

Information Models & Standards

ISO (CEN), INSPIRE, NL

OGh Spatial bijeenkomst 'Beyond Spatial Boundaries', De Meern

Peter van Oosterom

November 20, 2009

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Spatial Information Infrastructure (SII), a vision...

- Heading towards an **information society** with varying impact on sectors of our economy
- Impact on the geo-information sector is huge: geo-info and processing can be transported via (wireless) networks and can be combined with positioning
- Engines of the SII nodes: geo-DBMSs (Data Base Management Systems) filled with geo-data
- Fair pricing of data and services, no more endless copying of data (and loss of quality/up-to-dateness)

Overview

1. ISO (19152 Land Administration Domain Model)
2. INSPIRE (cadastral parcels)
3. NL (geo standaarden)

Standardization in Land Administration?

- There are supposed to be huge differences between cadastral and land registry systems
- Look to the common area's:
 - Standardised Model (adaptable, extensible)
 - Avoid re-inventing the wheel
 - Enable involved parties to communicate
- Lack of a shared set of concepts and terminology in the Land Administration Domain
 - **FIG, Washington 2002: Proposal for Domain Model**

Land Administration Domain Model ISO 19152 (LADM)

- Model includes:
 - Spatial part (geometry, topology)
 - Extensible frame for legal/admin part
- Object-orientation → express in UML
- Model Driven Architecture (MDA)
- FIG proposed LADM to ISO TC211, January 2008
- ISO 19152 – Copenhagen/May 2008, Delft/Sept 2008
Tsukuba/Dec 2008, Oslo/May 2009, Québec/Nov 2009

Background ISO TC211



ISO/TC 211
Geographic information/Geomatics

- over 60 member countries (participating + observing)
- liaisons with other organizations; e.g. OGC and FIG
- over 40 standards
- main phases in standards development process:
 1. Proposal of new work item (NWIP), determination of scope
 2. Develop specifications in Working Drafts (WD) and Committee Draft (CD) in consensus-building processes
 3. Formal approval International Standard (IS), via Draft IS (**DIS**) and Final Draft IS (FDIS)

ISO TC211 and CEN TC287



- close cooperation arranged via resolutions
- based on overall Vienna agreement between ISO and CEN
- goal: equal standards
 - existing ISO standards: unique acceptance procedure (UAP), fast
 - new/ongoing standards: parallel voting
- 26 February 2009: CEN TC287 accepted LADM
→ parallel voting in ISO TC211 and CEN TC287 on LADM

Where are we now?

NWIP – WD - CD – **DIS** (- FDIS) - IS

Voting	NWIP	CD
Approve	15	22
Disapprove	6	3
Abstain	4	4
Not Voted	7	3

287 Comments received on CD version

Interrelations between comments

All comments resolved at Québec, Nov'09 meeting

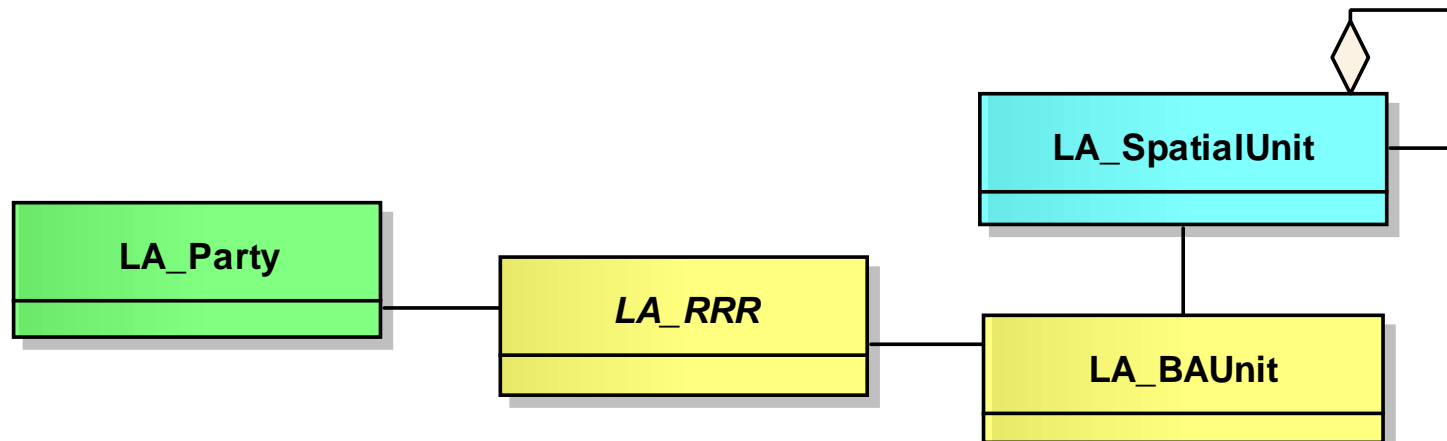
ISO 19152 Scope

- reference model (abstract, conceptual schema)
- land/water, below/above surface
- basic classes: (1) parties, (2) rights, responsibilities, and restrictions, (3) spatial units, (4) spatial sources, and (5) spatial representations
- terminology enabling communication
- shared description of formal or informal practices
- basis for national®ional profiles (application schema)

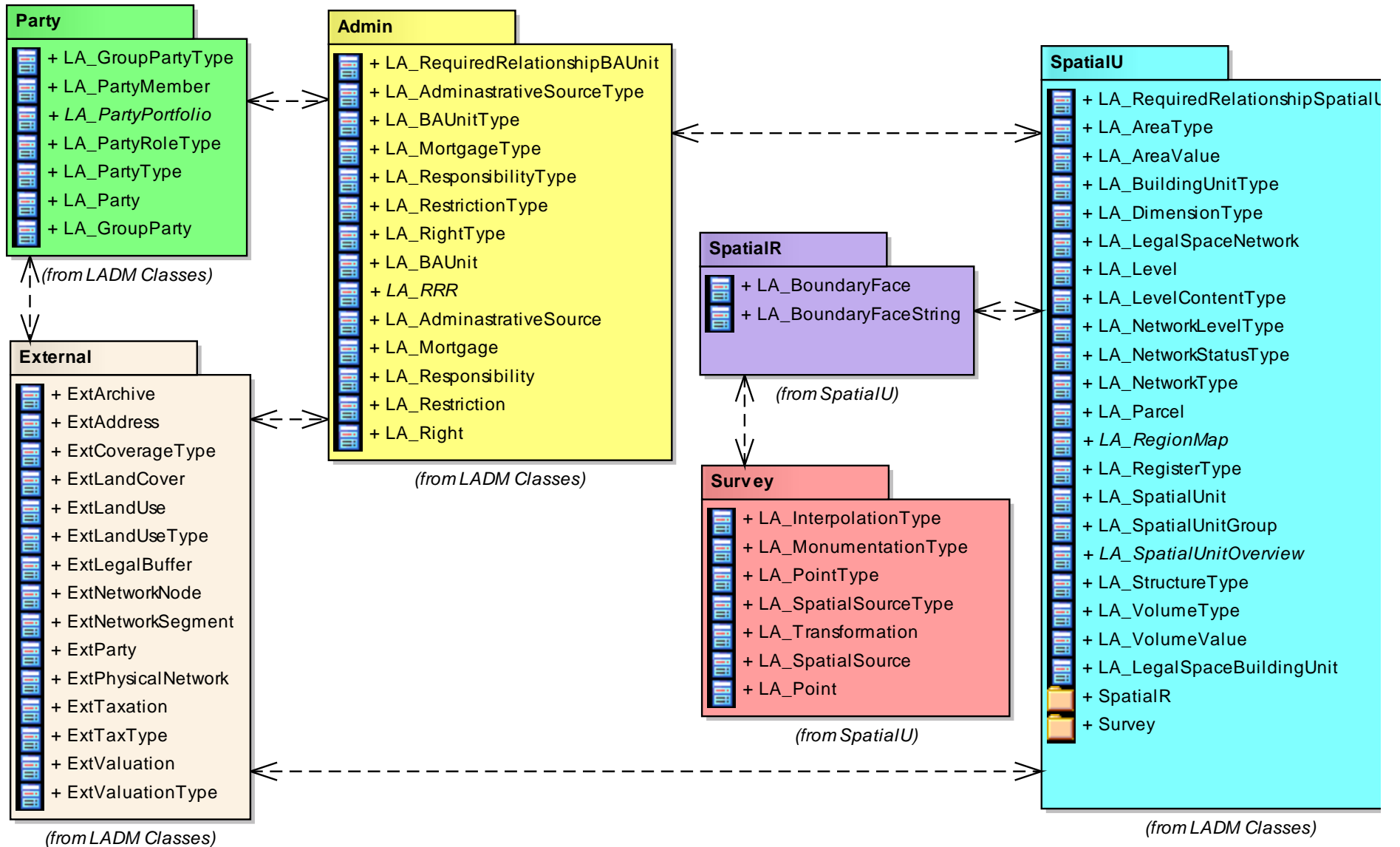
LADM core

- **LA_Party** Peter has **LA_RRR** ownership on **LA_BAUnit** Peter's estate consisting of 2 **LA_SpatialUnit** parcels (with same **LA_RRR**)
- **LA_BAUnit** stands for Basic Administration Unit

class Figure 1. Core classes of LADM

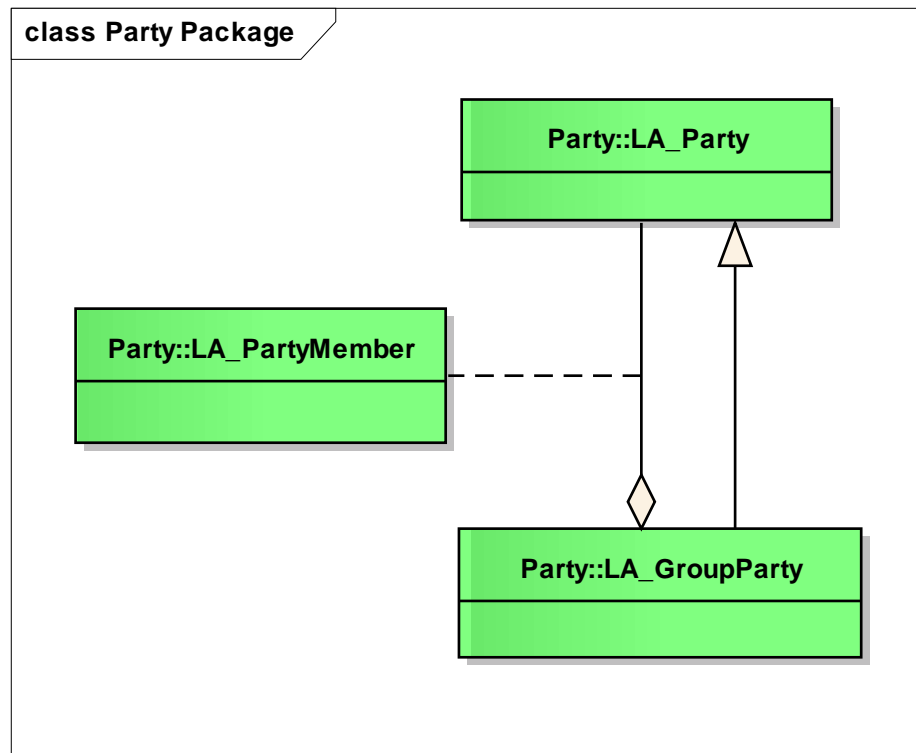


pkg LADM overview (classes and packages)

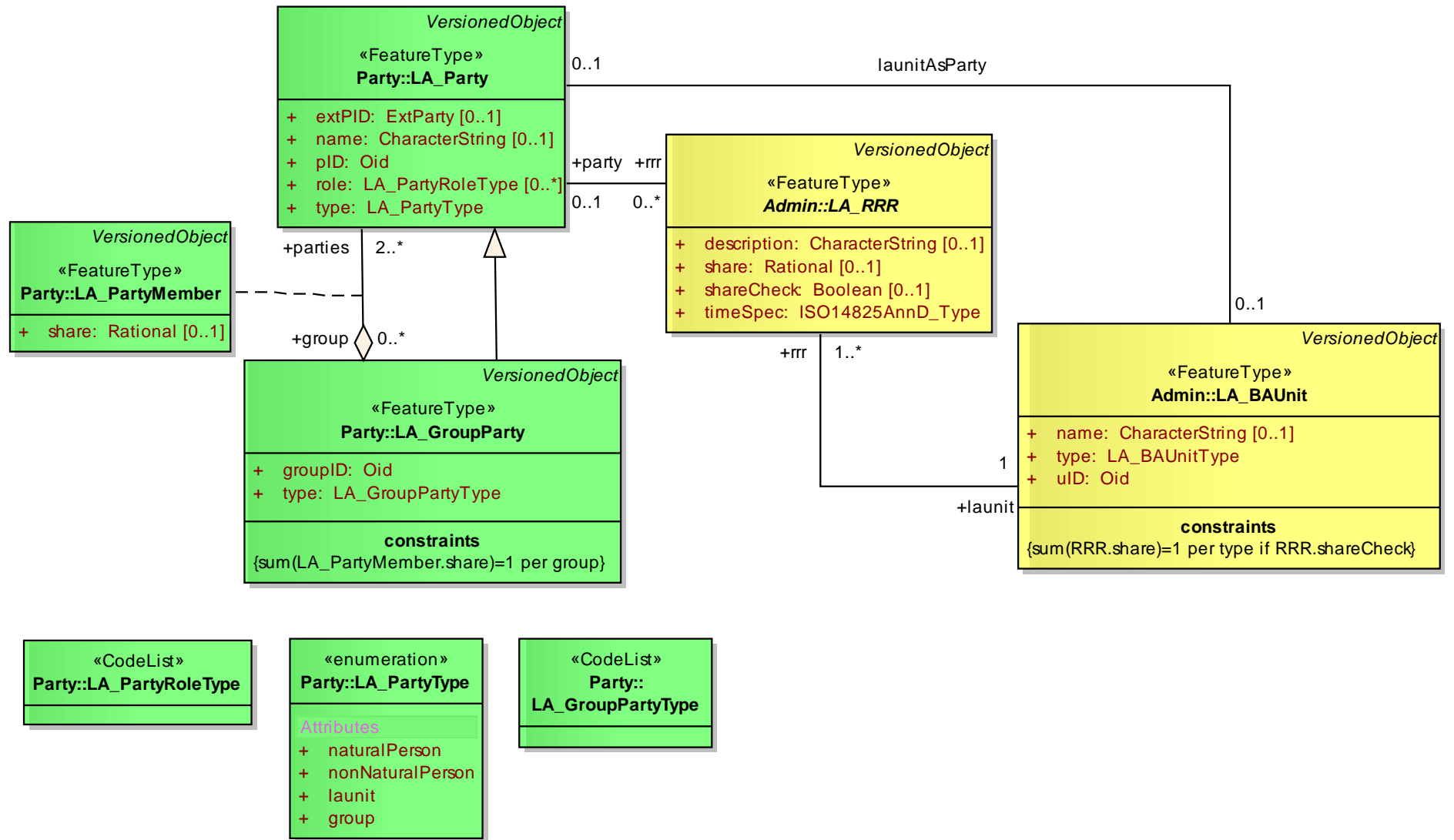


LADM: Party

- Parties can be natural or non natural (private, gov, groups, BAUnit, etc.)
- Surveyor, farmer, notary, money provider are included, role types of the Party class

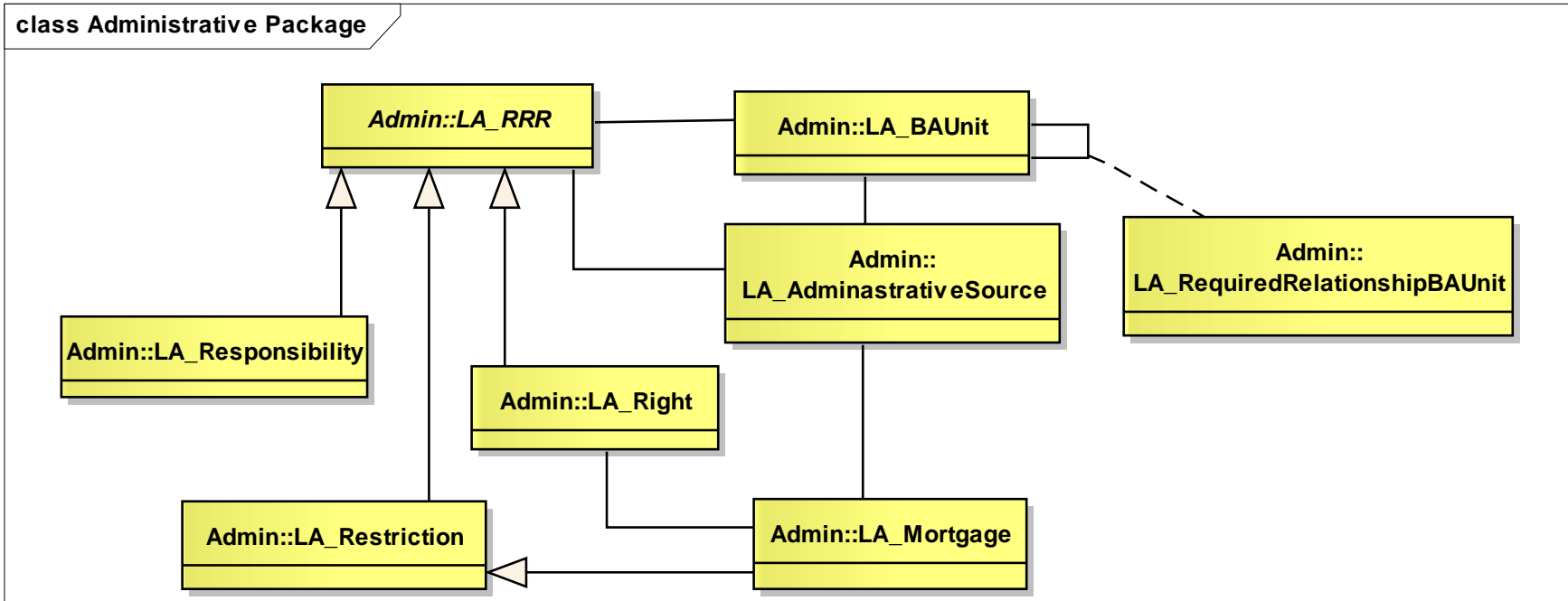


class Classes of Party Package

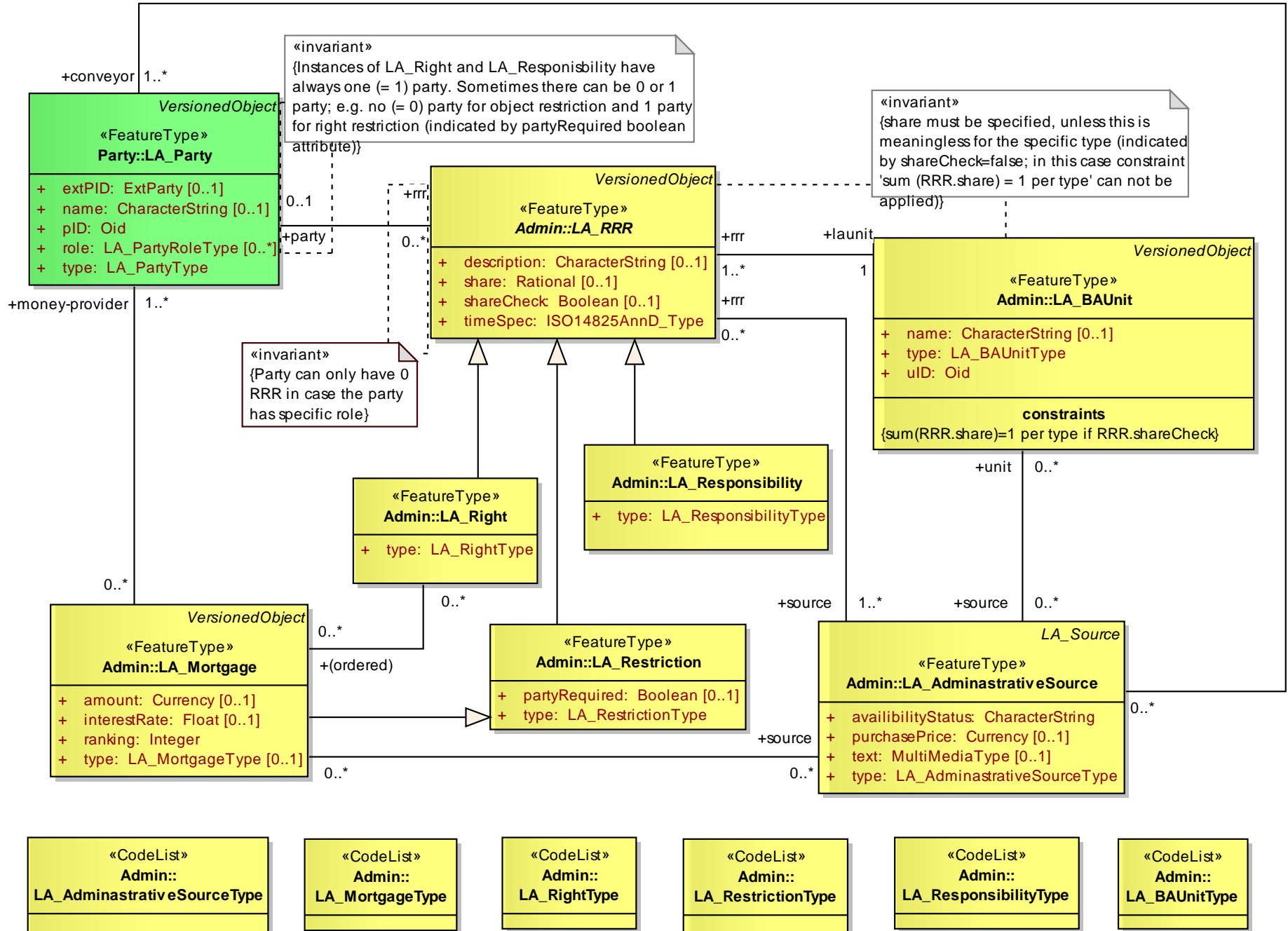


LADM: Administrative (legal)

- RRR (Right Restriction Responsibility) has associations with Party (Person) and Basic Administration Unit (and indirectly to SpatialUnit)
- RRRs are based on **legal documents** or decisions
- A RRR can be temporal:
 - Long lease (or ownership for limited time)
 - Nomadic behaviour/Hunting rights during certain season
 - Time-sharing (mon-fri:X, sat-sun:Y)

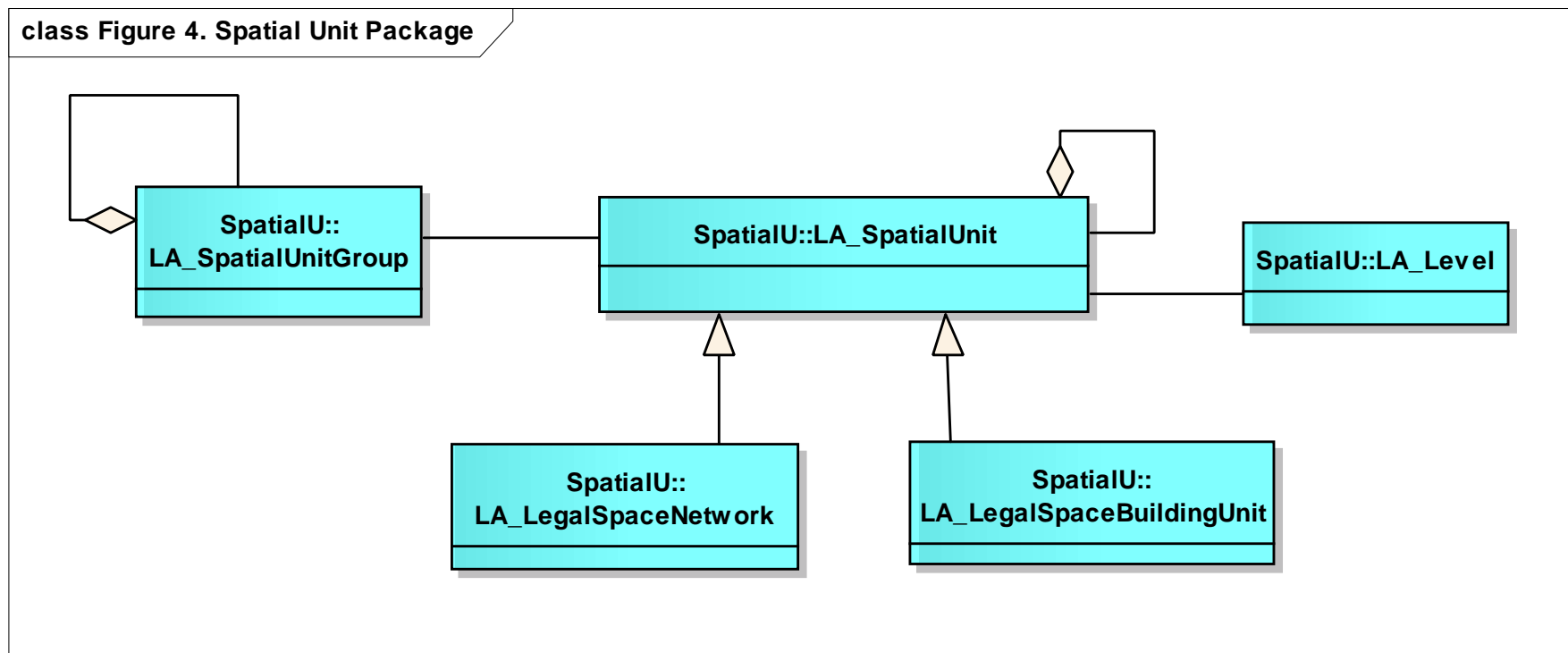


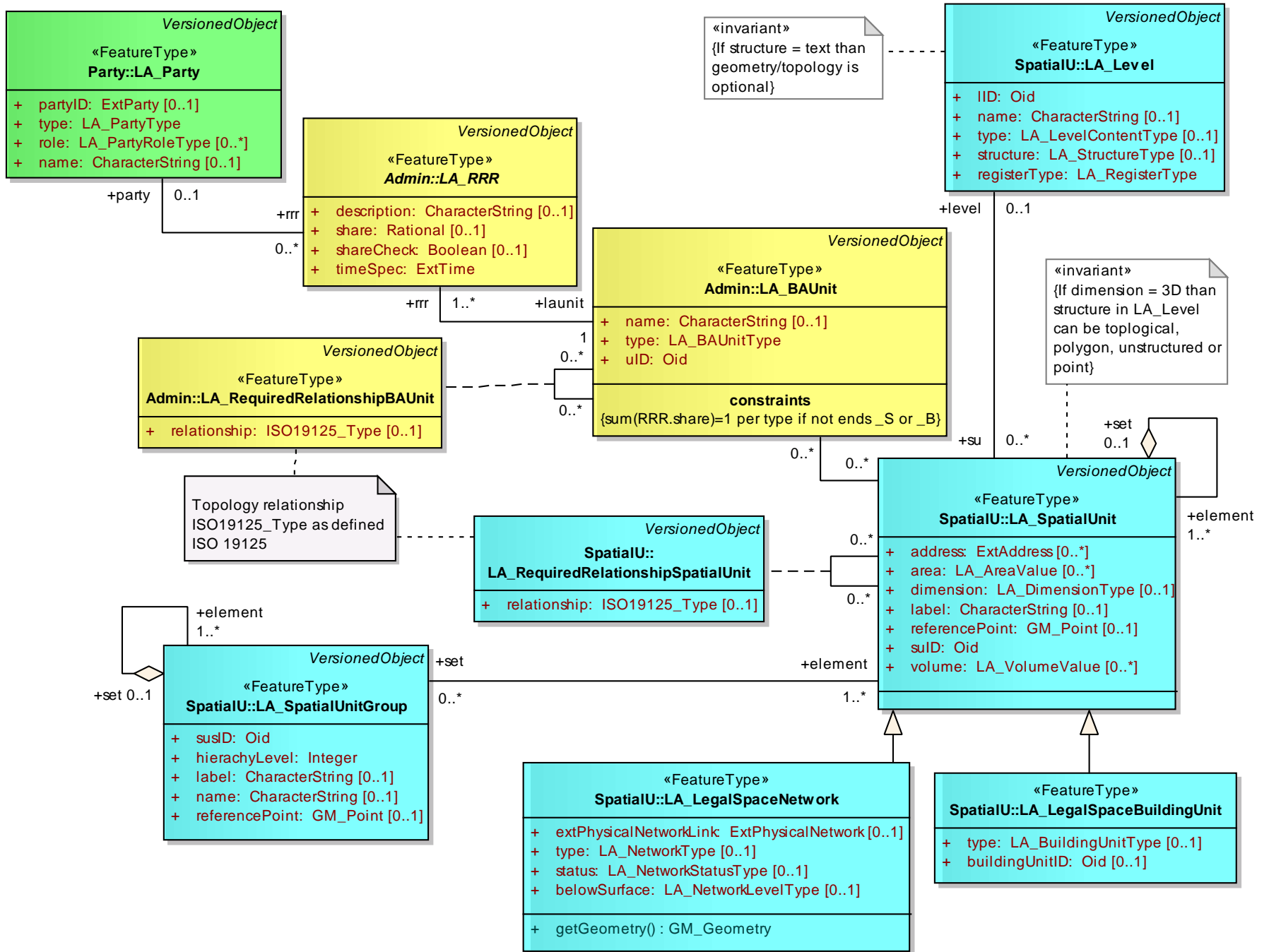
class Classes of Administrative Package



LA_SpatialUnit (alias LA_Parcel)

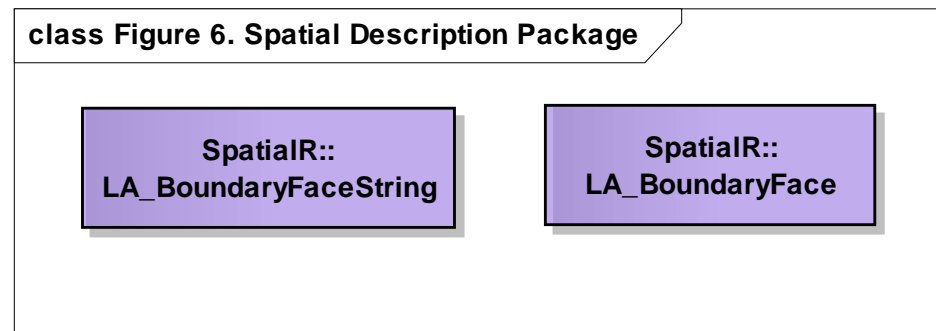
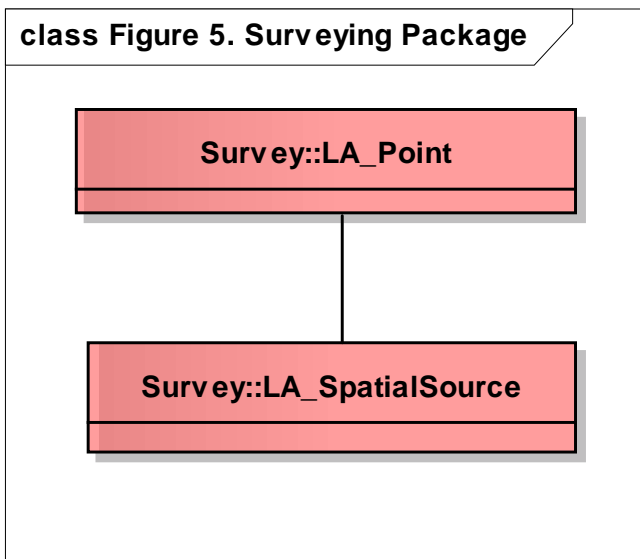
- LA_SpatialUnit specializations: network, building unit
- organized in LA_Layer based on structure or content
- 5 types: **point, text (unstructured) line, polygon, and topology**
- 2D and 3D integrated without complicating 2D





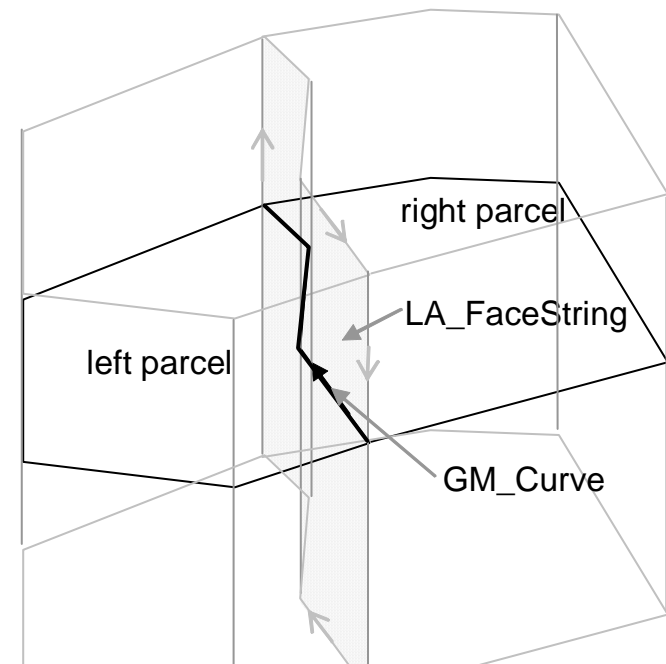
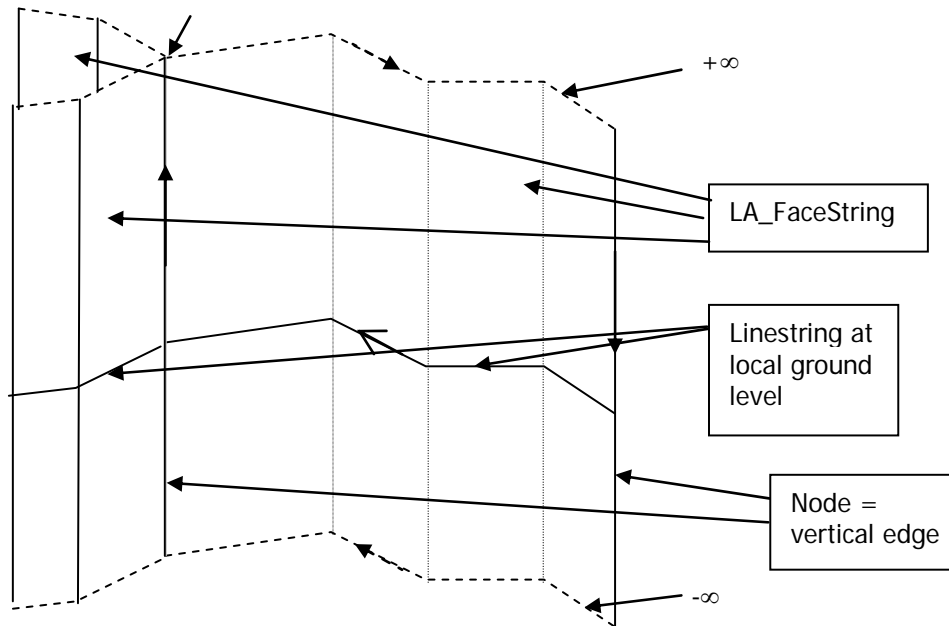
Spatial Representation and Survey subpackages of SpatialUnit

- Geometry, topology of Spatial Units (based ISO 19107)
- Spatial source (based ISO/CD 19156 Observations and Measurements)



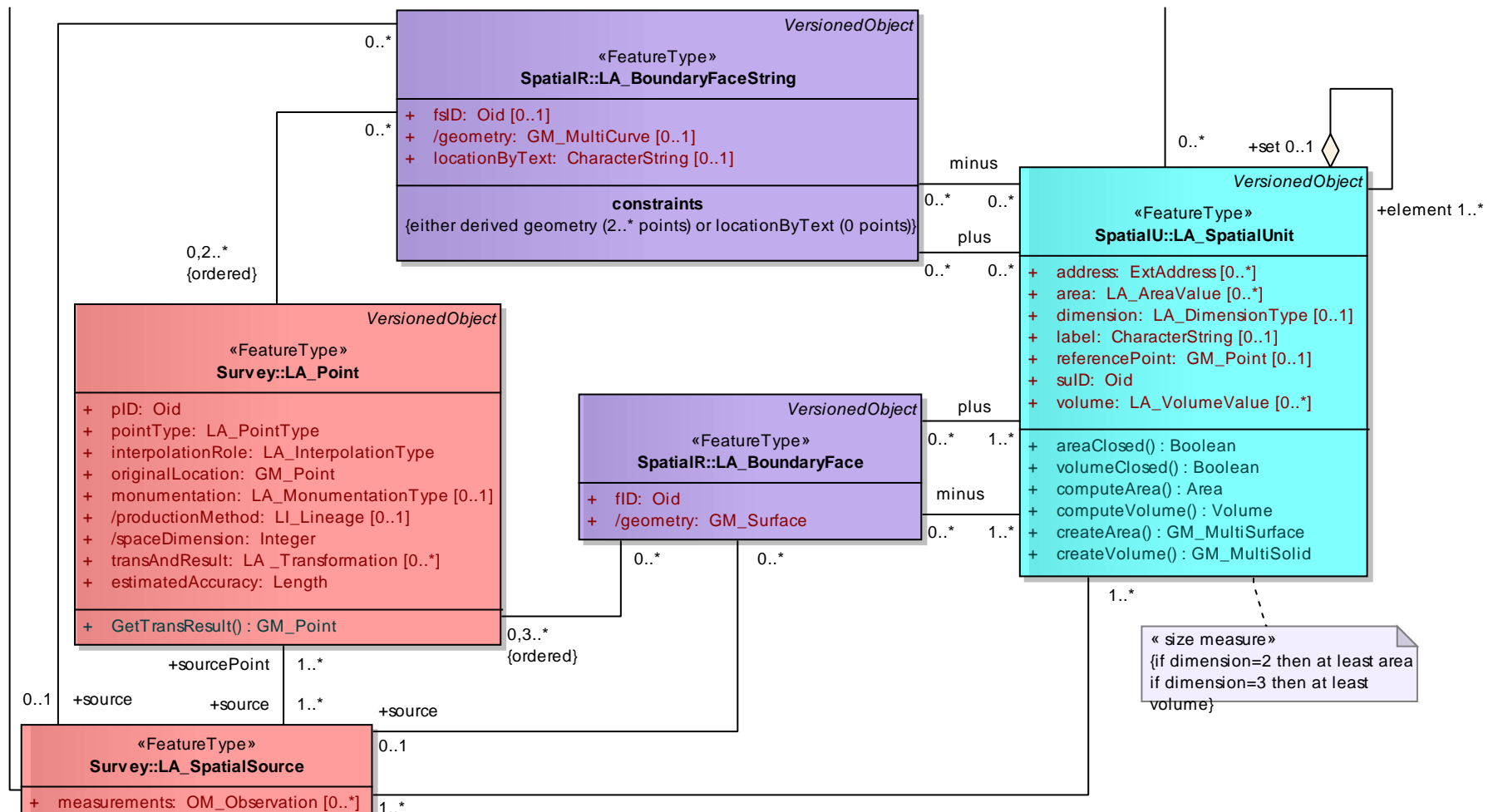
2D parcels and their 3D interpretation

- observation: 2D description implies 3D prismatic volume
- 2D polyline (GM_curve) implies string of vertical faces



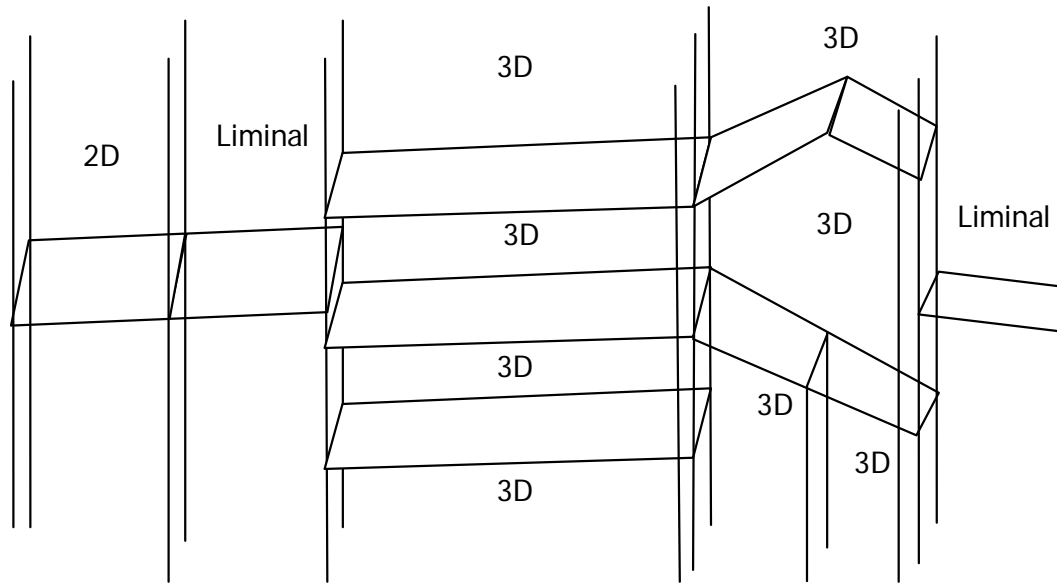
2D and 3D descriptions

- 2D polyline (GM_curve) implies string of vertical faces
LA_BoundaryFaceString
- true 3D described with arbitrary oriented faces
(GM_Surface): **LA_BoundaryFace**



2D and 3D integration

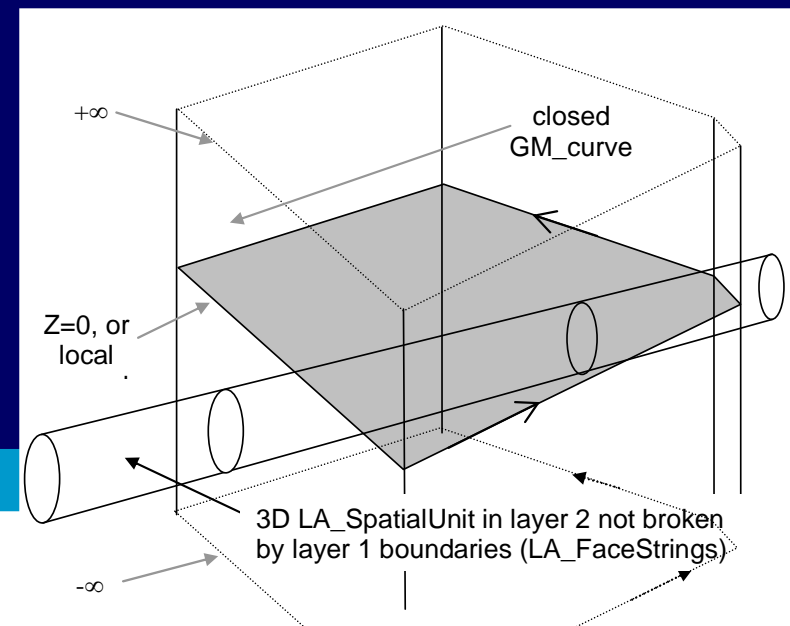
- between 2D and 3D spatial unit transition via **liminal** spatial units



Simple 2D spatial unit	Liminal 2D spatial unit	3D spatial units	3D spatial units	Liminal 2D spatial unit
			Liminal 2D spatial unit A	

Introduction of LA_Layer

- organization based on content or structure:
 - example 1, content-based: one layer with 'primary' (strongest) rights, another layer with rights that can be added/subtracted (e.g. restrictions)
 - example 2, structure-based: one layer with topologically structured parcels (one part of the country), another layer with (unstructured) line based parcels (other part of country)
- can also be used in 3D context:
 - one layer 'normal' parcels, another layer with subtracted 3D parcels
- based on independence principle
- each country design own layers



November 20, 2009



Where do we go?

- Draft International Standard (DIS): ISO/TC 211 meeting in Québec City, Canada, November 2009
- DIS distribution within ISO for voting: January 2010
- Final Draft International Standard (FDIS): December 2010, if needed
- International Standard (IS): June 2011

Overview

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2. INSPIRE (cadastral parcels)
3. NL (geo standaarden)

Harmonizing geoinformation in Europe

- Concerns about 34 different types of data sets
- 27 different countries with 22 languages (and more influence; e.g. Iceland, Norway and Switzerland are also involved)
- Agreement on content during **exchange**, considering consistency (within, but also) between:
 - Themes
 - Scales (levels of detail)
 - Borders

Themes (annex I and II)

Annex I:

- Coordinate reference systems
- Geographical grid systems
- Geographical names
- Administrative units
- Addresses
- Cadastral parcels
- Transport networks (water,..)
- Hydrography
- Protected sites

Annex II:

- Elevation
- Land cover
- Orthoimagery
- Geology (aquifers,..)

Themes (annex III)

- Statistical units
- Buildings
- Soil
- Land use
- Human health and safety
- Utility and Government services (water supply, sewage,..)
- Environmental monitoring facilities
- Production and industrial facilities (water abstraction,..)
- Agricultural and aquaculture facilities
- Population distribution – demography
- Area management/restriction/ regulation zones & reporting units (areas around drinking water,..)
- Natural risk zones
- Atmospheric conditions
- Meteorological geographical features
- Oceanographic geographical features
- Sea regions
- Bio-geographical regions
- Habitats and biotopes
- Species distribution
- Energy resources
- Mineral resources

INSPIRE components (drafting teams)

- metadata*
- data specification*
- network services*
- access and rights of use for Community institutions and bodies**
- monitoring and reporting mechanisms**

* technical: under JRC responsibility

** legal/procedural: under Eurostat responsibility

INSPIRE is a Framework Directive

Detailed technical provisions for the issues above will be laid down in Implementing Rules. Once adopted, Implementing Rules become European legislative acts and national law in 27 Member States and in some EFTA countries

Time table metadata and data in years after 15 may 2007

	Implementing rules metadata	Metadata (+after rules)	Implementing rules data	New data (+after rules)	Existing data (+after rules)
Annex I	1 2008	(+2 =) 3 2010	2 2009	(+2 =) 4 2011	(+7 =) 9 2016
Annex II	1 2008	(+2 =) 3 2010	5 2012	(+2 =) 7 2014	(+7 =) 12 2019
Annex III	1 2008	(+5 =) 6 2013	5 2012	(+2 =) 7 2014	(+7 =) 12 2019


Data specifications, results until today

D 2.3: Scope and Definition of Annex I/II/III Themes based on INSPIRE position papers, Selected reference materials submitted by the SDICs and LMOs	
D 2.5: Generic Conceptual Model based on ISO 19101, 19103, 19107, 19108, 19109, 19110, 19111, 19112, 19115, 19123, 19126, 19131, 19136, 19139, ISO/IEC 19501, OGC 06-103r3	
D 2.6: Methodologies for data specifications based on Methodology developed by the RISE project Selected reference materials submitted by the SDICs and LMOs	
D 2.7: Implementing rules for exchange of spatial data based on ISO 19118, 19136, 19139 INSPIRE Generic Conceptual Model	

Stakeholders' participation

Data specifications are developed by Thematic Working Groups consisting of domain experts proposed by the stakeholders (SDIC/LMO) and a facilitator and editor nominated by the Commission

8 Thematic Working Groups on Annex I data



INSPIRE
Infrastructure for Spatial Information in Europe

Call for Expression of Interest for Development of Data Specifications:

- to submit Candidate Specifications (scenario 1)
- to participate in Specification Development (scenario 2)

Title	Call for Expression of Interest for Development of Data Specifications: - to submit Candidate Specifications (scenario 1) - to participate in Specification Development process (scenario 2)
Creator	INSPIRE Consultation Team
Date	04 September 2007
Subject	INSPIRE - Call for Expression of Interest for development Data Specifications
Status	Final
Publisher	JRC-Institute for Environment and Sustainability-SCI Unit, Ispra
Type	Text
Description	INSPIRE, data specification, terms of reference, call for expression of interest
Contributor	Darya Litvincheva, Károlin Tóth, Vanda Maria de Lima, Éva Farkasová, Michel Mizot, Alessandro Annoni
Format	MS Word 95/2002 (doc)
Source	N/A
Rights	Public
Identifier	Call_scenario_1_2_updated30987.doc
Language	En
Relation	1. INSPIRE Work Programme Transposition Phase (2007-2009) http://www.ec.europa.eu/inspire/docs/inspire_wp070809_en.pdf 2. Terms of Reference for developing Implementing Rules laying down Technical Arrangements for Interoperability and Harmonisation of Spatial Datasets http://www.ec.europa.eu/inspire/docs/implementing_rules_en.pdf
Coverage	2007-2012

*These are Dublin Core metadata elements. See for more details and examples <http://www.dublincore.org/>



November

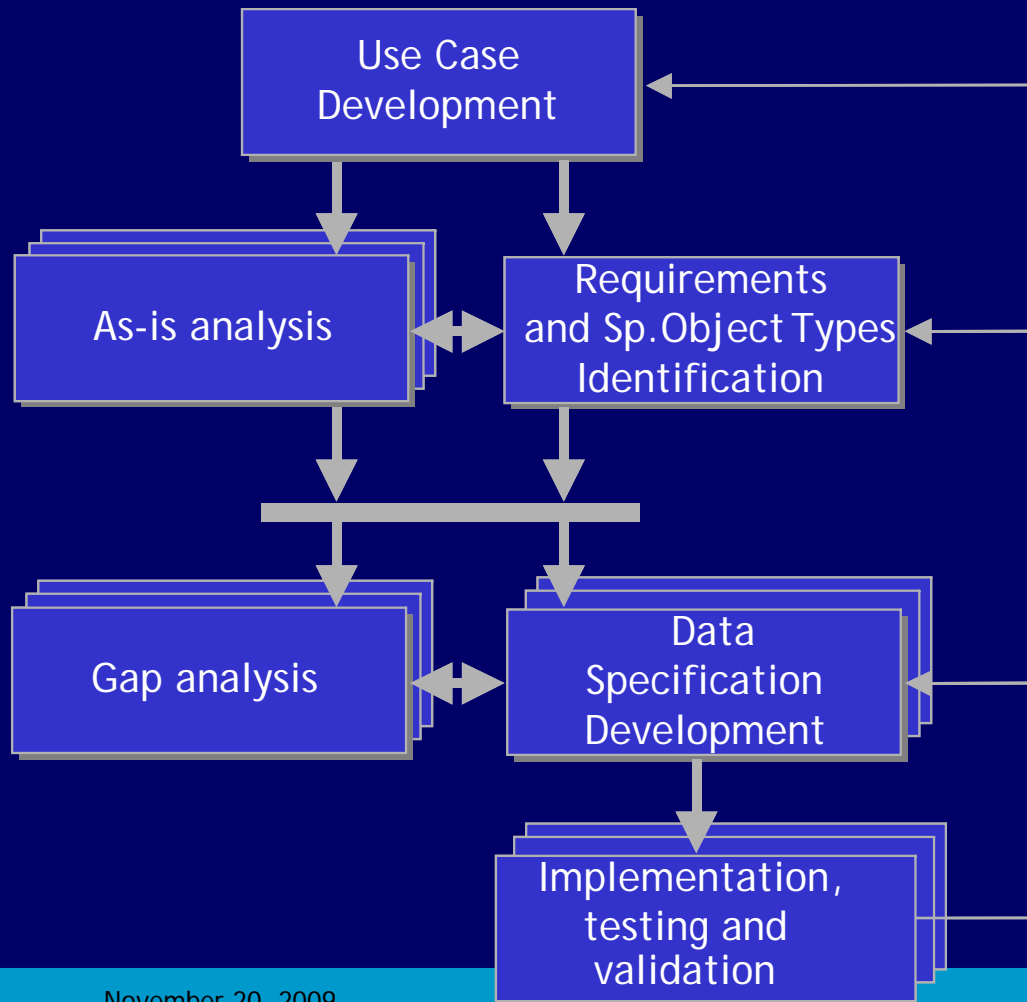
The context

1. Identification of main stakeholders:
 - PCC
 - EuroGeographics Expert Group on Cadastre
 - FIG
 - UN WPLA
 - EURODIN (*eContent* + project)
2. Identification of relevant standards: LADM a new work item proposal to ISO/TC 211 (by FIG)
3. Use a classification based on the one provided by WG-CPI survey
 - Land market - Agriculture
 - Environment - Spatial planning
 - Infrastructures - Public administration
 - Public safety - Socio-economic analysis

Definition of parcel

- In the INSPIRE Directive:
 - “areas defined by cadastral registers or equivalent”
 - not very explicit (specially for MS having sub-parcels or “over-parcels”)
- TWG CP explanation
 - **single** part of earth surface with homogeneous **rights**
- 5 Core elements (WG-CPI): Geometry, Surface (area/size), Identifier, Georeferencement, Temporal information, and many optional ones...

D2.6 Methodology for the development of data specifications



Step-wise methodology

Guideline for the
INSPIRE
Thematic Working Groups
(TWGs)

The first three steps...

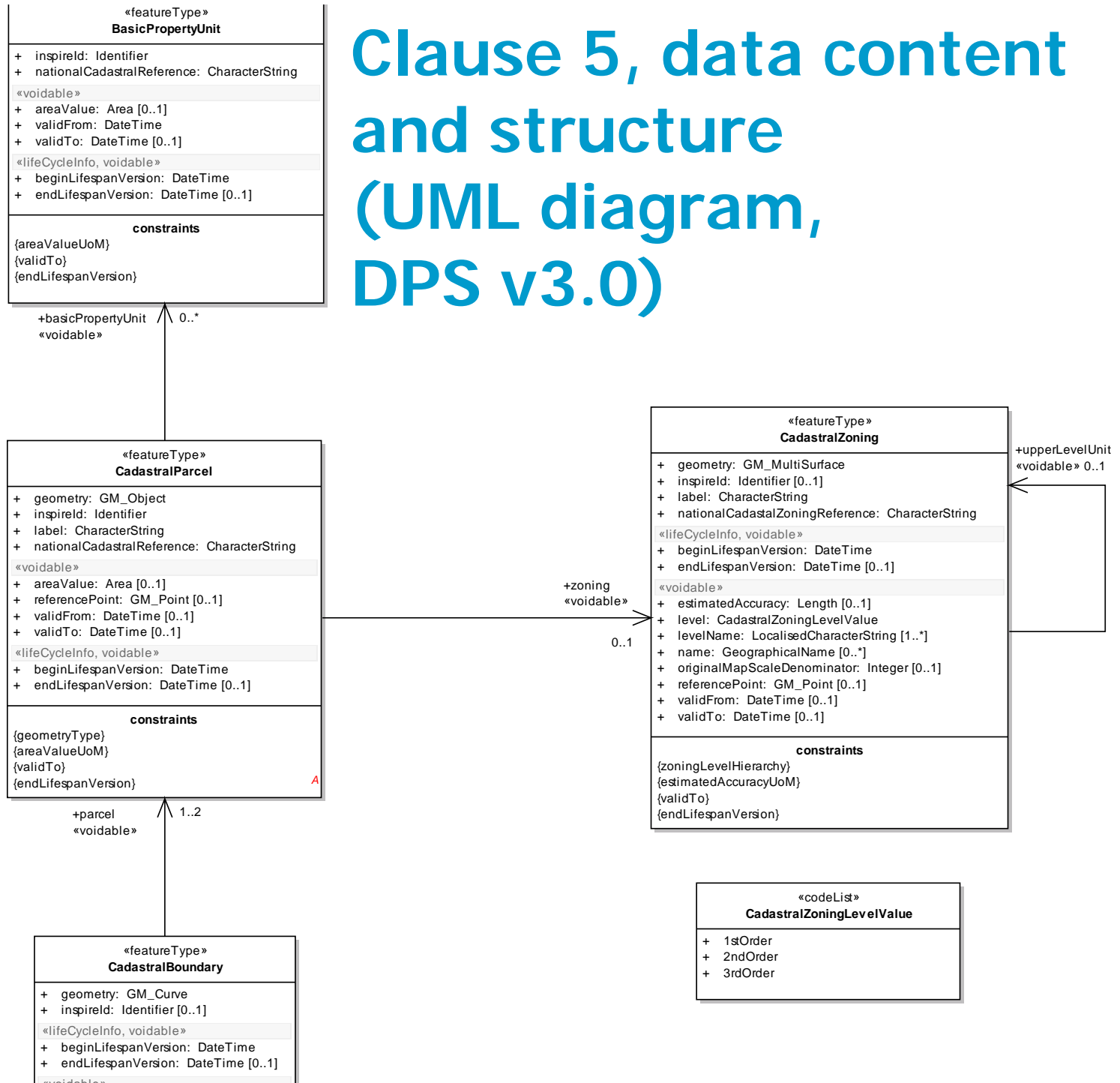
- As-is analysis
 - General overview (from WG-CPI survey in 2005)
 - More detailed information on 11 countries
- Requirements
 - INSPIRE (D2.5)
 - Available use cases/check-lists
 - TWG CP members expertise
- Gap analysis/first proposals
 - Discussion papers
 - Discussion during TWG CP meetings

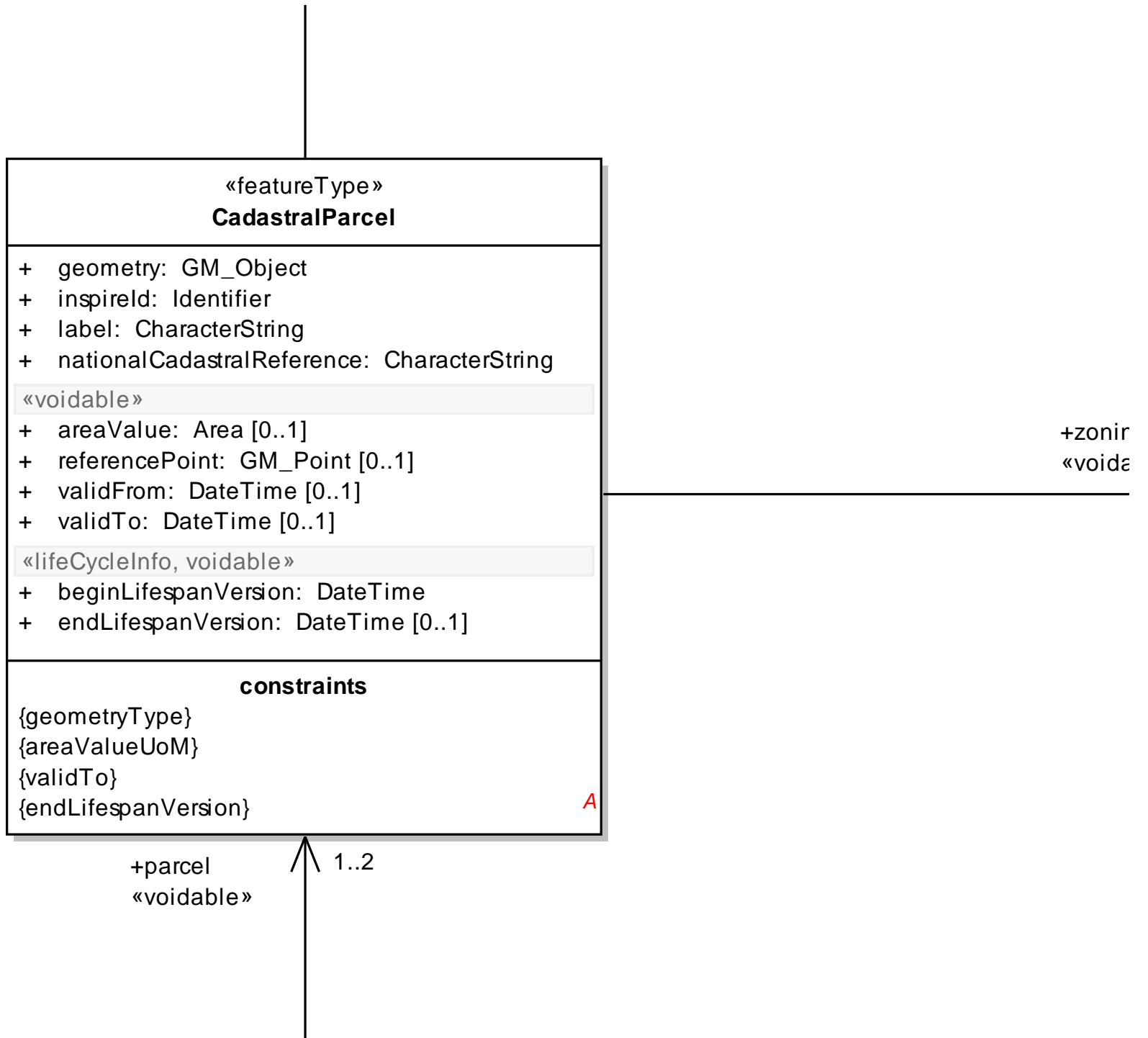
Content Data Product Specification

ISO 19131 based

- | | | | |
|---|-----------------------------|----|---|
| 1 | Scope (of the Document) | 8 | Metadata |
| 2 | Overview | 9 | Delivery |
| 3 | Specification scopes | 10 | Data Capture (optional) |
| 4 | Data product identification | 11 | Portrayal |
| 5 | Data content and structure | 12 | Additional information (optional) |
| 6 | Reference systems | | Annex A (normative) Abstract Test Suite |
| 7 | Data quality | | |

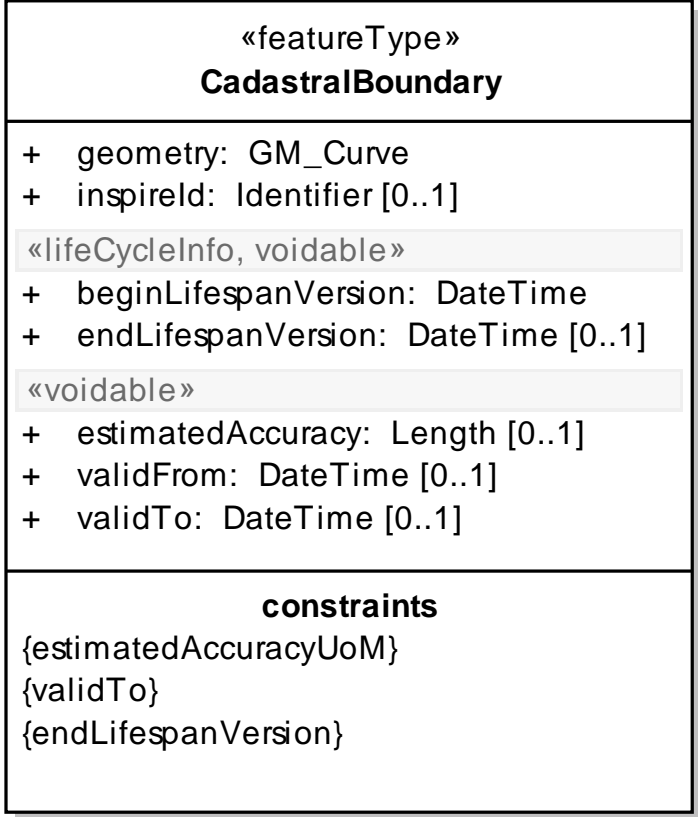
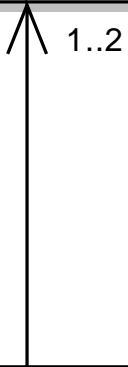
Clause 5, data content and structure (UML diagram, DPS v3.0)

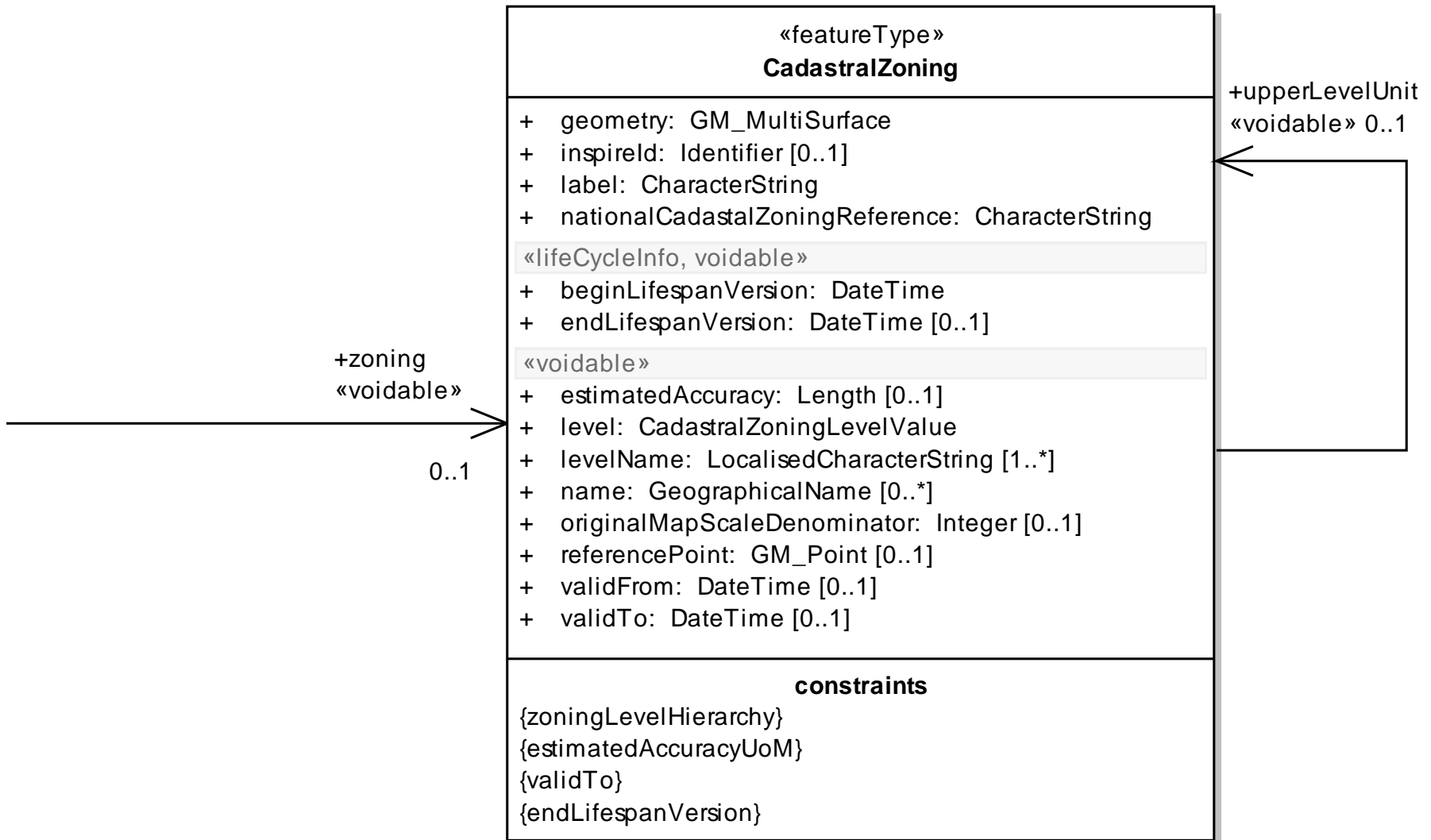




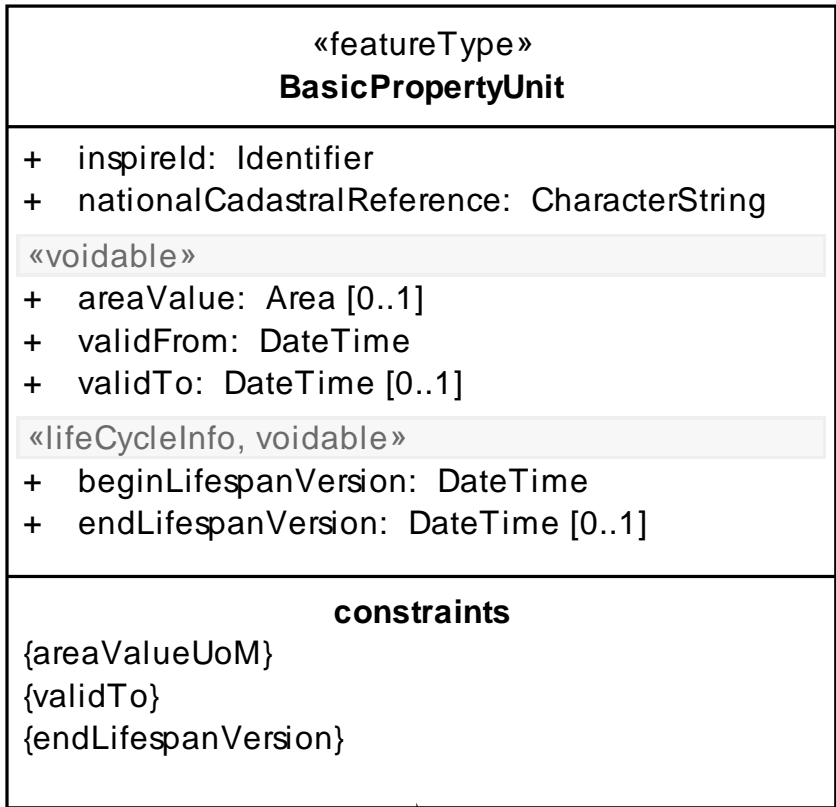
{geometryType}
{areaValueUoM}
{validTo}
{endLifespanVersion} A

+parcel
«voidable»

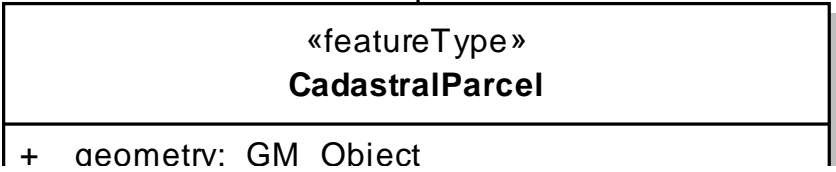




class CadastralParcels



+basicPropertyUnit 0..*
«voidable»



Constraints in the model

- **EndLifeSpanVersion**

Natural language: If set, the date endLifespanVersion must be later than beginLifespanVersion.

OCL: **inv: self.endLifespanVersion
.isAfter(self.beginLifespanVersion)**

- **withTopology**

Natural language: Attribute topology for cadastral parcel (TP_Face) is mandatory if topology for cadastral boundary (TP_Edge) is delivered.

OCL: **inv: self.boundary -> notEmpty() and
self.topology -> notEmpty() implies
CadastralBoundary.topology -> notEmpty()**

Some other points

- two identifiers: INSPIRE and national
- coordinates in ETRS89 on Eurasian plate, else ITRS
- recommendation: no gaps & overlaps between parcels
- CadastralZoning: 'below' admin units until municip
- rights and owners outside the scope
- portrayal for 3 layers with default:
 - parcel outline black 1 pixel, label Arial 10 black
 - zoning outline black 2 pixels, label Arial 20 black
 - boundary black 1 pixel
- encoding GML 3.2.1 (ISO 19136:2007)

XML/GML schema Cadastral Parcels

```
-<schema elementFormDefault="qualified" targetNamespace="urn:x-INSPIRE:specification:gmlas:CadastralParcels:2.0"
  <import namespace="http://www.opengis.net/gml/3.2" schemaLocation="../gml/3.2.1/gml.xsd"/>
  <import namespace="urn:x-INSPIRE:specification:gmlas:BaseTypes:3.1" schemaLocation="../GCM/BaseTypes.xsd"/>
  <import namespace="urn:x-INSPIRE:specification:gmlas:GeographicalNames:2.0" schemaLocation="../GN/Geographi
  <import namespace="http://www.iso211.org/2005/gmd" schemaLocation="../iso/19139/20070417/gmd/gmd.xsd
  <!--XML Schema document created by ShapeChange-->
  <element name="CadastralBoundary" substitutionGroup="gml:AbstractFeature" type="CP:CadastralBoundaryType
- <complexType name="CadastralBoundaryType">
  - <complexContent>
    - <extension base="gml:AbstractFeatureType">
      - <sequence>
        - <element maxOccurs="2" name="parcel" nillable="true" type="gml:ReferenceType">
          - <annotation>
            - <appinfo>
              <targetElement>CP:CadastralParcel</targetElement>
              <reversePropertyName>CP:boundary</reversePropertyName>
            </appinfo>
          </annotation>
        </element>
        <element name="geometry" type="gml:CurvePropertyType"/>
        <element name="inspireId" type="base:IdentifierPropertyType"/>
        <element name="estimatedAccuracy" type="gml:LengthType"/>
        <element minOccurs="0" name="topology" nillable="true" type="gml:DirectedEdgePropertyType"/>
      - <element name="beginLifespanVersion" nillable="true">
```

```
<element name="CadastralParcel" substitutionGroup="gml:AbstractFeature" type="CP:CadastralParcelType"/>
- <complexType name="CadastralParcelType">
  - <complexContent>
    - <extension base="gml:AbstractFeatureType">
      - <sequence>
        - <element minOccurs="0" name="indexSet" nillable="true" type="gml:ReferenceType">
          - <annotation>
            - <appinfo>
              <targetElement>CP:CadastralIndexSet</targetElement>
              <reversePropertyName>CP:parcel</reversePropertyName>
            </appinfo>
          </annotation>
        </element>
        - <element maxOccurs="unbounded" minOccurs="0" name="boundary" nillable="true" type="gml:ReferenceType">
          - <annotation>
            - <appinfo>
              <targetElement>CP:CadastralBoundary</targetElement>
              <reversePropertyName>CP:parcel</reversePropertyName>
            </appinfo>
          </annotation>
        </element>
        <element minOccurs="0" name="AU_admUnit" nillable="true" type="gml:ReferenceType"/>
        <element name="geometry" type="gml:SurfacePropertyType"/>
        <element name="inspireId" type="base:IdentifierPropertyType"/>
        <element name="nationalCadastralReference" type="string"/>
        <element name="nationalCalculatedArea" type="gml:AreaType"/>
        <element minOccurs="0" name="referencePoint" nillable="true" type="gml:PointPropertyType"/>
      - <element minOccurs="0" name="originalMapScaleDenominator" nillable="true">
```

ISO 19192 LADM based INSPIRE cadastral parcels

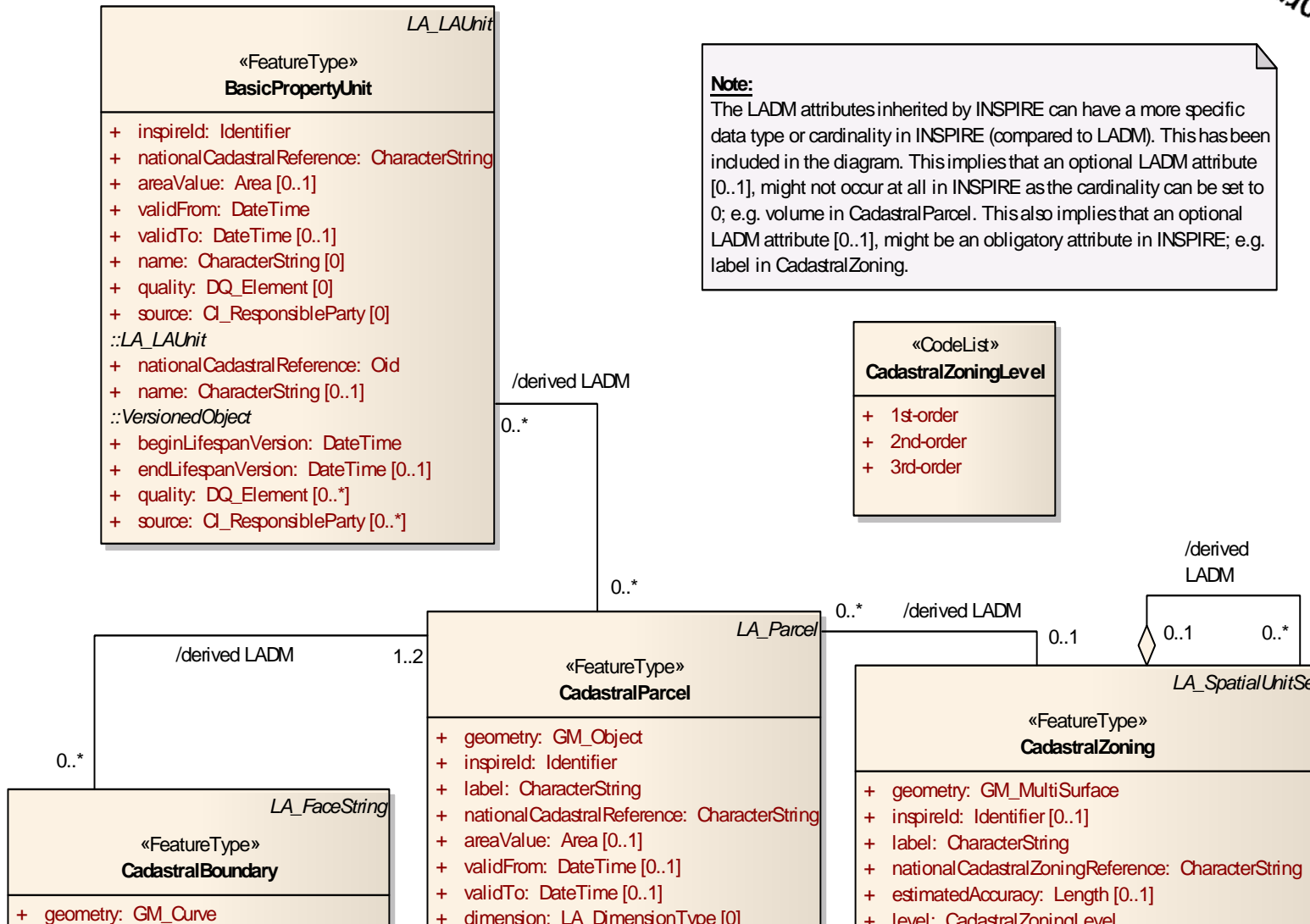
- Selection of relevant classes
- Based on inheritance
- Add attributes
- Add constraints (to refine meaning)

INSPIRE

Cadastral Parcels (CP)



class inspire cad parcels based on ladm - pure



Overview

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2. INSPIRE (cadastral parcels)
3. NL (geo standaarden)



FORUM STANDAARDISATIE



FORUM STANDAARDISATIE

Expertadvies

Geo Standaarden

Auteur(s)

prof.dr.ir. P.J.M. van Oosterom, ir. L.M. Punter

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Actieplan Nederland Open In Verbinding

1. Verbeteren adoptie van **open** standaarden
 - Actielijn 1: Publiceren basislijst met open standaarden
 - **Actielijn 2: Comply-or-explain**
 - ...
2. Stimuleren gebruik van **open** source software
 - Forum en College Standardisatie
 - Programmabureau Nederland Open in Verbinding
 - Nederlandse Overheids Referentie Architectuur (NORA)



Nederland Open in Verbinding
Een actieplan voor het gebruik
van Open Standaarden en Open
Source Software bij de (semi-)
publieke sector

November 20, 2009

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FORUM STANDAARDISATIE

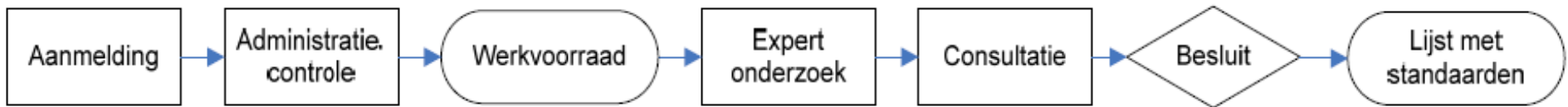
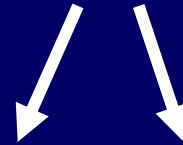
**TU**Delft

Standaarden aangemeld door Geonovum voor comply-or-explain

1. Nederlands metadata profiel op ISO 19115:2003 voor geografie, versie 1.2, maart 2009
2. Nederlands metadata profiel op ISO 19119 voor services, versie 1.1, maart 2009
3. Nederlands WMS profiel, versie 1.1
4. Nederlands WFS profiel, versie 1.1
5. NEN3610:2005
6. GML, versie 3.1.1



Procesbeschrijving nieuwe standaarden



- **Expertgroep** – verantwoordelijk voor toetsing van de standaard en adviseert het Forum / College
- **Publieke consultatie** – gebruikers en andere belanghebbenden worden geconsulteerd een zo breed mogelijk inzicht te krijgen
- **Forum / College Standaardisatie** – besluitvormend orgaan die de uiteindelijke beslissing neemt over het opnemen



Expertadvies

1. Toepassingsgebied en werkingsgebied
2. Toetsen voorgestelde standaarden
 - **Openheid** (Besluitvorming, Beschikbaarheid, Intellectueel eigendom, Hergebruik)
 - **Bruikbaarheid** (Volwassenheid, Functionaliteit, Concurrerende standaarden)
 - **Potentieel** (Leveranciersafhankelijkheid, Interoperabiliteit)
 - **Impact** (Bedrijfsvoering, Informatievoorziening, ICT, Beveiliging & privacy, Migratie)



Expertadvies rapport Geo standaarden

1. Toepassingsgebied: uitwisseling geografische informatie tussen organisaties.
Werkingsgebied: primair overheden, (semi-)publiek
2. Voorgestelde standaarden voldoende scoren op de vier vastgestelde toetsingscriteria (openheid, bruikbaarheid, potentieel en impact).

→ Opname van de standaarden draagt duidelijk bij aan de doelen van de lijst.



Expertadvies, randvoorwaarden

- Nieuwere versie (NEN3610 en GML) om te voldoen aan actuele vereisten (o.a. INSPIRE).
- Nederlandse profielen op internationale standaarden: baseren op ISO i.p.v. de OGC-standaarden
- WFS: proof-of-concept ivm OSB-WUS-standaard
- Geonovum moet de beheerprocedure expliciet maken
- Vrijwaringen intellectueel eigendom expliciet (incl. NEN3610)

→ Overleg Geonovum – Forum Standaardisatie
(besluit verwacht mei 2010)



Overview

1. ISO (19152 Land Administration Domain Model)
2. INSPIRE (cadastral parcels)
3. NL (geo standaarden)

→ Conclusion

Conclusion

- Standardization is a condition for realizing the SII
- Domain models (themes) contain knowledge
- INSPIRE is mega-construction
- ISO (TC211) is often the foundation
- ISO 19152 / LADM and INSPIRE cadastral parcel have different scope, but the overlap does fit
- NL is adopting and implementing international GI standards (taking care of various aspects: legal, organizational, technical)
- **Thanks for your attention!**