Workshop on
Standards in Action

Current NSDI Activities in Switzerland based on ISO 19100 standards

ISO TC211 Meeting
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Swiss Delegation

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Overview

- **Why Standards?**
  - Brief introduction
  - Example: Cadastral survey
- **National Profiles of ISO Standards**
  - Example: Metadata
- **Experiences with Standardization**
  - Example: Addresses
- **Organizational Aspects**
- **Conclusions**

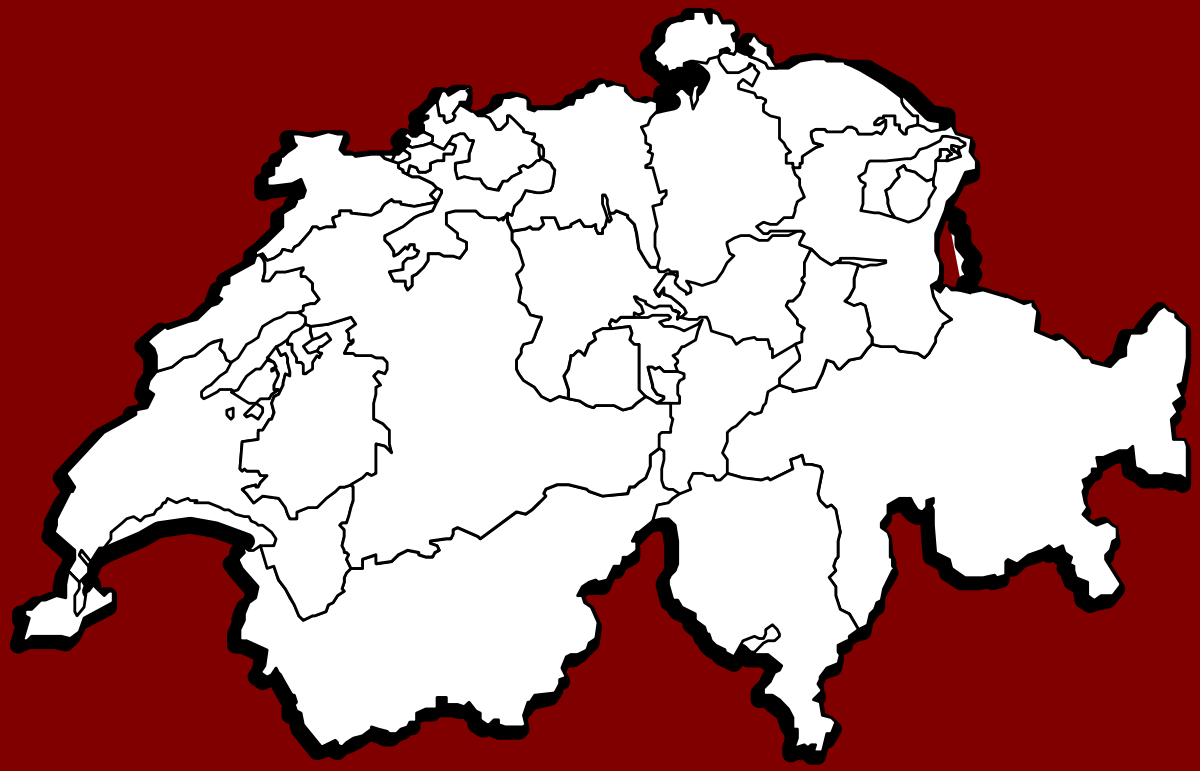
Why standards?

The foremost aim of international standardization is to facilitate the exchange of goods and services through the elimination of technical barriers to trade.

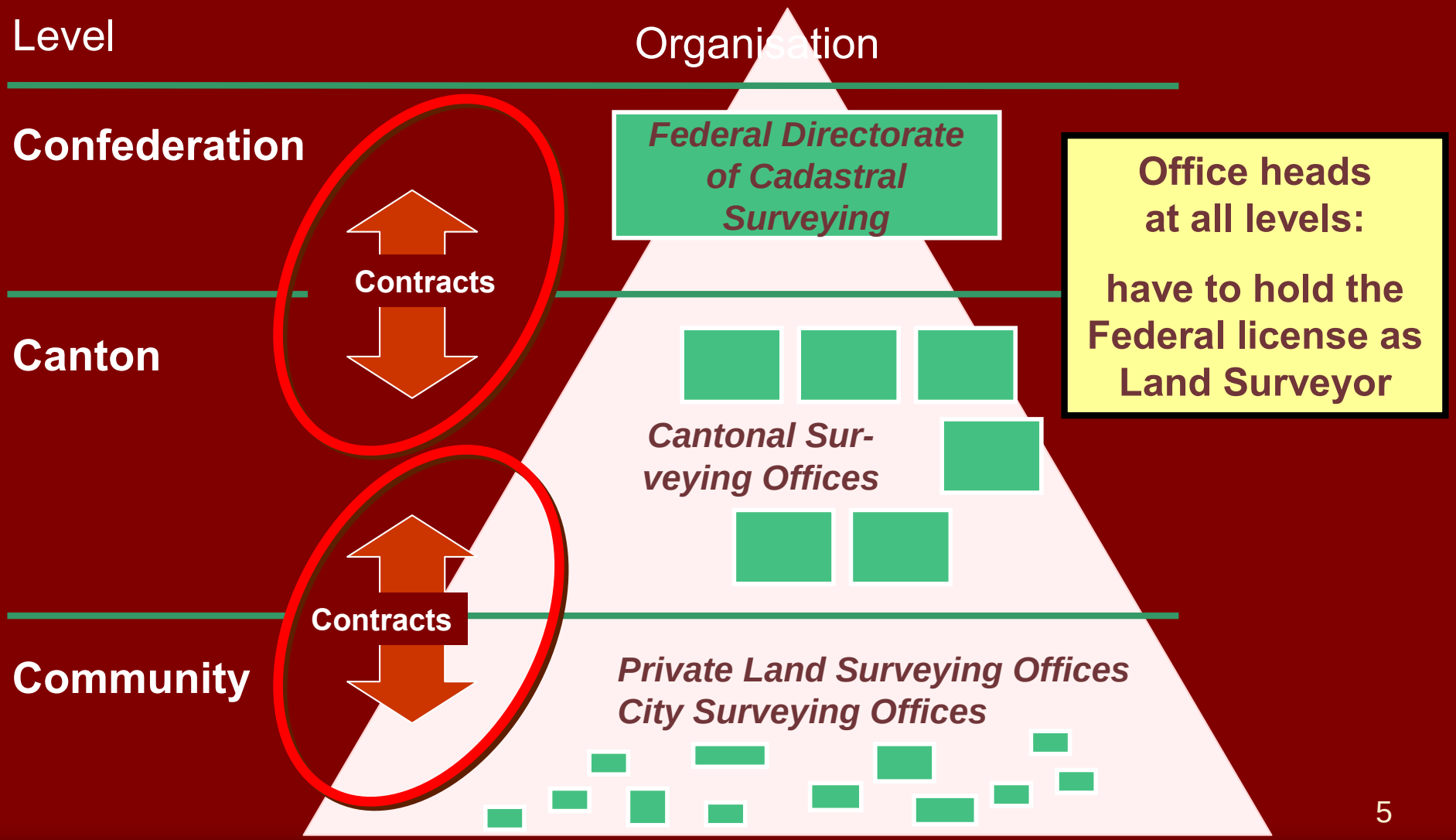
— Draft Business Plan ISO/TC 211

Administrative Structure

- **Cantons maintain their own political and administrative bodies**



Management of Official Surveying



Paper Maps = Open Standard
More Difficult With Digital Data

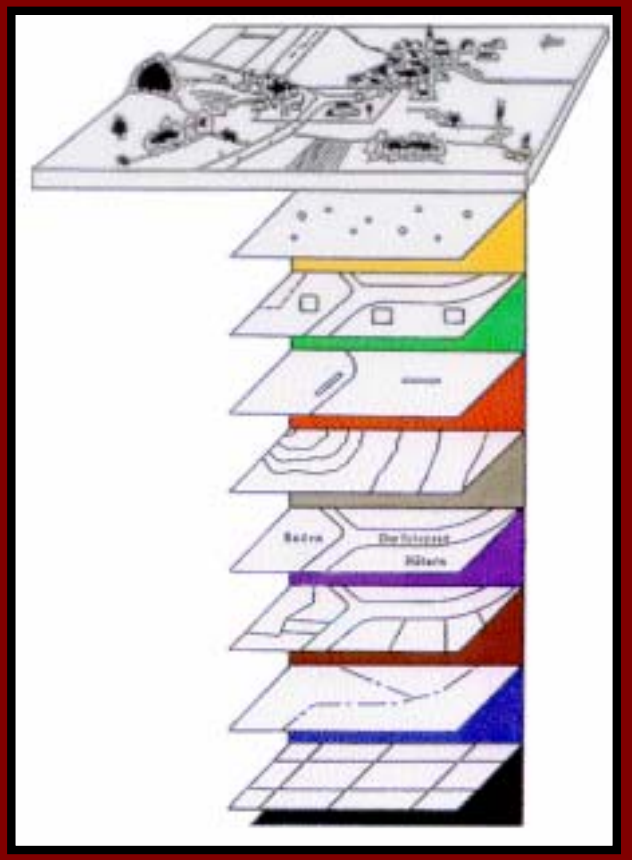
Sin[illegible]	Designation		Technical Characteristics	Legal Force
1993	AV93	Official Sur-veying 1993	Digital, data model, layer principle, topology	Digital Data
1993	PN	Provisionally digitised	Transitional standard, does not fulfil all requirements of AV93	Paper maps
1985	VN	Completely numerical	Digital, attributes	Paper maps
1970	TN	Partial numerical	List of Co-ordinates	Paper maps
1912	HG	Semi-graphic	Traverse points with calculated co-ordinates, co-ordinatograph	Paper maps
1900	GR	Graphic	Plain table	Paper maps
1850	ps	Provisionally approved	Plain table	Paper maps

Elements of AV93

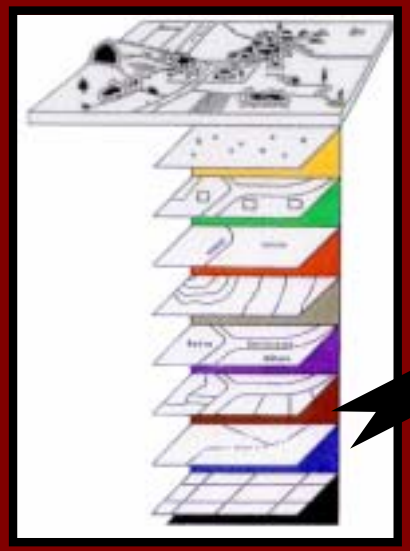
- **AV93**
  - Clear definition of the product
  - Independent information layers
    - link between layers through geographic location
  - Standardized data transfer (INTERLIS)
  - Free choice of methods
    for acquiring and maintaining data

Levels of AV93

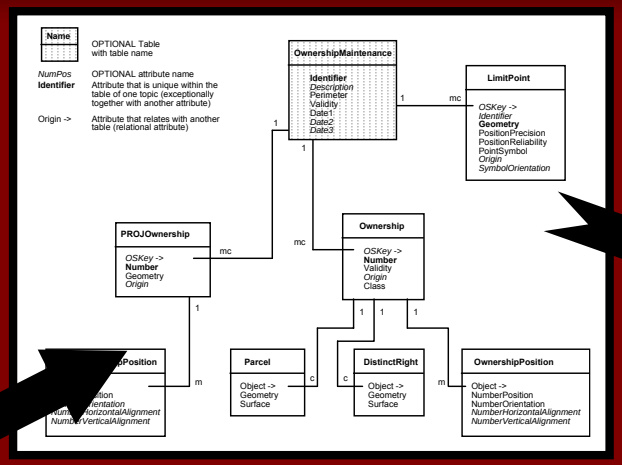
- **Levels of AV93 according to federal law**
  - Control points
  - Land cover
  - Single objects
  - Heights
  - Local names
  - Ownership
  - Pipelines > 5 bar
  - Administrative subdivisions



Model-Based Approach



real world



Conceptual Model
graphically realized (UML)

```
TRANSFER Data_Catalogue;

MODEL Basic_Data_Set
 DOMAIN
  LKoord = COORD2  480000.000   70000.000
                    840000.000  300000.000;
  HKoord = COORD3  480000.000   70000.000      0.000
                   840000.000  300000.000   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 =
DOMAIN
 Monumentation = (border_stone, plastic_peg, cross,
                  not_monumented);
 OwnershipType = (parcel, distinct_right,
                  construction_right, water_source_
                  right);
 OPTIONAL TABLE OwnershipMaintenance =
   Identifier = TEXT*12;
   Description = TEXT*30;
   Date2:  OPTIONAL DATE;
   Date3:  OPTIONAL DATE;
 IDENT
   Identifier;
 END OwnershipMaintenance;

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

END Basic_Data_Set.
```

Conceptual Model
textually realized (INTERLIS)

```
<?xml ...
```

Transfer Format
XML-Schema

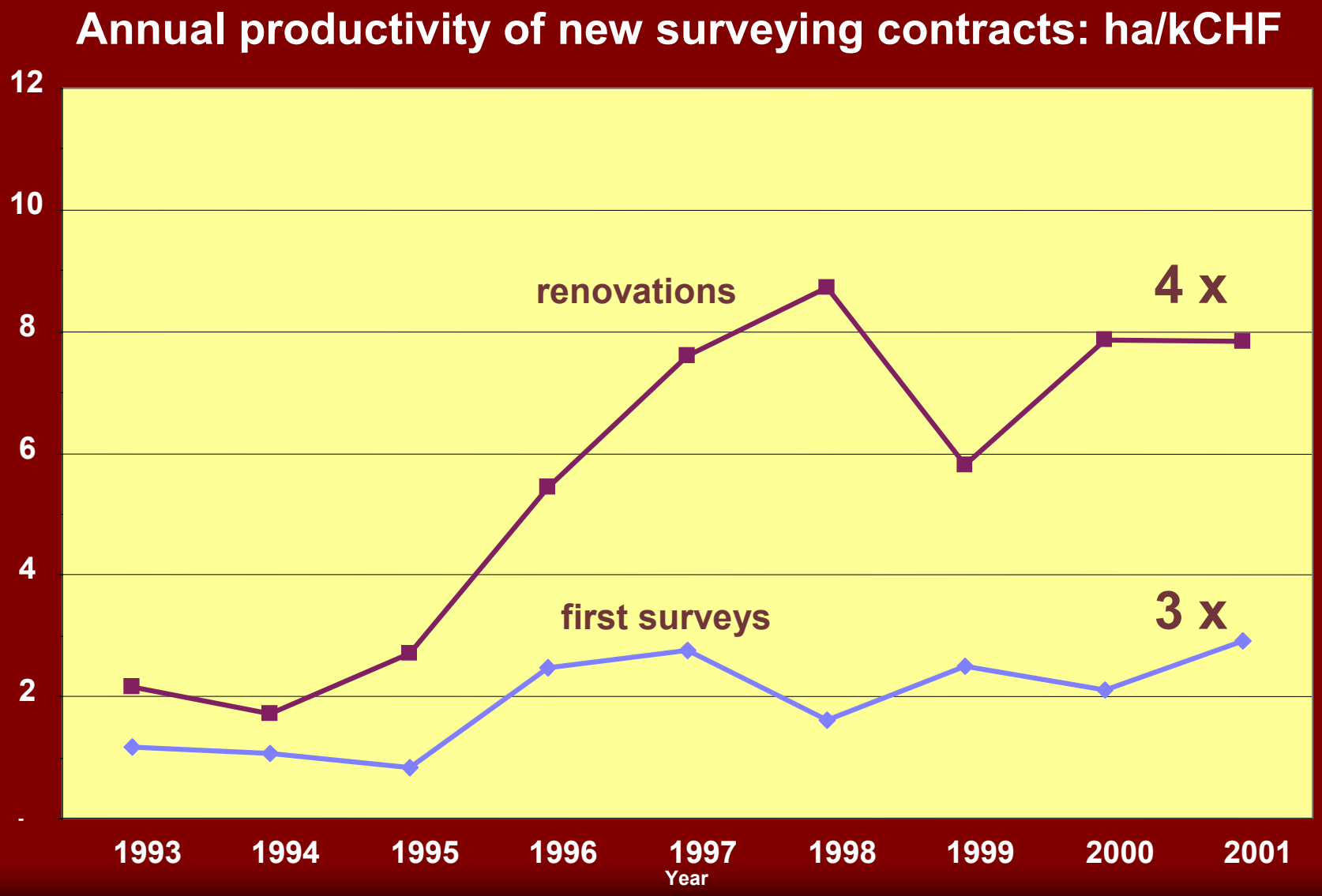
Advanced Goals

- **Some parts of ISO architecture are more advanced than what is common today — can these parts be possibly realized?**
  - Model-driven architecture
  - Strict system-neutrality
    - Protection of investments in data
    - Data transfer between different implementations without information loss
- **Some advanced aspects have been in use since 1993**

Unique Aspects

- **Unique aspects of INTERLIS-2 (non-ISO goals)**
  - Support for federalist administrative structure
    - Cantons *extend* common federal model according to their needs, municipalities *extend* common cantonal model
    - Everyone can use their own model
    - Federation can interpret municipal data without conversion steps (realized through polymorphous reading)
  - Support for multiple languages
    - Each model is defined in an “original” language, but users may use translations to their native language
    - XML tags (for transfer) derived from names in “original” language
    - Software performs necessary mappings

Standards Improve Productivity



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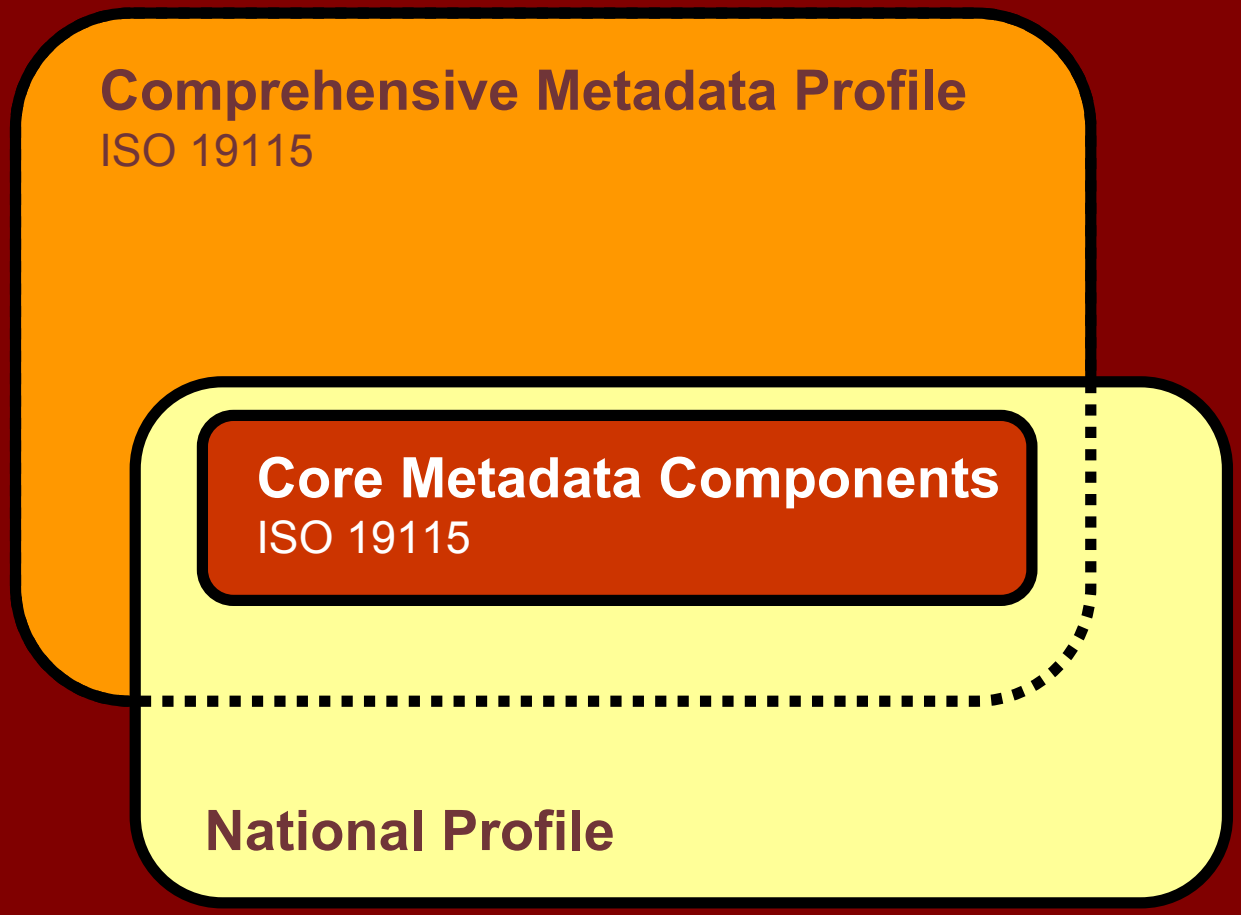
- **Conclusions**

Profiles for ISO 19115

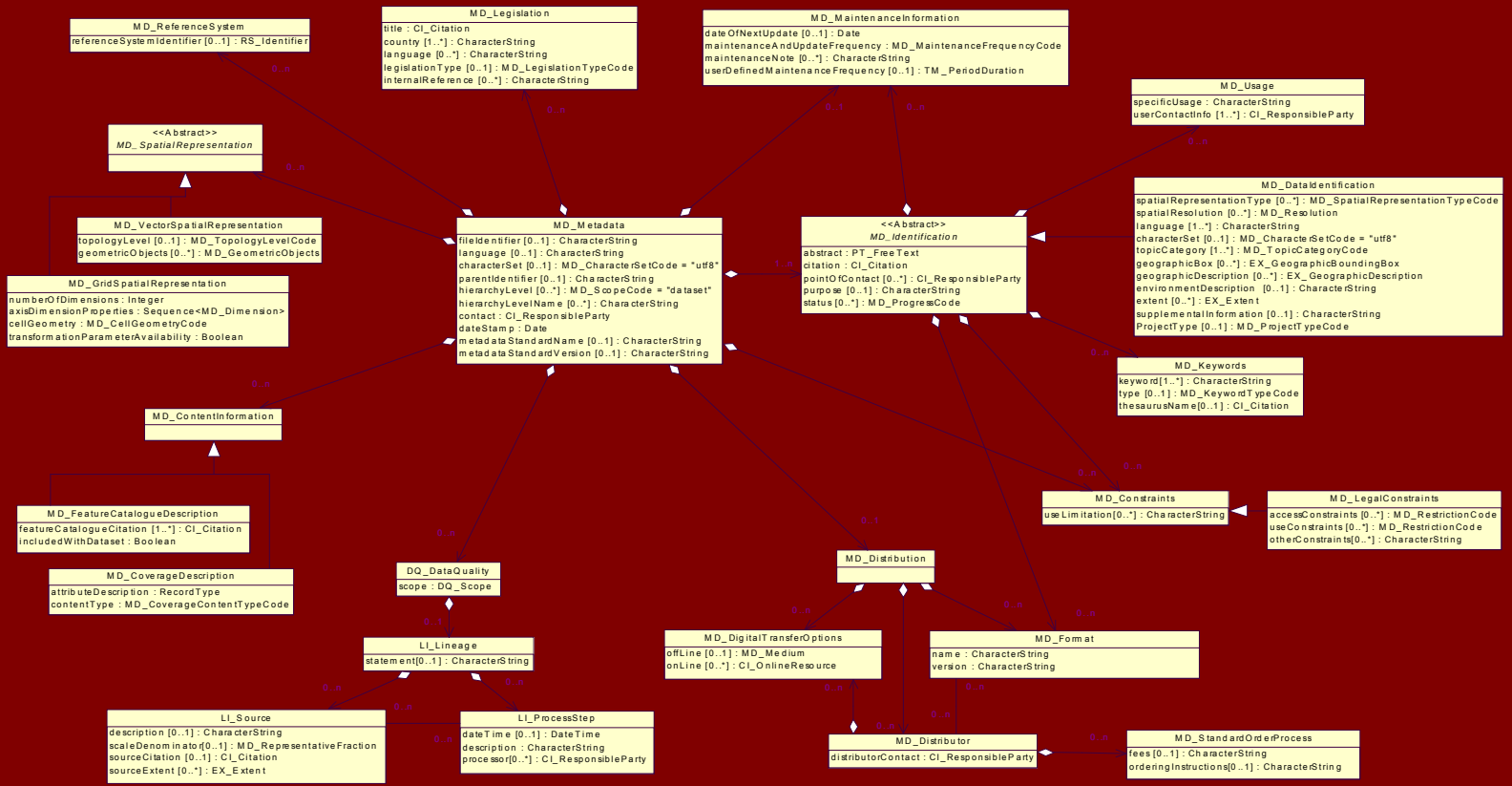


Criteria for Defining the Swiss Profile

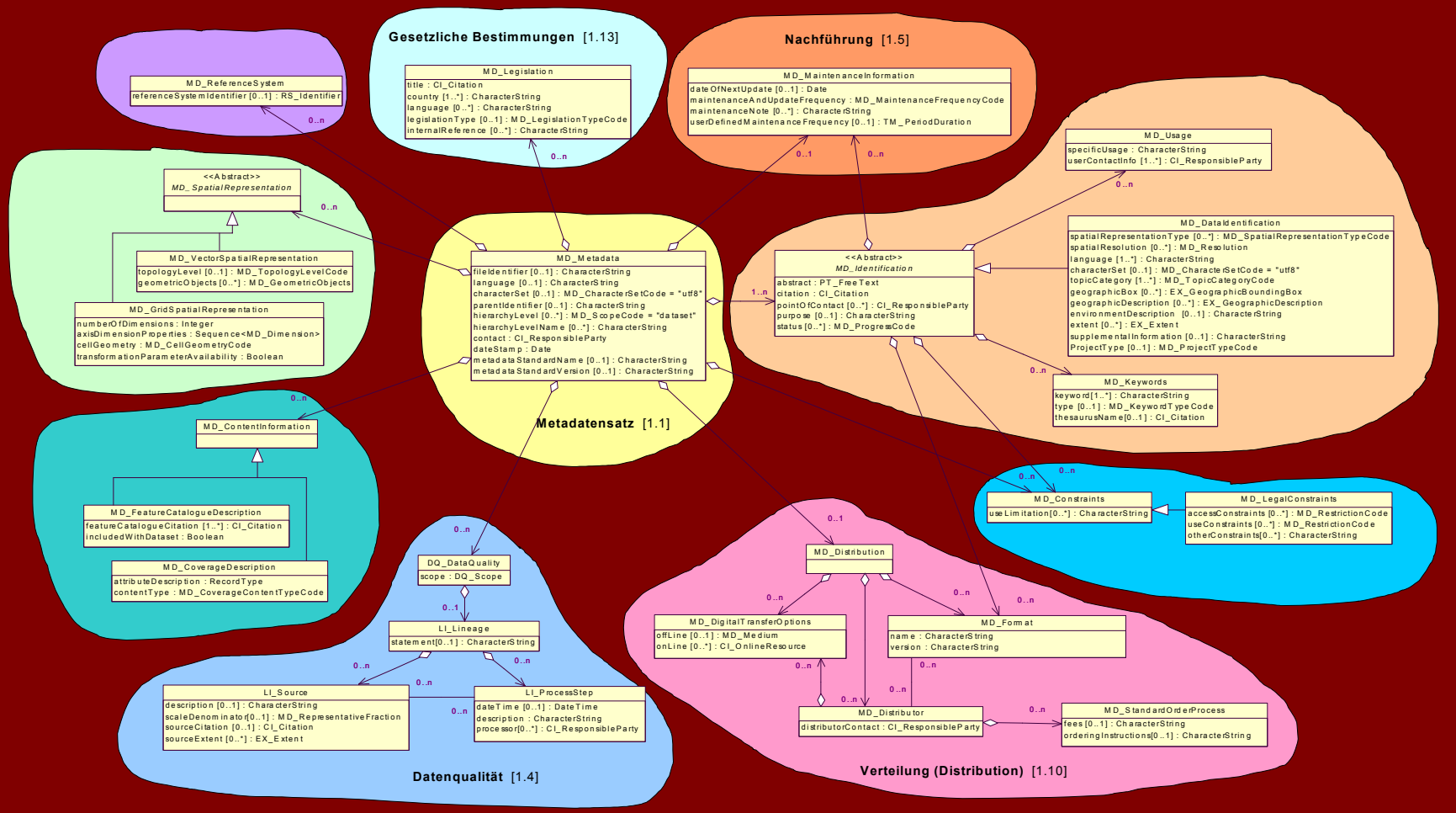
- **Core of ISO 19115**
- **From those non-core ISO classes required for *existing* metadata repositories**
  - their mandatory elements
  - their conditional elements

    (which can be mandatory under rules defined by ISO 19115)
- **→ Need to preserve previously collected metadata**

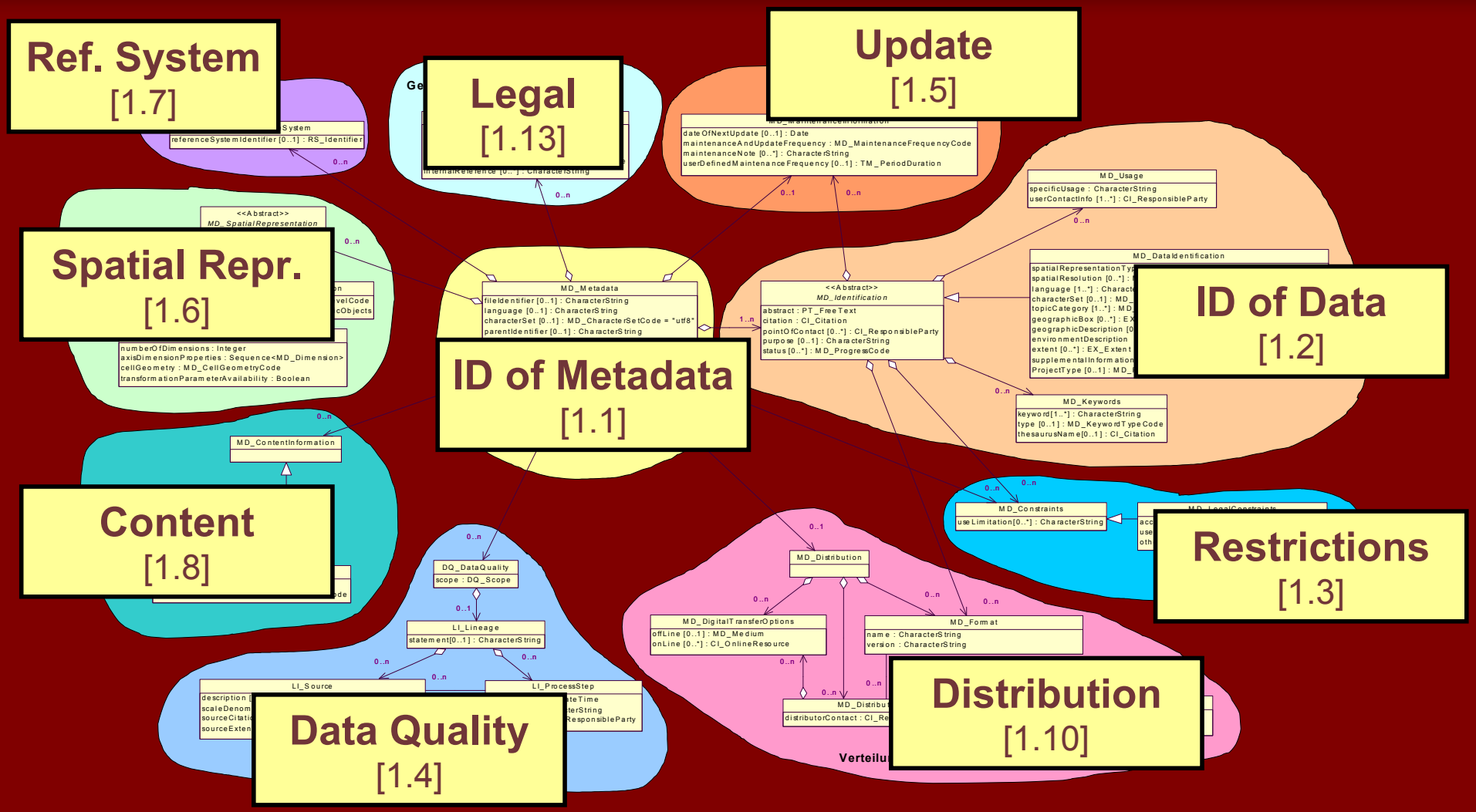
Talking about the Profile



Talking about the Profile — Structure helps



Talking about the Profile — Structure of ISO 19115 helps



Evaluation

- **Survey among 53 potential profile users**
  - Federal, cantonal, communal administration
  - Universities
  - Companies
  - Other organizations

Evaluation

- **Most users were satisfied**
  - some confused by complexity → need for education
- **Size**
  - too little metadata for some ...
  - ... and too much for others
  - strong desire to minimize number of mandatory elements
  - most users agree: extension of core was necessary
- **Implementation**
  - general need for metadata repositories uncontroversial
  - interested in integrated, common application: 60 – 80%

Issues Encountered: Multilingualism

- **Multilingualism**
  - Users would not accept restriction to one single language
    → treatment of multilingual metadata in an international context?
  - We need a *common* solution for multilingual text
  - Support for multilingualism is merely informative in ISO 19115
    → cannot be relied upon

- **Proposed solution**
  - Make the general (multilingual) case normative
  - One single language = special case of multiple languages
    → inheritance

Issues Encountered: Code Lists

- **Code Lists**
  - our users had difficulties understanding who is responsible for maintenance
    ISO, SNV, …, user?
  - specialization of code lists desired

Issues Encountered: Encoding across Standards

- **Encoding across standards**

```
<!ELEMENT uomName (#PCDATA)>
<!ELEMENT conversionToISOstandardUnit %Real;>
<!--PART 2 : SPATIAL DECLARATIONS-->
```

<!--The following elements and entites have been taken from the Spatial Schema (19107) DTD. They do not make up that DTD in its entirety, and are placed here for ease of use of this DTD-->

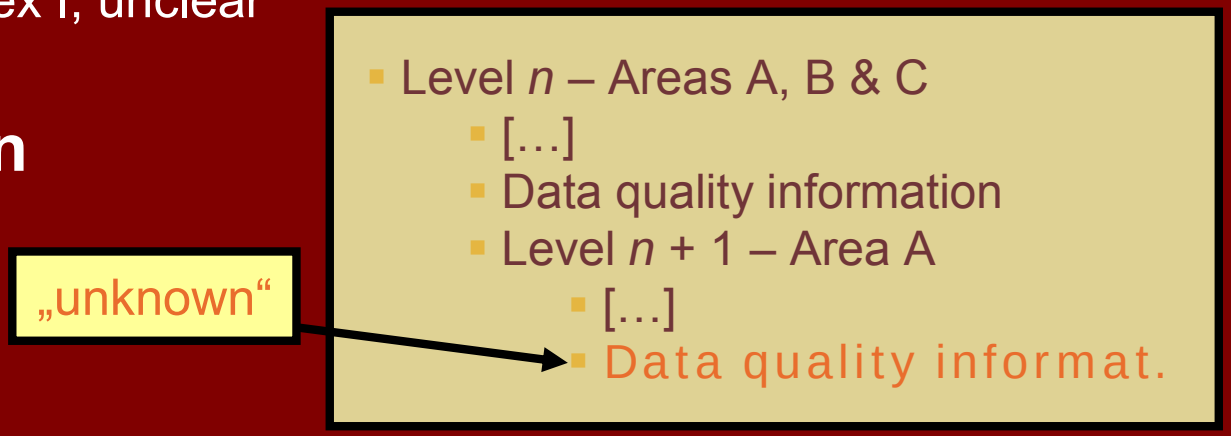
```
<!ENTITY % GM_ObjectTypes '(GM_Polygon)'>
<!ENTITY % GM_Polygon '(MdCoRefSys?, coordinates)'>
<!ENTITY % GM_Point '(MdCoRefSys?, coordinates)'>
```

Issues Encountered: Encoding across Standards

- **Encoding across standards**
  - Someone implementing a simple metadata repository needs to support more than just ISO 19115
    → might slow down industry adoption
- **Proposed solution**
  - adjust encoding rules to make 19115 self-contained

Issues Encountered: Hierarchical Levels of Metadata

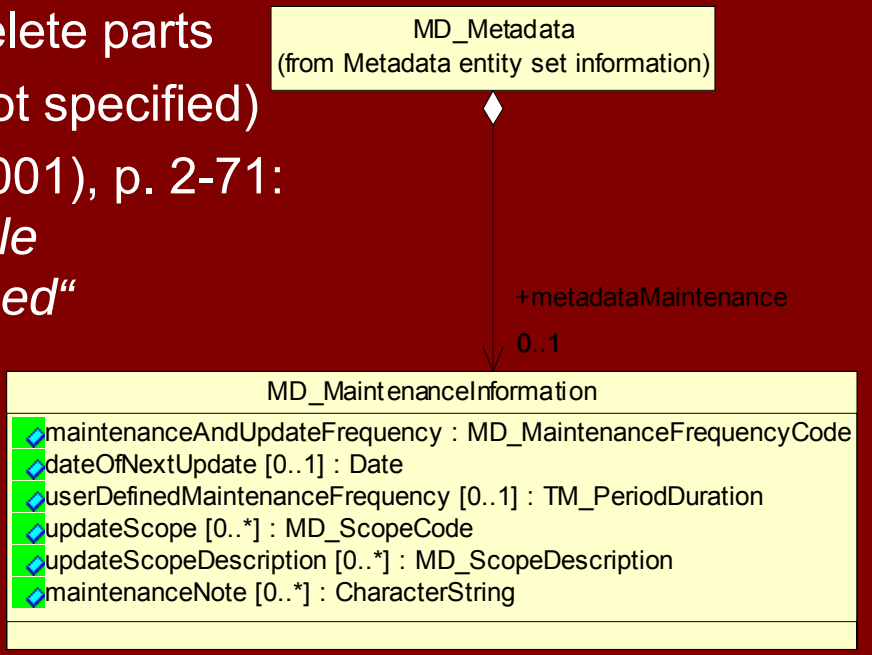
- **Hierarchical Levels of Metadata (Annex I)**
  - our users consider ISO 19115, Annex I, very useful
  - wording of Annex I seems to imply:
    missing metadata entry → see super-level's metadata
  - how to express that information for a sub-level is not known?
    → ISO 19115, Annex I, unclear
- **Proposed solution**
  - clarify Annex I



Issues Encountered: Object Lifecycle

- **Object Lifecycle**
  - When exactly does an object cease to exist?
    - delete *composite* aggregate → delete parts
    - delete *shareable* aggregate → (not specified)

      See UML 1.4 draft (February 2001), p. 2-71:
      „UML [...] leaves the shareable aggregate more loosely defined“



- **Proposed solution**
  - Clarification of Conceptual Schema Language (ISO 19103)

Metadata
Research asks a Question

- **The model-driven approach means**
  - every dataset „carries“ its data model
    (= exact feature catalog)
  - the data model is about 70% of the needed metadata
- **Why not extend the data model**
  to provide 100% of the needed metadata ?
- **Result :**
  → ISO 19115 may be *a specific view* on the data
  → easy access to data *and* metadata

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Addresses
1. Motivation

- **Euphorically jump into the market of located addressees**
  - Swiss official survey has detailed basic data
  - Swiss topographic office has digital maps
  - Swiss statistical office has census data
  - Post visits daily every household
  - Cantons/Cities/Communes have address registers
  - Building insurances as well – ...

  → Only small step to located addresses for each

Addresses
1. Motivation

- **Parallel data acquisition / refinement**
  - unnecessary redundancy
  - unnecessary huge loss of money
- **Parallel data maintenance**
  - → even more expensive
  - → even less reasonable
  - → even *?* for different actors

→ **Need for coordination**

→ **crucial condition : standardization**

Addresses
2. Experiences

- **Terminology**
  - heavy discussion needed at the beginning
  - to associate same definition with same term
  - because of very heterogeneous „cultures“
  - despite everybody speaking German
- **Experts and the model-driven approach (MDA)**
  - Expert of Swiss Statistical Office with incredible background of examples for exceptions of every rule/concept/definition
  - Won for MDA → discussion on structures become easy

Addresses
2. Experiences

- **Different exchange formats needed**
  - XML too complicated for some partners
  - additional „simple“ format added (plain, no tags)
  - both automatically derived from the conceptual schema according to a set of general + specific rules
- **Implementation on GIS**
  - the implementation schema (or logical schema) can automatically be derived from the conceptual schema by 2 GIS (Intergraph Geomedia/C-Plan Topobase)

  → not only transfer but implementation as well is defined by the conceptual schema

Addresses
3. To do

- **How SN612040 fits into ISO 19112 ?**
  - corresponding concepts ?
  - additional aspects in Swiss Addresses
    in ISO Geo Identifiers ?

  → **next (2 sided) test case**

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Organization
Swiss Steps to NSDI: KOGIS & NGN
1. Geo-data in Swiss Federal Administration

- **Positive experiences**
  - \+ Swiss surveying: data organization linked together by MDA transfer service
  - \+ Addresses : successful standardization of model and exchange formats by MDA
- **Negative aspects**
  - – report „Huber“ on wasting MCHF/year by parallel acquisition/duplication/redundancy of geo-data in federal administration

⇒ **Creation of KOGIS**

= coordination group for geo-information in Swiss federal administration

Organization
2. Structure and Goals of KOGIS

- **Mini-organization**
  - steering group : of every federal department
    at least one (expert) representative
  - executive board : 5 persons !
- **Main activities**
  - get overview ($\rightarrow$ metadata server)
  - enable exchange ($\rightarrow$ file transfer standard
    becomes law for federal agencies: MDA INTERLIS)
  - coordinate geo-data acquisition/use

Organization
2. Structure and Goals of KOGIS

- **Effect**
  - KOGIS operates as catalysis
  - interested partners are linked together
  - focused on real needs
  - small resources necessary
  - coordination saves personal/financial power
  - again : MDA is efficient and effective

Organization
3. Private sector will be included

- **KOGIS restriction**
  - only on federal administrative level
- **Just now : private parties interested**
  - private industry (utilities, electricity, GIS providers, ...)
    lower administrative levels (cantons, cities, communes)
    professional associations (geometers, planners, ...) etc.
    will participate too !
- **Organization of NGN**
  - NGN = National platform of Geo Norms(= Standards))
  - organization similar to that of KOGIS
    - steering group (2 meetings/year) : representative of part
    - executive board (4 meetings/year) : ≈ 6 experts
    - secretary coordinator (full job) : 1 person

Organization
4. Activities to be coordinated

- **The following 6 activity groups have been recognized**

Education	Technical develop-ments	Modeling Support Exchange	Help Desk	National + Internat. Standard	PR
- Modeling - MDA tools - Semantic Transform.	- MDA tools - SW Com-ponents	- Model repository			
- Universities - Technical High schools - Professional Associations	- KOGIS	- Private consulting companies	- Software companies - KOGIS - Secretary	- SNV	

Organization
5. Conclusion

- **What has to be fixed centrally ?**
  - Administration only :
    - discover GIS projects
    - enforce to these the Model Driven Approach
    - for description and exchange of data
  - Private sector (+ administration)
    - coordinate the needs and resources
      according to the 6 topics mentioned

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Conclusions

- **Observations**
  - Services are important,
    but every use depends heavily on models
  - Most interoperability discussions exclude migration.
    Model-driven connection of systems by file exchange
    is not only simpler/cheaper than centralized solutions,
    it is also a precondition for easy migration

Conclusions

- **Additional advantages seen with Model-Driven Approach**
  - System neutrality → larger market size
  - Massive productivity improvements
  - Additional benefits possible
    - Support for federalist, multi-lingual administrative structures
    - …

Conclusions

- **Model-Driven Approach is successful in Switzerland. Why?**
  - Switzerland was forced to concentrate on data exchange
  - Since beginning: Automated verification of quality and consistency of models (via compiler)
  - Switzerland applied consequently the *Minimum Principle*
    - Specify and implement only the needed minimum
  - Necessity for extensible solutions/models
  - Based on a simple but exact textual conceptual schema language

Conclusions: Last Page

- **Lesson learnt**
  - Model-Driven Approach = new culture needing years until really, fully accepted
- **Finally**
  - Metadata tested in Switzerland: ISO 19115 contains all that is necessary
  - What remains to be done:
    - Exchange metadata between nations

  → *Common use without depending on a central container*
  - We would like to encourage you