

Semantic model transformation within the context of INSPIRE

unter der Anleitung von

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Motivation



In May 2007 INSPIRE (Infrastructure for Spatial Information in the European Community) entered into force
Aims to ensure
compatibility
usability
in a community and cross-boundary context



Geodata infrastructure law GeoDIG establishing a Geodata infrastructure in Austria

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Motivation

INSPIRE offers the users to

- » **find**
- » **browse**
- » **share**
- » **and download**


spatial data

Problem: every state or federal offices

- » **create**
- » **manage and**
- » **provide**

in different systems, models and data formats

Solution: Harmonization of data models with the implementation of transformation services for geodata.



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Data Model Basics

Model transformation of geodata

» Syntactical transformation

Syntax of geodata is converted -> insufficient for the purpose of use

» Semantic transformation

Data is restructured, supplemented and/or reduced to fit
the target model

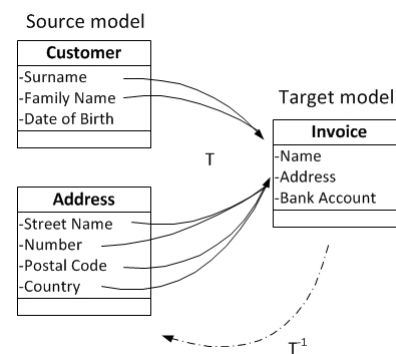
enables exchange of heterogeneous data

Data Model Basics

Semantic Transformation

Problems:

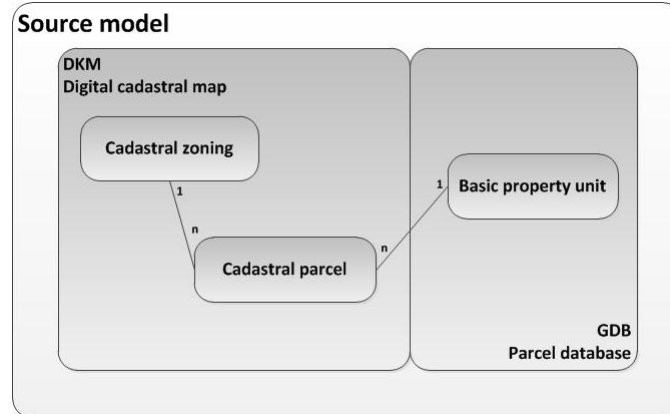
1. Lossless mapping of the semantics between different data models is not possible
2. The bijectivity of mapping rules from source- to target model is not guaranteed



Source model for CP (Austria)

Based on 2 pillars

- » cadastre (its technical implementation: digital cadastral map DKM)
- » land register



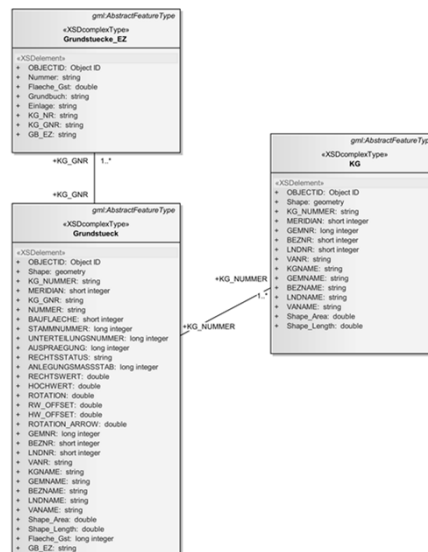
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Source model for CP (Austria)

Source model consist of:

- » Grundstück = parcel
- » Grundstück_EZ = parcel_basic property unit
- » KG = cadastral zoning



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Target model for CP (INSPIRE)

Target model consist of:

- » BasicPropertyUnit
- » CadastralBoundary
- » CadastralParcel
- » CadastralZoning

```

classDiagram
    class BasicPropertyUnit {
        + InspireID: Identifier
        + InspireID: CadastralReference: CharacterString
        + area: Area [0..1]
        + validFrom: DateTime
        + validTo: DateTime [0..1]
        + constraints: validation
        + InspireID: Response: DateTime
        + InspireID: Response: DateTime [0..1]
    }
    class CadastralParcel {
        + geometry: GM_Object
        + InspireID: Identifier
        + label: CharacterString
        + InspireID: CadastralReference: CharacterString
        + area: Area [0..1]
        + areaAccuracy: GM_Length [0..1]
        + validFrom: DateTime [0..1]
        + validTo: DateTime [0..1]
        + constraints: validation
        + InspireID: Response: DateTime
        + InspireID: Response: DateTime [0..1]
    }
    class CadastralBoundary {
        + geometryType: GM_Curve
        + InspireID: Identifier [0..1]
        + constraints: validation
        + InspireID: Response: DateTime
        + InspireID: Response: DateTime [0..1]
        + area: Area [0..1]
        + areaAccuracy: GM_Length [0..1]
        + validFrom: DateTime [0..1]
        + validTo: DateTime [0..1]
    }
    class CadastralZoning {
        + geometry: GM_MultiSurface
        + InspireID: Identifier [0..1]
        + label: CharacterString
        + InspireID: CadastralReference: CharacterString
        + constraints: validation
        + InspireID: Response: DateTime
        + InspireID: Response: DateTime [0..1]
        + area: Area [0..1]
        + areaAccuracy: GM_Length [0..1]
        + name: CharacterString [0..1]
        + geometryType: GM_Surface [0..1]
        + geometryType: GM_Surface [0..1]
        + validFrom: DateTime [0..1]
        + validTo: GM_Period [0..1]
        + validTo: DateTime [0..1]
    }
    BasicPropertyUnit <|-- CadastralParcel
    BasicPropertyUnit <|-- CadastralBoundary
    CadastralParcel --> CadastralZoning : zoning
    
```

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Humboldt Alignment Editor

- » Open Source tool
- » implemented within an EU Project

```

graph LR
    A[Zielschema GML, XSD] --> HALE[HALE]
    B[Quellschema GML, XSD] --> HALE
    C[Quelldaten GML] --> HALE
    HALE --> D[Projektdatei XML]
    HALE --> E[Transformations-ergebnisse GML]
    HALE --> F[Transformations-export RIF CSV RDF OML HTML]
    
```

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Humboldt Alignment Editor

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Humboldt Alignment Editor

Using an overview table

INSPIRE Element	DKM Element	M/V	Bestand	HALE Transformationsfunktion
CadastralParcel	Grundstueck_14168_UTM33			Retype Feature
administrativeUnit	GEMNR		✓	Attribute Rename Function auf Untertyp title
areaValue	Flaeche_GST	M	✓	Attribute Rename Function
basicPropertyUnit	GB_EZ	V	✓	Attribute Rename Function auf Untertyp title
beginLifespanVersion	*	V	*	NilReason Function
endLifespanVersion	*	V	*	NilReason Function
geometry	SurfaceProperty	M	✓	Attribute Rename Function
inspireID	KG_GNR	M	✓	INSPIRE Identifier Function

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Limits of Implementation

- » **Not all voidable attributes could be filled**
 - INSPIRE Nil Reason
 - beginLifespanVersion, endLifespanVersion*
 - validFrom, validTo*

- » **INSPIRE ID couldn't be generated**

Mapping	
	KG_14168_UTM33.KG_NUMMER - CadastralZoning.inspireId
Entity 1	KG_14168_UTM33.KG_NUMMER
Entity 2	CadastralZoning.inspireId
Transformation	eu.esdihumboldt.cst.core.functions.inspire.IdentifierFunction
countryName	AT
providerName	BEV
productName	CadastralParcels

➔

INSPIRE ID

AT . 0002 . 06 . 04

Ländercode . Anbieter . Datenthema . Objektart

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Limits of Implementation

- » **Estimated Accuracy maximum positional error**
 - Default value 20m within the Alps

- » **Reference Point couldn't be generated**
 - CadastralParcels: Coordinates
 - CadastralZoning: CentroidFunction

Positives (links) und negatives (rechts) Ergebnis einer Centroid-Funktion

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Conclusion

Most relevant results:

- » Finding and investigating current transformation tools and their transformation language
- » Analyzing the source model
- » Analyzing the target model
- » Establishing, executing and validating a prototype transformation

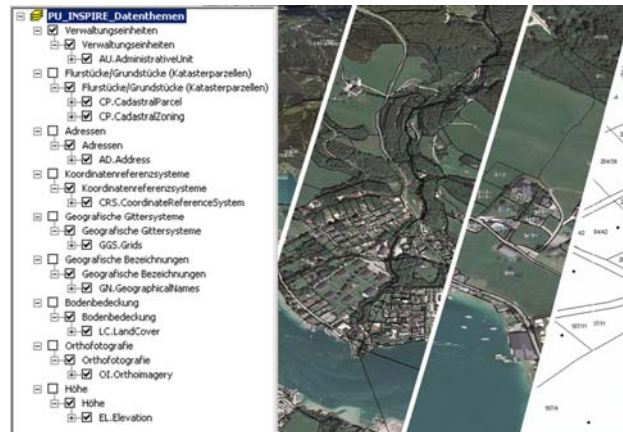
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Conclusion

- » In principle, semantic model transformation is **possible**
- » Austrian data model **fulfills** the INSPIRE target model
- » The tool shown is still **under-development**, essential functions are missing
 - So keep an eye on development
- » Data model in Austria will be **changed**
- » Current implementation at BEV: Download and Transformation services

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Thanks a lot for your attention!!!



Datathemes of INSPIRE WMS in BEV, in different scales