

3D spatial units – considering the ISO 19152 standard (LADM) as a base for 3D Cadastre

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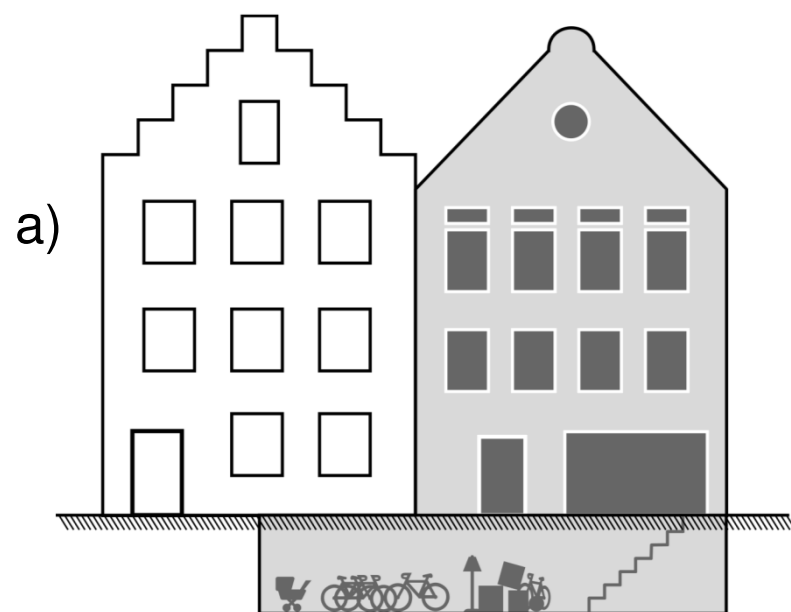


Content

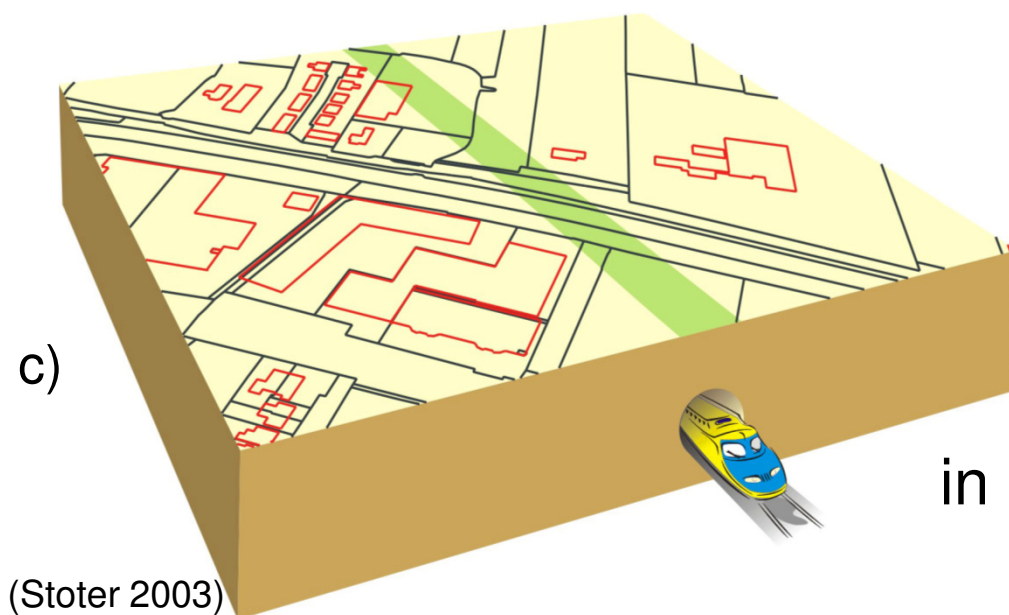
- Motivation for 3D Cadastre
- 3D spatial units according to ISO 19152 (LADM)
- FIG activities on 3D Cadastre



3D cadastre (geospatial.org)

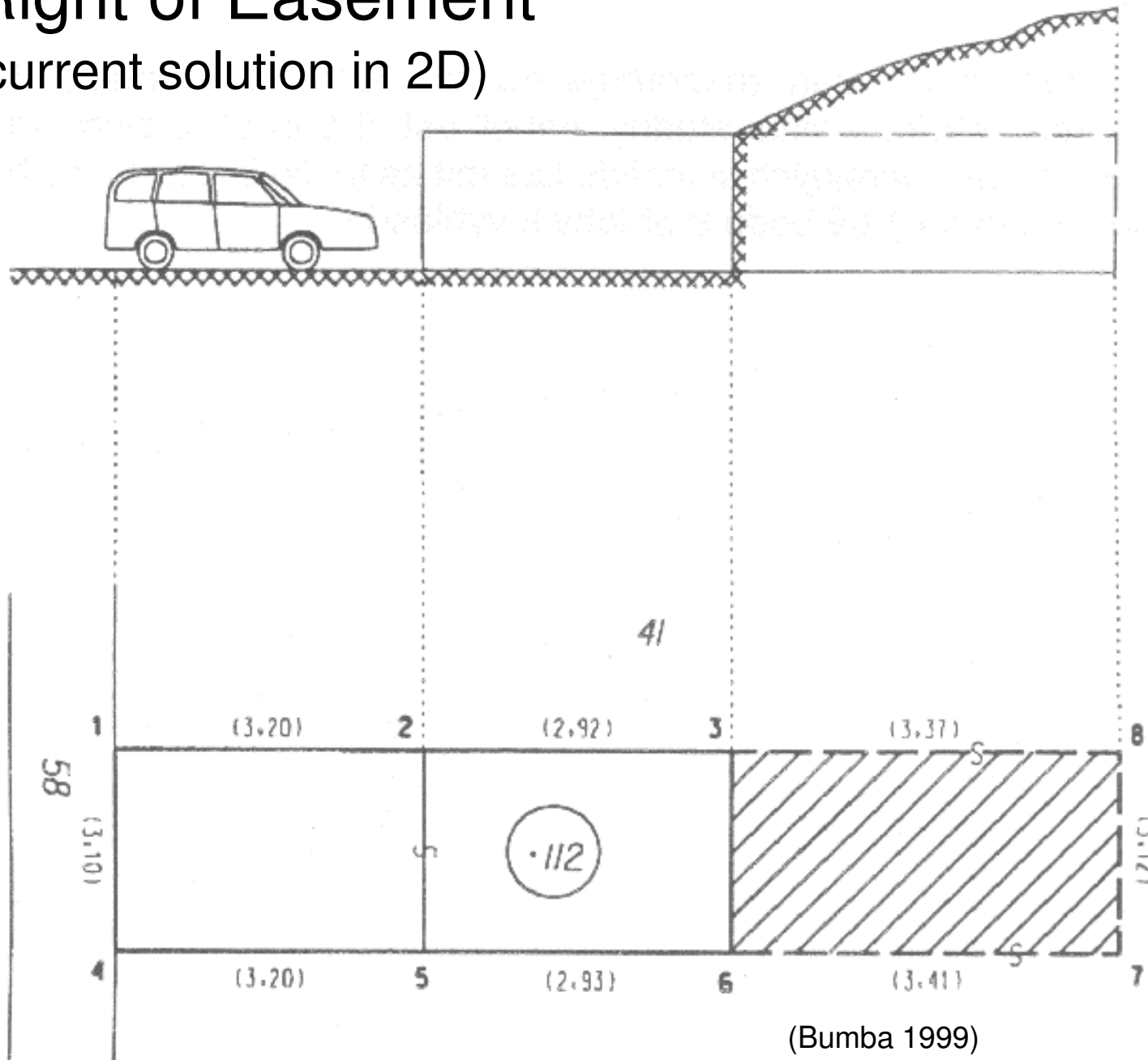


b)



in 2D: Right of Easement
(*věčné břemeno*)

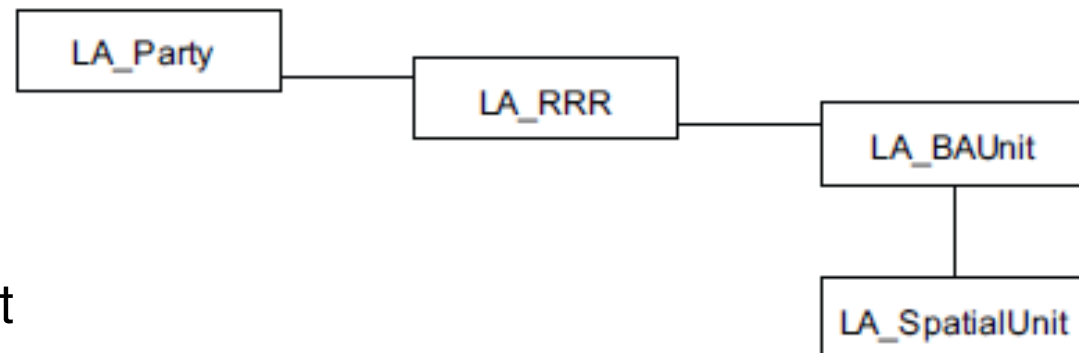
Right of Easement (current solution in 2D)



ISO 19152 Land Administration Domain Model

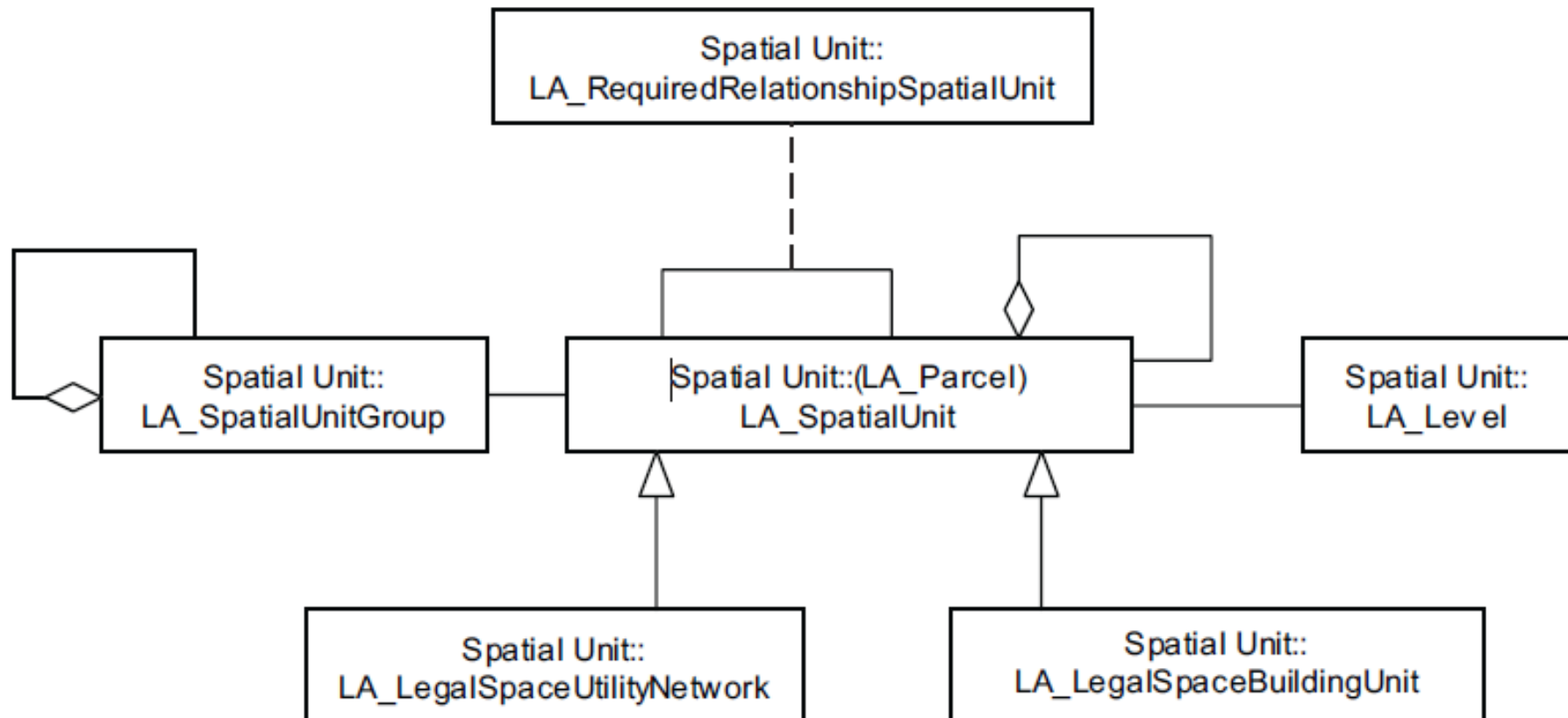
- is a conceptual schema for 3D Cadastre
- is based on four basic classes

- Class LA_Party
- Class LA_RRR
- Class LA_BAUnit
- Class LA_SpatialUnit

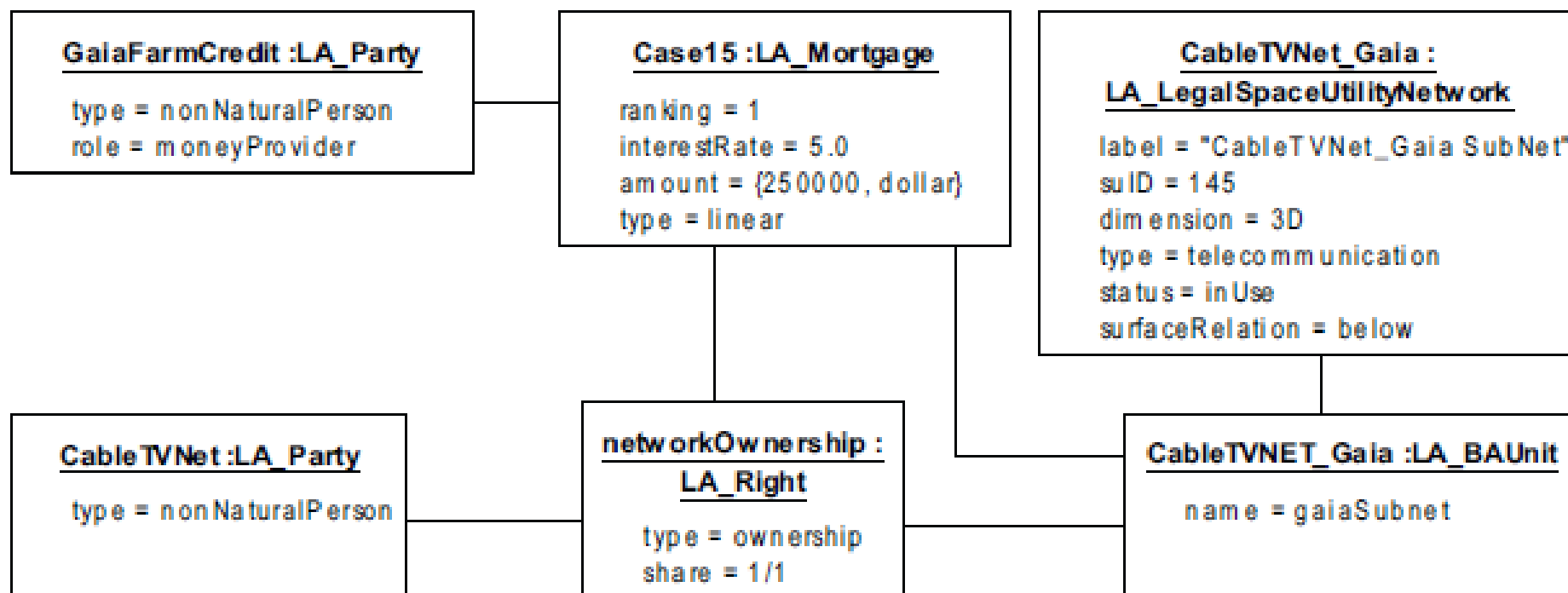


- **Spatial Unit** = single area (or multiple areas) of land and/or water, or a single volume (or multiple volumes) of space

Classes of Spatial Unit Package



Utility Network



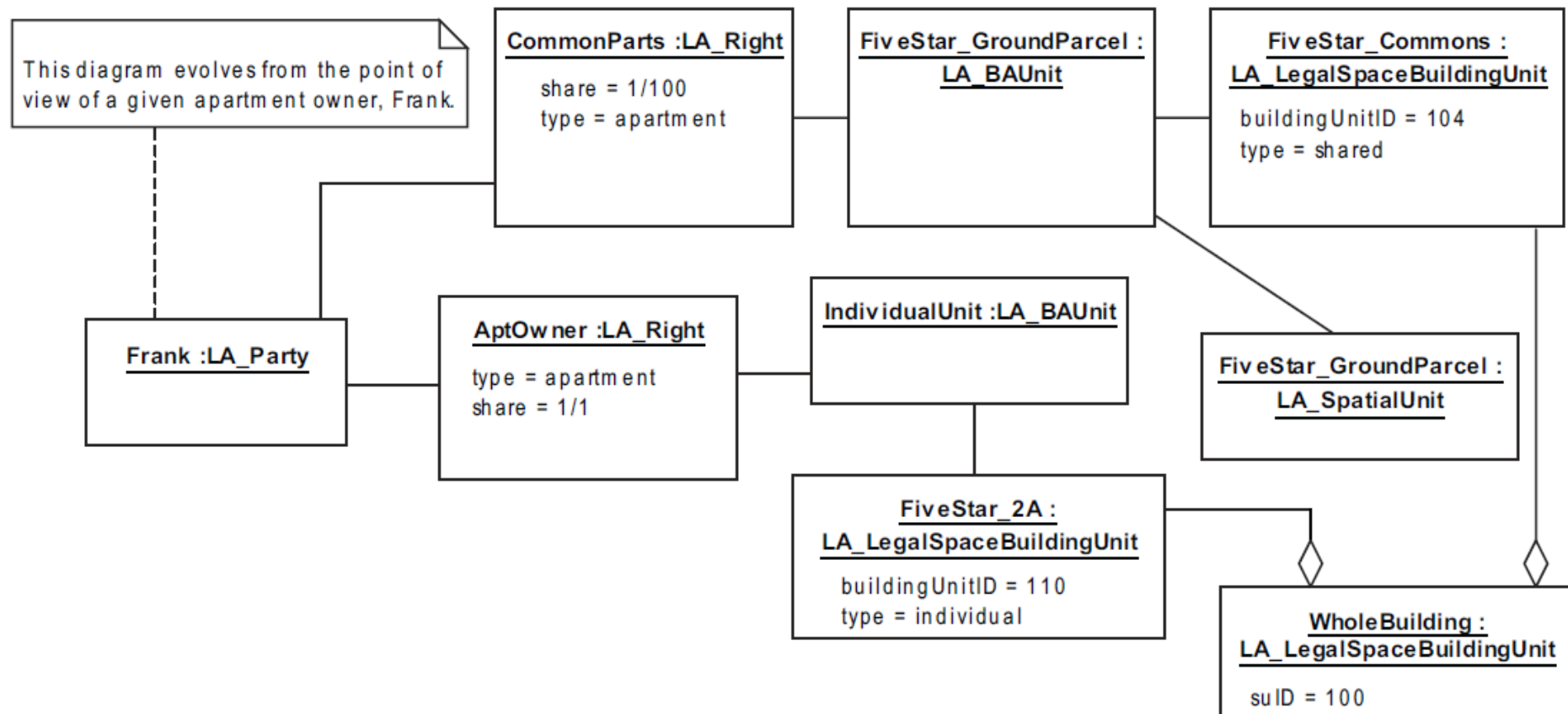
Cooperative property

Housing Co-operative x House Unit Owners Association



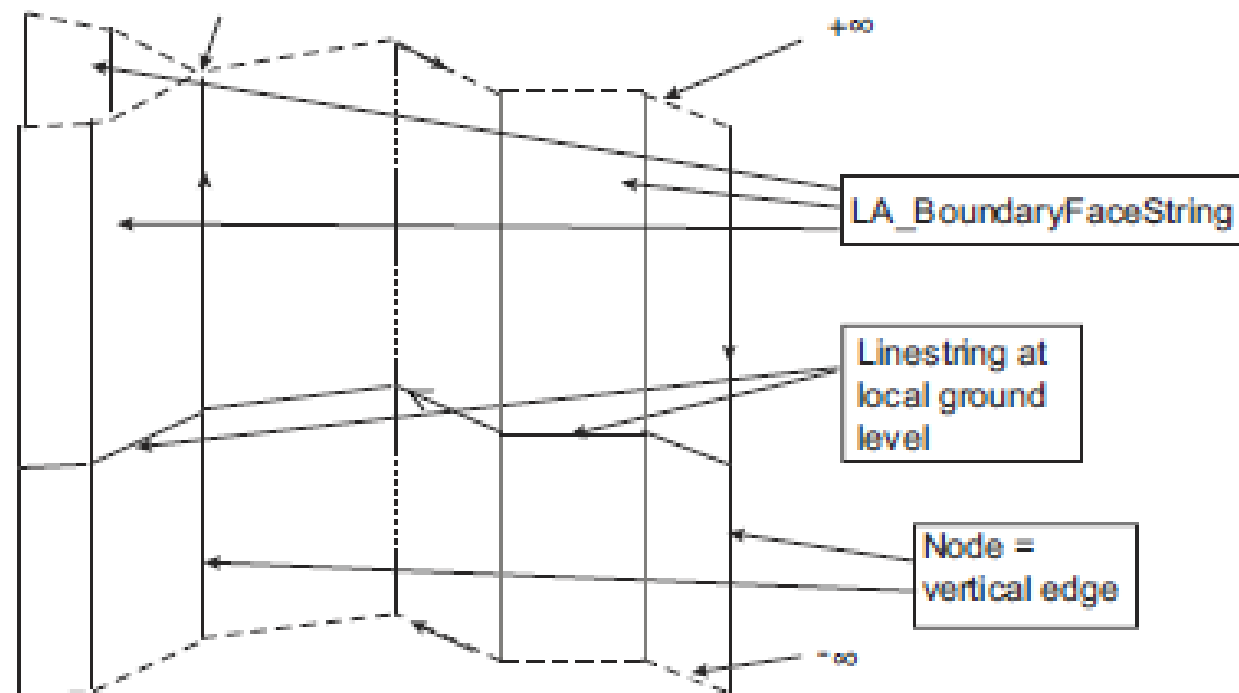
(Bydłosz 2012)

Apartment building – a point of view of apartment owner



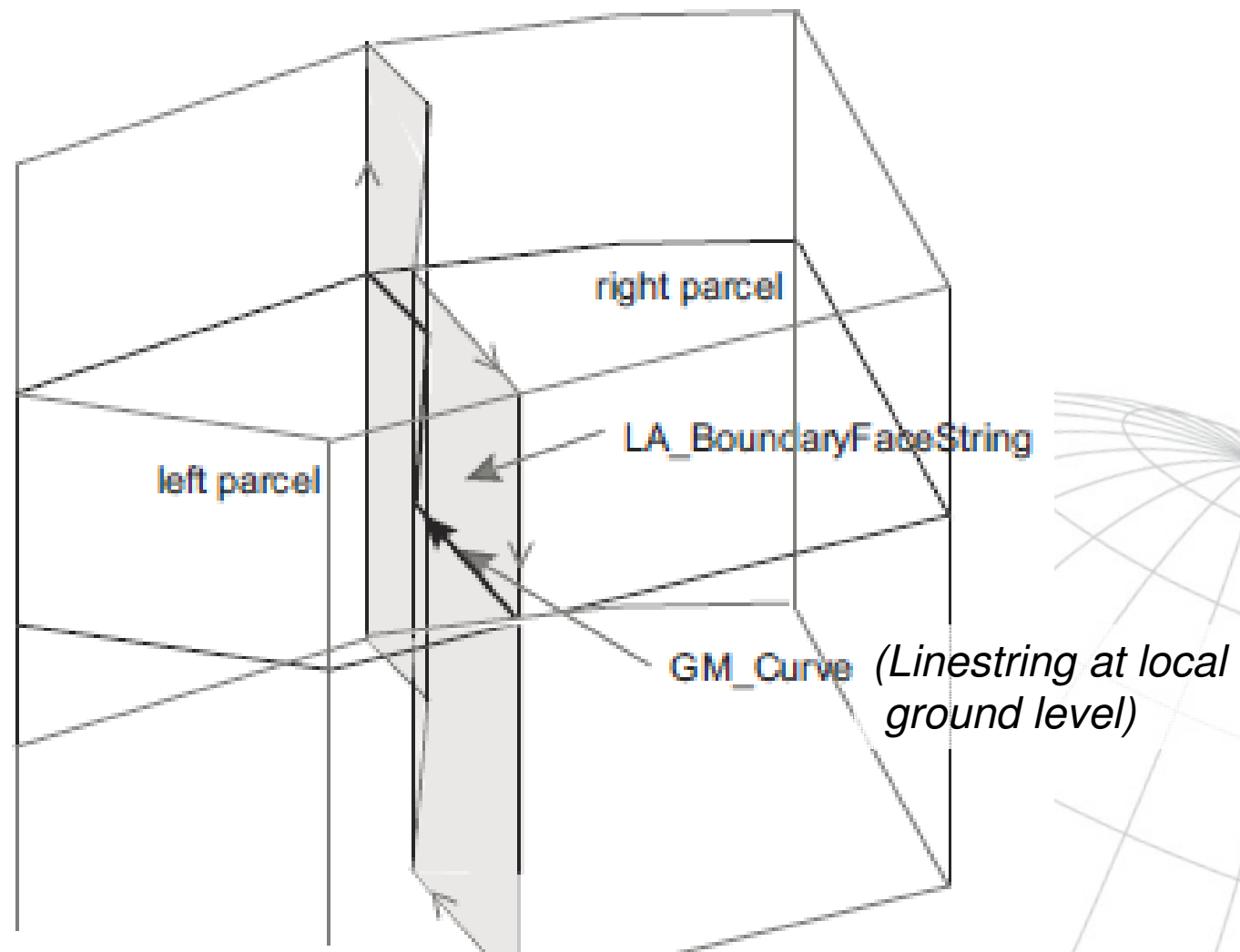
2D boundary representation - **boundary face string** concept

- GM_MultiCurve (linestring) used for **boundary face strings** storage



(ISO 19152)

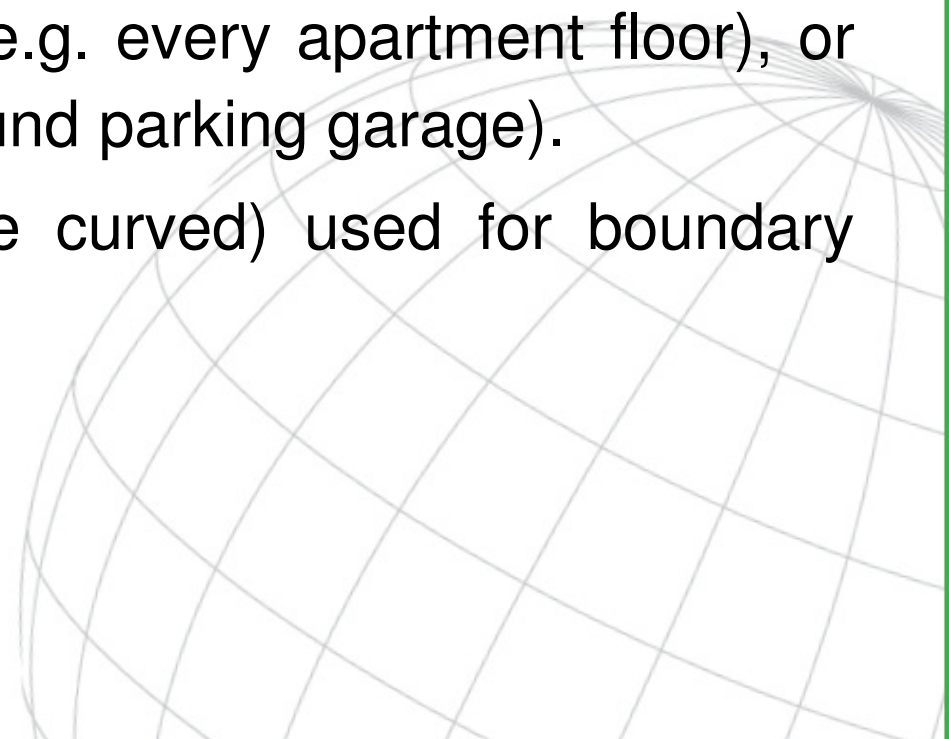
Spatial units defined by boundary face strings



(ISO 19152)

3D boundary representations – **boundary faces** concept

- Used when the implied vertical and unbounded faces of a boundary face string are not sufficient to describe 3D spatial units.
- Close volumes in height (e.g. every apartment floor), or in depth (e.g. an underground parking garage).
- GM_Surface (that may be curved) used for boundary faces storage.



3D (topology based) cadastre

This is the spatial profile of a pure 3D topology structure (so no 2D or liminal representations in this level). There are no overlapping volumes (3D_SpatialUnits). However, volumes may be open at the bottom or at the top, corresponding to non-bounded 3D_SpatialUnits (in this case the size of the volume cannot be computed). The following class should be omitted from any implementations of the 3D_ProfileDefinition: LA_BoundaryFaceString.

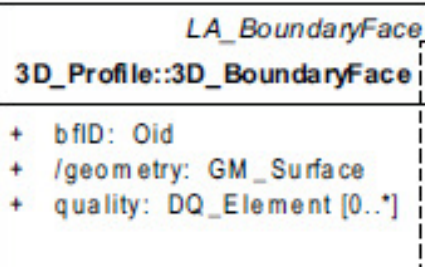
This is the topological spatial profile for the 3D case. Note that in 3D_Level the attribute structure is fixed to 'topological'. In the 3D_SpatialUnit the attribute dimension is fixed to '3D', there still is an optional referencePoint, which should be provided via a 3D GM_Point. Finally, there are a set of constraints defining a valid topological structure for a 3D volume partition.

«invariant»

{All topological boundary faces are used once in plus and also exactly once in minus direction. Unless the boundary face is on the edge of the domain then either the plus or the minus direction is used once (and the other zero times).}

«invariant»

{non_intersection: boundary faces do not (self-)intersect and do meet other boundary faces at their boundaries}



minus
/derived LADM

0..*

0..1

plus
/derived LADM

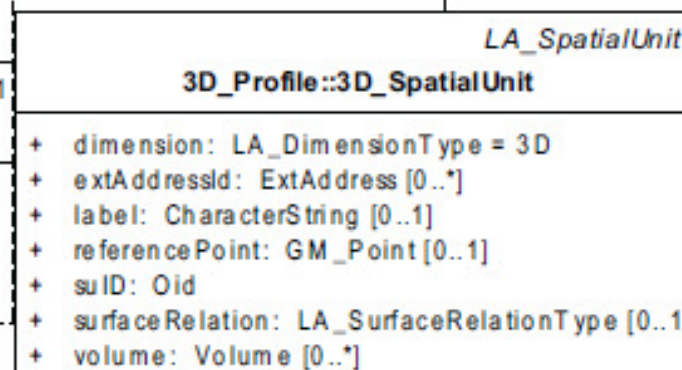
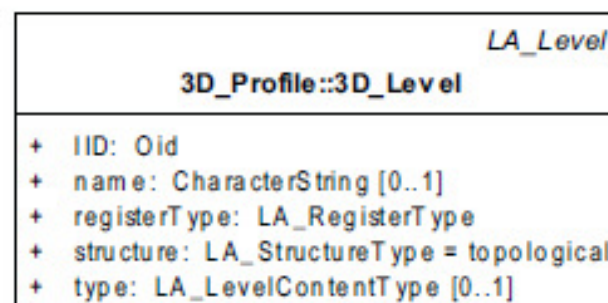
0..*

0..1

+su 0..*

+level 0..1

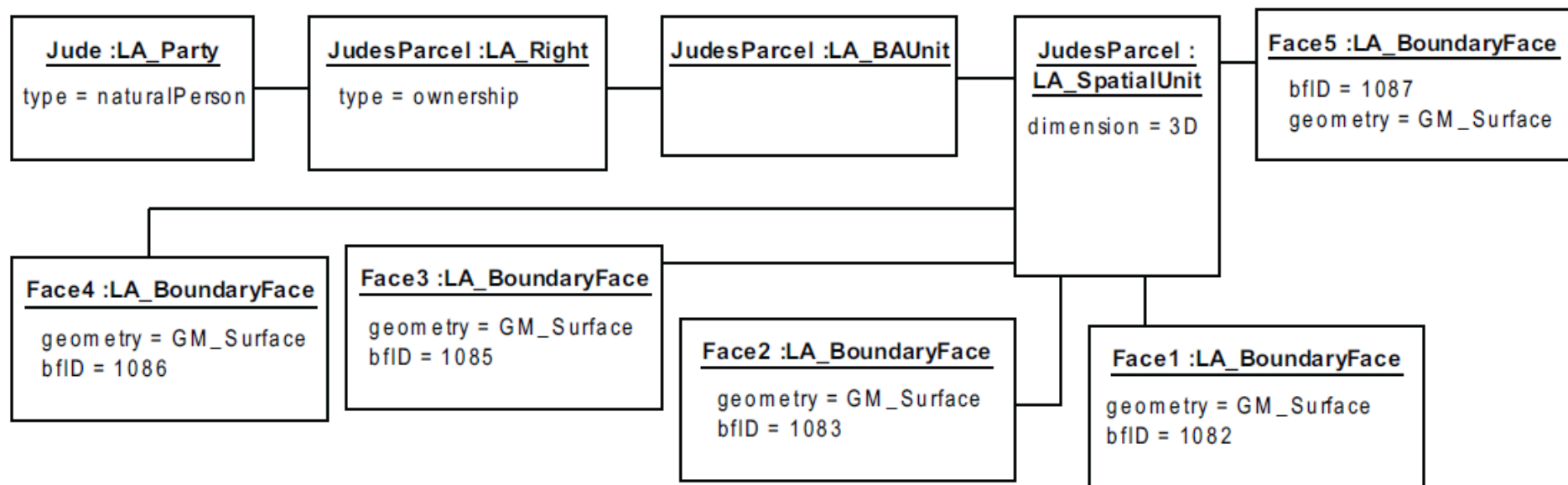
/derived LADM



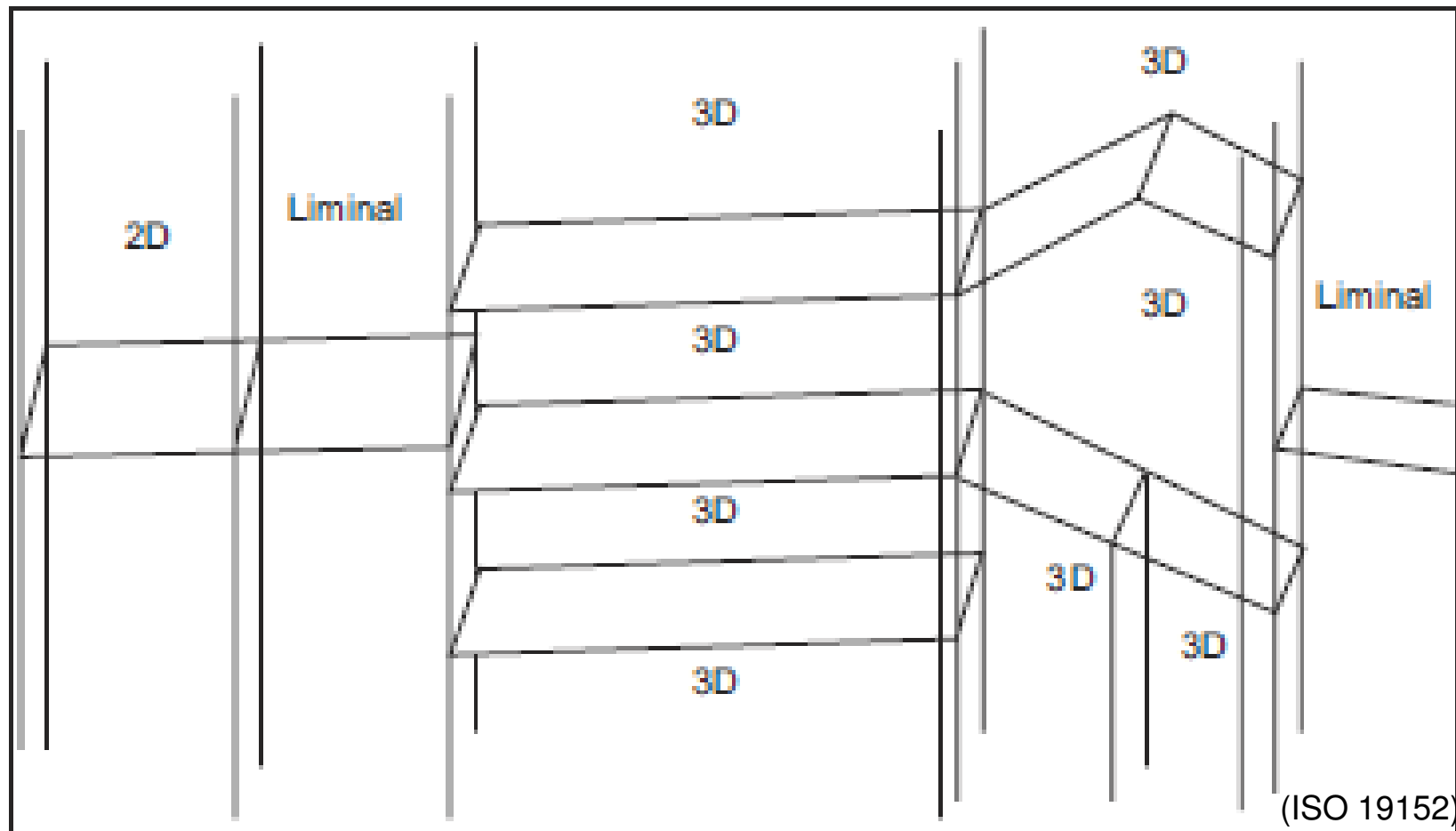
«Invariant»

{All 3D_BoundaryFaces have outward orientation (normal vector points to the outside). All 3D_BoundaryFaces together form at least one outer shell and 0 or more inner shells. In principle the shells are closed, with the exception that they may open (unbound) to the top (sky) and bottom (earth) direction.}

Example of 3D spatial unit – using boundary face concept



Bounded and unbounded 3D volumes



Side view showing the mixed use of **boundary face strings** and **boundary faces** to define both bounded and unbounded 3D volumes.



FIG & 3D Cadastre

- Workshops on 3D Cadastre (2001, 2011, 2012, 2014)
- Questionnaire – 3D Cadasters
 - In 2010: 43 countries involved (21 from Europe), Czech Republic didn't participate
 - In 2014: ??? countries involved, inc. Czech Republic



FIG joint commission 3 and 7 Working Group on 3D Cadastres

It is no longer a question if 3D cadastre should be realised, but **when** and **how**.



Thank you for your attention!

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