

ALKIS-ATKIS modelling using ISO 19100 standards

Workshop “Standards in action” – Lisbon – 2001-03-07

Clemens Portele

interactive instruments GmbH

Trierer Straße 70-72, 53115 Bonn, Germany

 +49 228 9141073

 portele@interactive-instruments.de

- Until 1999 ALKIS-ATKIS has been developed without using ISO draft standards.
- Main benefits by using ISO 19100 (expectations):
 - Reduction of software costs by using standard components (more off-the-shelf, less ALKIS-ATKIS-specific software).
 - Better integration into IT environments by following the IT mainstream developments (e.g. UML, XML).
 - Easier access to spatial information for users / customers by following internationally accepted practices.
 - Other spatial applications in Germany will be going to use the ISO 19100 standards **in the same way** they are used by ALKIS-ATKIS. ALKIS and ATKIS will form a basic layer of spatial information.

Covered Draft Standards

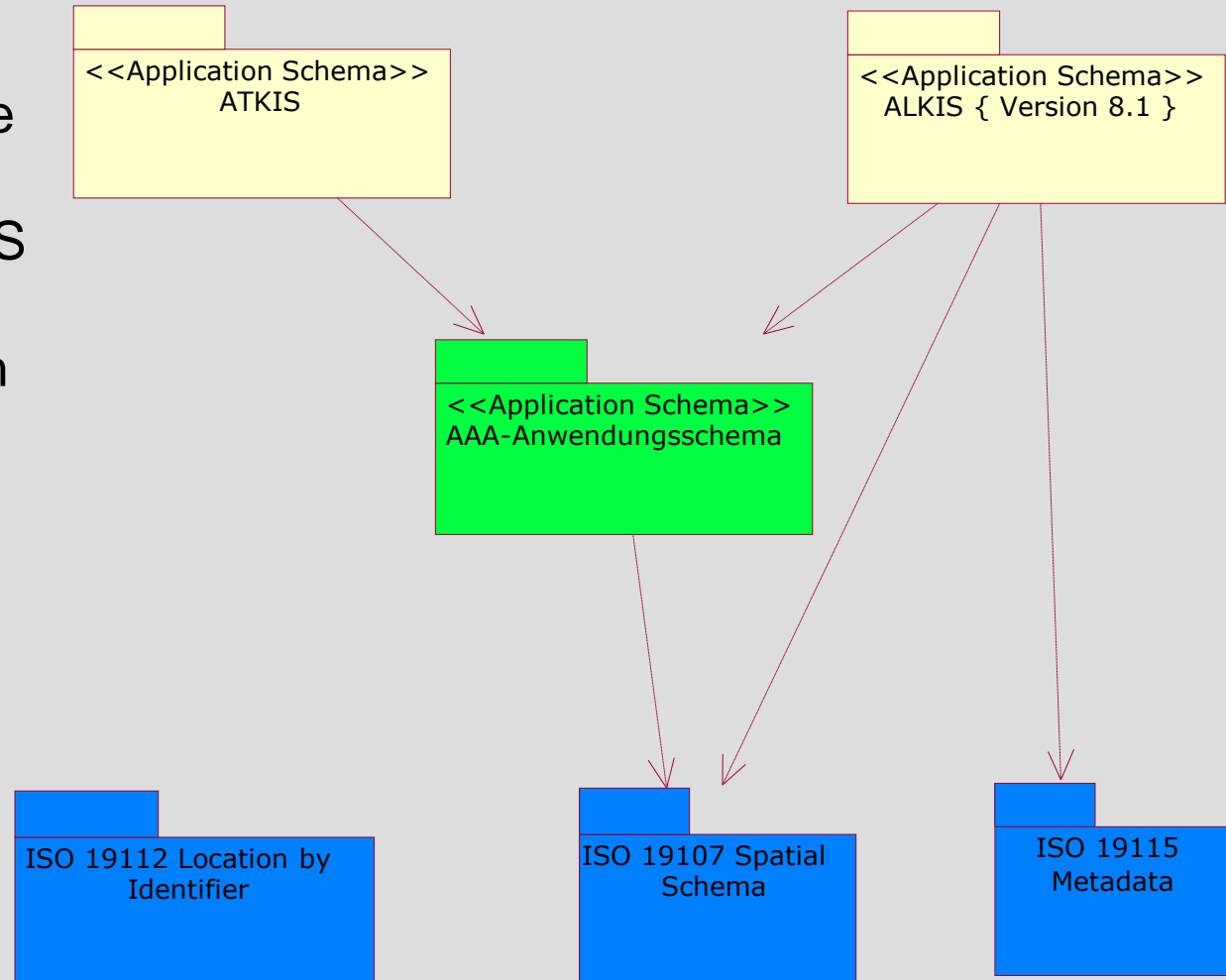
- ISO 19103 Conceptual schema language
- ISO 19107 Spatial schema
- ISO 19108 Temporal schema
- ISO 19109 Rules for application schema
- ISO 19110 Feature cataloguing methodology
- ISO 19112 Spatial referencing by geographic identifiers
- ISO 19113 Quality principles
- ISO 19115 Metadata
- ISO 19117 Portrayal
- ISO 19118 Encoding

- ISO 19103 Conceptual schema language
- ISO 19107 Spatial schema
- ISO 19108 Temporal schema
- ISO 19109 Rules for application schema
- ISO 19110 Feature cataloguing methodology
- ISO 19112 Spatial referencing by geographic identifiers
- ISO 19113 Quality principles
- ISO 19115 Metadata
- ISO 19117 Portrayal
- ISO 19118 Encoding

Application Schema and Feature Cataloguing

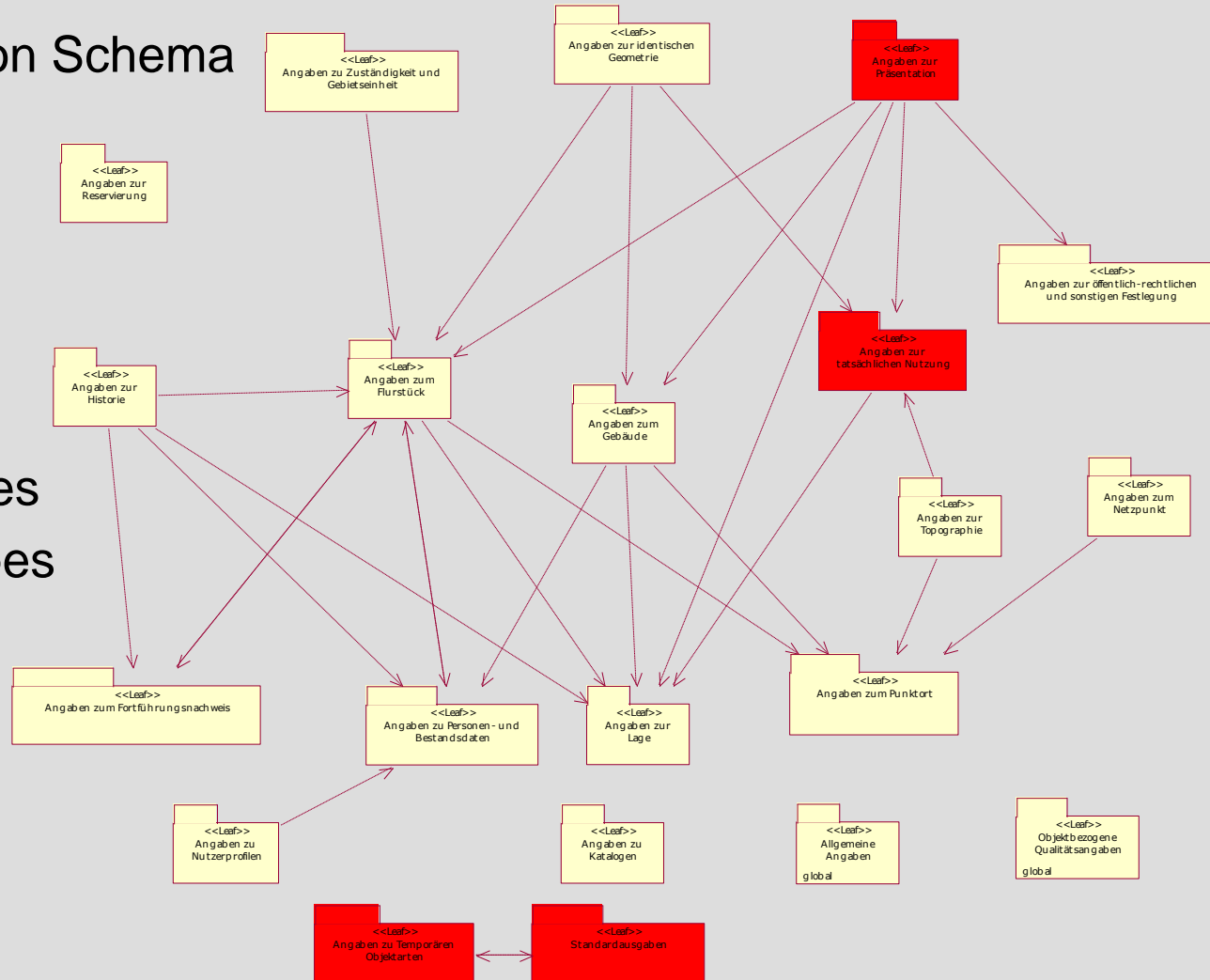
Rational Rose is used to model the UML application schemas of ALKIS and ATKIS in conformance with ISO 19103 and 19109.

(Simplified) structure of main packages.



Application Schema and Feature Cataloguing

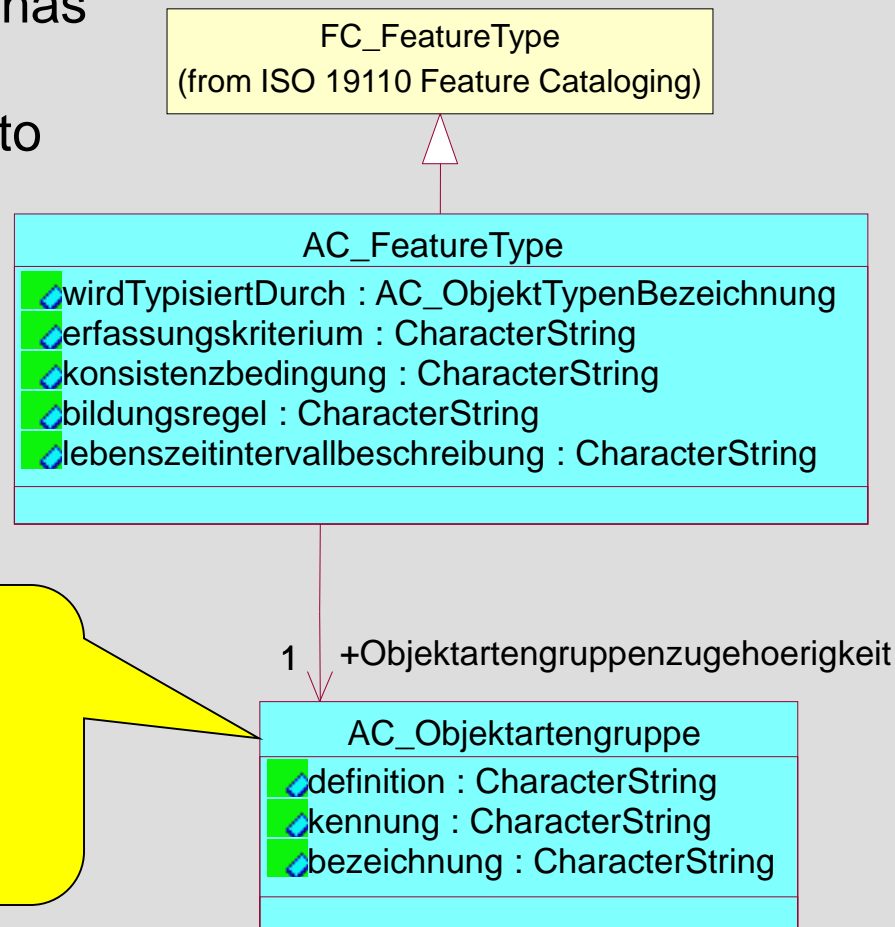
ALKIS Application Schema



Some statistics:
21 Leaf Packages
241 Feature Types

Application Schema and Feature Cataloguing

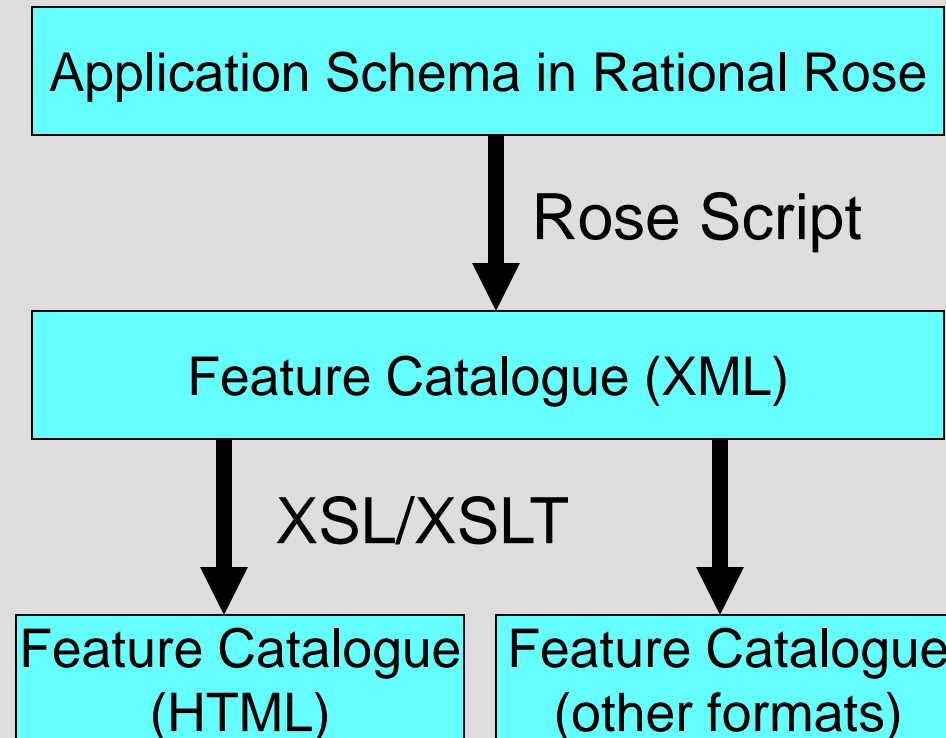
- Feature Cataloguing has been extended for ALKIS-ATKIS usage to include additional information in the catalogue.



This is more or less equivalent to a leaf package in the Application Schema.

Application Schema and Feature Cataloguing

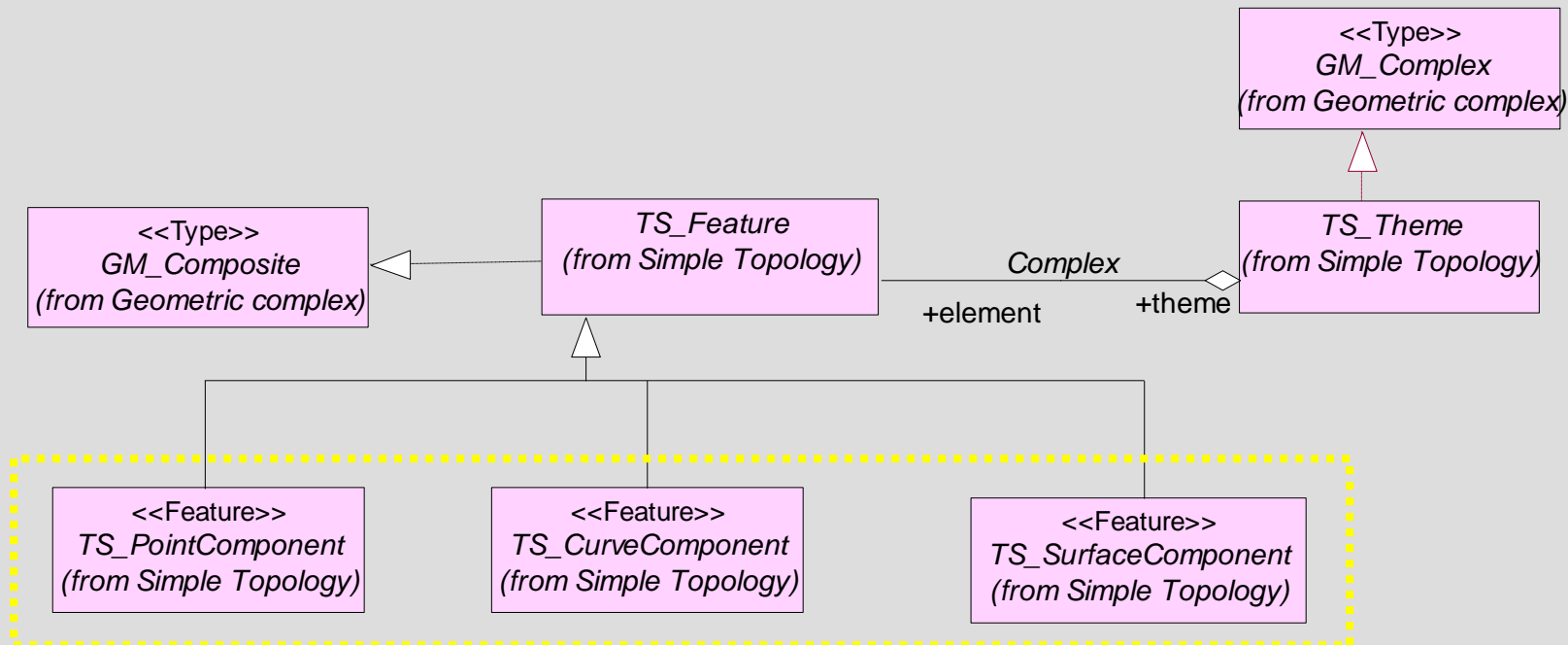
- Relation between Feature Cataloguing and General Feature Model unclear.
- ALKIS-ATKIS approach: The Feature Catalogue is derived from the application schema. The application schema is the reference.
- As a result, consistency between the different ways to describe the application domain is enforced.



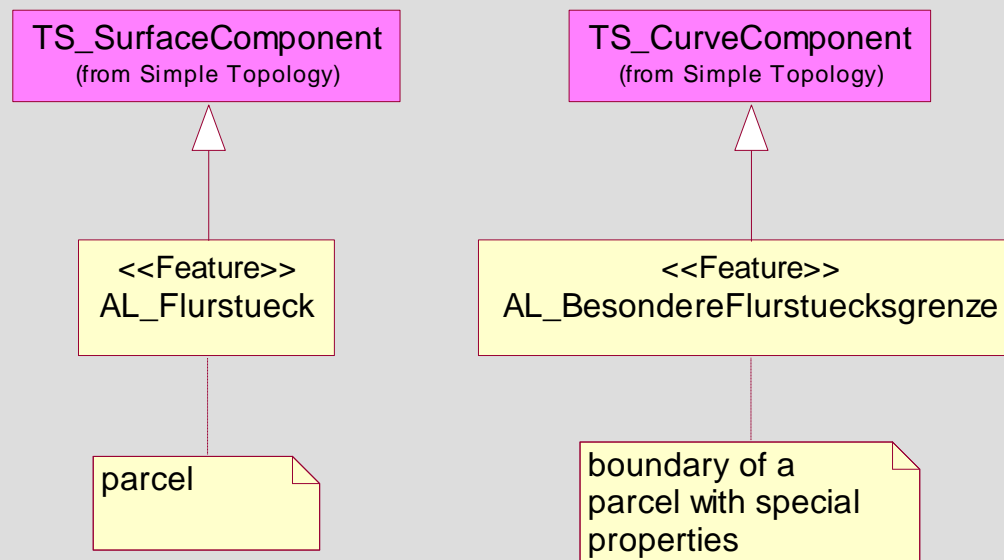
- ISO 19103 Conceptual schema language
- **ISO 19107 Spatial schema**
- ISO 19108 Temporal schema
- ISO 19109 Rules for application schema
- ISO 19110 Feature cataloguing methodology
- ISO 19112 Spatial referencing by geographic identifiers
- ISO 19113 Quality principles
- ISO 19115 Metadata
- ISO 19117 Portrayal
- ISO 19118 Encoding

- The Spatial Schema is a complex model with many options.
- Its usage must be restricted for ALKIS-ATKIS, otherwise standardisation goals are likely to be compromised (we do not expect that GIS vendors will implement the full model).
- Only the following spatial attribute types are allowed:
 - GM_Point, GM_Curve, GM_OrientableCurve, GM_PolyhedralSurface,
 - TS_Node, TS_DirectedEdge, TS_Face,
 - GM_CompositeCurve, GM_CompositeSurface,
 - GM_MultiPoint, GM_MultiCurve, GM_MultiSurface.
- Only the following types of curve segments are allowed:
 - GM_LineSegment, GM_LineString, GM_Arc (interpolation "CircularArc3Points"), GM_Circle, GM_CubicSpline.

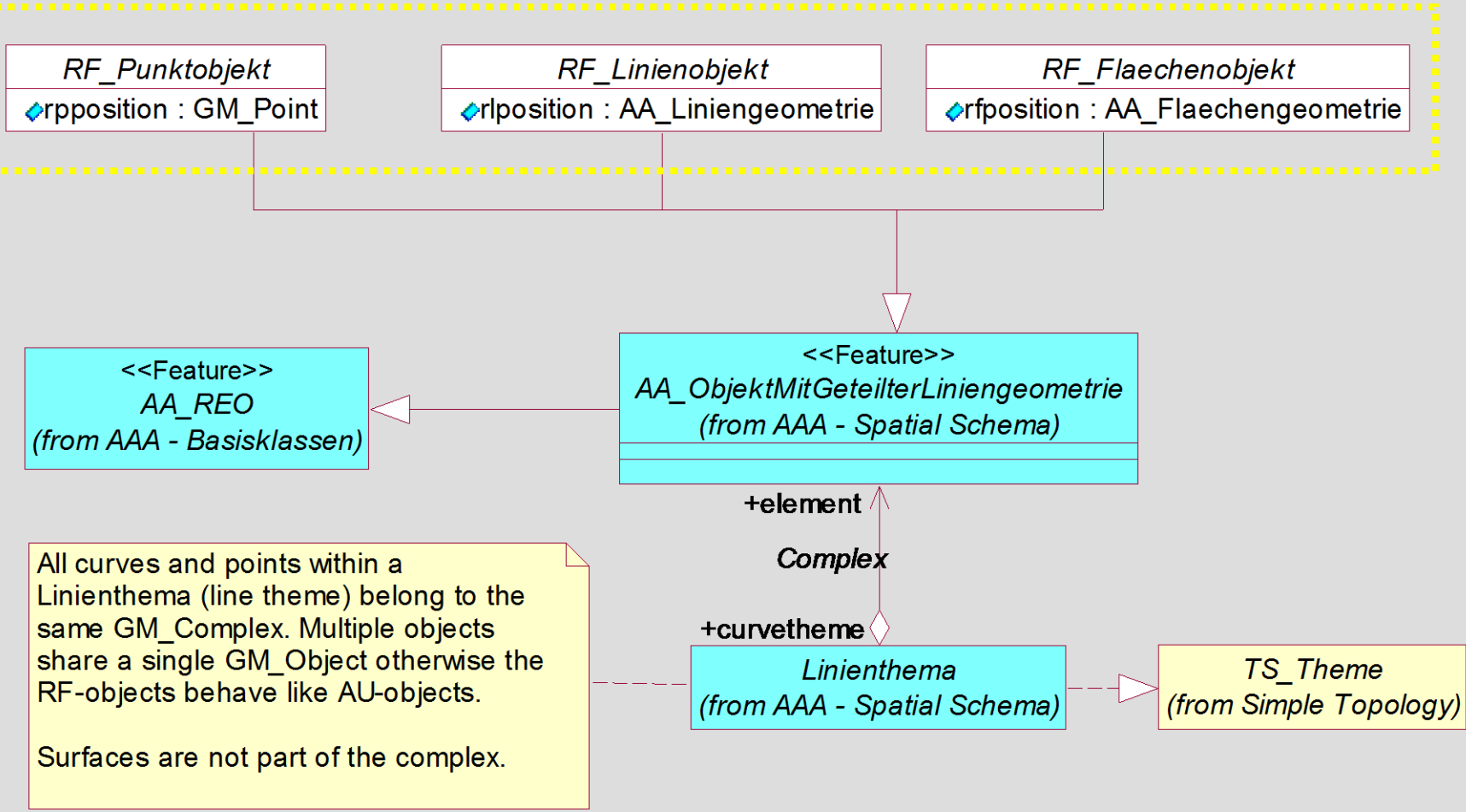
- A spatial schema for ALKIS-ATKIS has been developed, offering four ways to express the spatial properties of features.
 - Topology (TS = Simple Topology from ISO 19107)
 - Shared Geometry (RF)
 - Independent Geometry (AU)
 - Presentation Geometry (AP)
- ALKIS-ATKIS feature types with spatial attributes must be derived from the supertypes defined in one of these packages.



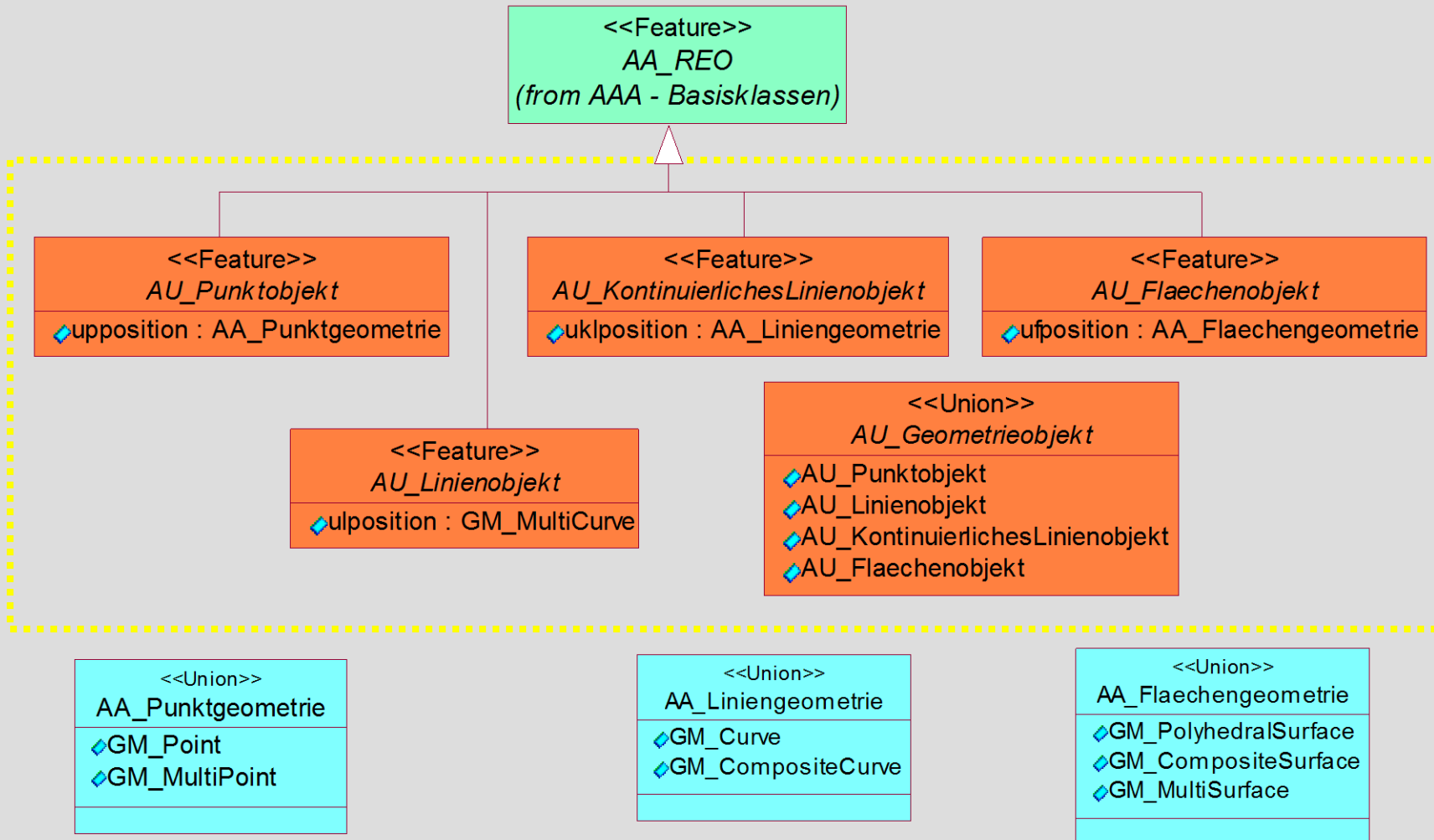
- Simple Topology is used for parcels, administrative areas, etc. where unique coverage of the earth surface is required.



Spatial Schema



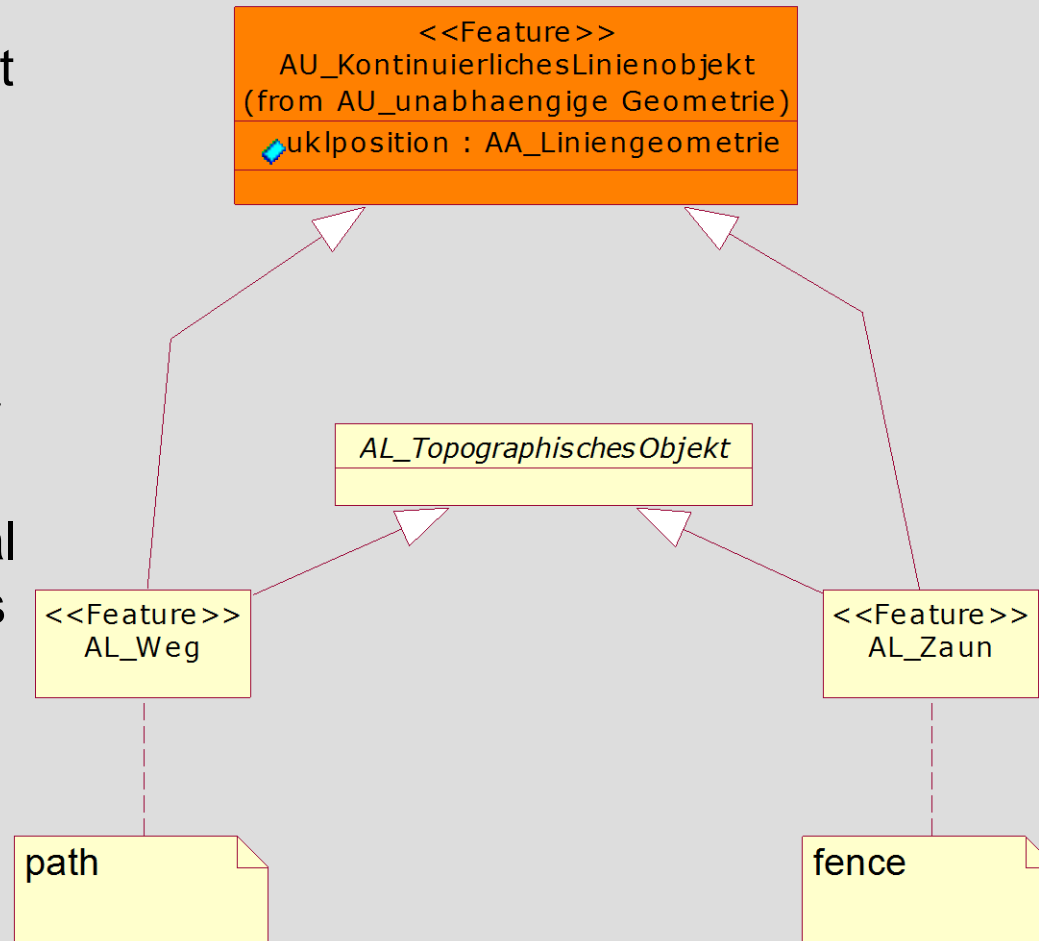
Spatial Schema



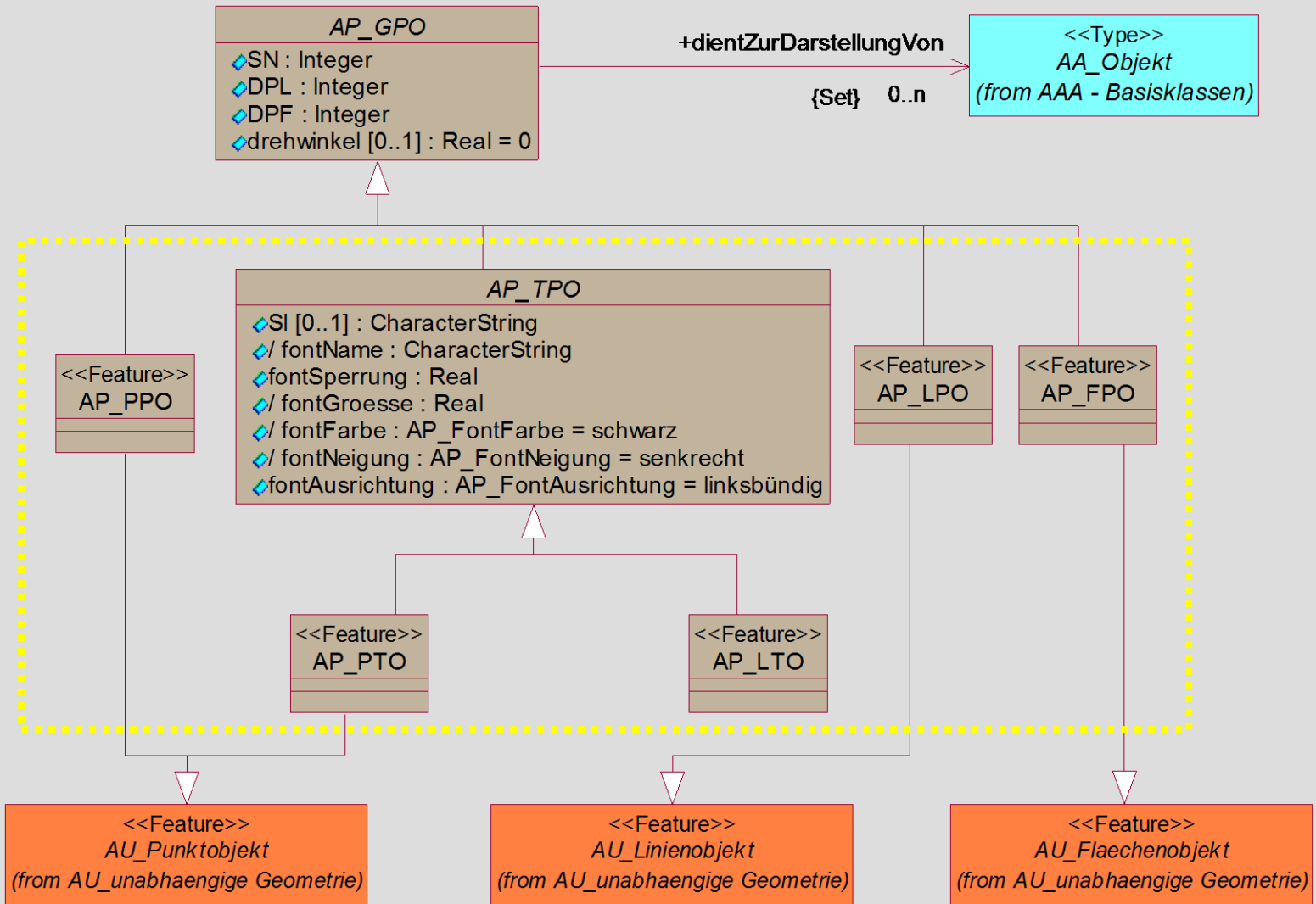
Spatial Schema

Example for independent spatial attributes:

Both “fence” and “path” are represented by continuous curves. Their geometry is only determined by the spatial extent of the feature. It is independent of all other features.



Spatial Schema



- ISO 19103 Conceptual schema language
- ISO 19107 Spatial schema
- **ISO 19108 Temporal schema**
- ISO 19109 Rules for application schema
- ISO 19110 Feature cataloguing methodology
- ISO 19112 Spatial referencing by geographic identifiers
- ISO 19113 Quality principles
- ISO 19115 Metadata
- ISO 19117 Portrayal
- ISO 19118 Encoding

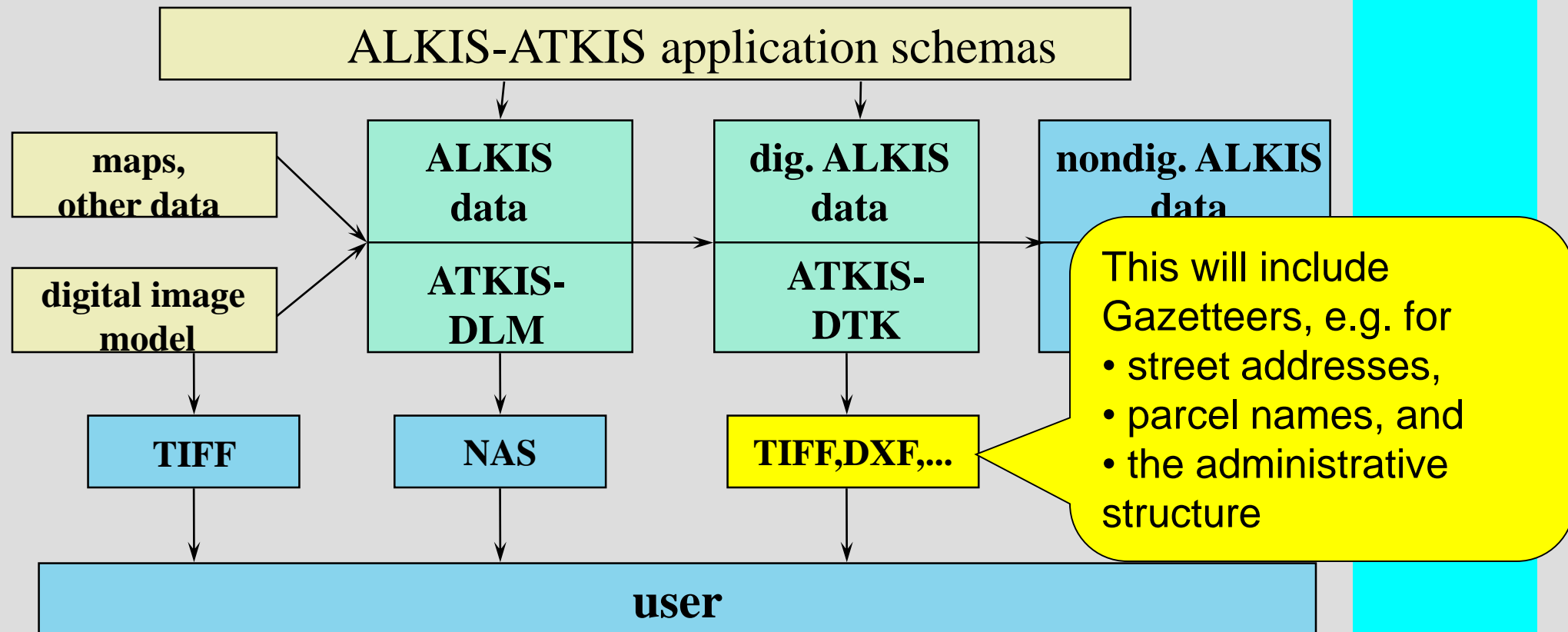
- ALKIS information shall be retrievable for any point in time \Rightarrow ALKIS features are time dependent.
- However, the Temporal Schema has not been used. The “tools” offered by ISO 19108/19109 were evaluated, but it has been decided not to use them for technical reasons.
- As a result, temporal aspects have been modelled on the application schema level.

Spatial referencing by geographic identifiers

- ISO 19103 Conceptual schema language
- ISO 19107 Spatial schema
- ISO 19108 Temporal schema
- ISO 19109 Rules for application schema
- ISO 19110 Feature cataloguing methodology
- **ISO 19112 Spatial referencing by geographic identifiers**
- ISO 19113 Quality principles
- ISO 19115 Metadata
- ISO 19117 Portrayal
- ISO 19118 Encoding

Spatial referencing by geographic identifiers

- Gazetteers will be defined as ALKIS products.



- ISO 19103 Conceptual schema language
- ISO 19107 Spatial schema
- ISO 19108 Temporal schema
- ISO 19109 Rules for application schema
- ISO 19110 Feature cataloguing methodology
- ISO 19112 Spatial referencing by geographic identifiers
- **ISO 19113 Quality principles**
- **ISO 19115 Metadata**
- ISO 19117 Portrayal
- ISO 19118 Encoding

- Work on metadata is still in progress in Germany. It will be based on 19115.
- ISO 19115 has been applied so far only **on the instance level** as specified by ISO 19109, Rules for Application Schema (which we found difficult to understand and handle – especially due to major changes in these drafts during the ALKIS-ATKIS application schema development).

Metadata / quality
information on the
instance level.

```
<<Feature>>  
AL_Punktort  
◆ modellartenZugehoerigkeit : Set<AA_Modellartenkennung> =...  
◆ liegenschaftskarte [0..1] : Boolean  
◆ qualitaetsangaben2D [0..1] : AL_DQ_Punktort2D  
◆ qualitaetsangaben3D [0..1] : AL_DQ_Punktort3D  
◆ qualitaetsangabenHoehe [0..1] : AL_DQ_PunktortHoehe  
◆ AL_Punktort(in objekt : AL_Punktort) : AL_Punktort  
◆ AL_Punktort(in nas : CharacterString) : AL_Punktort  
◆ AL_Punktort(position : GM_Primitive) : AL_Punktort
```

```
<<DataType>>  
AL_DQ_Punktort2D  
◆ herkunft [0..1] : LI_Lineage  
◆ genauigkeit [0..1] : AL_Genauigkeit2D_Punktort  
◆ vertrauenswuerdigkeit [0..1] : AL_Vertrauenswuerdigkeit2D_Punktort
```

```
context AL_DQ_Punktort2D inv:  
herkunft.source->size <= 1 and  
herkunft.source->size = 1 implies  
AL_Datenerhebung2D_Punktort.allInstances->exists(herkunft.source[1].description)  
  
-- Hinweis:  
-- Soll die Berechnung oder die Bestimmung mit Datum protokolliert werden,  
-- so ist ein entsprechender herkunft.processStep mit gesetzten Attributen  
-- dateTime und description ("Berechnung" oder "Bestimmung") zu erzeugen.  
-- Ansonsten muss gelten: herkunft.processStep->size = 0
```


- ISO 19103 Conceptual schema language
- ISO 19107 Spatial schema
- ISO 19108 Temporal schema
- ISO 19109 Rules for application schema
- ISO 19110 Feature cataloguing methodology
- ISO 19112 Spatial referencing by geographic identifiers
- ISO 19113 Quality principles
- ISO 19115 Metadata
- **ISO 19117 Portrayal**
- **ISO 19118 Encoding**

- Portrayal has not been used so far for ALKIS-ATKIS. The main reasons are:
 - In general, it will not be possible to exchange an ISO 19117 Portrayal Catalogue from application A to application B and get a proper visualisation of a dataset in application B automatically (dependency on external functions, no common language).
 - The current draft contains several inconsistencies between the UML diagrams and the written text.
- Therefore the use of a portrayal catalogue in its current form is limited and no resources have been put so far into describing it according to ISO 19117.

- ISO 19103 Conceptual schema language
- ISO 19107 Spatial schema
- ISO 19108 Temporal schema
- ISO 19109 Rules for application schema
- ISO 19110 Feature cataloguing methodology
- ISO 19112 Spatial referencing by geographic identifiers
- ISO 19113 Quality principles
- ISO 19115 Metadata
- ISO 19117 Portrayal
- **ISO 19118 Encoding**

- Encoded spatial data: this is the level where two ALKIS-ATKIS applications must be interoperable
⇒ Encoding is of major importance for ALKIS-ATKIS.
- The XML Schema definitions (“NAS”, standards-based data exchange interface) will be automatically derived from the Rational Rose UML Application Schema.

- Potential Risks:
 - We urgently need a stable foundation for the XML Schema definition. The Encoding DIS was expected for November 2000 and is still delayed.
 - Currently there are no standardised XML Schema definitions available for all the ISO 19100 schemas. We see a need for that, otherwise it is possible that different implementors will use different XML Schema definitions for the same ISO 19100 schema.
 - We are very concerned by the unrelated developments of ISO/TC 211 and OGC (GML) in that area.

- In addition to the expected benefits mentioned in the beginning, applying the ISO standards
 - avoided special ALKIS-ATKIS solutions in core areas and allowed to focus on the application domain,
 - provided a better understanding of the complex ALKIS-ATKIS application domain,
 - introduced a new way to manage the ALKIS-ATKIS standard. (The predecessor standards were modelled only in text documents. Using a CASE tool with computer processable results and deriving all other “modelling products” from it provides for a higher consistency and is helpful for implementors).

- The ALKIS-ATKIS application schema shall be finished by June 2001. This depends on the progress within ISO/TC 211:
 - Stable status of core ISO 19100 standards is required, especially the Encoding standard ISO 19118.
 - Availability of a stable, harmonised UML model and the corresponding XML Schema definitions of the ISO 19100 core schemas.
- ISO standards will only become true standards, if they will be standard components of GIS software. Therefore, a close cooperation of ISO/TC 211 and OGC is very important.



Thank you very much for your attention !