

Digiroad

Description of data objects

Version 3.7



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1 Version history

The Digiroad data object description document has been entirely reviewed and its layout has been updated to make it clearer. Therefore, versioning has been re-started from 3.1 and the previous version history will be removed. Unlike before, the data object description no longer contains information varying from release to release on the update status of the data objects, as this information is available in the Quality report published with each release.

Version	Date	Publication
3.1	13.7.2012	The Digiroad database's data objects have been re-categorised. Additionally, details have been added and the text layout has been updated, and some pictures have been added to clarify the text. The definition of the width data object has been changed. The definition of the data object bridge, tunnel or underpass has been clarified.
3.2	15.10.2012	To the definition of type of road element has been added category <i>rest area</i> (value 18) in the chapter 4.2.6. and to the definition of type of the rest area has been added category <i>no data</i> (value 4) in chapter 4.8.1.
3.3	15.1.2013	Definition of Alert-C point has been added to chapter 4.4.8. Also additional dynamic data attribute types have been included in chapter 4.5.3. To tables DIGIROAD_PALVELU and DIGIROAD_SEGMENTTI has been added one field to each. Additionally definitions of vehicle allowed or not allowed, directional traffic sign and intersection traffic light control data attribute have been updated.
3.4	15.7.2013	Chapter 3.2 Delivery formats has been updated as Digiroad R update and Digiroad XML R formats have been removed from the product range. Also appendix 8 with description of Digiroad XML has been removed.
3.5	15.10.2013	Exit numbers has been added to Digiroad-data as a dynamic segment type. Chapter 4.6.12 about Exit numbers describes the changes.
3.6	17.4.2014	Definitions about the VIITE_TAUU implication have been added for Chapter 3.1.5. Names.
3.7	24.10.2014	References to format Digiroad XML has been removed.

2 Definitions

Attribute data

Attribute data is an entity of identifiable, timeable and descriptive properties of a feature. For example, value and validity direction of speed limit are the attribute data of a speed limit.

Centre line geometry

Digiroad centre line geometry is formed by line segments that describe the positions of centre lines of roads, streets, pedestrian and cycle lanes, railways and ferry connections.

Data object

Data object is an attribute datum of traffic network, e.g. speed limit or traffic network feature, e.g. service.

Digiroad K

Digiroad K is a delivery format of Digiroad data in which traffic elements have been disconnected into equal parts according to their attribute data .

Digiroad R

Digiroad R is a delivery format of Digiroad data which includes dynamically segmented attribute data on reference chains.

Digiroad database

Digiroad database is a national road and street database for which Finnish Transport Agency (formerly Finnish Road Administration) is responsible and which includes centre line geometry of streets and roads and attribute data linked to traffic.

Dynamic segmentation

Dynamic segmentation is an indirect way of indicating position. The position is defined by a known point on linear referencing (reference chain in Digiroad).

Indirect position

Indirect position is a position indicated with the help of grid structure, positioning marker, address or of similar one concept system.

Line segment

Line segment is a segment which has as its indirect position the distance between two measures on a reference chain. The geometric shape formed by dynamic segmentation of a line segment is a line.

Linear referencing

Linear referencing is a line geometry from which position in relation to a known point on a line can be determined, e.g. according to measure like in Digiroad.

Measure

Measure is attribute data of linear geometry which helps to define the location on a line unambiguously.

Point segment

Point segment is a segment which has as its indirect location a point on a reference chain, i.e. one measure. The geometric shape of a point segment formed by dynamic segmentation is a point.

Position data

Position data is an entity formed by geometric type of feature (point, line, area) and by coordinate data indicating the position of a feature.

Reference chain

Reference chain is the linear referencing of Digiroad.

Road and street network

Road and street network is a part of traffic network consisting of road elements without ferries and railways.

Road element

Road element is a traffic element which is not a railway or ferry element.

Segment

A segment is a part of Digiroad's reference chain and has no geometry of its own. A segment is dynamically located in the reference chain with m values. The road network's attribute data have been saved in Digiroad as individual segments.

Service

In Digiroad, service refers to a service that helps and supports the users of road and street network, e.g. a parking building or bus station.

Traffic element

Traffic element is the smallest unit of Digiroad centre line geometry. Traffic elements reach from intersection to intersection (but may also be shorter)..

Traffic network

Traffic network is an entity consisting of traffic elements linked together. There are also elements in Digiroad that are separate from the traffic network (e.g. on islands).

3 Introduction

Digiroad is a national road and street database which includes centre line geometry of streets and roads. It also includes attribute data and other features of traffic system to be used for traffic planning. Centre line geometry includes vehicle accessible roads, ferry and cable ferry connections for cars and separate pedestrian and cycle paths. Attribute data related to traffic is e.g. speed limits and traffic volume. Other features of traffic system are services. Digiroad is a unified database developed by the Finnish Transport Agency (formerly Finnish Road Administration) and it contributes to the development of different transport telematic services and offers homogeneous information covering the whole Finland.

This document describes the structure, delivery formats and data objects of Digiroad. Data objects have in this description been divided into attribute data of traffic elements, segmented attributes and other features. Appendix 1 lists data objects published in Digiroad by road type.

Digiroad data sources are National Land Survey of Finland, Finnish Transport Agency, municipalities and some other authorities. Digiroad's geometry information is updated four times a year based on the National Land Survey's Terrain database. With respect to other attribute data, Digiroad is updated based on reporting from information administrators.

Digiroad's quality properties are reviewed from the perspective of position accuracy and coverage and the Digiroad data is compared to the source data. A more comprehensive description of Digiroad's general quality criteria and of the quality results of the published data objects can be found in the Quality report published with each data release.

3.1 Structure of data in Digiroad database

The centre line geometry of Digiroad network of roads and streets consists of traffic elements. Some of the data objects of Digiroad are attribute data of traffic elements. In Digiroad, the centre line geometry of road and street network is in addition to traffic elements also as reference chains. Reference chains are the linear referencing of Digiroad (fig. 1). Measure has been attached to the geometry of reference chains. Most of the data objects of Digiroad have been tied to reference chains using dynamic segmentation. Data objects that have been segmented dynamically do not have their own geometry, but they are located dynamically according to reference chains and measures (except Digiroad K – delivery format in which traffic elements have been disconnected into equal parts according to their attribute data). Digiroad data object can also be a point, e.g. a service. In addition Digiroad database has availability to include polygonal data objects but it is not in use yet.

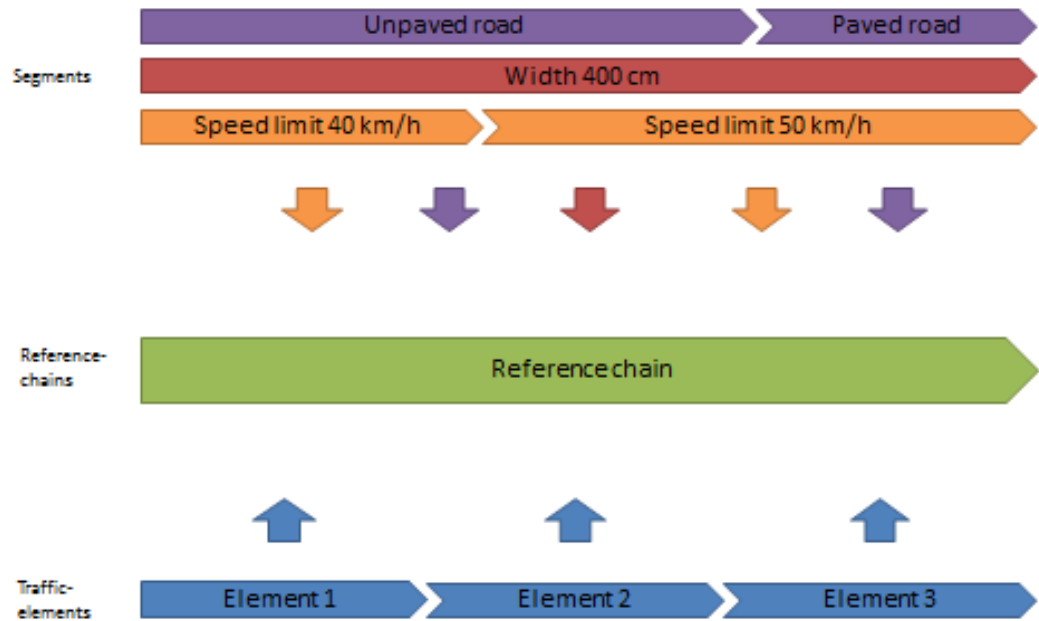


Figure 1. Reference chains are the linear referencing of Digiroad.

3.1.1 Traffic element, road element

Digiroad traffic network consists of traffic elements. A traffic element is the smallest unit of centre line geometry of a road, street, private road, pedestrian and cycle path, railway or ferry connection. Traffic elements cover the distance between intersections but can also be shorter. There are also road, railway and ferry elements. Railway and ferry are route types of traffic elements. Road element is the collective term for other route types, i.e. roads, streets, private roads and pedestrian and cycle paths. The direction of digitisation of a traffic element determines the direction of the traffic element to which the direction of traffic flow is compared. The direction of digitation is not necessarily logical but direction of each traffic element needs to be examined separately.

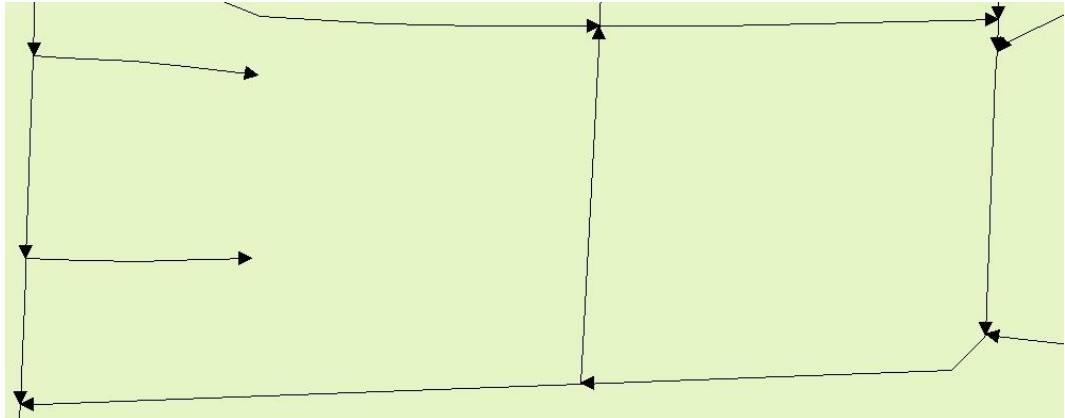


Figure 2. Image shows traffic elements connected to each other. Arrows show the direction of traffic elements.

3.1.2 Reference chain

Reference chains are the linear referencing of Digiroad. The measure has been attached to the geometry of a reference chain. Reference chain has its own centre line geometry. Reference chain has been formed by combining the geometries of traffic elements. Certain rules have been followed when forming reference chains but there is no comprehensive system of formation. The formation of reference chains is largely based on the same street name or road number. The maximum length of reference chains is within a municipality and they are never cut off in the middle of a traffic element. Reference chains do not break or branch.



Figure 3. A reference chain consists of all road elements on Kivenhakkaajantie.

Reference chains allow dynamic segmentation of attribute data. Most Digiroad data objects have been bound using dynamic segmentation. Because of dynamic segmentation, attribute data do not need to be repeated on each traffic element separately but can be stored as longer coherent data. Attribute data which are dynamically segmented do not have their own geometry but are located dynamically based on the reference chains and measures. The measures of reference chains are reference chain specific numbers and they do not represent metres.

Measures grow in the direction of digitisation of reference chains but do not always start from zero.

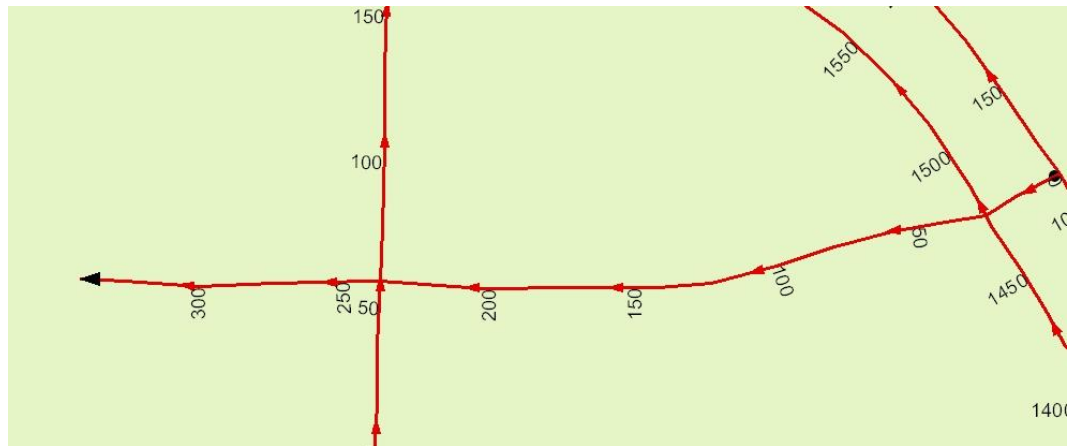


Figure 4. Image shows measures with geometry data of a reference chain.

3.1.3 Segment

Dynamically segmented attribute datum which is bound to a Digiroad reference chain is called a segment. Segments do not have their own geometry, they only have the information on which reference chain the segment is situated and at which point of a reference chain it is, i.e. measures at the beginning and end of a segment.

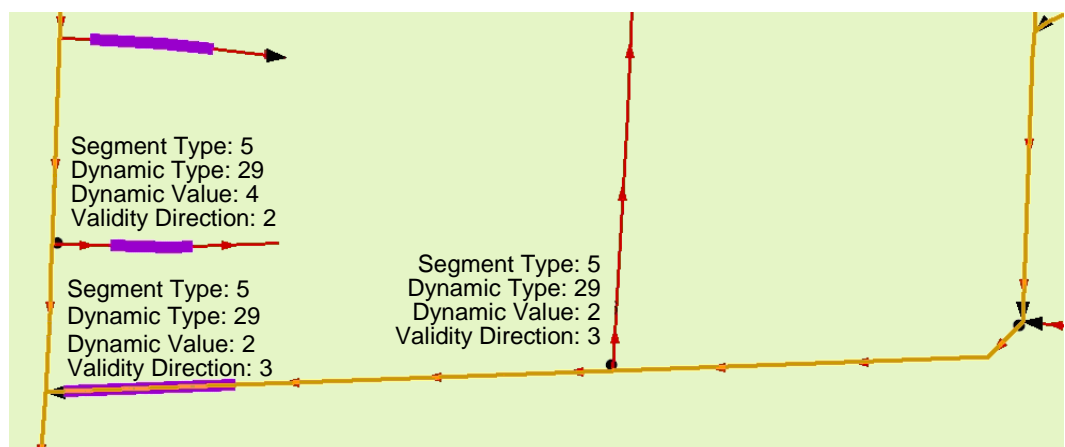


Figure 5. Image shows vehicle not allowed segments in purple and pavement segments in orange.

Segment is a line segment if the measure at the beginning is different from the measure at the end. The measures of a point segment are the same, e.g. starting and end points of a bus stop.



Figure 6. Point segment bus stop is at 2588,29 of a reference chain.

KETJU_OID	ALKUPISTE	LOPPUPISTE	VAIKUTUSSU	TYYPPI	DYN_TYYPPI	DYN_ARVO
12105	0,000000000000	13,740000000000	2	5	11	60
12072	661,080000000000	690,280000000000	1	5	29	12
12072	661,080000000000	690,280000000000	1	5	29	14

Figure 7. Data on a segment table (DIGIROAD_SEGMENTTI.dbf).

As shown in the previous example from a segment table, a segment has data of the reference chain (KETJU_OID). Measures (ALKUPISTE, LOPPUPISTE) determine the start and end points on a reference chain. The validity direction (VAIKUTUSSU) is for the first segment 2, i.e. in the direction of the digitisation of the reference chain and for the next two it is 1, i.e. both directions. The type of segment is 5, i.e. dynamic attribute. The type of dynamic attribute (DYN_TYYPPI) is 11 (speed limit) or 29 (vehicle not allowed). The value of dynamic attribute (DYN_ARVO) is for speed limit 60 km/h, for the first vehicle not allowed segment 12 (pedestrian) and for the second one 14 (tractor or farming vehicle).

In addition to location and validity direction, segments may also have attribute data that clarifies existing attributes (e.g. value of dynamic attribute or public transport stop identification code), a validity lane starting on the right in the validity direction and validity period as Time domain character string. Further information on Time Domain character string can be found in appendix 5.

The location of a segment has no effect on the location of another segment, which means that a segment may start or finish at any point on a reference chain. Certain segment types, e.g. width may only appear once at the same point. Some other segment types may appear more than once, e.g. vehicle not allowed, because only one vehicle type can be determined in one segment.

3.1.4 Identification of features

Traffic elements, along with other features and dynamically segmented attribute data taken from Digiroad database each get their own Digiroad ID. Digiroad ID is used as a unifying factor in updated data and transfers between different systems. Digiroad ID is a GUID identifier (Globally Unique Identifier).

ATTENTION! Due to the extraction process of Digiroad data, there may appear in same objects (same GUID identifier) in the DIGIROAD_KETJU table of different regions. If these regions are combined, one of these duplicates can always be removed safely.

3.1.5 Names

All name data in Digiroad are in a separate name table. Name table holds the names of road elements and among other things names of segmented attribute data. In addition to the name text, also language code and type of name are included. One feature may have several names. Typically each road element has an official name both in Finnish and in Swedish, e.g. Muurimestarintie, Murmästarsvägen. In the system it is also possible to store an alternative, e.g. Kehä 1, Ring 1. When using name data, the most appropriate name can be chosen according to municipality's first language. Further information on languages can be found in the Government decree 1174/2002.

A name can be added to a traffic element based on OID_tunnus (mode R) or VIITE_OID (mode K) field of the traffic element and on the LIIKENNE_E field of the name table.

A name can be added to a segment based on OID_tunnus (mode R) or VIITE_OID (mode K) field of the segment table and on the SEGMENTTI_ field of the name table.

A name can be added to a service based on OID_tunnus field and SEGMENTTI_ field of the name table.

When combining the services or traffic elements with names it is needed to use VIITE_TAUUL as it is possible to found from the name table same ID's (even inside the one export area) for example traffic element and service point. However it is possible to separate these ID's by using VIITE_TAUUL. If VIITE_TAUUL is not taken into account when combining tables, the ID will search the first OID and use that. For example if the first OID can be traffic element even if the aim would have been to combine services to names.

3.2 Delivery formats

Data from Digiroad is delivered to customers as transfer files based on the agreement between the customer and the Finnish Transport Agency (formerly Finnish Road Administration).

Digiroad database allows individual deliveries but for the time being Digiroad publishes material based on the release programme. The contents of the release programme can be changed when needed. There are four different material publications per year. Each publication contains the following:

- basic delivery Digiroad R and Digiroad K, in EUREF-FIN coordinate system, files according to regions
- basic delivery Digiroad R and Digiroad K, in EUREF-FIN coordinate system and YKJ (Finland's uniform coordinate system), files according to municipalities

The delivery formats Digiroad R and Digiroad K are in ESRI shape format. Digiroad R delivery format is suitable for e.g. ESRI ArcGIS. Digiroad K delivery format is suitable for e.g. MapInfo.

3.2.1 Digiroad R

Digiroad R delivery format includes dynamically segmented attribute data on reference chains. The data comprises two geometry layers that make up the centre line geometry of the road network and the network of attribute data describing the former. Methods for using the Digiroad R delivery format with ESRI's route event are described in more detail in appendix 6. Digiroad R is delivered in ESRI shape format.

3.2.2 Digiroad K

Digiroad K is a delivery format in which traffic elements are disconnected into homogenous parts according to their attribute data. Dynamically segmented attribute data, i.e. segments, are disconnected in the same way as traffic elements. In Digiroad K delivery format the attribute data in DIGIROAD_SEGMENTTI table do not need to be located dynamically with the help of reference chains because disconnected segments have their own geometry. There are as many overlapping segments (with their own geometries) as there are segmented attribute data at a particular location. In Digiroad K delivery format the disconnected attribute data in DIGIROAD_SEGMENTTI table can be connected with disconnected traffic elements in DIGIROAD_LIIKENNE_ELEMENTTI table. This delivery format is suitable for the use with e.g. MapInfo (version 7.0 or newer). Digiroad K is delivered in ESRI shape format. More on Digiroad K delivery format in appendix 7.

4 Data objects of Digiroad database

The code values of data objects' attribute data can be found in the code tables in appendix 4. Code values are also presented together with data objects. The attribute data of traffic elements are always defined in the traffic element table (LIIKENNE_ELEMENTTI) and are not separately mentioned in the section on data object descriptions. The description of segments and the items of other data objects specify in more detail which table each information can be found in.

4.1 Common attribute data of data objects

Both traffic elements and segments have elements common to the data objects. Usually, these elements are attributes that detail the validity of attribute data.

4.1.1 Name

Definition: A name is any combination of letters, numbers or punctuation which forms a valid name in the language indicated by the language code.

Name data includes:

- name (name text)
- type of name
- language code

Table: DIGIROAD_NIMI

Values: The code values of a name are:

- 1 Official
Official name is determined by the official organisation which is responsible for the existence and maintenance of the feature.
- 2 Alternate
Alternate name is a name used for an attribute or feature when the name has no official status, position or standing but it is widely used or known by the general public. The identifier used for the feature by the municipality can also be stored to an alternate name.

The most common language codes are:

- 1 fin Finnish
- 2 swe Swedish

4.1.2 Validity direction

Definition: Validity direction means the direction in which the attribute data is valid when using the road and street network.

In Digiroad, the validity direction of attribute data is determined by the direction of digitisation of centre line geometry. In delivery format Digiroad R the validity direction is expressed in relation to the direction of digitisation of a reference chain. In delivery format Digiroad K the validity direction is expressed in relation to direction of digitisation of traffic element and segment. For instance, for a bus stop, which is located on the right side in the direction of digitisation, the validity direction is in the direction of digitisation. Also, for a speed limit which is valid when using the road and street network against the direction of digitisation, the validity direction is against the direction of digitisation.

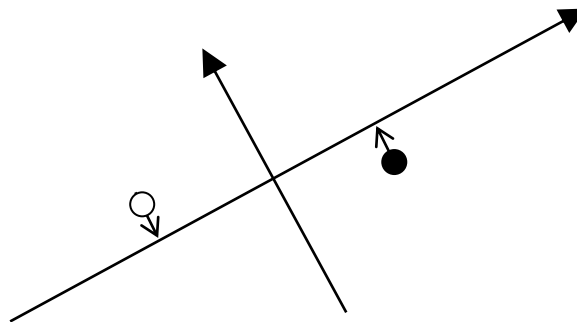


Figure 9. Figure shows two bus stop points. The validity direction of the black bus stop is in the direction of digitisation, because the point is located on the right side in relation to the direction of digitisation of Digiroad centre line geometry (in the direction of the longer arrow). The validity direction of the white bus stop is against the direction of digitisation, because the point is located on the left side in relation to the direction of digitisation of Digiroad centre line geometry (in the direction of the longer arrow).

Table: DIGIROAD_SEGMENTTI

Values: Validity direction can have values that are:

- 1 Both directions
- 2 In the direction of digitisation
- 3 Against the direction of digitisation

4.1.3 Validity period

Definition: Attribute data may have a validity period. Validity period is presented as Time Domain character string. There is a description of the structure of Time Domain character string in appendix 5.

Table: DIGIROAD_SEGMENTTI

4.1.4 Validity lane

Definition: Attribute data has validity lane when a carriageway has more than one lane in the validity direction and the attribute data is valid only on one of the lanes of the validity direction. More on the number of lanes in [4.6.4](#). There is no validity lane if the attribute is valid on all the lanes in the validity direction.

Certain lanes may, for instance, only allow buses. Other lanes in the same validity direction have no restrictions of vehicle type and therefore the restriction only buses allowed has to be added as validity lane data. More on data objects vehicle allowed and vehicle not allowed in [4.3.2](#).

Validity lanes are numbered starting from the first lane on the right in the validity direction (the one closest to the side of the road).

Table: DIGIROAD_SEGMENTTI

4.1.5 Owner

Definition: Segmented attribute data and service data may have owner information that tells the original source of the data.

Table: DIGIROAD_SEGMENTTI

Table: DIGIROAD_PALVELU

Values: Validity direction can have values that are:

- 1 Municipality
- 2 Local road authority
- 3 Helsinki Regional Transport
- 4 Finnish Transport Agency (FTA)

4.2 Attribute data of traffic element

Digiroad is a national road and street database which includes centre line geometry of streets and roads. Centre line geometry includes vehicle accessible roads, ferry and cable ferry connections for cars and separate pedestrian and cycle paths. Railways will be added later to the database.

Traffic element is the smallest unit of centre line geometry of a road, street, pedestrian or cycle path, railway or ferry connection. Attributes referring to traffic elements always applies to complete elements.

Road element is the collective term for other route types, i.e. roads, streets, private roads and pedestrian and cycle paths.

Tables: DIGIROAD_LIIKENNE_ELEMENTTI

DIGIROAD_NIMI

The attribute data of all traffic elements can be found in the above tables. Additionally, manoeuvres have references to more detailed specification tables, described in section 4.2.11.

4.2.1 Name

Information applies to road elements. Names are in Finnish or Swedish language depending on the official language of the municipality in which road elements belong to.

Names are stored on a separate name table. Address name of a road or street is connected to traffic elements. See [4.1.1](#).

4.2.2 Address numbers

Definition: Structure of address numbering used in Digiroad in most cases is “regular, even and uneven numbers on different sides”.

Digiroad includes the first and the last address numbers of road elements on the right and left sides. The exact positions of address numbers are not included in Digiroad.

Address numbers of houses consist of the following data:

- Structure of house numbering
- First house on the right
- First house on the left
- Last house on the right
- Last house on the left

Coverage: Information applies to road elements.

The values of house numbering structure are:

- 2 Regular, even and uneven numbers on different sides
- 3 Regular, even and uneven numbers on the same side
- 4 No regularity

4.2.3 Direction of traffic flow

Definition: The direction of traffic flow is determined in relation to the direction of digitisation of a traffic element.

Coverage: Information applies to road and ferry elements.

The values of the direction of traffic flow are:

- 2 Traffic is permitted in both directions
- 3 Traffic is permitted against the direction of digitisation
- 4 Traffic is permitted in the direction of digitisation
- 5 Traffic is closed in both directions

4.2.4 Route type

Definition: Traffic elements on route type are divided into roads, streets, private roads, separate cycle or pedestrian paths, ferries and railways. Only those pedestrian paths that are clearly separated from road network by e.g. green zone are included.

Coverage: Information applies to traffic elements.

Values of route type are:

- 1 Road
- 2 Street (or in practice equivalent to a street)
- 3 Private road (also the ones maintained by municipalities)
- 4 Pedestrian or cycle path
- 5 Railway
- 6 Ferry

4.2.5 Functional class

Definition: Functional class of Digiroad is based on the importance of a road or street. Functional class describes:

- service level of route to the traffic
- intention of the route maintainer to direct traffic to the route.

Functional classes of roads are mainly similar to the classification of the Finnish Transport Agency (formerly Finnish Road Administration).

Functional classes of streets may be determined by municipalities. The basis for the classification is the one used in the land use plan. If a road continues as a street, the functional class of the road affects the classification.

Regional main street serves mainly long distance or transit traffic and incoming traffic. There may also be traffic within the municipality on a regional main street.

Local main street serves mainly traffic within a municipality, e.g. from a suburb to the city centre or the traffic between different surrounding areas. There may also be long-distance, transit or incoming traffic on a local main street.

Collector street collects traffic from residential areas to main streets and roads. There should be no traffic through the residential area.

Feeder street connects the use of land to collector streets and roads. There is a direct connection from a feeder street to a plot of land or a building site.

Private roads belong to the functional classes 5 and 6.

The use of functional class 5 private road is commonly allowed and it can be used throughout the year. Typically a class 5 road is very important for the traffic in the area and there is also a road association that has been established and it has received funds from the state or municipality.

Functional class 6 includes all other private roads, including forest roads, which are not in class 5 and which are accessible by vehicles.

Cycle and pedestrian paths are included in the functional class 10.

<u>Streets</u>	<u>Functional class</u>	<u>Public roads</u>
Regional main street	1	Class I main road
	2	Class II main road
Local main street	3	Regional road
Collector street	4	Connecting road
Feeder street	5	Class I private road
	6	Class II private road
Cycle or pedestrian path	10	Cycle or pedestrian path

Figure 10. Functional classification of Digiroad.

Coverage: Information applies to road elements.

Values of functional class are:

- 1 Regional main street / Class I main road
- 2 Regional main street / Class II main road
- 3 Local main street / Regional road
- 4 Collector street / Connecting road
- 5 Feeder street / Class I private road
- 6 Class II private road
- 10 Cycle or pedestrian path

4.2.6 Type of road element

Definition: Type describes the physical or traffic-type attribute data. Values of road element type in use are as follows: part of a motorway, part of a multiple carriageway that is not a motorway, part of a single carriageway, part of a roundabout, slip roads, part of a pedestrian zone, part of a cycle path, part of a semi-motorway and rest area.

Enclosed traffic area, part of a service or emergency road and part of a pedestrian zone in some extent, are included in road type element part of a single carriageway.

Coverage: Information applies to road elements.

Values of road element type are:

- 1 Part of a motorway
- 2 Part of a multiple carriageway which is not a motorway
- 3 Part of single carriageway
- 4 Part of a roundabout
Parts of a roundabout are the road elements of the roundabout ring.
- 6 Enclosed traffic area
- 8 Slip road
Slip road is e.g. a ramp of a parallel, grade separated or roundabout junction or a one-way ramp, e.g. bus stop ramp on a motorway.
- 10 Part of a service or emergency road
- 13 Part of a pedestrian zone (e.g. a pedestrian street)
- 14 Part of a cycle path
- 17 Part of a semi-motorway
- 18 Rest area

4.2.7 Municipality number

Definition: The number of the municipality in which most of the traffic element is located. By using the municipality number the traffic elements of a municipality can be chosen with the accuracy described earlier.

Coverage: Information applies to traffic elements.

4.2.8 National road class

Coverage: Information applies to roads and streets that are part of the road address network maintained by Finnish Transport Agency (FTA).

Values of national road class are:

- 1 Class I main road
- 2 Class II main road
- 3 Regional road
- 4 Connecting road

4.2.9 E-road number

Definition: The numbers on E-roads are of format E+<number>.

Coverage: Information applies to roads and street network of some cities.

4.2.10 Type of ferry element

Coverage: Information applies to ferry elements.

Values of type of ferry element are:

- 1 Ferry
- 2 Cable ferry

4.2.11 Manoeuvre

Definition: Manoeuvre may indicate the compulsory, prohibited or blocked manoeuvres.

Manoeuvre consists of the type of manoeuvre, the start, intermediate, and end elements connected to manoeuvre and possible validity period as a Time Domain character string. More on Time Domain character string in appendix 5. There may also be vehicle segments attached to the manoeuvre that define the vehicle types affected by the manoeuvre.

Manoeuvre data is carriageway specific, not lane specific. There is manoeuvre between elements only if turning to another element is forbidden from all the lanes. Lane specific manoeuvre data is possible in Digiroad database, but the option is not in use.

Not all manoeuvres are indicated. If not, there must be some other attributes that indicate restrictions in traffic flow. Such are, for example, one-way road elements, pedestrian and cycle paths and blocked passages.

There may be vehicle allowed or not allowed data in the manoeuvre if the manoeuvre refers only to certain vehicle types. There is no manoeuvre if vehicle allowed or not allowed data is valid regardless of the direction of traffic because the vehicle type data without a manoeuvre attached to it is sufficient.

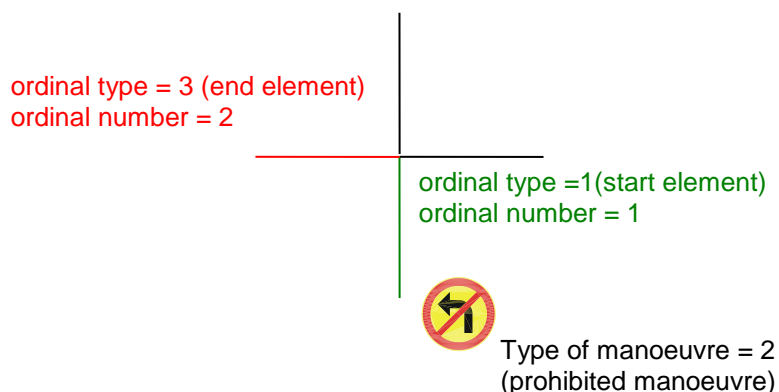


Figure 11. In the image the manoeuvre consists of two elements.

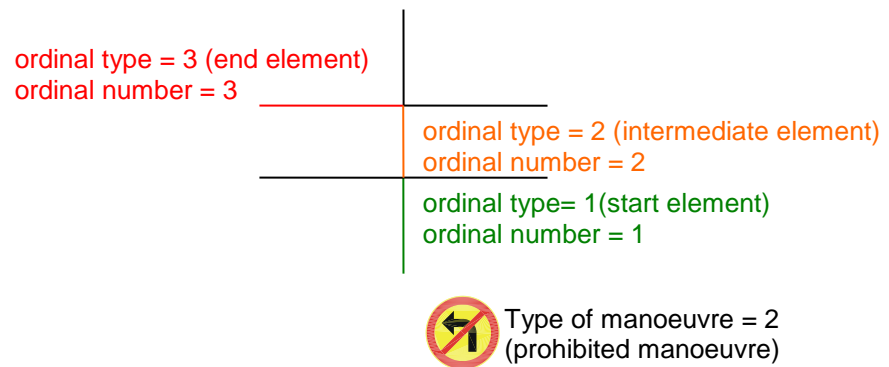


Figure 12. In the image the manoeuvre consists of three elements in the junction of a two-carriageway and single carriageway roads.

Tables: DIGIROAD_KAANTYMISMAARRAYS

DIGIROAD_KAANTYMISMAARRAYS_ELEMENTTI

DIGIROAD_SEGMENTTI_KAANTYMISMAARRAYS

DIGIROAD_SEGMENTTI

Values: Types of manoeuvre are:

- 1 Compulsory manoeuvre (information not yet available in Digiroad)
- 2 Prohibited manoeuvre
- 4 Physically restricted manoeuvre
There is a physical obstacle, e.g. pavement or traffic island between carriageways or lanes that has not been taken into account in the geometry. There may not be a need for a manoeuvre if the pavement or traffic island has been taken into account in the geometry.

The values of manoeuvre element are:

- 1 Start element
The sequence number of beginning element of a road is 1.
- 2 Intermediate element
The sequence number of intermediate element is 2 - (n-1) if there are any intermediate elements of a road.
- 3 End element
The sequence number of end element of a road is 2 - n.

4.3 Attribute data of traffic element not in use yet

It is also possible to include the following attribute data in Digiroad database, but they are not in use yet:

4.3.1 Type of railway element

Types of railway element are railway, narrow gauge railway and underground/metro.

4.3.2 Travel time

Travel time means the time used by a ferry connection or motorail on traffic element.

4.3.3 Restriction of use of road element

The use of a road element is restricted, for instance, in industrial areas.

4.3.4 Opening period of road element

Time indicated as Time Domain character string.

4.3.5 Traffic jam sensitivity of road element

4.3.6 Measured length of road element

4.3.7 Scenic value of road element

4.4 Segmented point-like attribute data

Segmented point-like attribute data refers to data objects with the same start and end point m value. These data objects are described as points in the Digiroad database.

4.4.1 Public transport stop

Definition: A stop has

- a name (see [4.1.1](#))
- type of stop (1-7)
- maintainer identifier (if there is one)
- national identifier
- information on the shelter existence of the stop (1-3) which can have values as follows:

- 1 No
- 2 Yes
- 3 No data
- owner (1-4) which can have values as follows:
 - 1 Municipality
 - 2 Local road authority
 - 3 HSL (Helsinki Region Transport)
 - 4 Finnish Transport Agency

Bus stops, which are not in contact with the reference chain (on the road network), e.g. Kamppi bus terminal in Helsinki, are represented as follows:

- A bus station type service has been created in the centre point of the bus stops (platforms)
- Entrance (and exit) segments have been recorded for the bus station service at the point on the road network where the roads enter and exit the terminal,
- all stops/platforms that belong to the bus station (terminal) have been stored as a bus stop type segment on a reference chain at the point where the road to the bus station (terminal) exits the road network and
- bus stop segments have been joined to the bus station type service.

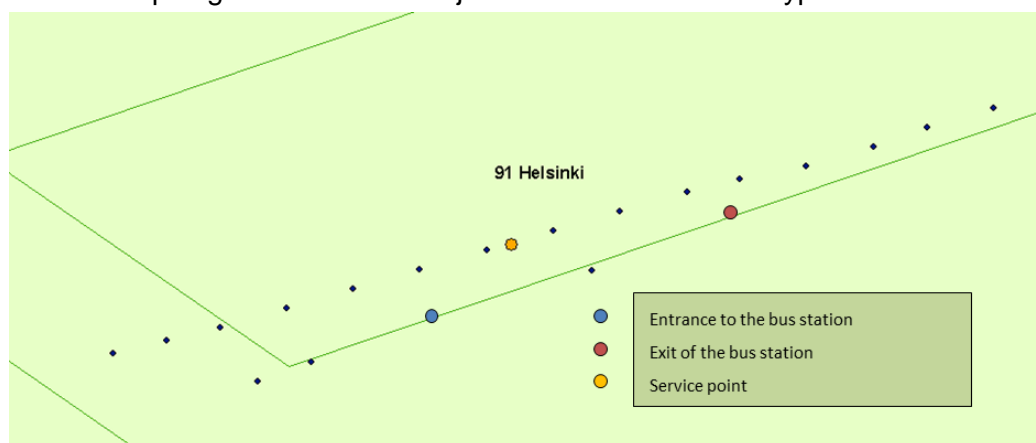


Figure 13. The positions of the stops in a bus station are stated as stop segments in Digiroad. They are saved in the road network at the position where the bus station's entry segment is located. For clarity, the picture also presents the actual position of the stops, which is not the case in Digiroad.

Coverage: Information applies to roads, streets and private roads.

Tables: DIGIROAD_SEGMENTTI

DIGIROAD_NIMI

segment type 4

Values of stop type are:

- 1 Tram
- 2 Local buses
- 3 Long distance buses
- 4 Local and long distance buses
- 5 Long distance and express buses
- 6 Local, long distance and express buses
- 7 No data

4.4.2 Intersection traffic light control or traffic light

Definition: Intersection traffic light control is as point segment at the distance of 5 meters from the intersection. It applies on all the reference chains that have direction of travel towards the intersection. So to say, reference chains that have direction of travel set both direction, may have two traffic light segments implemented – one each side of the intersection.

A traffic light between intersections is shown as a point segment, e.g. at a pedestrian crossing controlled by a traffic light if there is no crossing geometry.

Coverage: Information applies to roads and streets.

Table: DIGIROAD_SEGMENTTI

Segment type 5 / dynamic attribute type 9

4.4.3 Directional traffic sign and its information

Definition: Directional traffic sign and its information are the signposts which are situated on or directing to motorways or semi-motorways. Typically directional sign is located at a junction or just before it. There may be several directions (pieces of information on a directional sign) on a directional traffic sign.



Figure 14. Image shows four directions, i.e. four pieces of information on a directional traffic sign in a directional traffic sign segment.

Directional traffic sign information contains the following data, separated by a semicolon:

PLACE NAMES;COLOUR;LOCATION

Within the fields, the information is separated by a colon, for example:
 "HELSINKI:HELSINGFORS;1;500;"

More detailed description of the parts of the character string:

Place names: Names of places written as in the directional traffic sign (all CAPITAL letters).

Background colour:

- 0 no data
- 1 green (motorway or semi-motorway)
- 2 blue (road)
- 3 white (local, e.g. a town district)

Location: Distance of the directional traffic sign from the junction in metres.

Coverage: Information applies to roads (1-299), street and some private roads.

Tables: DIGIROAD_SEGMENTTI

DIGIROAD_OPASTUSTAULUN_INFORMAATIO

Segment type 5 / dynamic attribute type 13

4.4.4 Pedestrian crossing

Coverage: Information applies to streets.

Table: DIGIROAD_SEGMENTTI

4.4.5 Level crossing of a railway

Definition: Level crossing of a railway has:

- a name (see [4.1.1](#))
- type of safety device (1-5)

Coverage: Information applies to roads, streets and some private roads.

Tables: DIGIROAD_SEGMENTTI

DIGIROAD_NIMI

Segment type 5 / dynamic attribute type 25

Values given in the field of dynamic attribute value are of safety device type:

- 1 Railway not in use
- 2 No safety device
- 3 Only light and/or sound signal
- 4 Half barrier and possible light and/or sound signal
- 5 Full barrier and possible light and/or sound signal

4.4.6 Blocked passage

Definition: Blocked passage indicates a physical obstruction which prevents the use of road and street network via that point, e.g. the connection between two

streets have been cut off with a stone, a barrier gate which cannot be opened, or by a ditch.

Coverage: Information applies to streets and private roads.

Table: DIGIROAD_SEGMENTTI

Segment type 5 / dynamic attribute type 16

4.4.7 Traffic barrier gate which can be opened

Definition: A traffic barrier gate which can be opened is a point on an uninterrupted centre line geometry that has a locked barrier gate which can be opened.

Coverage: Information applies to streets.

Table: DIGIROAD_SEGMENTTI

Segment type 5 / dynamic attribute type 3

4.4.8 Alert-C location point

Definition: An Alert-C location point is a location point used in RDS-road TMC information service that is usually located in the intersections of main roads and streets.

Coverage: Information applies to main roads.

Table: DIGIROAD_SEGMENTTI

Segment type 1

4.5 Segmented attribute data stretched to lines

Some of the line-like data objects are described as points in the source material but have been stretched to line segments for the Digiroad database. The stretching has been done in an equal amount in both directions. These data objects have been described as lines with a usual length of 5–10 metres in the Digiroad information system. Attribute data stretched into lines include bridge, underpass and tunnel and, in certain cases, vehicle forbidden or allowed and the maximum allowed ... x 7 data objects.

If the information of a data object consists of segments stretched into a line and describing attribute data, the sections between the segments do not have a reference to a bridge/tunnel, vehicle prohibition or weight restriction. Only the start and end points of a bridge/tunnel or restriction have been described as a segment of 5–10 metres.

4.5.2 Maximum allowed ... x 7

Maximum allowed restrictions are:

- 18 Maximum height allowed for a vehicle
- 19 Maximum length allowed for a vehicle or articulated vehicle
- 20 Maximum total weight allowed for an articulated vehicle
- 21 Maximum weight per axle allowed for a vehicle
- 22 Maximum total weight allowed for a vehicle
- 23 Maximum width allowed for a vehicle
- 24 Maximum weight per tandem-axle allowed for a vehicle

Definition: The attribute data of the type maximum allowed are either segments stretched to a line or line segments. The segments of the maximum allowed restrictions have the length of the restricted road network segment if the length of the restriction is known. In cases where the length of the restriction is not accurately known, the restriction is given as a 5m segment at the location of the traffic sign that indicates the restriction. If the restriction applies to an entire area (such as a residential area), it is possible that the segment indicating the restriction is at the beginning of all roads leading to the area.

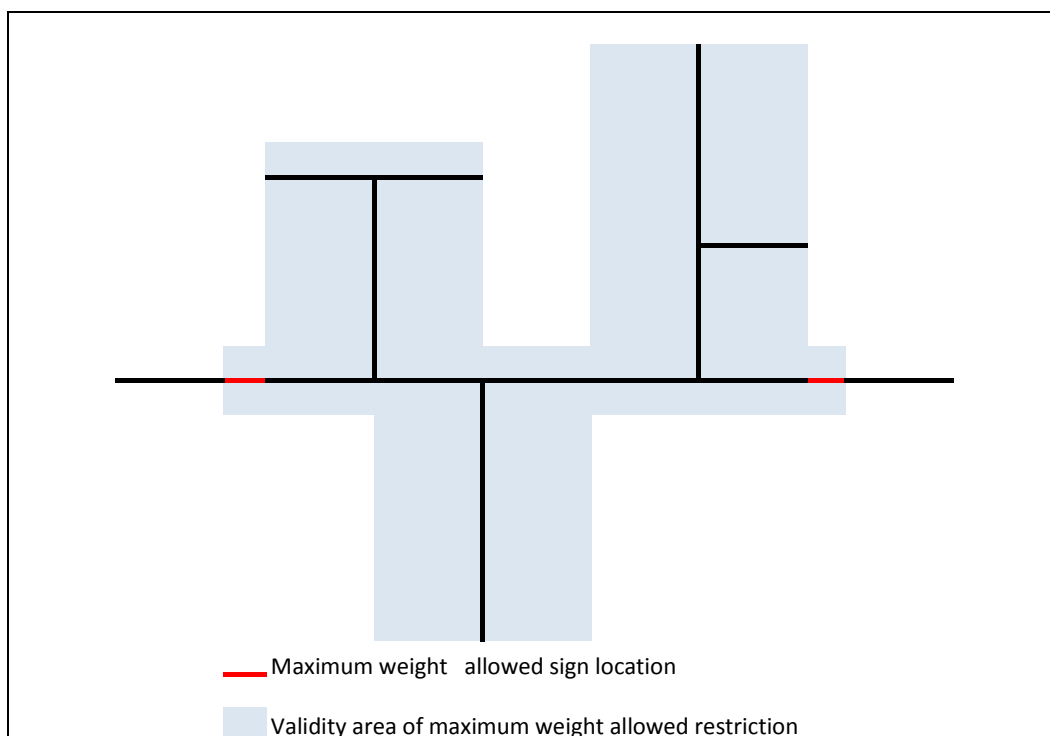


Figure16. Restriction is valid in a certain area if restriction signs are located at all roads leading to the area.

Coverage: Information applies to roads, streets and some private roads.

Table: DIGIROAD_SEGMENTTI

Segment type 5 / dynamic attribute types 18 - 24

Values: Height, length, and weight values of maximum allowed data are shown in centimetres with an accuracy of decimetres (e.g. a sign showing maximum height allowed restriction of 3,5 metres is in Digiroad displayed with the value 350). Maximum height allowed for a vehicle is displayed on roads only if it is below 440 cm.

Maximum height allowed for an underpass (cm) is counted by using the smallest difference between the obstacle or underpass in question and with the road lane center point and then the results is subtracted by 20 cm. The road lane in question must be chosen by using the wanted traffic direction. Exception is made with electrical rail road's aerial contact line which maximum height allowed is always 450 cm.

Mass values of maximum weight allowed data are in kilograms with an accuracy of hundred kilograms (e.g. a sign showing maximum weight allowed restriction of 25,5 tons is in Digiroad displayed with the value 25 500).

4.5.3 Vehicle allowed or not allowed

Definition: Vehicle not allowed segment has as its value the type of vehicle which is forbidden on the segment.

Vehicle allowed segment has as its value the type of vehicle which is allowed on the segment.

As a presumption the use of road and street network is allowed for all vehicle types. There is a vehicle allowed and vehicle not allowed segment only when there is a particular vehicle restriction on the road and street network.

When there is a vehicle restriction, the use of road and street network is allowed for all types of vehicles, except the ones that are restricted. On the other hand, if a carriageway (or lane) is permitted only for certain types of vehicles, it is informed like this; firstly the road segment is forbidden for all vehicle types and secondly the allowed vehicle types are marked as vehicle allowed segments. For example, on a bus lane, there is a "vehicle not allowed" segment with the value "all" and a vehicle allowed segment with bus as the value. If restriction applies to one lane only, is that mentioned in validity lane –column (see 4.1.4). Restrictions of that kind are only present in capital area at the moment and they include information about bus lanes only.

Other cases where there are both restrictions and vehicle allowed segments are, for example, when motor vehicles are not allowed but driving is allowed to the lots.



Selected Attributes of DIGIROAD_SEGMENTTI						
OID*	SEGM_TYYPPI*	SEGM_LOPPUPISTE	SEGM_ALKUPISTE*	SEGM_DYN_ARV	SEGM_DYN_TYYPPI	SEGM_PYS
9873187	5	122,74	117,74	2	29	<Null>
9872092	5	122,74	117,74	21	1	<Null>

Figure 17. Representation of multiple vehicle not allowed and allowed restriction at the same location in Digiroad.

Driving through traffic not allowed: If a “vehicle not allowed” segment only has the value “drive-through” it holds for every motor vehicles.

If there are other restrictions on the same route and same place as the “driving through not allowed” the driving through restriction concerns only these vehicle types. (For example, if there are two segments with “vehicle not allowed” values “driving through” and “truck”, then the driving through restriction is only for trucks.

If there are “vehicle allowed” segments on the same place where driving through is not allowed, the driving through restriction is for everything else but the allowed vehicle. (For example, if there are segments forbidding driving through but allowing busses then the driving through restriction is for every other vehicle type but busses.)

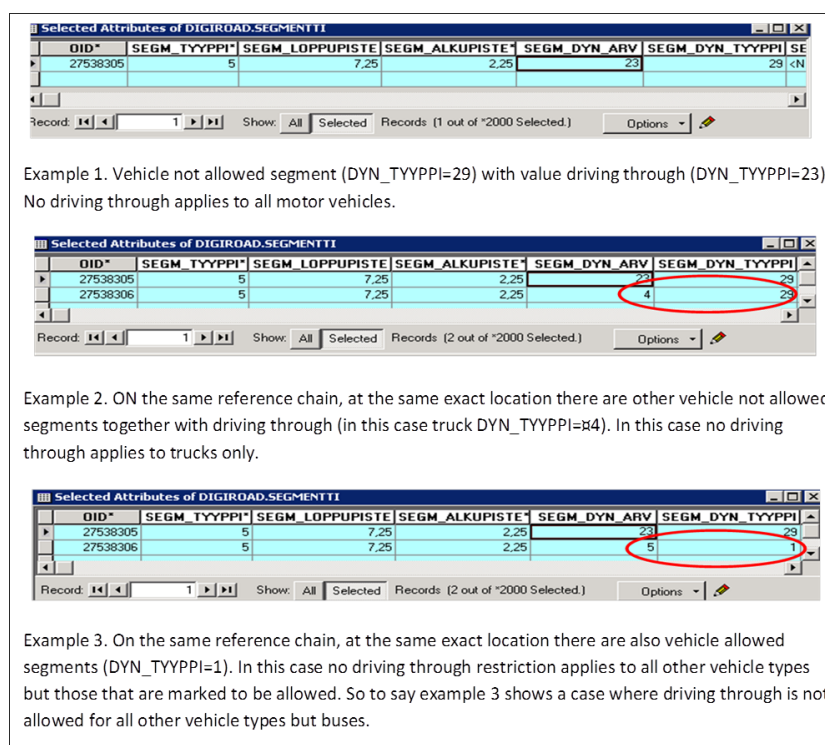


Figure 18. Different cases how “driving through” attribute data can be presented.

Vehicle with hazardous goods on board: attributed data may have values that are either vehicle with hazardous goods, A-VAK or B-VAK. The two last mentioned are additional information signs that only exist together with “the vehicle with hazardous goods” restriction sign in the reality. In Digiroad, anyhow, they are represented on their own attribute data types that define more in detail the type of hazardous goods restricted. So to say, they only apply on vehicles with hazardous goods even though attribute data of that kind is not present on the same reference chain in the Digiroad data.

For motorways and other road classes where certain vehicles are already forbidden by the general traffic regulations the “vehicle not allowed” -information will not be repeated in the Digiroad data from the publication 2011/3 onwards.

Tabel 1. The standard traffic regulations where vehicle is allowed or is not allowed. A=allowed, N = not allowed

	Truck	Car	Moped	Tractor	Bicycle	Pedestrian
Motorway	**	A	N	N	N	N
Semi-motorway	**	A	N	N	N	N
Road with multiple lanes	A	A	A	A	A	A
Road with one lane	A	A	A	A	A	A
Cycle and pedestrian paths	N	N	*	N	A	A

* Allowed when a traffic sign has a supplementary sign that allows mopeds

** Decree on Road traffic 182/2982 7§: If a motorway has at least three lanes in one direction, it is only allowed to drive a truck or an articulated vehicle, which is over 7 meters long, on the two most right-handed lanes, if not otherwise determined in 5§.

A segment for “vehicle not allowed” may also stand for restricting manoeuvres. In this case the restriction concerns only manoeuvring traffic. Vehicle restriction has no connection to turning order if the vehicle segment applies to the use of road and street network regardless of the direction of the traffic.

Vehicle segments are either segments stretched to lines or line-like segments. The length of a vehicle segment is that of the validity area or a segment is 5-10 metres long at the sign that denotes the restriction.

Vehicle segments may have a validity period as a Time Domain character string. More on the Time Domain character string in appendix 5.

Coverage: Information applies to roads, streets and some private roads.

Table: DIGIROAD_SEGMENTTI

Segment type 5 / dynamic attribute types 1 and 29

Values of vehicle type are:

- 1 All vehicles
- 2 Motor vehicle
- 3 Vehicle
- 4 Truck
- 5 Bus
- 6 Van
- 7 Passenger car
- 8 Taxi
- 9 Motorcycle
- 10 Moped
- 11 Cycle
- 12 Pedestrian
- 13 Articulated vehicle
- 14 Tractor or farm vehicle
- 15 Car with trailer/ recreational vehicle
- 16 Delivery vehicle
- 17 Emergency vehicle
- 18 Carpool (HOV) vehicle
- 19 Military vehicle
- 20 Vehicle with dangerous load
- 21 Driving in service purposes
- 22 Driving to the lots
- 23 Driving through

4.6 Segmented line-like attribute data

Segmented line-like attribute data refer to the data objects that are described as line segments in the Digiroad database. The length of a line segment varies depending on the dynamic value variation of the data object being described.

4.6.1 Road address

Definition: To avoid the same numbers as in continental Finland, 10 000 has been added to road numbers of Åland.

Road address has:

- a road number
- a number of the part of a road
- carriageway number

The validity direction of road address segments show the growth direction of the road addresses on road numbers 1 – 20 000 as well as on ramps and roundabouts.

Coverage: Information applies to roads and streets that have road address in Finnish Transport Agency registry.

Table: DIGIROAD_SEGMENTTI

Segment type 2

Values of carriageway numbers are:

- 1 First carriageway on the right in the direction of the road number
- 2 Second carriageway on the right in the direction of the road number
- 9 Single carriageway road

4.6.2 Speed restrictions

Definition: On main roads, the validity direction is always stated separately for each direction even if the position and value of the element are the same in both directions. Åland's information is, however, always valid in both directions. Slip roads and roundabouts do not have speed restriction information as, according to the road register, no restrictions are applied to them.

Coverage: Information applies to roads, streets and some private roads.

Table: DIGIROAD_SEGMENTTI

Segment type 5 / dynamic attribute type 11

Value of speed limit (km/h) is in the field of dynamic attribute data.

4.6.3 Paved road

Definition: All pavement types are classified as pavements. There is no pavement segment on the part of road network covered with gravel.

Coverage: Information applies to roads and streets.

Table: DIGIROAD_SEGMENTTI

Segment type 5 / dynamic attribute type 26

4.6.4 Number of lanes

Definition: The data on number of lanes is given according to the direction when there is more than one lane in a particular direction. In other cases the presumption is that there is one lane in each direction of traffic flow (two directions: 1+1 lanes, one direction: 1 lane). Diverging lanes are not included.

Coverage: Information applies to roads and streets.

Table: DIGIROAD_SEGMENTTI

Segment type 5 / dynamic attribute type 5

Value: Number of lanes (>1) is in the field of dynamic attribute value.

4.6.5 Width

Definition: Width of a road is the width of a road or street excluding the shoulders, i.e. the part of the carriageway for vehicle traffic. On paved roads the carriageway is often separated from the shoulders with a white border line. If a border line doesn't exist, the width equals the width of the paving. On gravel roads the width equals the width of the whole road, since gravel roads don't have shoulders.

Coverage: Information applies to roads, streets and private roads.

Table: DIGIROAD_SEGMENTTI

Segment type 5 / dynamic attribute type 8

Value: Width of road (cm) is in the field of dynamic attribute value.

4.6.6 Built-up area

Definition: Built-up area is the part of the road and street network which is inside the area indicated by a sign for a built-up area. On main roads, the validity direction is always stated separately for each direction even if the position and value of the element are the same in both directions. Åland's information is, however, always valid in both directions.

Coverage: Information applies to roads, streets and some private roads.

Table: DIGIROAD_SEGMENTTI

Segment type 5 / dynamic attribute type 30

4.6.7 Road affected by thawing

Definition: Road affected by thawing is the part of the traffic network that tends to suffer from thawing.

Coverage: Information applies to roads.

Table: DIGIROAD_SEGMENTTI

Segment type 5 / dynamic attribute type 6

4.6.8 Lit road

Definition: There is no lit road segment on the part of the road network that has no lighting.

Coverage: Information applies to roads and streets.

Table: DIGIROAD_SEGMENTTI

Segment type 5 / dynamic attribute type 27

4.6.9 Traffic volume

Definition: Traffic volume is the average number of vehicles passing per day. If the road that consists of one carriageway splits into two carriageways, the traffic volume gets the same value in both carriageways as long as there are no cross-roads that affect to the volume.

Coverage: Information applies to roads.

Table: DIGIROAD_SEGMENTTI

Segment type 5 / dynamic attribute type 33

Value of traffic volume is in the field of dynamic attribute value.

4.6.10 Construction status

Definition: Construction status is the part of the road network which is under construction or planned to be constructed. Construction status is a line segment.

Coverage: Information applies to roads, streets and private roads.

Table: DIGIROAD_SEGMENTTI

Segment type 5 / dynamic attribute type 15

Values of construction status are:

- 1 Under construction
- 2 Planned
- 3 Under construction, but open

4.6.11 Speed limit during winter

Definition: The speed limits during winter are in long segments without taking in to account the shorter parts of roads with limits that are lower than the general speed limit (point segments, steps etc.) Speed limits during winter are line segments.

Coverage: Information applies to roads.

Tables: DIGIROAD_SEGMENTTI

Segment type 5 / dynamic attribute type 31

Value of speed limit during winter (km/h) is in the field of dynamic attribute data.

4.6.12 Exit number

Definition: Exit numbers are numbers given to ramps on motorways or semi-motorways. Appendix 9 lists those ramps that have an exit number consisting of both a number and a letter.

Coverage: On roads (ramps on motorways and semi-motorways).

Table: DIGIROAD_SEGMENTTI

Segment type 5 / dynamic attribute 34

Value: The ramps number is saved in the dynamic attribute field.

4.7 Attribute data on segments not in use yet

It is also possible to include the following attribute data in Digiroad database but they have not been published yet:

4.7.1 Variable speed limit

Tables: DIGIROAD_SEGMENTTI

4.7.2 Owner

Definition: Type of owner is municipality, Finnish Transport Agency (FTA) or National Land Survey of Finland.

Tables: DIGIROAD_SEGMENTTI

4.7.3 Groundwater area

Table: DIGIROAD_SEGMENTTI

4.7.4 Overlapping tramline

Definition: Overlapping tramline is the part of road network where a tramline shares a lane with other vehicle traffic.

Table: DIGIROAD_SEGMENTTI

4.7.5 Restriction of passage

Table: DIGIROAD_SEGMENTTI

Restriction of passage is the part of traffic network where road works may impede traffic.

4.8 Other features

4.8.1 Service

Definition: Service means the kind of service that helps and supports the users of traffic network, e.g. a parking building or bus station. Service has a geometry point which is connected to traffic network by defining a point segment in the traffic network where there is an exit from and/or entrance to a service.

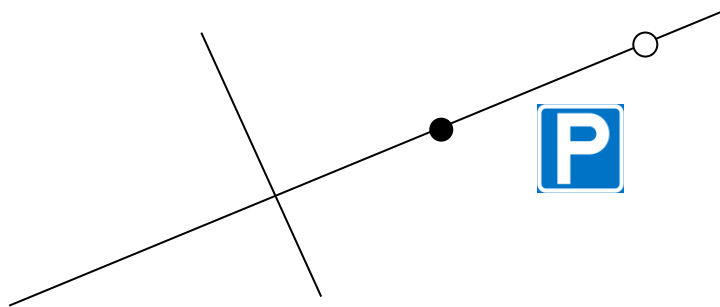


Figure 19. Figure shows a parking sign (parking area type service) at the actual location of the parking area. Service connection segment of an entrance to a parking area is marked with a black dot and that of the exit with a white dot.

Service has:

- a name (see [4.1.1](#))
- type of service (1-17), that can have values as follows:
 - 1 Hospital/polyclinic
 - 2 First aid post
 - 3 Cargo centre
Cargo centre is for collecting and sorting of non-passenger goods (not luggage).
 - 4 Customs
 - 5 Frontier crossing
 - 6 Rest area (or lay-by)
Types of rest area are:
 - 1 Comprehensive facilities
Wider range of facilities offers other facilities and services in addition to the basic ones.
 - 2 Basic facilities
Basic facilities include the following facilities or services:
 - parking area
 - waste container
 - toilets
 - table and bench
 - 3 Private service area
Privately run service area has e.g. a petrol station, kiosk, cafeteria, restaurant or accommodation services.
 - 4 No data
 - 7 City centre

City centre describes a central location of a municipality or built-up area. Typically it is the town hall, railway station or other central activity centre (i.e. church, market place or pedestrian district).

8 Airport

An airport which accommodates either cargo or passenger traffic of a commercial or private nature.

9 Ferry terminal

The access point or check-in area for a ferry company.

10 Taxi stand

11 Railway station

12 Parking lot

Parking lot which has at least 40–50 public parking spaces. There may be a charge for parking but there may not be other restrictions (e.g. parking only allowed for customers of a particular store). Parking lots have a corresponding facility classification to rest areas (see section 6, Rest area). In addition, parking lot object can also include more accurate information about facilities.

13 Car shipping terminal

A location where cars may be loaded onto trains or ferries.

14 Coach and lorry parking

15 Parking house

Parking house which has at least 40–50 public parking spaces. There may be a charge for parking but there may not be other restrictions (e.g. parking only allowed for customers of a particular store).

16 Bus station

17 Landmark

Landmark is a noticeable building, monument, nature attraction etc. which helps navigation, e.g. Näsinneula observation tower or the tower of Helsinki Olympic Stadium.

- type of rest area (on rest areas or lay-bys and parking areas)
- additional information (not obligatory)
- service segment (1 - n)

Passage to service has:

- connection to service
- type of passage (1-3), that can have values as follows:
 - 1 entrance and exit
 - 2 entrance only
 - 3 exit only

Service connection segments are not included to most of the services.

Tables: DIGIROAD_PALVELU

DIGIROAD_SEGMENTTI

DIGIROAD_SEGMENTTI_PALVELU

DIGIROAD_NIMI

Segment type 7 (connection to service)

4.9 Other features not in use yet

It is also possible to include the following attribute data in Digiroad database but they are not in use yet.

4.9.1 Municipality

Definition: Municipality has

- Municipality number
- Municipality language or language relation, that can have values as follows:
 - 10 fin only Finnish
 - 12 fin mainly Finnish
 - 20 swe only Swedish
 - 21 swe mainly Swedish

Municipality has no GUID identifier.

Table: DIGIROAD_KUNTA

Municipality data does not include location data. Municipality data can be connected to traffic elements according to the municipality number, which makes it possible to use the language or language relation data when handling or presenting names of traffic elements.

4.9.2 Enclosed traffic area

Definition: Enclosed traffic area is any area type feature inside which unplanned traffic is allowed. Enclosed traffic areas are not part of traffic network and they have no overlapping road elements. Some enclosed traffic areas may include a service feature point, e.g. parking area.

Table: DIGIROAD_LIITANNAISLIKENNEALUE

4.9.3 Junction

Definition: Junction is a numbered motorway junction consisting of traffic elements.

Tables: DIGIROAD_RISTEYS

DIGIROAD_RISTEYS_LIIKENNE_ELEMENTTI

DIGIROAD_NIMI

4.9.4 Specific combination of roads or routes

Definition: Specific combination of roads and routes is a group of traffic elements joined together by an activity or marker, e.g. routes for dangerous deliveries, historic roads or scenic roads.

Tables: DIGIROAD_VAYLA
DIGIROAD_VAYLA_LIIKENNEELEMENTTI

4.9.5 Train or ferry connection

Definition: Train or ferry connection is the part of traffic network which can be used for transporting cars using e.g. ferries or trains. Train or ferry connection consists of ferry or railway elements and describes one whole connection, e.g. car ferry from Turku to Mariehamn or autorack from Helsinki to Rovaniemi.

Tables: DIGIROAD_LIIKENNEYHTEYS

4.9.6 Grade separated point

Definition: Grade separated point is a geometry point where crossings of traffic elements occur with the help of bridges, underpasses or tunnels. Grade separated points always consist of two levels, i.e. reference to a traffic element going over or under.

Table: DIGIROAD_ERITASORISTEYS

4.9.7 Town district

Tables: DIGIROAD_KAUPUNGINOSA or DIGIROAD_PALVELU

5 APPENDIX

- Appendix 1: Data objects of the database
- Appendix 2: Adjustments on data objects
- Appendix 3: Files, fields and descriptions
- Appendix 4: Codes
- Appendix 5: Time Domain character string
- Appendix 6: Utilization of Digiroad R delivery format
- Appendix 7: Description of Digiroad K delivery format
- Appendix 8: Class chart of Digiroad
- Appendix 9: List of exit numbers that contain letter

APPENDIX 1: DATA OBJECTS OF THE DATABASE

This table shows the data objects of Digiroad database. The data objects included in material deliveries are described in Digiroad Quality description document.

28.4.2014	Data objects by functional class	1 - 4	5	6	10	Others
Attribute data of	Name	x	x	x	x	
traffic element	Address numbers	x	x	x	x	
	Direction of traffic flow	x	x	x	x	
	Route type	x	x	x	x	
	Functional class	x	x	x	x	
	Type of road element	x	x	x	x	
	Municipality number	x	x	x	x	
	National road class	x				
	E-road number	x				
	Type of ferry element					x
	Manoeuvre	x	x			
Attribute data of	Type of railway element					
traffic element	Travel time					
not in use yet	Restriction of use of road element					
	Opening period of road element					
	Traffic jam sensitivity of road element					
	Measured length of road element					
	Scenic value of road element					
Segmented	Alert-C Location point	x	x			
point-like	Public transport stop	x	x			
attribute data	Intersection traffic light control	x	x			
	Directional traffic sign and its information	x	x			
	Pedestrian crossing	x	x			
	Level crossing of a railway	x	x			
	Blocked passage	x	x	x	x	
	Traffic barrier gate which can be opened	x	x		x	
Segmented	Bridge, underpass or tunnel	x	x			
Attribute data	Maximum allowed ... X 7	x	x			
stretched to lines	Vehicle allowed	x	x			
	Vehicle not allowed	x	x			
Segmented line-like	Road address	x				
attribute data	Speed restrictions	x	x			
	Paved road	x	x	x	x	
	Number of lines	x	x			
	Width	x	x	x		
	Build-up area	x	x			
	Road affected by thawing	x	x			
	Lit road	x	x			
	Traffic volume	x				
	Construction status	x	x			
	Speed limit during winter	x				
	Exit number	x				
Attribute data	Variable speed limit					
on segments	Owner					
not in use yet	Groundwater area					
	Overlapping tram line					
	Restriction of passage					
Other features	Service					x
Other features	Municipality					
not in use yet	Enclosed traffic area					
	Junction					
	Special combination of roads or routes					
	Train or ferry connection					
	Grade separated point					
	Town district					

APPENDIX 2: ELABORATION OF DATA OBJECTS

28.4.2014	Data objects	C=compulsory, P=possible			
Attribute data of traffic element	Name	C			
	Address numbers	P			
	Direction of traffic flow	C			
	Route type	C			
	Functional class	C			
	Type of road element	P			
	Municipality number	C			
	National road class	P			
	E-road number	P			
	Type of ferry element	P			
	Manoeuvre	P			P
Attribute data of traffic element not in use yet	Type of railway element				
	Travel time				
	Restriction of use of road element				
	Opening period of road element				
	Traffic jam sensitivity of road element				
	Measured length of road element				
	Scenic value of road element				
		Name	Validity direction	Validity lane	Validity time
Segmented point-like	Alert-C Location point	C	C		
	Public transport stop	P	C		
Attribute data of	Intersection traffic light control		C		
	Directional traffic sign and its information		C		
	Pedestrian crossing		C		
	Level crossing of a railway	P	C		
	Blocked passage		C		
	Traffic barrier gate which can be opened		C		
Segmented	Bridge, underpass or tunnel	P	C		
Attribute data	Maximum allowed ... X 7		C		
stretched to lines	Vehicle allowed		C	P	P
	Vehicle not allowed		C	P	P
Segmented line-like	Road address		C		
attribute data	Speed restrictions		C	P	
	Paved road		C		
	Number of lines		C		P
	Width		C		
	Build-up area		C		
	Road affected by thawing		C		
	Lit road		C		
	Traffic volume		C		
	Construction status		C		
	Speed limit during winter		C	P	
	Exit number		C		
Attribute data on segments	Variable speed limit				
	Owner				
not in use yet	Groundwater area				
	Overlapping tram line				
	Restriction of passage				
Other features	Service	P			
Other features	Municipality				
not in use yet	Enclosed traffic area				
	Junction				
	Special combination of roads or routes				
	Train or ferry connection				
	Grade separated point				
	Town district				

APPENDIX 3: FILES, FIELDS AND DESCRIPTIONS

Main files of Digiroad R and K delivery formats and their fields and descriptions			15.1.2013
File	Field	Description (the ones in internal use are not included)	Unit
DIGIROAD_LIIKENNE_ELEMENTTI			
	VAYLATYYPPI	Route type	
	TOIMINNALL	Functional class	
	EUROOPPATI	E-road number	
	KANSALLINE	National road class of road element	
	TYYPPI	Type of road element	
	KAYTTORAJA	Restriction of use of road element	
	LIKENNEVI	Direction of traffic flow in relation to direction of digitisation	
	KAYTTOAIKA	Opening period presented as Time Domain character string	
	RUUHKAUTUM	Traffic jam sensitivity of road element	
	ENS_TALO_O	First house on the right in relation to direction of digitisation	
	TALONUMERO	House numbering structure of road element	
	ENS_TALO_V	First house on the left in relation to direction of digitisation	
	MITATTU_PI	Measured length of road element	cm
	MAISEMALLI	Scenic value of road element	
	VIIM_TALO_	Last house on the right in relation to direction of digitisation	
	VIIM_TAL_1	Last house on the left in relation to direction of digitisation	
	LAUT_TYYPPI	Type of ferry	
	RAUTAT_ELE	Type of railway	
	MATKA_AIKA	Travel time of ferry or railway element	
	INV_PAALU_	Start point on reference chain	ratio
	INV_PAAL_1	End point on reference chain	ratio
	LIIKYHTEYS	OID_TUNNUS in DIGIROAD_LIIKENNEYHTEYS table	
	LIITALUE_O	OID_TUNNUS in DIGIROAD_LIITANNAISLIKENNEALUE table	
	KETJU_OID	OID_TUNNUS in DIGIROAD_KETJU table	
	GUID / VIITE_GUID	Digiroad-ID, R: GUID K: VIITE_GUID	
	TIEE_KUNTA	Municipality number of most of traffic element	
	OID_TUNNUS / VIITE_OID	OID identifier for file connections, R: OID_TUNNUS K: VIITE_OID	
DIGIROAD_NIMI			
	NIMI_LAJI	Type of name	
	KIELIKOODI	Language code of name	
	TEKSTI	Name text	
	VIITE_TAU	Table the name refers to	
	VIITE_OBJE	OID_TUNNUS or VIITE_OID, that name refers to	
	LIKENNE_E	OID_TUNNUS or VIITE_OID in LIKENNE_ELEMENTTI table	
	SEGMENTTI_	OID_TUNNUS or VIITE_OID in DIGIROAD_SEGMENTTI table	
	OID_TUNNUS	OID identifier	
DIGIROAD_KETJU			
	TUNNUS	OID identifier for file connections	
	GUID	Digiroad-ID	
	OID_TUNNUS	OID identifier for file connections	

DIGIROAD_SEGMENTTI		
TYYPPI	Type of segment	
LOPPUPISTE	End point of the segment on reference chain	ratio
ALKUPISTE	Start point of the segment on reference chain	ratio
VAIKUTUSKA	Validity lane of segment on the right in the validity direction	
VAIKUTUSSU	Validity direction of segment in relation to: R: reference chain, K:segment	
VAIKUTUSAI	Validity period of segment as Time Domain character string	
TIEOSANUME	Road address segments number of part of road	
TIENUMERO	Road number of rado address segments	
DYN_ARVO	Value of dynamic data attribute	
DYN_TYYPPI	Type of dynamic data attribute	
PYSAKKI_VA	National identifier of stop	
PYSAKKI_TY	Type of stop	
PYSAKKI_SU	Direction of stop	
PYSAKKI_KA	Shleter of stop	
PYSAKKI_YL	Maintainer identifier of stop	
PALVELU_PA	Type of passage to service	
SILTATAITU	Type of bridge or tunnel	
PALVELU_OB	OID_TUNNUS in DIGIROAD_PALVELU table	
KETJU_OID	OID_TUNNUS in DIGIROAD_KETJU table	
AJORATANUM	Lane number of road address segments	
GUID / VIITE_GUID	Digiroad-ID, R: GUID K: VIITE_GUID	
OID_TUNNUS / VIITE_OID	OID identifier for file connections, R: OID_TUNNUS, K: VIITE_OID	
RDTCLIIIT	Junction number usedn in traffic information service	
DIGIROAD_KAANTYMISMAARAYS		
TYYPPI	Type of manoeuvre	
VAIKUTUSAIK	Validity period of manoeuvre as Time Domain character string	
GUID	Digiroad-ID	
OID_TUNNUS	OID identifier for file connections	
DIGIROAD_KAANTYMISMAARAYS_ELEMENTTI		
ELEMENT_OB	OID_TUNNUS or VIITE_OID in DIGIROAD_LIIKENNE_ELEMENTTI table	
KAANTIMAAR_	DIGIROAD_KAANTYMISMAARAYS -tiedoston OID_TUNNUS	
KAISTANRO	Validity lane of manoeuvre on the right in the validity direction	
ELEM_JARJE	Ordinal number of road element in manoeuvre	
ELEM_JAR_1	Ordinal type of manoeuvre element	
OID_TUNNUS	OID identifier	
DIGIROAD_SEGMENTTI_KAANTYMISMAARAYS		
SEGMENTTI_	OID_TUNNUS or VIITE_OID in DIGIROAD_SEGMENTTI table	
KAANTIMAAR_	OID_TUNNUS in DIGIROAD_KAANTYMISMAARAYS table	
OID_TUNNUS	OID identifier	
DIGIROAD_PALVELU		
TYYPPI	Types of service	
LISATieto	Additional information on service	
RAUTATIEAS	Type of railway station	
PAIKKOJEN_	Number of parking spaces	
LEPOALUE_T	Type of rest areas	
GUID	Digiroad-ID	
OID_TUNNUS	OID identifier	
OMISTAJA_T	Primary source of information	
DIGIROAD_SEGMENTTI_PALVELU		
PALVELU_OB	OID_TUNNUS in DIGIROAD_PALVELU table	
SEGMENTTI_	OID_TUNNUS or VIITE_OID in DIGIROAD_SEGMENTTI table	
OID_TUNNUS	OID identifier	
DIGIROAD_OPASTAULUN_INFORMAATIO		
TEKSTI	Text of one line on a directional sign	
ELEMENT_OB	OID_TUNNUS or VIITE_OID in DIGIROAD_LIIKENNE_ELEMENTTI table	
SEGMENTTI_	OID_TUNNUS or VIITE_OID in DIGIROAD_SEGMENTTI table	
GUID	Digiroad-ID	
OID_TUNNUS	OID identifier	
DIGIROAD_KUNTA		
KUNTA_KOODI	Municipality number	
KUNT_VIRAL	Language or language relation of municipality	
GUID	Digiroad-ID	
OID_TUNNUS	OID identifier for file connections	

APPENDIX 4: CODES

Main code values in Digiroad and their descriptions			15.10.2013		Unit
File	Field	Description	Value	Description of value	
DIGIROAD_LIIKENNE_ELEMENTTI	VAYLATYYPP	Route type	1	Road	
			2	Street	
			3	Private road	
			4	Cycle or pedestrian path	
			5	Railway	
			6	Ferry	
	TOIMINNALL	Functional class	1	Regional main street/ Class I main road	
			2	Regional main street/ Class II main road	
			3	Local main street/ Regional road	
			4	Collector road/ Connecting road	
			5	Feeder street/ Class I private road	
			6	Class II private road	
	TYYPPI	Type of road element	10	Cycle or pedestrian path	
			1	Part of a motorway	
			2	Part of a multiple carriageway which is not a motorway	
			3	Part of a single carriageway	
			4	Part of a roundabout	
			6	Enclosed traffic area	
			8	Slip road	
			10	Part of a service or emergency road	
			13	Part of a pedestrian zone (e.g. a pedestrian street)	
			14	Part of a cycle path	
DIGIROAD_LIIKENNEVI		Direction of traffic flow	17	Part of a semi-motorway	
			18	Rest area	
			2	Traffic is permitted in both directions	
			3	Traffic is permitted against the direction of digitisation	
			4	Traffic is permitted in the direction of digitisation	
DIGIROAD_TALONUMERO		Structure of house numbering	5	Traffic is closed in both directions	
			2	Regular, even and uneven on different sides	
			3	Regular, even and uneven on the same side	
			4	No regularity	
DIGIROAD_LAUT_TYYPP		Type of ferry	1	Ferry	
			2	Cable ferry	
DIGIROAD_NIMI	NIMI_LAJI	Type of name	1	Official	
			2	Alternate	
DIGIROAD_KIELIKOODI		Language code of name	1	fin Finnish	
			2	swe Swedish	
DIGIROAD_SEGMENTTI	VAIKUTUSSU	Validity direction of segment	1	Both directions	
			2	In the direction of digitisation	
			3	Against the direction of digitisation	
	TYYPPI	Type of segment	1	Alert-C location point	
			2	Road address	
			4	Stop	
			5	Dynamic attribute	
			6	Bridge, underpass or tunnel	
			7	Entrance to /exit from a service	
			8	Groundwater area	

DYN_TYYPPI	Type of dynamic attribute	1	Vehicle allowed	
		3	Traffic barrier gate that can be opened	
		5	Number of lanes	
		6	Road affected by thawing	
		8	Width	cm
		9	Intersection traffic light control or traffic light	
		11	Speed restriction	km/h
		13	Directional traffic sign	
		14	Overlapping tramline	
		15	Construction status	
		16	Blocked passage	
		17	Pedestrian crossing	
		18	Maximum height allowed for a vehicle	cm
		19	Max. length allowed for a vehicle or an articulated vehicle	cm
		20	Max. total mass allowed for an articulated vehicle	kg
		21	Maximum weight per axle allowed for a vehicle	kg
		22	Maximum total weight allowed for a vehicle	kg
		23	Maximum width allowed for a vehicle	cm
		24	Maximum weight per tandem-axle allowed for a vehicle	kg
		25	Level crossing of a railway	
		26	Paved road	
		27	Lit road	
		29	Vehicle not allowed	
		30	Build-up area	
		31	Speed limit during winter	
		32	Variable speed limit	
		33	Traffic volume	
		34	Exit number	
DYN_ARVO (values are type specific)	Dynamic attribute vehicle type	1	All	
		2	Motor vehicles	
		3	Vehicle	
		4	Truck	
		5	Bus	
		6	Van	
		7	Passenger car	
		8	Taxi	
		9	Motorcycle	
		10	Moped	
		11	Cycle	
		12	Pedestrian	
		13	Articulated vehicle	
		14	Tractor or farm vehicle	
		15	Car with trailer/ recreational vehicle	
		16	Delivery vehicle	
		17	Emergency vehicle	
		18	Carpool (HOV)	
		19	Military vehicle	
		20	Vehicle with hazardous load	
		21	Driving in service purposes	
		22	Driving to the lots	
		23	Driving through	
		24	A-VAK (additional information for hazardous load)	
		25	B-VAK (additional information for hazardous load)	
DYN_ARVO (arvot ovat tyypikohtaisia)	Dynamic attribute level crossing	1	Railway not in use	
		2	No safety device	
		3	Only light and/or sound signal	
		4	Half barrier and possible light and/or sound signal	
		5	Full barrier and possible light and/or sound signal	
DYN_ARVO (arvot ovat tyypikohtaisia)	Dynamic attribute construction status	1	Under construction	
		2	Planned	
		3	Under construction, but open for traffic	

PYSAKKI_TY	Type of stop	1	Tram
		2	Local buses
		3	Long distance buses
		4	Local and long distance buses
		5	Long distance and express buses
		6	Local, long distance and express buses
		7	No data
PYSAKKI_SU	Direction of stop	1	In the direction of digitisation
		2	Against the direction of digitisation
PYSAKKI_KA	Shelter existence of stop	1	No
		2	Yes
		3	No data
SILTATAITU	Type of bridge, underpass or tunnel	1	Bridge
		2	Tunnel
		3	Underpass
PALVELU_PA	Type of entrance/exit of a service	1	Entrance and exit
		2	Entrance
		3	Exit
SEGM_OMISTAJA_TYYPPI	Type of owner	1	Municipality
		2	Local road authority
		3	Helsinki Regional Transport
		4	Finnish Transport Agency
DIGIROAD_KAANTYMISMAARAYS_TYYPPI	Type of manoeuvre	1	Compulsory manoeuvre
		2	Prohibited manoeuvre
		4	Physically restricted manoeuvre
DIGIROAD_KAANTYMISMAARAYS_ELEMENTTI			
ELEM_JAR_1	Value of manoeuvre element	1	Start element
		2	Intermediate element
		3	End element
DIGIROAD_PALVELU_TYYPPI	Type of service	1	Hospital/polyclinic
		2	First aid point
		3	Cargo center
		4	Customs
		5	Frontier crossing
		6	Rest area (or lay-by)
		7	City centre
		8	Airport
		9	Ferry terminal
		10	Taxi stand
		11	Railway station
		12	Parking area
		13	Car shipping terminal
		14	Coach or lorry parking
		15	Parking building
		16	Bus station
		17	Landmark
LEPOALUE_T	Type of rest area	1	Rest area with a wide range of facilities
		2	Rest area, basic facilities
		3	Private rest area
		4	No data
RAUTATIEAS	Type of railway station	1	Important railway station
		2	Less important railway station
		3	Underground/metro station
OMISTAJA_T	Type of owner	1	Municipality
		2	Local road authority
		3	Helsinki Regional Transport
		4	Finnish Transport Agency
DIGIROAD_KUNTA			
KUNT_VIRAL	Language code	10	fin only Finnish
		12	fin majority Finnish
		20	swe only Swedish
		21	swe majority Swedish

APPENDIX 5: TIME DOMAIN CHARACTER STRING

General

Time Domain is defined in GDF and it is a way to indicate precise and complex validity periods for various features and attributes. Notation consists of starting time of the validity period and duration of the validity in the following way:[(starting time){duration}].

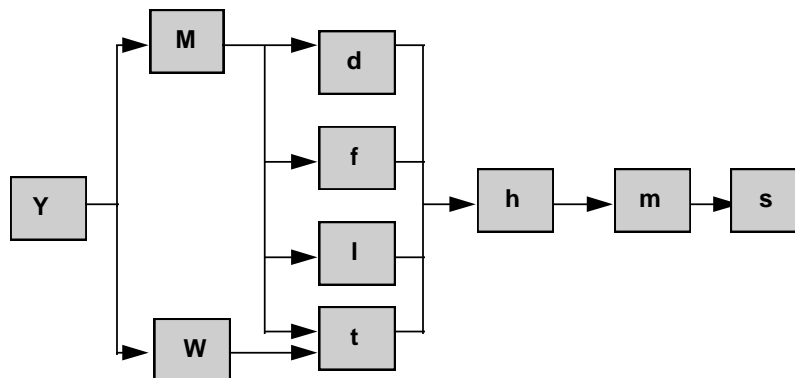
For example, [(M5d1){d1}] means:

- Starting time: any year in the fifth month on the 1st day at 00:00:00
- Duration: one day (i.e. 24 hours or 1440 minutes)

Starting time

Notations of Time Domain starting time

unit of time	compared time	code	values (n,x)	comment
year		ynnnn	0...9999	
month	of year	Mnn	1...12	
week	of year	wnn	1...53	
day	of month	dnn	1...28/29/30/31	maximum depends on month
day	of week	tn	1...7	from Sunday to Saturday
day of week	week of month	fxn	x: 1...5	week from beginning of month
				from where validity begins
	day of week		n: 1...7	from Sunday to Saturday
day of week	week of month	lxn	x: 1...5	week from end of month
				from where validity begins
	day of week		n: 1...7	from Sunday to Saturday
hour	of day	hnn	0...23	
minute	of hour	mnn	0...59	
second	of minute	snn	0...59	



Possible combinations of starting times codes.

Codes are listed from the longest period to the shortest one (y...s). If there is no unit of time marked in the beginning, all values are valid. If there is no unit of time marked in the middle or at the end, the value of the unit is its presumption value, i.e. the smallest possible unit (e.g. M1, w1, d1, h0, m0, s0).

Examples of the notations of starting times:

(y2001) 1.1.2001, 00:00:00
 (M5) every year, 1.5. 00:00:00
 (w12) every year, Sunday on the 12th week, 00:00:00
 (d14) every year, 14th of every month 00:00:00
 (t2) every year, Monday of every week 00:00:00
 (f23) every year, Tuesday of the second week of every month 00:00:00
 (l12) every year, Monday of the last week of every month 00:00:00
 (h6) every year, every day of every month 06:00:00
 (m30) every year, every day of every month, every hour 30:00
 (s15) every year, every day of every month, every hour, every minute :15
 (w9h11m30) every year, every day of the 9th week 11:30:00
 (M4m30) every year, every day of every April, every hour 30:00

Correspondingly:

14th November 2001 (00:00:00)	(y2001M11d14)
every year 2.5. 17:31:00	(M5d2h17m31)
every year, last Sunday of February	(M2l11)

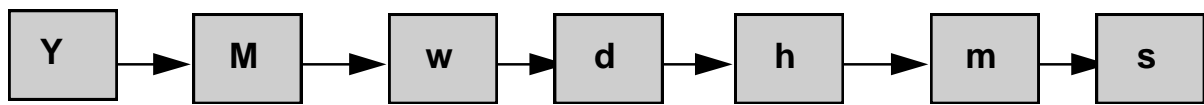
Duration

Duration is the total time of Time Domain notations of time units, e.g. {y2M2w1d2}, which means the validity from starting time onwards, for two years + two months + one week + two days.

A minus sign can be added in front of the duration, e.g. {-d5}, which means the validity on the preceding five days.

Notations of Time Domain duration

Unit of time	Code	Values (n)	Correspondence	Comments
year	ynn	0...99		Duration ends on the last day of the month if there is no such day in the year when duration ends, e.g. [(y2000M2d29){y2}].
month	Mnn	1...99	{M12}={y1}	Duration ends on the last day of the month if there is no such day in the month when duration ends, e.g. [(y2001M1d31){M1}].
week	wnn	1...99		
day	dnn	1...99	{d7}={w1}	
hour	hnn	0...99	{h24}={d1}	
minute	mnn	0...99	{m60}={h1}	
second	snn	0...99	{s60}={m1}	



Possible combinations of duration.

Time Domain combinations

There are combination options defined in the Time Domain notations that make it possible to indicate more complex durations. The following options are in use:

- A+B: property is valid in both cases (OR)
- A*B: property is valid when both are valid (AND)
- A-B: property is valid when only A is valid (A AND NOT B)

With combinations the same result can be achieved in several different ways, because e.g. $A*(B+C) = (A*B)+(A*C)$.

Examples

- Every day from 9 a.m. to 1 p.m.
[(h9){h4}]
- Every Friday in March from 7.30 p.m. to 10 p.m.
[(M3t6h19m30){h2m30}]
- The last 15 minutes of the year 2001 (15 minutes before the year 2002)
[(y2002){-m15}]
- Every day from Monday to Saturday between 9 a.m. and 12 noon and between 1.30 and 7 p.m., except on the last Tuesday in January, 1st of May and in August

[[[[(h9){h3}]+[(h13m30){h5m30}]]*[(t2){d6}]]-[(M1l13){d1}]-[(M5){d1}]-[(M8){M1}]]

APPENDIX 6: UTILIZATION OF DIGIROAD R DELIVERY FORMAT

Digiroad R can be utilised with RouteEvents function of ESRI. A route event is formed as follows:

- Route Reference: DIGIROAD_KETJU
- Route Identifier: TUNNUS
- Event Table: DIGIROAD_SEGMENTTI
- Route Identifier: KETJU_OID
- Point Events
- Measure: ALKUPISTE
- Line Events
- From-Measure: ALKUPISTE
- To-Measure: LOPPUPISTE

Add Route Events

Route events are objects with locations measured along routes. A table containing route events can be added to the map as a layer.

Specify the routes referenced by the events in the table

Route Reference: DIGIROAD_KETJU

Route Identifier: TUNNUS

Specify the table containing the route events

Choose a table from the map or browse for another table.

Event Table: DIGIROAD_SEGMENTTI

Route Identifier: KETJU_OID

Choose the type of events the table contains:

☐ Point Events: Occur at a precise location along a route

☒ Line Events: Define a discontinuous portion of a route

Choose the measure fields for line events:

From-Measure: ALKUPISTE

To-Measure: LOPPUPISTE

Choose the offset field. Events can be offset from their routes.

Offset: <None>

Advanced Options... OK Cancel

Figure 1. Forming a route event from Digiroad R data.

APPENDIX 7: DESCRIPTION OF DIGIROAD K DELIVERY FORMAT

General

Digiroad K is a delivery format in which traffic elements are disconnected into homogenous parts according to their attribute data. Dynamically segmented attribute data, i.e. segments have been disconnected in the same way as traffic elements. In Digiroad K delivery format the attribute data in DIGIROAD_SEGMENTTI table do not need to be located dynamically with the help of reference chains because disconnected segments have their own geometry. In Digiroad K delivery format the disconnected attribute data in DIGIROAD_SEGMENTTI table can be connected with disconnected traffic elements in DIGIROAD_LIIKENNE_ELEMENTTI table. This delivery format is suitable for the use with e.g. MapInfo (version 7.0 or newer). Digiroad K is delivered in ESRI shape format.

Digiroad R and Digiroad K delivery formats are similar except for two files. In Digiroad R delivery format the segments and traffic elements have been extracted directly into the files. In Digiroad K each traffic element is checked in case there are segments attached to it and after that they are extracted in one of the following ways.

Processing traffic elements when there are line segments

If there are segments attached to reference chains at a traffic element, the traffic element is disconnected based on the beginning and end points of the line segments and geometry data is created to the segments (images 1 and 3). If there is no segment at a traffic element or if the segment equals the traffic element in length, it is extracted directly to Digiroad K delivery format.

In the same way the Digiroad K export process checks the segments. If a segment is longer than a traffic element, the procedure disconnects the segment based on the beginning and end points of the traffic elements linked with it and geometry data is created to the new, disconnected segments based on the end points of traffic elements (image 2). If, instead, the segments are on top of each other, the procedure disconnects the overlapping segments in a way that at the traffic element that is to be disconnected there are segments of the same length as the disconnected traffic elements (image 3).

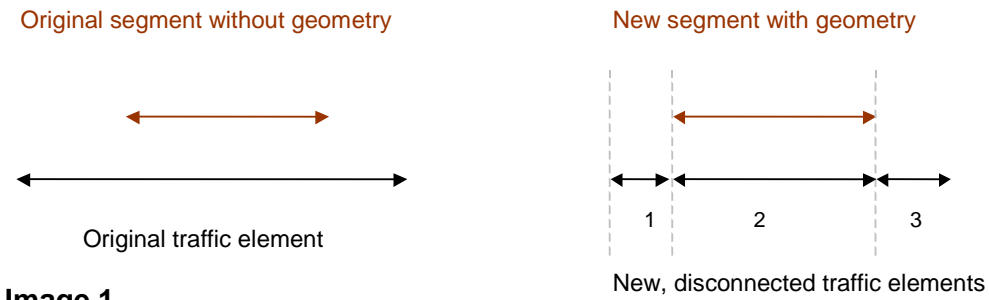


Image 1

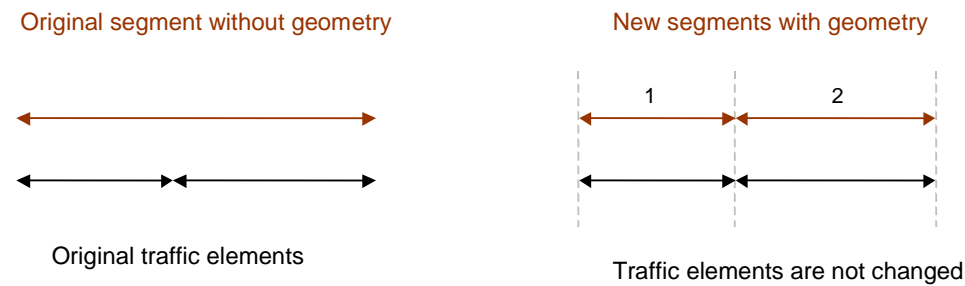


Image 2

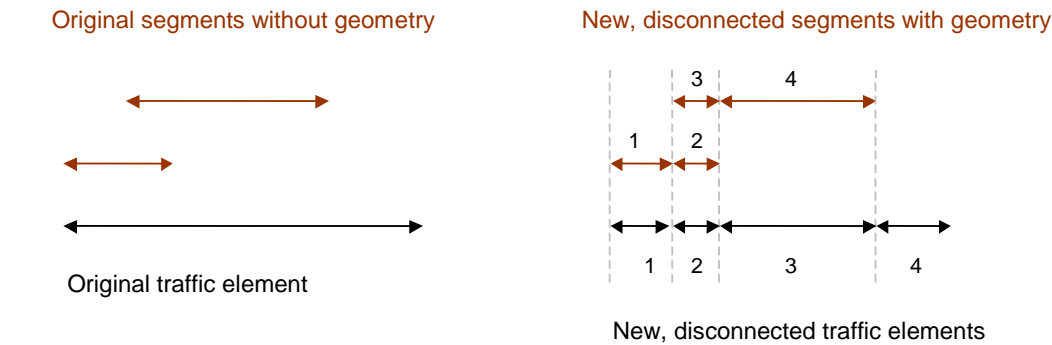


Image 3

Processing traffic elements when there are point segments

When segments are point segments, the processing of traffic elements is as follows:

If a segment is at the beginning of a traffic element, it should be checked which direction the pole values increase and then the traffic element is disconnected after one unit of measure from the segment, in the direction of the increase. For example, if $TIEE_INV_PAALU_ALKU < TIEE_INV_PAALU_LOPPU$, traffic element is disconnected at $SEGM_ALKUPISTE + 1$, for example 1201 or if TI-

$EE_INV_PAALU_ALKU > TIEE_INV_PAALU_LOPPU$, traffic element is disconnected at $SEGM_ALKUPISTE - 1$, for example 1799.

If a segment is at the end of a traffic element, it should be checked which direction the pole values increase and then the traffic element is disconnected after one unit of measure from the segment, against the direction of the increase. For example, if $TIEE_INV_PAALU_ALKU < TIEE_INV_PAALU_LOPPU$, traffic element is disconnected at $SEGM_LOPPUPISTE - 1$, for example 1499 or if $TIEE_INV_PAALU_ALKU > TIEE_INV_PAALU_LOPPU$, traffic element is disconnected at $SEGM_LOPPUPISTE + 1$, for example 1601.

If a segment is in the middle of a traffic element, processing is as for the previous ones. In the examples traffic elements are disconnected at 1350 and 1351 or at 1645 and 1646.

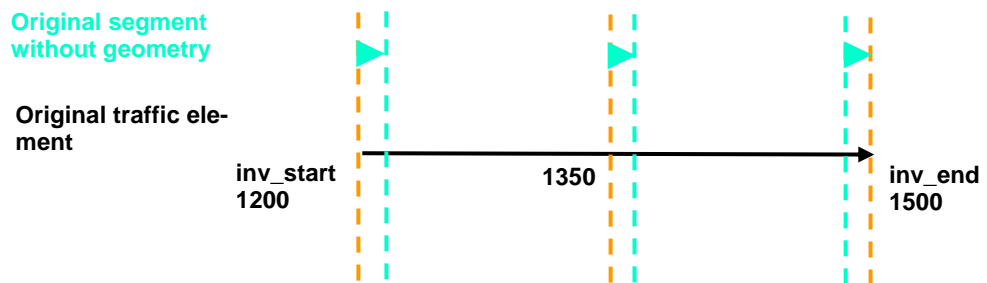


Image 4

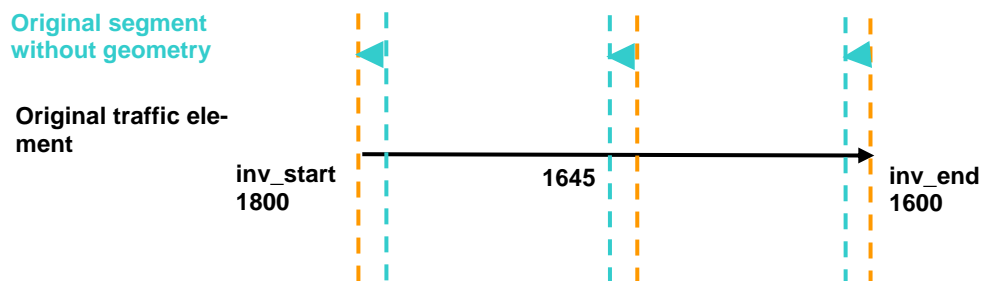


Image 5

Internal structure of Digiroad K files

Digiroad K export process goes through features that have been picked and stores them according to their feature classes into their own Shape files (e.g. DIGIROAD_SEGMENTTI, DIGIROAD_LIIKENNE_ELEMENTTI)

Digiroad internal identifier OBJECTID is stored during the Digiroad R export process into column OID_TUNNUS (applies to all tables) and during the Digiroad K export process in VIITE_OID column (applies only to segment and traffic element tables, for other tables OID is stored similarly to the export process of Digiroad

R). VIITE_OID is the identifier data of the original feature that has not been disconnected.

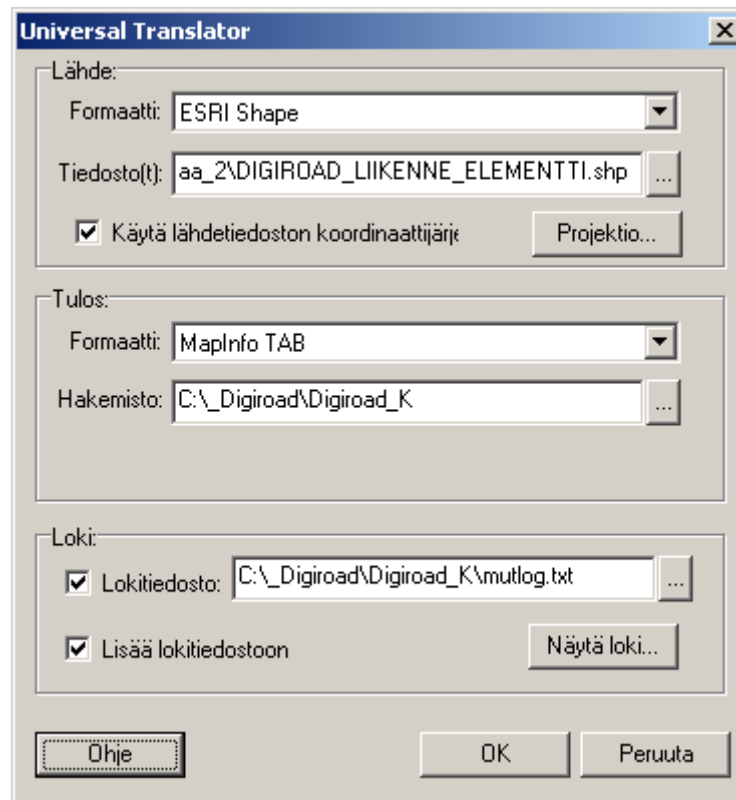
Digiroad external identifier GUID is stored during the Digiroad R export process in GUID column (applies to all tables) and during the Digiroad K export process in VIITE_GUID column (applies only to segment and traffic element tables, for other tables GUID is stored similarly to the export process of Digiroad R).

A field named K_ELEM_ID has been added to the Digiroad segments and traffic element –tables in the Digiroad K –export data. K_ELEM_ID connects the disconnected segments and element to one another. Each disconnected traffic element has K_ELEM_ID which is **unique within a municipality or a region** and refers to the same K_ELEM_ID in the segments –table.

In the YKJ coordinate conversion of Digiroad K and R export processes conversion tool offered by the National Land Survey of Finland is used. The tool is based on the Public Administration recommendation JHS 154 (2.12.2003).

Processing Digiroad K files in MapInfo

Digiroad K files can be converted into MapInfo's own format with Universal Translator which can be accessed via Tools in MapInfo. If the Universal Translator cannot be accessed via Tools, select Tools – Tool Manager and activate Universal Translator there.



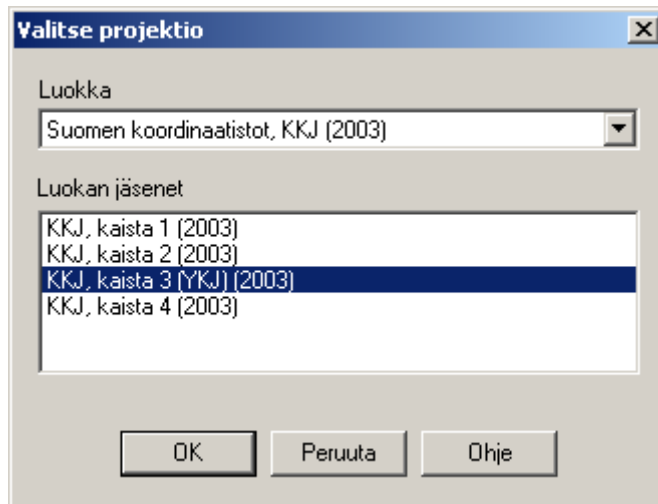
- Lähde (Source):
 - Formaatti (Format): ESRI Shape
 - Tiedosto(t) (Files): shp files created by the Digiroad K export process.
 - Käytä lähdetiedoston koordinaattijärjestelmää (Use projection setting in source file) (it is advised to carry out the coordinate and projection conversions later)
- Tulos (Destination)
 - Formaatti (Format): MapInfo TAB
 - Hakemisto (Directory): Directory where the converted file is stored
- Loki (Log)
 - Lokitiedosto (Log to File): Directory where the log of the conversion is created
 - Lisää lokitiedostoon (Append to Log): Select this if you do not want a separate file of each conversion

When the conversion has succeeded, there is a notice of it. As a result there are four files:

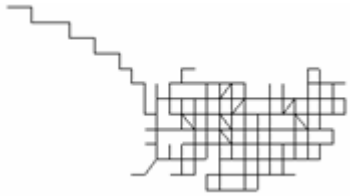
*.dat *.id *.map *.tab

Defining YKJ in Mapinfo

Coordinate and projection conversion in Universal Translator is not always successful with all the files. It is advised to carry out the coordinate and projection conversions after the Shape files have been converted to Tab files. Tab files are stored (File – Save Copy As) and YKJ (KKJ3) settings are chosen (File – Save Copy As – Projection).



If the coordinate system is defined together with the conversion from Shape to Tab (Projektio, Projection), data may be broken (lines turn into squares).



Connecting traffic elements and segments in Digiroad K delivery format

Segments and traffic elements are linked together with the help of K_ELEM_ID-attribute, which is found in both DIGIROAD_LIIKENNE_ELEMENTTI and DIGIROAD_SEGMENTTI –database files.

Open the files converted in MapInfo (DIGIROAD_LIIKENNE_ELEMENTTI.tab and DIGIROAD_SEGMENTTI.tab) and select in the MapInfo main menu Kysely (Query) => SQL-kysely (SQL Select)

- Valitse kentät (Select Columns): Asterisk as a presumption: all columns
- tietokannoista (from Tables): Select from the menu:
 - DIGIROAD_LIIKENNE_ELEMENTTI
 - DIGIROAD_SEGMENTTI
- jotka täyttävät ehdot (where Condition)
 - DIGIROAD_LIIKENNE_ELEMENTTI.K_ELEM_ID = DIGIROAD_SEGMENTTI.K_ELEM_ID
- Tietokantaan (into Table Named): Selection

Store the result (e.g. as ELEMENTIT_JA_SEGMENTIT) and open the chosen database.

As a result, in the ELEMENTIT_JA_SEGMENTIT database all segments are connected with all the traffic elements that have segments. The traffic elements that have no segments (pedestrian or cycle paths) in their segment database can be included in the result by doing the following:

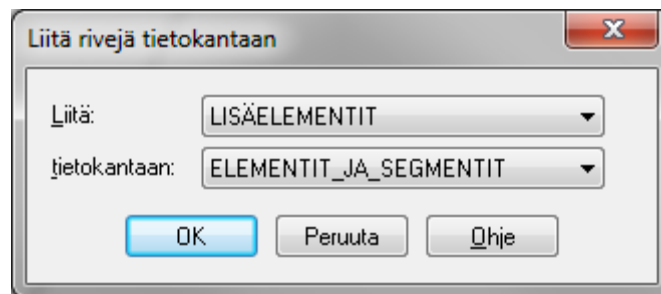
Conduct an invert selection to the result of the previous query (Query1)

- Kysely (Query) => Käänteinen valinta (Invert selection)

Store the result (Selection) (e.g. as LISÄ_ELEMENTIT ~ added elements) and open the stored database.

Attach the database LISÄ_ELEMENTIT to the database ELEMENTIT_JA_SEGMENTIT

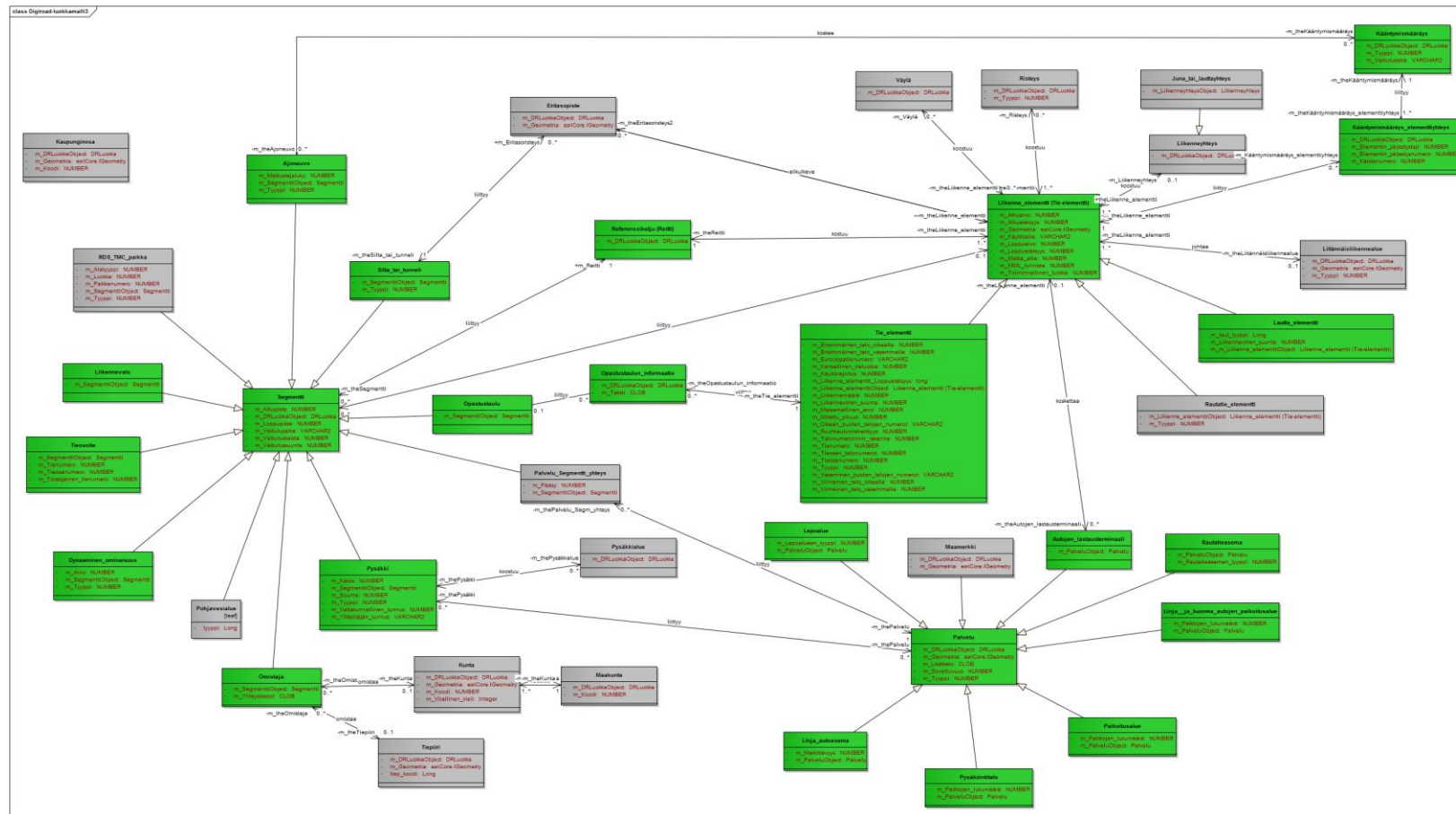
- Tietokanta => Lisää rivejä tietokantaan (Append Rows to Table)



- Liitä (Append table): LISÄ_ELEMENTIT
- tietokantaan (To table): ELEMENTIT_JA_SEGMENTIT

Store ELEMENTIT_JA_SEGMENTIT database to which LISÄ_ELEMENTIT has been added.

APPENDIX 8: CLASS CHART OF DIGIROAD (so far published data objects are marked with green color, this picture is found as a separate “Digiroad_tietomalli.pdf”-attachment)



APPENDIX 9: LIST OF EXIT NUMBERS THAT CONTAIN LETTER

Situation according to Digiroad 2013/4 publication.

Road number	Exit	Exit number	OID	Exit number	OID
3	VANTAANKOSKI (9/39A)	9A	4055501	9B	4055382
3	VANTAANKOSKI (9/39A)	9A	4055501	9B	4055382
50	VANTAANKOSKI (9/39A)	39B	4129314	39A	3979134
50	VANTAANKOSKI (9/39A)	39B	4129314	39A	3979134