



**swisstopo**



Bundesamt für Landestopographie  
Office fédéral de topographie  
Ufficio federale di topografia  
Uffizi federal da topografia

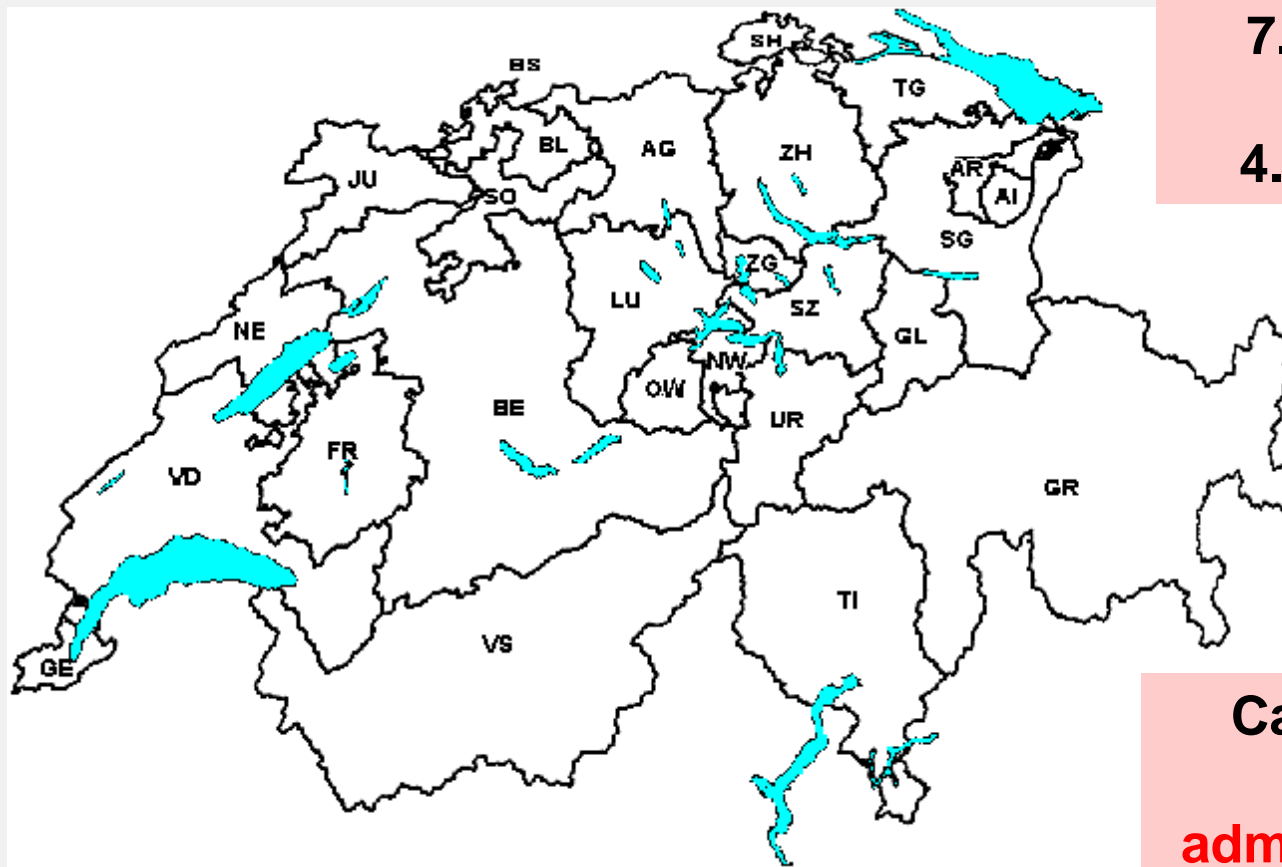
# **Swiss Cadastral Core Data Model – Experiences of the last 15 years**

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Federal Directorate of Cadastral Surveying

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- **Cadastral Data Model (introduced 1993)**
- **Experiences and Developments since**
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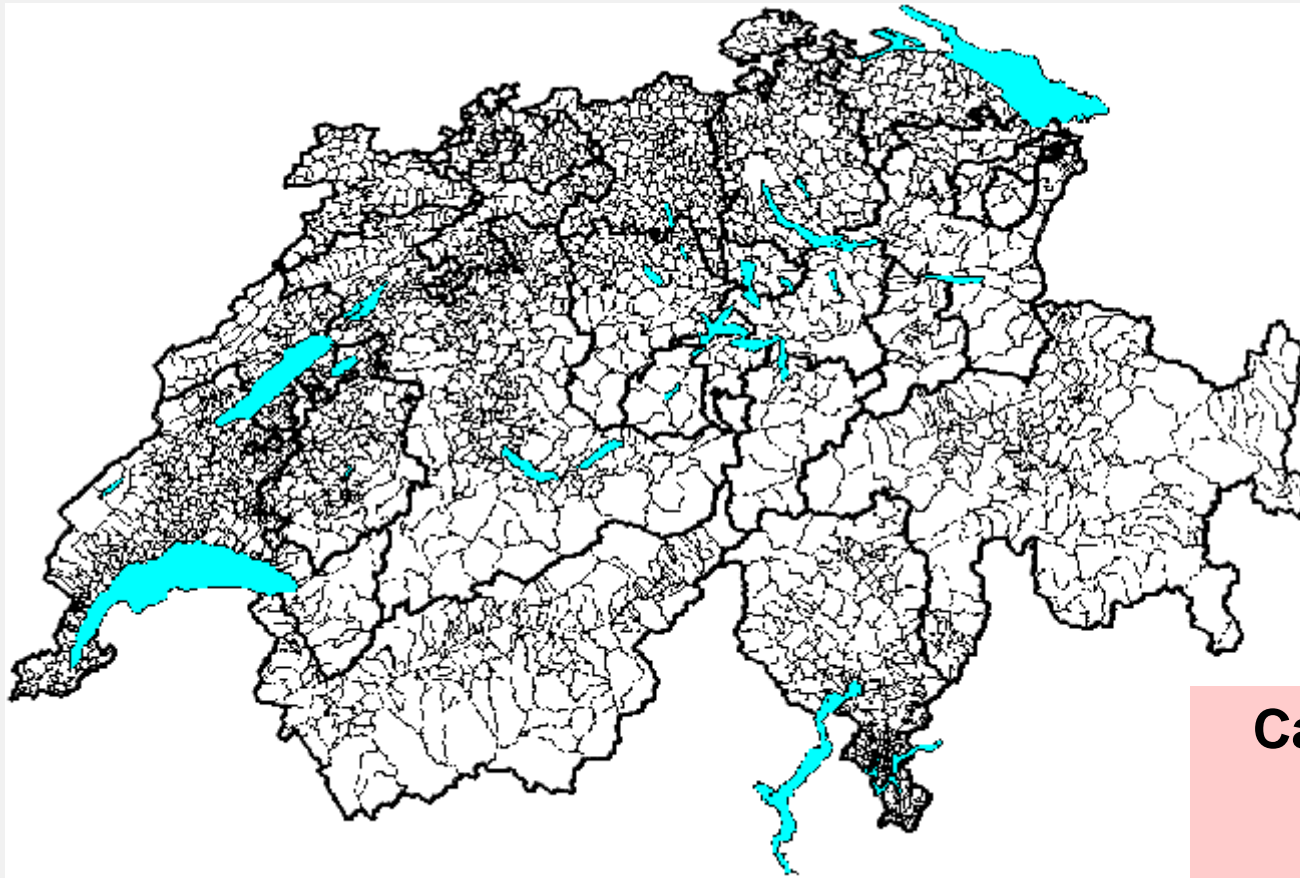
# Switzerland: Federated Country with 26 Cantons...



7.3 million people  
41'290 km<sup>2</sup>  
4.0 million parcels

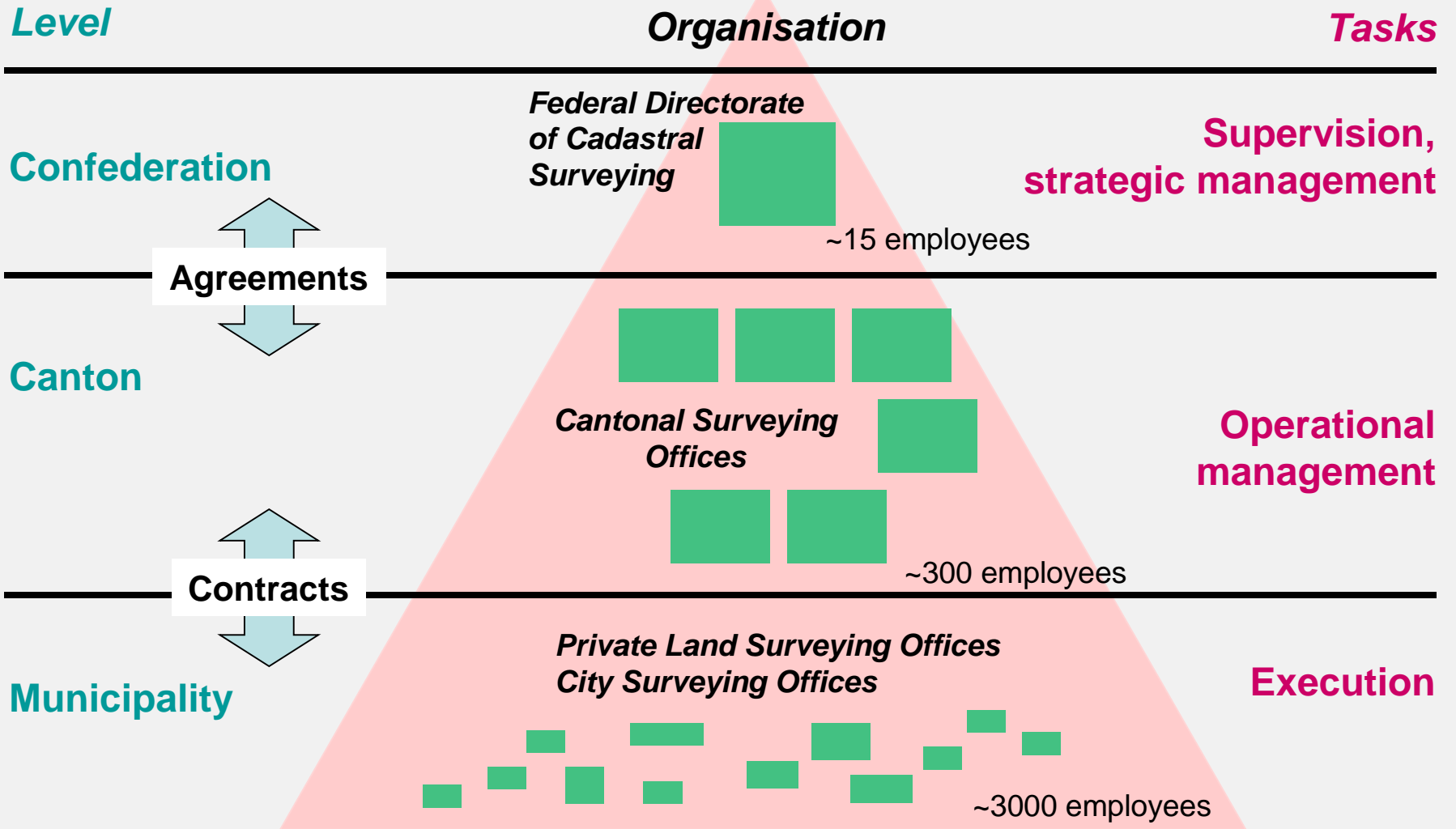
Cantons maintain  
political and  
administrative bodies  
on their own

## ... and 2903 Municipalities



Cantons are further  
divided into  
municipalities

# Organisation of cadastral surveying



# 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)**

1992

## Legal basis for **AV93**:

- Ordinance for Official Surveying (**VAV, 1.1.1993**)
- Technical Ordinance for Official Surveying (**TVAV, 1.7. 1994**)

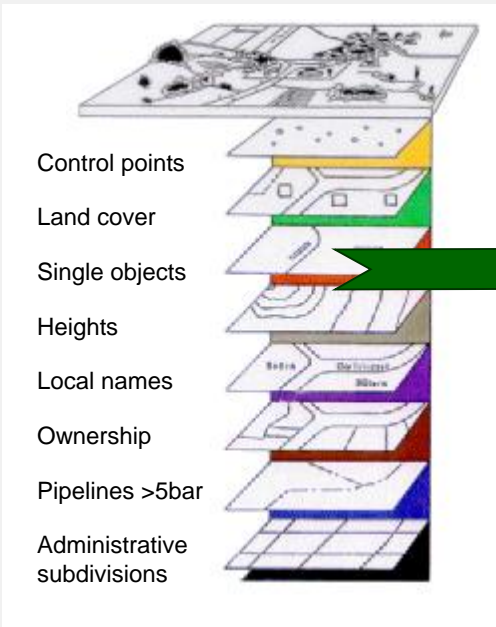
- à **extension of purpose (not only land registry, also land information in general)**
- à **need of flexible data exchange mechanism**

## Reasons for data modelling

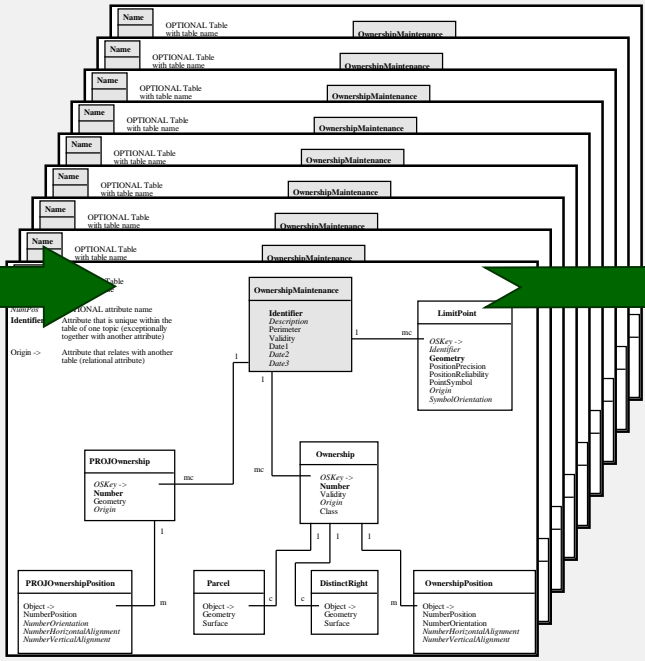
- high value of data vs. short life span of HW/SW
- data need to be transferred from older to newer systems
- devolution and networking (flexible and easy data sharing without information loss)
- product definition for introduction of tendering process (method and system independent) → model-based approach
- 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)

```
TRANSFER Data_Catalogue;
MODEL Basic_Data_Set
DOMAIN
  LKoord = COORD2  48000.000  70000.000
                84000.000  30000.000;
  HKoord = COORD3  48000.000  70000.000    0.000
                84000.000  30000.000  5000.000;
  Height = DIM1  0.000  5000.000;
  Precision = [0 .. 300];
  Reliability = (yes, no);
  LetterOrientation = GRADS  0.0  400.0;
  Status = (planned, valid);

TOPIC Control_Points =
  .....
END Control_Points;

TOPIC Land_Cover =
  .....
END Land_Cover;

TOPIC Ownership =
  .....
  OwnershipType = (parcel, distinct_right,
                  construction_right, water_source_
                  right);

TABLE LimitPoint =
  OSKey: OPTIONAL -> OwnershipMaintenance;
  Identifier: OPTIONAL TEXT*12;
  Geometry: LKoord;
  PositionPrecision: Precision;
  PositionReliability: Reliability;
  Origin: OPTIONAL TEXT*30;
  SymbolOrientation: OPTIONAL LetterOrientation;
  !! Default: 0.0
  IDENT
  Geometry;
END LimitPoint;
END Ownership;
END Basic_Data_Set.
```

Data Description Language  
INTERLIS



# 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













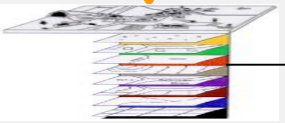

  TOPIC Liegenschaften =
    .....
    TABLE Grundstueck =
      Gueltigkeit: (rechtskraeftig, streitig);
      Art: Grundstuecksart; .....
    END Grundstueck;

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

  END Liegenschaften.

END DM01AVCH24D.
```

# Possible Structure for LIS

Legal topic	spatial data	textual data	Stakeholders (data owners)
Water protection			Local government
Noise protection			Local government
Environmental protection			Environmental department
Land use planning			Planning department
Indigenous land rights			Tribe, clan
Collective land rights			Corporations
Land ownership, cadastre			National government State government Local government

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:

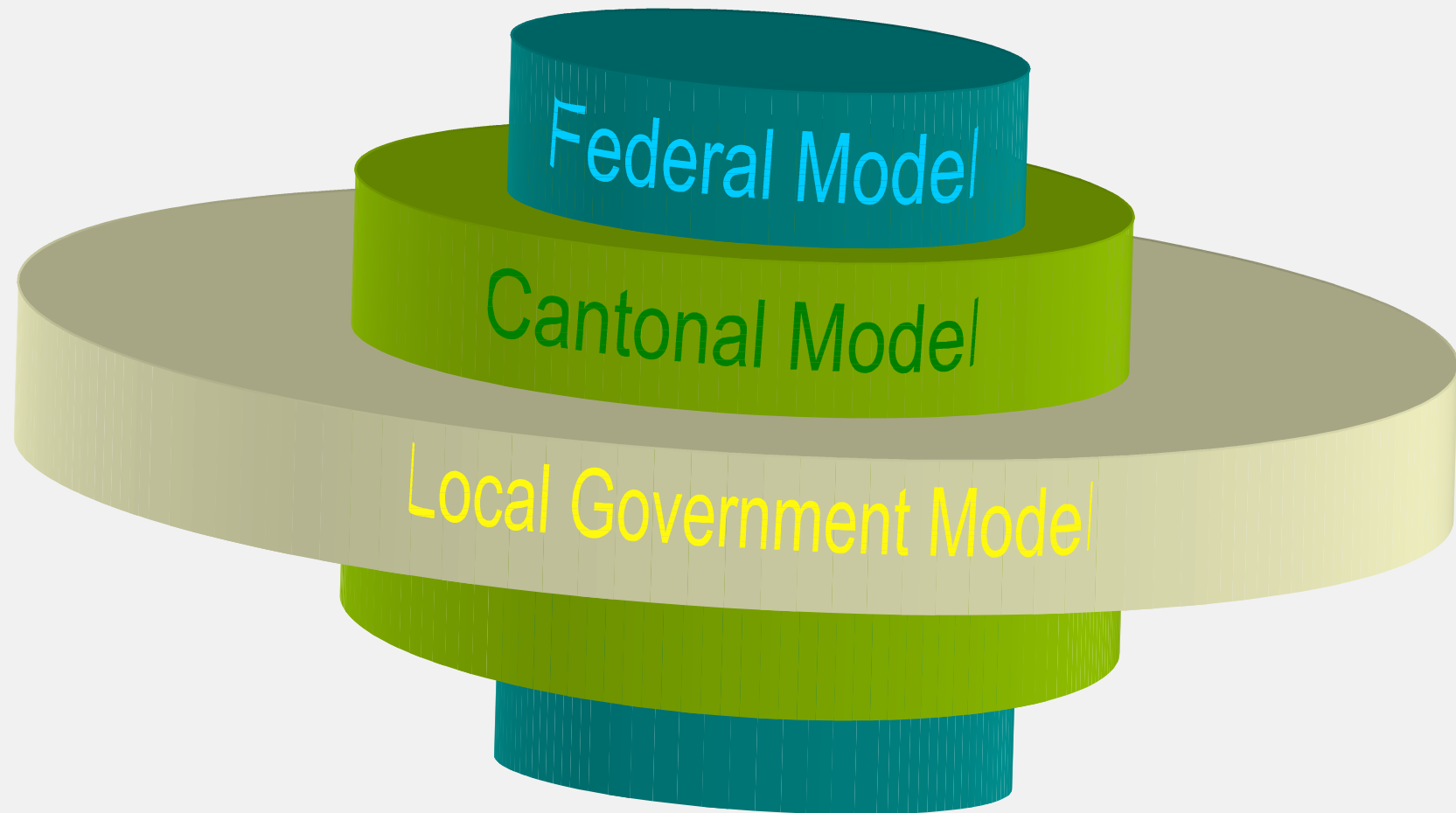
- one data model with cantonal options (for political reasons)
  - à heterogeneous development
  - à too many cantonal options
  - à no easy solution to consolidate data on federal level

## 2004: revised data model "DM.01"

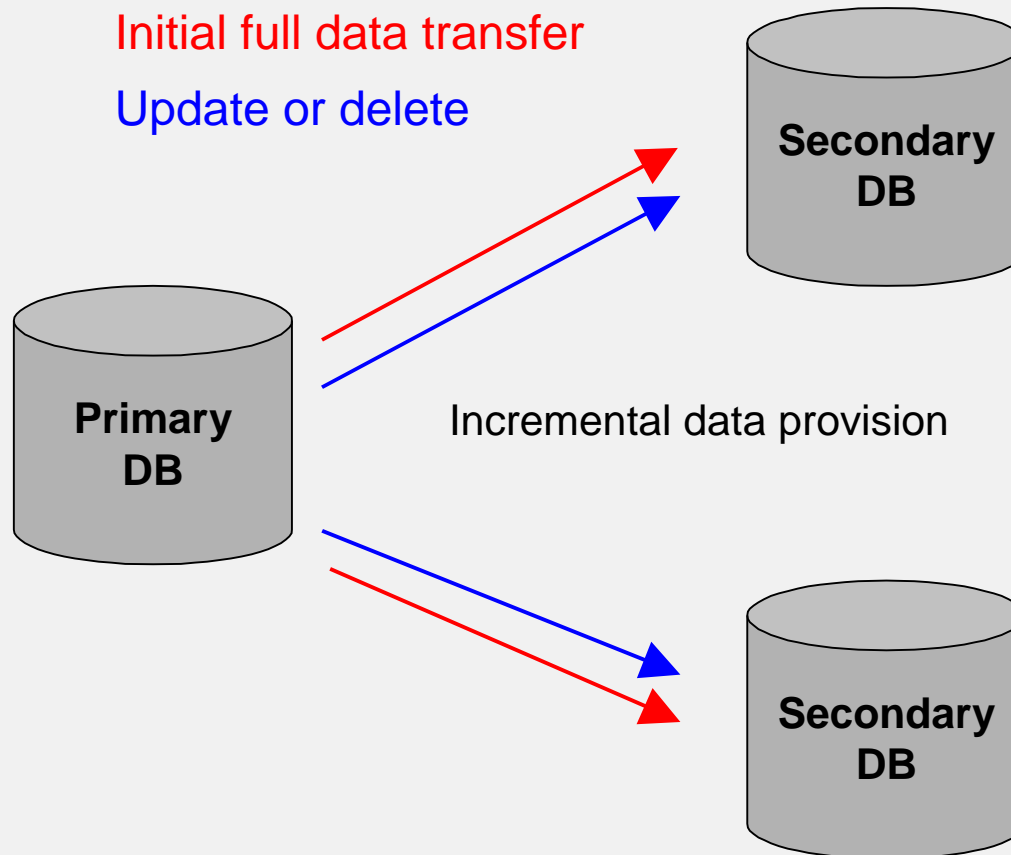
Main changes are:

- 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 à 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



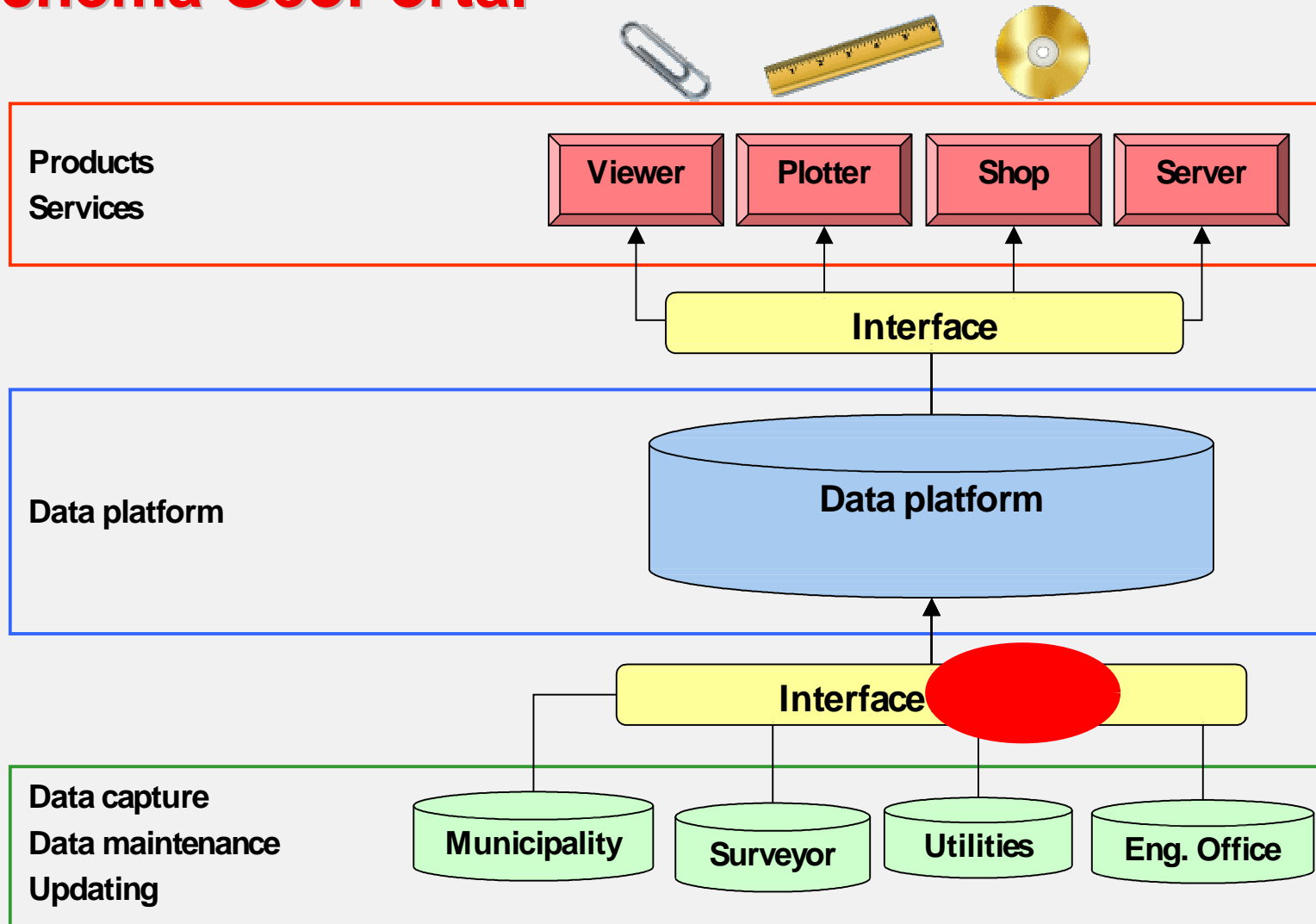
Incremental updating requires the introduction of an object ID (OID).

# Strengths and Weaknesses of INTERLIS2 and GML3

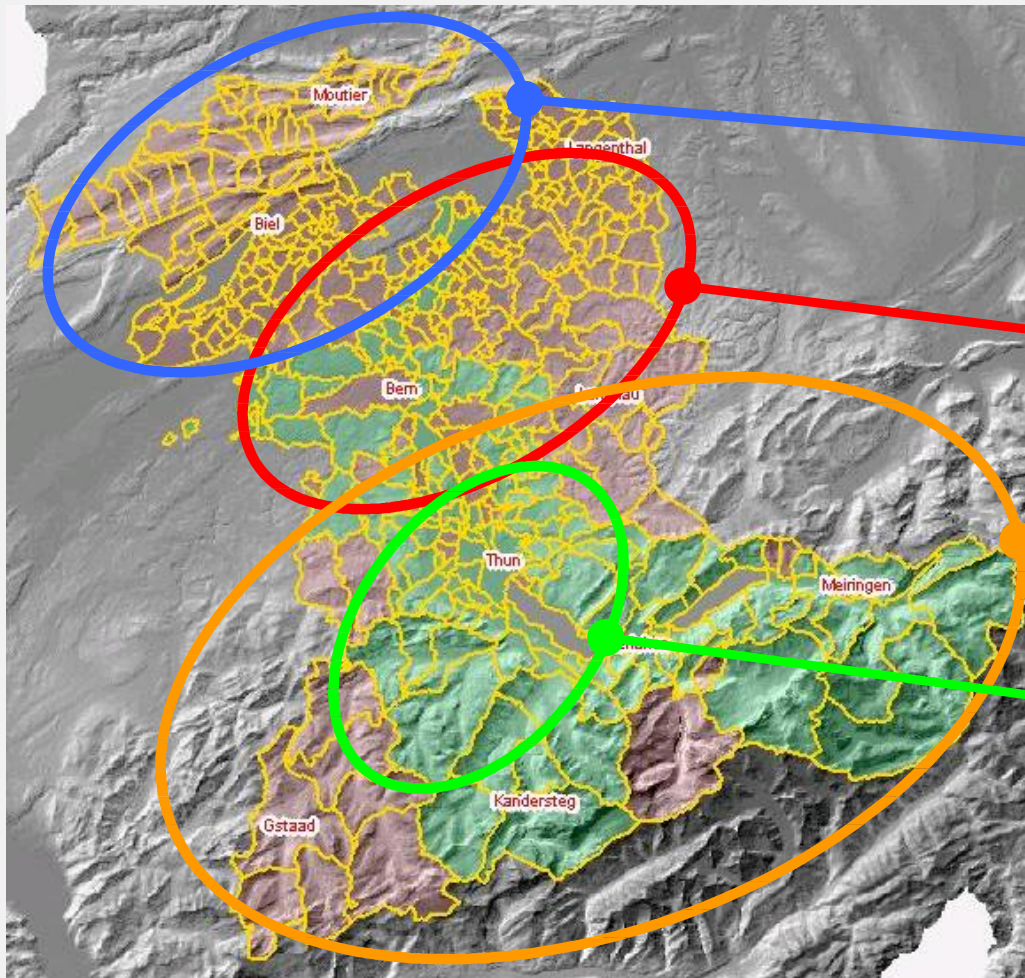
	Strengths	Weaknesses
<b>INTERLIS2</b>	<ul style="list-style-type: none"> <li>• precise and lean</li> <li>• version 1 already passed the test of practice</li> <li>• evolution rather than revolution</li> <li>• many software tools</li> <li>• UML and text</li> </ul>	<ul style="list-style-type: none"> <li>• only modelling and transfer</li> <li>• 'island' solution (national solution)</li> <li>• too good version 1</li> <li>• yet unclear role of XML (schema)</li> <li>• how to deal with further extensions?</li> </ul>
<b>GML3</b>	<ul style="list-style-type: none"> <li>• large basis in market</li> <li>• pragmatic modelling language</li> <li>• part of a standard family</li> <li>• application language</li> </ul>	<ul style="list-style-type: none"> <li>• flood of versions</li> <li>• large and complex</li> <li>• restrictions of the XML schema</li> <li>• cryptic model descriptions</li> <li>• lack of practice</li> <li>• lack of producer support</li> </ul>

(Nebiker, 2004)

# Schema GeoPortal



# be-geo.ch



• Seeland / Jura

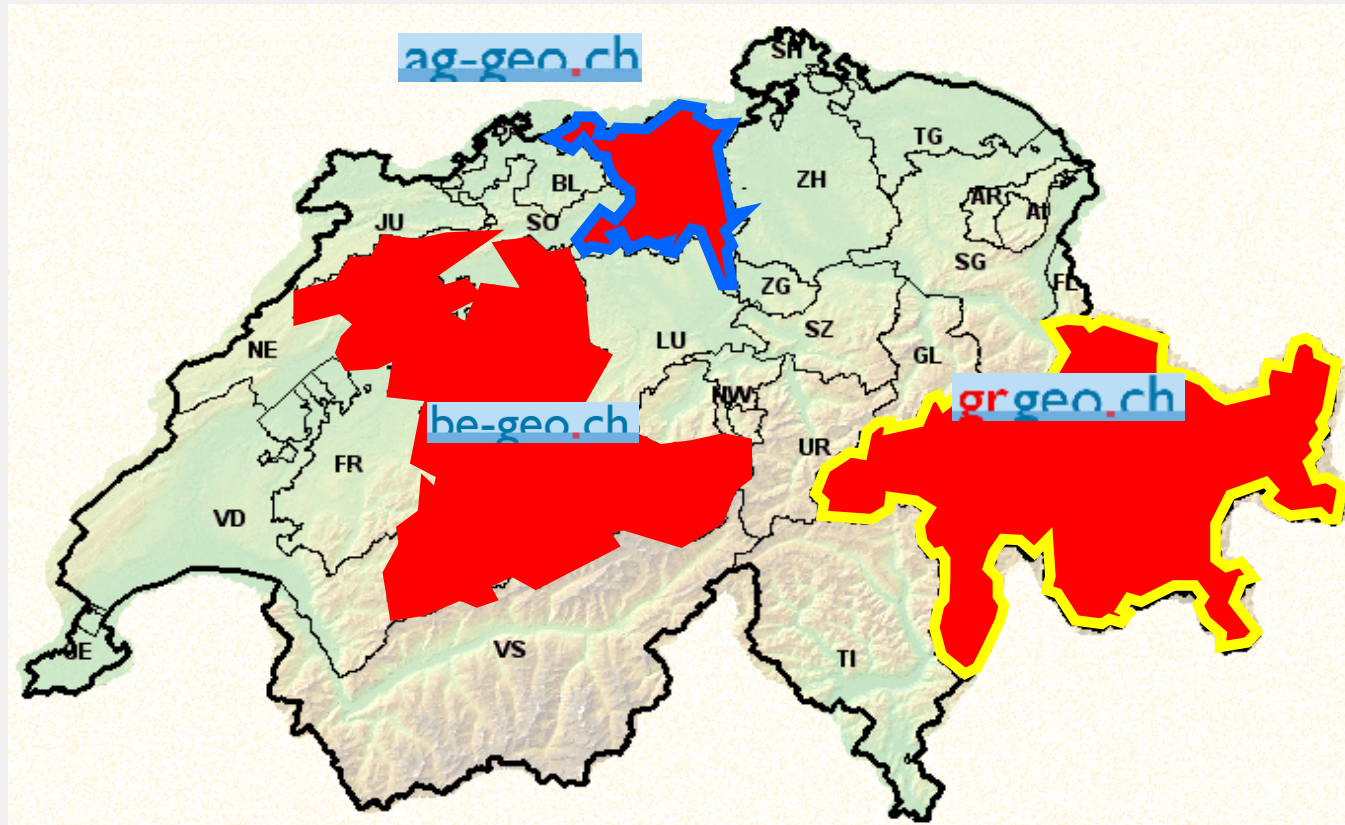
• Region Bern

• beodat

• Thun-Innertport



# regio-geo.ch / e-geo.ch




Geoportal regio-geo.ch - Schweiz - Bern - Startseite - Microsoft Internet Explorer

Adresse <http://www.be-geo.ch/>

zurück zu regio-geo.ch (Geodaten Schweiz) deutsch

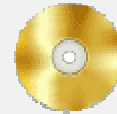


## Die Datendrehscheibe zum Bezug und Verwalten von Geo-Informationen

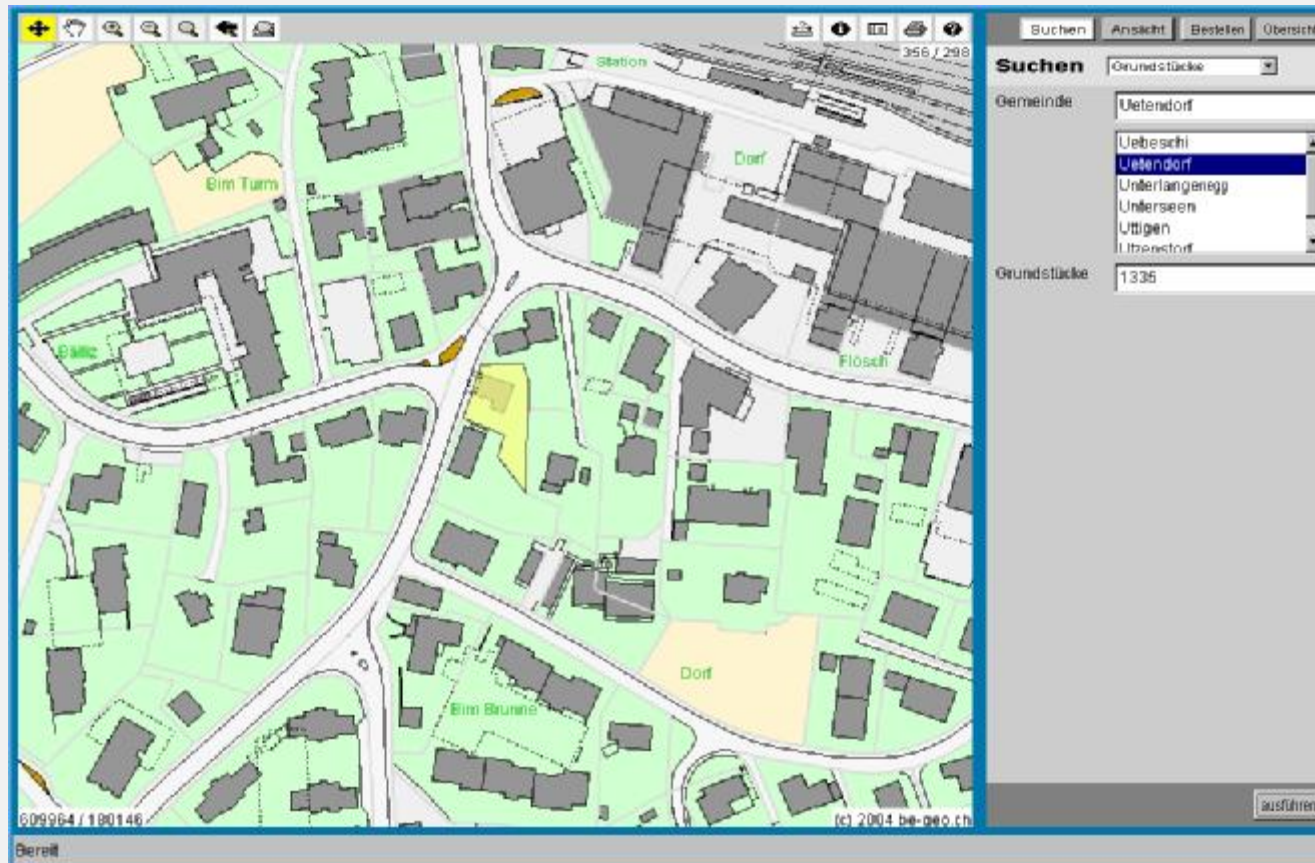
<b>Regionen</b>  Berner Oberland  Region Bern	<b>Ortspläne</b> <b>Bitte wählen Sie Ihre Gemeinde aus</b> <input type="text" value="alle Gemeinden"/> <input type="text" value="Strasse"/> <input type="button" value="suchen"/> Informationen über Ortspläne 	<b>Digitale GeoDaten</b> <b>GeoData Shop</b> Login für registrierte Benutzer Neuanmeldung / Demoshop <b>Datenanfrage</b> über Formular bestellen telefonisch bestellen Informationen über den GeoData Shop 	<b>Vorteile des Geoportals</b> <b>Gemeinde:</b> <ul style="list-style-type: none"> <li>• Gemeindegrenzen überschreitende Datenverfügbarkeit</li> <li>• Einfaches sichten der Geodaten mit dem GeoViewer</li> <li>• Ausbaufähige Basisanwendung, Gemeinde eigene Systeme können automatisch gespiesen werden</li> <li>• Zuverlässiges Datenmanagement gemäss offiziellen Standards</li> <li>• Bürgerfreundliche, transparente Verwaltung dank gezielter Freischaltung von öffentlichen Geodaten</li> </ul> <b>Kanton:</b> <ul style="list-style-type: none"> <li>• Zusammenführung der Daten der amtlichen Vermessung über die Region (Projekt ZAV)</li> <li>• Einheitliche Verfügbarkeit von aktuellen Geodaten</li> </ul> <b>Private und Gewerbe:</b>
	<b>Pläne mit Zusatzdaten</b> <b>GeoViewer</b> Login für registrierte Benutzer Neuanmeldung / Demo GeoViewer Informationen über den GeoViewer 	<b>Masstäbliche Pläne</b> <b>GeoPlotter (Orientierungskopien)</b> Login für registrierte Benutzer Neuanmeldung / Demo GeoPlotter <b>Datenanfrage</b> Pläne über Formular bestellen telefonisch bestellen Informationen über den GeoPlotter 	
	<b>GeoDaten Verwaltung</b> <b>GeoVerwaltung</b> Neuanmeldung Informationen über die GeoVerwaltung 	<b>Allgemeines</b> <b>Kontakt</b> Feedback Zuständiger Geometer Benutzerdaten ändern 	



# GeoData-Shop



**Ausschnitt suchen**



## **GeoDaten-Shop**

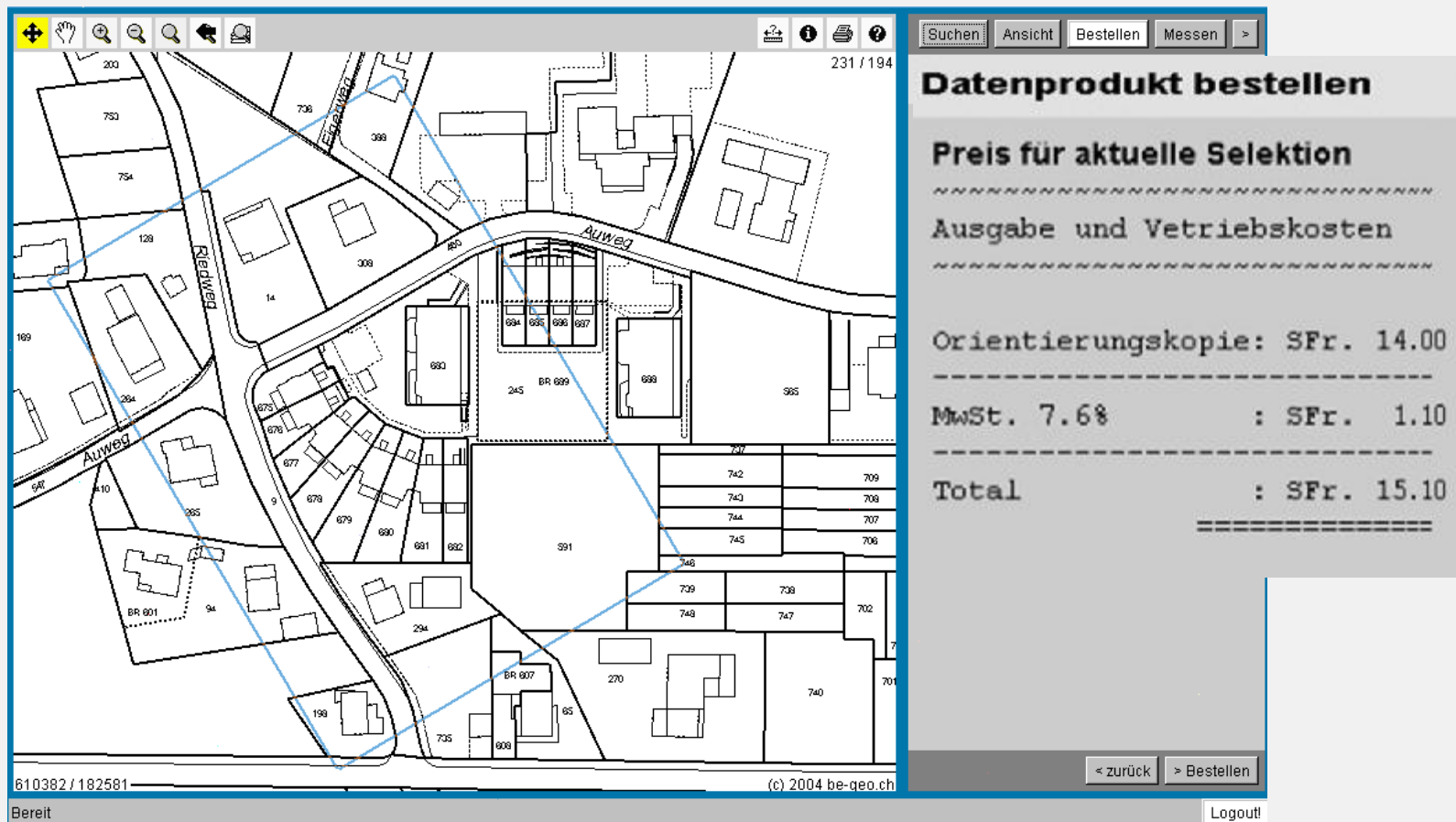
Information über vorhandene Datensätze

Suchen nach Adressen und Parzellen

Bestellen in Standardformaten Geobau und INTERLIS



## Preisberechnung



The screenshot displays the GeoPlotter interface. On the left, a map shows a street layout with buildings and plots. A blue selection box highlights a specific area. The right panel, titled 'Datenprodukt bestellen', shows a price calculation for the selected area. The calculation includes the price for the current selection, output and distribution costs, an orientation copy, and a total price including VAT (MwSt. 7.6%).

Datenprodukt bestellen	
Preis für aktuelle Selektion	
~~~~~	
Ausgabe und Vertriebskosten	
~~~~~	
Orientierungskopie: SFr. 14.00	
-----	
MwSt. 7.6%	: SFr. 1.10
-----	
<b>Total</b>	<b>: SFr. 15.10</b>
=====	

610382 / 182581 (c) 2004 be-geo.ch

Bereit Logout

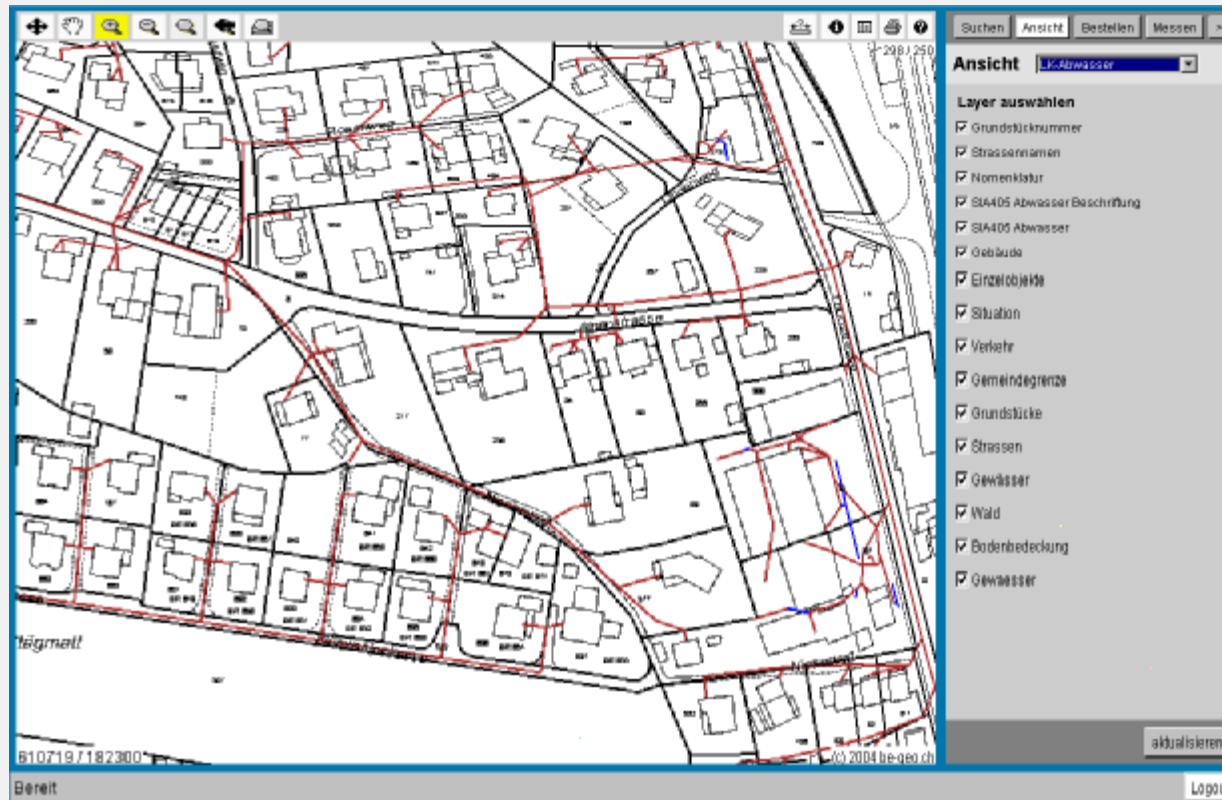
### GeoPlotter

Sichten und drucken von masstäblichen Plänen

# GeoViewer

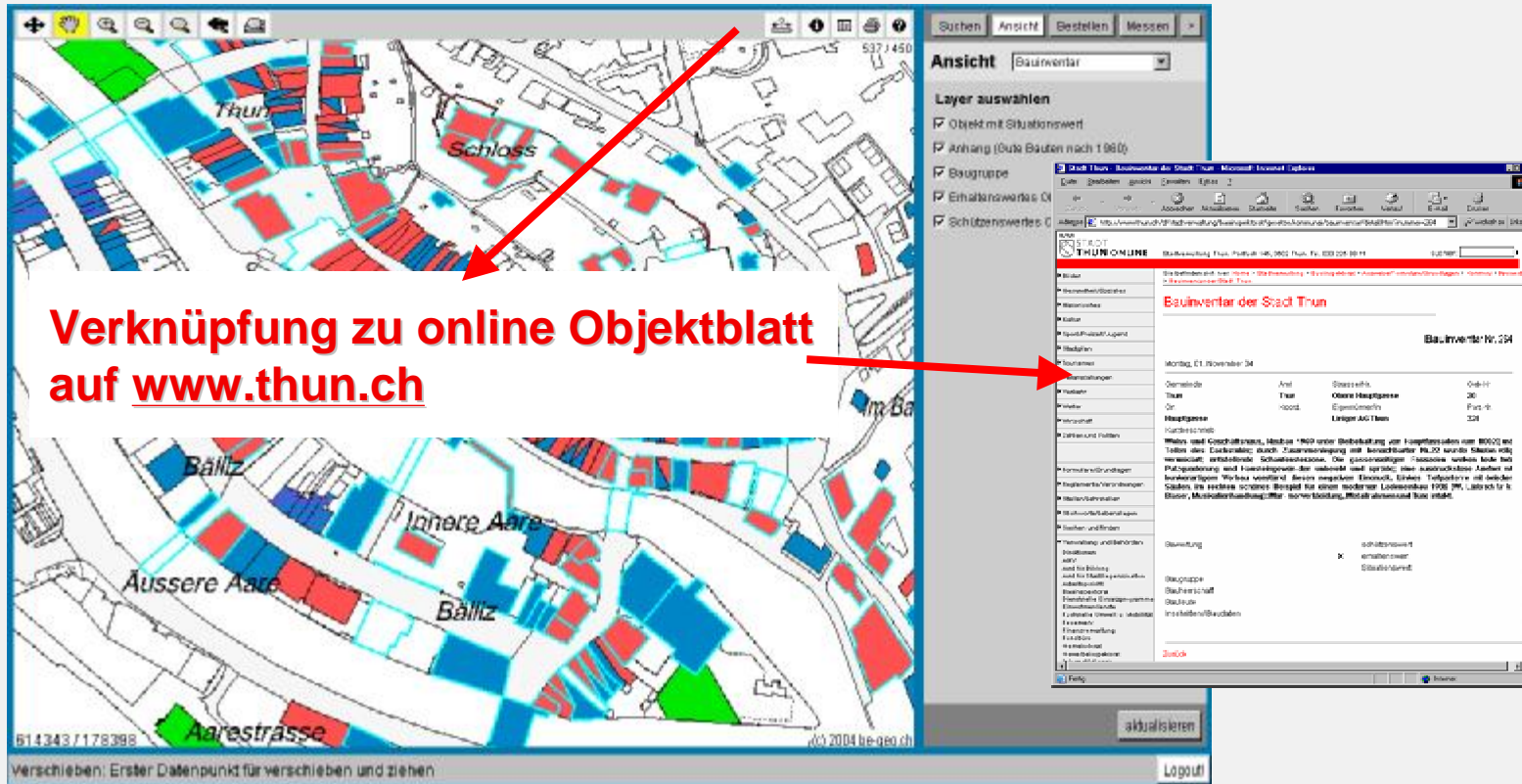


## Ansicht LK Abwasser



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

## Bauinventar Stadt Thun



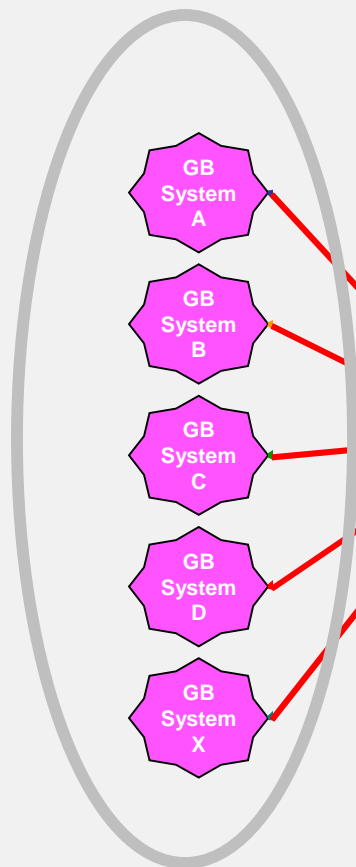
**Verknüpfung zu online Objektblatt auf [www.thun.ch](http://www.thun.ch)**

Objekt-ID	Art	Strassen-Nr.	Objekt-Nr.
100	Thun	Obere Hauptgasse	30
101	SP	Eggenriedstr.	201
102	Hauptgasse	Länge AG Thun	

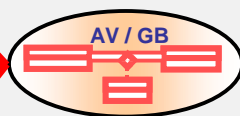
**GeoViewer** Zusätzlich zu *GeoPlotter* :  
Anbindung an GRUDIS  
Nutzer- und Sichtenverwaltung  
Individuelle Freigabe der Gemeindedaten (z.B. Leitungskataster)

# Case Study "Kleine Schnittstelle"

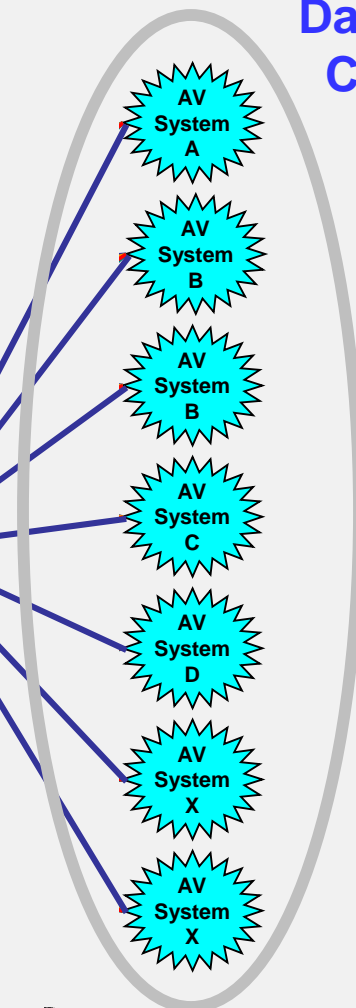
Data model  
Land Registration



Data model for  
data exchange



Data model  
Cadastre



## 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.