A parameter specifying that a unit of absolute coordinates is second
secondu1	A parameter specifying that a unit of relative coordinates is normalized
secondu2	A parameter specifying that a unit of relative coordinates is some value
utmp	A parameter specifying that the blocking is the UTM primary mesh dividing
utms	A parameter specifying that the blocking is the UTM secondary mesh dividing
x	The value of horizontal axis on relative coordinates
y	The value of vertical axis on relative coordinates
z	The value of height in relative coordinates

A.1.3 Data elements

In Table A.2, the maximum value (labelled with MAX) in the column “Valid value rule” is specified first when defining unambiguous rules for a physical format by establishing the system implementation.

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Table A.2 — Data elements used in the Annex A location reference format

Data element name	Definition	Data type	Valid value rule
Absolute_Coordinate_Unit	A unit for an Absolute Coordinate	BIT STRING	ENUMERATED { degree, ddmmss, second}
Airline_Distance_from_Origin	The shortest distance from an origin to a point	Distance_type	CHOICE {INTEGER, REAL}
Altitude	The geographic altitude of a node	Altitude_type	CHOICE {INTEGER, REAL}
Angle	An Integer angle from a starting point to a feature, in units defined by Offset_Angle_Unit	Angle_type	CHOICE {INTEGER, REAL}
Block_Code	A code given to an area such as one of UTM's meshes or some rectangles	INTEGER	SIZE (0..MAX)
Block_Code_Table	A table of Block Codes	BIT STRING	ENUMERATED { utms, utmp, rectc, pgrid1}
Brunnel_Name	Text name of a Brunnel	UTF8String	SIZE (0..255)
Coordinate_Type	A type of the coordinate such as the absolute, the relative and the composite	BIT STRING	ENUMERATED { absolute, relative, grid}
Definition_Offset_Origin	A parameter specifying whether an origin of offset is starting node or end node	BIT STRING	ENUMERATED { Start point, End point}
Direction	A parameter specifying the direction from a starting point to a feature, in units defined by Offset_Distance_Unit either as integer value or as real value	Direction_type	CHOICE {INTEGER, REAL}

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Table A.2 *(continued)*

Data element name	Definition	Data type	Valid value rule
Extension_Identifier	Identifier of a user defined data element	Extension_Id_type	CHOICE {INTEGER, UTF8String}
Extension_Name	Name of a user defined data element	UTF8String	SIZE (0..255)
Extension_Type	Type of a user defined data element	BIT STRING	ENUMERATED { extensiontype1, extensiontype2, ... extensiontypen}
Height_Error	The height (vertical) error specifying an altitude accuracy of coordinates	BIT STRING	ENUMERATED { error1, error2}
Horizontal_Error	The horizontal error specifying a horizontal accuracy of coordinates	BIT STRING	ENUMERATED { basemap1, basemap2, basemap3}
Intersection_Name	Text name of an intersection	UTF8String	SIZE (0..255)
Intersection_Number	Integer number of an intersection	INTEGER	SIZE (0..MAX)
Latitude	ITRF geographic latitude of a node	Latitude_type	CHOICE {INTEGER, REAL}
Link_ID	Link identifier	INTEGER	SIZE (0..MAX)
Location_Information_Type	A parameter specifying whether the Location Information used for the location referencing is information of a point, lines, or area	BIT STRING	ENUMERATED{ point, line, face}
Longitude	ITRF geographic longitude of a node	Longitude_type	CHOICE {INTEGER, REAL}
Node_ID	Node Identifier	INTEGER	SIZE (0..MAX)

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Table A.2 *(continued)*

Data element name	Definition	Data type	Valid value rule
Number_of_Absolute_Coordinates	The number of absolute coordinates in a Coordinate_Information Data Frame	INTEGER	SIZE (0..MAX)
Number_of_Coordinates_Information	The number of Coordinate_Information Data Frames	INTEGER	SIZE (0..MAX)
Number_of_Blocks	The number of Blocks in a Coordinate_Information Data Frame	INTEGER	SIZE (0..MAX)
Number_of_Offsets	The number of Offsets in an Offset_Information_Data Frame	INTEGER	SIZE (0..MAX)
Number_of_Offset_Information	The number of Offset_Information Data Frames	INTEGER	SIZE (0..MAX)
Number_of_Regions	The number of Regions in a Coordinate_Information Data Frame	INTEGER	SIZE (0..MAX)
Number_of_Relative_Coordinates	The number of relative coordinates in a Coordinate_Information Data Frame	INTEGER	SIZE (0..MAX)
Number_of_Road_Descriptors	The number of Road_Descriptors in a Road_Descriptor_Information Data Frame	INTEGER	SIZE (0..MAX)
Number_of_Road_Descriptor_Information	The number of Road_Descriptor_Information Data Frames	INTEGER	SIZE (0..MAX)
Offset_Angle_Unit	The unit of an angle defining the direction from a starting point to the feature such as a degree or a radian	BIT STRING	ENUMERATED{ degree, radian}
Offset_Distance_Unit	The unit defining a distance from a starting point to the feature such as 1 m or 10 m	BIT STRING	ENUMERATED{ 1m, 10m, 100m}
Offset_Type	A type of the offset, on-road or airline	BIT STRING	ENUMERATED{ on-route, airline}
Precoded_Table_Name	The text identifier of a pre-coded table containing location information	UTF8String	SIZE (0..255)
Precoded_Table_Version	Version of the pre-coded table	Precoded_Table_Version_type	CHOICE {INTEGER, UTF8String}
Region_Code	A code of a region such as a country, city or state	INTEGER	SIZE (0..MAX)

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Table A.2 *(continued)*

Data element name	Definition	Data type	Valid value rule
Region_Code_Table	A table of Region_Codes	BIT STRING	ENUMERATED { rct1, rct2}
Relative_Coordinate_Unit	A unit for a Relative Coordinate	BIT STRING	ENUMERATED { secondu1, secondu2}
Relative_X	The value of horizontal axis on relative coordinates	INTEGER	SIZE (0..MAX)
Relative_Y	The value of vertical axis on relative coordinates	INTEGER	SIZE (0..MAX)
Relative_Z	The value of height in relative coordinates	INTEGER	SIZE (0..MAX)
Road_Descriptor_Size	A number of characters of a Road Descriptor	INTEGER	SIZE (0..MAX)
Road_Descriptor_Type	Classification of a Road Descriptor such as express way, national road and others	INTEGER	SIZE (0..MAX)
Road_Name	Text name of a road	UTF8String	SIZE (0..255)
Road_Number	Integer number of a road	INTEGER	SIZE (0..MAX)
Vehicle_Driving_Distance	The distance a vehicle drives to an offset point	Distance_type	CHOICE {INTEGER, REAL}

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A.1.4 Data frames

See Table A.3.

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