- National (Swiss) Standard
- Conceptual Schema Language,
- Object Relational modeling language
- Neutral Transfer Format (XML-based),
- Formal specification of constraints,
- Automated quality control of the data,
- Long-term availability (archiving data)
- Interoperability between information systems

A data exchange mechanism for LAS

[Cogis, 2006]
Technical model (physical reality) described in INTERLIS language

Conceptual model (legal reality) described in UML diagrams

Model described in INTERLIS language

INTERLIS quality check

INTERLIS Database generation

Populate database with use cases

Validation of the database/ final schema

Visualization of legal & physical in 3D environment

Query the database
Towards the development of a prototype
Transformation on conceptual schema level

Conceptual model based on LADM in EA model

Re-design the model in INTERLIS

Solutions from the literature

Interoperability Issues

Rational Rose XMI

Transfer format [IFC, CityGML, InfraGML]

INTERLIS

INTERLIS Database schema [constraints supported]

Populate database with real data

Validation of the database/ final schema
Already described **ISO models** from Swiss Land Management Group

Neutral vendor format – Explicit formulation of constraints

**KEY challenges to describe**

- Code lists – Enumeration types
- Constraints
- 3D data type

```
INTERLIS 2.3;
CONTRACTED MODEL LADM_GR (en)
AT "http://www.gdmc.nl/"
VERSION "2015-11-30" =

IMPORTS UNQUALIFIED ISO_Base;
IMPORTS UNQUALIFIED ISO19107;
IMPORTS UNQUALIFIED ISO19111;
IMPORTS UNQUALIFIED ISO19115;
IMPORTS UNQUALIFIED ISO19156;
IMPORTS UNQUALIFIED LADM_Base;
IMPORTS UNQUALIFIED LADM;
```
INTERLIS UML Editor

INTERLIS 2 models [.ili]
ISO_19107
ISO_19111
ISO_Base
ISO_19115
ISO_19156
LADM_Base
LADM
LADM_GR

INTERLIS Compiler

Ili2c

Correct INTERLIS 2 model

igcheck2

INTERLIS Checker

LOG file

XTF/FMT, XML, ILI, XML - Schema, GML - Schema

Ili2pg

Errors

No Errors

XML

ILI

ILI

ILI

Errors

No Errors

XML

- Schema
CLASS GR_LegalSpaceUnfinishedConstruction EXTENDS GR_LegalSpaceBuildingUnit =
    unfinishedID: MANDATORY Oid;
type: LIST {0..1} OF
GR_LegalSpaceUnfinishedConstructionType;
startDate: MANDATORY DateTime;
endExpected: MANDATORY DateTime;
MANDATORY CONSTRAINT
    endExpected <= startDate;
END GR_LegalSpaceUnfinishedConstruction;

INTERLIS language

UML Diagram

Database tables

<table>
<thead>
<tr>
<th>GR_LegalSpaceUnfinishedConstruction</th>
<th>unfinished_id</th>
<th>Integer</th>
<th>”pK”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endexpected</td>
<td>DateTim</td>
<td></td>
<td></td>
</tr>
<tr>
<td>startDate</td>
<td>DateTim</td>
<td></td>
<td></td>
</tr>
<tr>
<td>type</td>
<td>Integer</td>
<td>”fK”</td>
<td></td>
</tr>
</tbody>
</table>

ID reference from the code list table
Conclusions & Challenges

- **INTEROPERABILITY**: definition of functions, constraints and rules to be applied at the data types and check their validation;
- creation of the mappings between the tools in order to recognize & check the proposed structures;

- **Quality checking** both 2D & 3D representations:
  - (a) avoid gaps and overlapping between neighboring objects
  - (b) validate that all the objects are closed

- **Directly implementable LADM model** which speed up the technical implementation;
- **Compatibility** problems arise – faced;
- Formulate **Code lists** to achieve semantically meaningful concept (hierarchy);
- Formal specification of constraints.
Thank you!!