Edge Matching of National INSPIRE Datasets at European State Boundaries

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Overview
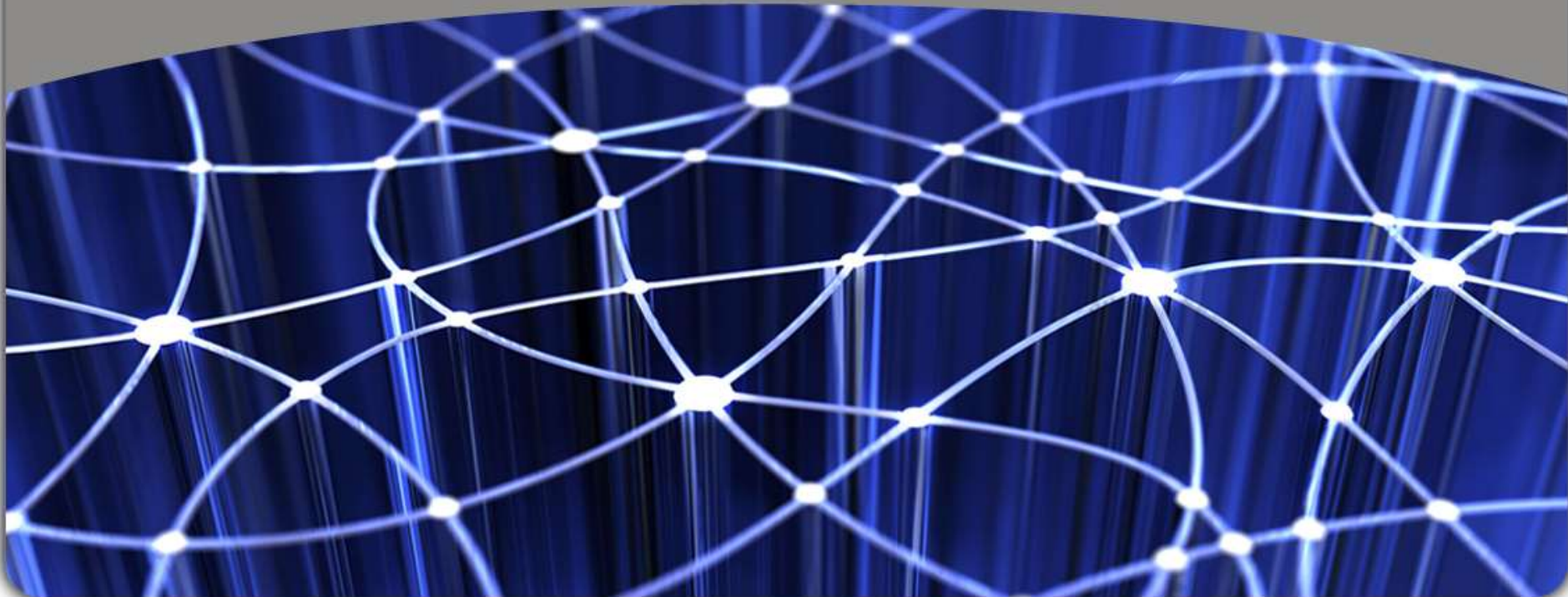
- Challenges of INSPIRE implementation
- State Boundaries of Europe (SBE)
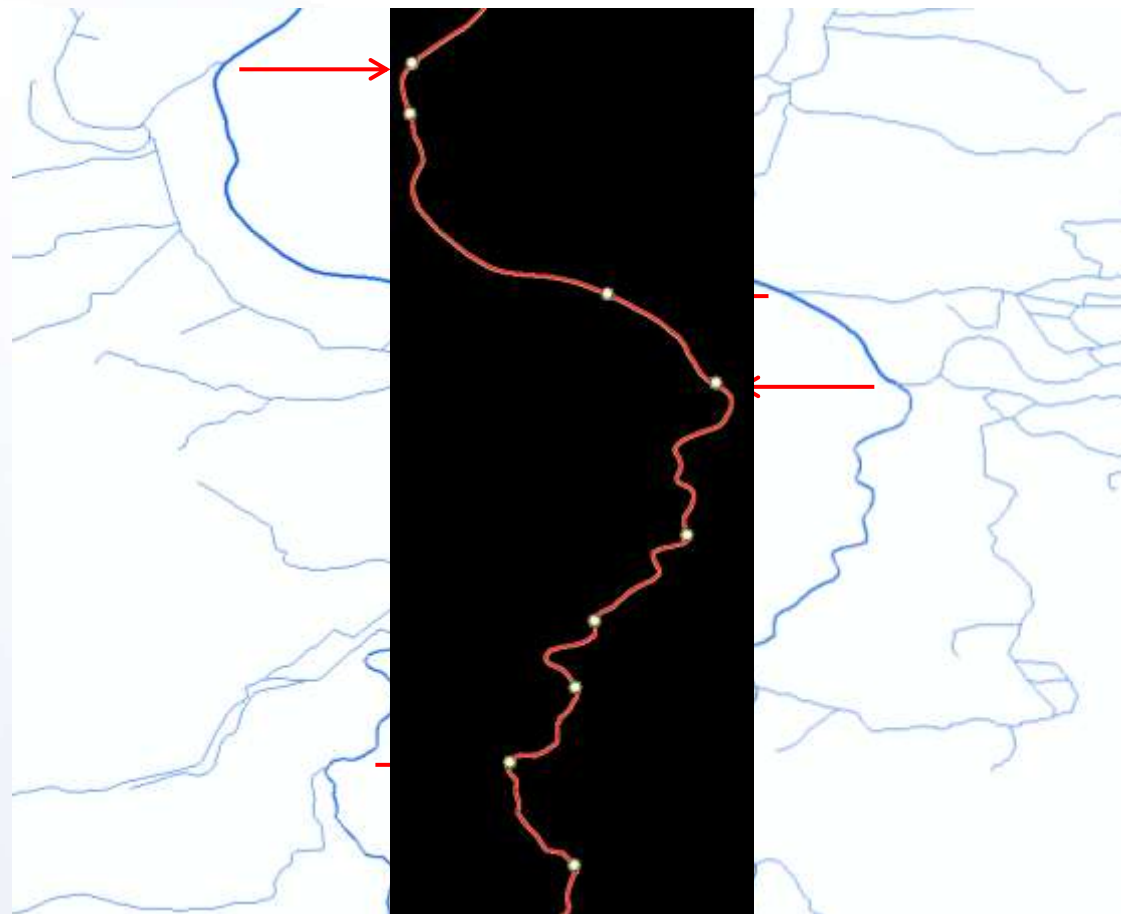- Edge matching

EuroGeographics AISBL

- Membership association comprising public authorities respon-sible for national cadastre, land registry and mapping (e.g. BKG)
- Purpose: further the development of the European Spatial Data Infrastructure through collaboration in the area of geographic information and the representation of the EuroGeographics' membership and its capabilities

Challenges of INSPIRE implementation

- Focus of national INSPIRE implementation:
  - Identification of national datasets which have to be considered for INSPIRE
  - Setting of INSPIRE compliant services on national datasets
  - Schema transformation of national datasets to INSPIRE data specifications

- Challenges:
  - Boundaries (outlines) of national datasets
  - Level of detail (scale)
  - Edge matching of features across boundaries

  → Not focused by the the National Mapping and Cadastre Agencies up to now

Challenges of INSPIRE implementation

German watercourse network   Polish watercourse network

Regional level of detail (medium scale)

To benefit from different national INSPIRE datasets in pan-European context

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Edge matching

of national features

to agreed state boundaries needed

State Boundaries of Europe (SBE)

- Project launched by EuroGeographics
- Goal: to compile a multipurpose State Boundaries of Europe database, meant to be the "definite" description of all European state boundaries.
- The SBE project aims at providing and maintaining:
  - The administrative and legal definition of state boundaries, based on boundary treaties,
  - Their precise geometric description expressed in ETRS89 coordinates of boundary points, marks and lines,
  - Generalised versions of the state boundaries in different levels of detail.

State Boundaries of Europe (SBE)

- SBE will be realised for different levels of detail:

Level of detail	Scale	Type of data	Realisation
Treaty level	cadastre scale	high precision coordinates of boundary points and lines	long-term
Master data level	1:10' to 1:50'	large scale boundary lines from national basic cadastral or topographic database	medium-term (E.L.F. project)
Regional level	1:100' to 1:250'	agreed state boundaries for use at medium scale	first version available
Global level	1:500' to 1:2 M	generalised version	(end 2013)

State Boundaries of Europe (SBE)

- Why is it so difficult to get the legal definition of state boundaries?
  - Definitions of state boundaries are laid down in historical documents.
  - Coordinates, if included, are difficult to transform to ETRS89.
  - New surveying campaigns are costly and time-consuming.
  - Bilateral negotiations are time-consuming and influenced by complex technical issues.
  - Some European state boundaries are in dispute.

- Short-term realisation: SBE database in regional level of detail
  - Derived from existing European reference databases: EuroBoundaryMap (EBM) and EuroRegionalMap (ERM).
  - EBM and ERM are compiled from the medium scale topographic databases of the national mapping agencies (official data).
  - State boundaries are agreed for EBM and ERM as technical solution for use at medium scale.
  - Remaining issues will be clarified in 2013.

Edge matching

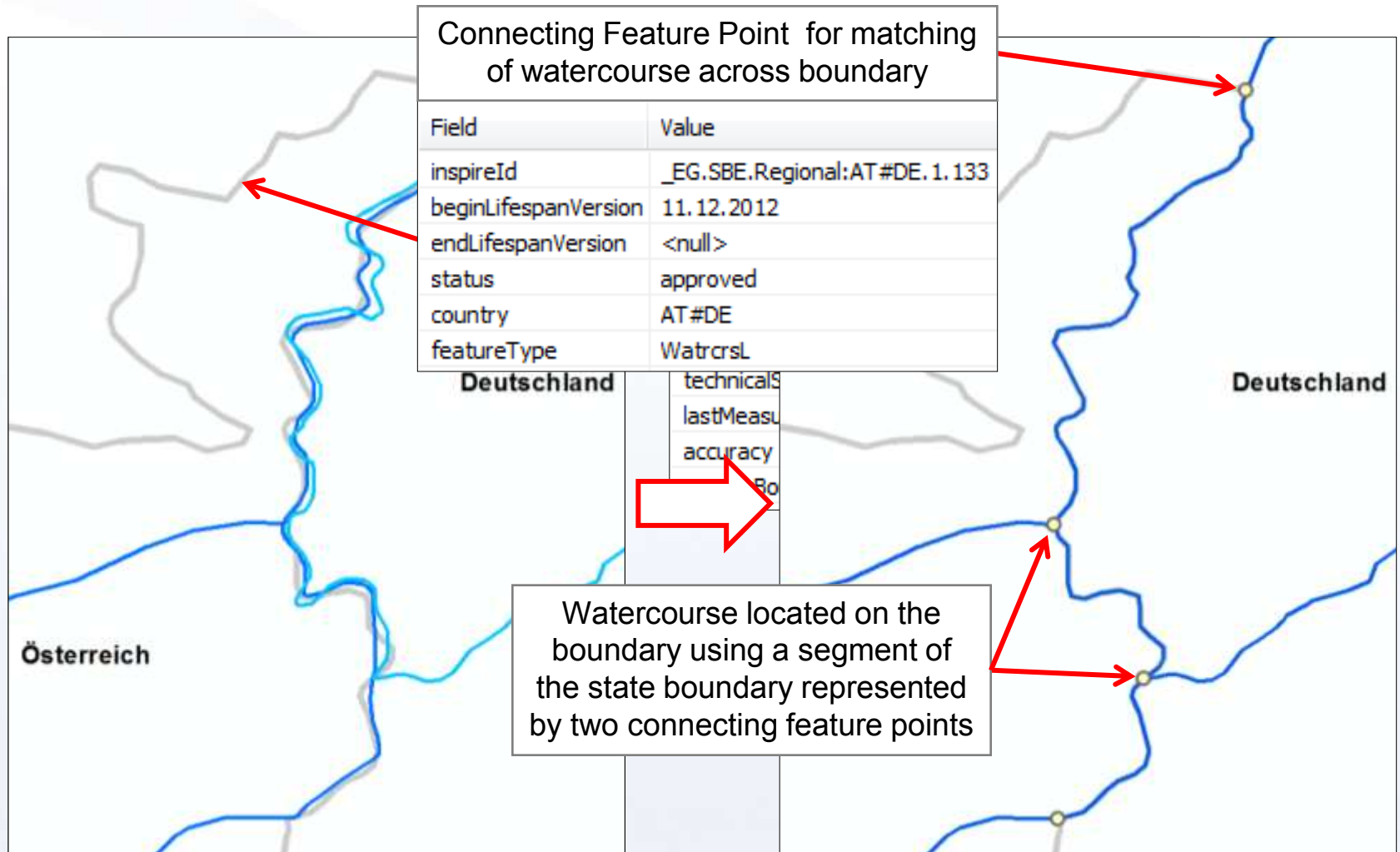- Definition in the scope of INSPIRE:

  Edge matching comprises all process steps needed to combine INSPIRE datasets (especially topographic reference data) made accessible by different data providers via INSPIRE services to pan-European datasets, in order to achieve geometrical, topological and semantic cross-boundary consistency.

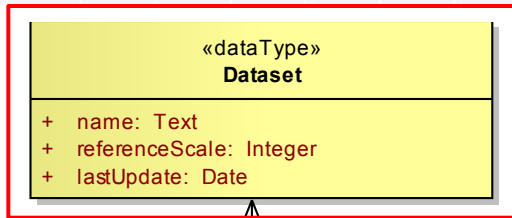- EuroGeographics concept: Connecting Features on the State Boundaries
  - Connecting features represent locations on the state boundaries where edge matched geographic entities from neighbouring countries connect.
  - Connecting features serve as anchor for repeatable edge matching.
  - First realisation for regional level of detail, derived from existing European reference databases EBM and ERM.

Edge matching

Connecting Feature Point for matching of watercourse across boundary

Field	Value
inspireId	_EG.SBE.Regional:AT#DE.1.133
beginLifespanVersion	11.12.2012
endLifespanVersion	<null>
status	approved
country	AT#DE
featureType	WatrcrsL
technicalS	
lastMeasu	
accuracy	
Bo	

Deutschland

Deutschland

Österreich

Watercourse located on the boundary using a segment of the state boundary represented by two connecting feature points

Data model of SBE database for edge matching

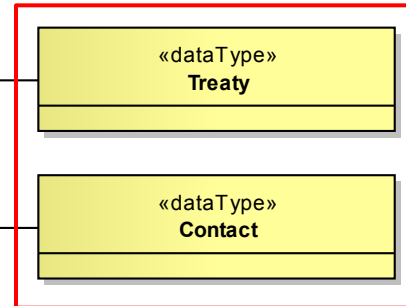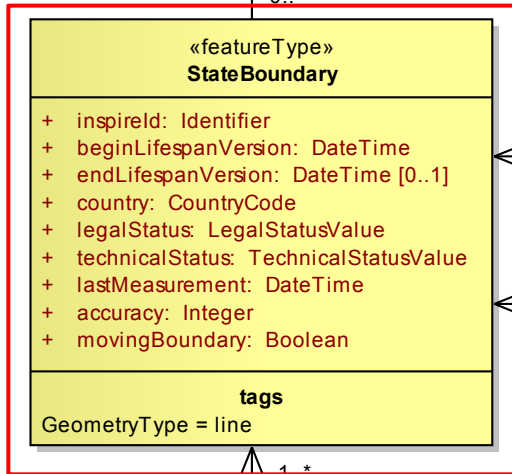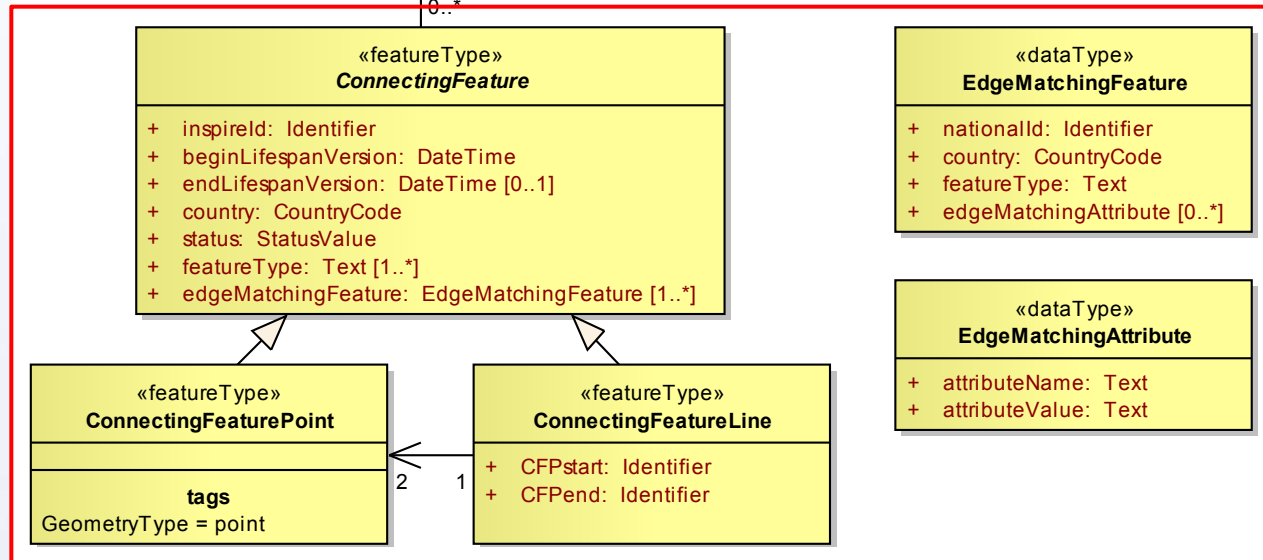**Dataset** «dataType»
+ name: Text
+ referenceScale: Integer
+ lastUpdate: Date

Metadata (level of detail)
State boundaries: based on INSPIRE feature type AdministrativeBoundary, additional attributes

StateBoundary «featureType»
+ inspireId: Identifier
+ beginLifespanVersion: DateTime
+ endLifespanVersion: DateTime [0..1]
+ country: CountryCode
+ legalStatus: LegalStatusValue
+ technicalStatus: TechnicalStatusValue
+ lastMeasurement: DateTime
+ accuracy: Integer
+ movingBoundary: Boolean

tags
GeometryType = line

Treaty «dataType»

Contact «dataType»

Metadata: information about boundary treaties and point of contact

ConnectingFeature «featureType»
+ inspireId: Identifier
+ beginLifespanVersion: DateTime
+ endLifespanVersion: DateTime [0..1]
+ country: CountryCode
+ status: StatusValue
+ featureType: Text [1..*]
+ edgeMatchingFeature: EdgeMatchingFeature [1..*]

EdgeMatchingFeature «dataType»
+ nationalId: Identifier
+ country: CountryCode
+ featureType: Text
+ edgeMatchingAttribute [0..*]

EdgeMatchingAttribute «dataType»
+ attributeName: Text
+ attributeValue: Text

Edge matching concept: connecting features and link to national objects by inspireId

ConnectingFeaturePoint «featureType»

tags
GeometryType = point

ConnectingFeatureLine «featureType»
+ CFPstart: Identifier
+ CFPend: Identifier

0..1..*
1..*
0..*
2   1

Next steps

- Make SBE Regional Level available for a broader audience

- Compile SBE database for other level of detail (master data level)

- Set up web service (web tool) for automatic edge matching
  ($\rightarrow$ E.L.F. project)

Conclusion

- Edge matching to agreed state boundaries is necessary to use different national INSPIRE datasets in pan-European context.

- SBE project will provide the legal definition of state boundaries in different levels of detail and additional connecting features to support edge matching.

- First realisation for European coverage is SBE in regional level of detail.

Contact / References
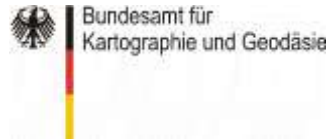
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State Boundaries of Europe (SBE), EBM, ERM

www.eurogeographics.org/sbe

www.eurogeographics.org/products-and-services

Edge matching concept (ESDIN project)

http://www.esdin.eu/sites/esdin.eu/files/D9.1_EdgeMatching-ProcessSpec_v1.0.pdf

➔ E.L.F. Project (start 03/2013)