	Reference: D2.7-1_ELF_IB_DataSpecification_v1.1		
ELF WP 2	ELF International Boundaries – Data Specification	08/11/2013	2/21

Executive Summary

This data specification describes the data model of the ELF International Boundaries (ELF IB). ELF IB are an important input for edge matching of topographic reference data at cross-border areas.

The core section of this deliverable is section 5, providing:

- A narrative description of the ELF International Boundaries,
- An example of the data content,
- UML diagrams,
- The feature catalogue,
- Basic guidelines for implementation.

This specification contains also information about data capture, data quality and delivery. Some sections (metadata, data maintenance) will be expanded later based on the progress of the ELF project.



	Reference: D2.7-1_ELF_IB_DataSpecification_v1.1		
ELF WP 2	ELF International Boundaries – Data Specification	08/11/2013	3/21

Table of contents

1	Scope	4
2	Overview	4
2.1	Name and acronyms	4
2.2	Normative references	4
2.3	Information about the creation of the specification	5
2.4	Terms and definitions	5
2.5	Symbols and abbreviations	5
2.6	Conformance	6
3	Specification scopes	6
4	Identification information	6
5	Data content and structure	7
5.1	Basic notions	7
5.2	Application Schema and Feature Catalogue	7
5.2.1	Narrative description	7
5.2.2	UML Overview	9
5.2.3	Levels of implementation	11
5.2.4	Feature Catalogue	12
5.3	Application to other type of boundaries	15
6	Reference systems	16
6.1	Coordinate reference system	16
6.1.1	Datum	16
6.1.2	Coordinate system	16
6.1.3	List of coordinate reference systems	16
6.2	Temporal reference system	17
7	Data quality	17
7.1	Introduction	17
7.2	Data quality elements	17
7.2.1	Completeness	17
7.2.2	Logical consistency	17
7.2.3	Positional accuracy	18
7.2.4	Thematic accuracy	18
7.2.5	Temporal accuracy	18
8	Metadata	18
9	Delivery	18
9.1	Delivery medium	18
9.2	Encodings	18
9.2.1	Encoding for ELF IB application schema	18
9.2.2	Alternative encoding	19
10	Data Capture	19
11	Data Maintenance	19
12	Portrayal	19
13	Bibliography	19
	Annex A – Abstract Test Suite	20

	Reference: D2.7-1_ELF_IB_DataSpecification_v1.1		
ELF WP 2	ELF International Boundaries – Data Specification	08/11/2013	4/21

1 Scope

This document defines a harmonised data specification for ELF International Boundaries. ELF International Boundaries are an important input for the edge matching tools, which will be developed for the ELF data maintenance and processing framework.

The specification of ELF International Boundaries defines:

- International boundaries,
- Connecting features: locations on the boundaries where edge matched geographic entities from neighbouring countries connect,
- Linkage with the national edge matched geographic entities.

2 Overview

2.1 Name and acronyms

ELF International Boundaries will be referred to with the acronym ELF IB.

The ELF IB data specification itself is scale independent. It will be implemented for all level of detail described in the ELF Description of Work (DoW). The names of the datasets, storing the international boundaries for different scales, will be:

- ELF International Boundaries in Master Level of Detail (LoD 0, LoD 1 and LoD 2) – acronym ELF IB Master
- ELF International Boundaries in Regional Level of Detail – acronym ELF IB Regional
- ELF International Boundaries in Global Level of Detail – acronym ELF IB Global


2.2 Normative references

INSPIRE

- [IR MD] COMMISSION REGULATION (EC) No 1205/2008 of 3 December 2008 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata
- [IR MDa] Corrigendum to INSPIRE Metadata Regulation published in the Official Journal of the European Union, L 328, page 83
- [IR DS] COMMISSION REGULATION (EU) No 1089/2010 of 23 November 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services
- [IR DSa] COMMISSION REGULATION amending regulation 1089/2010 as regards interoperability of spatial data sets and services (amendment to the regulation on the interoperability of spatial data sets and services regarding code lists)

ISO

- [ISO 19107] EN ISO 19107:2005, Geographic Information – Spatial Schema
- [ISO 19108] EN ISO 19108:2005, Geographic Information – Temporal Schema
- [ISO 19108-c] ISO 19108:2002/Cor 1:2006, Geographic Information – Temporal Schema, Technical Corrigendum 1
- [ISO 19111] EN ISO 19111:2007 Geographic information - Spatial referencing by coordinates (ISO 19111:2007)

	Reference: D2.7-1_ELF_IB_DataSpecification_v1.1		
ELF WP 2	ELF International Boundaries – Data Specification	08/11/2013	5/21

- [ISO 19113] EN ISO 19113:2005, Geographic Information – Quality principles
- [ISO 19115] EN ISO 19115:2005, Geographic information – Metadata (ISO 19115:2003)
- [ISO 19118] EN ISO 19118:2006, Geographic information – Encoding (ISO 19118:2005)
- [ISO 19131] EN ISO 19131:2007 – Geographic Information – Data product specification
- [ISO 19135] EN ISO 19135:2007 Geographic information – Procedures for item registration (ISO 19135:2005)
- [ISO 19138] ISO/TS 19138:2006, Geographic Information – Data quality measures
- [ISO 19139] ISO/TS 19139:2007, Geographic information – Metadata – XML schema implementation

2.3 Information about the creation of the specification

Document title: ELF International Boundaries – Data Specification
Reference date: 25/10/2013
Responsible party: ELF WP2
Language: English

2.4 Terms and definitions

Terms and definitions necessary for understanding this document are defined in the INSPIRE Glossary, available from <http://inspire-registry.jrc.ec.europa.eu/registers/GLOSSARY>.

2.5 Symbols and abbreviations

DoW	<u>D</u> escription of <u>W</u> ork
EBM	<u>E</u> uro <u>B</u> oundary <u>M</u> ap
EG	<u>E</u> uro <u>G</u> eographics
EGM	<u>E</u> uro <u>G</u> lobal <u>M</u> ap
ELF	<u>E</u> uropean <u>L</u> ocation <u>F</u> ramework
ELF IB	<u>ELF</u> <u>I</u> nternational <u>B</u> oundaries
ERM	<u>E</u> uro <u>R</u> egional <u>M</u> ap
ESDIN	Underpinning the <u>E</u> uropean <u>S</u> patial <u>D</u> ata <u>I</u> nfrastructure with a Best Practise <u>N</u> etwork
EU	<u>E</u> uropean <u>U</u> nion
GCM	INSPIRE <u>G</u> eneric <u>C</u> onceptual <u>M</u> odel
GML	<u>G</u> eography <u>M</u> ark-up <u>L</u> anguage
INSPIRE	The EU Directive to establish an <u>I</u> nfrastructure for <u>S</u> patial Information in <u>E</u> urope
IR	<u>I</u> mplementing <u>R</u> ules
ISO	<u>I</u> nternational <u>O</u> rganization for <u>S</u> tandardization
LoD	<u>L</u> evel of <u>D</u> etail
NMCA	<u>N</u> ational <u>M</u> apping and <u>C</u> adastral <u>A</u> gency
NSDI	<u>N</u> ational <u>S</u> patial <u>D</u> ata <u>I</u> nfrastructure

	Reference: D2.7-1_ELF_IB_DataSpecification_v1.1		
ELF WP 2	ELF International Boundaries – Data Specification	08/11/2013	6/21

SBE State Boundaries of Europe
UML Unified Modelling Language
WP ELF Work Package

2.6 Conformance


Any data set claiming conformance with this ELF IB data specification shall pass the requirements described in Annex A – Abstract Test Suite.

3 Specification scopes

This data specification has only one scope, the general scope.

4 Identification information

ISO 19131 suggests further identification information to be included in this section. The proposed items are already described in the document metadata, executive summary, overview description (section 2) and descriptions of the application schemas (section 5). In order to avoid redundancy, they are not repeated here.

	Reference: D2.7-1_ELF_IB_DataSpecification_v1.1		
ELF WP 2	ELF International Boundaries – Data Specification	08/11/2013	7/21

5 Data content and structure

5.1 Basic notions

This section explains some of the basic notions used in the ELF IB application schema. These explanations are based on the INSPIRE GCM [DS-D2.5].

The following stereotypes, which have been defined as part of the INSPIRE UML profile, are used in the data model:

- Feature types: spatial object types,
- Data types: structured data without identity,
- Enumerations: fixed lists of valid identifiers of named literal values, cannot be expanded,
- Code lists: value domain, include a code for each permissible value.

Additional ELF IB elements have been defined following the principles of INSPIRE.

Some voidable attributes, inherited from INSPIRE feature types, which shall be populated with a proper value, have been marked with the tag «neverVoid». The INSPIRE concept «voidable» has been introduced for ELF IB elements, which are not needed for the basic level of the ELF IB concept, but defined for more advanced levels (see section 5.2.3).

5.2 Application Schema and Feature Catalogue

5.2.1 Narrative description

The concept of ELF International Boundaries describes a reference framework for edge matching of European cross-border data. This framework consists of agreed international boundaries, connecting features on the boundaries and the linkage with the national edge matched geographic entities.

This concept arose from experiences gained during the production of the pan-European datasets EBM, ERM and EGM, when repeating interactive edge matching with new dataset versions. The concept is based on the ESDIN deliverable D9.1 and the outcome of the State Boundaries of Europe (SBE) project.

The components of ELF IB are:

- **InternationalBoundary:**
 - This basic component represents boundaries which are agreed between neighbouring countries for specific level of detail.
 - This feature type is subtyped from the ELF feature AdministrativeUnit, which is a subtype of the INSPIRE feature AdministrativeUnit, and inherits all concerning attributes. It is restricted to 1st order national level only.
 - The INSPIRE attributes, which are defined as voidable, are mandatory for ELF IB and have to be populated properly.
 - The feature contains additional attributes which are of special interest for international boundaries. These properties are voidable.
- **ConnectingFeature:**
 - Connecting Features represent locations on the international boundaries where edge matched geographic entities from neighbouring countries connect. They serve as anchor for repeatable edge matching.
 - The geometry is either point or line, where connecting feature lines are related to two connecting feature points (start and end point).
 - Connecting features provide information about the features to be edge matched.
 - This feature is modelled for ELF following the INSPIRE principles.
- **EdgeMatchingFeature:**
 - Edge Matching Features provide the link to the objects in the national data source.
 - The linkage is implemented by the inspireId of the national objects.

	Reference: D2.7-1_ELF_IB_DataSpecification_v1.1		
ELF WP 2	ELF International Boundaries – Data Specification	08/11/2013	8/21

- This data type does not include geometry. It is defined as lookup table between the national objects and the connecting features.
- Important attributes, which have to be identical for cross-border objects, can be stored with the data type *EdgeMatchingAttribute*. In that way, a semantic edge matching is supported.

An example is given in the following picture:

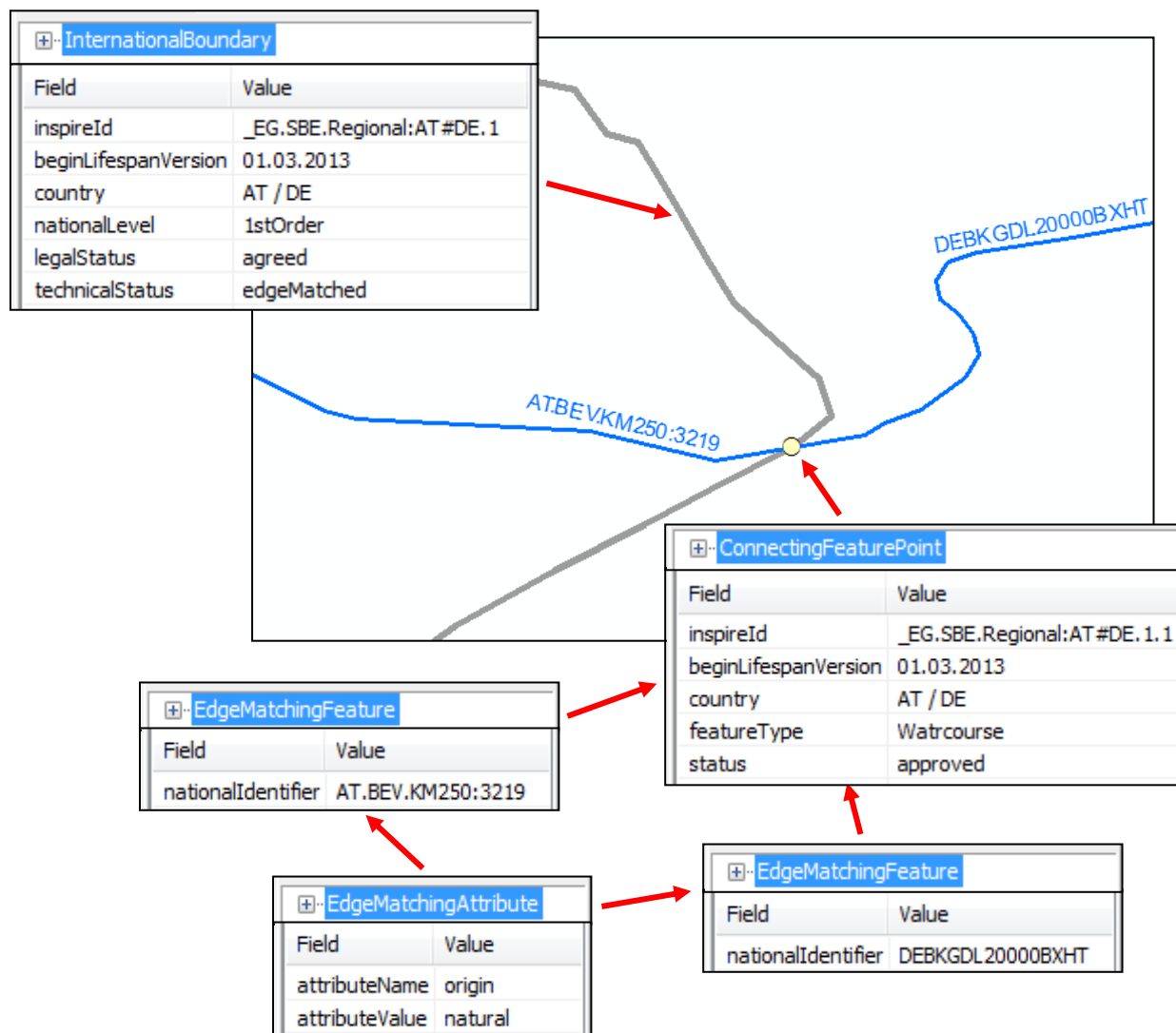



Figure 1 – Example of a watercourse crossing the international boundary Austria /Germany

This example visualises an international boundary (*nationalLevel=1stOrder*) between Austria and Germany (*country*). Both neighbouring countries agreed (*legalStatus*) to use a common line as boundary (*technicalStatus*). This boundary object was created on 01/03/2013 (*beginLifespanVersion*) within the EuroGeographics project State Boundaries of Europe for regional level of detail (*inspireId*).

A connecting feature point is located on the international boundary. Both countries agreed (*status*) to use this connecting feature to match watercourses (*featureType*).

An Austrian and a German watercourse object (*EdgeMatchingFeature*) are matched on the connecting feature point. Both objects have a property 'origin' (*attributeName*) with value 'natural' (*attributeValue*).

 ELF EUROPEAN LOCATION FRAMEWORK	Reference: D2.7-1_ELF_IB_DataSpecification_v1.1		
ELF WP 2	ELF International Boundaries – Data Specification	08/11/2013	9/21

5.2.2 UML Overview

The following diagram shows the relation between the feature type InternationalBoundary and its parent feature types defined in the ELF data specification and the INSPIRE data model.

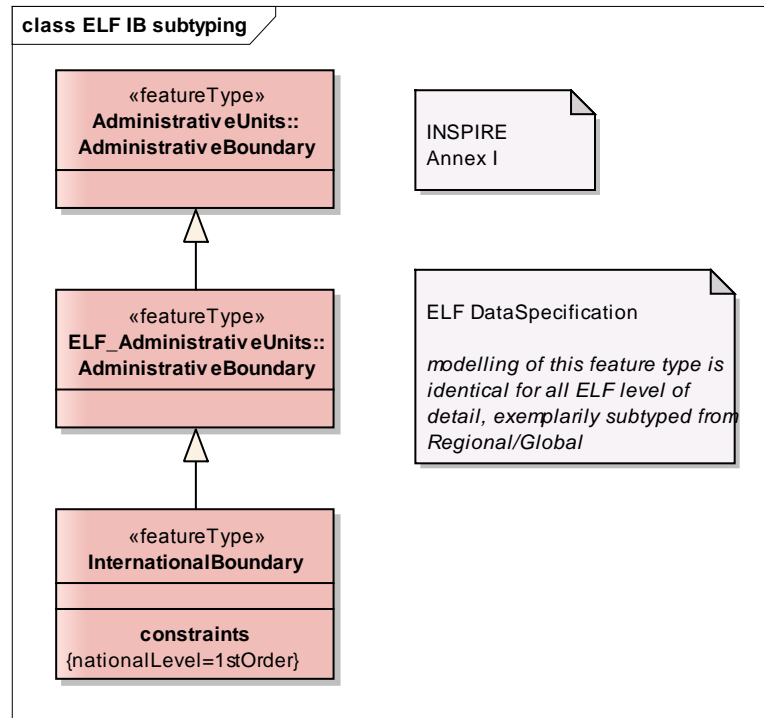



Figure 2 – Relation between InternationalBoundary and AdministrativeBoundary

 ELF EUROPEAN LOCATION FRAMEWORK	Reference: D2.7-1_ELF_IB_DataSpecification_v1.1		
ELF WP 2	ELF International Boundaries – Data Specification	08/11/2013	10/21

The complete UML class diagram is given in the following figure.

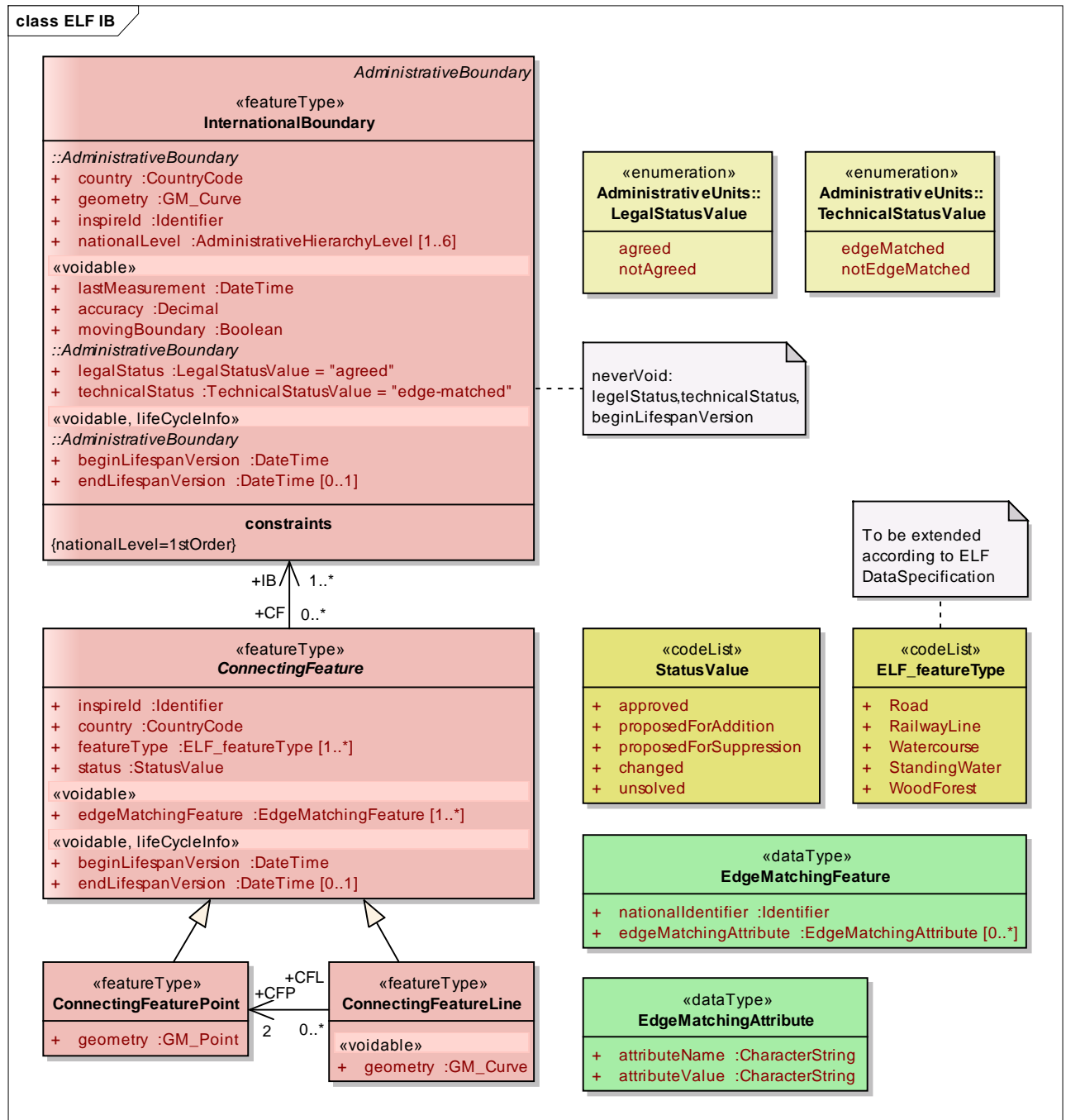



Figure 3 – ELF International Boundaries data model

 ELF EUROPEAN LOCATION FRAMEWORK	Reference: D2.7-1_ELF_IB_DataSpecification_v1.1		
ELF WP 2	ELF International Boundaries – Data Specification	08/11/2013	11/21

5.2.3 Levels of implementation

This data specification describes a consistent set of components, which will be used for edge matching. Some elements might be difficult to implement. Therefore a stepwise approach is recommended, see following figure.

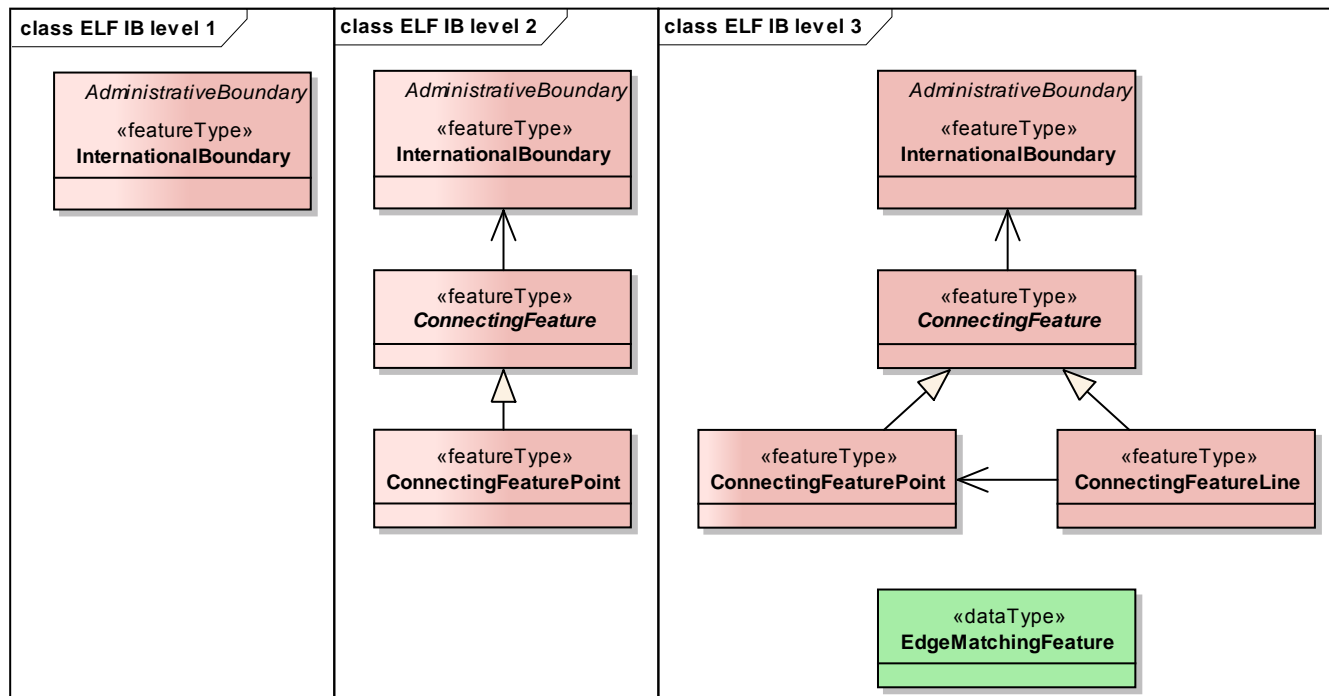



Figure 4 – Levels of implementation

The basic level of implementation provides only the agreed international boundaries. The next level includes also the connecting features, basically as point geometry. The most advanced level contains also the concept of edge matching features.

The recommendation is to aim, at least, for the second level. The third level is probably challenging, because it demands stable unique identifiers (inspireld) for the related national data.


 ELF EUROPEAN LOCATION FRAMEWORK	Reference: D2.7-1_ELF_IB_DataSpecification_v1.1		
ELF WP 2	ELF International Boundaries – Data Specification	08/11/2013	12/21

5.2.4 Feature Catalogue

Properties inherited or adopted from INSPIRE are marked italic. If not specified explicitly, properties are not voidable and have multiplicity 1.


5.2.4.1 Feature types

InternationalBoundary	
Definition:	A line of demarcation between countries.
Description:	International boundaries should be agreed between neighbouring countries.
Attribute: geometry	
Definition:	Geometric representation of border line.
Value type:	GM_Curve
Attribute: inspireId	
Definition:	External object identifier of the spatial object.
Description:	An external object identifier is a unique object identifier published by the responsible body, which may be used by external applications to reference the spatial object. The identifier is an identifier of the spatial object, not an identifier of the real-world phenomenon.
Value type:	Identifier
Attribute: beginLifespanVersion	
Definition:	Date and time at which this version of the spatial object was inserted or changed in the spatial data set.
Value type:	DateTime
Attribute: endLifespanVersion	
Definition:	Date and time at which this version of the spatial object was superseded or retired in the spatial data set.
Value type:	DateTime
Stereotype:	voidable
Attribute: country	
Definition:	Two-character country code according to the Interinstitutional style guide published by the Publications Office of the European Union.
Value type:	CountryCode
Attribute: nationalLevel	
Definition:	The hierarchy levels of all adjacent administrative units this boundary is part of.
Value type:	AdministrativeHierarchyLevel
Attribute: legalStatus	
Definition:	Legal status of this administrative boundary.
Description:	The legal status is considered in terms of political agreement or disagreement of the administrative units separated by this boundary.
Value type:	LegalStatusValue
Attribute: technicalStatus	
Definition:	The technical status of the administrative boundary.
Description:	The technical status of the boundary is considered in terms of its topological matching or not-matching with the borders of all separated administrative units. Edgematched means that the same set of coordinates is used.
Value type:	TechnicalStatusValue
Attribute: lastMeasurement	
Definition:	Date of the last common/agreed measurement of the boundary.
Value type:	DateTime
Stereotype:	voidable
Attribute: accuracy	
Definition:	Accuracy of the position of the boundary.
Value type:	Decimal
Stereotype:	voidable

	Reference: D2.7-1_ELF_IB_DataSpecification_v1.1		
ELF WP 2	ELF International Boundaries – Data Specification	08/11/2013	13/21

Attribute: movingBoundary	
Definition:	Indication if the boundary is not fixed but moving.
Description:	For example the middle of a river.
Value type:	Boolean
Stereotype:	voidable

ConnectingFeature	
Definition:	Location on the international boundary where edge matched geographic entities from neighbouring countries connect.
Description:	Connecting features serve as anchor for repeatable edge matching.
Abstract:	Abstract feature type
Attribute: inspireId	
Definition:	External object identifier of the spatial object.
Description:	An external object identifier is a unique object identifier published by the responsible body, which may be used by external applications to reference the spatial object. The identifier is an identifier of the spatial object, not an identifier of the realworld phenomenon.
Value type:	Identifier
Attribute: beginLifespanVersion	
Definition:	Date and time at which this version of the spatial object was inserted or changed in the spatial data set.
Value type:	DateTime
Attribute: endLifespanVersion	
Definition:	Date and time at which this version of the spatial object was superseded or retired in the spatial data set.
Value type:	DateTime
Stereotype:	voidable
Attribute: country	
Definition:	Two-character country code according to the Interinstitutional style guide published by the Publications Office of the European Union.
Value type:	CountryCode
Attribute: featureType	
Definition:	ELF feature type for which the connecting feature is used.
Value type:	ELF_featureType
Multiplicity:	1..*
Attribute: status	
Definition:	Indication if the connecting feature has been agreed between neighbouring countries.
Value type:	StatusValue
Attribute: edgeMatchingFeature	
Definition:	Link between connecting features and objects in the national data source.
Value type:	EdgeMatchingFeature
Stereotype:	voidable
Multiplicity:	1..*
Association: IB	
Definition:	International Boundary the connecting feature is linked to.
Description:	Connecting feature should be properly located on the international boundary. A connecting feature can be used for boundaries in different levels of detail.
Value type:	InternationalBoundary
Multiplicity:	1..*

 ELF EUROPEAN LOCATION FRAMEWORK	Reference: D2.7-1_ELF_IB_DataSpecification_v1.1		
ELF WP 2	ELF International Boundaries – Data Specification	08/11/2013	14/21

ConnectingFeaturePoint	
Definition:	Connecting feature with point geometry.
Subtype of:	ConnectingFeature
Attribute: geometry	
Definition:	Geometric representation of connecting feature point.
Value type:	GM_Point

ConnectingFeatureLine	
Definition:	Connecting feature with line geometry.
Subtype of:	ConnectingFeature
Attribute: geometry	
Definition:	Geometric representation of connecting feature line.
Value type:	GM_Curve
Stereotype:	voidable
Association: CFP	
Definition:	Connecting feature lines are related to two connecting feature points (start and end point).
Value type:	ConnectingFeaturePoint
Multiplicity:	2


5.2.4.2 Data types

EdgeMatchingFeature	
Definition:	Link between connecting features and objects in the national data source.
Attribute: nationalIdentifier	
Definition:	National inspireId of the object linked to a connecting feature.
Value type:	Identifier
Attribute: edgeMatchingAttribute	
Definition:	Attributes, which have to be identical for cross-border objects matched on connecting features.
Value type:	EdgeMatchingAttribute
Multiplicity:	0..*

EdgeMatchingAttribute	
Definition:	Attributes, which have to be identical for cross-border objects matched on connecting features.
Description:	Attributes should be ELF attributes of ELF feature types.
Attribute: attributeName	
Definition:	Name of the attribute.
Value type:	CharacterString
Attribute: attributeValue	
Definition:	Value of the attribute.
Value type:	CharacterString

5.2.4.3 Code lists

StatusValue	
Definition:	Indication of the technical status of connecting features.
Value: approved	
Definition:	Connecting feature is agreed between countries.
Value: proposedForAddition	
Definition:	Connecting feature is proposed to be added.

 ELF EUROPEAN LOCATION FRAMEWORK	Reference: D2.7-1_ELF_IB_DataSpecification_v1.1		
ELF WP 2	ELF International Boundaries – Data Specification	08/11/2013	15/21

Value: proposedForSuppression	
Definition:	Connecting feature is proposed to be deleted.
Value: changed	
Definition:	Attributes of connecting feature are proposed to be changed.
Value: unsolved	
Definition:	Status is unsolved.

ELF_featureType	
Definition:	Indication of the ELF feature types for which connecting feature are used.
Values: <i>will be added later according to the ELF DataSpecification</i>	

5.2.4.4 Enumerations

The following enumerations are inherited from INSPIRE.

LegalStatusValue	
Definition:	Description of the legal status of administrative boundaries.
Value: agreed	
Definition:	The edge-matched boundary has been agreed between neighbouring administrative units and is stable now.
Value: notAgreed	
Definition:	The edge-matched boundary has not yet been agreed between neighbouring administrative units and could be changed.

TechnicalStatusValue	
Definition:	Description of the technical status of administrative boundaries.
Value: edgeMatched	
Definition:	The boundaries of neighbouring administrative units have the same set of coordinates.
Value: notEdgeMatched	
Definition:	The boundaries of neighbouring administrative units do not have the same set of coordinates.

5.3 Application to other type of boundaries

The application schema for international boundaries can be easily adapted for any other type of boundaries or outlines dividing areas, where neighbouring data providers have to edge match data. Examples are:

- Regional or communal boundaries,
- Boundaries of river basin districts,
- Boundaries of postal areas.

The approach to create an additional application schema is the following:

- Replace feature type *InternationalBoundary* by an appropriate feature type. If possible, subtype an existing ELF / INSPIRE feature type. Example: new feature type *RegionalBoundary* as subtype of ELF feature *AdministrativeBoundary* without constraint on attribute *nationalLevel*.
- Copy concept of connecting features.
- Depending on the level of implementation, copy concept of edge matching features.

	Reference: D2.7-1_ELF_IB_DataSpecification_v1.1		
ELF WP 2	ELF International Boundaries – Data Specification	08/11/2013	16/21

6 Reference systems

In general, the INSPIRE requirements for reference systems (Datum, Coordinate reference systems, Display, Identifiers for coordinate reference systems and Temporal reference systems) are valid for ELF International Boundaries. The recommendations below seek to further detail these requirements for the scope of ELF IB.

6.1 Coordinate reference system

6.1.1 Datum

INSPIRE requires the datum of the European Terrestrial Reference System 1989 (ETRS89) using the parameters of the GRS80 ellipsoid. This requirement will be applied for ELF IB, as the spatial extent of this data specification covers Europe.

6.1.2 Coordinate system

For the purpose of implementation of ELF IB, the following coordinate system is sufficient:

- Two-dimensional geodetic coordinates (geographic coordinates with longitude and latitude). Units of measurement are decimal degrees.

For the display of ELF IB it might be suitable to apply a projection. The following projected coordinate systems are recommended:

- Plane coordinates using the Lambert Azimuthal Equal Area projection for spatial analysis and display,
- Plane coordinates using the Lambert Conformal Conic projection for mapping at scales $\leq 1: 500.000$,
- Plane coordinates using the Transverse Mercator projection for mapping at scales $> 1: 500.000$.


ELF IB does not define features with height information. Three-dimensional coordinate systems are not necessary.

6.1.3 List of coordinate reference systems

The following table lists possible coordinate reference systems. Each entry starts with the identifier used in the INSPIRE specifications followed by a short description. Additionally, the EPSG codes are added. The system of EPSG codes is maintained by the International Association of Oil & Gas Producers (OGP).

Table 6-1 List of 2D coordinate reference systems

INSPIRE identifier	Description	EPSG code
ETRS89-XYZ	Two-dimensional geodetic coordinates in ETRS89 on the GRS80 ellipsoid (Note: Sequence of axis: latitude and longitude, orientation is north/east. UoM is degree.)	4258
ETRS89-LAEA	ETRS89 coordinates projected into plane coordinates by the Lambert Azimuthal Equal Area projection	3035
ETRS89-LCC	ETRS89 coordinates projected into plane coordinates by the Lambert Conformal Conic projection	3034
ETRS89-TMzn	ETRS89 coordinates projected into plane coordinates by the Transverse Mercator projection (for TM zones 26 to 39)	3038-3051

	Reference: D2.7-1_ELF_IB_DataSpecification_v1.1		
ELF WP 2	ELF International Boundaries – Data Specification	08/11/2013	17/21

6.2 Temporal reference system

As required by INSPIRE, the Gregorian Calendar shall be used for as a reference system for date values, and the Universal Time Coordinated (UTC) or the local time including the time zone as an offset from UTC shall be used as a reference system for time values.

7 Data quality

7.1 Introduction

The objective of ELF International Boundaries is to provide a European dataset for edge matching of European cross-border data. As it is defined as a basic framework, ELF IB demands data of high quality.

The focus of this section is to describe the quality requirements for ELF IB. This is depending on the level of detail (2.1) and the level of implementation (5.2.3).

7.2 Data quality elements

7.2.1 Completeness

Feature type **InternationalBoundary** should be provided with 100% completeness for whole Europe and all level of detail. All attributes are mandatory and should be populated properly. If a full completeness cannot be achieved, it has to be complete, at least, for a specific level of detail and a defined European region, where edge matching of European cross-border data will be applied.


Feature type **ConnectingFeature** should be provided with point geometry for the second level of implementation. In this case, ConnectingFeature should be 100% complete for a specific ELF feature type for a specific level of detail and European region. For instance, if edge matching of the Scandinavian watercourse network in regional level of detail is needed, ELF IB should contain all concerning connecting features points for watercourses at regional LoD.

Data type **EdgeMatchingFeature** is difficult to implement. If provided, it should be 100% complete for edge matching feature of a specific country and ELF feature type. For instance, if inspireId are defined for Swedish watercourse objects, the edge matching features can be populated to link the Swedish data with the connecting features on the state boundaries.

7.2.2 Logical consistency

ELF IB dataset has to be 100% logical consistent in terms of concept, domain, format and topology.

Topological consistency includes, that international boundaries are connected on their end nodes and don't intersect each other. Further, connecting features have to be located properly on the international boundaries.

	Reference: D2.7-1_ELF_IB_DataSpecification_v1.1		
ELF WP 2	ELF International Boundaries – Data Specification	08/11/2013	18/21

7.2.3 Positional accuracy

Positional accuracy depends on the level of detail. International boundaries and connecting features should be provided at a detail that approximates the level of detail. International boundaries have to be generalised if the source data is too detailed.

The horizontal geometric resolution of the data should conform to the level of detail. This means, the geometric data resolution in the density of vertices on an edge should be as low as possible keeping a realistic size and shape of the object.

Level of detail	Positional accuracy	Recommendation for geometric resolution
ELF IB Master	10 m	1 m
ELF IB Regional	50 m	5 m
ELF IB Global	500 m	10 m

7.2.4 Thematic accuracy

ELF IB dataset has to be 100% thematic consistent in terms of classification and correctness of attributes.

7.2.5 Temporal accuracy

International boundaries should represent the latest official version of this boundary or the latest version agreed between countries for use for a specific level of detail.

Connecting features should represent the latest agreed locations for edge matching of European cross-border data.

8 Metadata

Metadata are the fundamental elements needed to discover, access and use geographic data products. ELF IB will follow the general metadata guidelines of the ELF project.

9 Delivery

9.1 Delivery medium

ELF WP 3 will set up web services of the ELF IB for all level of detail.

Alternative delivery will be defined on request.


9.2 Encodings

9.2.1 Encoding for ELF IB application schema

Standard encoding of ELF IB is GML (version 3.2.1). The specification of this format is described in the INSPIRE Guidelines for the encoding of spatial data [DS-D2.7]. The character set is UTF-8.

The GML Application Schema of ELF IB is distributed in a zip-file as part of the ELF Deliverable D2.7.

It will also be made available, as indicated in the targetNamespace, under www.locationframework.eu

	Reference: D2.7-1_ELF_IB_DataSpecification_v1.1		
ELF WP 2	ELF International Boundaries – Data Specification	08/11/2013	19/21

9.2.2 Alternative encoding

Alternative encodings will be defined in the ESRI™ data formats: Geodatabase (version 9.x/10.x) and Shapefile. These schemas will be distributed separately from this deliverable.

10 Data Capture

The primary sources for **ELF IB Master** are the most accurate boundary representation based on large scale national topographic datasets which can be provided by the NMCA's. The national versions of the international boundaries, claiming to be the official ones, have to be analyzed for neighbouring countries. In case of differences, a common version has to be agreed between the NMCA's. Connecting features have to be derived from the national data and the results of edge matching discussions between neighbouring countries. The creation of ELF IB Master is part of the ELF project.

ELF IB Regional will be adopted from the existing EuroGeographics products. NMCA's have already approved common international boundaries for the medium scale products EuroBoundaryMap and EuroRegionalMap. These agreed boundaries as well as connecting feature for all ERM feature types are stored in a dataset. This existing data will be the basis for the ELF IB Regional dataset.

ELF IB Global will be created similarly, because agreed international boundaries in small scale are already existing for the EuroGlobalMap project. Connecting features will be derived from the EGM feature types.

11 Data Maintenance


Data maintenance and update frequency of ELF IB will be defined within the ELF project by the project partners. After the completion of the ELF project, ELF IB will be maintained by EuroGeographics.

12 Portrayal

A definition, how the ELF IB data should be presented as graphic output, is not necessary.

13 Bibliography

- [DS-D2.5] INSPIRE DS-D2.5, Generic Conceptual Model v3.3
- [DS-D2.7] INSPIRE DS-D2.7, Guidelines for the encoding of spatial data v3.2
- [DS AU] INSPIRE Data Specification on Administrative Units - Guidelines v3.0.1, 03.05.2010
- [ELF DoW] ELF Description of Work (DoW) / 25.01.2013
- [ESDIN D9.1] ESDIN D9.1 General Specifications and Guidelines for the Maintenance of Edge Matched Features at Cross-Border Areas / v1.0 / 29.06.2010 / ESDIN WP9
- [SBE] State Boundaries of Europe (SBE) / EuroGeographics website / 2013 / <http://www.eurogeographics.org/sbe>

	Reference: D2.7-1_ELF_IB_DataSpecification_v1.1		
ELF WP 2	ELF International Boundaries – Data Specification	08/11/2013	20/21

Annex A – Abstract Test Suite

Any dataset conforming to this ELF IB data specification shall meet all requirements specified in this document.

1. Test module for Data structure

1.1 Data structure

- a.) **Test purpose:** Check the conformance to the ELF IB application schema
- b.) **Test method:** Check that the feature types and the data types specified in the application schemas of ELF IB are used.
- c.) **Reference:** ELF IB data specification, section 5
- d.) **Test type:** Basic

1.2 Test case for Feature types

- a.) **Test purpose:** Check the conformance to the specified feature types
- b.) **Test method:** Inspect the data and check that all spatial objects are of types specified in the ELF IB data specification.
- c.) **Reference:** ELF IB data specification, section 5
- d.) **Test type:** Basic

1.3 Test case for Data types

- a.) **Test purpose:** Check the conformance to the specified data types
- b.) **Test method:** Inspect the data and check that the data types are of types specified in the ELF IB data specification.
- c.) **Reference:** ELF IB data specification, section 5
- d.) **Test type:** Basic

2. Test module for Reference systems

2.1 Reference systems

- a.) **Test purpose:** Check the conformance of the reference systems used in the dataset to the ELF IB data specification
- b.) **Test method:** Inspect the data and check that the datum, the coordinate system, the identifiers of the coordinate reference system and the temporal reference system used in the dataset are in conformance with the ELF IB data specification
- c.) **Reference:** ELF IB data specification, section 6
- d.) **Test type:** Basic

2.2 Test case for Datum


- a.) **Test purpose:** Check the conformance of the geodetic Datum
- b.) **Test method:** Inspect the data and check that the data set uses the datum European Terrestrial Reference System 1989 (ETRS89) for the coordinate reference system.
- c.) **Reference:** ELF IB data specification, section 6.1.1
- d.) **Test type:** Basic

2.3 Test case for the Coordinate Reference System

- a.) **Test purpose:** Check the conformance of the Coordinate Reference System
- b.) **Test method:** Inspect the data and check that the data set uses one of the two-dimensional or compound coordinate systems listed in section 6.1.3 with the appropriate identifiers.
- c.) **Reference:** ELF IB data specification, section 6.1.3
- d.) **Test type:** Basic

2.4 Test case for the Temporal reference system

- a.) **Test purpose:** Check the conformance of the temporal reference system
- b.) **Test method:** Inspect the data and check that the data set uses the Gregorian calendar for date values and the Universal Time Coordinate (UTC) or the local time including the time zone as an offset from UTC as a reference system for time values.

	Reference: D2.7-1_ELF_IB_DataSpecification_v1.1		
ELF WP 2	ELF International Boundaries – Data Specification	08/11/2013	21/21

c.) **Reference:** ELF IB data specification, section 6.2

d.) **Test type:** Basic

3. Test module for Data Quality

3.1 Data Quality

a.) **Test purpose:** Check the conformance to the data quality rules

b.) **Test method:** Inspect the data and check that the data quality rules and requirements stated in section 7 are met.

c.) **Reference:** ELF IB data specification, section 7

d.) **Test type:** Basic

3.2 Test case for Positional Accuracy

a.) **Test purpose:** Check the conformance of the positional accuracy

b.) **Test method:** Inspect the data and check that information about the positional accuracy of the data set is included in the metadata at the data set level.

c.) **Reference:** ELF IB data specification, section 7.2.3

d.) **Test type:** Basic

3.3 Test module for Topology

a.) **Test purpose:** Check the conformance to the topology rules.

b.) **Test method:** Inspect the data and check that the topology rules stated in section 7.2.2 are met.

c.) **Reference:** ELF IB data specification, section 7.2.2

d.) **Test type:** Basic

4. Test case for Encoding

a.) **Test purpose:** Check the conformance of the encoding

b.) **Test method:** Inspect the data and check that it is encoded using either the default encoding or the alternative encoding specified in section 9.2.

c.) **Reference:** ELF IB data specification, section 9.2.1

d.) **Test type:** Basic