Gesellschaft für Navigations- und Logistikunterstützung in der Forst- und Holzwirtschaft mbH

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NavLog GmbH

Format Description for Creating a Navigation Database for Forestry Applications

Pragmatic Shape^{Forst} (Version 3.2)

(Appendix 1 of the Acquisition and Qualification Agreement)

NavLog GmbH
Spremberger Str. 1
64823 Gross-Umstadt

Phone: 06078/785-16
Fax: 06078/785-50
E-mail: kontakt@navlog.de
Internet: www.navlog.de

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Authors:	Brigitte Bonder LOGIBALL GmbH, Herne Bernhard Hauck, KWF, Groß Umstadt Martin Stöcker, Institut für Agrar- und Forstinformatik, Münster Sergej Chmara, LFV Thüringen Oliver Starka, Intergraph
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3.2	01.12.2014	B. Hauck	Additions and modifications based on the results of the workshop on 08/10/2013 and the Forest Advisory Board on 25/09/2014

Contents

III. Pragmatic Shape[Forst]

1 Introduction

The KWF is dedicated to supporting the assembly of a database for nationwide routing and navigation purposes for the timber and forest sector. The GEODAT-workgroup "Specifications" is responsible for developing the database content requirements and selecting the target formats (shape, GDF).

The GEODAT-standard consists of the KWF report 04/2008 including all attachments (available as final report 2004 FINAL on CD-ROM) and the Pragmatic Shape^{Forst}.

This document contains the format descriptions for the Pragmatic Shape^{Forst}. This document is designed as a reference and interface description for data providers from individual federal states and the private forest sector.

In addition to this, a procedure description will be available in the future. This document will contain an explanation of data alignment/update procedures and measures required for dealing with data inconsistency, contradiction and plausibility.

In addition, data providers can obtain an exact description of the validations that are performed while importing data, if desired.

2 Data acquisition

Information concerning the characteristics of forest roads is fundamental for optimizing timber transport in forests.

In many cases, federal states or forest enterprises are able to generate the necessary road data from existing data. This chapter describes a simplified specification designed to facilitate the procedure for deriving relevant information from existing data. This enables forest enterprises to regularly transfer information concerning their district in the Shape format specified below. In order to ensure independent navigation, Appendix 3 of this document contains an overview of the essential and optional attributes.

2.1 Recording roads

Existing navigational databases must be augmented with records of forest and field roads suitable for timber haulage before they can be used for forestry applications. Roads are classified into "standard haulage road" and "other haulage road" depending on their capacity to carry trucks.

Each haulage road consists of individual road sections terminated by junctions. Each road section is assigned a specific set of attributes. However, road sections are not only separated by junctions and attribute changes but also by point objects such as bridges or underpasses (see below).

Road sections are presented as line objects and may contain several data points. The digitized direction plays an important role because the road section attributes such as gradient are related to the sequence of data points.

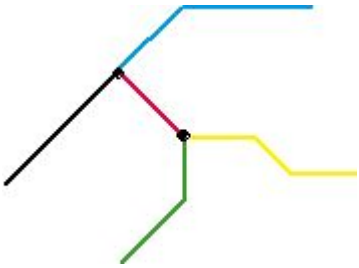

Figure 1: Road sections (each one a Shape-Object) with junctions

Road sections that do not intersect in reality (see bridges, underpasses) must be labeled by the corresponding point object (no intersection, see chapter 2.2.1).

In addition to this it is important to note that circular routes are not permitted. These must be subdivided into at least two sections

Each digitized road section is assigned a set of attributes. These comprise details concerning road trafficability.

A road section may be suitable for trucks or unsuitable. Roads suitable for trucks are divided into four categories (1, 2, 3 and 9):

<table>
<tr><th>Site</th><th>Vehicle</th><th>Function</th><th colspan="2">Class</th></tr>
<tr><th></th><th></th><th></th><th>Standard haulage road</th><th>Other haulage road</th></tr>
<tr><td rowspan="4">Forest (user's own responsi-bility)</td><td rowspan="2">Trucks (+ cars)</td><td>operational steering function</td><td>Class 1
well-constructed primary choice for transporting timber</td><td>Class 2
construction not 1, but preferred for transporting timber</td></tr>
<tr><td>no operational steering function</td><td>--</td><td>Class 3
restricted use for transporting timber</td></tr>
<tr><td colspan="2">Orientation layer;
no routing</td><td colspan="2">Class 4
Roads not suitable for trucks or cars (e.g. skidder trails and machinery roads, paths, inclines, stairways)</td></tr>
<tr><td colspan="2">Other routing-capable roads (optional)</td><td colspan="2">Class 5
Not suitable for transporting timber, but passable with (forestry-capable) cars</td></tr>
<tr><td>Outside user's own responsi-bility [1)]</td><td>Trucks</td><td>Required link between class 1/2/3 and truck-capable road network</td><td colspan="2">Class 9
Roads / streets that are not truck-capable in accordance with HERE data[2)], but are required as approach / departure routes</td></tr>
<tr><td colspan="5">[1)] Roads outside private forest, roads in other forests, public road network
[2)] Roads and public roads with truck restrictions (general and specific)</td></tr>
</table>

Table 1: Forest road classes (comp. HAUCK 2003)

Roads with an operational steering function indicate the preferred route for hauling timber (this is always assumed for standard haulage roads). A road without an operational steering function should only be used if the destination cannot be reached by another route.

Exact assessment of the roads requires expert surveyors familiar with the region. The following attribute definitions serve as a decision-making guide for classifying a road section. There is no need for complex, high-precision assessments and recording techniques – the sound opinion of the experts is sufficient. If trucks have previously used a road to haul timber without encountering a problem then that road is a standard haulage road (comp. HAUCK 2003).

Standard haulage road	
Bearing strength	he road is passable with a full load without irreversible deformation (Except: water-logged conditions)
Road width	At least 3.0 m (bearing capacity provided over a width of 3.0 m)
Curvature	At least 10.0 m (incl. lane widening) At least 30.0 m (no lane widening)
Gradient	Normally a maximum of 12%
Clearance profile	At least 4.0 m wide, At least 4.2 m high (considerably more clearance required for landings and stacking areas)
Turning place	Also provided for unloaded combinations (circular turning place at least 20.0 m in, or t-shaped turning place at least 25.0 m long (incl. road width) and 5.0 m wide, with a bellmouth radius of at least 5 m on either side)
Bridge, culvert	Capable of bearing fully loaded vehicle
Underpass	At least 3.5 m wide and 4.2 m high

Table 2: Classification of standard haulage roads (see HAUCK 2003)

Other haulage roads	
Bearing strength	The road is generally passable with a full load without irreversible deformation, but not in poor weather conditions (rain, snow).
Road width	At least 3.0 m (bearing capacity provided over a width of 3.0 m)
Curvature	Some or all curves have a radius of curvature smaller than the minimum radius required for standard haulage roads
Gradient	Is steeper than the permitted gradient for standard haulage roads for parts of the section or over the whole length.
Clearance profile	At least 4.0 m wide, At least 4.2 m high (considerably more clearance required for landings and stacking areas)
Turning place	Not specified
Bridge, culvert	Not specified, all restrictions in comparison to the standard haulage roads are logged.
Underpass	At least 3.5 m wide and 4.2 m high

Table 3: Classification of other haulage roads (see HAUCK 2003)

In addition to this classification, it is also possible to record the appropriate official road name for the section and state whether the road is paved or not.

All other non-haulage roads that are not suitable for trucks and cars (road class 4) are recorded without additional attributes. These roads are required in the visualization for better orientation and to support navigation prompts.

Optionally, other routing-capable roads (road class 5) that are passable by (forestry-capable) cars can also be detected; these can be routed on suitable navigation devices.

In practice, the road / street network (HERE data) on the edge of the forest development often has the attribute "no trucks". In order to ensure a clean connection for vehicle navigation, the GeoDat forest road must be continued without this attribute until the nearest road. The required roads are recognized as Class 9 (roads / streets outside of the user's own responsibility that are required by the forest operation to transport timber.

Roads of classes 1-3 absolutely must have a point object at the end of the road – either a connection object (to another road) or a place where a U-turn can be performed (which can also have attribute 5 = no turn-around).

2.2 Restrictions

Logged roads may be subject to restrictions, which may limit their capacity for heavy haulage vehicles. To ensure exact navigation, certain restrictions (obligatory data according to GEODAT standard) must be logged. This may, for example, concern road width and clearance limitations or excessively steep gradients. If available, optional restrictions as specified in the GEODAT-Standard should also be included. Such data will help to improve navigation.

Some restrictions will be rendered as point objects and demarcate the end of a road section, for example a restrictive bridge. The topology ensures that these restrictions are assigned to the appropriate connecting road sections. Other restrictions, such as gradients, may apply for a whole road section. Information concerning the type of restriction is assigned directly to the affected road section.

2.2.1 Point geometry

Restrictions rendered as point geometries will demarcate the end of a road section in the form of a junction. Thus bridges, passes, bends etc, are logged as points. Each point restriction is assigned a maximum of two attributes. The following table lists possible restrictions and their attributes.

Real object	First attribute value	Second attribute value
Bridge (1)	width in m	Load carrying capacity in t
Bend (2)	Radius in m	Lane widening present yes / no
Pass (3)	width in m	-
Underpass (4)	width in m	clearance in m
Turning place (5)	Type of turn-around: 0 = not specified 1 = WPS 2 = WPG 3 = WHS 4 = WHG 5 = no turn-around	-
No intersection (10)	-	-

Table 4: road section restrictions rendered as point objects

The following section explains how point objects should be recorded using examples.

Example: bridge

A restricting bridge may mark the end of a section because it is either too narrow and/or the carrying capacity is too low. If both attributes apply, then the bridge is logged as a bridge restriction together with the attributes width and load carrying capacity. Only the first attribute is required in cases where a single property (such as width) causes the restriction.

The restricting object is rendered as a point dividing a road into new sections. This procedure ensures that the restriction is assigned to adjacent sections by topology.

Figure 2: a bridge separates two road sections

The procedure is analogous for restricting bends, passes and underpasses.

Example: turning place

Turning places are another type of restriction. These may be situated at the end of a cul-de-sac or at any location along the road. In any case they must be recorded as a point object "turning place".

Figure 3: turning place at end of cul-de-sac and along the road

In order to categorize the turning place it is necessary to log the turning place as a restricting value. These are classified according to size and type using the following scheme.

	Unloaded solo vehicle	Unloaded combination
Circle turning place	**1: WPS**: minimum diameter 12.0 m	**2: WPG**: minimum diameter 20.0 m
T-type turning place	**3: WHS**: total length min. 12.0 m (incl. adjacent road width), Width min. 5.0 m Bellmouth radius min. 5.0 m on both sides	**4: WHG**: total length min. 25.0 m (incl. adjacent road width) Width min. 5.0 m Bellmouth radius min. 5.0 m on both sides

Table 5: Size/type of turning places (see HAUCK 2003)

In addition to the point restriction a turning place may, under specific circumstances, be logged as a discrete road section. In this case the T-type turning place is rendered to scale as a junction with 1 – 2 cul-de-sacs (road class: Other haulage road without operational steering function). The length of the turning place is proportional to the recorded length (see Figure 4).

Figure 4: T-type turning place

A scale depiction of a circle turning place is rendered as 2 road sections (road class: Other haulage road without operational steering function). The diameter of the depicted circle is proportional to the recorded diameter. In addition to this, it is also necessary to specify a point object "turning place".

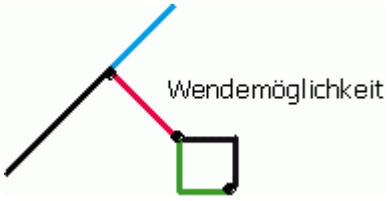

Figure 5: Turning place at end of cul-de-sac

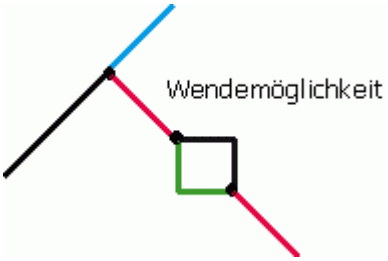

Figure 6: Circle turning place along the road

Specific attributes are required (section 3.3.2) for turning places that have been rendered both as a point object as well as a scale depiction of road sections

2.3 Traffic signs

Traffic signs are also digitized as separate point objects. They must be topologically located on the corresponding road section, but not directly on the endpoint of the road section; otherwise, they must be located a maximum of 15 m from the corresponding location (intersection, etc.). They do not separate individual road sections (road signs are not junctions).
Direction signs always point towards digitized direction if the entered key is positive and in the opposite direction if negative.
Specifying a traffic sign type also describes the characteristics of the sign:

Traffic sign type	Key
Not set	0
No turn-around (cul-de-sac)	1
Turning prohibited	2

No right turn	3
No left turn	4
No entrance	5
No right turn (no right turn next two roads)	6
No left turn (no left turn next two roads)	7
No right or left turn	8

Table 6: Traffic signs

The traffic sign point object with turn restriction must be clearly positioned on the appropriate road section from which it is prohibited to turn. The object must be assigned one of the attributes "no right turn" or "no left turn".
Additional details may be provided in text form.

Figure 7: Traffic signs

Note that traffic signs do not separate road sections!

2.4 General orientation objects

Certain objects do not restrict the use of a forest road. However, it may be prudent to record such objects since they may be helpful as an orientation aid, for example non-restricting bridges, barriers etc.

The logging procedure is analogous to that described for point object restrictions. Any general object that has not been assigned attributes will always be considered as non-restrictive. However, general objects will be treated as restrictions if the values of optionally assigned attributes exceed threshold values.

Real object	First attribute value	Second attribute value
Bridge (1)	width in m	load carrying capacity in t
Pass (3)	width in m	-
Underpass (4)	width in m	clearance in m
Barrier (6)	-	-
Space (7)	width in m	length in m

Table 7: General point objects

2.5 Spaces

Spaces also play a role in addition to road and point object information.
The following spaces must be logged:
- the region of responsibility

The following spaces may be logged optionally:
- Forest areas including internal organizational divisions representing up to 5 administrative levels:
- Forest enterprise district (FBB)
- Division
- Subdivision

- Landing areas
- Administrative areas
- Community boundaries
- District boundaries
- Federal states

Landing areas and traffic areas such as parking lots and passing places are only recorded as point objects (space) together with the attributes width and length (compare Table 8).

2.6 Metadata

In order to authorize a dataset and facilitate data consolidation it is necessary to provide specific metadata. The following metadata are required:

- Data collector
- Copyright owner
- Date of last update/revision (date of last update in the field)
- Precision (average deviation of rendered object location from true position in m)
- Data sources (list, several lists possible)
- Processing tool: name and version
- Language
- Used character set
- Used specifications: name and version (e.g. ShapeForst 1.1)
-

This information is recorded in an Excel spreadsheet or directly recorded as an attribute in the relevant spaceshape file for the region of responsibility.

2.7 POIs

Points of Interest are stored in a separate point-shape file together with the appropriate attributes:

- Name
  - Example: T-12-14-19
  - Example: H-20-06-1
- Street (subject to name conventions defined in chapter 1 of the appendix)
- House number
- Postal code
- Town
- X-coordinate
- Y-coordinate
- Telephone number (international syntax: + 49 (0) ...)
- Company
- Owner
- Object group (category)
- Comment

2.8 Connecting objects

In order to ensure that forest roads are correctly connected to the public road network it is necessary to specify connecting objects as point objects. Connecting objects may be positioned where a road joins a public road and where a road joins a forest road outside the area of responsibility. Basically, a connecting object can only be placed at the beginning/end of a road section. The attribute describes the type of connection and distinguishes between a direct connection and a connection to the nearest intersection. As a rule, connecting objects exclude connections to other field roads. Since public road datasets usually exclude these roads it would be difficult in this case to create a continuous road object. Where it is necessary for a vehicle to first cross a field road to reach a public road, the field road must be recorded and treated as a forest road.

The following examples illustrate how to specify connecting objects.

Case 1: Direct connection of a forest road

A forest road must be connected to a public road or a forest road beyond the boundary of the area of responsibility of the data collector (Figure 8 Initial situation). A connecting object is placed at the end of the forest road to be connected to a public road or a forest road beyond the boundary of the area of responsibility of the data collector (topological link). The following diagrams illustrate the procedure.

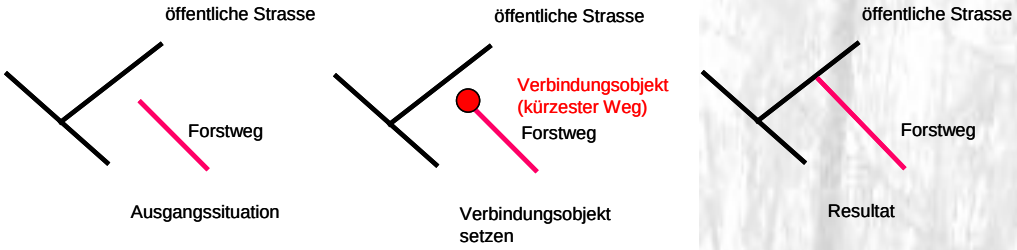

Figure 8: Direct connection of a forest road (shortest route)

Case 2: Connecting a forest road to the nearest intersection

In this case, a forest road must be connected to an intersection along a public road or a forest road beyond the boundary of the area of responsibility of the data collector (Figure 8 Initial situation). A point object is placed on the end of the appropriate forest road that connects to an intersection (topological link). The following diagrams illustrate the procedure.

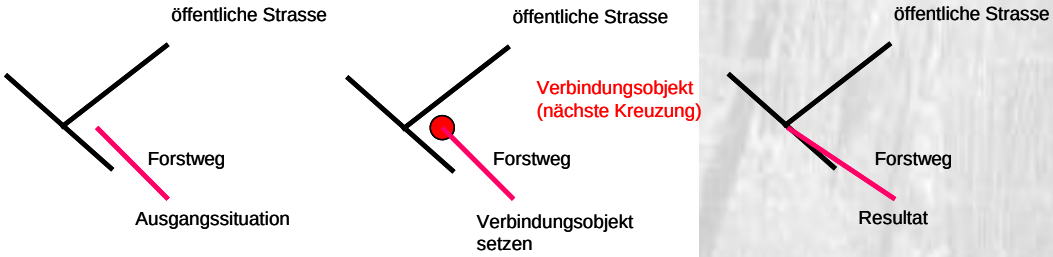

Figure 9: Connecting a forest road to the nearest intersection

3 Description of the Shape-dataset

All data are stored in ESRI-Shape format, which facilitates simple exchange of forest data. The objects to be displayed are sorted into thematic groups. Individual Shape-files are necessary as a result of this classification. This chapter describes the structure of these Shape-files in detail.

3.1 Index and file structure

All files supplied by a data producer are stored in an index file labeled with the ID of the data producer [nr].

Index	Crucial	File name	Contents
o_[nr]	Yes	[nr]_way	Roads
o_[nr]	Yes	[nr]_points	Restricting or non-restricting point objects as well as traffic signs and connection objects
o_[nr]	Yes	[nr]_pois	Points of Interest
o_[nr]	No	[nr]_adminarea	Administrative areas
o_[nr]	No	[nr]_forestarea	Forest areas, division boundaries, landings
o_[nr]	Yes	[nr]_border	Area of responsibility; metadata as attributes

Table 8: Index and file structure

The name of the Shape-file is specified and contains a single variable: the producer ID.

Each Shape-file must be associated and supplied with a relevant *.prj-file. These contain the required information concerning the projection (e.g. UTM), units (e.g. meters), datum (WGS84 obligatory), spheroid, zone Z-unit and other parameters. The remaining metadata must be delivered in an Excel-file as specified below.

3.2 Storing the geometries

In Shape-files, geometries are stored in a separate file. Each Shape-file is associated with a specific type of geometry. Thus, roads are rendered as polylines and point objects or areas as polygons. All geometries must use the **ETRS89/UTM32 coordinate system**. The following table lists the individual Shape-files and the associated geometry types.

Shape-file	Type
[nr]_way	Line
[nr]_points	Point
[nr]_pois	Point
[nr]_adminarea	Polygon
[nr]_forestarea	Polygon
[nr]_border	Polygon

Table 9: Shape-files and types

3.2.1 [nr]_way

The geometry of a road section is described as a line object and may contain several vertices. However, a section may only consist of a single part bounded by a start and an end point. The direction of these points is determined by the digitizing direction.
An intersection always marks the beginning of a new road section.

3.2.2 [nr]_points

All point objects are described as points in Shape-files :
- limiting restrictions
- non-restricting point objects
- Traffic signs
- Connecting objects

3.2.3 [nr]_pois

Points of Interest are described as points in Shape-files. POI geometry does not demand spatial proximity to road sections or other objects.

3.2.4 [nr]_adminarea

All administrative boundaries are stored as polygons in this Shape-file:
- community boundaries

3.2.5 [nr]_forestarea

The area of the forest including internal organizational divisions representing up to 5 administrative levels is summarized in the Shapefile [nr]_forestarea e.g.:
- Forestry office/forest enterprise
- District/ forest enterprise district (FBB)
- Division/district/hunting
- Subdivision/subarea
- Stand

3.2.6 [nr]_border

The boundaries of the area of responsibility are stored as polygons in this Shape-file.

3.3 Storing attributes

Each of the Shape-files described above is associated with a dBase table containing all relevant attributes. The table structure is explained in the following section.

Attribute names must comply with the naming scheme created for each dBase table. In some cases, attribute values must be selected from a predetermined list. These are also described below.

3.3.1 Shape-file containing logged roads ([nr]_way)

The Shape-file [nr]_way contains information concerning the recorded roads. Everything from the unambiguous identifier, to classification elements up to blocks can be stored in the associated dBase table.

Attribute	Type	Crucial	Explanation
(ID)	Auto	Yes	System-generated key (unique within the delivered data)
OID	String (128)	Yes	Unique organizational unit identifier
FID	String (128)	No	Unique object identifier within area of responsibility – permanent even between updates.
WAYCLASS	Int	Yes	classification of roads into forest road classes
NAME	String (128)	No	Official name of the road (may be redundant over several road sections)
CONCR	Int	No	Indicates presence or absence of paving
TRAGF	Int	No	Load bearing capacity
TONNAGE	Float	No	Maximum permissible vehicle weight
GRADIENT	Float	No	Gradient of road section
BLOCK	String	No	Temporary closure of a road section (values in time domains)
CLEARWIDTH	Float	No	Restricted clearance width of a road section
CLEARHEIGHT	Float	No	Restricted clearance height of a road section
LANEWIDTH	Float	No	Restricted lane width
COMMENT	String (128)	No	Free text comment

Table 10: [nr]_way attributes

3.3.1.1 ID

System-generated key.

3.3.1.2 OID

The organization ID clearly identifies the organizational unit containing the data and is generated by NavLog during initial data transfer. Additional information is found in the appendix.

3.3.1.3 FID

Every organizational unit continually allocates a Forest-ID. Each FID is unique; this means that it is not re-used once an object has been deleted. This is a permanent key, which never changes when data is updated.

3.3.1.4 WAYCLASS

In addition to the GDF-classification, the attribute WAYCLASS also requires an additional classification of forest roads according to the following scheme:

Forest road classes	Key
Standard haulage road	1
Other haulage road with steering function	2
Other haulage road without steering function	3
Other orientation roads	4
Other routing-capable roads	5
Connecting roads	9

Table 11: Value range for WAYCLASS

3.3.1.5 NAME

Many forest roads may have an official name. This name must be entered in the attribute NAME.

3.3.1.6 CONCR

Information concerning road surface (attribute CONCR) must be entered using the following key:

Pavement	Key
Not specified	0
Not paved	1
Paved	2

Table 12: Value range for CONCR

3.3.1.7 TRAGF

Information concerning bearing capacity (attribute TRAGF) of a road must be entered using the following key:

Bearing capacity	Key
Not specified	0
Insufficient bearing capacity	1
Sufficient bearing capacity	2

Table 13: Value range for TRAGF

3.3.1.8 TONNAGE

A road section may be limited by a maximum permissible vehicle weight (in tons). The default value of this attribute is zero (= empty, not specified).

3.3.1.9 GRADIENT

A road section may have a gradient. The default value of the attribute is zero (= no entry). This means there is no information concerning the gradient. For roads with a gradient, the magnitude of the slope is expressed as a percentage. If an exact value is not available but the slope is significantly larger than 12%, then the attribute is given the value 99. Positive numbers indicate ascents in the digitizing direction, negative values represent descents in digitizing direction.

3.3.1.10 BLOCK

A road section may be closed. This affects the entire road section and the attribute value is stored in the form of time domains. Further details are described in the chapter 5 of the appendix.

3.3.1.11 CLEARWIDTH

The attribute CLEARWIDTH describes a width limitation due to a restricted clearance profile. This attribute requires an exact value in m.

3.3.1.12 CLEARHEIGHT

The attribute CLEARHEIGHT describes a height limitation due to a restricted clearance profile. This attribute requires an exact value in m.

3.3.1.13 LANEWIDTH

The attribute LANEWIDTH describes a restricted lane width. This attribute requires an exact value in m.

3.3.1.14 COMMENT

Free text comment (e.g. note for processing on the central system, additional information, cause of closure).

3.3.2 Shape-file with point information ([nr]_points)

The Shape-file [nr]_points includes all point information (restrictions, general point objects, traffic signs and connecting objects).

Attribute	Type	Crucial	Explanation
(ID)	Auto	Yes	System-generated key
OID	String (128)	No	Unique organizational unit identifier.
FID	String (128)	No	Unique object identifier within area of responsibility – permanent even between updates.
TYPE	Int	Yes	Type of point object
VALUE1	Float	No	First attribute value (see Table 16)
VALUE2	Float	No	Second attribute value (see Table 16)
TOPOLOGY	Int	No	Indicates whether turning place is described as individual road sections
COMMENT	String (128)	No	Free comments

Table 14: Attributes of [nr]_points

3.3.2.1 ID

The system-generated ID clearly identifies an object in the appropriate database.

3.3.2.2 OID

The organization ID clearly identifies the organizational unit containing the data and is generated by NavLog during initial data transfer. Additional information is found in the appendix.

3.3.2.3 FID

Every organizational unit continually allocates a Forest-ID. Each FID is unique; this means that it is not re-used once an object has been deleted. This is a permanent key, which does not change when data is updated.

3.3.2.4 TYPE

The TYPE attribute determines the type of point object. The following types are available:

Type	Key
Bridge	1
Curve	2
Passage	3
Underpass	4
Turning place	5
Barrier	6
Space	7
Traffic sign	8
Connecting object	9
No intersection	10

Table 15: value range for TYPE

3.3.2.5 VALUE1 and VALUE2

These attribute values contain point-specific attributes. The following table lists which attributes are associated with individual point objects.

Type	VALUE1	VALUE2
Bridge	Width in m	Load carrying capacity in t
Curve	Curve radius in m	0 / 1 (no lane widening/widened lane)
Pass	Width in m	-
Underpass	Width in m	Height in m
Turning place	0 = not specified 1 = WPS 2 = WPG 3 = WHS 4 = WHG 5 = no turn-around	-
Barrier	-	-
Space	Width in m	Length in m
Traffic sign	0 = not set 1 = no turn-around (cul-de-sac) 2 = turning prohibited 3 = no right turn 4 = no left turn 5 = no entry 6 = no right turn (no right turn next two roads) 7 = no left turn (no left turn next two roads) 8 = no right or left turn	0 = not specified 1 = real 2 = virtual
	Direction signs always point towards digitized direction if the entered key is positive and in the opposite direction if negative.	
Connection object	1 = Direct connection to public road (shortest route) 2 = Connection to public road (to nearest intersection) 3 = direct connection to forest road outside area of responsibility (shortest route) 4 = direct connection to forest road outside area of responsibility (to nearest intersection)	-
No intersection	-	-

Table 16: Value range for VALUE1 and VALUE2

Attributes for bridges, curves, passes and underpasses are only necessary if these cause a restriction. For example, the width of a bridge that is too narrow for trucks must be entered under VALUE1. Attribute values are optional for bridges without restricting characteristics. Space attributes are also optional. Attribute values are obligatory for all other point objects (traffic signs, connecting objects).

3.3.2.6 TOPOLOGY

This boolean attribute determines whether the turning place point object restriction is also rendered in the form of road sections. In this case the attribute value is 1. In the other case the value is 0. If the point represents a feature other than a turning place then the attribute value is also 0.

TOPOLOGY	Key
Turning place not described as individual road sections or point object is not a turning place	0
Turning place is also described as individual road sections.	1

Figure 10: Value range for TOPOLOGY

3.3.2.7 COMMENT

Free text comment. This may include additional regulatory signs for traffic signs (e.g. Traffic sign "No Entry" COMMENT= ">5 t").

3.3.3 Shape-file with POIs ([nr]_pois)

The Shape-file [nr]_pois comprises all Points of Interest, for example forestry administrations. In contrast to general point objects, they do not relate to specific road sections.

Attribute	Type	cruscial	Explanation
(ID)	Auto	Yes	System-generated key
OID	String (128)	No	Unique organizational unit identifier.
FID	String (128)	No	Unique object identifier within area of responsibility – permanent even between updates.
XCOORD	Float	No	X-coordinate
YCOORD	Float	No	Y-coordinate
NAME	String (128)	Yes	Name of POI
STREET	String (128)	No	Street name of POI
HOUSNUMBER	String (128)	No	House number of POI
ZIP	String (128)	No	Postal code of POI
CITY	String (128)	No	Town of POI
COUNTRY	String (128)	No	Country where POI is located (always 276 for Germany)
PHONE	String (128)	No	Telephone number
COMPANY	String (128)	No	Company
OWNER	String (128)	No	Owner
REMARK	String (128)	No	General comments
OBJGROUP	Int	Yes	Assigns POI to object group

Table 17: Attributes of [nr]_pois

Alternatively, POIs may be stored in an Excel spreadsheet.

3.3.3.1 ID

A unique ID allocated within an organizational unit (ShapeFile).

3.3.3.2 OID

The organization ID clearly identifies the organizational unit containing the data and is generated by NavLog during initial data transfer. Additional information is found in the appendix

3.3.3.3 FID

The Forest-ID is continually allocated by each organizational unit. Each FID is unique; this means that it is not re-used once an object has been deleted. This is a permanent key, which does not change when data is updated.

3.3.3.4 XCOORD

X-coordinates of the POI in the WGS84 coordinate system, if no postal address is available.

3.3.3.5 YCOORD

Y-coordinates of the POI in the WGS84 coordinate system, if no postal address is available

3.3.3.6 Name, STREET, HOUSENUMBER, ZIP, CITY, COUNTRY, PHONE, COMPANY, OWNER

These attributes are required to describe POIs with a postal address. The names and structure comply with GDF-standard..
COUNTRY for Germany is always 276.

3.3.3.7 REMARK

The attribute REMARK permits the entry of free text information.

3.3.3.8 OBJGROUP

This attribute assigns POIs to object groups. Specific object groups are defined here. The following object groups may also be added in concurrence with the data provider and central office:

1. Forest enterprises, Forestry departments
2. Timber industry enterprises
3. Rescue points
4. Landings
5. Railway stations/harbors
6. Haulage companies
7. Forest contractors
8. Objgroup 8
9. Other POI

3.3.4 Shape-file containing administrative areas ([nr]_adminarea)

The Shape-file [nr]_adminarea contains optional information concerning administrative areas. This includes:

- community boundaries

County and state boundaries may be derived from the community number key if they are sourced from the community key catalogue.

The structure of the attributes is as follows:

Attribute name	Type	Crucial	Explanation
(ID)	Auto	Yes	System-generated key
OID	String (128)	No	Unique organizational unit identifier.
FID	String (128)	No	Unique object identifier within area of responsibility – permanent even between updates.
GEMNR	Float	No	Nationwide common community key according to official catalogue.
NAME	String (128)		Name of the area
ISOCODE	String (128)		ISO Code of the area, if available
COMMENT	String (128)		Free text comment

Table 18: Attributes of [nr]_adminarea

3.3.4.1 ID

System-generated key.

3.3.4.2 OID

The organization ID clearly identifies the organizational unit containing the data and is generated by NavLog during initial data transfer. Additional information is found in the appendix

3.3.4.3 FID

Every organizational unit continually allocates a Forest-ID. Each FID is unique; this means that it is not re-used once an object has been deleted. This is a permanent key, which does not change when data is updated.

3.3.4.4 GEMNR

The GEMNR is available in the nationwide official catalogue of community keys.

3.3.4.5 NAME

The name of the area is only required if such a name exists.

3.3.4.6 ISOCODE

The ISO code for the area is only required if such a code exists. A list of country ISO codes is found in chapter 4 of the appendix.

3.3.4.7 COMMENT

Free-text comment.

3.3.5 Shape-file containing forest areas ([nr]_forstarea)

Forest areas including, if necessary, administrative subdivisions are summarized in the Shape-file [nr]_forestarea. An option for displaying company specific divisions of the forest area internal is available for better orientation. Up to 5 hierarchical levels of forest subdivisions can be displayed:

- First organizational level (e.g. forest office, forest enterprise)
- Second organizational level (e.g. section, forest enterprise district)
- Third organizational level (e.g. district, division)
- Fourth organizational level (e.g. subdivision/area)
- Fifth organizational level (e.g. stand)

The structure of the attributes is as follows:

Attribute name	Type	Crucial	Explanation
ID	Auto	Yes	System-generated Key
OID	String (128)	No	Unique organizational unit identifier.
FID	String (128)	No	Unique object identifier within area of responsibility – permanent even between updates.
NAME	String (128)	No	Name of area
AREA	Float	No	Surface area in m²
ORG1	String (128)	No	First organizational level
ORG2	String (128)	No	Second organizational level
ORG3	String (128)	No	Third organizational level
ORG4	String (128)	No	Fourth organizational level
ORG5	String (128)	No	Fifth organizational level
COMMENT	String (128)	No	Free comment

Table 19: Attributes of [nr]_forestarea

3.3.5.1 ID

System-generated key.

3.3.5.2 OID

The organization ID clearly identifies the organizational unit containing the data and is generated by NavLog during initial data transfer. Additional information is found in the appendix

3.3.5.3 FID

Every organizational unit continually allocates a Forest-ID. Each FID is unique; this means that it is not re-used once an object has been deleted. This is a permanent key, which does not change when data is updated.

3.3.5.4 NAME

The name of the area is entered here, if one is available. This name may consist of the division and subdivision. Individual name components must be separated by a semicolon (;).

3.3.5.5 AREA

The surface area in m²of the relevant area is recorded here, if available.

3.3.5.6 ORG1 to ORG5

Name/unique identifier for up to 5 levels of forestry administration.

3.3.5.7 COMMENT

Free-text comment.

3.3.6 Shape-file containing the area of responsibility ([nr]_border)

The area of responsibility is stored in the Shape-file [nr]_border. All other objects must be located within this area (road lines and point objects may also be positioned directly on the perimeter of the area of responsibility).
The necessary metadata must be recorded in the Shape attributes.

The structure of the attributes is as follows:

Attribute name	Type	Crucial	Explanation
(ID)	Auto	Yes	System-generated key
OID	String (128)	No	Unique organizational unit identifier.
FID	String (128)	No	Unique object identifier within area of responsibility – permanent even between updates.
NAME	String (128)	No	Name of area
AREA	Float	No	Surface area in m²
GENER	String (128)	Yes	Name of data producer
COPYRIGHT	String (128)	Yes	Copyright owner
ACTDATE	Date	Yes	Date of last update (deadline/date of last update of field data)
ACCURACY	Int	Yes	Average deviation of object position
SOURCE	String (128)	No	Used data source(s) (several possible)
TOOL	String (128)	No	Name of the used acquisition tool
TOOLVERS	Float	No	Version of used acquisition tool
SPEC	String (128)	Yes	Name of used specification
SPECVERS	Float	Yes	Version of used specification
RELEASE	Int	Yes	Data release number
LANGUAGE	String (128)	Yes	Used language
CHARSET	String (128)	Yes	Used character set
COMMENT	String (128)	No	Free-text comment

Table 20: [nr]_borders attributes

3.3.6.1 ID

System-generated key.

3.3.6.2 OID

The organization ID clearly identifies the organizational unit containing the data and is generated by NavLog during initial data transfer. Additional information is found in the appendix

3.3.6.3 FID

Every organizational unit continually allocates a Forest-ID. Each FID is unique; this means that it is not re-used once an object has been deleted. This is a permanent key, which does not change when data is updated.

3.3.6.4 NAME

Enter the name of the area here, if one is available. This name may consist of several components. Individual name components must be separated by a semicolon (;).

3.3.6.5 AREA

Enter the size of the area in m² here, if known.

3.3.6.6 GENER

This attribute contains the name of the data producer as a string, e.g. "State forestry department XY"

3.3.6.7 COPYRIGHT

This attribute stores the name of the copyright owner, e.g. "NavLog".

3.3.6.8 ACTDATE

The attribute ACTDATE stores the date (year, month, day) of the last update. For example, 2004_09_25.

3.3.6.9 ACCURACY

The average deviation of the displayed object from the real position is given here in meters, e.g. 3 m.

3.3.6.10 SOURCE

The source of the data (the geometric basis), for example ATKIS or an own data source is stored in this attribute (e.g. ATKIS, ALK, Ortho, GPS, CURSOR – for manual digitization of paper maps).

3.3.6.11 TOOL

The name of the data acquisition tool must be provided (e.g. ArcView)

3.3.6.12 TOOLVERS

The version of the tool specified in 4.2.2.9 must be provided, e.g. "1.0".

3.3.6.13 SPEC

The name of the used specification, for example "Shape-Forst".
Permitted values:
1-Shape-Forst
2-GDF-Forst

3.3.6.14 SPECVERS

The version of the specification specified in 4.2.2.11 must be provided, e.g. "2.0".

3.3.6.15 RELEASE

The data release number is stored in the attribute RELEASE.

3.3.6.16 LANGUAGE

The fundamental language especially for the names of places and roads must be provided here, e.g. "de" = German. See Siehe list of ISO 3166-1 country codes in the appendix.

3.3.6.17 CHARSET

The used character set is stored in the attribute CHARSET. ISO 8859-1 is the default character set of this application.

3.3.6.18 COMMENT

Free-text comment.

4 Description of Excel spreadsheets

4.1 Excel-spreadsheet containing meta-information

All necessary meta-information beyond that already contained in the *.prj file is stored in an Excel or DBF file. This spreadsheet includes information concerning the data producer, acquisition tools, used specifications as well as additional details.
Alternatively, the metadata can be stored directly in the shape file attribute table [nr]_border (see above)

Attribute	Type	Crucial	Explanation
GENER	String (128)	Yes	Name of data producer
COPYRIGHT	String (128)	Yes	Copyright owner
ACTDATE	Date	Yes	Date of last update (deadline/date of last update of field data)
ACCURACY	Int	Yes	Average deviation of object position
SOURCE	String (128)	No	Used data source
TOOL	String (128)	No	Name of the used acquisition tool
TOOLVERS	Float	No	Version of used acquisition tool
SPEC	String (128)	Yes	Name of used specification
SPECVERS	Float	Yes	Version of used specification
RELEASE	Int	Yes	Data release number
LANGUAGE	String (128)	Yes	Data release number
CHARSET	String (128)	Yes	Used language
COMMENT	String (128)	No	Used character set

Table 21: Attributes of the Excel spreadsheet containing the metadata

4.1.1 GENER

This attribute contains the name of the data producer as a string, e.g. "State forestry department XY"

4.1.2 COPYRIGHT

This attribute stores the name of the copyright owner, e.g. "NavLog".

4.1.3 ACTDATE

The attribute ACTDATE stores the date (year, month, day) of the last update. For example 2004_09_25.

4.1.4 ACCURACY

The average deviation of the object on display from the real position is given here in meters, e.g. 3 m.

4.1.5 SOURCE

The source of the data (the geometric basis), for example ATKIS or an own data source is stored in this attribute (e.g. ATKIS, ALK, Ortho, GPS, CURSOR – for manual digitization of paper maps).

4.1.6 TOOL

The name of the data acquisition tool must be provided (e.g. ArcView)

4.1.7 TOOLVERS

The version of the tool specified in 4.2.2.9 must be provided, e.g. "1.0".

4.1.8 SPEC

The name of the used specification, for example "Shape-Forst".
Permitted values:

1-Shape-Forst
2-GDF-Forst

4.1.9 SPECVERS

The version of the specification specified in 4.2.2.11 must be provided, e.g. "2.0".

4.1.10 RELEASE

The data release number is stored in the attribute RELEASE.

4.1.11 LANGUAGE

The fundamental language especially for the names of places and roads must be provided here, e.g. "de" = German. See Siehe list of ISO 3166-1 country codes in the appendix.

4.1.12 CHARSET

The used character set is stored in the attribute CHARSET. ISO 8859-1 is the default character set of this application.

4.1.13 COMMENT

Free-text comment

Appendix

1 Name conventions

Specific conventions apply for recording names such as road names or POI addresses:

- Permitted characters for names are alphabetic characters, numbers or number and letter combinations
- Names and upper and lower case rules must comply with the spelling given in the Duden
- Names must be written in full. Acronyms must not be expanded (see following examples):

Correct:	**Wrong:**
Münsteraner Straße	Münsteraner Str.
NATO	North Atlantic Treaty Organisation

- Excluded from this rule are abbreviations provided by professional agencies (see following examples):

Correct:	**Wrong:**
A43	Autobahn 43
B4	Bundesstrasse 4
Frankfurt Hbf	Frankfurt Hauptbahnhof

- Components of names are separated by blanks, hyphens (-) or slashes (/). Full stops and brackets are part of the name component e.g. Halle (Westfalen)
- A name may contain a cardinality or ordinality number
  - place du 8 mai 1945
  - Fifth Avenue
- Special characters are permitted
  - e.g. rue de la Vérité
- The default character set is ISO 8859-1.

2 Key system

A key system is required for precise allocation of forest objects. This cross-platform key system is formed by assigning multipart keys. The international production of navigational data carriers demands the allocation of standard and unambiguous IDs to forest objects. This ensures that objects can be matched across national boundaries.

This comprehensive unambiguous key (META KEY) is produced by the central agency from the following key elements generated by the data supplier:

2.1 ID

The key "ID" is a system-generated surrogate key which clearly identifies a dataset within the system.

2.2 OID (Organisation ID)

The key "OID" clearly describes the organizational unit responsible for the relevant data. The central agency assigns this key to the data supplier during initial data transfer.
In cases where the data supplier has not provided an OID, this will be generated by the central agency.

2.3 FID (Forst ID)

The key "FID" is continually allocated in each organizational unit. Each FID is assigned only once by the appropriate organizational unit. This means that once an object has been deleted, the released ID is not used again. The FID is an immutable key and does not change during individual data updates.
In cases where the data supplier has not provided a FID, this will be generated by the central agency.

3 Minimal content requirements

A fundamental navigation basis for forestry applications does not require a complete record of all objects described above. However, it should include the appropriate data necessary for depicting the characteristics of every forest road that is potentially useable for transporting timber.

All the important forest roads within one organizational unit must be digitized and classified. The user must be able to see whether a road is suitable for heavy haulage vehicles or not. In addition to this, all restricting objects must be recorded if the entire road has not been de-classified. Cul-de-sacs and turning places are also necessary features.

Mandatory	Optional

• Road sections
  • ID
  • Road class
• Connecting objects
 	
For not entirely de-classified road sections:
• Restrictive bridges
• Restrictive curves
• Restrictive passes
• Restrictive load carrying capacities
• Gradients
• Blockages
• Turning places
• Cul-de-sacs
• No turning
 	
• Meta information
	• OID
	• FID
	• Road name
	• Paved/unpaved
	• Parking space/passing places
	• Non-restricting objects
	  • Bridges
	  • Passes
	  • Underpasses
	  • Barriers
	  • Lane width
	  • Clearance profile
	• POIs
	• Object information

Table 22: Mandatory and optional objects

4 Country codes:

CODE	Country	ISO_CODE two-letter	ISO_CODE three-letter
4	AFGHANISTAN	AF	AFG
8	ALBANIA	AL	ALB
12	ALGERIA	DZ	DZA
16	AMERICAN SAMOA	AS	ASM
20	ANDORRA	AD	AND
24	ANGOLA	AO	AGO
660	ANGUILLA	AI	AIA
10	ANTARCTICA	AQ	ATA
28	ANTIGUA AND BARBUDA	AG	ATG
32	ARGENTINA	AR	ARG
51	ARMENIA	AM	ARM
533	ARUBA	AW	ABW
36	AUSTRALIA	AU	AUS
40	AUSTRIA	AT	AUT
31	AZERBAIJAN	AZ	AZE
44	BAHAMAS	BS	BHS
48	BAHRAIN	BH	BHR
50	BANGLADESH	BD	BGD
52	BARBADOS	BB	BRB
112	BELARUS	BY	BLR
56	BELGIUM	BE	BEL
84	BELIZE	BZ	BLZ
204	BENIN	BJ	BEN
60	BERMUDA	BM	BMU
64	BHUTAN	BT	BTN
68	BOLIVIA	BO	BOL
70	BOSNIA AND HERZEGOWINA	BA	BIH
72	BOTSWANA	BW	BWA
74	BOUVET ISLAND	BV	BVT
76	BRAZIL	BR	BRA
86	BRITISH INDIAN OCEAN TERRITORY	IO	IOT
96	BRUNEI DARUSSALAM	BN	BRN
100	BULGARIA	BG	BGR
854	BURKINA FASO	BF	BFA
108	BURUNDI	BI	BDI
116	CAMBODIA	KH	KHM
120	CAMEROON	CM	CMR
124	CANADA	CA	CAN
132	CAPE VERDE	CV	CPV
136	CAYMAN ISLANDS	KY	CYM
140	CENTRAL AFRICAN REPUBLIC	CF	CAF
148	CHAD	TD	TCD
152	CHILE	CL	CHL
156	CHINA	CN	CHN
162	CHRISTMAS ISLAND	CX	CXR
166	COCOS (KEELING) ISLANDS	CC	CCK
170	COLOMBIA	CO	COL
174	COMOROS	KM	COM
178	CONGO	CG	COG
180	CONGO, THE DEMOCRATIC REPUBLIC OF THE	CD	COD
184	COOK ISLANDS	CK	COK
188	COSTA RICA	CR	CRI
384	COTE D'IVOIRE	CI	CIV
191	CROATIA (local name: Hrvatska)	HR	HRV
192	CUBA	CU	CUB
196	CYPRUS	CY	CYP
203	CZECH REPUBLIC	CZ	CZE
208	DENMARK	DK	DNK
262	DJIBOUTI	DJ	DJI
212	DOMINICA	DM	DMA
214	DOMINICAN REPUBLIC	DO	DOM
626	EAST TIMOR	TP	TMP
218	ECUADOR	EC	ECU

818	EGYPT	EG	EGY
222	EL SALVADOR	SV	SLV
226	EQUATORIAL GUINEA	GQ	GNQ
232	ERITREA	ER	ERI
233	ESTONIA	EE	EST
231	ETHIOPIA	ET	ETH
238	FALKLAND ISLANDS (MALVINAS)	FK	FLK
234	FAROE ISLANDS	FO	FRO
242	FIJI	FJ	FJI
246	FINLAND	FI	FIN
250	FRANCE	FR	FRA
249	FRANCE, METROPOLITAN	FX	FXX
254	FRENCH GUIANA	GF	GUF
258	FRENCH POLYNESIA	PF	PYF
260	FRENCH SOUTHERN TERRITORIES	TF	ATF
266	GABON	GA	GAB
270	GAMBIA	GM	GMB
268	GEORGIA	GE	GEO
276	GERMANY	DE	DEU
288	GHANA	GH	GHA
292	GIBRALTAR	GI	GIB
300	GREECE	GR	GRC
304	GREENLAND	GL	GRL
308	GRENADA	GD	GRD
312	GUADELOUPE	GP	GLP
316	GUAM	GU	GUM
320	GUATEMALA	GT	GTM
324	GUINEA	GN	GIN
624	GUINEA-BISSAU	GW	GNB
328	GUYANA	GY	GUY
332	HAITI	HT	HTI
334	HEARD AND MC DONALD ISLANDS	HM	HMD
336	HOLY SEE (VATICAN CITY STATE)	VA	VAT
340	HONDURAS	HN	HND
344	HONG KONG	HK	HKG
348	HUNGARY	HU	HUN
352	ICELAND	IS	ISL
356	INDIA	IN	IND
360	INDONESIA	ID	IDN
364	IRAN (ISLAMIC REPUBLIC OF)	IR	IRN
368	IRAQ	IQ	IRQ
372	IRELAND	IE	IRL
376	ISRAEL	IL	ISR
380	ITALY	IT	ITA
388	JAMAICA	JM	JAM
392	JAPAN	JP	JPN
400	JORDAN	JO	JOR
398	KAZAKHSTAN	KZ	KAZ
404	KENYA	KE	KEN
296	KIRIBATI	KI	KIR
408	KOREA, DEMOCRATIC PEOPLE'S REPUBLIC OF	KP	PRK
410	KOREA, REPUBLIC OF	KR	KOR
414	KUWAIT	KW	KWT
417	KYRGYZSTAN	KG	KGZ
418	LAO PEOPLE'S DEMOCRATIC REPUBLIC	LA	LAO
428	LATVIA	LV	LVA
422	LEBANON	LB	LBN
426	LESOTHO	LS	LSO
430	LIBERIA	LR	LBR
434	LIBYAN ARAB JAMAHIRIYA	LY	LBY
438	LIECHTENSTEIN	LI	LIE
440	LITHUANIA	LT	LTU
442	LUXEMBOURG	LU	LUX
446	MACAU	MO	MAC
807	MACEDONIA, THE FORMER YUGOSLAV REPUBLIC	MK	MKD
450	MADAGASCAR	MG	MDG
454	MALAWI	MW	MWI
458	MALAYSIA	MY	MYS
462	MALDIVES	MV	MDV
466	MALI	ML	MLI
470	MALTA	MT	MLT

584	MARSHALL ISLANDS	MH	MHL
474	MARTINIQUE	MQ	MTQ
478	MAURITANIA	MR	MRT
480	MAURITIUS	MU	MUS
175	MAYOTTE	YT	MYT
484	MEXICO	MX	MEX
583	MICRONESIA, FEDERATED STATES OF	FM	FSM
498	MOLDOVA, REPUBLIC OF	MD	MDA
492	MONACO	MC	MCO
496	MONGOLIA	MN	MNG
500	MONTSERRAT	MS	MSR
504	MOROCCO	MA	MAR
508	MOZAMBIQUE	MZ	MOZ
104	MYANMAR	MM	MMR
516	NAMIBIA	NA	NAM
520	NAURU	NR	NRU
524	NEPAL	NP	NPL
528	NETHERLANDS	NL	NLD
530	NETHERLANDS ANTILLES	AN	ANT
540	NEW CALEDONIA	NC	NCL
554	NEW ZEALAND	NZ	NZL
558	NICARAGUA	NI	NIC
562	NIGER	NE	NER
566	NIGERIA	NG	NGA
570	NIUE	NU	NIU
574	NORFOLK ISLAND	NF	NFK
580	NORTHERN MARIANA ISLANDS	MP	MNP
578	NORWAY	NO	NOR
512	OMAN	OM	OMN
586	PAKISTAN	PK	PAK
585	PALAU	PW	PLW
591	PANAMA	PA	PAN
598	PAPUA NEW GUINEA	PG	PNG
600	PARAGUAY	PY	PRY
604	PERU	PE	PER
608	PHILIPPINES	PH	PHL
612	PITCAIRN	PN	PCN
616	POLAND	PL	POL
620	PORTUGAL	PT	PRT
630	PUERTO RICO	PR	PRI
634	QATAR	QA	QAT
638	REUNION	RE	REU
642	ROMANIA	RO	ROM
643	RUSSIAN FEDERATION	RU	RUS
646	RWANDA	RW	RWA
659	SAINT KITTS AND NEVIS	KN	KNA
662	SAINT LUCIA	LC	LCA
670	SAINT VINCENT AND THE GRENADINES	VC	VCT
882	SAMOA	WS	WSM
674	SAN MARINO	SM	SMR
678	SAO TOME AND PRINCIPE	ST	STP
682	SAUDI ARABIA	SA	SAU
686	SENEGAL	SN	SEN
690	SEYCHELLES	SC	SYC
694	SIERRA LEONE	SL	SLE
702	SINGAPORE	SG	SGP
703	SLOVAKIA (Slovak Republic)	SK	SVK
705	SLOVENIA	SI	SVN
90	SOLOMON ISLANDS	SB	SLB
706	SOMALIA	SO	SOM
710	SOUTH AFRICA	ZA	ZAF
239	SOUTH GEORGIA AND THE SOUTH SANDWICH ISLANDS	GS	SGS
724	SPAIN	ES	ESP
144	SRI LANKA	LK	LKA
654	ST. HELENA	SH	SHN
666	ST. PIERRE AND MIQUELON	PM	SPM
736	SUDAN	SD	SDN
740	SURINAME	SR	SUR
744	SVALBARD AND JAN MAYEN ISLANDS	SJ	SJM
748	SWAZILAND	SZ	SWZ
752	SWEDEN	SE	SWE

756	SWITZERLAND	CH	CHE
760	SYRIAN ARAB REPUBLIC	SY	SYR
158	TAIWAN, PROVINCE OF CHINA	TW	TWN
762	TAJIKISTAN	TJ	TJK
834	TANZANIA, UNITED REPUBLIC OF	TZ	TZA
764	THAILAND	TH	THA
768	TOGO	TG	TGO
772	TOKELAU	TK	TKL
776	TONGA	TO	TON
780	TRINIDAD AND TOBAGO	TT	TTO
788	TUNISIA	TN	TUN
792	TURKEY	TR	TUR
795	TURKMENISTAN	TM	TKM
796	TURKS AND CAICOS ISLANDS	TC	TCA
798	TUVALU	TV	TUV
800	UGANDA	UG	UGA
804	UKRAINE	UA	UKR
784	UNITED ARAB EMIRATES	AE	ARE
826	UNITED KINGDOM	GB	GBR
840	UNITED STATES	US	USA
581	UNITED STATES MINOR OUTLYING ISLANDS	UM	UMI
858	URUGUAY	UY	URY
860	UZBEKISTAN	UZ	UZB
548	VANUATU	VU	VUT
862	VENEZUELA	VE	VEN
704	VIET NAM	VN	VNM
92	VIRGIN ISLANDS (BRITISH)	VG	VGB
850	VIRGIN ISLANDS (U.S.)	VI	VIR
876	WALLIS AND FUTUNA ISLANDS	WF	WLF
732	WESTERN SAHARA	EH	ESH
887	YEMEN	YE	YEM
891	YUGOSLAVIA	YU	YUG
894	ZAMBIA	ZM	ZMB
716	ZIMBABWE	ZW	ZWE

5 Time Domains

Time Domain is a combination of start time and end time using following notation:
[(Start time){Duration}]

Example: [(M5d1){d1}] means:
Start time: Annually, fifth month (May), first day at 0:00 hours
Duration: one whole day

5.1 Syntax Start time

The start time is identified by defining year, month, week, day, hour, minute and second represented by the following symbols:

5.1.1 Year

Ynnnn: defines a specific year e.g. Y2004 specifies the year 2004.

5.1.2 Month

Mnn: defines a particular month in a specific year or any year (if no "Y" information provided). The values range from 1 – 12. For example, M5 signifies May.

5.1.3 Week

Wnn: defines a particular week in a specific year or any year (if no "Y" information provided). The values range from 1 – 53.

5.1.4 Day

Days can be coded in a number of ways. The appropriate code depends on the specific day to be defined: a particular day of the month or week or any day of a particular week or month.

dnn: defines a specific day of a particular month, previously defined in the "M" format. Without "M" information, this code signifies every n-th day of the month. For example d14 means the 14th day of the month. The permitted values range from 1– 28, 29, 30 or 31, depending on the month.

tn: defines a specific weekday of any week or a previously defined week. Permitted values range from 1 = Sunday to 7 = Saturday. For example: W5t2 signifies: Monday of the 2nd week in May.

fxn: defines a specific weekday of any month or a previously defined month. The following rules apply: n is used as analogous to t (values 1 = Sunday to 7 = Saturday). The following values for x are possible: 1 = first, 2 = second, 3 = third, 4 = fourth, 5 = fifth. For example: f12: every first Monday.

lxn: defines a specific weekday of any month or a previously defined month. The following rules apply: n is used as analogous to t (values 1 = Sunday to 7 = Saturday). The value for x is selected from the following set: 1 = last, 2 = next to last, 3 = second to last, 4 = third to last, 5 = fifth to last.
For example: l12 denotes the last Monday of the month.

5.1.5 Hour

hnn: defines a specific hour on any day or a previously defined day. Permitted values range from 0 – 23. For example: d12h6 signifies every 12th day of the month at 6:00:00 hours.

5.1.6 Minute

mnn: defines a specific minute . Permitted values range from 0 – 59.

5.1.7 Second

snn: defines a specific second. Permitted values range from 0 – 59.

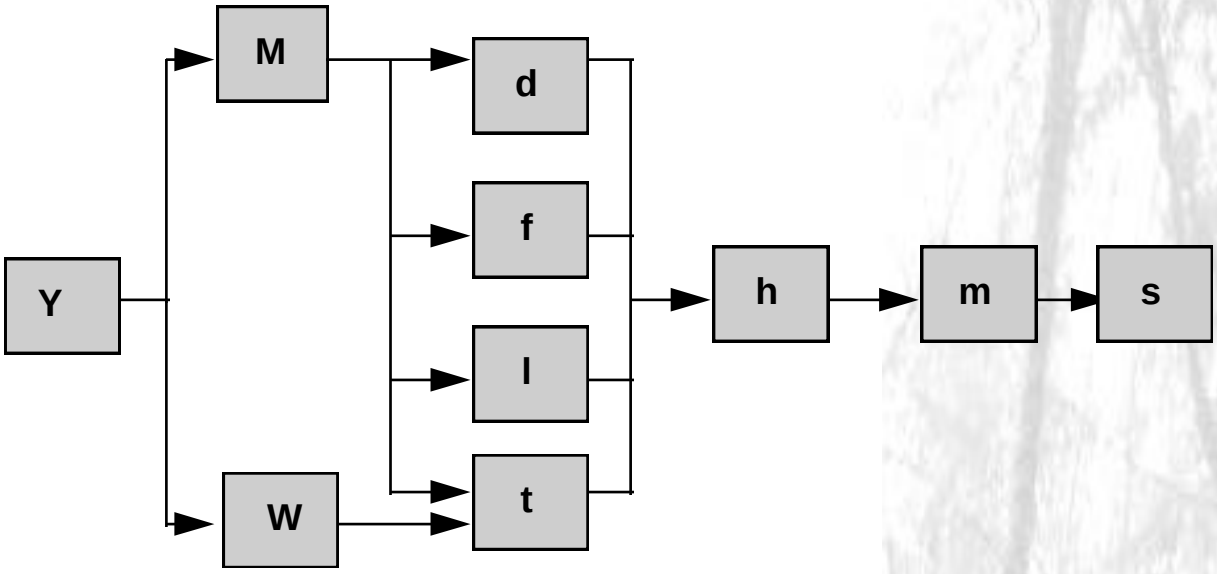

Figure 11: Permitted symbol combinations for start time

5.2 Syntax duration

The notation for duration also comprises symbols for year, month, week, day, hour, minute and second. A complete time domain is described by the combined values for duration and start time.

5.2.1 Year

Ynnnn: defines the duration in years, e.g. [(Y1991M11d14h5m30s19){Y1}] means one year from November, 14, 1991 at 5:30:19 to from November, 14, 1992 at 5:30:19

5.2.2 Month

Mnn: defines the duration in months, e.g. M3 means: duration 3 months.

5.2.3 Week

Wnn: defines the duration in weeks, e.g. W2 means: duration 2 weeks.

5.2.4 Day

dnn: defines the duration in days, e.g. d2 means: duration 2 days.

5.2.5 Hour

hnn: defines the duration in hours.

5.2.6 Minute

mnn: defines the duration in minutes.

5.2.7 Second

snn: defines the duration in seconds.

Figure 12: Combination of symbols for duration

6 References

HAUCK, BERNHARD (2003): *Konzept zur Entwicklung von bundeseinheitlichen Geographischen Standards für die Holzlogistik*. KWF Bericht 04/2003

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