Swiss Cadastral Core Data Model – Experiences of the last 15 years

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- Cadastral Data Model (introduced 1993)
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**Switzerland: Federated Country with 26 Cantons**

- 7.3 million people
- 41'290 km²
- 4.0 million parcels

Cantons maintain political and administrative bodies on their own.
... and 2903 Municipalities

Cantons are further divided into municipalities
Organisation of cadastral surveying

**Level**
- Confederation
- Canton
- Municipality

**Organisation**
- **Federal Directorate of Cadastral Surveying**
  - ~15 employees
- **Cantonal Surveying Offices**
  - ~300 employees
- **Private Land Surveying Offices / City Surveying Offices**
  - ~3000 employees

**Tasks**
- Supervision, strategic management
- Operational management
- Execution
Reform of cadastral surveying (1980's)

Principles of Reform Project RAV:
- Minimum of regulations on the Federal level
- Avoidance of double data acquisition
- Increase of data actuality
- Freedom of data acquisition method
- Data as basis for LIS as well (not only registry)

Legal basis for AV93:
- Ordnance for Official Surveying (VAV, 1.1.1993)
- Technical Ordnance for Official Surveying (TVAV, 1.7. 1994)

‡ Extension of purpose (not only land registry, also land information in general)
‡ Need of flexible data exchange mechanism
Reasons for data modelling

• high value of data vs. short life span of HW/SW
• data need to be transferred from older to newer systems
• devolution and networking (flexible and easy data sharing without information loss)

• product definition for introduction of tendering process (method and system independent) † model-based approach
• separation of data model and description language (data models always evolve, concept can be used for any other data model)

• quality checking and assurance
• long-time archiving
Core Data Model of Swiss Cadastral Surveying

Digital data description AV93 (introduced in 1993)

8 Information Layers
(Possibility to manage the layers separately)

Data Model (UML)
(8 Entity-Relationship-Diagrams)

Data Description Language
INTERLIS

Core Data Model
Swiss Cadastral
Standardization Workshop,
Bamberg, 10 Dec. 2004
INTERLIS

- object-oriented (can also deal with non-geographic data)
- effortless transfer of data without loss of semantic, topologic and geometric information
- complementary to UML (automatic generation of transfer file)
- clear distinction between real world object and its graphical representation
- structured language
- easily readable by humans

```
MODEL DM01AVCH24D

  TOPIC Liegenschaften = ......
  TABLE Grundstueck =
    Gueltigkeit: (rechtskraeftig, streitig); Art: Grundstuecksart; ......
  END Grundstueck;

  TABLE Liegenschaft =
    Liegenschaft_von: -> Grundstueck ......
  END Liegenschaft;

END Liegenschaften.

END DM01AVCH24D.
```
### Possible Structure for LIS

<table>
<thead>
<tr>
<th>Legal topic</th>
<th>spatial data</th>
<th>textual data</th>
<th>Stakeholders (data owners)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water protection</td>
<td></td>
<td>Local government</td>
<td></td>
</tr>
<tr>
<td>Noise protection</td>
<td>Local government</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental protection</td>
<td>Environmental department</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land use planning</td>
<td>Planning department</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indigenous land rights</td>
<td>Tribe, clan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collective land rights</td>
<td>Corporations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land ownership, cadastre</td>
<td>National government State government Local government</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Two preconditions:**

- **common geodetic reference framework**
- **common data modelling concept**
Case Study DM.01

1994: introduction of data model "AV93"

Shortcomings in AV93 data model:
- one data model with cantonal options (for political reasons)
  - heterogeneous development
  - too many cantonal options
  - no easy solution to consolidate data on federal level

2004: revised data model "DM.01"

Main changes are:
- one clearly defined federal data model
- hierarchy of data models (Cantons can add options to federal model, but have to provide data in federal model)
- checking of data becomes much easier + introduction of check service on Internet
- technical possibility of incremental updating (requires OID and INTERLIS2)
Federal Model as Core for Other Models
Incremental Updating with INTERLIS2

Initial full data transfer
Update or delete

Incremental data provision

Primary DB

Secondary DB

Secondary DB

Incremental updating requires the introduction of an object ID (OID).
<table>
<thead>
<tr>
<th></th>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
</table>
| **INTERLIS2** | • precise and lean  
• version 1 already passed the test of practice  
• evolution rather than revolution  
• many software tools  
• UML and text | • only modelling and transfer  
• 'island' solution (national solution)  
• too good version 1  
• yet unclear role of XML (schema)  
• how to deal with further extensions? |
| **GML3** | • large basis in market  
• pragmatic modelling language  
• part of a standard family  
• application language | • flood of versions  
• large and complex  
• restrictions of the XML schema  
• cryptic model descriptions  
• lack of practice  
• lack of producer support |

(Nebiker, 2004)
Schema GeoPortal

Products
Services

Viewer
Plotter
Shop
Server

Interface

Data platform

Data platform

Data capture
Data maintenance
Updating

Municipality
Surveyor
Utilities
Eng. Office

swisstopo

Swiss Cadastral
Core Data Model

Standardization Workshop,
Bamberg, 10 Dec. 2004
be-geo.ch

- Seeland / Jura
- Region Bern
- beodat
- Thun-Innertport
regio-geo.ch / e-geo.ch
GeoData-Shop

Information über vorhandene Datensätze
Suchen nach Adressen und Parzellen
Bestellen in Standardformaten Geobau und INTERLIS

Ausschnitt suchen
GeoPlotter

Preisberechnung

Datenprodukt bestellen

Preis für aktuelle Selektion
Ausgabe und Vetriebstkosten

Orientierungskopie: SFr. 14.00
MwSt. 7.68 : SFr. 1.10
Total : SFr. 15.10

GeoPlotter
Sichten und drucken von massstäblichen Plänen
GeoViewer

Ansicht LK Abwasser

Zusätzlich zu GeoPlotter:
Anbindung an GRUDIS
Nutzer- und Sichtenverwaltung
Individuelle Freigabe der Gemeindedaten (z.B. Leitungskataster)
GeoViewer

Bauinventar Stadt Thun

Verknüpfung zu online Objektblatt auf www.thun.ch

GeoViewer  Zusätzlich zu GeoPlotter:
Anbindung an GRUDIS
Nutzer- und Sichtenverwaltung
Individuelle Freigabe der Gemeindedaten (z.B. Leitungskataster)
Case Study "Kleine Schnittstelle"

Data model
Land Registration

Data model for data exchange

Data model
Cadastre

GB System A

GB System B

GB System C

GB System D

GB System X

AV / GB

AV System A

AV System B

AV System C

AV System D

AV System X

AV System X

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Lessons Learned (1/2)

• constant dialogue between authorities and private sector is crucial
• very important political argument: data are the most expensive element in cadastre – and therefore have to be protected against the fast changes in hard- and software systems;
• acceptance of INTERLIS concept in practice was not very high initially; only the development and provision of software tools made a difference and produced tangible benefits;
• creation of a competence centre for data modelling and data exchange provided the crucial support for the INTERLIS concept;
Lessons Learned (2/2)

- the supervising body for cadastral surveying on the federal level used its subsidy system to put financial pressure on the implementation of the INTERLIS concept;

- transparent communication: it was important to communicate that the data model as well as the description language are in constant development; the first revisions have now been made with DM.01 and INTERLIS2 and the changes were understood and accepted by partners.