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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)

Reference number
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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 17572-2 was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

ISO 17572 consists of the following parts, under the general title *Intelligent transport systems (ITS) — Location referencing for geographic databases*:

— *Part 1: General requirements and conceptual model*

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

— *Part 3: Dynamic location references (dynamic profile)*

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 Location Reference 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, Location References are often coded. This is especially significant if the Location Reference 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 will be addressed. Amongst these, Location Referencing of the road network, or components thereof, is a particular focus.

Communication of a Location Reference for specific geographic phenomena, corresponding to objects in geographic databases, in a standard, unambiguous manner is a vital part of an integrated ITS system in which different applications and sources of geographic data will be 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 Location Referencing Method 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. 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 Location Referencing Methods.

This International Standard provides specifications for location referencing for ITS systems (although other committees or standardization bodies may subsequently consider extending it to a more generic context). In addition, this edition does not deal with public transport location referencing; this issue will be dealt with in a later edition.

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

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

1 Scope

This International Standard specifies Location Referencing Methods (LRM) that describe locations in the context of geographic databases and will be used to locate transport-related phenomena in an encoder system as well as in the decoder side. This International Standard 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.

This International Standard specifies two different LRMs:

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

— dynamic location references (dynamic profile).

This International Standard does not define a physical format for implementing the LRM. However, the requirements for physical formats are defined.

This part of ISO 17572 specifies the pre-coded location referencing method, comprising:

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

— logical format for VICS link location;

— TPEG physical format for ALERT-C-location references;

— TPEG physical format for Korean node-link ID references.

It is consistent with other International Standards developed by ISO/TC 204 such as ISO 14825, *Intelligent transport systems — Geographic Data Files (GDF) — Overall data specification*.

2 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.

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.

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)
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
SOEI	System Operating and Exchanging Information
TMC	Traffic Message Channel
TPEG	Transport Protocol Expert Group
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 Location Referencing Methods, see ISO 17572-1:2008, Annex A.

6 Conceptual data model for location referencing methods

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 a location database (LDB) that is exactly the same as the corresponding location database used by a service provider of a particular message being exchanged. All pre-coded location referencing methods 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 location referencing method here is divided into three steps performed to implement the location referencing system. 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 (location database creation). In the second step, this database is provisioned via various means into the service providers database as well as into all receiving systems (location database 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 (location database usage). See Figure 1 illustrating this concept.

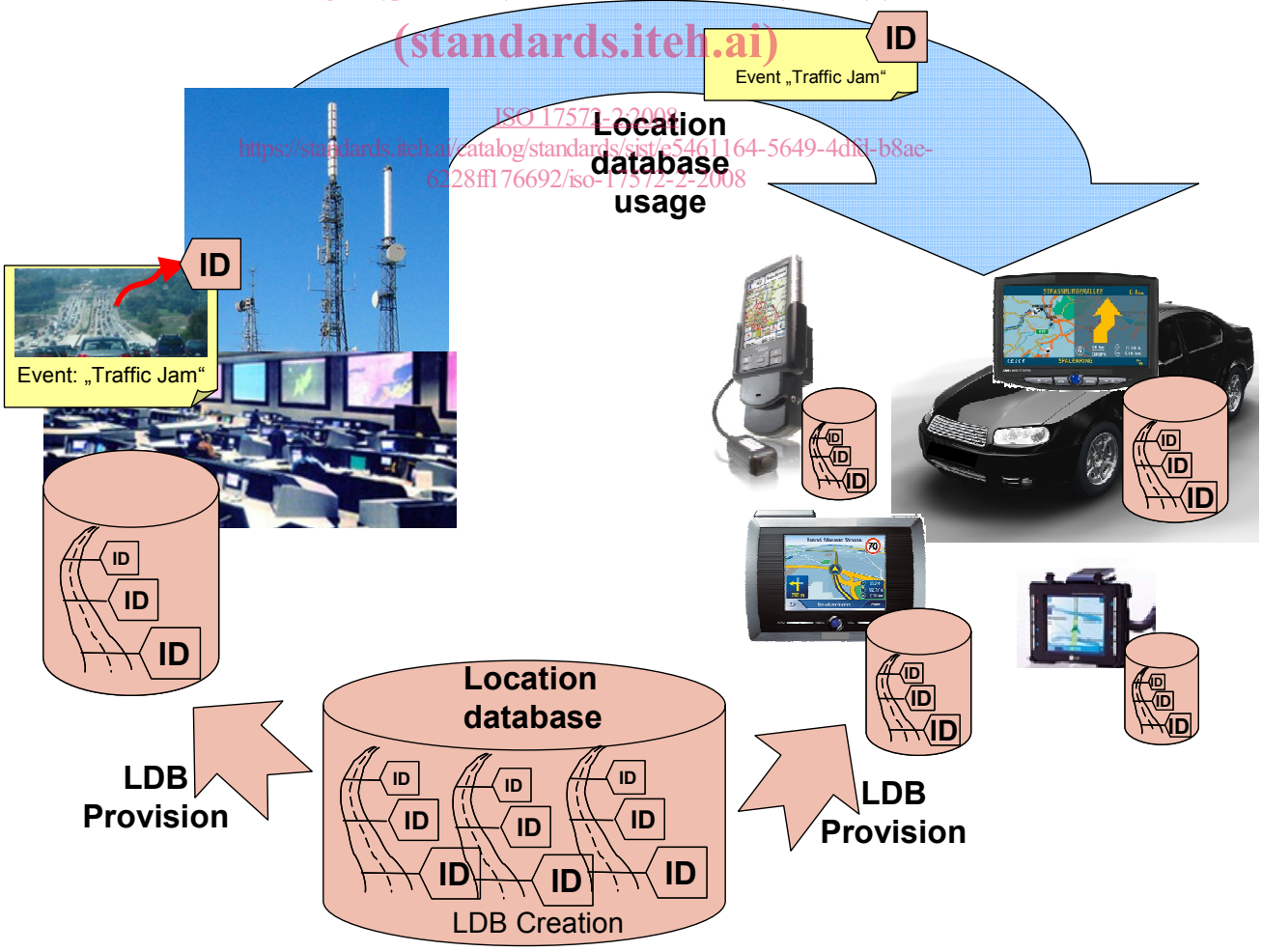

Figure 1 — General concept of pre-coded location referencing system

7.2 Location database creation and updating

The different location referencing systems more or less support standardized ways to create a new release of a location database. 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 location database.

7.3 Location database provision

After finalization of the creation process, the newly created location database is provisioned into the devices with maintenance service agreements. This is mostly done on a regular based map release update. The location referencing system 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 Location database usage

A service provider, using the current release dataset, now creates messages with location references according to specified rules a location reference 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 Introduction

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 location referencing methods and introduces them shortly. It also refers the reader to the different documents needed to fully apply to the different implementations.

8.2 Traffic Message Channel (TMC) / Alert-C Specification

8.2.1 General

The location referencing rules defined in ISO 14819-3 [11] address the specific requirements of Traffic Message Channel (TMC) systems, which use abbreviated coding formats to provide TTI messages over mobile bearers (e.g. GSM, DAB) or via exchange protocols like DATEX. In particular, the rules address the Radio Data System Traffic Message Channel (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].

8.2.2 Location database 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].

8.2.3 Location database usage

A location ID in such a message refers and serves as a tabular 'address' of the pre-stored location details in the location database 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 location database.

8.3 Vehicle Information and Communication System (VICS)

8.3.1 Location database creation

Vehicle Information and Communication System specifies in bibliography item [2] a digital map database as the basis for other map provider 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. See Figure 2 which defines the conceptual data model for this map.

8.3.2 Location database 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 bibliography item [1] defines how the digitized location IDs has to be coded to build up a more sophisticated location.

8.4 Korean node link ID system

8.4.1 General

The Ministry of Construction and Transportation (MOCT) of Korea has developed 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 Location database creation

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

8.4.3 Location database usage

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

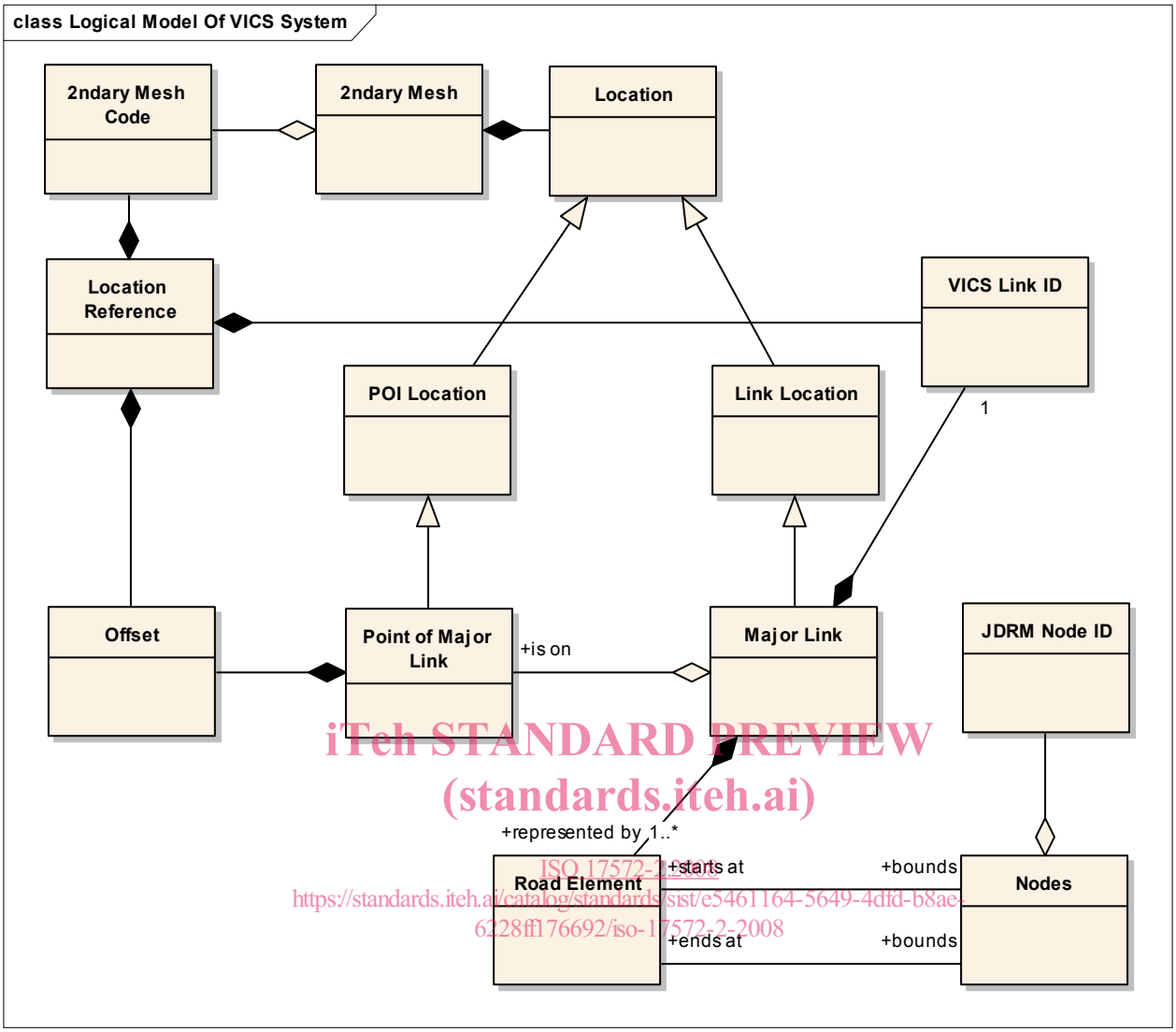

Figure 2 — Logical data model of VICS digital base map

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 Data structure helps to understand the concept. It consists of a Location Information (LI) Header and Location Content as shown in Figure A.1, with the latter further subdivided functionally into Coordinates, Descriptors and Offset information. The Figure A.2 describes the structure of the LI main in form of a UML Diagram. Clauses A.3 and A.4 do 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.

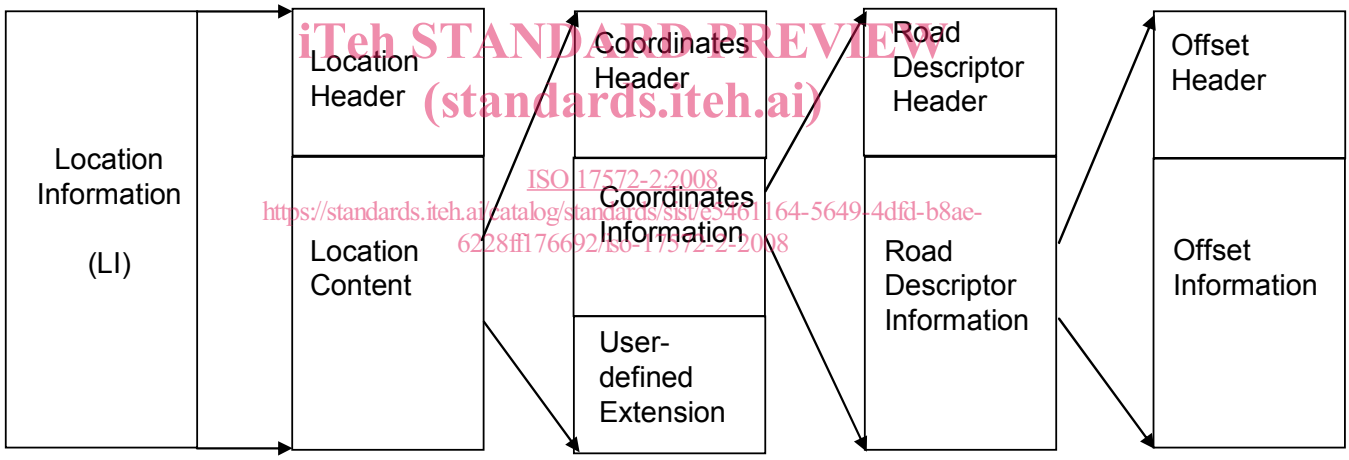

Figure A.1 — Outline diagram of logical structure