Karlsruher Institut für Technologie

LandXML – Review with respect to the modelling of Utility Networks

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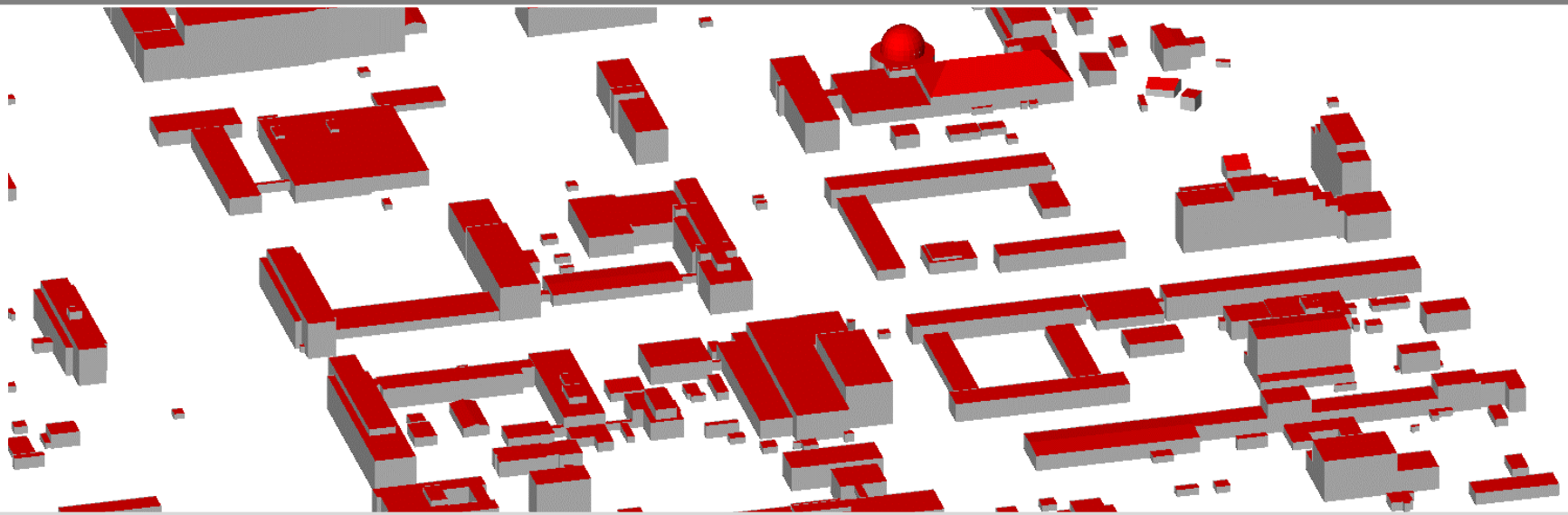


Agenda

- Overview, general characteristics
- Model structure
- **PipeNetwork**
  - **Pipe** element
  - **Struct** element
- Other important elements
  - **Alignment**
  - **Surface**
  - **Material**
- Summary

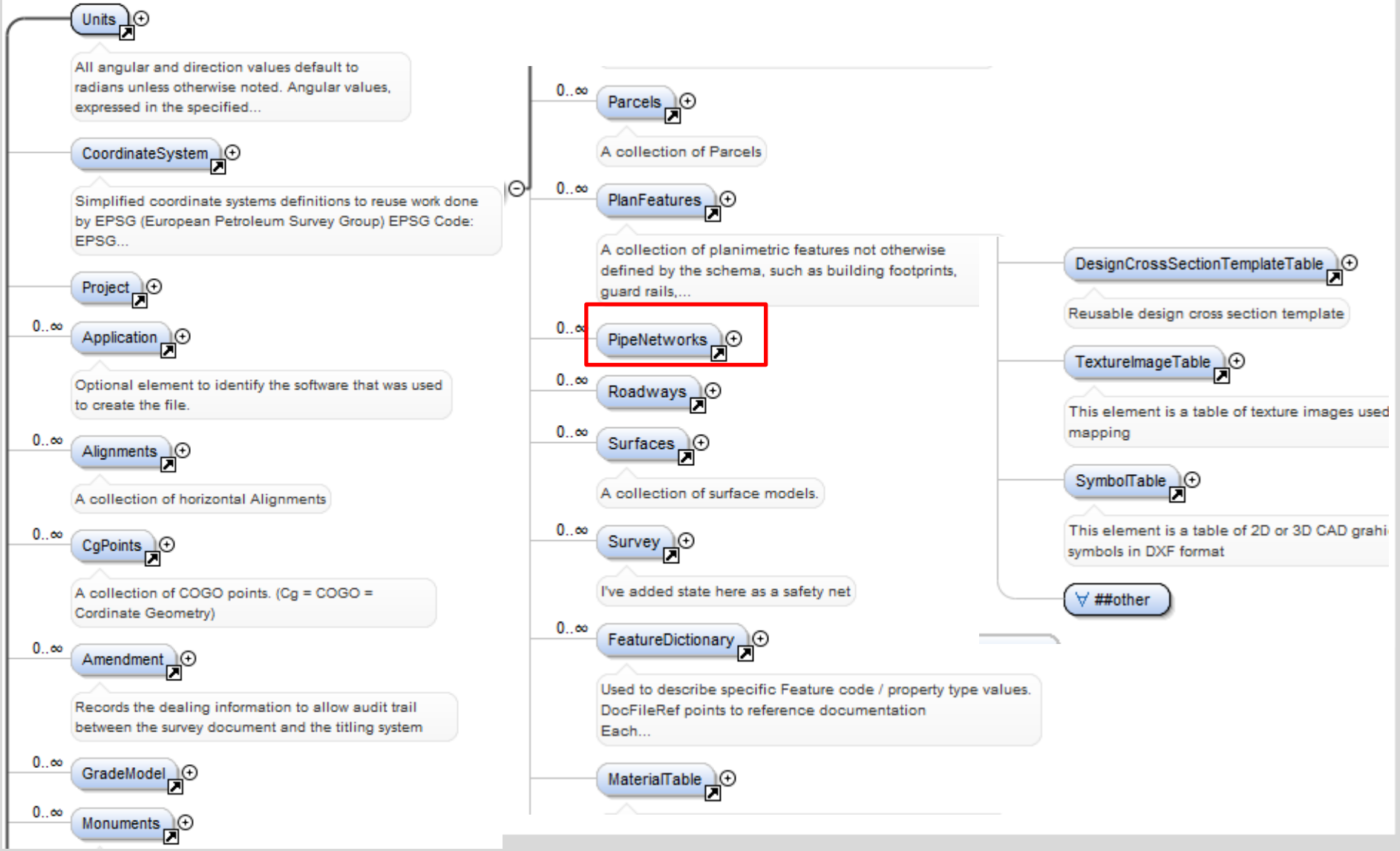
Overview LandXML – 1

- Model type
  - XML-based data exchange format, represented as one XSD file
  - No conceptual model existing
  - Open, royalty free
- Application range
  - Civil, esp. underground engineering (e.g. roadworks), surveying
- Responsible organization
  - Industry consortium LandXML.org (open, participation with no cost) with 669 organizations
  - Important members: Autodesk, Bentley, Carlsson Software, Leica Geosystems, Trimble,…
- Software support
  - Autodesc tools (e.g. Civil3D)
  - Free viewers

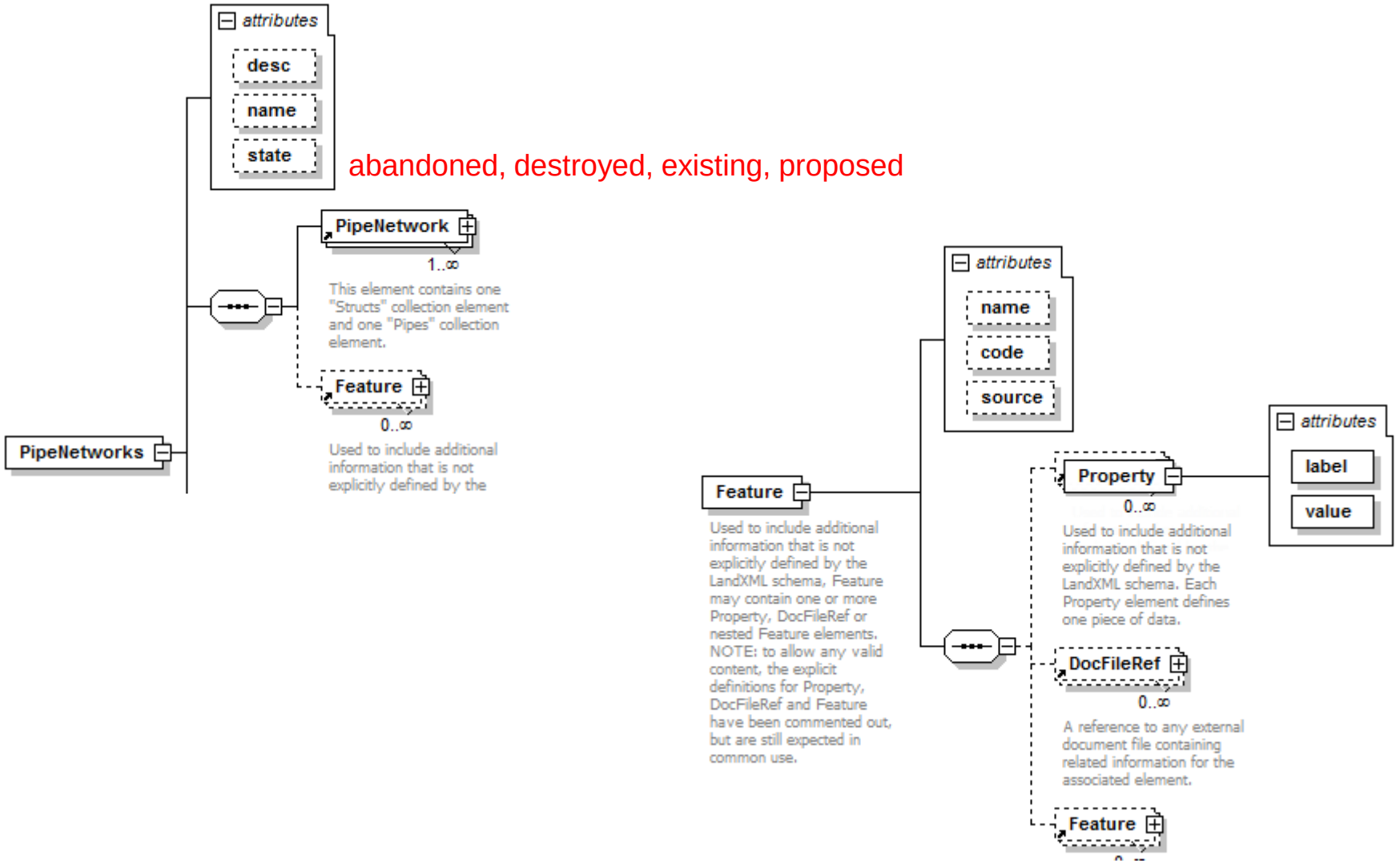
Overview LandXML – 2

- Documentation
  - Automatically generated on base of annotations integrated into the XSD-file
  - Very short and incomplete
- Actual version
  - LandXML 2.0

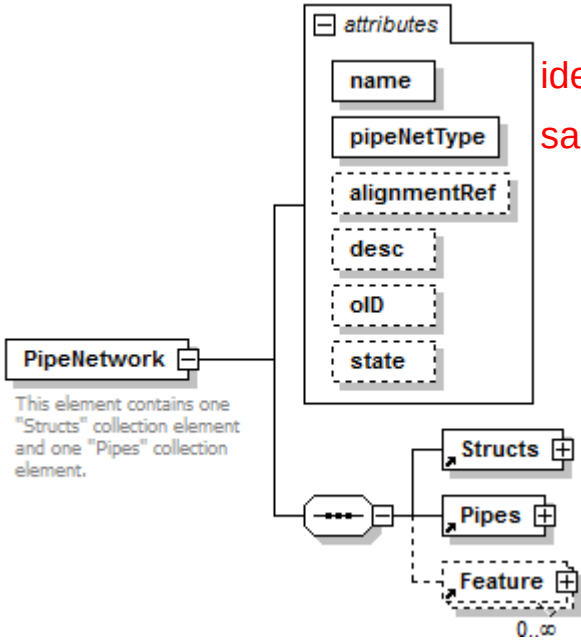
Model structure – Base element LandXML



PipeNetworks



PipeNetwork



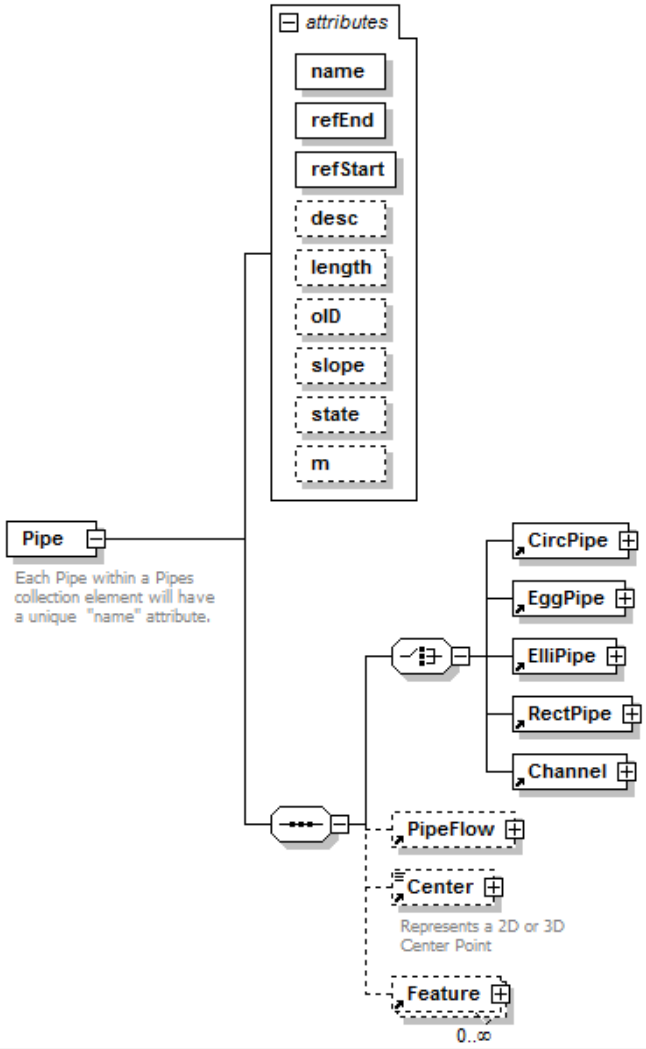
identifier, used for references

sanitary, storm, water, other

2 or more **Struct** objects

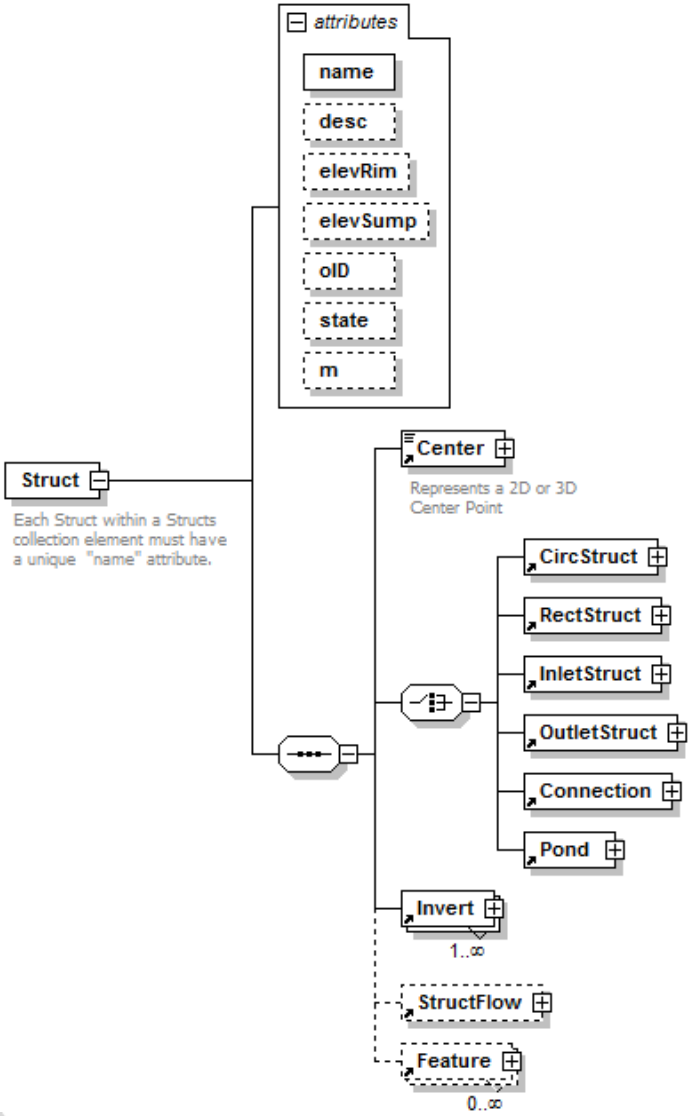
1 or more **Pipe** objects

Pipe



- **Pipe** represents different types of connecting elements
  - Refers to two **Struct** elements
  - Represent the edges in the topological network
  - Optionally has (among others) length, slope, material and center point coordinate properties, and different flow parameters
- A **Pipe** must be related with a **CircPipe**, **EggPipe**, **ElliPipe**, **RectPipe** or **Channel**
  - Specific geometry parameters for the cross section (except of **Channel**)
  - Optional: Material and thickness information, physical parameters
  - The **Channel** refers to an arbitrary **Alignment** and **Surface** geometry

Struct



- A **Struct** represents different types of (physical or virtual) structural components in a pipe network
  - Refers to one or more **Pipe** objects, including elevation and flow direction information
  - Represents the nodes of the topological network
  - Has (among others) elevation (rim and sump) values, a center point coordinate, and flow parameters
- A **Struct** must be related with a **CircStruct**, **RectStruct**, **InletStruct**, **OutletStruct**, **Connection** or **Pond**
  - Geometrical, material, thickness and physical properties (**CircStruct** and **RectStruct**)
  - The **Pond** references to an arbitrary **Alignment** and **Surface** geometry

Other LandXML elements

- **Alignment**
  - Representation of 2D and 3D centerlines of e.g., roadways or pipe networks, including profile and cross-section geometry
  - Very general and complex model
  - The documentation is very short and, without specific experiences in surveying and road construction techniques, merely not understandable
- Surface
  - Representation of digital terrain models, including the source data (points, boundaries, break lines, contour lines) and the generated TIN
- Material
  - A material is only represented by a textual name and corresponding styling information (color, texture, symbols)

Summary

- LandXML can only represent very specific Utility Networks: Open channels for water, sanitary water, storm water, …
- For this application area, efficient software tools for modelling, visualization, simulation, … exist
- LandXML contains a very simple topology model
- Most of the relevant Pipe/Struct elements have a very simple, parametrical geometrical representation, and a spatial reference based on point coordinates
- All elements have a number of properties (e.g. specific elevations, physical values) specific for the application area