



Deliverable D6.4

Draft specification of core European road data

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1 Summary

This draft document is not a complete specification of core European road data. It should be seen as a basis for further discussions and considerations. The Final document will be delivered in April.

This document includes a definition of referred road network and a specification of common features (feature types, attribute types and attribute value domain). It also contains specified quality levels for the content, generalization rules for the road network, geodetic reference system and rules for edge-matching at nation and dataset borders.

2 Introduction

2.1 The EuroRoadS project

EuroRoadS will lay the ground for a pan-European road data infrastructure built on identified user requirements. It will be a key for opening up public sector road information, for promoting public-private partnership and for establishment of important applications.

The main objective for the project is to build a platform for a European road data solution through a specification framework. The framework will consist of specifications for data content and data exchange. The European road information solution will be built and maintained taking full advantage of national road data solutions as well as existing standards. It will make national data available to the market in a harmonised, interoperable and quality assured way.

2.2 The handling of road data

The handling of road data can be described as a business refinement process with four steps (see figure 2.1). The EuroRoadS project will focus on step two, the "Content provider", but will also cover the other three steps in order to guarantee that the specifications and technical solutions being chosen for EuroRoadS will be efficient for the compilation of raw data as well as for the following steps in the refinement process.

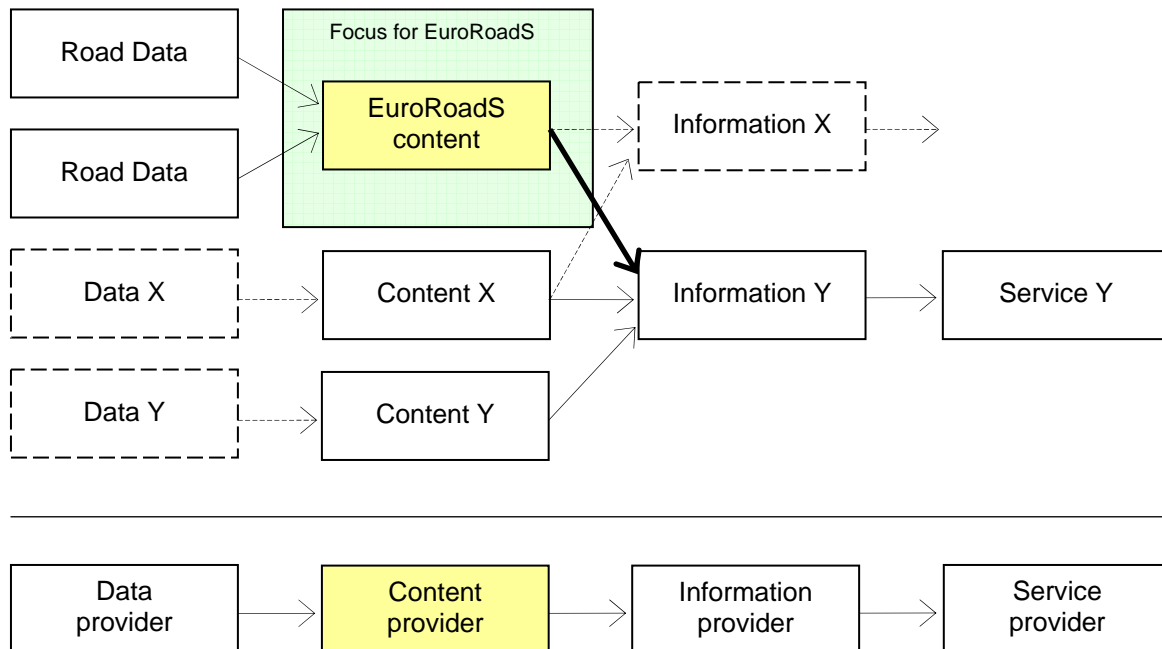


Figure 2.1 Business and data refinement process

Figure 2.1 describes the business and data refinement process, where the end user of data and services is placed to the far right in the figure. Different content providers ideally shall be viewed as keepers of data of a certain domain or possibly also competing providers of data for the same domain.

EuroRoadS shall primarily focus on specifications for Content providers for road data.

From a specification development perspective, the business refinement chain can be viewed in the opposite direction (from right to left). In the end, the service users are the ultimate owners of requirements that propagate back all the way to the Data providers.

The business refinement view of EuroRoadS points out that:

- End users will need services that make use of data from different domains.
- Every Content provider can not (or very seldom) be the one and only provider of data for a certain end user service.
- EuroRoadS – will have to be very specific on the question of what is part of the road data domain, and what is not.

Here follows a more in depth description of each step in the information chain.

2.2.1 Data provider

Step one in the information chain includes data capture of different kinds of "raw" data, e.g. existing databases with road networks, geocoded addresses, and information on road technical descriptions, traffic regulations, administrative details, etc. This kind of information is available from national mapping agencies, national road administrations, municipalities and the private mapping industry.

2.2.2 Content provider

Step two is about production – or compilation – of basic data (reference data) needed for many applications, such as intelligent transport systems, mobility management, traffic management, road maintenance, traffic safety, environmental and society planning. This compilation will make use of existing databases with road information, but it is also foreseen that the specification for reference data will have an impact on the future structure of national or regional databases with road data.

2.2.3 Information provider

Step three includes data which are adjusted and "wrapped up" in order to suit a specific application, for example a road map on a CD for a vehicle navigation system.

2.2.4 Service provider

Step four is about more advanced services with different kinds of functions, e.g. to develop a fleet management system due to specific user requirements.

2.3 Baseline and results from WP6

By the end of this project, EuroRoadS will have developed a specification framework built on identified user requirements and developed quality model. The project will also have taken into account existing standards and solutions within the area. EuroRoadS will develop a framework, prepared for a European standard (a profile based on ISO 19 100 components). The framework will consist of:

- **A road network information model** that defines road network objects and a method for how road related objects (attributes) can associate to the network. This common and agreed structure can be the road data "language" of Europe, a harmonised and unified view of how to describe a digital road network.
- **A definition of core European road data** within the proposed structure. This will point out a basic level of data content proposed to be the data set that in the future might be provided to the European market. The European data set should be built on national road database solutions. The future goal is not to establish a European road database. The goal is to be able to, through national contributions of data, transform data and provide it to the market through a standardised data exchange. In many cases existing data, mainly from the public sector (road administrations, mapping agencies, municipalities etc.), will become easily available in this way.
- **A specification of a data exchange model and format** together with a **meta-data catalogue**, showing the characteristics of the accessible information. These

specifications can be adopted as the basis of an interface solution, supporting an easy access to European road data defined as above. The data exchange model and format will support exchange of complete data sets and just changes.

2.4 Deliverables from work package 6: Road data specification framework

WP6 will deliver seven official documents, as described below.

Report on preliminary findings and directions for the specification work [6.1]

The aim of this document is to give recommendations and directions for the work in WP6, especially in the area of road data model, core road data and exchange formats. The recommendations will be based on user requirements, existing road data solutions in Europe and standards within the area. Draft delivered 09/09/2004.

Specification of Road Network Information model [6.2 / 6.3]

The document will include a definition of the data structure of the road network, including quality modelling, and a definition of levels of details and a reference system (e.g. how to reference objects to the road network).

Specification of core European road data [6.4 / 6.5]

The document will include a definition of referred road network and specification of common features (feature types, attribute types and attribute Value domain). It also should contain specified quality levels for the content, generalization rules for the road network, geodetic reference system to be used and rules for edge-matching at nation borders.

Specification of road network exchange model [6.6 / 6.10]

Specification of road network exchange format [6.7 / 6.11]

Two documents will describe the exchange model and the exchange format.

Data exchange should be specified as a road network exchange model (corresponding to the information model), and a road data exchange format that can communicate road data (both the whole data set and just the changes) structured as specified in the exchange model.

Meta-data catalogue [6.8]

The document will define a meta-data catalogue/model showing the characteristics of the accessible information.

Terminology catalogue [6.9 / 6.12]

The terminology catalogue will include definitions of road data related terms used in the EuroRoadS project.

3 Road Network

According to the EuroRoadS findings the roads in a network shall be represented as centre lines. The centre lines in a network can be used for routing and other network analysis. Intersections in the same level are to be represented as nodes. Road nodes are represented where road links begin or end, see figure 3.2.

A plain form of a road network is a geometrically represented network, which consists of road links only where each road link has a geometric representation (road nodes are not required in this case). The only use for nodes in this case is, if there is information associated with the node.

It is however recommended that the supplier of the network do supply nodes, to which the providers can attach their information to the road network, later in the information chain.

On some occasions it will be necessary to generalize e.g. road links or intersections. In that matter, generalization rules are described, see chapter 10.

Road	
Definition	<p>A way maintained for vehicular use.</p> <p>A linear section of the earth which is designed for, or the result of, vehicular movement. [GDF]</p> <p>Generally roads for bicycle and tractor are not classified as roads for vehicular use, but can be included in the road network if they are classified with the attribute <i>Form of way</i>.</p>

Rode node	
Definition	<p>0-dimensional object in a road network representing a road crossing or an end of a road.</p> <p>A node can also be stored where an object changes attribute value.</p>

Road link	
Definition	<p>1-dimensional object in a road network.</p> <p>Represents a road section between two nodes in a road network.</p>

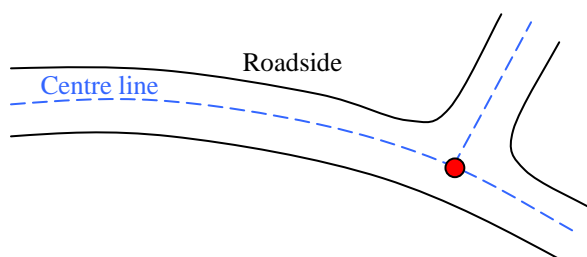


Figure 3.1. The road represented as a centre line.

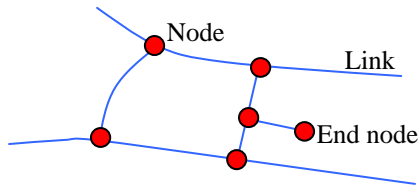


Figure 3.2 Nodes and links in a network.

4 Features and attributes

According to the EuroRoadS findings information about roads is stored as features and attributes to the road network in two different kinds of reference mechanisms. Either they will be stored as attributes with values directly to the link or node, or stored as features with attributes and values referred to the link or node. This document is a guide on how to declare featuring and attributing, and how to attach them to the road network. The EuroRoadS project has conducted business cases and market analysis to examine which features and attributes to be included in the EuroRoadS specification. For detailed information and description, see annex A.

4.1 Core mandatory attributes

According to the EuroRoadS findings mandatory attributes are to be stored on the road network. The mandatory attributes represent the core information of the roads, and form the basis for how other features and attributes should be stored. A network delivered according to the EuroRoadS specification must include the following attributes:

- Geometry
- Universal Unique Identifier - UUID/GUID [ISO 19118, ISO 11578]
- Functional road class, traffic importance
- Form of way, road type.

The UUID/GUID (Universal Unique Identifier) is proposed to be used as object identifier in the EuroRoadS specification. The UUID/GUID helps each content-provider to keep track of ID's for links and nodes within their systems. It is important that nodes and links of the road network have unique identifiers and are stable over time, since they represent a linear reference system. Therefore, it is proposed that UUID/GUID is mandatory information.

Many features attached to the road network in the information chain demand a stable network as a stable reference system.

4.2 Optional features and attributes

As a complement to the mandatory attributes, there are other optional features and attributes attached to the network. This means, that the features and attributes are defined as optional in

the EuroRoadS specification. The optional features and attributes must be described in accordance with the feature catalogue in Annex A.

If the method of linear referencing is used the attributes can be delivered separately. In this case the features and attributes requires references to an existing network.

The following features and attributes are examples of what can be specified as optional in the EuroRoadS specification. (To be completed after input from the reference groups).

Access	Location level	Route restrictions
Address *	One way / No entry	Seasonal restrictions
Direction of flow	Road junctions	Steep gradient
Gate/Barrier/Tollbooth	Road length	Speed limit *
Height restrictions	Road name *	Tunnel or bridge
Mandatory turn	Road number *	Turn restrictions
National owner/manager	Road width	Urban area*
Number of lanes	Road surface	Weight restrictions
Junction number / name	Roundabout *	Width restrictions
Length restrictions	Route instructions	

* *Described in the Feature Catalogue in Annex A.*

4.3 Supplier defined features

Apart from the mandatory and optional features and attributes, there is a possibility to define new features and attributes, which are not described within the EuroRoadS specification. If new features and attributes are defined they are recommended to be described in accordance with the feature catalogue in Annex A. See also deliverable 6.2.

5 Quality classes and levels

According to combinations of the core required features and attributes, the network can be divided into quality classes. The quality classes can have different quality levels. Most of the quality information should be stored as metadata. Positional accuracy for geometry is stored as external or absolute accuracy. Positional accuracy for features referred to the road network is stored as internal or relative accuracy.

Examples of quality elements for metadata:

- Thematic accuracy
- Temporal accuracy
- Completeness
- Logical consistency

Quality elements from ISO	Quality class 1	Quality class 2	Quality class n
Positional accuracy	Quality level 1	Quality level 2	Quality level n1
Thematic accuracy	Quality level A	Quality level B	Quality level n2
Temporal accuracy	Quality level α	Quality level β	Quality level n3
Completeness	...		
Logical consistency			

Table 5.1 Examples on how to define quality levels for different quality classes

Example of Quality classes from the National Road Database (NVDB) in Sweden (see figure 5.1):

National roads	European and national roads.
Urban area	Roads in densely built up areas.
Countryside	Smaller roads in the countryside.
Remaining roads	Roads in the forest road network.

The quality classes can be described in metadata, describing the average quality of the dataset.

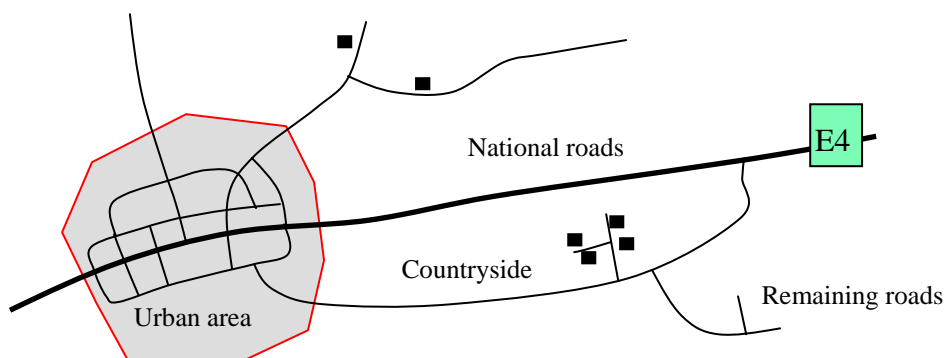


Figure 5.1 Example of quality-classes from NVDB in Sweden.

6 How to connect features and attributes to the road

Characteristics of roads, and traffic rules valid for roads, are described in the EuroRoadS specification as features. The features are composed by a description and a specification of its position on the road network. The description consists of one or several attributes. The position is located by indicating a feature expression. The feature expression, is a description on how the features are connected to the road network (links and nodes). If the features are of the type *Segment expression*, their extent on the links is described. It is also possible to store features as attributes with a value attached directly to the link.

6.1 Different types of expression

In a reference system there is a need for definition of different types of locations. The position of a feature or attribute in a road network is located by an expression. The expression includes a method on how to connect to the road network, an element reference and a measure value etc.

In the EuroRoadS specification, five types of expressions are described. These are segment-, node-, point-, turn- and manoeuvre expressions. Every feature is defined by one type of expression, and most features are defined by the type segment expression.

See D 6.2, for a more technical description.

6.1.1 Segment expression

The segment expression represents a part of a linear element, and is defined by a from- and to-position. The segment expression can be used for an attribute along a road, such as speed limit. See figure 6.1.

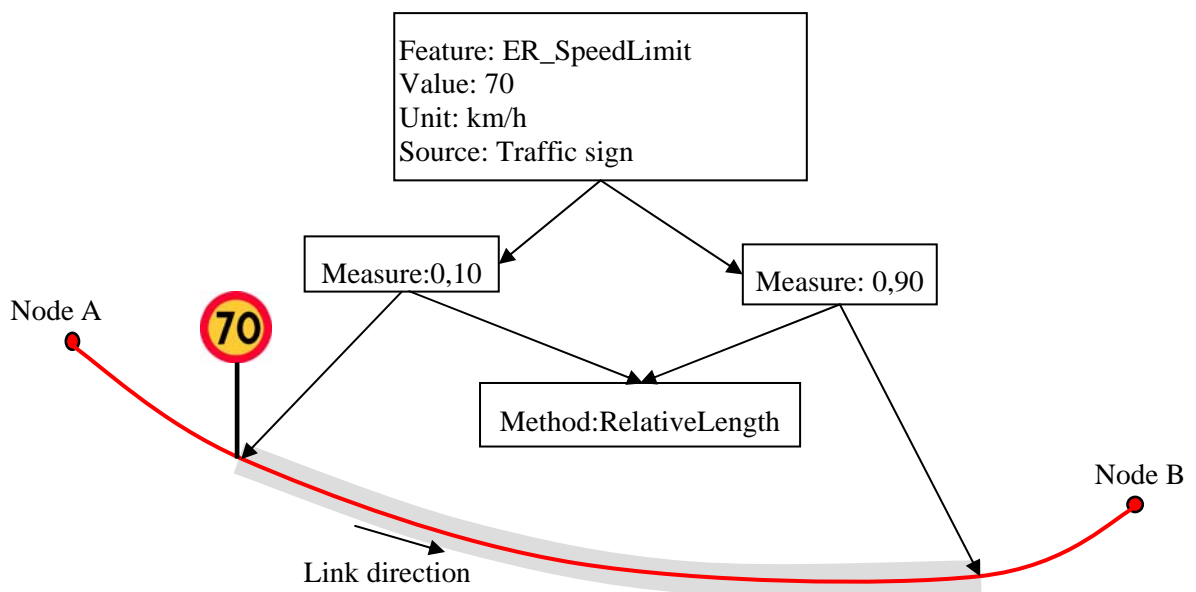


Figure 6.1. The feature *ER_SpeedLimit* is attached to the road with the linear referencing method *Segment expression*.

6.1.2 Node expression

The node expression represents a location in a road network of a feature or an attribute, which is connected to a node. An example of node expressions is the location of a node at a border.

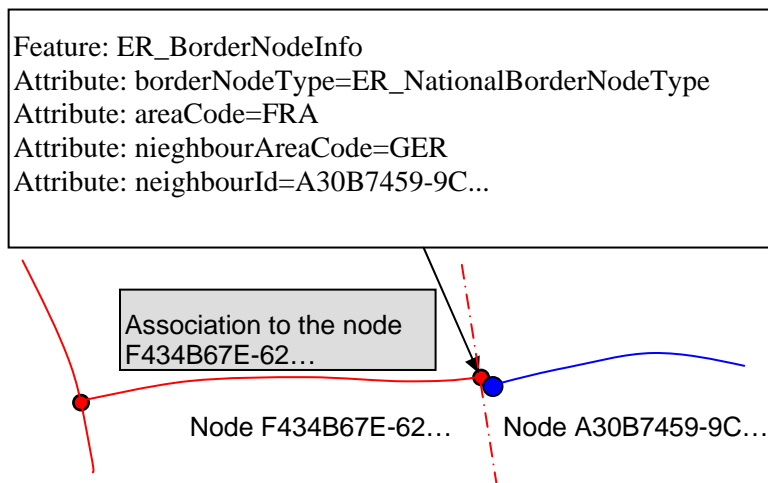


Figure 6.2. The feature type *ER_BorderNodeInfo* represents a continuation of the road on the other side of the border. The feature is described by a node expression, which is attached to the node.

6.1.3 Point expression

The point expression represents a location in a reference system, which is connected to a point on a linear element (link). An example of point expressions is an address that is connected to the road link (see figure 6.3).

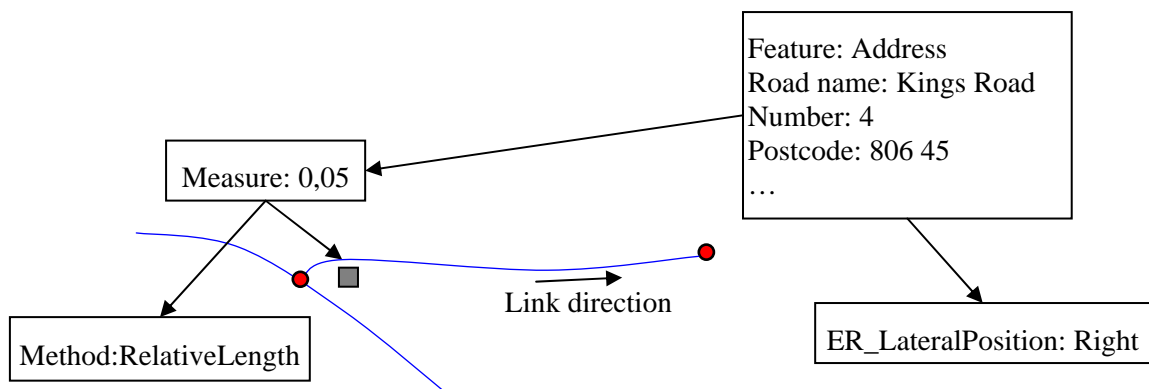


Figure 6.3. A feature, *Address*, is described by its location connected to the link. The position of the point is measured from the start node along the link.

6.1.4 Turn expression

The turn expression represents a mechanism for traversing a network in a node. The expression is connected to a node, and describes a turn at the node by a specific from-element for entering the node, and a specific to-element for leaving the node. An example of turn expressions is the description of a prohibited turn in a junction (see figure 6.4).

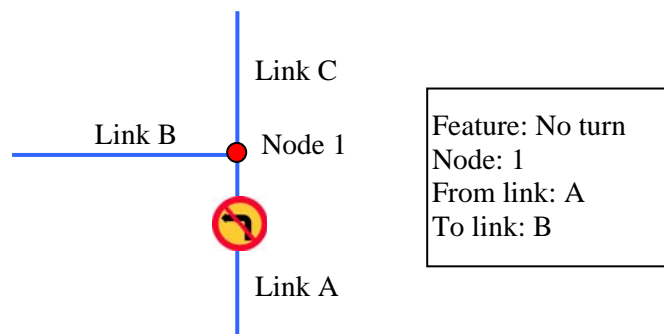


Figure 6.4. Example of a turn expression to describe that it is prohibited turn left to link B, from link A, at node 1.

6.1.5 Manoeuvre expression

A manoeuvre expression represents a sequence of turn expressions in a reference system. The first turn expression, ends on the element which constitutes the start of the next turn. An example of manoeuvre expressions is a sequence of turns for a manoeuvre restriction (see figure 6.5).

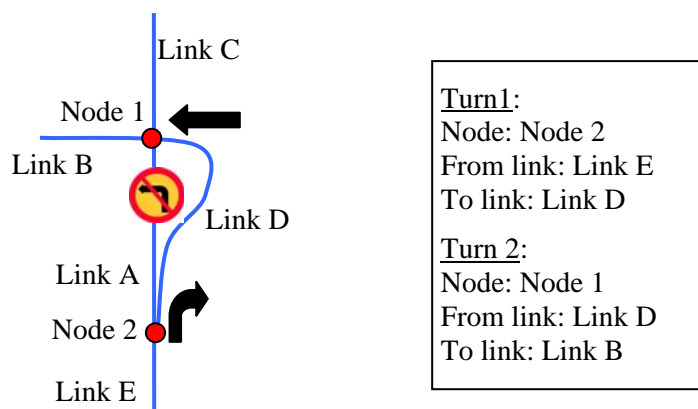


Figure 6.5. Example of a manoeuvre restriction which leads the traffic to a left turn in a junction where a direct left turn is prohibited.

7 General rules for expression

7.1 Start and end

If the expression represents a segment of a linear system, it is defined by a from- and to-position. This means that the positions, which specify the beginning and the end of the segment, must be registered.

7.2 Direction

The attribute *Direction* is used to describe that a segment expression only is valid for one direction of the road. This implies that the feature is valid only for one direction of the road.

The attribute is optional, and if left out means that the expression is direction independent. A field of application for the attribute *Direction* is speed limit (see figure 7.1).

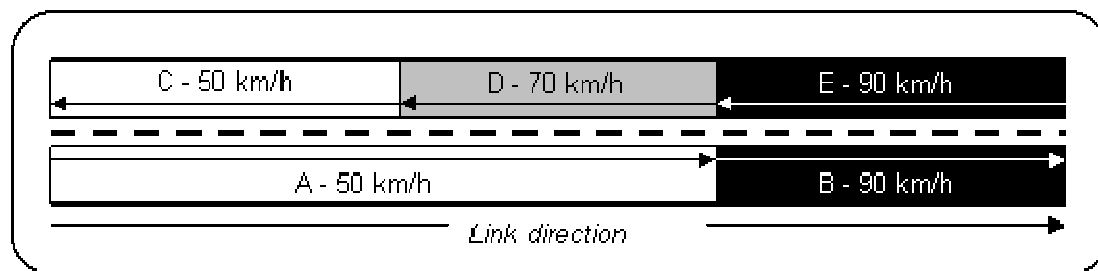


Figure 7.1. When the attribute *direction* is used it is essential that the expression has a clear direction in relation to the link.

7.3 Overlapping expression for features of the same type

Overlapping expression implies that a feature can have more than one attribute, of the same type, at the same segment of the linear element. An example of this is when the feature *Road name* occurs more than one time at the same segment of a road link. If a road segment has two, or more, names registered at the same segment, it is represented by one segment expression per feature.

If point- or node expressions are overlapping, it implies that the expressions have identical positions.

7.4 Expression on an entire link

A feature with an expression on an entire link indicates that the attribute has the same value on the whole link. Some attributes are stored as attributes directly on the link.

8 General rules for attributes

8.1 Mandatory attributes

Most features have at least one mandatory attribute. This implies that a value must be registered for the attribute. The purpose of mandatory attributes is to avoid the risk of

registering a feature only represented by its position. The mandatory attributes are the minimum of information necessary for use of the road network content.

For example, it is of no value to register optional feature *Road name*, if the name of the road is not registered. Though, it is essential to register the mandatory attributes *Form of way* and *National road class* even if they are without a registered value. In those cases, the value *Unknown* is to be used.

8.2 An unknown value

An attribute can have the value: *Unknown*. It is important to recognise the difference between registering the value *Unknown* and registering nothing. If an attribute is registered as *Unknown*, it indicates that the attribute has been considered.

9 General quality attributes

The quality of geometry and expressions is described by positional accuracy. Generally the external or absolute accuracy is stored for geometry. Positional accuracy can be used to analyse the reliability of the objects position, especially if a conflict occurs between two objects or between the data and the navigation system.

Internal or relative accuracy are used to describe the positional accuracy of the features related to the reference element e.g. an expression on a link. Positional accuracy of measurements as distance along a link, from a node, is also dependent of the position accuracy of the node.

Quality parameters as completeness, up to date ness and consistency, describes that the whole dataset can not be stored at each object, which are to be stored as metadata.

The quality parameters are further described in report D 2.2 and D2.3.

10 Generalization rules

The generalization rules for the geometry representation of the road network are used to simplify the representation of the road network. For example, a very short link may not bring any valuable information to a network. The generalization rules allows data providers to assign limits for their generalization rules, these values are to be stored in metadata.

10.1 Mandatory Generalization rules

According to EuroRoadS findings mandatory generalization rules applies to nodes. Nodes shall be placed at the following junctions in the road network:

- road intersections in the same level
- road ends
- ferry lines end points.

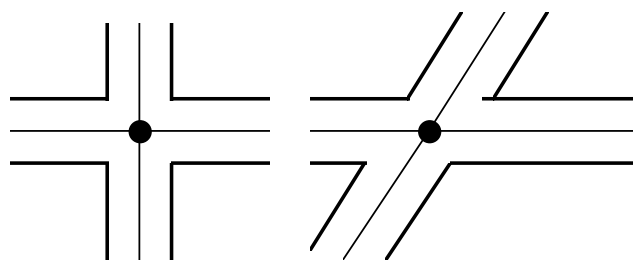


Figure 10.1. Road network represented by centrelines with nodes at the junctions.

10.2 Optional Generalization rules

According to EuroRoadS findings there are a number of optional generalization rules. The basis for optional generalization rules is the non representation of short links, which is here presented with a couple of examples.

10.2.1 “Displaced” four way junctions

If the distance between the intersections of the road centrelines, in a four way junction, is less than X meter (“displaced junction”), the intersections should be generalized and represented as one node.

If the distance between the intersections of the road centrelines is bigger than X m, the intersections should be represented as separate nodes.

The distance X, should be stored as metadata. The EuroRoadS specification recommends X=5 meter.

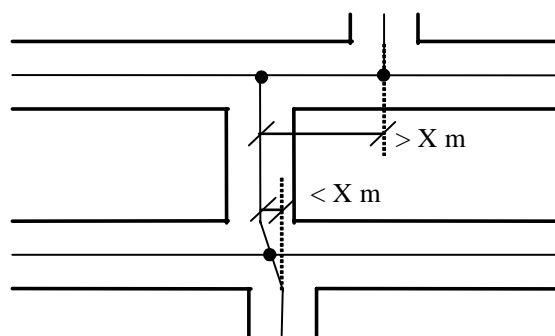


Figure 10.2 Example of “displaced” junctions

10.2.2 Dividers of junctions

Dividers of junctions can be physical or non physical. A physical divider implies a permanent obstacle or barrier e.g. traffic island or rail. A non physical divider implies a crossable legal divider e.g. a solid line.

If a physical divider fulfil one of the following criteria’s the divider should be generalized and represented as one node:

- the length of the divider is less than Y meter or the width is less than X meter
- the length of the divider is less than Y meter and divides carriageways in the same direction.

If this does not apply, road links shall be represented by their true geometry.

The distances X and Y shall be stored as metadata. The EuroRoadS specification recommends $X=10$ meters and $Y=25$ meter.

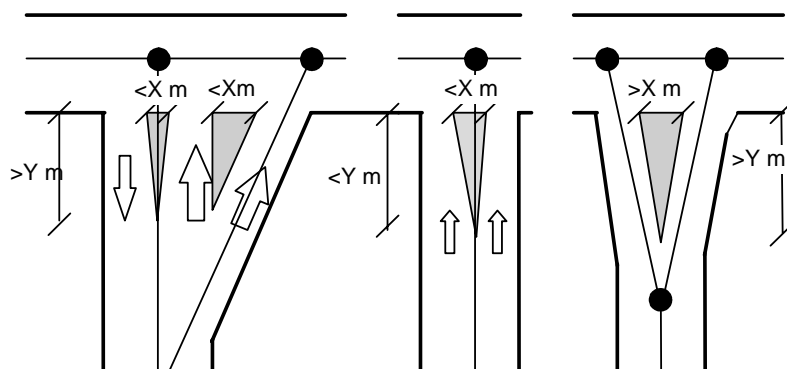


Figure 10.3. Interpretation of generalization rules for dividers.

10.2.3 Dividers of carriageways

Dividers of carriageways can be physical or non physical. A physical divider implies a permanent obstacle or barrier e.g. rail. A non physical divider implies a crossable legal divider e.g. a solid line.

Carriageways separated by physical dividers shall be registered as separate links. This applies to the following three cases:

- carriageways of motorways, and freeways with physical dividers
- carriageways physically separated between two nodes
- carriageways physically separated with a divider with a minimum length of X meter.

The distance X for physically separated carriageways shall be stored in metadata. The EuroRoadS specification recommends $X=200$ meter. In cases with interruptions in the physical separation, it is recommended to keep continuity in the representation of the roads.

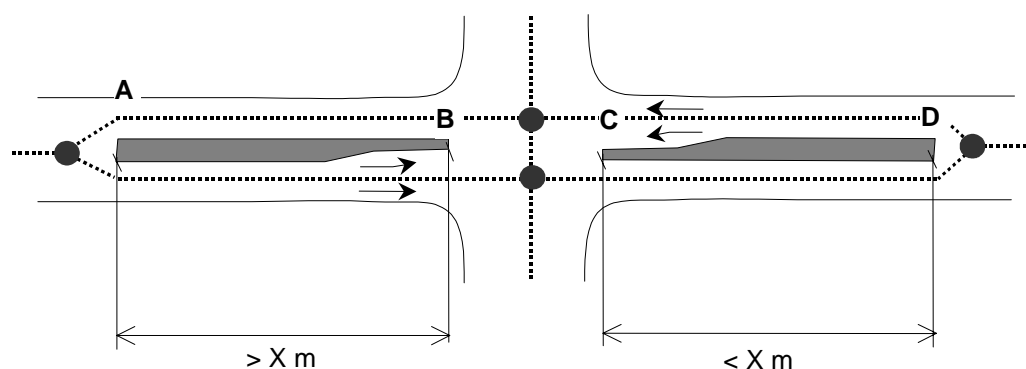


Figure 10.4. One of the dividers is shorter than the minimum length (X m). To keep continuity of the link, the road is represented as separated links all through the junction.

10.2.4 Roundabout

A roundabout should be represented by its true geometry if the diameter is more than X meter. The attribute value *Roundabout* should be stored in the included links.

If the diameter is less than X meter, the roundabout should be generalized and represented as a node. The attribute value *Roundabout* should be stored on the node.

The diameter X shall be stored in metadata. EuroRoadS specification recommends a diameter of 20 metres for the centre lines.

If a roundabout is stored at an aggregated level (always represented as a node), this information shall be stored in metadata.

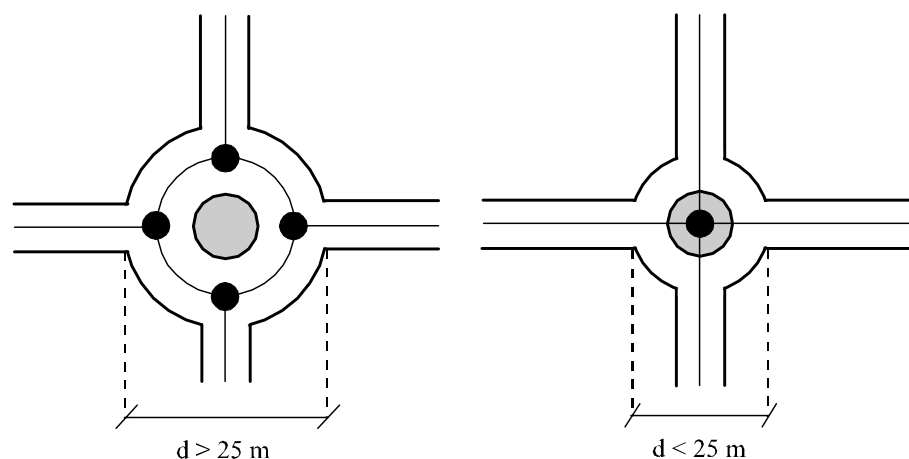


Figure 10.5. Example of a roundabout with the limit of 25 meters for the outer diameter, as a level for generalization.

10.2.5 Enclosed traffic area

An enclosed traffic area should be represented with a centre line through the area with end nodes at its border. If there are more than two connected roads, a node has to be registered to connect the links.

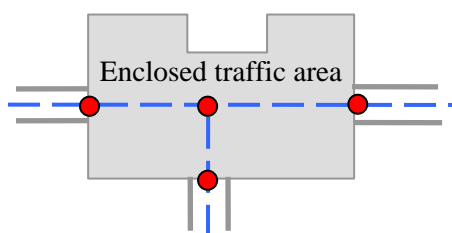


Figure 10.6. In an enclosed traffic area, the road links are only representing a possible itinerary.

11 Geodetic reference system

It is proposed to adopt the recommendations on the Geodetic Reference system and projections contained in the INSPIRE Reference Data and Metadata Position Paper.

The errors that can be derived from differences from the transformation processes are small in comparison to positional accuracy requirement for road elements. In some countries, the height coordinates have larger differences dependent on the used zero-level.

11.1 Geodetic Reference system and projections

INSPIRE has recognised that ETRS89 is the most appropriate geodetic datum to use within Europe. It remains a need to accept the use of a European height reference for vertical measurements (it is proposed to use normal heights based on EVRF2000).

Vector data should be delivered in geographical coordinates based on ETRS89. Depending on the type of application users will apply projections corresponding to their needs.

The INSPIRE Reference Data and MetaData Position Paper proposes three different projections to be used in Europe (the countries are allowed to use other ETRS89 based projections).

It is important that the parameters required to convert from the national reference system to ETRS89 are provided.

The INSPIRE Reference Data and Metadata Position Paper recommends the following:

- Use ETRS89 as geodetic datum and to express and store positions, as far as possible, in ellipsoidal coordinates, with the underlying GRS80 ellipsoid (ETRS89). To further use EVRF2000 for expressing orthometric heights.
- Use ETRS89 Transverse Mercator coordinate reference systems (ETRS-TMzn), for conformal pan-European mapping at scales larger than 1:500 000.
- Every country will provide algorithms to convert coordinates from their national coordinate reference system to ETRS89.
- Every country will, as well, provide the necessary conversion. [Inspire]

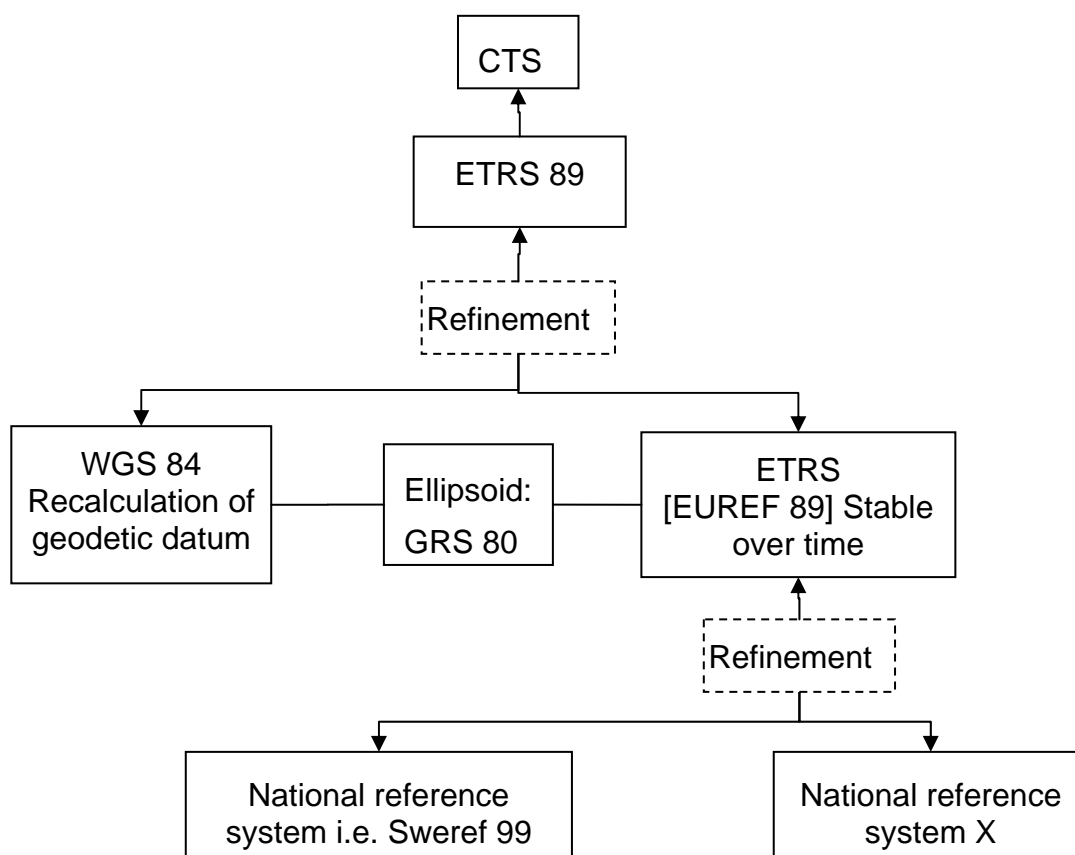


Figure 11.1. Example of a EuroRoadS reference system and relations to national reference system.

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CTS	<i>Conventional Terrestrial System</i>
ETRS	<i>European Terrestrial Reference System</i>
GRS	<i>Geodetic Reference System</i>
WGS	<i>World Geodetic System</i>
EUREF	<i>European Reference System</i>

12 Rule for edge-matching at dataset borders

If road continues after the end of the dataset border in reality, it has to be registered as an attribute to the node. There are two kinds of dataset borders, one is administrative, national or county border, and the other is the end of a dataset. The second kind can also be a ferry connection. If the corresponding node identification number is known it shall be stored. (See Annex A, Feature catalogue for detailed description).

13 Terminology

Attribute	Characteristic of a feature.
Core data	Information that is essential for the scope, and for therefore classified as mandatory.
Feature	Abstraction of real world phenomena.
Road	A way maintained for vehicular use. A linear section of the earth which is designed for or the result of vehicular movement. [GDF].

14 References

GDF 3.0 October 1995

IEEE 802

INSPIRE - Map Projections for Europe [A. Annoni et al] (EuroGeographics) <http://www.ec-gis.org:8080/wecgis/docs/F2682/MAP%20PROJECTIONS%20FOR%20EUROPE%20EUR%2020120.PDF>

ISO 3166

ISO 8910

ISO 11578

ISO 19110

ISO 19118

NVDB – Specifikation av innehåll 4.1 (National Road Database of Sweden – specification of content)

RADEF G-R-03

Annex A Feature catalogue

This feature catalogue is written in a more descriptive way in comparison to ISO 19110. The feature, attribute and attribute values are described together in a clear way. The feature catalogue is not describing a database, code numbers are not included. The bold words starting with **ER_ ...** refers to classes in deliverable 6.2. The reference mechanism refer to the linear referencing system, it is also possible to attach features as attributes at the link.

Address	
Definition	Address decided by authority.
Reference mechanism	Point expression at the road link or attribute on link.
Comment	Point expression can be an exact address or first and last address on a link Attribute on link can be an address as a sequence between two road junctions

Border node information		ER_BorderNodeInfo
Definition	Describes in what way the node connect to another dataset.	
Attributes	Border node type	National Border - The road node is positioned on a national border.
		Administrative border - The road node is positioned on another administrative border than a national border.
		Dataset border – The road node is positioned at the end of the dataset.
	Area code	A code that identifies the area to which the road node belongs. If the border is a national border, the code shall be a country code according to ISO 3166.
	Neighbour area code	The neighbour area code if it is known. If the border is a national border, the code shall be a country code according to ISO 3166.
	Neighbour node identification number	The identification number at the node in the neighbouring area.
Reference mechanism	Node expression.	

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Built up area	
Definition 	A structured built up area. Traffic rules are dependent of built up area e.g. speed limit.
Reference mechanism	Segment expression or attribute on link.

Ferry link		ER_FerryLinkType
Definition	Ferry connection – A vehicle transport facility between two fixed locations on the road network which uses a prescribed mode of transport.	
Value domain	Ferry or hovercraft	The seaway is operated by a ferry or a hovercraft.
	Train	The link is operated by a train.
Reference mechanism	Mandatory attribute value on ER_FerryLink.	

Form of way		ER_FormOfWay	
Definition	Physical classification. The form of way describes its function as road with or without rules.		
Value domain	Motorway 	A Motorway is defined as a road permitted for motorized vehicles only in combination with a prescribed minimum speed. It has two or more physically separated carriageways and no single level-crossings. This definition can be supported by the requirement that a road is only a motorway when it has a sign along its side. [GDF 3.0 / NVDB] No minimum speed limit in UK. [RADEF / France]	
	Dual carriageway	A multiple carriageway is defined as a road with physically separated carriageways regardless of the number of lanes. [GDF 3.0 / NVDB]	
		<i>Generalization</i>	The shortest length of a physical separator shall be registered in metadata.
		<i>Rule</i>	If a road also is a motorway or a freeway it shall be coded as such.
	Enclosed traffic area	An area with no internal structure of legally defined driving directions. At least two roads are connected to the area.	
	Entrance or exit car park	An Entrance or Exit of a Car Park is a road specially designed to enter or to leave a Parking Area. [GDF]	
	Entrance or exit service	An Entrance or Exit of a Service is a road used only to enter or to leave a Service. [GDF]	
Single carriageway	A road where the traffic is not separated by any physical object. All roads without separate carriageways are considered as roads with a single carriageway. [GDF]		

	Roundabout 	A Roundabout is a road which forms a ring on which traffic travelling in only one direction is allowed. [GDF]
		<i>Generalization</i> If roundabouts are generalized it shall be registered in metadata with the generalization limit for the diameter.
	Slip road	A Slip Road is a road especially designed to enter or leave a <i>Road Element</i> . [GDF]
	Service road	A Service Road is a road, running parallel to and connecting to a Road with a relatively high connectivity function, which is especially designed to enable access from the connecting roads to roads with a low connectivity function in its vicinity. Generally, service roads have the same name as the higher class road it runs parallel to and are only divided from it by small constructions like walkways, traffic islands etc. [GDF]
	Traffic square	A Traffic Square is an open area (partly) enclosed by roads which is used for non-traffic purposes and which is not a Roundabout. [GDF]
	Freeway 	A Freeway is defined as a road having no single level crossings with other roads. This means that connections with other <i>Road Elements</i> only consist of Slip Roads and/or Parallel Roads [GDF / NVDB].
	Bicycle	The road is only allowed for traffic with bicycles.
	Tractor	The road is only usable for a tractor or terrain vehicle.
	Walkway	A road mentioned for pedestrian and closed for vehicular use by a physically barrier.
	Unknown	A not classified road e.g. a road measured by photogrammetry
Reference mechanism	Mandatory attribute at ER_RoadLink.	
Metadata	Possible values in the dataset shall be listed in metadata.	

National Road Class	ER_NationalRoadClass	
Definition	Traffic importance of the road.	
	Main roads	The most important roads in a given network. [GDF]
	1	First class roads.
	...	Second ...
	n	The least important roads in a given network. [GDF] The farthest ways in the forest road network. It has no regular maintenance. [NVDB] 9 classes in NVDB and GDF.
	Unknown	A not classified road e.g. a road measured by photogrammetry
Metadata	Number of classes in delivered dataset.	
Reference mechanism	Mandatory attribute at ER_RoadLink.	

Pedestrian zone	
Definition 	A Pedestrian Zone is an area with a road network which is especially designed for use by pedestrians. Pedestrian Zones are usually located in urban areas. Except for emergency vehicles and for delivery vehicles during certain hours no traffic is allowed on the <i>Road net elements</i> which are located inside the Zone. [GDF]
Reference mechanism	Segment expression or attribute on link.

Quality class		
Definition	A classification of data to apply different requirements at different parts of the road network.	
Value	1	Road with the highest quality requirements.
	2	Road with the second highest quality requirements.
	...	
	n	Roads with the lowest quality requirements.
	Unknown	A not classified road
Metadata	Number of classes in delivered dataset.	
Reference mechanism	Segment expression or attribute on link.	

Road name	
Definition	The name assigned to a particular road or street by the official organization responsible for the existence and the maintenance of the name. [GDF]
Value	Character string Unicode, ISO 8910
Reference mechanism	Segment expression or attribute on link.
Comment	It must be possible to store name in the current language. E.g. Greece, Lappish.

Road number		
Definition	The number assigned to a particular road by the official organization responsible for the existence and the maintenance of the number.	
Attributes	Number	Character string
	Europe way	Boolean
Reference mechanism	Segment expression or attribute on link.	

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Speed limit	ER_Speed		
Definition	Maximum speed limit decided in a traffic regulation by an authority.		
Value	Character string		
Unit	Value domain	Km/h	Kilometre per hour
		Miles/h	Miles per hour
Source	Value domain	Traffic sign	
		Traffic regulation from authority.	
Reference mechanism	Segment expression or attribute on link.		
Comment	In the case of speed limit value as text, the unit is not relevant.		

Urban area	
Definition	A structured built up area with a minimum level of citizens. Urban area is not associated with traffic rules.
Metadata	The minimum number of citizens for registration of urban areas in the dataset.
Comment	SWE – 200 inhabitants, stated by Statistics Sweden. FRA – 10000 inhabitants, used as quality zone.

Universal Unique Identifier – UUID	
Definition	<p>A unique persistent identifier for every feature instance (object).</p> <ul style="list-style-type: none"> • Globally unique and stable over time. • Different versions of an exchange item must have the same ID. • Independent of the application domain and feature type. • Possible to automate and computerize. • Not dependent of any specific it-system. • Shall be system generated locally, where a new feature is created. • Shall have the name uuid [ISO 19118]. • Shall belong to the data type UUID/GUID [ISO 11578 / compatible Global variant from Microsoft].
Value	<p>A 128-bit value built in tree parts: a timestamp, the clock sequence and a unique identifier for the node; normally the MAC address [IEEE 802] of the network card in the computer which generated the UUID.</p> <p>An example printed in hexadecimal form, in five groups: {A30B7459-9CBD-11D7-987D-00065B664BC4}.</p>
Reference mechanism	Mandatory attribute for ER_RoadLink, ER_FerryLink and ER_RoadNode.