

ISO/TC 211 Workshop Standards in Action

Swiss Contribution

Overview

- **Introduction**
History of Geostandards in Switzerland
- **Standards in Action**
Examples of ISO/TC211 Standards Applications
- **Summary and Outlook**
Experiences and Results

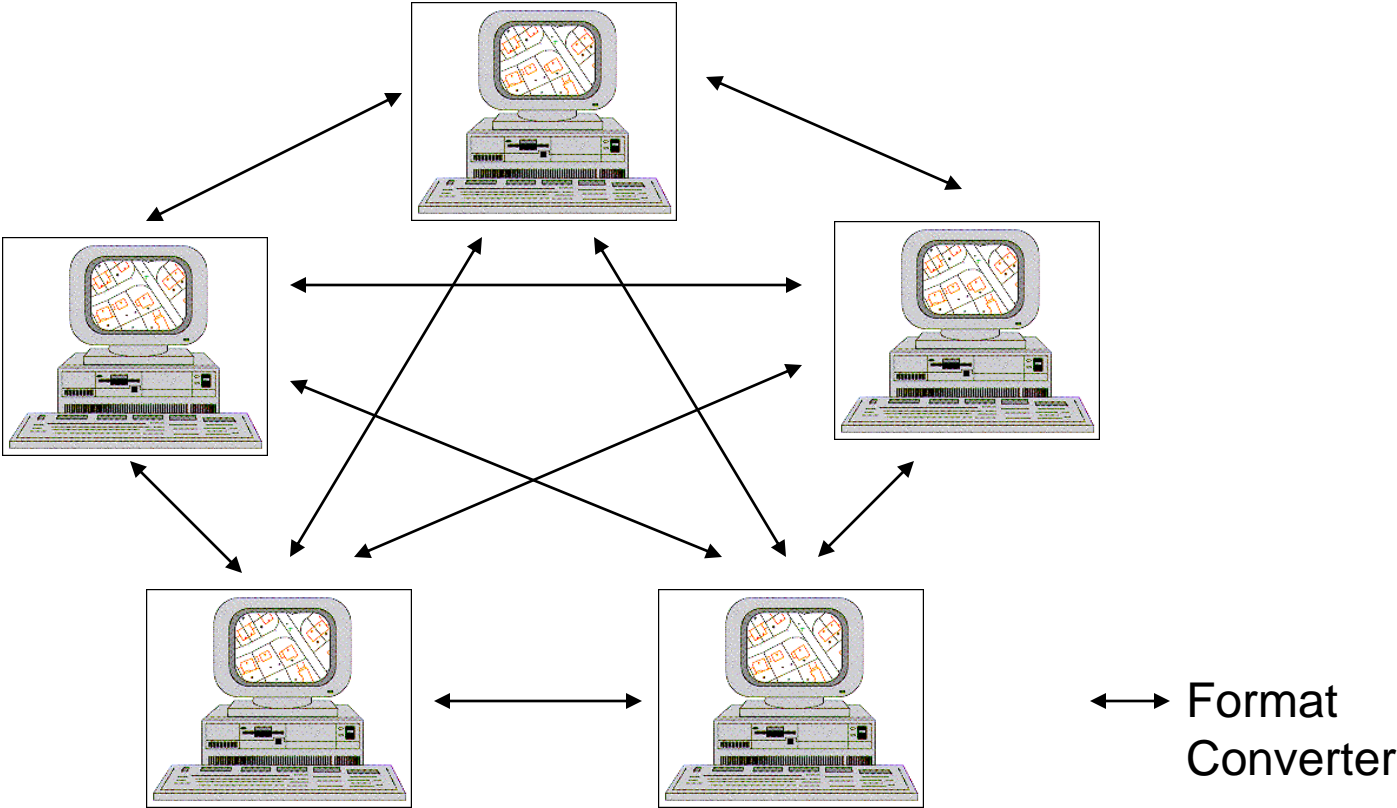
Introduction

History of Geostandards in Switzerland

Introduction

M105

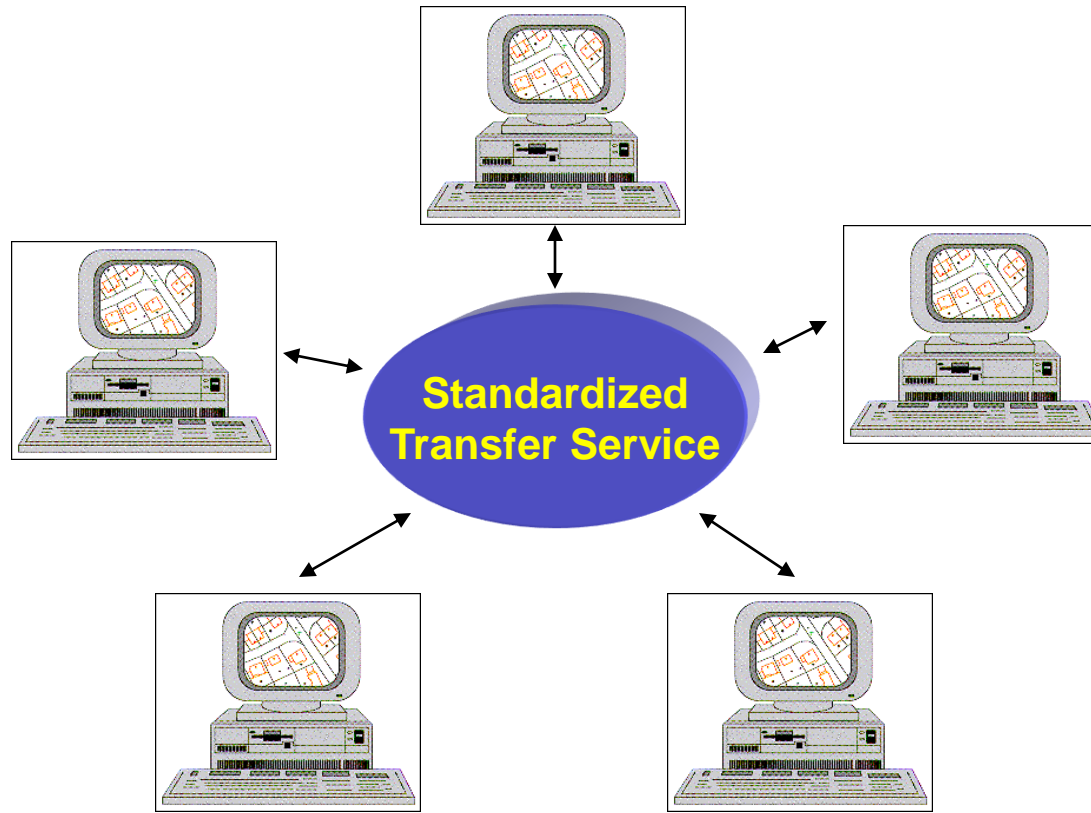
- Motivation for using a Geostandard in Switzerland



Introduction

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- Motivation for using a Geostandard in Switzerland



Introduction

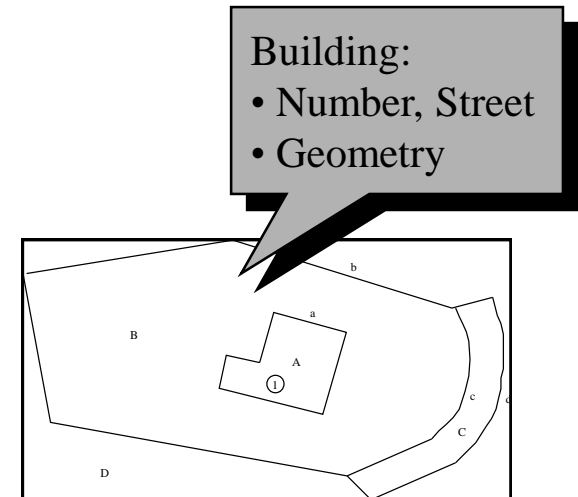
M202

History:

- 1985** development of model-based Geostandard (INTERLIS 1)
- 1992** Swiss law: use standard for the documentation of land surveying data
- 1992 - 2000** development of conceptual models for various application domains, corresponding data acquisition followed by data transfer between different GIS
- 1998 - 2000** development of second version of standard (INTERLIS 2) based on current IT, and experiences with INTERLIS 1, and requirements of ISO/TC211, PT CSL

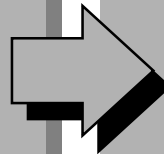
Introduction

- What is **INTERLIS**?
 - A **conceptual schema language**
 - A **sequential transfer format**
 - Encoding rules (**XML**)



Data description:

```
DATA MODEL =  
  
DOMAIN  
  Point2D = COORD2 111.11 222.22  
  
TOPIC T =  
  
  CLASS C =  
    Attr1: TEXT*12;  
    Attr2: Point2D;  
    ...
```



Data transfer format:

```
<Grunddatensatz_Fixpunkte_LFP>  
  <Grunddatensatz_Fixpunkte_LFP_OBJE  
    TID="T101" Art="LFP1" LageZuv="ja"  
    HoeheGen="0.0" Nummer="1091111.2"  
    Geometrie="675899.226/245270.946"  
    LageGen="0.0"  
    NumPos="675895.761/245263.124"  
    HoeheZuv="ja"  
  />  
<Grunddatensatz_Fixpunkte_LFP_OBJE  
  ...
```

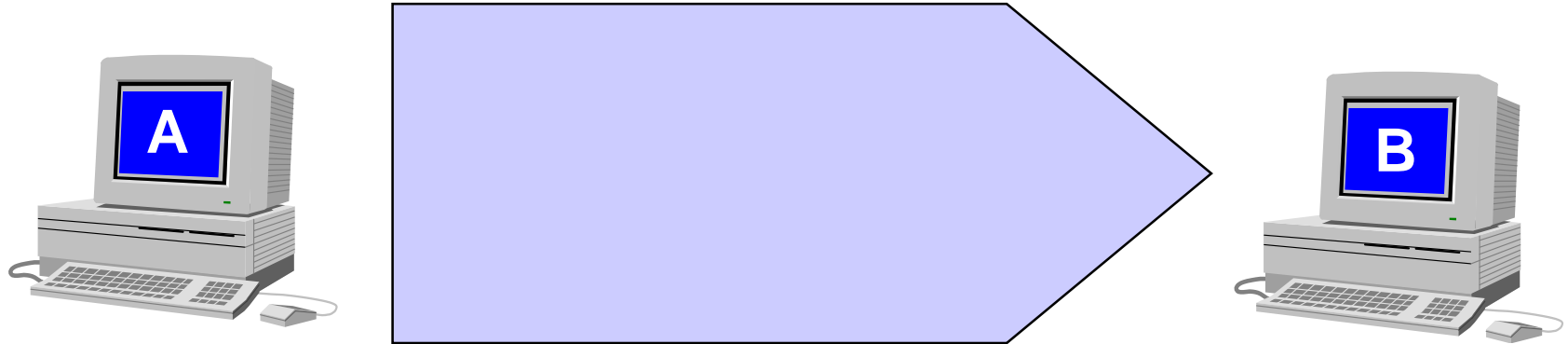


Introduction

M204

Model-based Geodata transfer from GIS A to GIS B

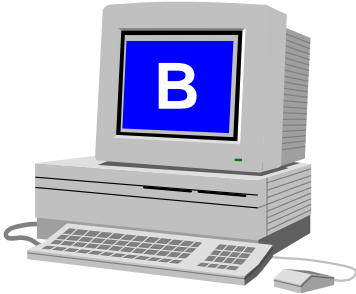
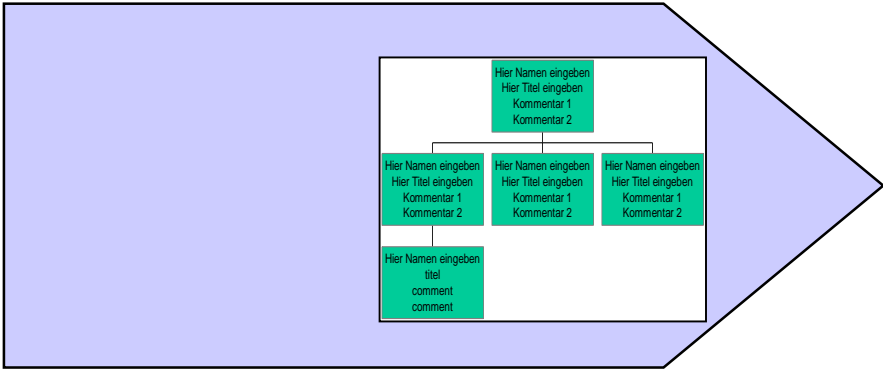
Structure of the transfer file:



Introduction

Model-based Geodata transfer from GIS A to GIS B

Structure of the transfer file: first data model

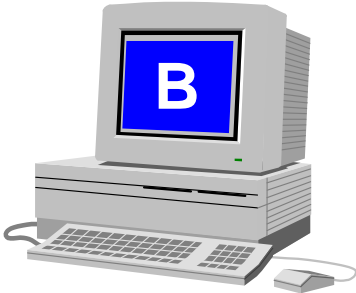
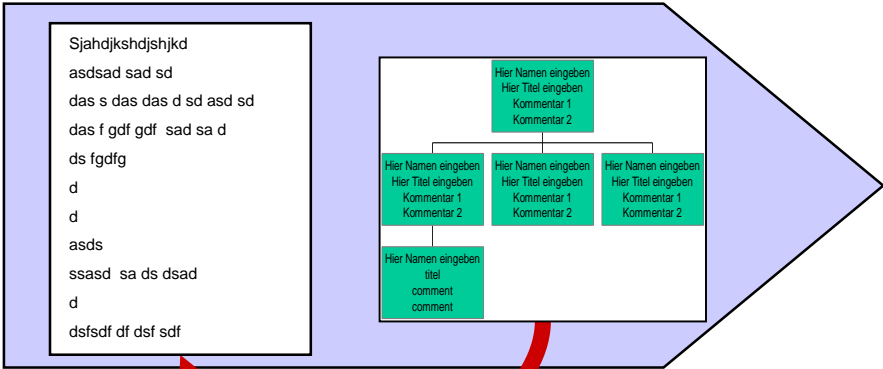


Introduction

Model-based Geodata transfer from GIS A to GIS B

Structure of the transfer file:

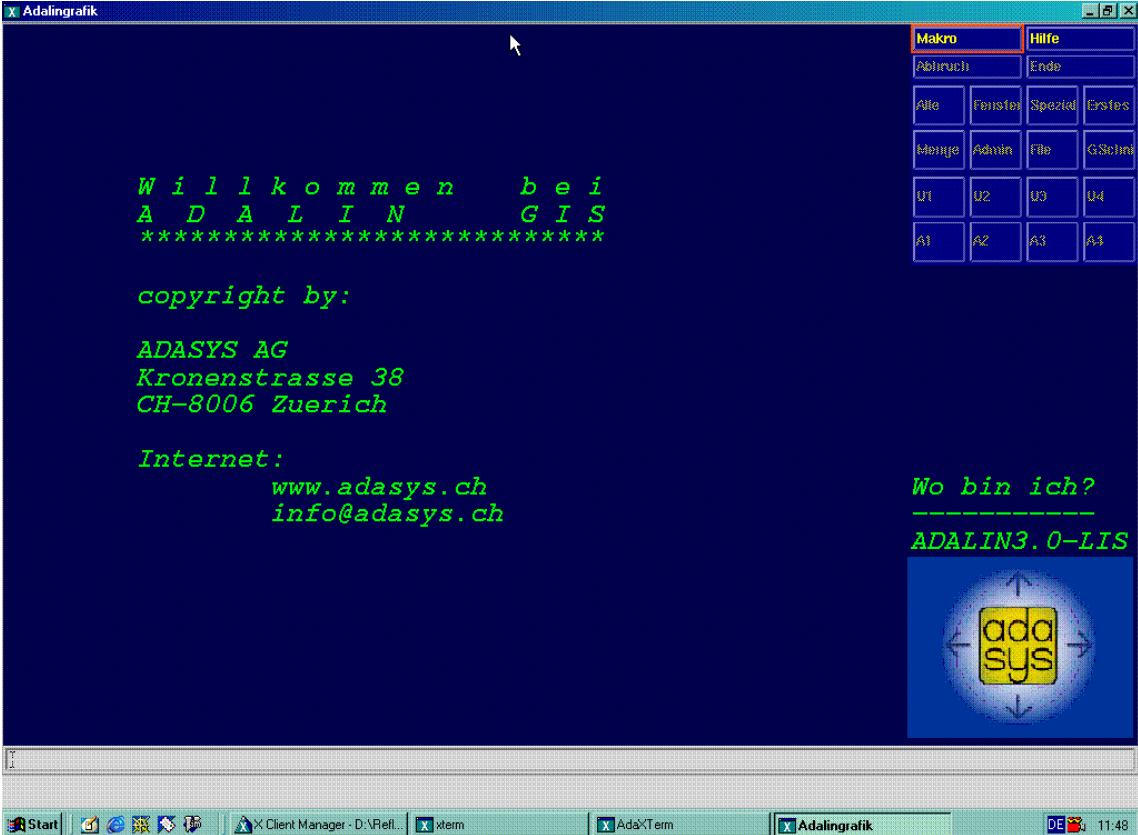
first data model
then data



**From the data model
the transfer format can be derived**

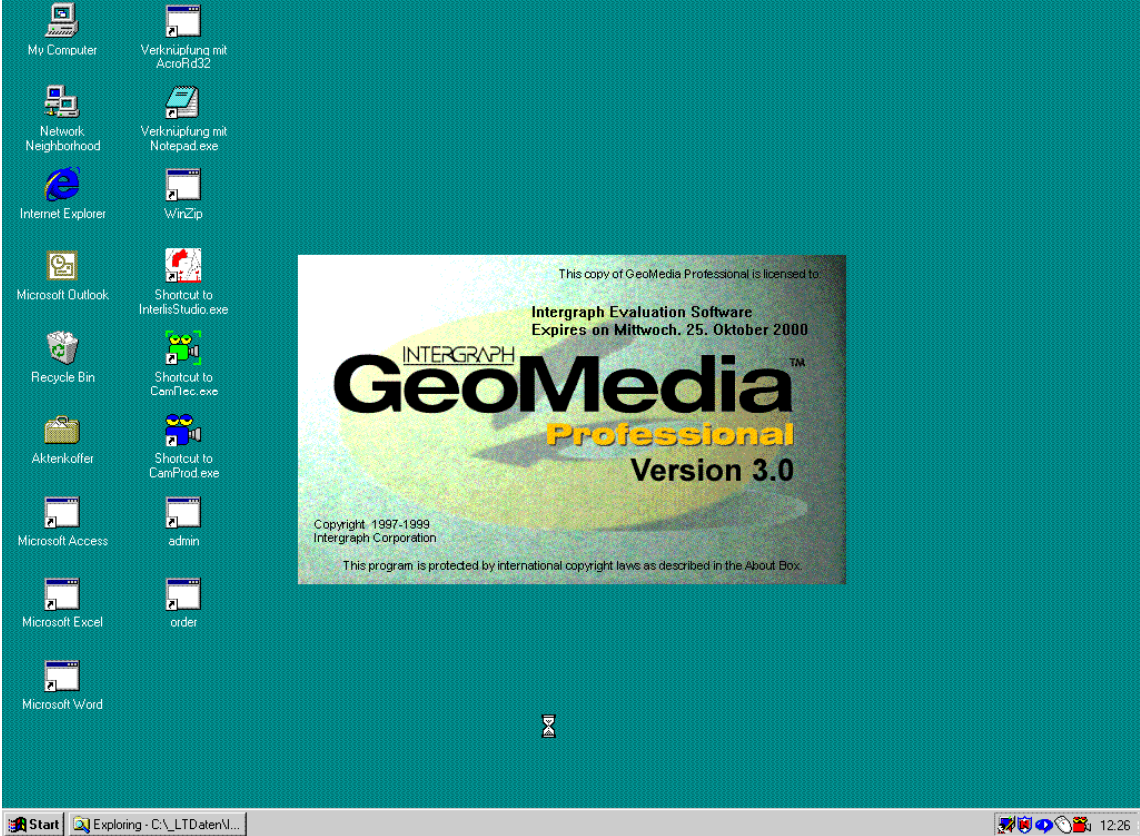
Introduction

M203.2



Introduction

M203.3



Introduction

- **Experiences**
 - **Model-based approach is suitable for GIS data transfer:**
 - **standards can be independent of any application**
 - **Data once captured need not be recaptured if system changes**
 - **Freedom of implementation for system developers and freedom of the users to chose the best system**
 - **Reusability of data, interoperability of systems**

Introduction

- **Experiences**
 - **INTERLIS 1 has several disadvantages:**
 - **no possibility for class and type extensions (OO)**
 - **no incremental update**
 - **not XML-based**
 - **no unit and co-ordinate reference types**
 - **no multi-lingual support**
 - **OID specification missing**
 - **not conform to ISO 19100**

Standards in Action

Examples of ISO/TC211 Standards Applications

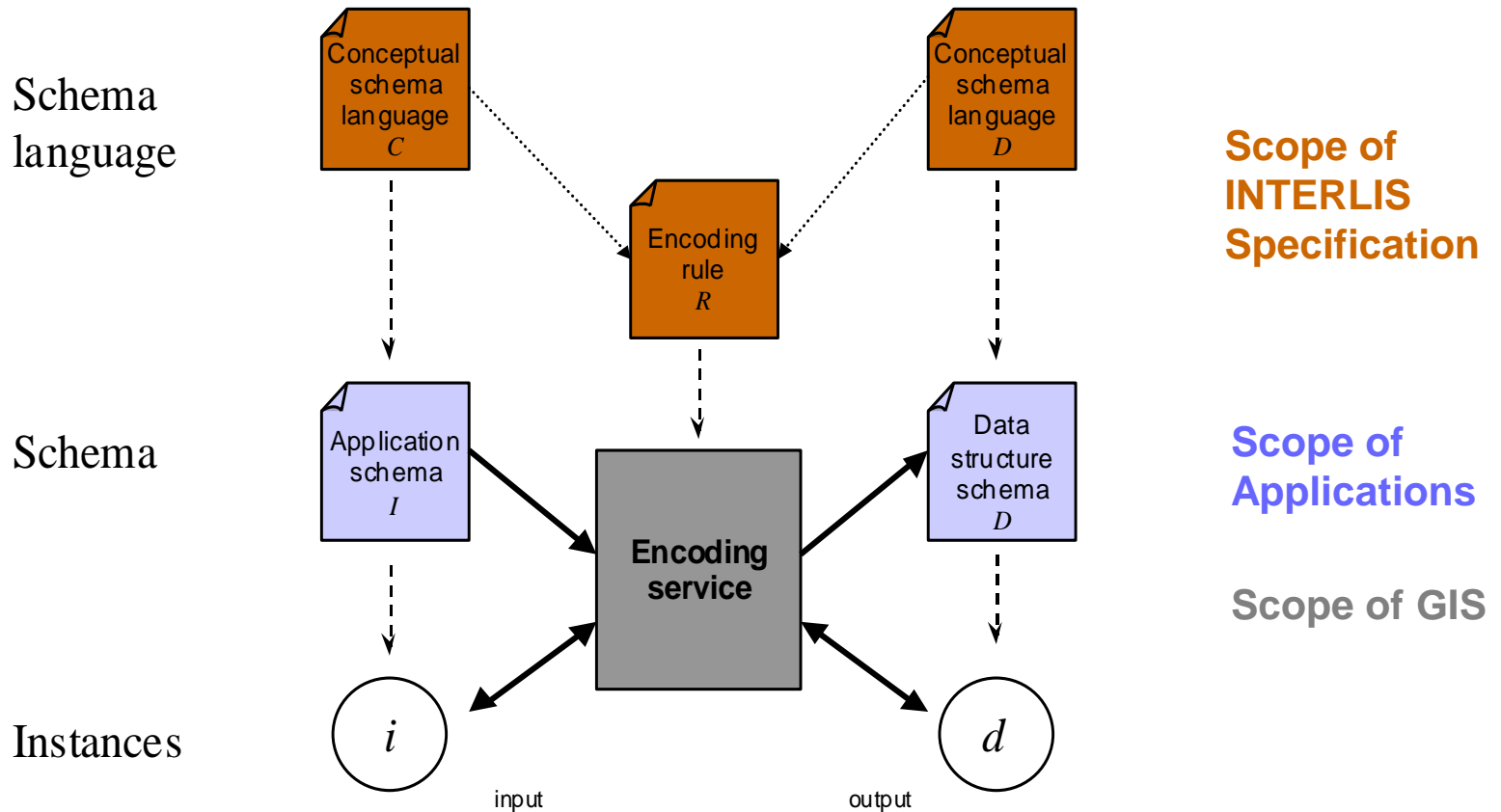
Standards in Action

M202




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Standards in Action

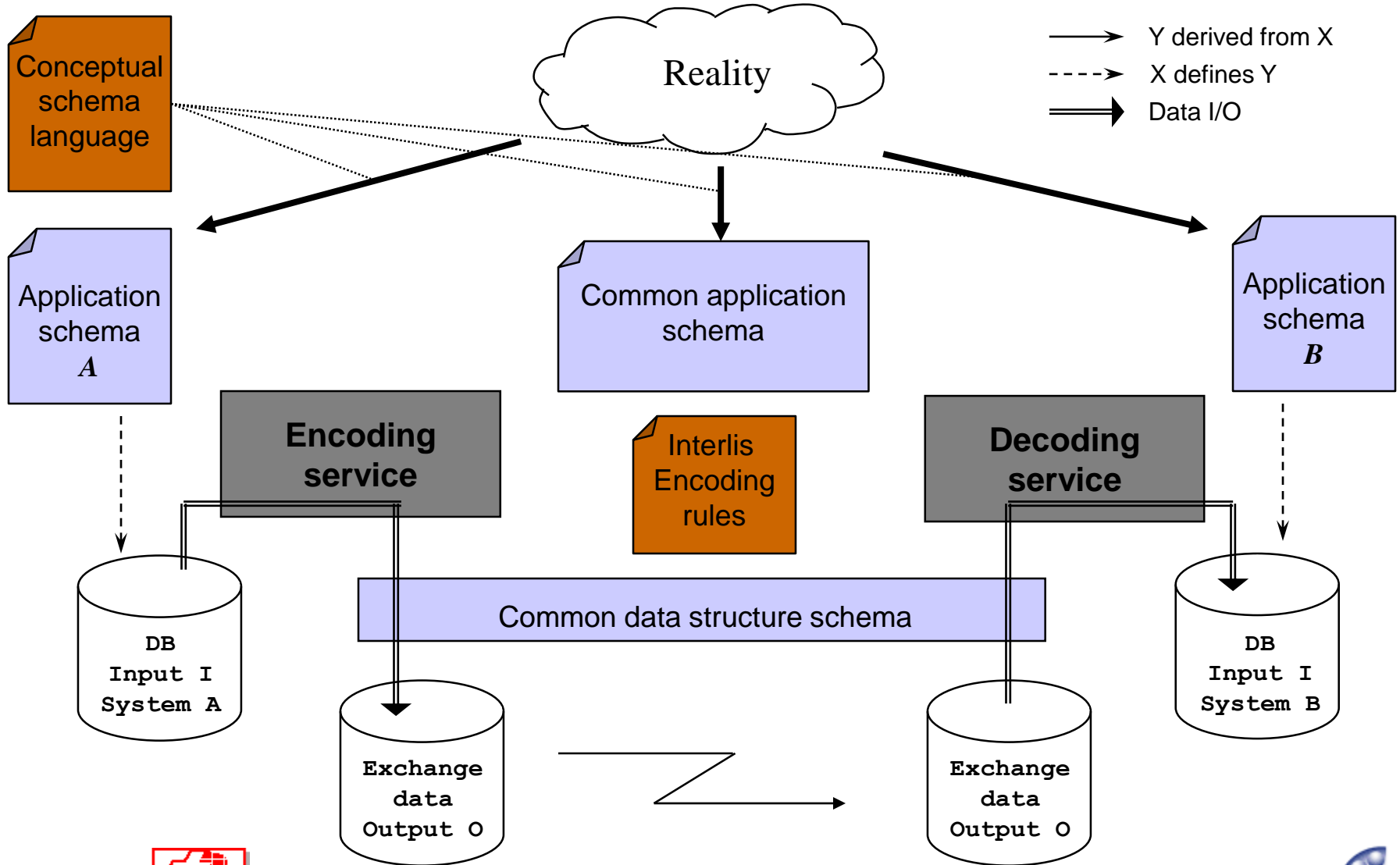


ISO 19118.2 Figure 2: Overview of the encoding process

 Defines
  Data flow
  Relationship

Standards in Action

Implementation of the Encoding Process in Switzerland



Standards in Action

M221

INTERLIS-CSL

MODEL

TOPIC

CLASS

CLASS (ABSTRACT)

-> (Association)

-<> (Aggregation)

LIST OF, BAG OF

CLASS A EXTENDS B

UML Element

Package(s)

Package in package

Class

Abstract class

Association

Aggregation Association

Composition Association

Generalization

Standards in Action

M220

No.	ISO document title	INTERLIS part
19101	Reference model	Chap. 1, chap. 2
19109	Rules for application schema	Chap. 1 + user manual
19103	Conceptual schema language (CSL)	Chap. 2 CSL
19107	Spatial schema	Geometric data types
19103	CSL (+Object Constraint L.)	Constraints + Logical Expr.
19108	Temporal schema	Units + Ref.Sys, etc. ...
19111	Spatial ref. by coord.	Reference system (CRS)
?	?	Views (~ SQL92)
19117	Portrayal	Graphic description + symb.
19118	Encoding	Seq. transfer + update

Standards in Action

M222

ISO 19107 Spatial Schema	INTERLIS data types	Remarks
GM_Point	COORD2, 3, ...	-
GM_Curve GM_LineString	POLYLINE WITH...	POLYLINE can be mapped to several GMx
GM_GenericSurface GM_Surface GM_SurfacePatch GM_Polygon	SURFACE WITH...	SURFACE can be mapped to several GMx
GM_MultiPoint, Curve GM_MultiLineString GM_MultiSurface	<i>Not defined</i>	user definable, done with compositions
TP_Face	AREA WITH ...	-
TP_Solid	<i>definable with classes</i>	-

Standards in Action

R204

- **Example**
 - **Data modeling with UML**
 - **UML-input and data model refinement in INTERLIS**
 - **INTERLIS compiler produces output data model as XML Schema/DTD (+ empty data section)**
 - **Data consistent to defined data model in XML(-DTD + data section)**

Standards in Action

M208

Example: UML → INTERLIS



Standards in Action

M209

Example: INTERLIS schema

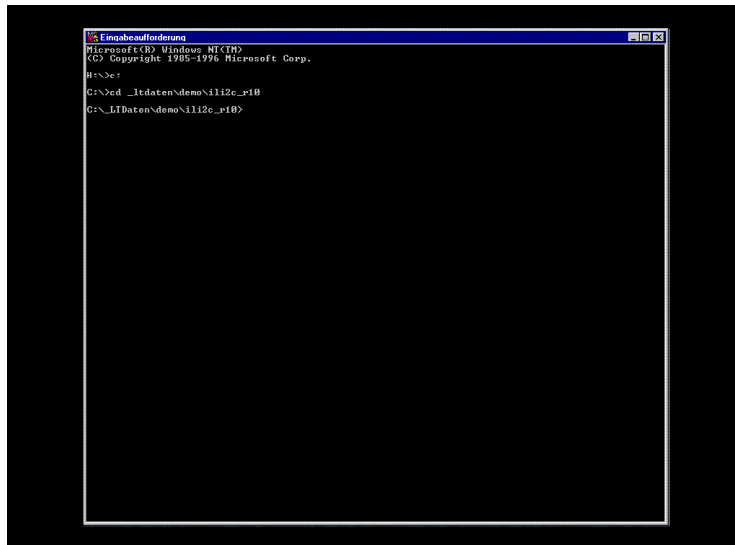
```
!! Version 2000-03-26
INTERLIS 2.0; LANGUAGE = en; !! 2-letter code (ISO 639)
DATA MODEL Roads2Example =
  DOMAIN
    Point2D = COORD 0.000 .. 200.000, !! Min_East Max_East
              0.000 .. 200.000, !! Min_North Max_North
              ROTATION 2 -> 1;
    Orientation = 0.0 .. 360.0;
  TOPIC Roads =
    CLASS LandCover =
      Type: MANDATORY (building, street, water, other);
      Geometry: MANDATORY SURFACE WITH (STRAIGHTS) VERTEX Point2D
                WITHOUT OVERLAPS > 0.100;
    END LandCover;
    CLASS Street =
      Name: MANDATORY TEXT*32;
    END Street;
    CLASS StreetAxis =
      Street: MANDATORY -> Street;
      Geometry: MANDATORY POLYLINE WITH (STRAIGHTS) VERTEX Point2D;
      Precision: MANDATORY (precise, unprecise);
    END StreetAxis;
    CLASS StreetNamePosition =
      Street: MANDATORY -> Street;
      NamPos: MANDATORY Point2D;
      NamOri: MANDATORY Orientation;
    END StreetNamePosition;
    CLASS PointObject =
      Type: MANDATORY (tree, geodetic_point, other);
      Position: MANDATORY Point2D;
    END PointObject;
  END Roads; !! of TOPIC
```


Standards in Action

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Example: compile INTERLIS → XML (or DTD or XML Schema)

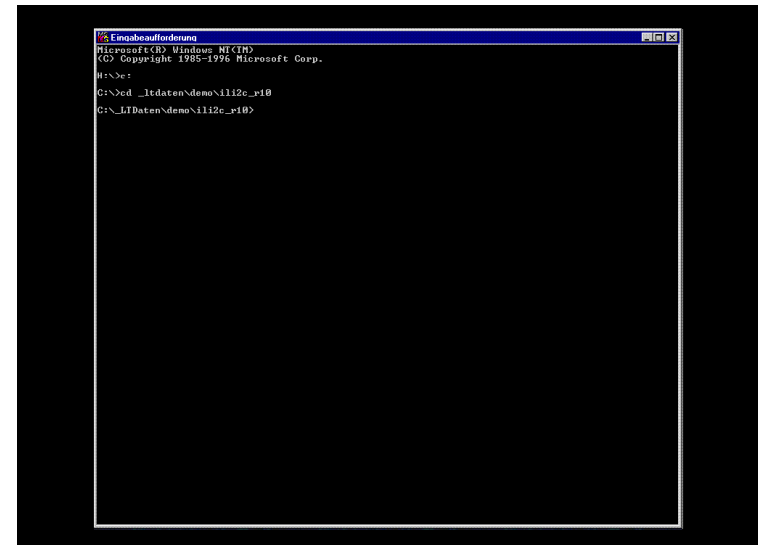
ili2 compiler



```
Eingabeaufforderung
Microsoft Windows [ITR]
(C) Copyright 1985-1996 Microsoft Corp.

H:\Se:
C:\_l1Daten\demo\ili2c_r10
C:\_l1Daten\demo\ili2c_r10>
```

ili to DTD



```
Eingabeaufforderung
Microsoft Windows [ITR]
(C) Copyright 1985-1996 Microsoft Corp.

H:\Se:
C:\_l1Daten\demo\ili2c_r10
C:\_l1Daten\demo\ili2c_r10>
```

Standards in Action

M211

Example: corresponding XML data

```
<DATASECTION>
  <Roads2Example-m>
    <Roads2Example.Roads BASKETID="B1">
      <Roads2Example.Roads.LandCover TID="B1.16" Type="water">
        <Roads2Example.Roads.LandCover.Geometry>
          <SURFACE>
            <POLYLINE>
              <LINEATTR>
                <Roads2Example.Roads.LAttr LArt="welldefined" />
              </LINEATTR>
              <P C1="39.038" C2="60.315" />
              <P C1="41.200" C2="59.302" />
              <P C1="43.362" C2="60.315" />
              <P C1="44.713" C2="66.268" />
              <P C1="45.794" C2="67.662" />
              <P C1="48.766" C2="67.408" />
              <P C1="53.360" C2="64.115" />
              <P C1="56.197" C2="62.595" />
              <P C1="57.818" C2="63.862" />
              <P C1="58.899" C2="68.928" />
              <P C1="55.927" C2="72.348" />
              <P C1="47.955" C2="75.515" />
              <P C1="42.281" C2="75.388" />
              <P C1="39.308" C2="73.235" />
              <P C1="36.741" C2="69.688" />
              <P C1="35.525" C2="66.268" />
              <P C1="35.661" C2="63.735" />
              <P C1="37.957" C2="61.455" />
              <P C1="39.038" C2="60.315" />
            </POLYLINE>
          </SURFACE>
        </Roads2Example.Roads.LandCover.Geometry>
      </Roads2Example.Roads.LandCover>
    </Roads2Example.Roads BASKETID="B1">
  </Roads2Example-m>
</DATASECTION>
```

Standards in Action

R204

Implementation Experiences:

- **Application experts develop system independent conceptual schemas**
- **GIS can implement encoding services on an abstract (= application independent) level!**
- **Transfer format or service (API) need not be developed but is automatically derived from the conceptual application schema by using the encoding rules!**

Standards in Action

M306

Phases of standards life cycles	INTERLIS 1	INTERLIS 2
development	1985	1998-2000
publication of draft	1986	2000
first implementation and application tests	1986-1990	2000
review and refinement of draft according to test results	1990-1991	2000-2001
publication as standard	1991	2001
Further implementations and applications	1991-2000	

Standards in Action

- **Experiences**
 - **Commercial tools for deriving XML out of UML (automatically) are available**
 - **Commercial GIS which support model-based data transfer are available (examples: ADALIN, ArcInfo, C-Plan, GeoMedia, MapInfo)**
 - **Commercial software for quality checks of data models and data is available**
 - **Minimal model can be fixed worldwide; national, regional and local extensions are possible**
 - **Existing development and tools can be reused**

Summary and Outlook

Experiences and Results

Summary and Outlook

R502

Experiences and Results

- **Model-based approach is successfully used for data transfer in Switzerland since 1988**
- **ISO/TC211-based tools are implemented, tested and available**
- **Testing of concepts and tools**
 - **necessary for standards' acceptance**
 - **lasted about 6 to 12 months**
 - **leads to minor changes in the standard's definition, which are essential regarding applicability of the standard**

Summary and Outlook

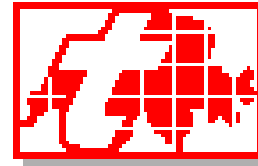
Outlook:

- **Swiss Proposal:**
 - **ISO/TC211 documents should be published, tested, and altered according to the test results**
- **Switzerland will participate actively in the financing and implementation of testing frameworks (example: project CHEETAH)**
- **Switzerland offers experience with the model-based approach and implemented and working tools**
- **Switzerland will adapt its national standard to further ISO/TC211 results (INTERLIS 3 will be based on the 19100 International Standards)**

Supported by



**Bundesamt
für Landestopographie**



Coordination de l'information géographique et des systèmes d'information géographique
Coordinamento del informazione geografica e dei sistemi di informazione geografica
Coordination of geographic information and geographic information systems
Koordination der Geoinformation und geografischen Informationssysteme

Appendix: Contact

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