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Traffic and Travel Information (TTI) — TTI via Transport Protocol Expert Group (TPEG) data-streams —

Part 6: Location referencing applications

Informations sur le trafic et le tourisme (TTI) — Messages TTI via les flux de données du groupe d'experts du protocole de transport (TPEG) —

Partie 6: Applications de référence de localisation

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Contents

Page

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Foreword

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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.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of normative document:

— an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;

— an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

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/TS 18234-6 was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

ISO/TS 18234 consists of the following parts, under the general title *Traffic and Travel Information (TTI) — TTI via Transport Protocol Expert Group (TPEG) data-streams:*

— *Part 1: Introduction, numbering and versions*

— *Part 2: Syntax, Semantics and Framing Structure (SSF)*

— *Part 3: Service and Network Information (SNI) application*

— *Part 4: Road Traffic Message (RTM) application*

— *Part 5: Public Transport Information (PTI) application*

— *Part 6: Location referencing applications*

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Introduction

The TPEG technology uses a byte-oriented stream format, which may be carried on almost any digital bearer with an appropriate adaptation layer. TPEG-messages are delivered from service providers to end-users, and are used to transfer information from the database of a service provider to an end-user's equipment.

The TPEG-Loc methodology has been developed to provide a unified location referencing system for all TPEG applications that require such referencing systems. This CEN ISO Technical Specification describes the TPEG-Loc application in detail.

TPEG-Loc is designed to offer service providers and end-users several large and significant advantages over previous location based services. TPEG-Loc forms the basis of location referencing for any TPEG application that may be specified.

It is very important to remember the original TPEG objectives, which ensure that the TPEG-Loc is designed to meet all needs. It is flexible in use, from both a service provision and end-user viewpoint. TPEG-Loc offers choices for service providers to provide simple single-application services through to multi-application services using the *same* location referencing method. TPEG-Loc offers filtering choices for end-users to provide wide or narrowly focussed information, both urban and inter-urban and for single or multi-modal journeys. TPEG-Loc provides for both large networked service providers and small single area service providers and allows a full range of end-user products to be developed, from thick clients such as navigation systems to thin clients such as small hand held travel assistants.

The Broadcast Management Committee of the European Broadcast Union (EBU) established the B/TPEG project group in autumn 1997 with the mandate to develop, as soon as possible, a new protocol for broadcasting traffic and travel-related information in the multimedia environment. The TPEG technology, its applications and service features are designed to enable travel-related messages to be coded, decoded, filtered and understood by humans (visually and/or audibly in the user's language) and by agent systems.

One year later in December 1998, the B/TPEG group produced its first public specifications. Two documents were released. Part 2 (TPEG-SSF, CEN ISO/TS 18234-2) described the Syntax, Semantics and Framing structure, which will be used for all TPEG applications. Part 4 (TPEG-RTM, CEN ISO/TS 18234-4) described the *first* application, for Road Traffic Messages.

CEN /C 278/WG 4, in conjunction with ISO/TC 204/WG 10, established a project group comprising the members of B/TPEG and they have continued the work concurrently since March 1999. Since then two further parts have been developed to make the initial complete set of four parts, enabling the implementation of a consistent service. Part 3 (TPEG-SNI, CEN ISO/TS 18234-3) describes the Service and Network Information Application, which is likely to be used by all service implementations to ensure appropriate referencing from one service source to another. Part 1 (TPEG-INV, CEN ISO/TS 18234-1), completes the work, by describing the other parts and their relationship; it also contains the application IDs used within the other parts.

In April 2000, the B/TPEG group released revised Parts 1 to 4, all four parts having been reviewed and updated in the light of initial implementation results. Thus a consistent suite of specifications, ready for wide scale implementation, was submitted to the CEN/ISO commenting process.

In November 2001, after extensive response to the comments received and from many internally suggested improvements, all four parts were completed for the next stage: the Parallel Formal Vote in CEN and ISO. But a major step forward has been to develop the so-called TPEG-Loc location referencing method, which enables both map-based TPEG-decoders and non map-based ones to deliver either map-based location referencing or human readable information. Part 6 (TPEG-Loc, CEN ISO/TS 18234-6, this document) is now a separate specification and is used in association with the other parts of CEN ISO/TS 18234 to provide comprehensive location referencing. Additionally Part 5, the Public Transport Information Application (TPEG-PTI, CEN ISO/TS 18234-5), has been developed and been through the commenting process.

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This Technical Specification, CEN ISO/TS 18234-6, describes the data structure, the encoding and decoding of “TPEG-Loc”. This document has been prepared by CEN/TC 278 *Road Transport and Traffic Telematics* in co-operation with ISO/TC 204, *Intelligent Transport Systems*.

During the development of the TPEG technology a number of versions have been documented and various trials implemented using various versions of the specifications. At the time of the publication of this Technical Specification, all parts are fully inter-workable and no specific dependencies exist. This Technical Specification has the technical version number TPEG-Loc_3.0/001.

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Traffic and Travel Information (TTI) — TTI via Transport Protocol Expert Group (TPEG) data-streams —

Part 6:
Location referencing applications

1 Scope

This Technical Specification establishes the method of location referencing used by TPEG applications such as TPEG-RTM or TPEG-PTI.

TPEG applications are specified to contain all the information required by a client TPEG decoder (i.e. both location referencing and event information), to present all the information intended for the end-user when it was originated by the service provider.

The term “application” is used in TPEG specifications to describe specific applications, which are at the highest layer of the ISO/OSI protocol stack (ISO/IEC 7498-1). Each TPEG application (e.g. TPEG-RTM) is assigned a unique number that is called the Application IDentification (AID). In this respect TPEG-Loc is not an application, but it is an *essential* constituent part of an application.

Location referencing requires a service provider to give an impression or image to the human end-user of where an event has taken place. This cannot be done easily because the human end-user may or may not be familiar with the location. TPEG-Loc has the added challenge of attempting to be as language independent as possible. This is achieved by the use of TPEG-Loc tables (essentially word oriented data object dictionaries).

TPEG-Loc also provides location data in a machine-readable form that allows a “thick” client such as a navigation system to map-match, on-the-fly, to locate the event being described onto a digital map display.

NOTE Explicit backwards compatibility with the RDS-TMC location referencing method (EN ISO 14819-3) has NOT been attempted, because RDS-TMC locations are finite in number and must be predetermined. TPEG technology does not suffer from this restriction.

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/TS 18234-1, *Traffic and Travel Information (TTI) — TTI via Transport Protocol Expert Group (TPEG) data-streams — Part 1: Introduction, Numbering and Versions*

ISO/TS 18234-2, *Traffic and Travel Information (TTI) — TTI via Transport Protocol Expert Group (TPEG) data-streams — Part 2: Syntax, Semantics and Framing Structure (SSF)*

ISO/TS 18234-3, *Traffic and Travel Information (TTI) — TTI via Transport Protocol Expert Group (TPEG) data-streams — Part 3: Service and Network Information (SNI) Application*

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ISO/TS 18234-4, *Traffic and Travel Information (TTI) – TTI via Transport Protocol Expert Group (TPEG) data-streams — Part 4: Road Traffic Message (RTM) application*

ISO/TS 18234-5, *Traffic and Travel Information (TTI) — TTI via Transport Protocol Expert Group (TPEG) data-streams — Part 5: Public Transport Information Application*

ISO/IEC 7498-1, *Information technology — Open Systems Interconnection — Basic Reference Model: The Basic Model*

3 Terms and definitions

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

NOTE 1 TPEG-Loc is completely focussed on location references for TPEG applications, which are delivering messages to end-users, so for this key operational reason some definitions have a different meaning from that found in other location reference systems.

NOTE 2 Digital map based systems, either on the message generation side or the client end-user side tend to be based upon road mapping rather than, for example, rail track mapping, therefore throughout this specification there is a tendency to use roads as examples. However roads are not necessarily implied, so the use and context of an element must be clarified and this is declared in the coding in 5.3.1.

3.1
additional location descriptions
all information needed to filter, select and process a location in only text-based systems. Information referenced through hierarchically structured text

3.2
connected point
point where several *intersection points* or *non-linked points,* together, make up one connected location. Also the connected points are listed within it

3.3
framed point
a Framed point may be used to describe a point on a network such as a road network or rail network, where the location is not likely to be well known or is a point without a predefined name. The two points either side are used to frame the location with known points

3.4
height
in TPEG-Loc, height is used to describe a point in the vertical plane, relative to the height descriptor as shown in TPEG Table loc04. Height consists of a numerical value, in metres, and descriptor

3.5
intersection point
Point at the intersection of two roads. The given co-ordinate is accompanied by up to three road descriptors to match it exactly on the map

3.6
large area
an area with a large radius of more than one kilometre. The longitude/latitude co-ordinate pair used, does not need to be matched exactly to a road or other object on the map

3.7
location container
in TPEG-Loc, a location container is a concept applied to the location referencing elements, to show how they are grouped together. The TPEG-Loc container comprises a default language code, a location co-ordinates container and an additional location descriptions container

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3.8
location co-ordinates
in TPEG-Loc, the location co-ordinates container includes information needed to identify a location exactly in map-based systems and in many cases also in text-based systems. Information includes WGS 84 co-ordinate pair and descriptive information

3.9
location referencing
method for referencing locations to facilitate the exchange of location related information between different systems

3.10
location type
in TPEG-Loc, a location type describes the structure of location referencing data as defined in TPEG Table loc01

3.11
message
collection of coherent information sent through an information channel. Describes an event or a collection of related events, or status information and includes message management information

3.12
network description
network description describes links in networks. It is an element of the additional location descriptions container

3.13
nodal area
area with a small radius, e.g. less than one kilometre. The given co-ordinate should be accompanied by one or more descriptors to match it exactly on a map

3.14
node description
node description describes single points or complex nodes, which are part of a network. It is an element of the additional location descriptions container

3.15
non-linked point
Point that cannot be matched exactly with the road network on a map. Road descriptors therefore do not accompany the point co-ordinate

3.16
position
position defines where an event has taken place in relation to the road: e.g. driving lane 1, hard shoulder, central reservation, etc. The driving lanes are numbered according to the usual local practice, i.e. driving Lane 1 is the lane nearest to the hard shoulder. In countries which drive on the left, driving lanes are hence numbered from left-to-right, and in countries driving on the right, from right-to-left

NOTE Position is an event element and NOT a location reference element.

3.17
radius of expansion
in TPEG-Loc, a radius of expansion is described by a circle of a certain radius value around a fixed point

3.18
segment
segment marked by two co-ordinates. The direction of the segment is default from first co-ordinate to second co-ordinate. The direction field can change this. Both co-ordinates are accompanied by up to three road descriptors to match them exactly on the map

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3.19
TPEG-Loc definitions
see section 5 for further explanations

3.20
WGS 84 usage
in TPEG-Loc, latitude and longitude are the only two elements used from the WGS 84 specification (see bibliography)

4 Abbreviations

For the purposes of this Technical Specification, the following abbreviations apply.

4.1
BPN
Broadcast, Production and Networks (an EBU document publishing number system)

4.2
B/TPEG
Broadcast/TPEG (the EBU project group name for the specification drafting group)

4.3
CEN
Comité Européen de Normalisation

4.4
EBU
European Broadcasting Union

4.5
IC
Inter City (normally railway and bus routes)

4.6
ILOC
Intersection location

4.7
IPR
Intellectual Property Right(s)

4.8
ISO
International Organization for Standardization

4.9
OSI
Open Systems Interconnection

4.10
PTI
Public Transport Information (see CEN ISO/TS 18234-5)

4.11
RFU
Reserved for Future Use (not necessarily abbreviated)

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4.12
RTM
Road Transport Message (see CEN ISO/TS 18234-4)

4.13
TPEG
Transport Protocol Experts Group

4.14
TPEG-ilc
Descriptor formed according to TPEG-Loc rules

4.15
TTI
Traffic and Travel Information

4.16
WGS 84
World Geodetic System 1984

5 Location container

Most TPEG applications are designed to deliver TPEG-messages, which consist of three high level containers, each with one or more elements. These containers are for message management, event information and location referencing information. Note some special application messages do NOT include a TPEG-Loc container, such as a cancellation message. It should also be noted that each container does not necessarily have all possible lower level elements included.

Figure 1 shows the structure likely to be used, for example, when a TPEG-RTM (CEN ISO/TS 18234-4) application message is generated to describe a road event and location references need to be given to the end-user.

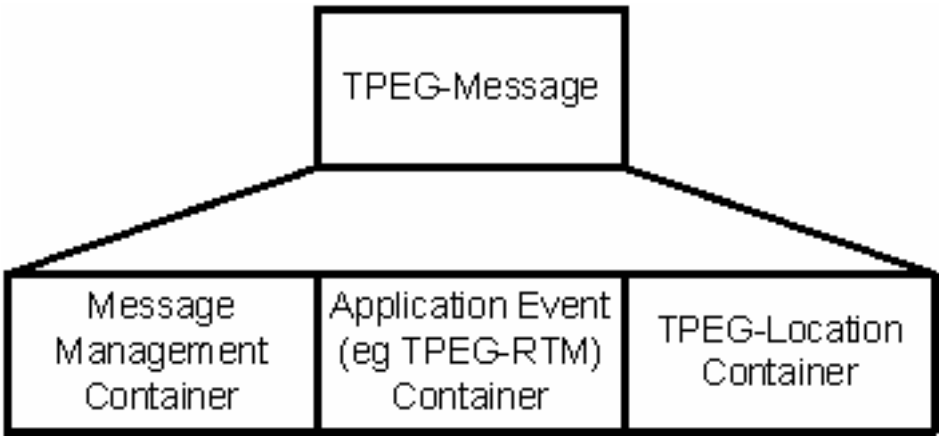

Figure 1 — The TPEG-message container and the three lower level containers

The main purpose of TPEG-Loc is to provide both human understandable and machine-readable elements to any client TPEG decoder. It may be a 'thin' client only able to convey limited location referencing information to the end-user or it may be a 'thick' client using a considerable number of elements and using considerable processing power to filter the information for complex display to an end-user.

The TPEG-Loc concept combines two aspects of location references: both machine-readable and human understandable, are delivered together. Within TPEG-Loc, there is a super-set of the so-called intersection

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location, ILOC method[1)], which may be used in a terminal client to map match on the fly to an installed digital map regardless of exact compatibility with the digital map being used by a service provider. Additionally, the TPEG-Loc super set of ILOC allows a human readable description to be easily decoded and displayed for an end-user. The rules for this method, within TPEG-Loc, are given in Section 6.

The TPEG-location container shown in Figure 2 provides for extensive location descriptions, which shall be matched by the service provider to local signposts to allow the human user to orient the received information with local visual information.

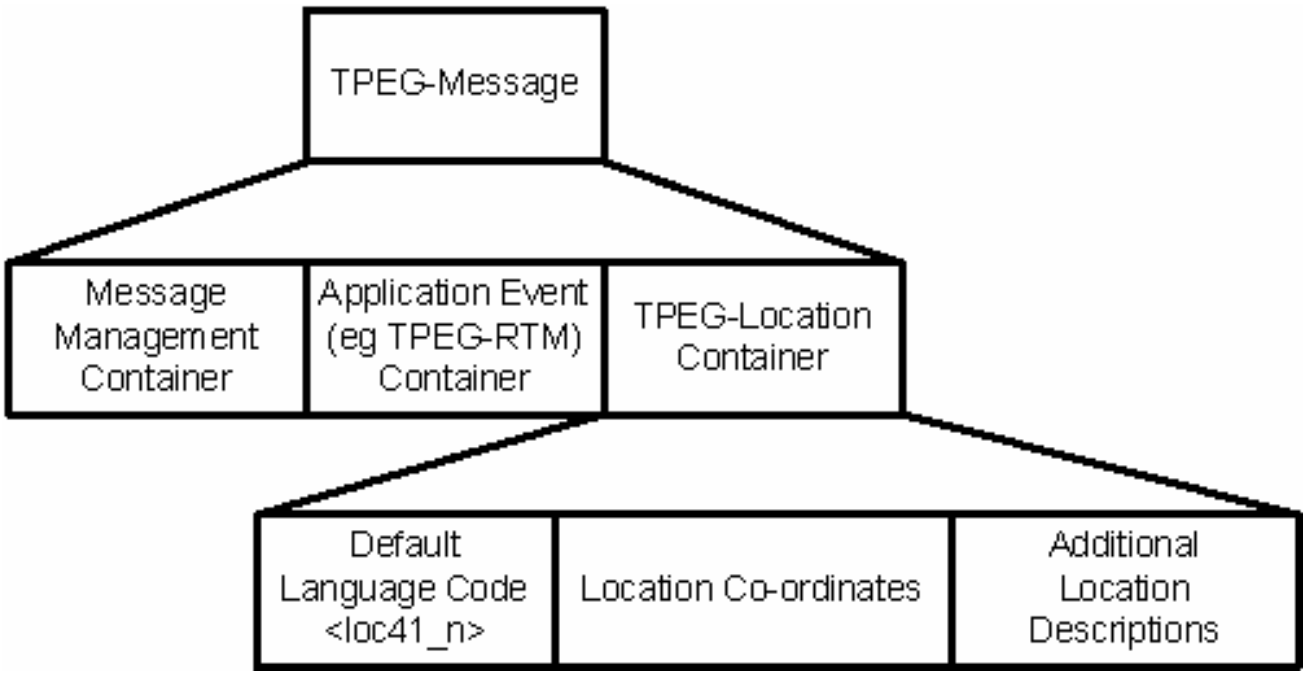

Figure 2 — The TPEG-location container concept

TPEG applications are designed to be language independent, thus a default language code is included within the TPEG-Loc container to determine an overall language for the descriptive elements of the TPEG-Loc information. Further element-related language codes may be used to describe, for example, location names having more than one language description (e.g. Brussels and Bruxelles or Casnewydd and Newport).

It is important to note that the location co-ordinates container mixes location co-ordinates and human readable description elements together to achieve the mix of both machine and human readable aspects. Whereas the additional location descriptions container is designed to facilitate human readable aspects alone, by providing extended descriptions that are essentially designed for human readability.

5.1 Location container concepts

The TPEG-Loc concept is easily described by the use of diagrams in this section, before more technical descriptions are given in later sections.

These diagrams are intended to provide a first appreciation of the structure, before going onto the coding architecture and finally coding detail.

The text in the boxes represents the name of the coding element and corresponds to the coding architecture definition explained in 5.2 and coding detail, which is described in 5.3.

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1) For further reading: EVIDENCE: Detailed ILOC Location Referencing Rules Specifications Version Nr 1.0, dated 28.06.1999, (also logged as EBU B/TPEG PG 99/102)

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Text in the boxes that is written in brackets defines the data type for this coding element:

(code) the element is coded (language independently) through the use of a TPEG-Loc table

(text) or (string) the element is a string

(number) or (radius) the element is a (language independent) number with a numeric value

In case of descriptors, the text in brackets gives a hint about the string or descriptor type, e.g. (area name), (TPEG-ilc1), (node name).

All “Descriptors” in TPEG-Loc are composed of a descriptor_type (table loc03), a text string and a language code. *The language code is only used if the string is not written in the default language.* All “descriptors” in TPEG-Loc may be repeated to deliver names of the same place in multiple languages.

EXAMPLE Brussels and Bruxelles, Casnewydd and Newport.

NOTE The dotted notation for an element box is used to indicate that an element is optional. The shadow notation is used to indicate that an element may be repeated.

A shadowed element box may be repeated according to the service provider requirements to describe locations in more detail or according to the definitions given by the different concept diagrams.

5.1.1 Location co-ordinates

The location co-ordinates container includes all elements required to describe a location, for both human understandable and machine-readable needs. The elements can be grouped together in a number of ways according to the type of point, segment or area to be described. The most commonly encountered combinations are shown in the following sections.

The location co-ordinates method is used to describe any kind of geo-referenced location information in TPEG. It has a universal structure visualized in Figure 3 and defined in 5.2.2 and 5.3.1.2.

This universal method must be applied dependent upon the various TPEG location types (see Table 1 below) and according to the definitions given in 5.1.1.1 to 5.1.1.7. The concept diagrams are an indispensable part of the location co-ordinates definition, because they specify the permitted *usage, order* and *number* of descriptors for a specific TPEG-Loc table loc01 value. *It is important to note that in TPEG-Loc the elements WGS 84 and Descriptors, are fixed **related-elements** and may not be mixed, regardless of order.* (This element usage differs from the general declarative concept, where the order of transmission is theoretically unimportant.)

Each descriptor usually occurs just once according to the TPEG-Loc table loc01_n diagrams, but can be repeated if the service provider wants to transmit the same name in more than one language. Each descriptor must be labelled with “descriptor type” and the codes specified through the TPEG-Loc table loc01_n diagrams and “table loc03”. (The repetition of a specific descriptor type only makes sense if the service provider wants to transmit the same name in different languages, otherwise a repetition would imply a contradiction.)

NOTE To understand the location co-ordinates definition, the reader must take into account Figure 3, Table 1, 5.2.2, 5.3.1.2, 5.1.1.1 to 5.1.1.7 and Table loc03. There is a close relationship between the coding, the TPEG-Loc table loc01 value, the TPEG-Loc table loc01_n diagrams and Table loc03.

Table 1 shows an extract from the TPEG-Loc table loc01, which acts as an “internal index” to the following concept diagrams covering the needs of location co-ordinates elements.

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Table 1 — Index to concept diagrams following this section

Table code	Description
loc01_01	large area
loc01_02	nodal area
loc01_03	segment
loc01_04	RFU
loc01_05	intersection point
loc01_06	framed point
loc01_07	non-linked point
loc01_08	connected point

The overall TPEG-Location Container concept was shown in Figure 1, in 5.1, above. The location co-ordinates container part is expanded out as shown in Figure 3. This figure indicates the complete concept and shows the lower layers of the concept diagram describing elements in terms of the rules established in this section.

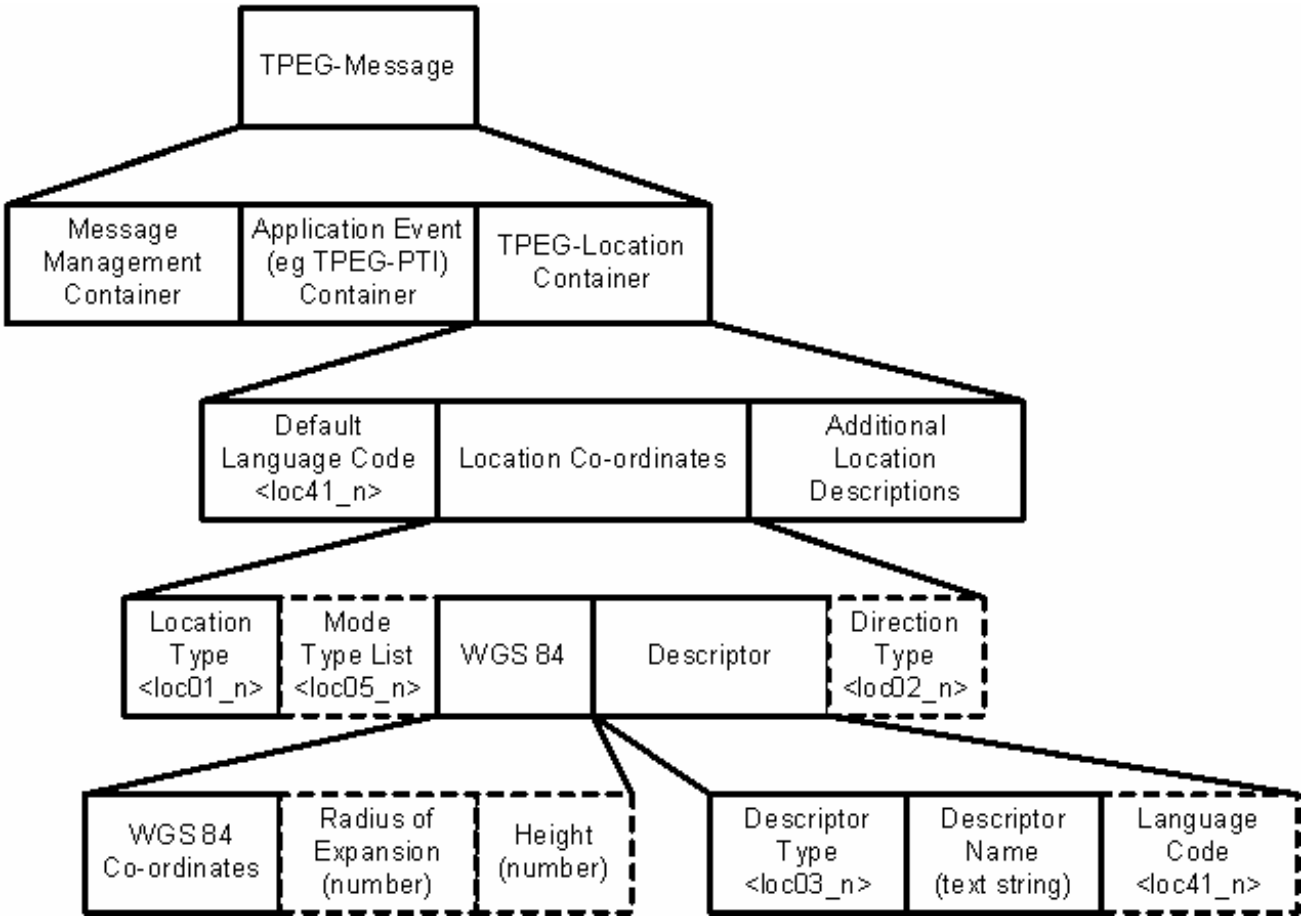

Figure 3 — Location container overall concept

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5.1.1.1 Large area

Where type is defined by TPEG Table loc01_1

A large area may be used to describe a location such as a conceptually large area (e.g. the Black Forest) where messages covering the large area need to be conveyed, such as network restrictions due to wide ranging weather conditions. A large area can be defined to describe 'area locations' from a village or town up to counties, countries and large fuzzy regions.

EXAMPLE The following hierarchy of information may be needed to describe a location such as the Black Forest (based on Bad Rippoldsau-Schapbach):

location_co-ordinates
  location_type: large area (loc01_1)
  point
    WGS 84
      longitude: E 8.32826
      latitude: N 48.42844
      radius of expansion: 50 km
    descriptor
      type: area name (loc03_1)
      text: Black Forest
      language
        language_code: English (loc41_30)
    descriptor
      type: area name (loc03_1)
      text: Schwarzwald
      language
        language_code: German (loc41_40)

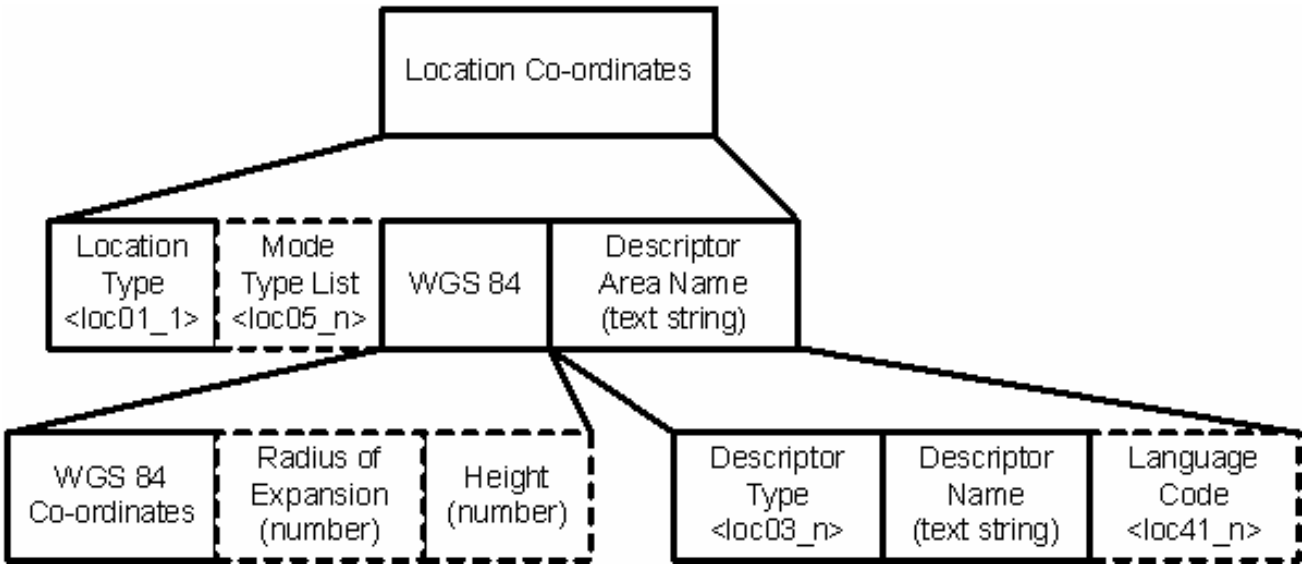

Figure 4 — Location co-ordinates container – Large area elements

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5.1.1.2 Nodal area

Where type is defined by TPEG Table loc01_2

A nodal area may be used to describe a location with access to one or multiple transport mode. For example, Frankfurt Airport, which has a number of locations to be described such as airport bus stop, taxi rank and railway station, that are all within the airport area.

EXAMPLE The following hierarchy of information may be needed to describe a location such as Frankfurt Airport Terminal 1:

location_co-ordinates
- location_type: nodal area (loc01_2)
- mode_type_list
  - mode_of_transport: aircraft (loc05_9)
  - mode_of_transport: railway (loc05_2)
- point
  - WGS 84
    - longitude: E 8.56964
    - latitude: N 50.05062
    - radius of expansion: 3 km
  - descriptor
    - type: tpeg-ilc1 (loc03_7)
    - text: A03
  - descriptor
    - type: tpeg-ilc2 (loc03_8)
    - text: B43
  - descriptor
    - type: tpeg-ilc3 (loc03_9)
    - text: Hugo-Eckener-Ring
  - descriptor
    - type: node name (loc03_2)
    - text: Frankfurt Airport

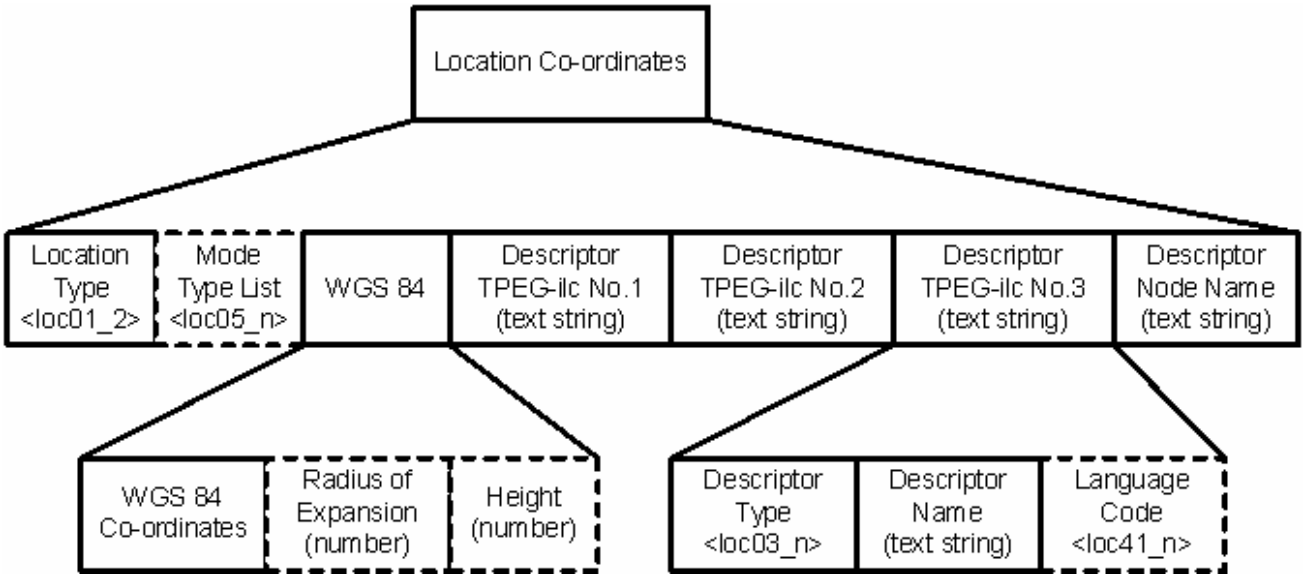

Figure 5 — Location co-ordinates container – Nodal area elements

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5.1.1.3 Segment

Where type is defined by TPEG Table loc01_3

A segment may be used to describe a connection within a network such as a road network or rail network, from one city to another, framed by the two intersection points for which the coordinate pairs are transmitted.

The first set of descriptors indicate the “from point” and the second set of descriptors indicate the “to point”. The direction is implied by this structure as “from” to “to”. The element direction is additionally described by TPEG Table loc02.

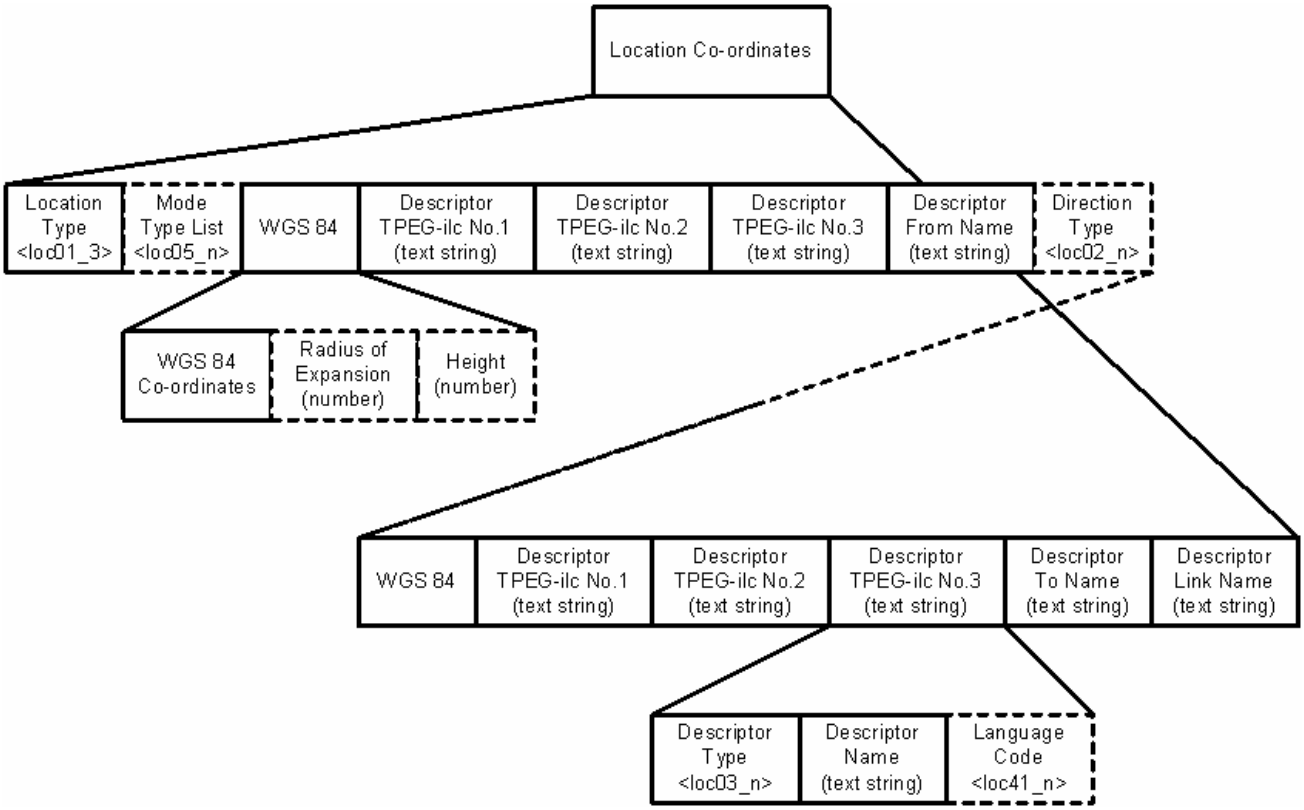

Figure 6 — Location co-ordinates container – Directional segment elements

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5.1.1.4 Intersection point

Where type is defined by TPEG Table loc01_5

An intersection point may be used to describe a point on a network such as a road crossing (e.g. Oxford Circus where Regent Street and Oxford street cross). The intersection point is a defined intersection of several roads given by a centre co-ordinate (using the WGS 84 co-ordinates) and up to 3 road descriptors, TPEG-ilc 1 to 3.

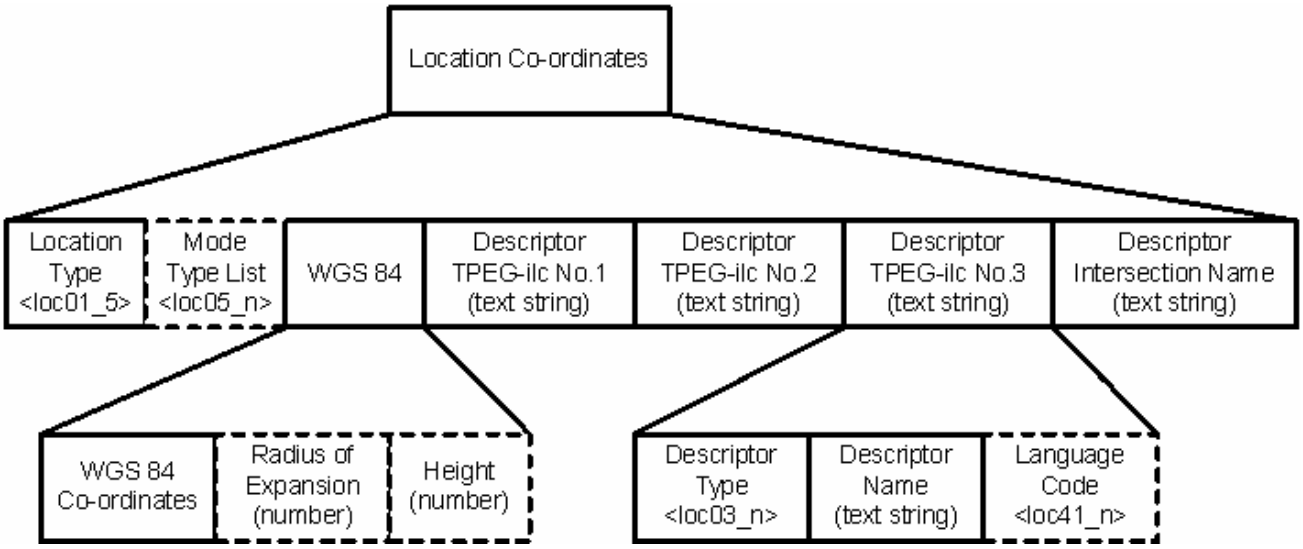

Figure 7 — Location co-ordinates container – Intersection point elements

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5.1.1.5 Framed point

Where type is defined by TPEG Table loc01_6

A Framed Point may be used to describe a point on a network such as a road network or rail network, where the location is not likely to be widely known. The two points either side are used to frame the location with known points, for example a rural junction with an established local name, i.e. Bowship roundabout, which is 3 km from one town (Hailsham) and 6 km from another town (Horam).

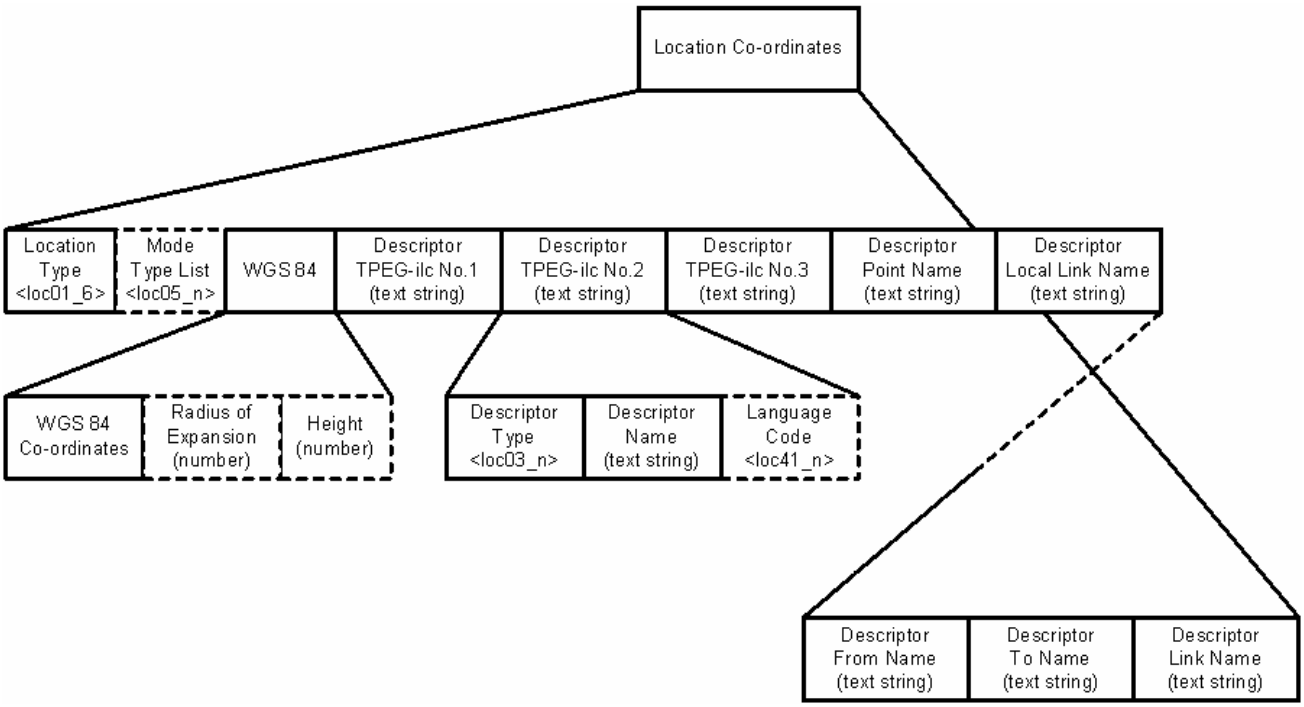

Figure 8 — Location co-ordinates container – Framed point elements

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5.1.1.6 Non-linked point

Where type is defined by TPEG Table loc01_7

A non-linked point may be used to describe a point (defined through the co-ordinate) which is not located on any transport network or part of one. It may be used to identify an off-network point (e.g. in a field where an event is taking place).

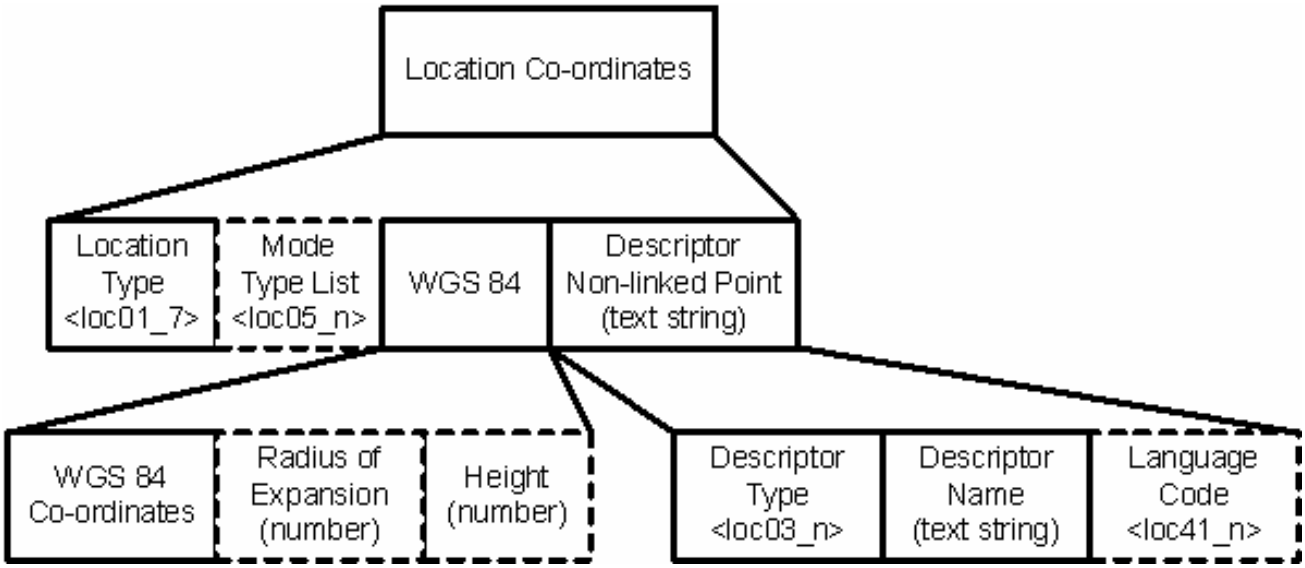

Figure 9 — Location co-ordinates container – Non-linked point elements

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5.1.1.7 Connected points

Where type is defined by TPEG Table loc01_8

Connected points may be used to describe a collection of transport modes. In TPEG-Loc 'connected coints' is used to describe multimodal locations that represent a node with more than one sub-node with access to multiple transport modes. A service provider may want to describe the airport, the long-distance railway station, the regional railway station, the underground, the bus stops, the Park-and-Ride facilities and so on. TPEG-Loc even allows the service provider to give location information on different terminals within the airport.

EXAMPLE The following hierarchy of information may be needed to describe connected points at a location such as London Heathrow Airport:

location_co-ordinates
- location_type: connected points (loc01_8)
- mode_type_list
  - mode_of_transport: aircraft (loc05_9)
  - mode_of_transport: suburban railway (loc05_4)
  - mode_of_transport: metro (loc05_5)
  - mode_of_transport: bus (loc05_6)
- point
  - WGS 84
    - longitude: W 0.45294
    - latitude: N 51.478253
    - radius of expansion: 3 km
  - descriptor
    - type: multimode point (loc03_13)
    - text: London Heathrow
  - descriptor
    - type: airport name (loc03_17)
    - text: Heathrow
  - WGS 84
    - longitude: W 0.45232
    - latitude: N 51.47099
    - radius of expansion: 300 m
  - descriptor
    - type: railway station name (loc03_18)
    - text: Heathrow Express, Terminal 1
  - WGS 84
    - longitude: W 0.45232
    - latitude: N 51.47099
  - radius of expansion: 200 m
- descriptor
  - type: Metro station name (loc03_19)
  - text: Picadilly Line, Heathrow Terminals 1, 2, 3
- WGS 84
  - longitude: W 0.44725
  - latitude: N 51.45923
  - radius of expansion: 200 m
- descriptor
  - type: Metro station name (loc03_19)
  - text: Picadilly Line, Heathrow Terminal 4
- WGS 84
  - longitude: W 0.45162
  - latitude: N 51.47228
  - radius of expansion: 200 m
- descriptor
  - type: bus stop name (loc03_33)
  - text: Airport Bus Terminal 1

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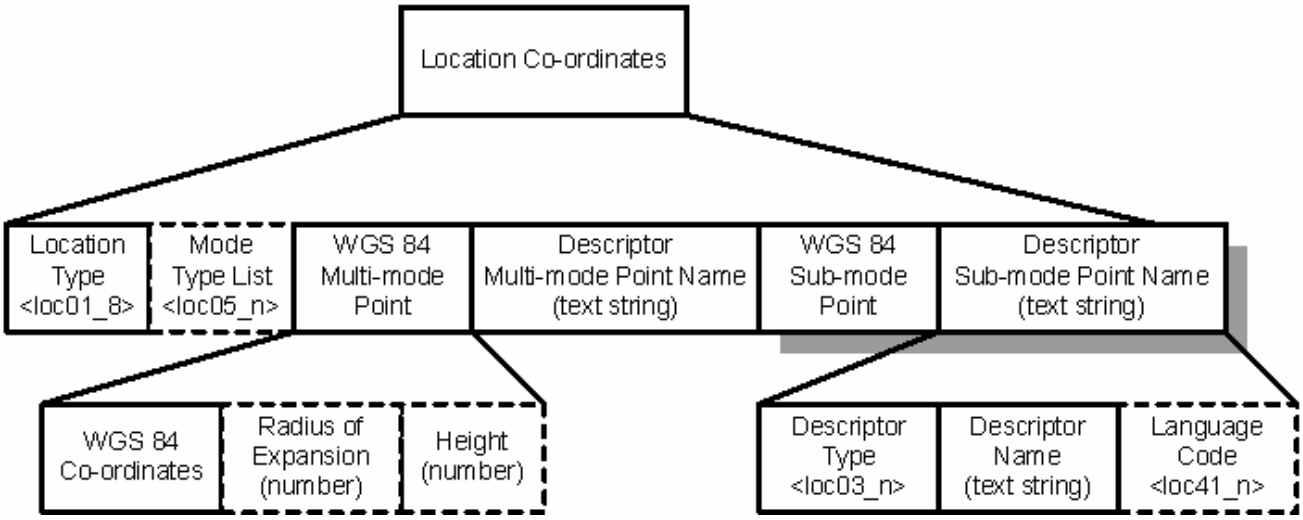

Figure 10 — Location co-ordinates container – Connected points elements

5.1.2 Additional location descriptions

In addition to the location co-ordinates described above, TPEG-Loc also offers the use of additional descriptive location referencing. The main use of this is to provide a human user with information on the location without any need for co-ordinate references to a map, as may be experienced when using a 'thin-client' TPEG decoder (non-map-based).

The method allows a relatively large amount of language independence, by employing various TPEG tables (numbered locxx) that may be translated into suitable descriptive word combinations for human end-users. It allows referenced text-based location information to be delivered in a fully, understandable, structured format without the *essential* use of WGS 84 co-ordinates.

Location referencing is achieved through the hierarchically structured use and context of data elements and codes. This provides both full network and node descriptions and an area referencing method to allow client geo-area filtering.

The TPEG-location container concept is shown in Figure 11 with the additional location descriptions container shown in more detail.

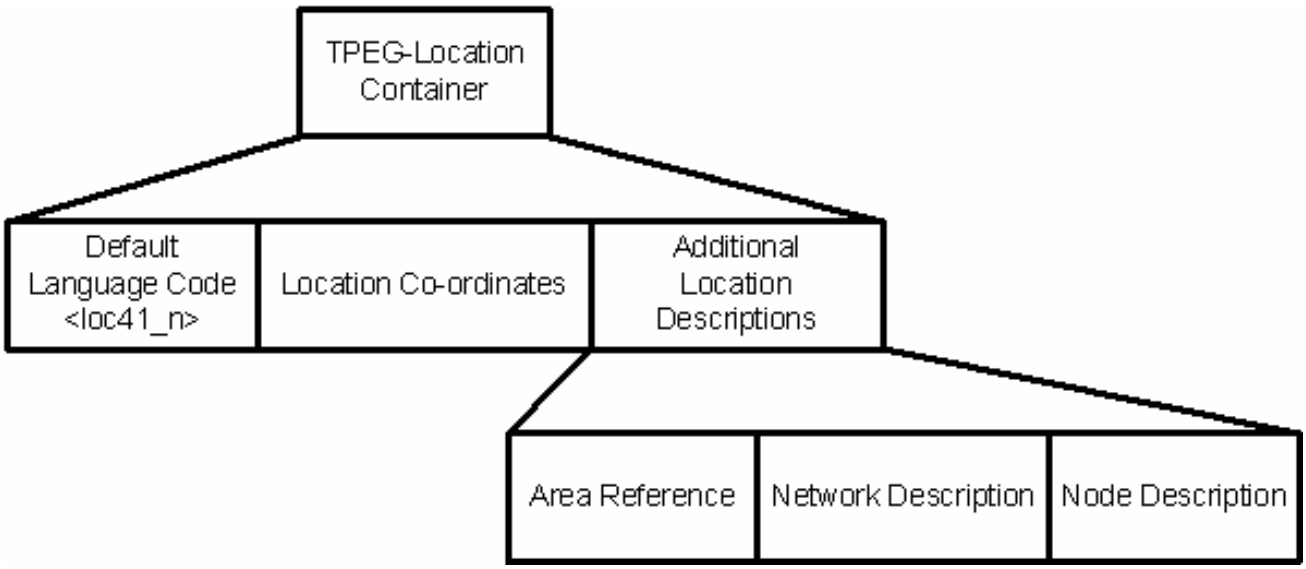

Figure 11 — Additional location description components

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5.1.2.1 Area referencing

The concept of providing area references allows a client decoder to filter messages on a geographical-area basis. It has the major advantage that a receiver/decoder without a map database can filter messages.

An area reference describes an area in relation to all other possible areas within a service component, and is an element of the additional location descriptions container.

Area referencing is achieved by defining an area tree structure, in which each area name is given a unique "triplet number". This definition is individually determined by each service provider. Therefore a service provider can optimize an area tree structure for their services, without reference to other area definitions that are not optimized for end-user requirements (e.g. administrative areas such as cantons).

EXAMPLE Figure 12 shows an example of an area tree structure, where branches are identified by levels numbered from 0 upwards. The root of the tree structure is "0" and in this example the geographical-area of the country Germany. Level 1 then provides a reference to large geographical-areas such as the Black Forest. Level 2 provides references to smaller geo-areas than level 1 such as "The North of the Black Forest" and large cities like Stuttgart. Level 3 provides references to even smaller areas and levels 4 to 8, are available for progressively smaller geo-areas. The root of an area tree is decided by the service provider. This means that a local service provider, for example in Munich may use Greater Munich as the root and the service provider does not have to generate a complete tree starting with Germany, Bavaria, etc. A typical area tree may be quite small with perhaps up to 20 entries in 3 levels to make it simple for the end-user to select the preferred area, within the service being used.

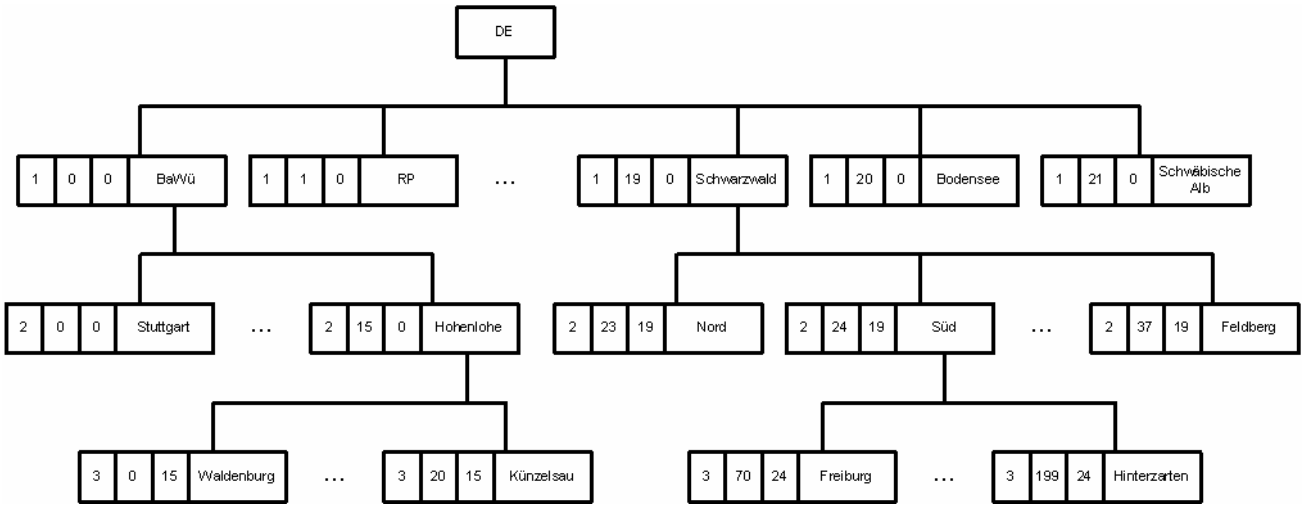

Figure 12 — An example of an area tree

Each area tree refers to specific service component within a service. This means that the service provider can adapt an optimal area tree for each component. A service, for example, which delivers one component containing national traffic information for the main roads and another component for local traffic information may have different area trees for each component for the benefit of the end-user.

The indexing of geo-areas by "triplet number" makes it possible for a receiver to store the area tree structure together with area names. A receiver may then filter messages referring to a specific area by its unique "triplet number". This provides the opportunity for the end-user to select messages only referring to a particular area.

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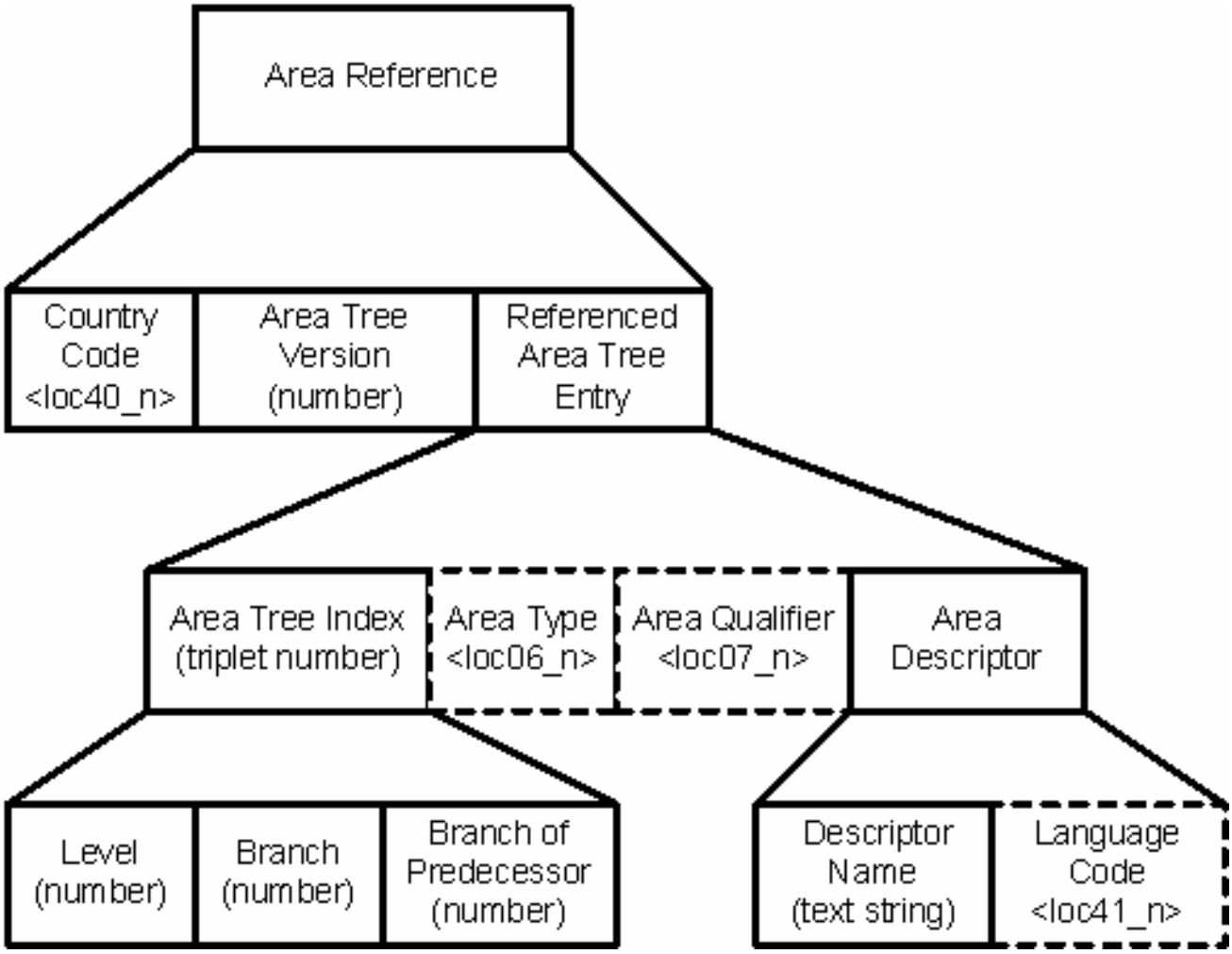

Figure 13 — Area referencing

5.1.2.2 Network description

The network description provides information about links in networks, and is an element of the additional location descriptions container. The defined structure of the element permits filtering and selection based on e.g. road types and numbers, rail link types and numbers, water link types and numbers, flight link types and numbers, and even on segment names and directions.

To cover a maximum variety of network situations, the information elements of the network description may be repeated as a whole, in order to describe a link that affects, for example, several roads having the same physical route (e.g. A8 Dreieck Leonberg – Kreuz Stuttgart, A81 Dreieck Leonberg – Kreuz Stuttgart, E52 Dreieck Leonberg – Kreuz Stuttgart), or may be repeated in parts, in order to describe a single link that has various names in one or multiple languages. To gain maximum flexibility all elements in the network description container, apart from network layer and link type are optional in order to describe also, for example, small roads without a road (link) number.

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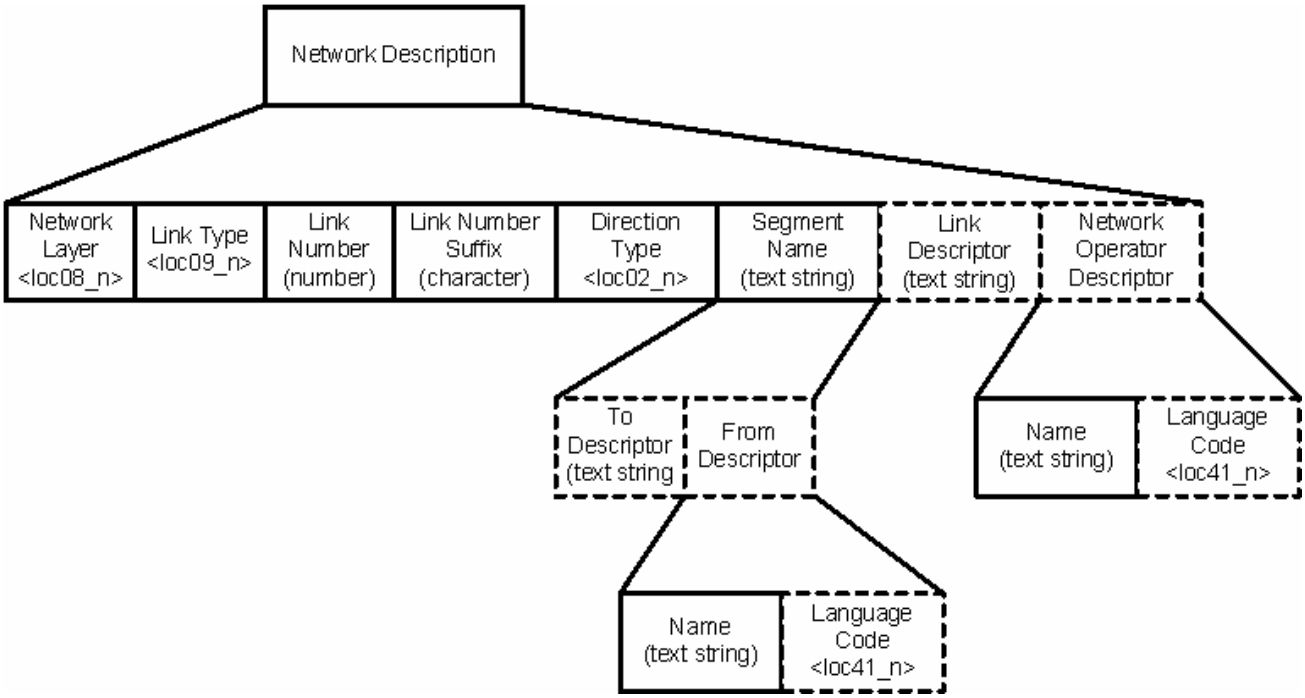

Figure 14 — Network description details

To illustrate how some of the above elements should be used the following examples provide a guide:

EXAMPLE 1 In the case of the M25, network description could be used as follows:

Network Layer = Loc08_01	> Road Network
Link Type = Loc09_01	> Motorway (if presentation In English)
Link Number = 25	> 25
Link Number Suffix =	> not used

EXAMPLE 2 In the case of a road in Stuttgart, which is called the 'B27a', network description could be used as follows:

Network Layer = Loc08_01	> Road Network
Link Type = Loc09_02	> Bundesstrasse (if presentation in German)
Link Number = 27	> 27
Link Number Suffix = 'a'	> a

EXAMPLE 3 In the case of a German rail link called 'IC 576', network description could be used as follows:

Network Layer = Loc08_05	> Rail Network
Link Type = Loc13_03	> Intercity or IC
Link Number = 576	> 576
Link Number Suffix =	> not used

The link_descriptor may be used, if there exists a specific name for the part of the road, which is described by network description (e.g. London North Circular road). Usually the segment name should be enough to describe the link sufficiently. The elements: network_layer, link_type and link_number are those elements in the network description, which describe the network information. Based on this it is possible for a text-based receiver to filter and select TPEG messages for the end-user.

5.1.2.3 Node description

The node description describes single points or complex nodes, which are part of a network. It is an element of the additional location descriptions container.

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Filtering and selection may be achieved through node type or the defined structure of the element or through the associated area reference and/or network description.

The node description is a recursive data structure, which may be used to describe all kinds of (traffic) nodes from the very simple to a very complex one. A single point, e.g. on a road, needs no recursion, but for a multimodal node the structure may be repeated as many times as sub-nodes need to be described. This method equals the definition for connected points inside the TPEG-Loc element, Location Co-ordinates.

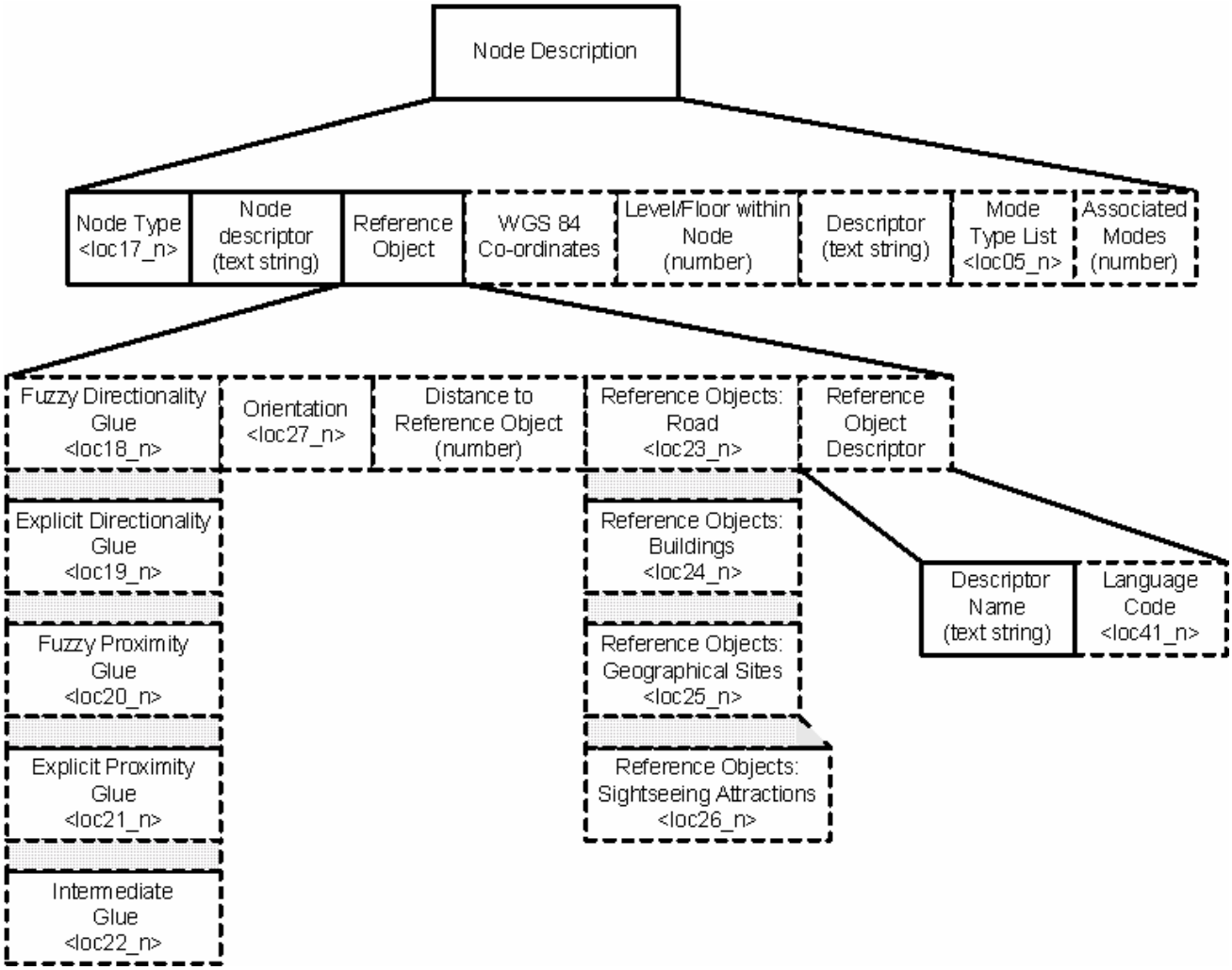

Figure 15 — Node description details

5.2 Structure of TPEG-Loc

5.2.1 TPEG location container

location_container (default_language/loc41,[]..)

location_co-ordinates : Section 5.2.2

additional_location_descriptions : Section 5.2.3

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5.2.2 Location co-ordinates

location_co-ordinates (location_type/loc01, [ ]..)

mode_type_list ([ ]..)

modes_of_transport(modes_of_transport/loc05)

direction_type(direction_type/loc02)

point

WGS 84 (longitude, latitude, [ ]..)

expansion (radius_of_circle/m)

height (height_descriptor/loc04, height/m)

descriptor (descriptor_type/loc03, text/s_string, [ ]..)

language (language_code/loc41)

5.2.3 Additional location descriptions

additional_location_descriptions(area_reference, [ ]..)

area_reference : Section 5.2.3.1

network_description : Section 5.2.3.2

node_description : Section 5.2.3.3

5.2.3.1 Area reference

area_reference(country_code/loc40, area_tree_version/byte, [ ]..)

area_tree_entry(level/byte, branch/word, predecessor_branch/word, [ ]..)

area_type (area_type/loc06)

area_qualifier (area_qualifier/loc07)

area_descriptor(area_name(text/s_string), [ ] …)

language (language_code/loc41)

5.2.3.2 Network description

network_description(network_layer/loc08, link_type/loc_z, [ ]..)

link_number (byte)

link_number_suffix (character)

direction_type (direction_type/loc02)

segment_name ([ ] ..)

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from_descriptor(from_name(text/s_string), [ ]..)

language (language_code/loc41),

to_descriptor(to_name(text/s_string), [ ]..)

language (language_code/loc41))

link_descriptor (link_name (text/s_string), [ ]..)

language (language_code/loc41))

network_operator_descriptor (network_operator_name (text/s_string), [ ]..)

language (language_code/loc41))

5.2.3.3 Node description

node_description(node_type/loc17, [ ]..)

node_descriptor (node_name (text/s_string), [ ]..)

language (language_code/loc41)

reference_object([ ]..)

fuzzy_directionality_glue(fuzzy_directionality_glue/loc18)

explicit_directionality_glue(explicit_directionality_glue/loc19)

fuzzy_proximity_glue(fuzzy_proximity_glue/loc20)

explicit_proximity_glue(explicit_ proximity_glue/loc21)

intermediate_glue(intermediate_glue/loc22)

orientation (orientation/loc27)

distance(distance/numag)

road_object(road_object/loc23)

building(building/loc24)

geographical_site(geographical_site/loc25)

sightseeing_attraction(sightseeing_attraction/loc26)

reference_object_descriptor (reference_object_name(text/s_string), [ ]..)

language (language_code/loc41)

WGS 84 (longitude, latitude, [ ]..)

expansion (radius_of_circle/m)

height (height_descriptor/loc04, height/m)

floor(floor/ signed_byte)

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mode_type_list ([ ]..)

modes_of_transport/loc05

associated_modes(number_of_modes, [ ]..)

node_description : defined in 5.2.3.3

5.3 Coding of location container

5.3.1 TPEG-Loc container

<tpeg_loc_container>:=	
<loc41>	: Default language for TPEG-Loc components
m * **<tpeg_loc_component()>**;	: TPEG-Loc components

5.3.1.1 TPEG-Loc component template

<tpeg_loc_component(x)>:=	: TPEG-Loc component template
<intunti>(id),	: Identifier, id = x hex
<intunli>(n),	: Length, n, of component data in bytes
n * **<byte>**;	: Component data

5.3.1.2 Location co-ordinates

<tpeg_loc_component(00)>:=	: Location co-ordinates component
<intunti>(id),	: Identifier, id = 00 hex
<intunli>(n),	: Length, n, of component data in bytes
<loc01>,	: Location type, TPEG table loc01
m * **<co-ordinates_component()>**;	: Location co-ordinates components

5.3.1.2.1 Location co-ordinates template

<co-ordinates_component(x)>:=	: Location co-ordinates component template
<intunti>(id),	: Identifier, id = x hex
<intunti>(n),	: Length, n, of component data in bytes
n * **<byte>**;	: Component data

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5.3.1.2.2 Mode type list

<co-ordinates_component(00)>:=	: Mode type list
<intunti>(id),	: Identifier, id = 00 hex
<intunti>(n),	: Length, n, of component data in bytes
m * **<mode_component()>**;	: Mode of transport components

5.3.1.2.2.1 Mode type list template

<mode_component(x)>:=	: Mode type list component template
<intunti>(id),	: Identifier, id = x hex
<intunti>(n),	: Length, n, of component data in bytes
n * **<byte>**;	: Component data

5.3.1.2.2.2 Mode of transport

<mode_component(00)>:=	: Mode of transport
<intunti>(id),	: Identifier, id = 00 hex
<intunti>(n),	: Length, n, of component data in bytes
<loc05>,	: Mode of transport, TPEG table loc05

5.3.1.2.3 Direction type

<co-ordinates_component(03)>:=	: Direction type
<intunti>(id),	: Identifier, id = 03 hex
<intunti>(n),	: Length, n, of component data in bytes
<loc02>;	: Direction type, TPEG table loc02

5.3.1.2.4 Location point

<co-ordinates_component(04)>:=	: Location point
<intunti>(id),	: Identifier, id = 04 hex
<intunti>(n),	: Length, n, of component data in bytes
m * **<location_point_component()>**;	: Location point components

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5.3.1.2.4.1 Location point component template

<location_point_component(x)>:=	: Location point component template
<intunti>(id),	: Identifier, id = x hex
<intunti>(n),	: Length, n, of component data in bytes
n * **<byte>**;	: Component data

5.3.1.2.4.2 WGS 84

<location_point_component(00)>:=	: WGS 84
<intunti>(id),	: Identifier, id = 00 hex
<intunti>(n),	: Length, n, of component data in bytes
<intsilo>(longitude),	: Longitude (in 10 micro-degrees units)
<intsilo>(latitude),	: Latitude (in 10 micro-degrees units)
m * **<WGS84_component()>**;	: WGS 84 components

5.3.1.2.4.2.1 WGS 84 template

<WGS84_component(x)>:=	: WGS 84 component template
<intunti>(id),	: Identifier, id = x hex
<intunti>(n),	: Length, n, of component data in bytes
n * **<byte>**;	: Component data

5.3.1.2.4.2.2 Expansion

<WGS84_component(00)>:=	: Expansion
<intunti>(id),	: Identifier, id = 00 hex
<intunti>(n),	: Length, n, of component data in bytes
<intunli>(r);	: Radius of circle (in metres * 10)

5.3.1.2.4.2.3 Height

<WGS84_component(01)>:=	: Height
<intunti>(id),	: Identifier, id = 01 hex
<intunti>(n),	: Length, n, of component data in bytes
<loc04>;	: Height descriptor, TPEG table loc04
<intsili>(h);	: Height in metres (signed)

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5.3.1.2.4.3 Descriptor

<location_point_component(01)>:=	: Descriptor
<intunti>(id),	: Identifier, id = 01 hex
<intunti>(n),	: Length, n, of component data in bytes
<loc03>,	: Descriptor type, TPEG table loc03
<short_string>(name),	: Descriptor
m * **<descriptor_component()>**;	: Descriptor components

5.3.1.2.4.3.1 Descriptor template

<descriptor_component(x)>:=	: Descriptor component template
<intunti>(id),	: Identifier, id = x hex
<intunti>(n),	: Length, n, of component data in bytes
n * **<byte>**;	: Component data

5.3.1.2.4.3.2 Language code

<descriptor_component(00)>:=	: Language
<intunti>(id),	: Identifier, id = 00 hex
<intunti>(n),	: Length, n, of component data in bytes
<loc41>;	: Language code, TPEG table loc41

5.3.1.3 Location descriptions

<tpeg_loc_component(01)>:=	: Location descriptions component
<intunti>(id),	: Identifier, id = 01 hex
<intunli>(n),	: Length, n, of component data in bytes
m * **<descriptions_component()>**;	: Location descriptions components

5.3.1.3.1 Location descriptions template

<descriptions_component(x)>:=	: Location descriptions component template
<intunti>(id),	: Identifier, id = x hex
<intunli>(n),	: Length, n, of component data in bytes
n * **<byte>**;	: Component data

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5.3.1.3.2 Area reference

<descriptions_component(00)>:=	: Area reference
<intunti>(id),	: Identifier, id = 00 hex
<intunli>(n),	: Length, n, of component data in bytes
<loc40>,	: 2-Alpha country code
<intunti>(ver),	: Area tree version number
m * **<area_reference_component()>**;	: Area reference components

5.3.1.3.2.1 Area reference component template

<area_reference_component(x)>:=	Area reference component template
<intunti>(id),	: Identifier, id = x hex
<intunti>(n),	: Length, n, of component data in bytes
n * **<byte>**;	: Component data

5.3.1.3.2.2 Area tree entry

<area_reference_component(00)>:=	: Area tree entry
<intunti>(id),	: Identifier, id = 00 hex
<intunti>(n),	: Length, n, of component data in bytes
<intunti>(level),	: Area tree level (index part1)
<intunli>(branche),	: Area tree branche (index part2)
<intunli>(predecessor),	: Predecessor branche (index part3)
m * **<area_tree_entry_component()>**;	: Area tree entry components

5.3.1.3.2.2.1 Area tree entry component template

<area_tree_entry_component(x)>:=	: Area tree entry component template
<intunti>(id),	: Identifier, id = x hex
<intunti>(n),	: Length, n, of component data in bytes
n * **<byte>**;	: Component data

5.3.1.3.2.2.2 Area type

<area_tree_entry_component(00)>:=	: Area type
<intunti>(id),	: Identifier, id = 00 hex
<intunti>(n),	: Length, n, of component data in bytes
<loc06>;	: Area type, TPEG table loc06

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5.3.1.3.2.2.3 Area qualifier

<area_tree_entry_component(01)>:=	: Area qualifier
<intunti>(id),	: Identifier, id = 01 hex
<intunti>(n),	: Length, n, of component data in bytes
<loc07>;	: Area qualifier, TPEG table loc07

5.3.1.3.2.2.4 Area descriptor

<area_tree_entry_component(02)>:=	: Area descriptor
<intunti>(id),	: Identifier, id = 02 hex
<intunti>(n),	: Length, n, of component data in bytes
<short_string>(area),	: Area name
m * **<area_descriptor_component()>**;	: Area descriptor components

5.3.1.3.2.2.4.1 Area descriptor component template

<area_descriptor_component(x)>:=	: Area descriptor component template
<intunti>(id),	: Identifier, id = x
<intunti>(n),	: Length, n, of component data in bytes
n * **<byte>**;	: Component data

5.3.1.3.2.2.4.2 Language code

<area_descriptor_component(00)>:=	: Language code
<intunti>(id),	: Identifier, id = 00
<intunti>(n),	: Length, n, of component data in bytes
<loc41>;	: Language code, TPEG table loc41

5.3.1.3.3 Network description

<descriptions_component(01)>:=	: Network description
<intunti>(id),	: Identifier, id = 01 hex
<intunli>(n),	: Length, n, of component data in bytes
<loc08>(layer),	: Network layer, TPEG table loc08
<intunti>(subtype),	: Link_type according to table given in 5.4.5
m * **<network_description_component()>**;	: Network description components

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5.3.1.3.3.1 Network description component template

<network_description_component(x)>:=	: Network description component template
<intunti>(id),	: Identifier, id = x hex
<intunti>(n),	: Length, n, of component data in bytes
n * **<byte>**;	: Component data

5.3.1.3.3.2 Link number

<network_description_component(00)>:=	: Link number
<intunti>(id),	: Identifier, id = 00 hex
<intunti>(n),	: Length, n, of component data in bytes
<intunli>(linknum);	: Link number e.g. “52” in case of link: E 52

5.3.1.3.3.3 Link number suffix

<network_description_component(01)>:=	: Link number suffix
<intunti>(id),	: Identifier, id = 01 hex
<intunti>(n),	: Length, n, of component data in bytes
<ch_def>(suffix);	: Link number suffix

5.3.1.3.3.4 Direction type

<network_description_component(02)>:=	: Direction type
<intunti>(id),	: Identifier, id = 02 hex
<intunti>(n),	: Length, n, of component data in bytes
<loc02>;	: Direction relating “from-to”, TPEG table loc02

5.3.1.3.3.5 Segment name

<network_description_component(03)>:=	: Segment name
<intunti>(id),	: Identifier, id = 03 hex
<intunti>(n),	: Length, n, of component data in bytes
m * **<segment_name_component()>**;	: Segment name components

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5.3.1.3.3.5.1 Segment name component template

<segment_name_component(x)>:=	: Segment name component template
<intunti>(id),	: Identifier, id = x hex
<intunti>(n),	: Length, n, of component data in bytes
n * **<byte>**;	: Component data

5.3.1.3.3.5.2 "From" descriptor

<segment_name_component(00)>:=	: "From" descriptor
<intunti>(id),	: Identifier, id = 00 hex
<intunti>(n),	: Length, n, of component data in bytes
<short_string>(from),	: "From" name
m * **<from_descriptor_component()>**;	: "From" descriptor component data

5.3.1.3.3.5.2.1 "From" descriptor component template

<from_descriptor_component(x)>:=	: "From" descriptor component template
<intunti>(id),	: Identifier, id = x hex
<intunti>(n),	: Length, n, of component data in bytes
n * **<byte>**;	: Component data

5.3.1.3.3.5.2.2 Language code

<from_descriptor_component(00)>:=	: Language code
<intunti>(id),	: Identifier, id = 00 hex
<intunti>(n),	: Length, n, of component data in bytes
<loc41>;	: Language code, TPEG table loc41

5.3.1.3.3.5.3 "To" descriptor

<segment_name_component(01)>:=	: "To" descriptor
<intunti>(id),	: Identifier, id = 01 hex
<intunti>(n),	: Length, n, of component data in bytes
<short_string>(to),	: "To" name
m * **<to_descriptor_component()>**;	: "To" descriptor components

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5.3.1.3.3.5.3.1 "To" descriptor component template

<to_descriptor_component(x)>:=	: "To" descriptor component template
<intunti>(id),	: Identifier, id = x hex
<intunti>(n),	: Length, n, of component data in bytes
n * **<byte>**;	: Component data

5.3.1.3.3.5.3.2 Language code

<to_descriptor_component(00)>:=	: Language code
<intunti>(id),	: Identifier, id = 00 hex
<intunti>(n),	: Length, n, of component data in bytes
<loc41>;	: Language code, TPEG table loc41

5.3.1.3.3.6 Link descriptor

<network_description_component(04)>:=	: Link descriptor
<intunti>(id),	: Identifier, id = 04 hex
<intunti>(n),	: Length, n, of component data in bytes
<short_string>(link),	: Link name
m * **<link_descriptor_component()>**;	: Link descriptor components

5.3.1.3.3.6.1 Link descriptor component template

<link_descriptor_component(x)>:=	: Link descriptor component template
<intunti>(id),	: Identifier, id = x hex
<intunti>(n),	: Length, n, of component data in bytes
n * **<byte>**;	: Component data

5.3.1.3.3.6.2 Language code

<link_descriptor_component(00)>:=	: Language code
<intunti>(id),	: Identifier, id = 00 hex
<intunti>(n),	: Length, n, of component data in bytes
<loc41>;	: Language code, TPEG table loc41

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5.3.1.3.3.7 Network operator descriptor

<network_description_component(05)>:=	: Network operator descriptor
<intunti>(id),	: Identifier, id = 05 hex
<intunti>(n),	: Length, n, of component data in bytes
<short_string>(operator),	: Network operator name
m * **<network_operator_descriptor_component()>**;	: Network operator descriptor components

5.3.1.3.3.7.1 Network operator descriptor component template

<network_operator_descriptor_component(x)>:=	: Network operator descriptor component template
<intunti>(id),	: Identifier, id = x hex
<intunti>(n),	: Length, n, of component data in bytes
n * **<byte>**;	: Component data

5.3.1.3.3.7.2 Language code

<network_operator_descriptor_component(00)>:=	: Language code
<intunti>(id),	: Identifier, id = 00 hex
<intunti>(n),	: Length, n, of component data in bytes
<loc41>;	: Language code, TPEG table loc41

5.3.1.3.4 Node description

<descriptions_component(02)>:=	: Node description
<intunti>(id),	: Identifier, id = 02 hex
<intunli>(n),	: Length, n, of component data in bytes
<loc17>,	: Node type, TPEG table loc17
m * **<node_description_component()>**;	: Node description components

5.3.1.3.4.1 Node description template

<node_description_component(x)>:=	: Node description component template
<intunti>(id),	: Identifier, id = x hex
<intunli>(n),	: Length, n, of component data in bytes
n * **<byte>**;	: Component data

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5.3.1.3.4.2 Node descriptor

<node_description_component(00)>:=	: Node descriptor
<intunti>(id),	: Identifier, id = 00 hex
<intunli>(n),	: Length, n, of component data in bytes
<short_string>(node),	: Node name
m * **<node_descriptor_component()>**;	: Node descriptor components

5.3.1.3.4.2.1 Node descriptor component template

<node_ descriptor_component(x)>:=	: Node descriptor component template
<intunti>(id),	: Identifier, id = x hex
<intunti>(n),	: Length, n, of component data in bytes
n * **<byte>**;	: Component data

5.3.1.3.4.2.2 Language code

<node_ descriptor_component(00)>:=	: Language code
<intunti>(id),	: Identifier, id = 00 hex
<intunti>(n),	: Length, n, of component data in bytes
<loc41>;	: Language code, TPEG table loc41

5.3.1.3.4.3 Reference object

<node_description_component(01)>:=	: Reference object
<intunti>(id),	: Identifier, id = 01 hex
<intunli>(n),	: Length, n, of component data in bytes
m * **<reference_object_component()>**;	: Reference object components

5.3.1.3.4.3.1 Reference object component template

<reference_object_component(x)>:=	: Reference object component template
<intunti>(id),	: Identifier, id = x hex
<intunti>(n),	: Length, n, of component data in bytes
n * **<byte>**;	: Component data

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5.3.1.3.4.3.2 Fuzzy directionality glue

<reference_object_component(00)>:=	: Fuzzy directionality glue
<intunti>(id),	: Identifier, id = 00 hex
<intunti>(n),	: Length, n, of component data in bytes
<loc18>;	: Fuzzy directionality glue, TPEG table loc18

5.3.1.3.4.3.3 Explicit directionality glue

<reference_object_component(01)>:=	: Explicit directionality glue
<intunti>(id),	: Identifier, id = 01 hex
<intunti>(n),	: Length, n, of component data in bytes
<loc19>;	: Explicit directionality glue, TPEG table loc19

5.3.1.3.4.3.4 Fuzzy proximity glue

<reference_object_component(02)>:=	: Fuzzy proximity glue
<intunti>(id),	: Identifier, id = 02 hex
<intunti>(n),	: Length, n, of component data in bytes
<loc20>;	: Fuzzy proximity glue, TPEG table loc20

5.3.1.3.4.3.5 Explicit proximity glue

<reference_object_component(03)>:=	: Explicit proximity glue
<intunti>(id),	: Identifier, id = 03 hex
<intunti>(n),	: Length, n, of component data in bytes
<loc21>;	: Explicit proximity glue, TPEG table loc21

5.3.1.3.4.3.6 Intermediate glue

<reference_object_component(04)>:=	: Intermediate glue
<intunti>(id),	: Identifier, id = 04 hex
<intunti>(n),	: Length, n, of component data in bytes
<loc22>;	: Intermediate glue, TPEG table loc22

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5.3.1.3.4.3.7 Orientation

<reference_object_component(05)>:=	: Orientation
<intunti>(id),	: Identifier, id = 05 hex
<intunti>(n),	: Length, n, of component data in bytes
<loc27>;	: Orientation, TPEG table loc27

5.3.1.3.4.3.8 Distance

<reference_object_component(06)>:=	: Distance
<intunti>(id),	: Identifier, id = 06 hex
<intunti>(n),	: Length, n, of component data in bytes
<numag>(m);	: Distance in metres

5.3.1.3.4.3.9 Road object

<reference_object_component(07)>:=	: Road object
<intunti>(id),	: Identifier, id = 07 hex
<intunti>(n),	: Length, n, of component data in bytes
<loc23>;	: Road object, TPEG table loc23

5.3.1.3.4.3.10 Building

<reference_object_component(08)>:=	: Building
<intunti>(id),	: Identifier, id = 08 hex
<intunti>(n),	: Length, n, of component data in bytes
<loc24>;	: Building, TPEG table loc24

5.3.1.3.4.3.11 Geographical site

<reference_object_component(09)>:=	: Geographical site
<intunti>(id),	: Identifier, id = 09 hex
<intunti>(n),	: Length, n, of component data in bytes
<loc25>;	: Geographical site, TPEG table loc25

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5.3.1.3.4.3.12 Sightseeing attraction

<reference_object_component(0A)>:=	: Sightseeing attraction
<intunti>(id),	: Identifier, id = 0A hex
<intunti>(n),	: Length, n, of component data in bytes
<loc26>;	: Sightseeing attraction, TPEG table loc26

5.3.1.3.4.3.13 Reference object descriptor

<reference_object_component(0B)>:=	: Reference object descriptor
<intunti>(id),	: Identifier, id = 0B hex
<intunti>(n),	: Length, n, of component data in bytes
<short_string>(ref_object),	: Reference object name
m * **<reference_object_descriptor_component()>**;	: Reference object descriptor components

5.3.1.3.4.3.13.1 Reference object descriptor component template

<reference_object_descriptor_component(x)>:=	: Reference object descriptor component template
<intunti>(id),	: Identifier, id = x hex
<intunti>(n),	: Length, n, of component data in bytes
n * **<byte>**;	: Component data

5.3.1.3.4.3.13.2 Language code

<reference_object_descriptor_component(00)>:=	: Language code
<intunti>(id),	: Identifier, id = 00 hex
<intunti>(n),	: Length, n, of component data in bytes
<loc41>;	: Language code, TPEG table loc41

5.3.1.3.4.4 WGS 84

<node_description_component(02)>:=	: WGS 84
<intunti>(id),	: Identifier, id = 02 hex
<intunli>(n),	: Length, n, of component data in bytes
<intsilo>(longitude),	: Longitude (in 10 micro-degrees units)
<intsilo>(latitude),	: Latitude (in 10 micro-degrees units)
m * **<WGS84_component()>**;	: WGS 84 components

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5.3.1.3.4.4.1 WGS 84 component template

<WGS84_component(x)>:=	: WGS 84 component template
<intunti>(id),	: Identifier, id = x hex
<intunti>(n),	: Length, n, of component data in bytes
n * **<byte>**;	: Component data

5.3.1.3.4.4.2 Expansion

<WGS84_component(00)>:=	: Expansion
<intunti>(id),	: Identifier, id = 00 hex
<intunti>(n),	: Length, n, of component data in bytes
<intunli>(r);	: Radius of circle (in metres * 10)

5.3.1.3.4.4.3 Height

<WGS84_component(01)>:=	: Height
<intunti>(id),	: Identifier, id = 01 hex
<intunti>(n),	: Length, n, of component data in bytes
<loc04>;	: Height descriptor, TPEG table loc04
<intsili>(h);	: Height in metres (signed)

5.3.1.3.4.5 Floor

<node_description_component(03)>:=	: Floor
<intunti>(id),	: Identifier, id = 03 hex
<intunli>(n),	: Length, n, of component data in bytes
<intsiti>(floor);	: Floor

5.3.1.3.4.6 Mode type list

<node_description_component(04)>:=	: Mode type list
<intunti>(id),	: Identifier, id = 04 hex
<intunli>(n),	: Length, n, of component data in bytes
m * **<mode_component()>**;	: Mode components

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5.3.1.3.4.6.1 Mode component template

<mode_component(x)>:=	: Mode component template
<intunti>(id),	: Identifier, id = x hex
<intunti>(n),	: Length, n, of component data in bytes
n * **<byte>**;	: Component data

5.3.1.3.4.6.2 Mode of transport

<mode_component(00)>:=	: Mode of transport
<intunti>(id),	: Identifier, id = 00 hex
<intunti>(n),	: Length, n, of component data in bytes
<loc05>;	: Mode of transport, TPEG table loc05

5.3.1.3.4.7 Associated modes

<node_description_component(05)>:=	: Associated modes
<intunti>(id),	: Identifier, id = 05 hex
<intunli>(n),	: Length, n, of component data in bytes
<intunti>(m),	: Number of associated modes
m * **<descriptions_component(02)>**;	: Associated modes (= node reference “repeated”)

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5.4 TPEG-Loc application primitives

5.4.1 TPEG tables - loc01 to loc27 and loc40 to loc41

Table 2 — TPEG tables – loc01 to loc27 and loc40 to loc41

<loc01>:=	: Location type
<intunti>;	: TPEG table loc01

<loc02>:=	: Direction type
<intunti>;	: TPEG table loc02

<loc03>:=	: Descriptor type
<intunti>;	: TPEG table loc03

<loc04>:=	: Height descriptor
<intunti>;	: TPEG table loc04

<loc05>:=	: Modes of transport
<intunti>;	: TPEG table loc05

<loc06>:=	: Area type
<intunti>;	: TPEG table loc06

<loc07>:=	: Area qualifier
<intunti>;	: TPEG table loc07

<loc08>:=	: Network layer
<intunti>;	: TPEG table loc08

<loc09>:=	: Road link type
<intunti>;	: TPEG table loc09

<loc10>:=	: Bus link type
<intunti>;	: TPEG table loc10

<loc11>:=	: Metro rail link type
<intunti>;	: TPEG table loc11

<loc12>:=	: Tram link type
<intunti>;	: TPEG table loc12

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Table 2 (*continued*)

<loc13>:=	: Train link type
<intunti>;	: TPEG table loc13

<loc14>:=	: Telecabin link type
<intunti>;	: TPEG table loc14

<loc15>:=	: Water transport link type
<intunti>;	: TPEG table loc15

<loc16>:=	: Air link type
<intunti>;	: TPEG table loc16

<loc17>:=	: Node type
<intunti>;	: TPEG table loc17

<loc18>:=	: Fuzzy directionality glue word
<intunti>;	: TPEG table loc18

<loc19>:=	: Explicit directionality glue word
<intunti>;	: TPEG table loc19

<loc20>:=	: Fuzzy proximity glue word
<intunti>;	: TPEG table loc20

<loc21>:=	: Explicit proximity glue word
<intunti>;	: TPEG table loc21

<loc22>:=	: Intermediate glue word
<intunti>;	: TPEG table loc22

<loc23>:=	: Road objects
<intunti>;	: TPEG table loc23

<loc24>:=	: Buildings
<intunti>;	: TPEG table loc24

<loc25>:=	: Geographical sites
<intunti>;	: TPEG table loc25

<loc26>:=	: Sightseeing attractions
<intunti>;	: TPEG table loc26

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Table 2 (*continued*)

<loc27>:=	: Directions
<intunti>;	: TPEG table loc27

<loc40>:=	: Country code
<intunti>;	: TPEG table loc40

<loc41>:=	: Language code
<intunti>;	: TPEG table loc41

5.4.2 TPEG tables (loc01 to loc27 and loc40 to loc41) indexing

The TPEG tables (loc) numbers and code values have no order-significance and only have number values randomly assigned during the development process. In order to aid navigation of these tables the following two sections provide an "internal index" to the tables, firstly in name order and secondly in number order.

5.4.3 TPEG tables (loc01 to loc27 and loc40 to loc41) – ordered by names

Table 3 — TPEG tables (loc01 to loc27 and loc40 to loc41) – ordered by names

Description	Table	Description	Table
air_link_type	16	language_code	41
area_qualifier	07	location_type	01
area_type	06	metro_rail_link_type	11
buildings	24	modes_of_transport	05
bus_link_type	10	network_layer	08
country_code	40	node_type	17
descriptor_type	03	orientations	27
direction_type	02	road_link_type	09
explicit_directionality_glue	19	road_objects	23
explicit _proximity_glue	21	sightseeing_attractions	26
fuzzy_directionality_glue	18	telecabin_link_type	14
fuzzy_proximity_glue	20	train_link_type	13
geographical_sites	25	tram_link_type	12
height_decriptor	04	water_transport_link_type	15
intermediate_glue	22	*~ end of version 3.0 tables ~*	

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5.4.4 TPEG tables (loc01 to loc27 and loc40 to loc41) – ordered by table numbers

Table 4 — TPEG tables (loc01 to loc27 and loc40 to loc41) – ordered by table numbers

Table	Description	Table	Description
01	location_type	17	node_type
02	direction_type	18	fuzzy_directionality_glue
03	descriptor_type	19	explicit_directionality_glue
04	height_decriptor	20	fuzzy_proximity_glue
05	modes_of_transport	21	explicit _proximity_glue
06	area_type	22	intermediate_glue
07	area_qualifier	23	road_objects
08	network_layer	24	buildings
09	road_link_type	25	geographical_sites
10	bus_link_type	26	sightseeing_attarctions
11	metro_rail_link_type	27	orientations
12	tram_link_type	..	..
13	train_link_type	40	country_code
14	telecabin_link_type	41	language_code
15	water_transport_link_type		*~ end of version 3.0 tables ~*
16	air_link_type		

5.4.5 TPEG tables (loc01 to loc27 Version 3.0) TPEG table loc08 cross-references

The specific link type can only be decoded given the code for the network layer. Therefore a cross-reference table exists to inform a client decoder what TPEG table it should use to decode the specific link type, given the code for the network layer type.

NOTE Some network layers do not have a link_type table defined. In these cases a code (one byte, set to 0) for the link_type must be transmitted; however TPEG decoders should ignore the code for the link_type.

Table 5 — Cross-references

Code	CEN-English 'Word'	Use of related TPEG Table (link_type), table name:
0	unknown	Unknown
1	road network	TPEG table loc09 “road_link_type”
2	bus network	TPEG table loc10 “bus_link_type”
3	metro rail network	TPEG table loc11 “metro_rail_link_type”
4	tram network	TPEG table loc12 “tram_link_type”
5	rail network	TPEG table loc13 “rail_link_type”
6	telecabin	TPEG table loc14 “telecabin_link_type”
7	water transport network	TPEG table loc15 “water_transport_link_type”
8	airway network	TPEG table loc16 “air_link_type”

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5.4.6 TPEG tables – structure and semantics

TPEG tables provide a list of the CEN-English 'word' with associated code value, and additionally comments, and where helpful, examples are given. The CEN-English 'word' describes a single entity as far as possible with a single word, but it is necessary to sometimes use a short phrase to describe the entity, e.g. north-east bound; nevertheless, TPEG tables are in essence tables of singular words. Where the coding allows multiplicity of the entity then the CEN-English 'word' shall be singular. In other cases there are a number of logical plurals, e.g. both ways, which are commented accordingly.

The key principle for the use of the CEN-English 'word' code value is that all client devices shall be designed to make their own assessment of the context and multiplicity, in order to deliver a semantically acceptable message in the chosen display language.

5.4.7 TPEG tables (loc01 to loc27 and loc40 to loc41 Version 3.0)

Table 6 — TPEG table loc01: location_type

Code	CEN-English 'Word'	Comments	Examples
0	unknown	*not used*	
1	large area	location type 1	
2	nodal area	location type 2	
3	segment	location type 3 (directional)	
4	reserved for future use	If this code is received the default word for this table shall be displayed	
5	intersection point	location type 5	
6	framed point	location type 6	
7	non-linked point	location type 7	
8	connected point	location type 8	
..	***~ end of version 3.0 ~***		
..			
255	Unknown	- the table default word -	

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Table 7 — TPEG table loc02: direction_type

Code	CEN-English 'Word'	Comments	Examples
0	unknown		
1	opposite		
2	both ways	logical plural	
3	north bound		
4	north-east bound		
5	east bound		
6	south-east bound		
7	south bound		
8	south-west bound		
9	west bound		
10	north-west bound		
11	clockwise		
12	anti-clockwise		
13	inner-ring		
14	outer-ring		
15	all directions	logical plural	
..	***~ end of version 3.0 ~***		
..			
255	unknown	- the table default word -	

Table 8 — TPEG table loc03: descriptor_type

Code	CEN-English 'Word'	Comments	Examples
0	unknown		
1	area name		in DE: Schwarzwald
2	node name		
3	from name (segment)		
4	to name (segment)		
5	link name	i.e. road name	
6	local link name		
7	tpeg-ilc name 1		
8	tpeg-ilc name 2		
9	tpeg-ilc name 3		
10	intersection name		
11	point name		
12	non-linked point name		
13	multimode point name		in UK: Heathrow Airport
14	submode point name		in UK: Heathrow Airport - underground station
15	mode name		railway
16	internal division name		in UK: Heathrow Airport – Terminal 3
17	airport name		

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Code	CEN-English 'Word'	Comments	Examples
18	railway station name		in FR, Paris: Gare du Nord
19	metro station name		in DE, Munich: Marienplatz
20	terminal identifier		in CH: GVA International
21	gate identifier		Gate 55
22	platform identifier		
23	building name		in UK, London: Centre Point
24	town name		in UK: Battle
25	county name		in UK: East Sussex
26	region name		in UK: South-East England
27	nation name		in UK: England
28	river name		in FR: Loire
29	canal name		in UK: Kennet and Avon
30	lake name		in CH: Lac Leman
31	sea name		North Sea
32	junction name	name or number	in UK: J19 in DE: Frankfurter Kreuz
33	bus stop name		
34	IATA identifier	i.e. code for airport name	in UK: "LGW"
35	tidal river name		in UK: Medway
36	bus stop identifier	i.e. national bus stop number	in UK: NaPTAN number
37	ferry port name		in UK: Hollyhead
38	administrative area name		In UK: Highways Agency area
39	police force control area name		
40	administrative reference name		In UK: Highways Agency road
41	point-of-interest name		
42	parking facility name		
43	service area name		
..	***~ end of version 3.0 ~***		
..			
255	descriptor name	- the table default word -	

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Table 9 — TPEG table loc04: height_descriptor

Code	CEN-English 'Word'	Comments	Examples
0	unknown		
1	above	relative to location	
2	below	relative to location	
3	at	relative to location	
4	above sea level		
5	below sea level		
6	at sea level		
7	above street level		
8	below street level		
9	at street level		
..	***~ end of version 3.0 ~***		
..			
255	undefined	- the table default word -	

Table 10 — TPEG table loc05: modes_of_transport

Code	CEN-English 'Word'	Comments	Examples
0	unknown		
1	road		
2	railway	full-size carriages	in UK: Connex SE
3	coach		
4	suburban railway	full-size carriages	in DE: Berlin S-Bahn
5	underground	also metro	in FR: Ligne 14
6	bus	also trolleybus	
7	tram		in BE: Pre-metro
8	water transport	canal, river and sea	
9	aircraft		
10	telecabin		
11	funicular		
12	taxi		
13	self drive		
14	cable–drawn boat		
15	monorail		
16	light railway	light-weight carriages	
..	***~ end of version 3.0 ~***		
..			
255	undefined	- the table default word -	

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Table 11 — TPEG table loc06: area_type

Code	CEN-English 'Word'	Comments	Examples
0	unknown		
1	continent		Europe
2	country		Italy
3	first subdivision of a country	largest defined area	Federal states, Länder, Scotland
4	second subdivision of a country	regions	Provence, South-East England, Schwaben
5	third subdivision of a country	subdivision of a region	County, Kreis, Département, Kanton
6	fuzzy		Schwarzwald, Vosges, Lake District, Marches
7	city		in UK: Canterbury
8	town		in UK: Battle
9	village		in UK: Catsfield
10	urban district		in UK: Rother
..	***~ end of version 3.0 ~***		
..			
255	Unknown	- the table default word -	

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Table 12 — TPEG table loc07: area_qualifier

Code	CEN-English 'Word'	Comments	Examples
0	unknown		
1	part of		
2	higher part of		
3	lower part of		
4	low lying area of		
5	all of		
6	much of		
7	in the middle of		
8	in the centre of		
9	inside of		
10	outside of		
11	outskirts of	i.e. periphery of logical plural	
12	edge of		
13	bottom of		
14	top of		
15	greater		in UK: Greater London
16	northern part of		
17	north-eastern part of		
18	eastern part of		
19	south-eastern part of		
20	southern part of		
21	south-western part of		
22	western part of		
23	north-western part of		
..	***~ end of version 3.0 ~***		
..			
255	Unknown	- the table default word -	

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Table 13 — TPEG table loc08: network_layer

Code	CEN-English 'Word'	Comments	Examples
0	unknown		
1	road network		
2	bus network	also coach or trolleybus network	
3	metro rail network		
4	tram network		
5	rail network		
6	telecabin		
7	water transport network		
8	airline network		
9	underground rail network		
..	***~ end of version 3.0 ~***		
..			
255	Unknown	- the table default word -	

Table 14 — TPEG table loc09: road_link_type

Code	CEN-English 'Word'	Comments	Examples
0	unknown		
1	motorway	first order road	in UK: Motorway
2	principal road	second order road	in UK: A-class road
3	secondary road	third order road	in UK: B-class road
4	local road	forth order road	in UK: C-class road
5	unnumbered road	fifth order road	U
6	european route	E numered road	E 52
7	deviation route		in DE: U 26, itinéraire bis
8	tourist route		in DE: Weinstrasse, Schwarzwaldhoch-strasse
9	route		in FR: périphérique
10	ferry	vehicle carrying ferry link	
11	railway	vehicle carrying railway link	
12	link	vehicle carrying link	
..	***~ end of version 3.0 ~***		
..			
255	road link	- the table default word -	

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Table 15 — TPEG table loc10: bus_link_type

Code	CEN-English 'Word'	Comments	Examples
0	unknown		
1	express	inter-city, with hourly or so services	in UK: London to Edinburgh
2	night bus	hourly or so services	in UK: London, N5 route
3	service bus	frequent services (no distinction for trolleybus or tram)	in CH: Geneva, Line 5 TPG (using scheduled service at signposted stops)
4	post bus	limited seating vehicle on postal route, not tightly scheduled	in UK: rural routes operated by Royal Mail
5	local bus	small 4/8 seater	in FR: Ferney-Voltaire Navette
6	regional bus	only occasional services	regular service in rural areas
7	school bus	stopping in special places and near schools	
8	special needs bus	vehicle for wheel chair users and people of limited mobility	
9	sightseeing bus	often start and stop at same place	in UK: London circular route
10	airport link bus	bus services between airports	in UK: 747 Express Bus between LHR and LGW
..	***~ end of version 3.0 ~***		
..			
255	bus link	- the table default word -	

Table 16 — TPEG table loc11: metro_rail_link_type

Code	CEN-English 'Word'	Comments	Examples
0	unknown		
1	underground link		in UK: London: Circle line, in DE: Berlin: U-Bahn - U6 in FR: Paris: Metro - Ligne 4
2	suburban city train link		in UK: Thames Link: Farringdon to St Albans in DE: S-Bahn: Munich Airport to City in FR: RER: St Germain to Marne-la-Vallée
3	metro rail link		
4	airport rail link		in UK: Heathrow Express rail
5	mono-rail link		in DE: Schwebebahn Wuppertal
..	***~ end of version 3.0 ~***		
..			
255	metro rail link	- the table default word -	

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Table 17 — TPEG table loc12: tram_link_type

Code	CEN-English 'Word'	Comments	Examples
0	unknown		
1	service tram link	frequent services	in DE: Line 17 München (using scheduled service at signposted stops)
2	sightseeing tram link		in UK: Blackpool sea front route
..	***~ end of version 3.0 ~***		
..			
255	tram link	- the table default word -	

Table 18 — TPEG table loc13: train_link_type

Code	CEN-English 'Word'	Comments	Examples
0	unknown		
1	international train link		Eurostar, TGV, Thalys
2	national train link		ICE, TGV, HST
3	inter-city train link		IC, HST
4	regional train link		IR, Thames Link
5	suburban train link		in UK: Silver Link Metro
6	local train link		in UK: Nene Valley Railway
7	tourist train link		in UK: Romney, Hythe & Dymchurch Railway
8	rack railway link		in CH: Roches de Nayes
..	***~ end of version 3.0 ~***		
..			
255	train link	- the table default word -	

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Table 19 — TPEG table loc14: telecabin_link_type

Code	CEN-English 'Word'	Comments	Examples
0	unknown		
1	telecabin link		in FR: Crozet
2	funicular link		in CH: Territet, in FR: Montmatre
3	cable car link		in FR: Salève
4	elevator link		in PO: Lisbon
5	chair lift link		
6	drag lift link		
7	egg lift link		
8	mineral buckets link		in UK: Mountfield, East Sussex
..	***~ end of version 3.0 ~***		
..			
255	telecabin link	- the table default word -	

Table 20 — TPEG table loc15: water_transport_link_type

Code	CEN-English 'Word'	Comments	Examples
0	unknown		
1	local passenger boat link		in IT: Venice waterbus
2	regional passenger boat link		Geneva lake, Vier Waldstattersee, Stockholm arhipel
3	national passenger boat link		Sweden – Gotland
4	international passenger boat link		Malmö - Copenhagen
5	local car ferry link		Lisbon harbour, Venice Lido-link
6	regional car ferry link		Holland - between the islands of Zeeland
7	national car ferry link		Sweden – Gotland
8	international car ferry link	including hovercraft	Between Belgium and Dover, Finlands Färjan
9	post boat link		Norway Bergen Sogne fjord
10	train ferry link		Helsingør - Helsingborg
11	road ferry link		in UK: Reedham Ferry Norfolk
12	airport boat link		in IT: San Marco - Venice Airport
13	sightseeing boat link		
14	school boat link		
..	***~ end of version 3.0 ~***		
..			
255	water transport link	- the table default word -	

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Table 21 — TPEG table loc16: air_link_type

Code	CEN-English 'Word'	Comments	Examples
0	unknown		
1	long haul scheduled intercontinental air link		Schiphol – New York
2	international scheduled air link		London - Lisbon
3	short haul international scheduled air link	city hopper	Amsterdam - Brussels
4	internal scheduled air link		London – Leeds
5	intercontinental charter air link		Frankfurt - Florida
6	international charter air link		London - Majorca
7	internal charter air link	event flights	Concorde round trip
8	sightseeing air link		Swiss Alps Interlaken, Las Vegas - Grand Canion
9	shuttle service air link		Boston – New York
10	helicopter service air link		New-York JFK – Manhattan
..	***~ end of version 3.0 ~***		
..			
255	air link	- the table default word -	

Table 22 — TPEG table loc17: node_type

Code	CEN-English 'Word'	Comments	Examples
0	unknown		
1	mono mode point		
2	multimodal node		
..	***~ end of version 3.0 ~***		
..			
255	unknown	- the table default word -	

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Table 23 — TPEG table loc18: fuzzy_directionally_glue

Code	CEN-English 'Word'	Comments	Examples
0	unknown		
1	above		
2	over		
3	under		
4	below		
5	after		
6	before		
7	in front of		
8	behind		
9	beyond		
10	past		
11	outside		
12	inside		
13	down from		
14	down to		
15	up from		
16	up to		
17	from		
18	to		
19	towards		
20	approaching		
21	in the direction of	accurate direction	
22	direction	approximate direction	
..	***~ end of version 3.0 ~***		
..			
255	unknown	- the table default word -	

Table 24 — TPEG table loc19: explicit_directionality_glue

Code	CEN-English 'Word'	Comments	Examples
0	unknown		
1	opposite		
2	via		
3	entrance to		
4	exit from		
..	***~ end of version 3.0 ~***		
..			
255	unknown	- the table default word -	

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Table 25 — TPEG table loc2: fuzzy_proximity_glue

Code	CEN-English 'Word'	Comments	Examples
0	unknown		
1	near by	vicinity of (within 1 km)	
2	height of		
3	close to	within a few hundred metres	
4	beside		
5	near		
6	next to	smallest distance	
..	***~ end of version 3.0 ~***		
..			
255	unknown	- the table default word -	

Table 26 — TPEG table loc21: explicit_proximity_glue

Code	CEN-English 'Word'	Comments	Examples
0	unknown		
1	reserved for future use	If this code is received the default word for this table shall be displayed	
2	at		
3	on		
4	upon		
5	in		
..	***~ end of version 3.0 ~***		
..			
255	unknown	- the table default word -	

Table 27 — TPEG table loc22: intermediate_glue

Code	CEN-English 'Word'	Comments	Examples
0	unknown		
1	between		
2	downhill		
3	uphill		
4	along		
5	through		
6	with		
..	***~ end of version 3.0 ~***		
..			
255	Unknown	- the table default word -	

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Table 28 — TPEG table loc23: road_objects

Code	CEN-English 'Word'	Comments	Examples
0	unknown		
1	junction		
2	roundabout		
3	bridge		
4	dam		
5	fuel station		
6	ringroad		
7	gyratory system	rotary one way road system	
8	road tunnel		
9	toll booth		
10	toll plaza		
11	flyover		
12	underpass		
13	traffic lights	logical plural	
14	road-rail crossing	in UK: level crossing	
15	marker post		kilometre or mile marker
16	exit		
17	cross road		
18	kiss and ride	area or lane for passenger set down only	
19	set-down	area or lane	
20	pick-up	area or lane	
21	set-down and pick-up	area or lane	
..	***~ end of version 3.0 ~***		
..			
255	unknown	- the table default word -	

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Table 29 — TPEG table loc24: buildings

Code	CEN-English 'Word'	Comments	Examples
0	unknown		
1	airport terminal		
2	ferry terminal		
3	railway car terminal		
4	railway station		
5	underground station	also metro	
6	bus station		
7	cable car station		
8	tram station		
9	rapid transit station		
10	manor		
11	church		
12	store		
13	retail park		
14	multi-story car park		
15	fire station		
16	ambulance station		
17	police station		
18	school		
19	university		
20	palace		
21	hospital		
22	hotel		
23	motel		
24	lighthouse		
25	mine		
26	swimming pool	indoor swimming pool building	
27	prison		
28	official building		
29	town hall		
30	pub		
31	restaurant		
32	bistro		
33	guest house		
34	café		
35	fast food restaurant		
36	military barracks	logical plural	
37	sports hall	logical plural	
38	exhibition hall		
39	convention centre		
40	cultural hall		in UK: London - Festival Hall
41	concert hall		

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Code	CEN-English 'Word'	Comments	Examples
42	theatre		
43	opera house		
44	cinema		
45	museum		
46	tourist information office		
47	railway tunnel entrance		
48	water tower		
49	large telecommunications tower	> 30 metre tall logical plural	
50	small telecommunications tower	< 30 metre tall logical plural	
51	tower		
52	post building		
53	government building		
54	border checkpoint		
55	supermarket		
56	newsagent		
57	kindergarten		
58	senior citizens residence	logical plural	
59	college		
60	embassy		
61	waiting room		
62	toilets	logical plural	
..	***~ end of version 3.0 ~***		
..			
255	Unknown	- the table default word -	

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Table 30 — TPEG table loc25: geographical_sites

Code	CEN-English 'Word'	Comments	Examples
0	unknown		
1	coast		
2	mountain		
3	mountainous region		in UK: "The Grampians" (Scotland)
4	airport area		
5	alpine region		
6	canal		
7	cave		
8	retail park		
9	car park		
10	park and ride area		
11	forest		
12	sports stadium	logical plural	
13	sports ground	logical plural	
14	golf course		
15	harbour		
16	marina		
17	island		
18	lake		
19	river		
20	swimming area		
21	leisure centre		
22	beach area		
23	mountain pass		
24	summit		
25	peninsula		
26	service area		
27	picnic area		
28	rest area	i.e. including large layby	
29	railway line		
30	military restricted area		
31	camping area		
32	caravan park		
33	community		
34	village		
35	fair ground		
36	waterfall		
37	market place		
38	park	i.e. green area possibly with trees	
39	view point		
40	border		
41	theme park		

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Code	CEN-English 'Word'	Comments	Examples
42	industrial area		
43	race course		
44	science park		
45	city centre		
46	village centre		
47	town centre		
48	town		
49	city		
..	***~ end of version 3.0 ~***		
..			
255	Unknown	- the table default word -	

Table 31 — TPEG table loc26: sightseeing_attractions

Code	CEN-English 'Word'	Comments	Examples
0	unknown		
1	botanical garden		
2	castle		
3	manor		
4	cave		
5	church		
6	geological site		
7	archaeological site		
8	ruined building		
..	***~ end of version 3.0 ~***		
..			
255	unknown	- the table default word -	

Table 32 — TPEG table loc27: orientations

Code	CEN-English 'Word'	Comments	Examples
0	unknown		
1	north		
2	north-east		
3	east		
4	south-east		
5	south		
6	south-west		
7	west		
8	north-west		
9	clockwise		
10	counter clockwise		
11	all directions	logical plural	
..	***~ end of version 3.0 ~***		
..			
255	Unknown	- the table default word -	

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Table 33 — TPEG table loc40: country_code

Code	CEN-English Country Name	2-Alpha Code
0	unknown	
1	Afghanistan	AF
2	Albania	AL
3	Algeria	DZ
4	American Samoa	AS
5	Andorra	AD
6	Angola	AO
7	Anguilla	AI
8	Antarctica	AQ
9	Antigua and Barbuda	AG
10	Argentina	AR
11	Armenia	AM
12	Aruba	AW
13	Australia	AU
14	Austria	AT
15	Azerbaijan	AZ
16	Bahamas	BS
17	Bahrain	BH
18	Bangladesh	BD
19	Barbados	BB
20	Belarus	BY
21	Belgium	BE
22	Belize	BZ
23	Benin	BJ
24	Bermuda	BM
25	Bhutan	BT
26	Bolivia	BO
27	Bosnia and Herzegovina	BA
28	Botswana	BW
29	Bouvet Island	BV
30	Brazil	BR
31	British Indian Ocean Territory	IO
32	Brunei Darussalam	BN
33	Bulgaria	BG
34	Burkina Faso	BF
35	Burundi	BI
36	Cambodia	KH
37	Cameroon	CM
38	Canada	CA
39	Cape Verde	CV
40	Cayman Islands	KY
41	Central African Republic	CF

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Code	CEN-English Country Name	2-Alpha Code
42	Chad	TD
43	Chile	CL
44	China	CN
45	Christmas Island	CX
46	Cocos (Keeling) Islands	CC
47	Colombia	CO
48	Comoros	KM
49	Congo	CG
50	Congo, The Democratic Republic of the	CD
51	Cook Islands	CK
52	Costa Rica	CR
53	Côte D'ivoire	CI
54	Croatia	HR
55	Cuba	CU
56	Cyprus	CY
57	Czech Republic	CZ
58	Denmark	DK
59	Djibouti	DJ
60	Dominica	DM
61	Dominican Republic	DO
62	East Timor	TP
63	Ecuador	EC
64	Egypt	EG
65	El Salvador	SV
66	Equatorial Guinea	GQ
67	Eritrea	ER
68	Estonia	EE
69	Ethiopia	ET
70	Falkland Islands (Malvinas)	FK
71	Faroe Islands	FO
72	Fiji	FJ
73	Finland	FI
74	France	FR
75	French Guiana	GF
76	French Polynesia	PF
77	French Southern Territories	TF
78	Gabon	GA
79	Gambia	GM
80	Georgia	GE
81	Germany	DE
82	Ghana	GH
83	Gibraltar	GI
84	Greece	GR
85	Greenland	GL
86	Grenada	GD

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Code	CEN-English Country Name	2-Alpha Code
87	Guadeloupe	GP
88	Guam	GU
89	Guatemala	GT
90	Guinea	GN
91	Guinea-Bissau	GW
92	Guyana	GY
93	Haiti	HT
94	Heard Island and McDonald Islands	HM
95	Holy See (Vatican City State)	VA
96	Honduras	HN
97	Hong Kong	HK
98	Hungary	HU
99	Iceland	IS
100	India	IN
101	Indonesia	ID
102	Iran, Islamic Republic of	IR
103	Iraq	IQ
104	Ireland	IE
105	Israel	IL
106	Italy	IT
107	Jamaica	JM
108	Japan	JP
109	Jordan	JO
110	Kazakstan	KZ
111	Kenya	KE
112	Kiribati	KI
113	Korea, Democratic People's Republic of	KP
114	Korea, Republic of	KR
115	Kuwait	KW
116	Kyrgyzstan	KG
117	Lao People's Democratic Republic	LA
118	Latvia	LV
119	Lebanon	LB
120	Lesotho	LS
121	Liberia	LR
122	Libyan Arab Jamahiriya	LY
123	Liechtenstein	LI
124	Lithuania	LT
125	Luxembourg	LU
126	Macau	MO
127	Macedonia, The Former Yugoslav Republic of	MK
128	Madagascar	MG
129	Malawi	MW
130	Malaysia	MY
131	Maldives	MV

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Code	CEN-English Country Name	2-Alpha Code
132	Mali	ML
133	Malta	MT
134	Marshall Islands	MH
135	Martinique	MQ
136	Mauritania	MR
137	Mauritius	MU
138	Mayotte	YT
139	Mexico	MX
140	Micronesia, Federated States of	FM
141	Moldova, Republic of	MD
142	Monaco	MC
143	Mongolia	MN
144	Montserrat	MS
145	Morocco	MA
146	Mozambique	MZ
147	Myanmar	MM
148	Namibia	NA
149	Nauru	NR
150	Nepal	NP
151	Netherlands	NL
152	Netherlands Antilles	AN
153	New Caledonia	NC
154	New Zealand	NZ
155	Nicaragua	NI
156	Niger	NE
157	Nigeria	NG
158	Niue	NU
159	Norfolk Island	NF
160	Northern Mariana Islands	MP
161	Norway	NO
162	Oman	OM
163	Pakistan	PK
164	Palau	PW
165	Palestinian Territory, Occupied	PS
166	Panama	PA
167	Papua New Guinea	PG
168	Paraguay	PY
169	Peru	PE
170	Philippines	PH
171	Pitcairn	PN
172	Poland	PL
173	Portugal	PT
174	Puerto Rico	PR
175	Qatar	QA
176	Réunion	RE

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Code	CEN-English Country Name	2-Alpha Code
177	Romania	RO
178	Russian Federation	RU
179	Rwanda	RW
180	Saint Helena	SH
181	Saint Kitts and Nevis	KN
182	Saint Lucia	LC
183	Saint Pierre and Miquelon	PM
184	Saint Vincent and The Grenadines	VC
185	Samoa	WS
186	San Marino	SM
187	Sao Tome and Principe	ST
188	Saudi Arabia	SA
189	Senegal	SN
190	Seychelles	SC
191	Sierra Leone	SL
192	Singapore	SG
193	Slovakia	SK
194	Slovenia	SI
195	Solomon Islands	SB
196	Somalia	SO
197	South Africa	ZA
198	South Georgia and the South Sandwich Islands	GS
199	Spain	ES
200	Sri Lanka	LK
201	Sudan	SD
202	Suriname	SR
203	Svalbard and Jan Mayen	SJ
204	Swaziland	SZ
205	Sweden	SE
206	Switzerland	CH
207	Syrian Arab Republic	SY
208	Taiwan, Province of China	TW
209	Tajikistan	TJ
210	Tanzania, United Republic of	TZ
211	Thailand	TH
212	Togo	TG
213	Tokelau	TK
214	Tonga	TO
215	Trinidad And Tobago	TT
216	Tunisia	TN
217	Turkey	TR
218	Turkmenistan	TM
219	Turks and Caicos Islands	TC
220	Tuvalu	TV
221	Uganda	UG

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Code	CEN-English Country Name	2-Alpha Code
222	Ukraine	UA
223	United Arab Emirates	AE
224	United Kingdom	GB
225	United States	US
226	United States Minor Outlying Islands	UM
227	Uruguay	UY
228	Uzbekistan	UZ
229	Vanuatu	VU
230	Venezuela	VE
231	Vietnam	VN
232	Virgin Islands, British	VG
233	Virgin Islands, U.S.	VI
234	Wallis and Futuna	WF
235	Western Sahara	EH
236	Yemen	YE
237	Serbia and Montenegro	CS
238	Zambia	ZM
239	Zimbabwe	ZW
..	***~ end of version 3.0 ~***	
..		
255	Unknown	- the table default word -

NOTE 1 This table is based upon EN ISO 3166-1.
NOTE 2 The 2-Alpha codes are provided for information only.

Table 34 — TPEG table loc41: language_code

Code	CEN English Language Name	2-Alpha code
0	unknown	
1	(Afan) Oromo	om
2	Abkhazian	ab
3	Afar	aa
4	Afrikaans	af
5	Albanian	sq
6	Amharic	am
7	Arabic	ar
8	Armenian	hy
9	Assamese	as
10	Aymara	ay
11	Azerbaijani	az
12	Bashkir	ba
13	Basque	eu
14	Bengali	bn
15	Bhutani	dz
16	Bihari	bh

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Code	CEN English Language Name	2-Alpha code
17	Bislama	bi
18	Breton	br
19	Bulgarian	bg
20	Burmese	my
21	Byelorussian	be
22	Cambodian	km
23	Catalan	ca
24	Chinese	zh
25	Corsican	co
26	Croatian	hr
27	Czech	cs
28	Danish	da
29	Dutch	nl
30	English	en
31	Esperanto	eo
32	Estonian	et
33	Faeroese	fo
34	Fiji	fj
35	Finnish	fi
36	French	fr
37	Frisian	fy
38	Galician	gl
39	Georgian	ka
40	German	de
41	Greek	el
42	Greenlandic	kl
43	Guarani	gn
44	Gujarati	gu
45	Hausa	ha
46	Hebrew	he (former iw)
47	Hindi	hi
48	Hungarian	hu
49	Icelandic	is
50	Indonesian	id (former in)
51	Interlingua	ia
52	Interlingue	ie
53	Inupiak	ik
54	Inuktitut (Eskimo)	iu
55	Irish	ga
56	Italian	it
57	Japanese	ja
58	Javanese	jw
59	Kannada	kn
60	Kashmiri	ks
61	Kazakh	kk

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Code	CEN English Language Name	2-Alpha code
62	Kinyarwanda	rw
63	Kirghiz	ky
64	Kirundi	rn
65	Korean	ko
66	Kurdish	ku
67	Laothian	lo
68	Latin	la
69	Latvian, Lettish	lv
70	Lingala	ln
71	Lithuanian	lt
72	Macedonian	mk
73	Malagasy	mg
74	Malay	ms
75	Malayalam	ml
76	Maltese	mt
77	Maori	mi
78	Marathi	mr
79	Moldavian	mo
80	Mongolian	mn
81	Nauru	na
82	Nepali	ne
83	Norwegian	no
84	Occitan	oc
85	Oriya	or
86	Pashto, Pushto	ps
87	Persian	fa
88	Polish	pl
89	Portuguese	pt
90	Punjabi	pa
91	Quechua	qu
92	Rhaeto-Romance	rm
93	Romanian	ro
94	Russian	ru
95	Samoan	sm
96	Sangro	sg
97	Sanskrit	sa
98	Scots Gaelic	gd
99	Serbian	sr
100	Serbo-Croatian	sh
101	Sesotho	st
102	Setswana	tn
103	Shona	sn
104	Sindhi	sd
105	Singhalese	si
106	Siswati	ss

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Code	CEN English Language Name	2-Alpha code
107	Slovak	sk
108	Slovenian	sl
109	Somali	so
110	Spanish	es
111	Sudanese	su
112	Swahili	sw
113	Swedish	sv
114	Tagalog	tl
115	Tajik	tg
116	Tamil	ta
117	Tatar	tt
118	Tegalu	te
119	Thai	th
120	Tibetan	bo
121	Tigrinya	ti
122	Tonga	to
123	Tsonga	ts
124	Turkish	tr
125	Turkmen	tk
126	Twi	tw
127	Uigur	ug
128	Ukrainian	uk
129	Urdu	ur
130	Uzbek	uz
131	Vietnamese	vi
132	Volapuk	vo
133	Welsh	cy
134	Wolof	wo
135	Xhosa	xh
136	Yiddish	yi (former ji)
137	Yoruba	yo
138	Zhuang	za
139	Zulu	zu
..	***~ end of version 3.0 ~***	
..		
255	unknown	- the table default word -

NOTE 1 This table is based upon ISO 639-1.
NOTE 2 The 2-Alpha codes are provided for information only.

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6 TPEG-Loc coding for compatibility with ILOC method

The basis of the TPEG-Loc element “location co-ordinates”, is the longitude/latitude co-ordinate of the approximate centre of the crossing or intersection. This part of location co-ordinates is referred to as the ‘spatial descriptor’. Appended to the spatial descriptor are road descriptors of roads connecting at the intersection. A road descriptor consists of the road number, road name or other descriptor at the intersection.

The rules for forming the spatial descriptor and the road descriptors are described in the following Sections. In essence, the rules are designed to ensure that the road descriptors are compiled in a consistent manner by service providers for both presentation and to allow standardised, machine-readable ILOC references to be formed by a decoder.

An intersection is represented by the use of “location co-ordinates” according to Figure 7 in 5.1.1.4. A section of a road is represented by a pair of intersections, the descriptors ‘from name’ and ‘to name’ (see Figure 6 in 5.1.1.3).

If the direction of traffic flow on the road sector is represented by a notional arrow, then the ‘from name’ represents the point at the tail of the notional arrow and the ‘to name’ represents the point at the head of the notional arrow.

An important aspect of the TPEG-Loc referencing method is that a location description may be created ‘on-the-fly’ by the service provider when needed. It may then be interpreted and used by the TPEG-decoder, and then discarded. The pre-creation of codes and the use of a database, and code maintenance is entirely avoided.

The location reference format allows the location to be presented in a ‘plain-language’ manner directly to the end-user, and also to be converted by a TPEG decoder to a machine-readable format for map-based system use.

6.1 TPEG location referencing within ‘location co-ordinates’ – Encoding and decoding

‘Location co-ordinates’ in some cases describes locations by using one or two ‘intersection locations’ to define respectively a point or segment on the road network. An intersection location is defined as a location where two or more roads having different sets of road descriptors meet, and on a road at a point of a road descriptor change.

‘Location co-ordinates’ is the method used to code locations according to certain rules to ensure that they may be interpreted by navigation agents. ‘Location co-ordinates’ also allows presentation directly to the end-user in a ‘plain-language’ format.

A TPEG location by ‘location co-ordinates’ is described using two types of descriptors. One, the ‘spatial descriptor’ is machine readable, and is formed from the geographical co-ordinates of the location. The other is a ‘road descriptor’, formed from the numbers or names of up to three roads at the intersection location. The road descriptor may be used on its own for direct presentation of the names of the roads to the end-user. It may also be used, after conversion into a ‘standardised’ ILOC machine-readable format, by map-based systems to resolve any ambiguity in the spatial descriptor.

This section describes the form in which the spatial descriptor part of the location reference is carried by ‘location co-ordinates’, and the rules to be followed by the service provider to form road descriptors.

Rules are also given which allow a TPEG-decoder to present the location appropriately to an end-user, and to derive the machine-readable standardised ILOC format of the road descriptor from ‘location co-ordinates’, necessary for map-based systems.

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6.2 TPEG-location encoder rules

6.2.1 Forming spatial descriptor

The basis of the intersection location reference is the longitude/latitude co-ordinate pair of the approximate centre of the road crossing, referred to as the 'spatial descriptor'. This is expressed as an ordered pair of WGS 84 longitude and latitude, given in degrees/decimal degrees with five decimal places of resolution (i.e. 10 micro-degrees). This is equivalent to a resolution in latitude of 1.1 metres, and a resolution in longitude of 1.1 metres at the equator, 0.7 metres at 50° latitude.

The WGS 84 co-ordinate pair must be converted for delivery in 'location co-ordinates' to a pair of **<**Integer Signed Long**>** components. Conversion between the WGS 84 representation and 'location co-ordinates' is straightforward: degrees/decimal degrees are multiplied by 100,000 to give an integer number.

Eastern longitude and northern latitude are signed with a plus (+), and western longitude and southern latitude with a negative (-).

EXAMPLE 1 Longitude 2.34356º West (an intersection location in Bristol, UK) is transmitted as the **<**Integer Signed Long**> -234356**.

EXAMPLE 2 Latitude 51.25190º North (an intersection location in Bristol, UK) is transmitted as the **<**Integer Signed Long**> +5125190**.

6.2.2 Forming road descriptors

Usually the spatial descriptor alone describes the location without any ambiguity, but to resolve cases where it does not uniquely describe a location (for example, underpasses, flyovers, etc.) appending up to three road descriptors for the connecting roads at the location, extends the spatial description. Within TPEG-Loc, each of the road descriptors is a short string of any length from 0 - 255 characters.

The road descriptors transmitted are determined by rules designed to ensure that they are compiled in a consistent manner, across different service providers.

In essence, the rules determine which three roads should be used as road descriptors in the case of more than three roads meeting, and/or different names existing for one road, how the character string is arranged, and order in which the road descriptors should be transmitted. This ensures that the machine-readable ILOC [8] format may be formed by the TPEG decoder.

For these purposes, three categories of road descriptors exist:

a) Road number;

b) Road name;

c) Other road descriptors:

- Exit/entry/interchange number or name,
- Square name,
- Roundabout name,
- Bridge name,
- Tunnel name,
- Ferry name,
- Border post name.

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6.2.3 Forming road descriptors from road numbers

The road descriptor is derived from the full road/route number, omitting any spaces or other punctuation used.

6.2.4 Forming road descriptors from road names

When deriving road descriptors from road names, the significant part of the name always appears first. In languages where common prefixes are used, the prefix is appended *after* the significant part, separated by a 'comma'. Table 35 shows examples of the part of the name regarded as a prefix, according to language and is illustrative only. This equates to the order of presentation found in the index of typical street atlases. Spaces are NOT removed, but other punctuation is removed.

NOTE In this section, a space character is shown as '._.', in the tables.

Table 35 — Examples of the part of the name regarded as a prefix

Language	Prefix
English	The
French	Avenue Avenue de la Avenue des Avenue d' Rue Rue de la Rue des Rue d'
German	Platz des Platz der Sankt St Strasse des Strasse der
Italian	Via

6.2.5 Forming road descriptors from road number/name combinations

Where roads are commonly referred to by a combination of *both* a road number and road name, the road descriptor is formed by applying the rules above to each individual part, and combining them using a semicolon – the number appearing first.

6.2.6 Forming road descriptors from other road descriptors

The same rules used for road names apply.

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6.2.7 Examples of formation of road descriptors

Table 36 — Examples of formation of road descriptors

Road/Route number/name	Resultant Road Descriptor
N5	N5
E52	E52
A329(M)	A329M
A1000(M)	A1000M
A4 Great Western Road	A4;Great Western Road
Bristol _ Parkway	Bristol _ Parkway
St _ James _ Avenue	St _ James _ Avenue
Rue _ de _ Aix	Aix,Rue _ de _
Voie _ de _ Moëns	Moëns,Voie _ de _
Route _ de _ Neuchatel	Neuchatel,Route _ de _
Place _ de _ la _ Concorde	Concorde,Place _ de _ a _
Neuburgstrasse	Neuburgstrasse
Platz _ der _ Einheit	Einheit,Platz _ der _

6.2.8 Hierarchical order of road descriptors

The order of transmission of the road descriptors is important to ensure that when required, ILOCs may be correctly formed by decoders. The three groups of road descriptors, (road numbers, road names, other road descriptors) are hierarchical, in that *in general* road descriptors derived from road numbers are preferred over those from road names, which in turn are preferred over those from other road descriptors. However, if the intersection location itself has a specific name, such as a square or roundabout name, then this should be the first descriptor transmitted, even if three different road numbers or road names exist at the location.

When selecting road descriptors derived from road numbers, the highest route number classes are preferred, according to the practice in the country concerned. This order, (highest class first) is tabulated below for some of the major European countries.

Table 37 — Examples of route number class ordering

Country	Route Number Classes
Austria	A, S, B
Belgium	E, A, N
France	A, N, D
Germany	A,B
Italy	A, SS, SP
Netherlands	A, N
Norway	E, #
Spain	A, N
Sweden	E, #
Switzerland	A, #
United Kingdom	M, A, B

Within each route class, the lower numbers are “preferred” (i.e. A5 is preferred to A12, which in turn is preferred to A217) in determining which road numbers to use, and the order used.

When selecting road descriptors derived from road names, the alphabetical order of the resulting road descriptor is used to determine the order of transmission of the names.

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6.3 TPEG-location decoder rules

6.3.1 Deriving spatial descriptors for map-based use

The ILOC form of the spatial descriptor requires longitude to be expressed as a sign, followed by eight numeric characters. Conversion from the 'location co-ordinates' form is straightforward: the integer number is padded to eight numeric characters by the addition of leading zeros as necessary, immediately after the sign.

Similarly, the ILOC form of the spatial descriptor uses latitude expressed as a sign, followed by seven numeric characters. Conversion from the form transmitted in 'location co-ordinates' is straightforward: the integer number is padded to seven numeric characters by the addition of leading zeros as necessary, immediately after the sign.

EXAMPLE The **<**Integer Signed Long**>** form of Longitude **-234356** is converted to **-00234356**.

In this example, the **<**Integer Signed Long**>** form of Latitude **+5125190** is already eight-characters, thus is unchanged and remains **+5125190**.

6.3.2 Presentation of road descriptors to end-users

Each TPEG-Loc short-string road descriptor may be converted to the form required for direct presentation by applying the following rules:

— a semicolon is converted to a space character;

— characters following a comma are presented first, then the remaining (significant) characters.

6.3.3 Examples of 'location co-ordinates' road descriptors for presentation

Table 38 — Examples of 'location co-ordinates' road descriptors for presentation

Transmitted TPEG-Loc Road Descriptor	Resultant form for presentation
N5	N5
E52	E52
A329M	A329M
A1000M	A1000M
A4;Great _ Western _ Road	A4 _ Great _ Western _ Road
Bristol _ Parkway	Bristol _ Parkway
St _ James _ Avenue	St _ James _ Avenue
Aix,Rue _ de _	Rue _ de _ Aix
Moëns,Voie _ de _	Voie _ de _ Moëns
Neuchatel,Route _ de _	Route _ de _ Neuchatel
Concorde,Place _ de _ la _	Place _ de _ la _ Concorde
Neuburgstrasse	Neuburgstrasse
Einheit,Platz _ der _	Platz _ der _ Einheit

6.3.4 Deriving 3 x 5-character road descriptor form for machine use

Each 'location co-ordinates' short-string road descriptor may converted to the five-character ILOC form required for machine readability by applying the following rules:

— remove any spaces in the road descriptor,

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— truncate the road descriptor to first five characters, if necessary, or pad out to five characters by addition of one or more trailing space,

— strings with semicolon or comma within first five characters are modified by replacing the semicolon or comma and subsequent characters by spaces,

— convert lower case, and accented characters, to their *upper*-case non-accented equivalent.

6.3.5 Examples of 5-character ILOC machine-readable form of 'location co-ordinates' road descriptors

Table 39 — Examples of 5-character ILOC machine-readable form of 'location co-ordinates' road descriptors

Transmitted TPEG-Loc Road Descriptor	Resultant 5-character ILOC form
N5	N5 _ _ _
E52	E52 _ _
A329M	A329M
A1000M	A1000
A4;Great _ Western _ Road	A4 _ _ _
Bristol _ Parkway	BRIST
St _ James _ Avenue	STJAM
Aix,Rue _ de _	AIX _ _
Moëns,Voie _ de _	MOENS
Neuchatel,Route _ de _	NEUCH
Concorde,Place _ de _ la _	CONCO
Neuburgstrasse	NEUBU
Einheit,Platz _ der _	EINHE

The complete machine-readable road descriptor part of the ILOC descriptor always comprises fifteen characters, formed by joining three, five-character strings in the order in which they are transmitted in 'location co-ordinates'.

In the case where less than three 'location co-ordinates' road descriptors are transmitted, the fifteen-character ILOC road descriptor is padded out with trailing spaces.

6.3.6 Forming a complete machine-readable ILOC descriptor

A complete ILOC descriptor will always be 32 characters in length comprising the 9-character longitude code and 8-character latitude code (together known as the spatial descriptor), and the 15-character ILOC road descriptor.

Table 40 — Forming a complete machine-readable ILOC descriptor

Spatial Descriptor		ILOC Road Descriptor		
Longitude	Latitude	Road Des. 1	Road Des. 2	Road Des. 3
-00234356	**+5125190**	**STJAM**	**BRIST**	**_ _ _ _ _**

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[1] EN ISO 14819-2; *Traffic and Traveller Information (TTI), TTI Messages via traffic message coding — Part 2: Event and information codes for Radio Data System — Traffic Message Channel (RDS-TMC)*

[2] EVIDENCE: *Detailed ILOC Location Referencing Rules Specifications Version Nr 1.0*, dated 28.06.1999, (also logged as EBU B/TPEG PG 99/102)

[3] ISO 639-1; *Codes for the representation of names of languages — Part 1: Alpha-2 code*

[4] ISO 3166-1; *Codes for the representation of names of countries and their subdivisions — Part 1: Country codes*

[5] NIMA Technical Report 8350.2, Third edition, Amend 1, 2000-01-03, *USA DoD World Geodetic System 1984*, WGS 84 – (see URL: www.nima.mil)

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