EuroRegionalMap and EuroGlobalMap

A Technical Challenge Building European Spatial Reference Data

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Content

- Introduction to EuroRegionalMap (ERM) and EuroGlobalMap (EGM)
- Presentation of the workflow and usage of ESRI software
  - Data model and data formats
  - National data production
  - Building a European-wide dataset
- Conclusion / Future

EuroGeographics

- Association of European National Mapping and Cadastral Agencies
- currently 49 member organisations from 42 countries
- **Vision** → Interoperability of European mapping & other GI data

EuroRegionalMap
1: 250 000

Projects
Harmonisation
Data models
Spatial
reference data

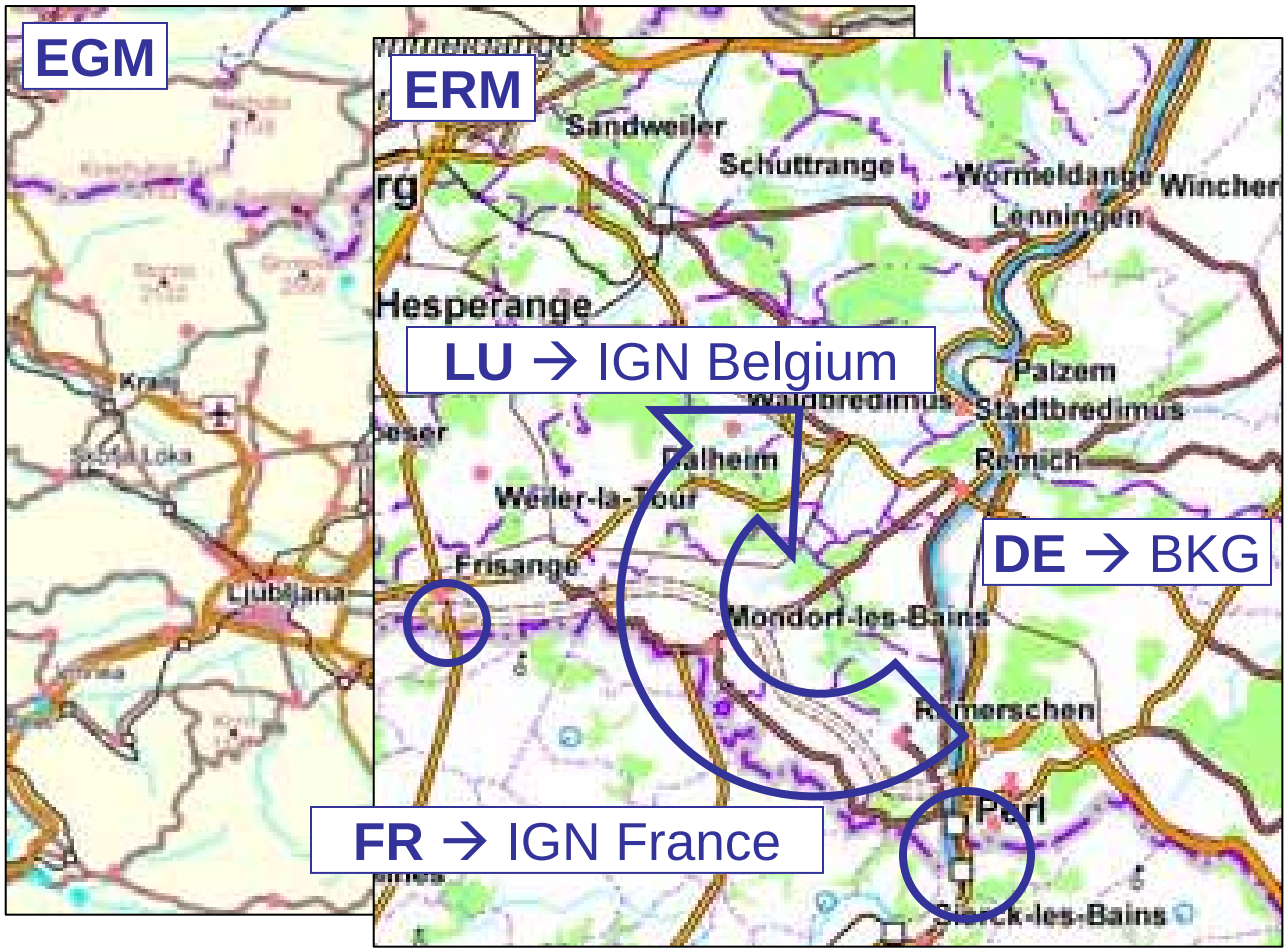
EuroGlobalMap
1:1 Mio

European Datasets

- Uniform Geodetic Reference System
- Common specification for all participating countries
- No gaps or overlaps along the boundaries
- European wide coverage
- Common marketing and licensing conditions

- Other advantages of ERM / EGM:
  - Authorised data of NMCAs
  - Assured maintenance and update of data
  - High quality standard
  - Detailed documentation, Metadata (ISO 19115)
  - Online delivery

European Datasets



- Authorised data
- Comparable content / density of objects
- Seamless water & transportation network

EuroRegionalMap (ERM)

1:250 000

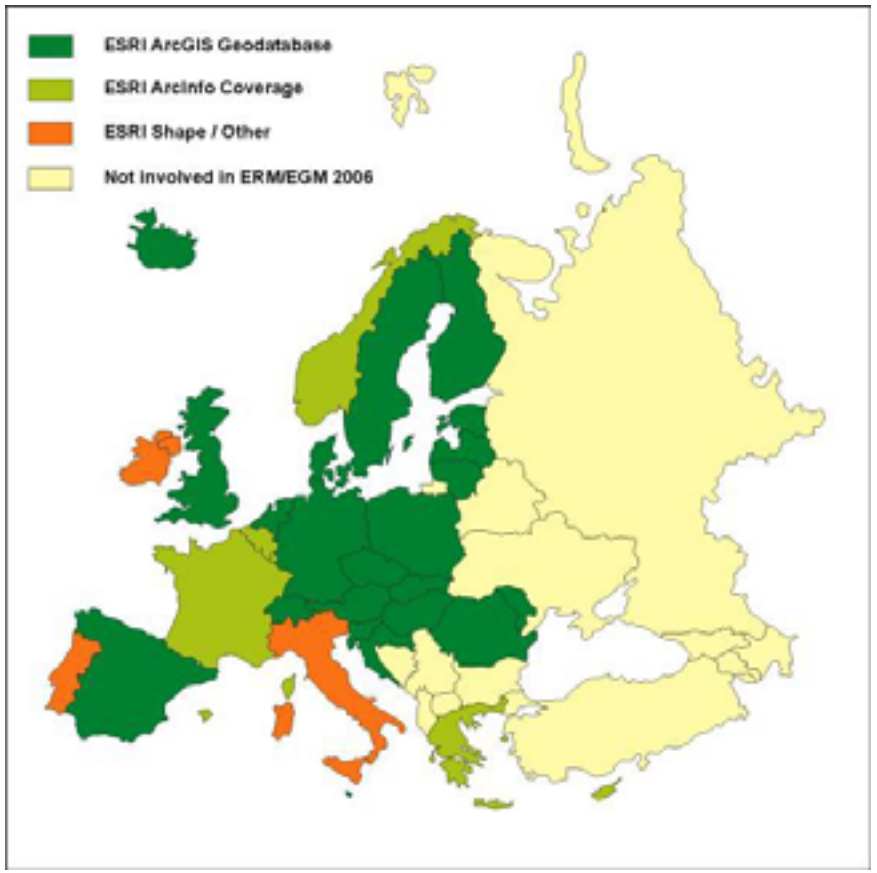
EuroGlobalMap (EGM)

1:1 Mio

7 countries → ERM 2006: 31 countries	32 countries → EGM 2006: 32 countries
Geodetic Datum: ETRS89 (~WGS84)	
Coordinate System: Geographic in Decimal degree	
Accuracy: 125 m	Accuracy: 1000 m
Themes: Administrative boundaries, Hydrography, Transportation, Settlements, Named Locations	
Vegetation, Miscellaneous	Spot elevation
Delivery formats: ArcExport (e00), ArcGIS Geodatabase, Shape, MapInfo	

Organisation of work for ERM / EGM

- Decentralised organisation of work
  - All participating countries produce their own data according to the specification
- QA/QC by Regional Coordinators
- Data Integration and final data assembly by project leader:
  - ERM: IGN Belgium
  - EGM: NLS Finland



Workflow

Data Model

- Common specification
- Definition of data formats
- Technology, Guidelines

National Data Production

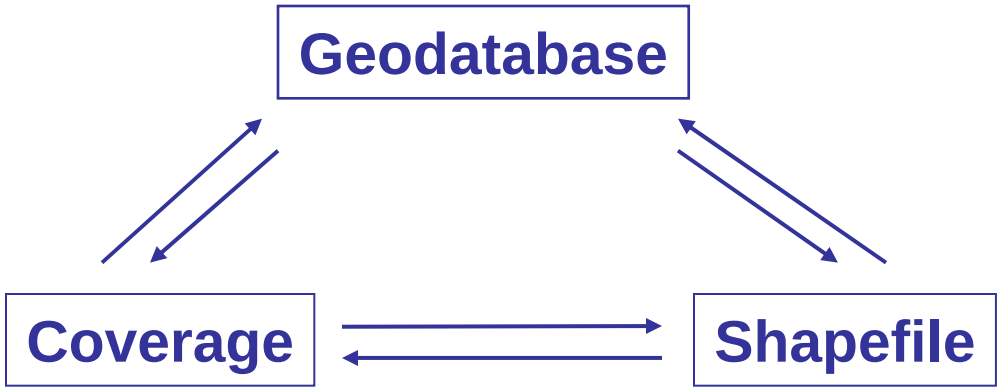
- Derivation from national database
- Editing
- QA/QC

European Reference Data

- Data exchange
- Edgematching
- QA/QC

Data Formats

- Previous data formats: ArcInfo Coverage, data exchange also in Shape-File
- ERM / EGM Update 2006: Geodatabase ⇔ Coverage



Problems:

- Coordinate precision
- Codepages
- Annotation

Investigation of Problems in Data Exchange

- Precision
  - Interrelation between precision, cluster-tolerance and coordinate displacement
  - Max displacement of coordinates in diff. data formats of 4 cm with choosen spatial reference
  - Topology can be recovered
- Codepages
  - Conversion of text attributes in country specific codepages to Unicode and vice versa
  - Description of workflow and tools
- Annotation
  - No satisfying result yet

Implementation into ArcGIS Geodatabase

- Requested by customers
- More possibilities in data modelling
  (e.g. Feature Classes with Subtypes)
- Coded/Range values for attributes (Domains)
- Topological relationships
- Names in Unicode (all European Characters available)

Coverage with Codepage

Èeská republika
ÅËËÁÓ
Deutschland

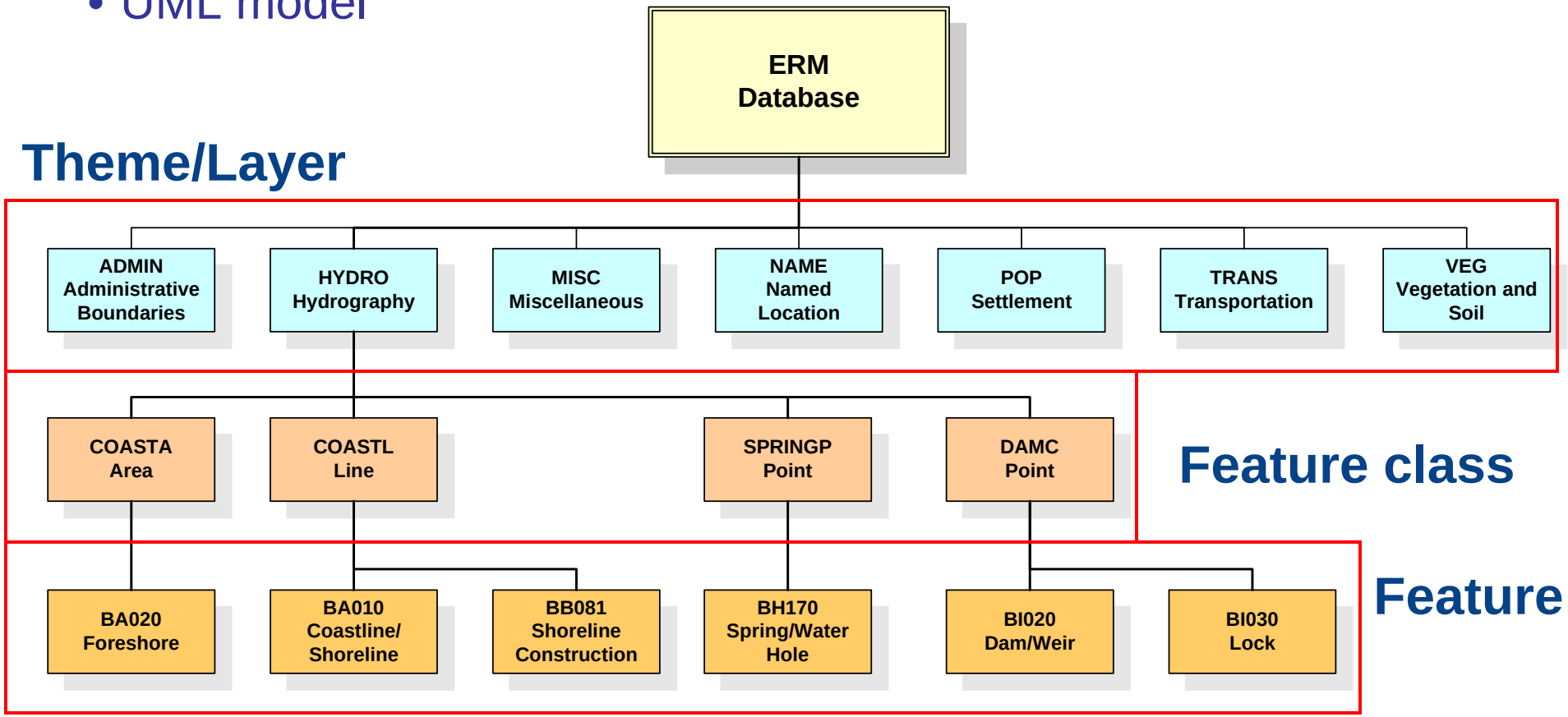
Geodatabase with Unicode

Česká republika
ΕΛΛΑΣ
Deutschland

→ Improvement of Data Production and Quality Control

Data Schema

- UML model



Data Model

→ Implementation as ArcGIS Personal Geodatabase:

- Definition of coordinate system, X/Y extent, precision
- One feature dataset (→ setting topology)
- Feature classes, one annotation feature class (Named Locations)
- Features as subtypes
- Domains for attributes
- Tables with relationship classes

National Data Production

- Import from previous ERM / EGM Version
- Import from national Database

ArcCatalog: Load	• Interactive procedure
ESRI Production Line Toolset (PLTS)	• Automated procedure • Cross-Reference Database contains selection and attribute reference
FME	• Automated procedure with FME workbench • Diverse data formats • Selection and attribute reference • Geometric selection • Calculate/Set attribute values

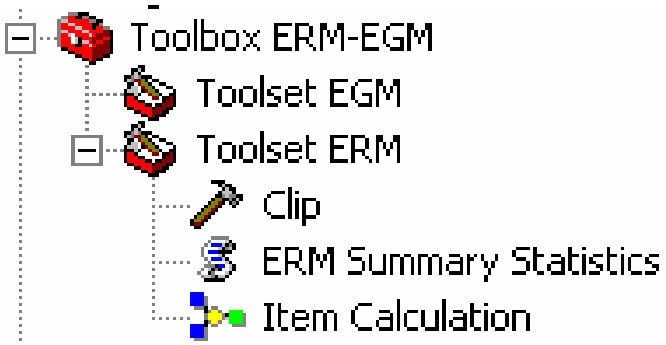
National Data Production

- Editing according ERM / EGM specification:
  - Generalisation

National database ⇨ **ERM /EGM**: Geometric resolution: area, line, point offset

  - Attribute completeness
    - E.g. populating administrative key codes, National hydrographic identifier, Road numbers

- Tools:
  - Geoprocessing tools
  - Models, scripts



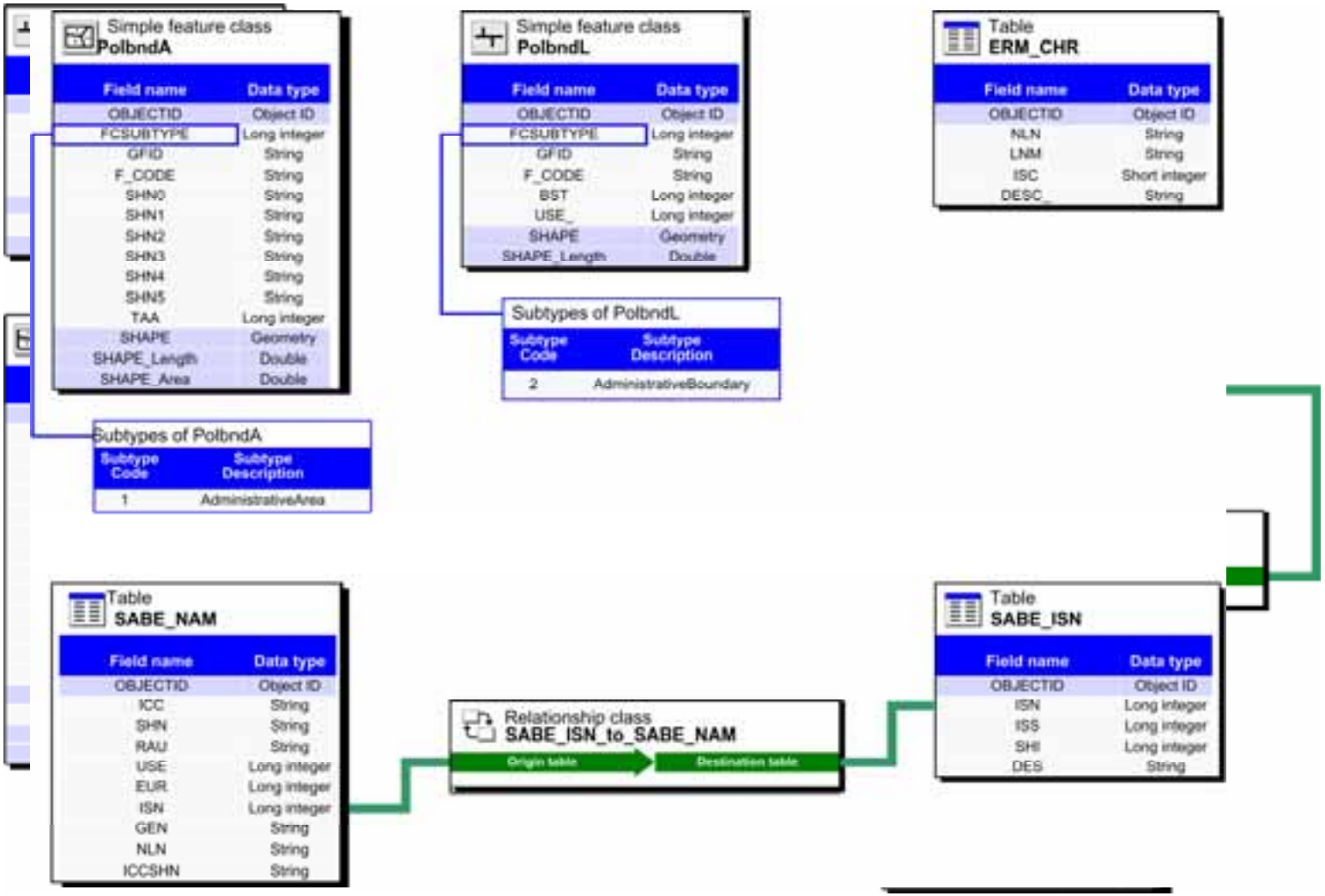
Data production Switzerland

- Building cross-reference documentation, starting from the target model it describes the derivation from the source
  - Documentation of production
  - Maintenance and update
  - Source for metadata production
- Derivation and transformation of data
- Editing the derived data
  - Topological relationship with other layers
  - Correction
  - QA/QC

Derivation of ERM Administrative Boundaries (CH)

Source
National database **VECTOR200**
SABE

Target
ERM



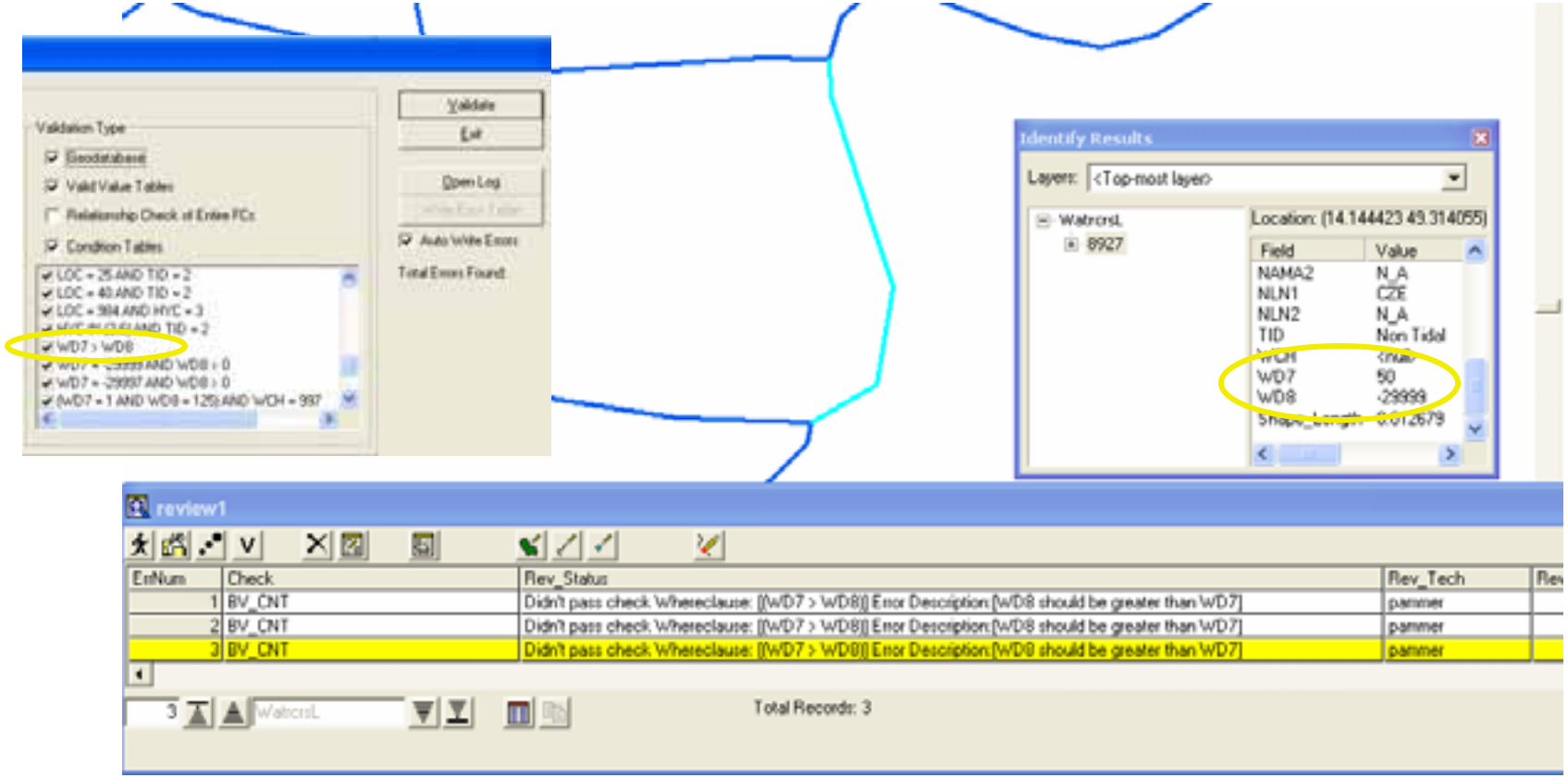
Quality Control

- Checking compliance with specification
- Identify feature and attribute discrepancies and inconsistencies
- Feature density, generalisation degree

PLTS Data Reviewer (Knowledgebase)	• Automated validation of attribute domains as well as combinations of attributes • Validation of minimum dimensions
GDB Topology	• Validation of topology • Not all relationships can be defined
Scripts	• Validation of generalisation degree, • Attribute completeness
Visual control	• Necessary as not all checks can be automated (e.g. feature density)

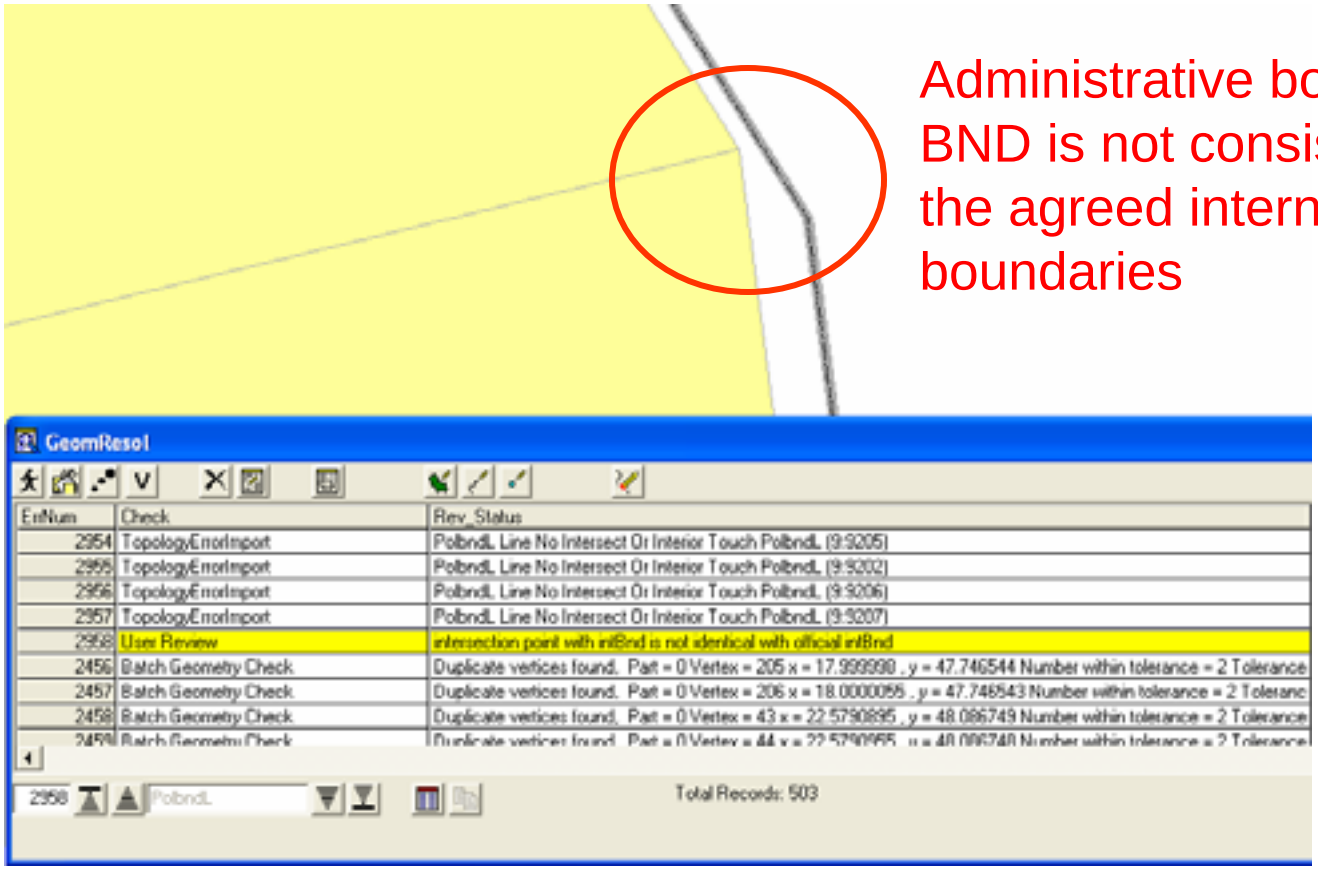
Quality Control - Examples

- Automated validation of attribute domains: e.g. watercourse width



Quality Control - Examples

- Validation of topology for the database



Quality Control - Examples

- Python script: Automated validation of generalisation degree

```
Start SumStat at Wed, 19 Apr 2006 15:54:53

Delete output tables SumStat_* if they exist.

Feature Class: PolbndL_Lambert
ShapeType of PolbndL_Lambert: Polyline
:) Found item CountVerts and Dist
   Perform Summary Statistics
    Mean distance between vertices: 131.673244294
End Processing...PolbndL_Lambert


Feature Class: PolbndA_Lambert
ShapeType of PolbndA_Lambert: Polygon
:) Found item CountVerts and Dist
   Perform Summary Statistics
    Mean distance between vertices: 114.670274347
End Processing...PolbndA_Lambert

End SumStat at Wed, 19 Apr 2006 15:55:02
```

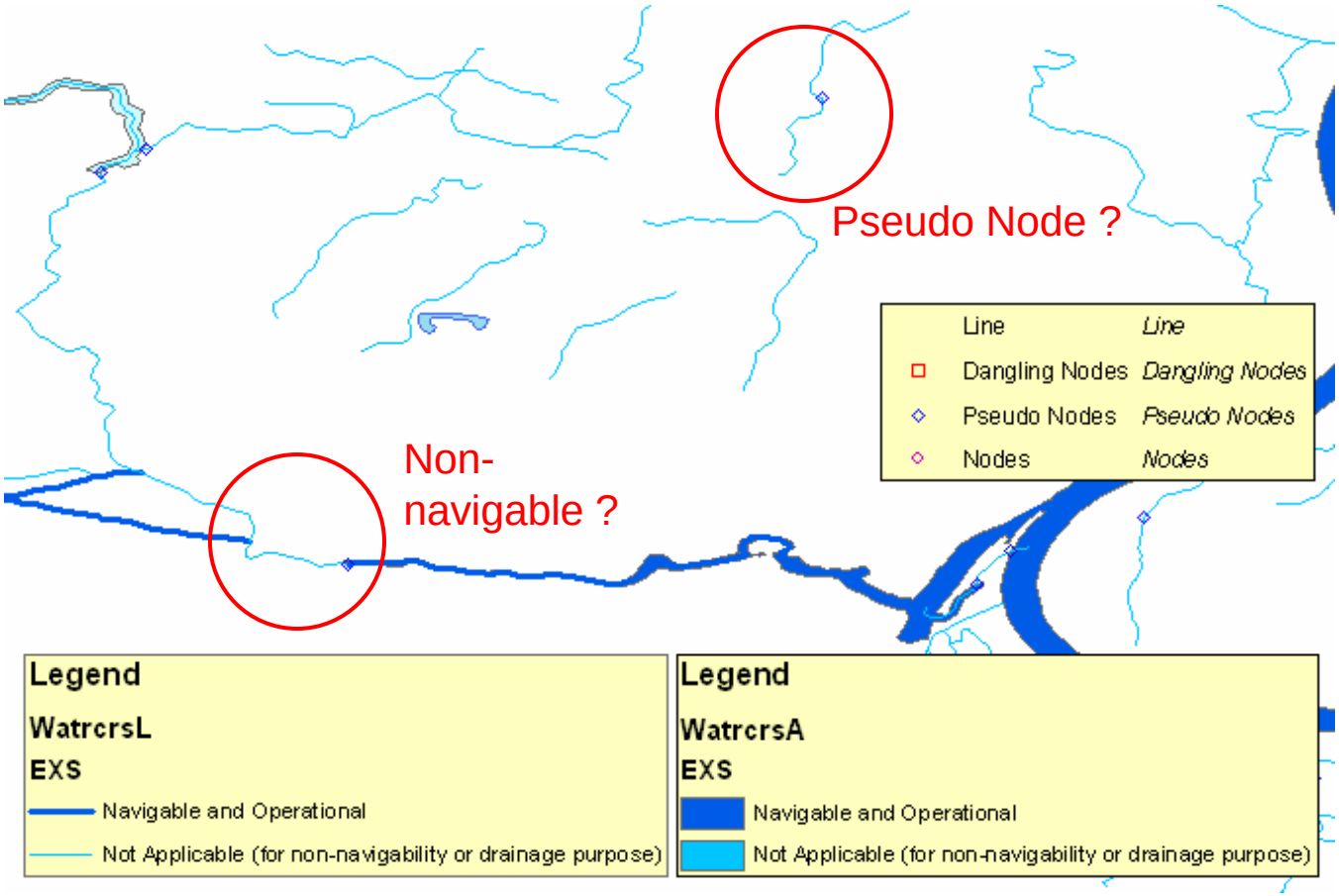
- Python Script: Attribute Completness

```
Item Statistics (Attribute Completion rate)
Start at Fri, 21 Apr 2006 16:31:41

Feature Class: WatrcrsL
==================
Field: EXS
Value = 724 --> 117 objects - 0%
>>> Value = 998 --> 14484 objects - 99%
--------------------
Field: HOC
Value = 4 --> 94 objects - 0%
Value = 5 --> 14507 objects - 99%
--------------------
Field: HYC
Value = 6 --> 11 objects - 0%
Value = 8 --> 14590 objects - 99%
--------------------
Field: LOC
Value = 8 --> 12108 objects - 82%
Value = 40 --> 24 objects - 0%
Value = 984 --> 2469 objects - 16%
--------------------
Field: NHI
>>> Value = N_P --> 14601 objects - 100%
--------------------
Field: NAMA1
```

Quality Control - Examples

- Visual Control



European wide dataset

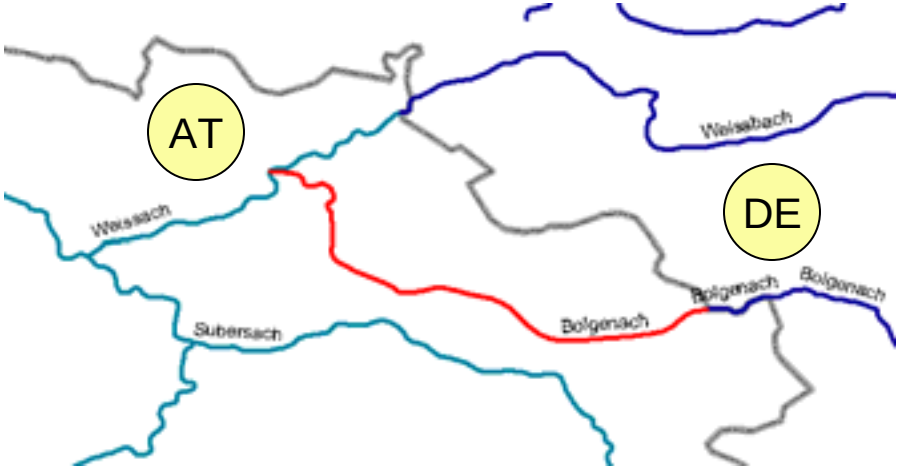
- Data Exchange:
  - Personal Geodatabase (for single layer)
  - Export as coverage (e00) → for countries working with ArcInfo
  - Through Internet based services (e.g. Projectplace)

- Edgematching:
  - Bilateral edgematching along international boundaries:
    - Geometric matching (common endpoints or consistent geometry of boundaries)
    - Create cross-border network (e.g. watercourses, roads)
    - Complete attribution of features on the boundary

Edgematching - Examples

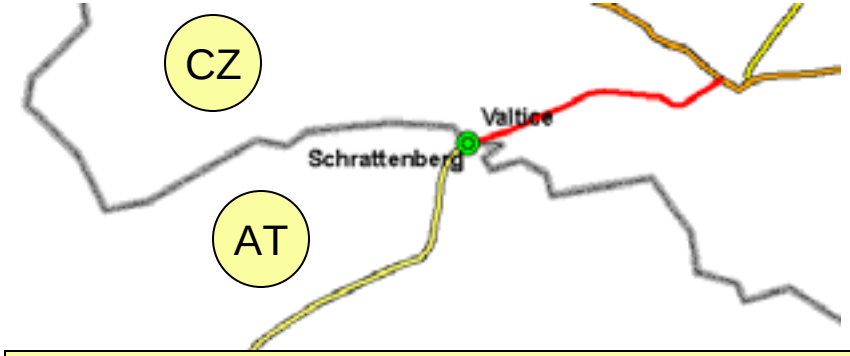
- Create cross-border network, e.g. watercourses Germany - Austria

EGM - HYDRO



- Complete attribution of features on the boundary

EGM - TRANS



Attributes for bordercrossing point

Attribut	Original AT	Original CZ	EGM
NAMN1	Schrattenberg	Valtice	Valtice
NAMN2	N_A	N_A	Schrattenberg
NAMA1	Schrattenberg	Valtice	Valtice
NAMA2	N_A	N_A	Schrattenberg
NLN1	GER	CZE	CZE
NLN2	N_A	N_A	GER

Conclusion / Future

- EuroRegionalMap / EuroGlobalMap meet the requirements of European spatial reference data
- ESRI ArcGIS provides improved possibilities in data modelling, production and QA/QC
- Implementation of PLTS and FME
- Improved functionality of ArcGIS desirable

- Availability of ERM / EGM:
  - Version 2.0 (2006) available

- Customers:
  - European Commission (EuroStat)
  - International River Commissions of Rhine, Elbe, Danube
  - Alpine Convention

European datasets

- Contact:
  - EuroGeographics (Online Ordering & Delivery System): www.eurogeographics.org