BIM Legal

Proposal for defining legal spaces for apartment rights in the Dutch cadastre using the IFC data model

P5 – Public presentation & final assessment

Roeland Willem Erik Meulmeester | 4175417 | r.w.e.meulmeester@student.tudelft.nl

First Mentor:	Prof. dr. ir. P.J.M. Van Oosterom
Second Mentor:	Prof. mr. dr. H.D. Ploeger
Kadaster Contact:	E. Hagemans
2nd Kadaster Contact:	G. Dabroek
Co-reader:	Ir. Juan Francisco Azcarate-Aguerre
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Presentation Outline

- Introduction
- Motivation
- Methodology
- Developed proof of concept
- Case study
- Conclusions

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- BIM Legal: Proposal for defining legal spaces for apartment rights in the Dutch cadastre using the IFC Data model

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- **BIM** Legal: Proposal for defining legal spaces for apartment rights in the Dutch cadastre using the **IFC Data model**

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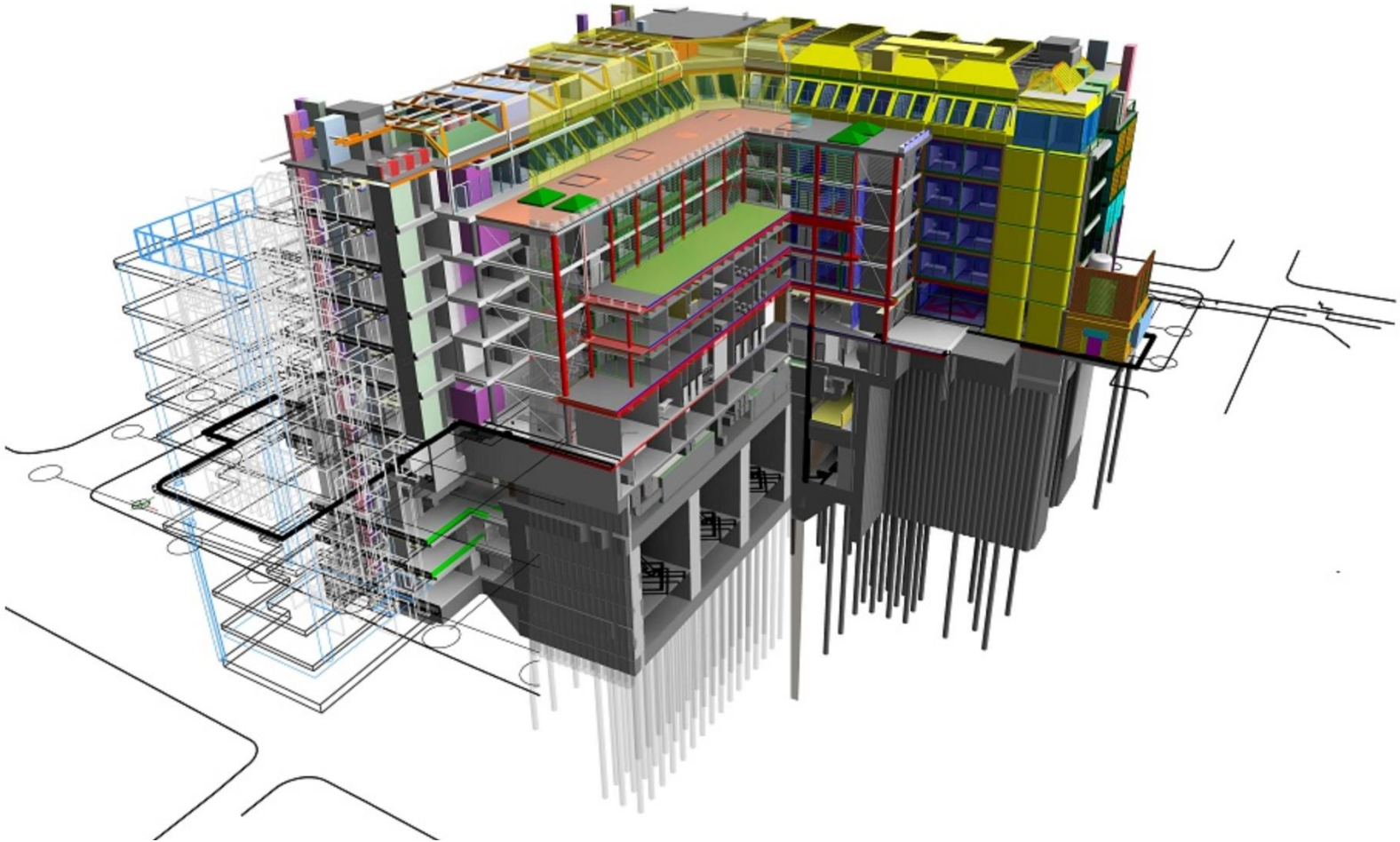

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IFC Data Model

- Open data format for BIM
- Most used data model in AEC sector
- BIM mandatory for buildings > €10M
- Rijksvastgoeddienst, BIM Loket
- No legal space in IFC

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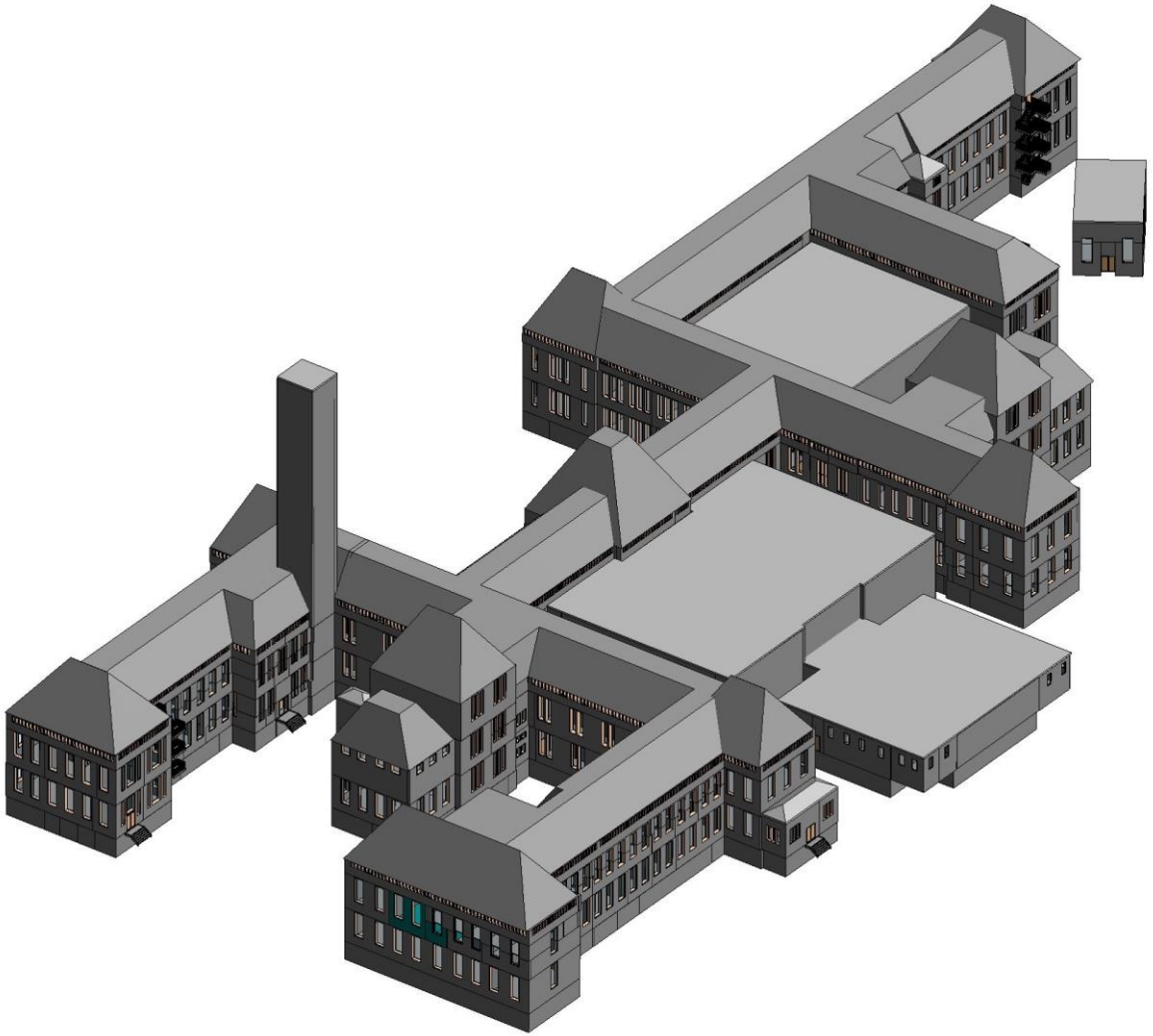

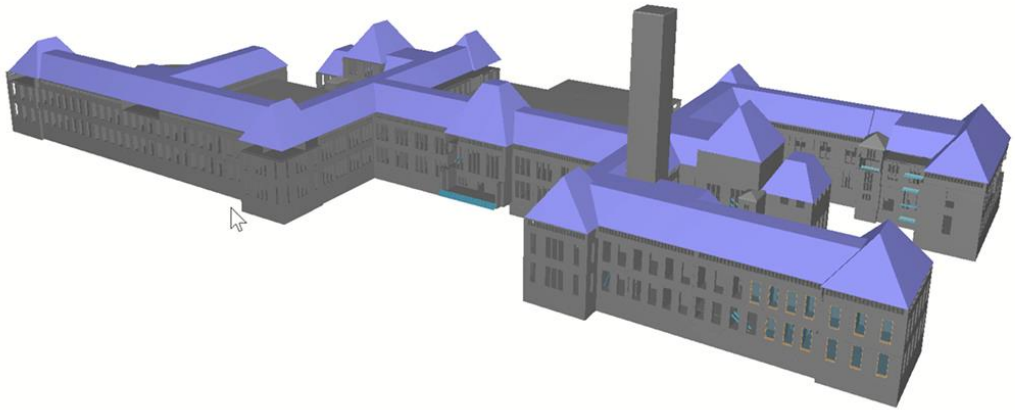

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Introduction

- Proposal for defining legal spaces for **apartment rights** in the **Dutch cadastre** using the IFC Data model

kadaster

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Apartment Rights

- Registered ownership to individual apartment unit
- Registered with a notarial deed
  - Internal Arrangements + 2D Floor plan

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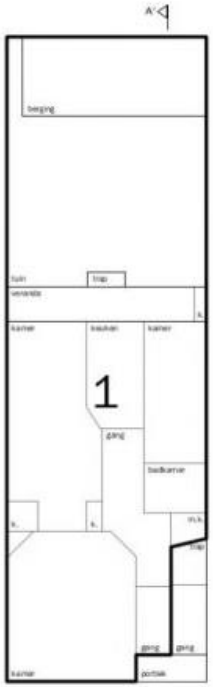
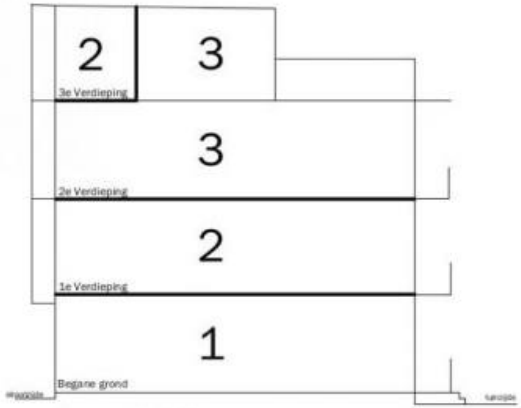


Begane grond
schaal 1:100



Doorsnede A-A'
schaal 1:100

Situatietekening
schaal 1:1000

Voorgenomen splitsing in 3 appartementsrechten kadastraal bekend:

GEMEENTE Amsterdam SECTIE X NUMMER ####

Plaatselijk bekend als; Xxxxxxxxx ###

De datum; De Notaris;

1e Verdieping
schaal 1:100

2e Verdieping
schaal 1:100

3e Verdieping
schaal 1:100

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Complex buildings

- Hard to depict ownership situation in 2D
- Time consuming, thus expensive (avg €105/h)
- IFC BIM already contains some data about spaces

Figure 3 (Atazadeh et al., 2017)

2D Parcel map

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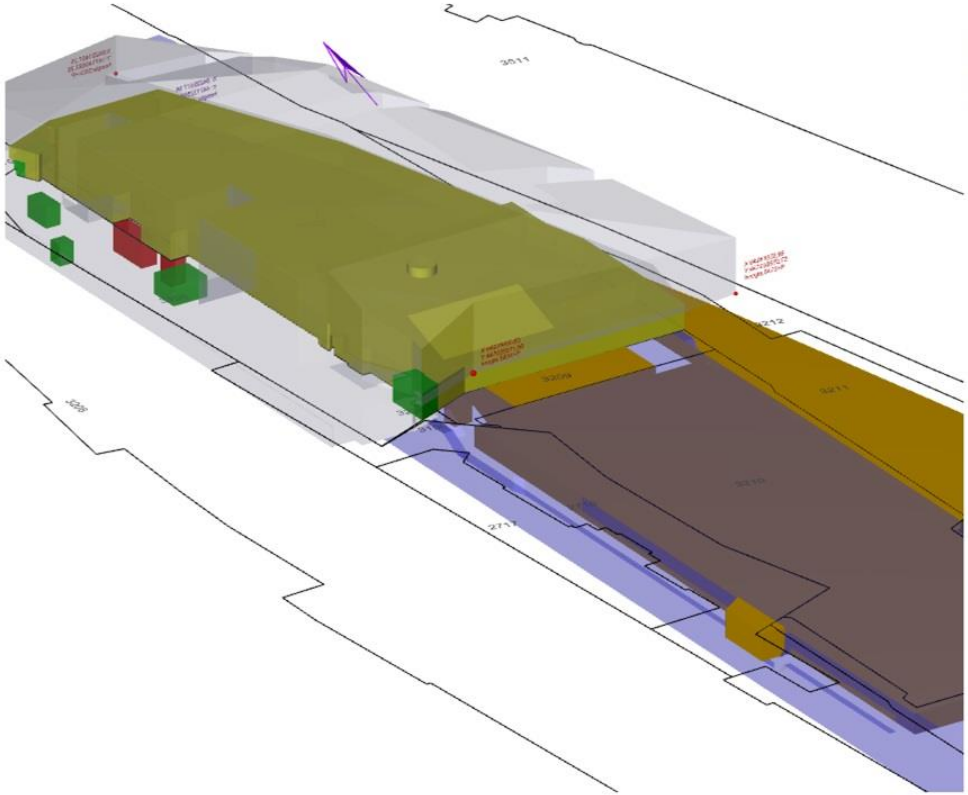
Railway Station Delft



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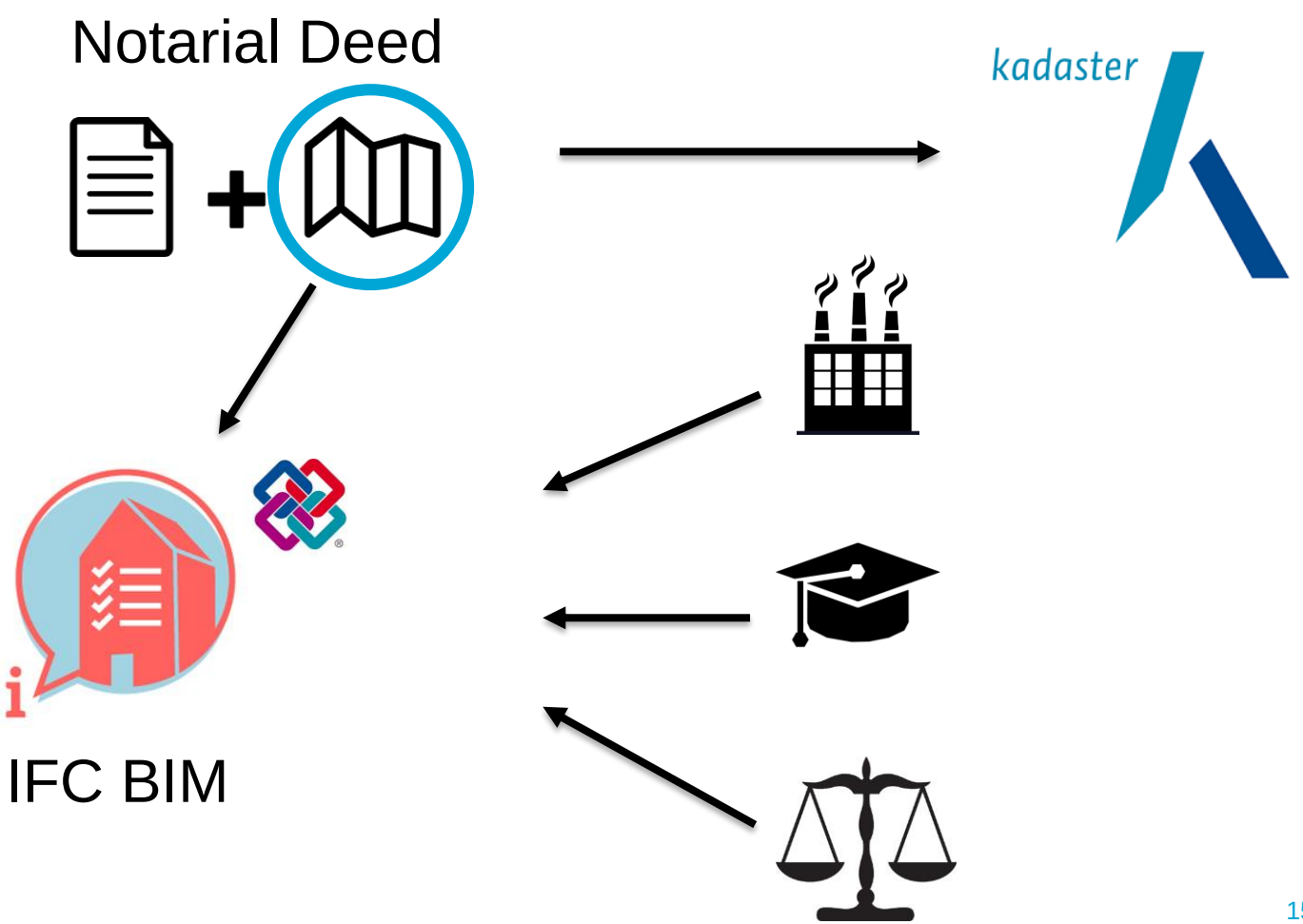

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Proof of concept

1. Enriched BIM Legal creation
2. Automatic extraction of 3D legal space
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4. Storage
5. Visualisation
6. (sub-) Splitting

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Research Question

How can the IFC Data Model possibly be extended to extract legal space for apartment rights for registration in the Dutch cadastre?

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Proposed Solution

- User Defined Property Sets for IfcSpaces
- IfcSpace one out of 800 entities
- User Defined Property Set: custom set of attributes on entity

Example IFC BIM

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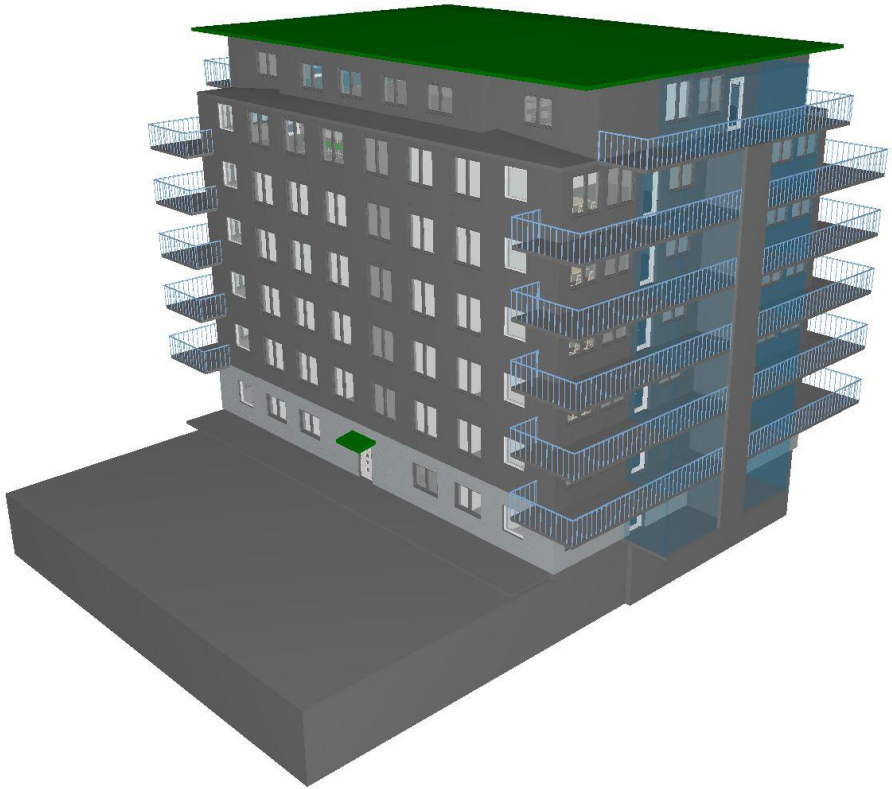
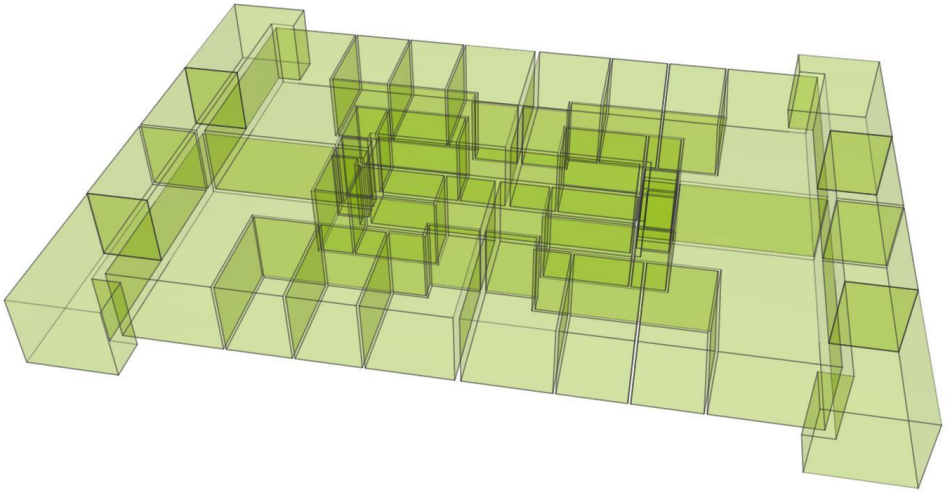


Storey sliced out



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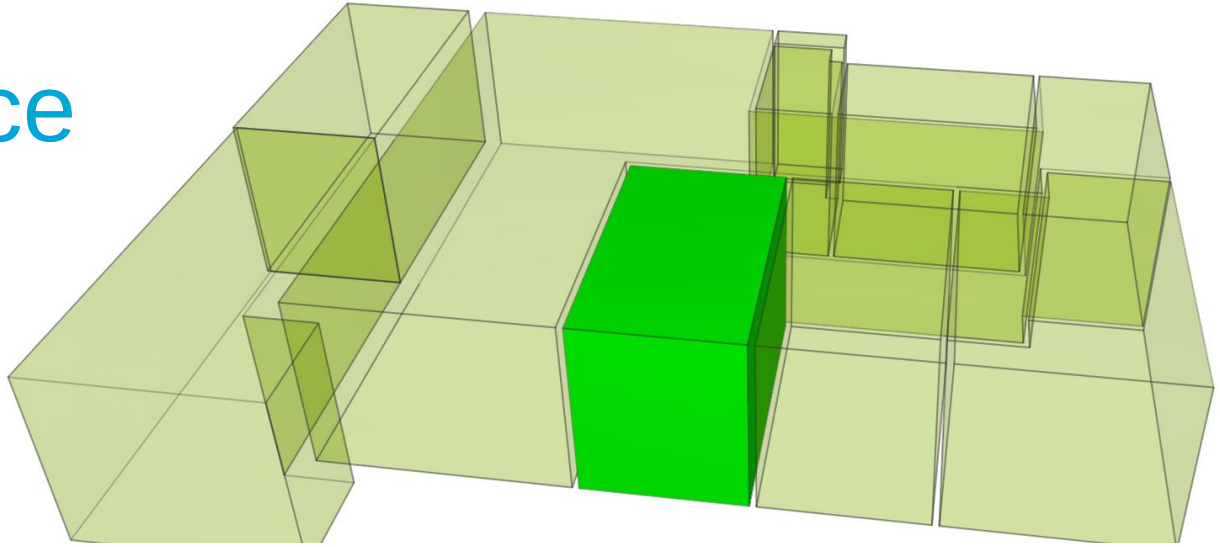
IfcSpace



INFO

Space.4.8 : Room[133]

Identification	Location	Quantities	Profile	Relations	Space Boundaries	Space Boundary Areas	Classification
Hyperlinks	Pset_AirSideSystemInformation	Pset_CadastralInformation	Pset_ProductRequirements	Pset_SpaceCommon			

Property	Value
complexnumber	8897 A
indexnumber	15
municipality	Delft
parcelnumber	8897
section	A
spacetype	Private

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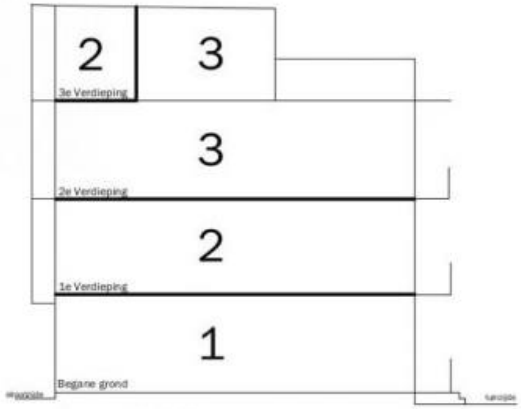

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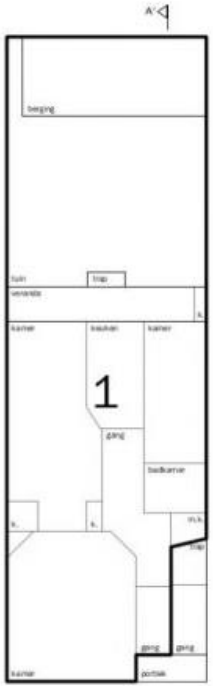

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schaal 1:100

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User Defined Property Set

- Based on 2D requirements for map in notarial deed
  - Dutch Civil Code
- Official IFC method
- Fits into current practices
  - RVB BIM Norm (Rijksvastgoeddienst)
  - BIM Loket IDM

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Legal Space

- The function of the drawing
- Internal Arrangements: detailed written information
- Map for distinguishing private and shared space according to the *“functional arrangement”* (Article 5:106 (4) DCC)

Extensibility to other IFC Elements

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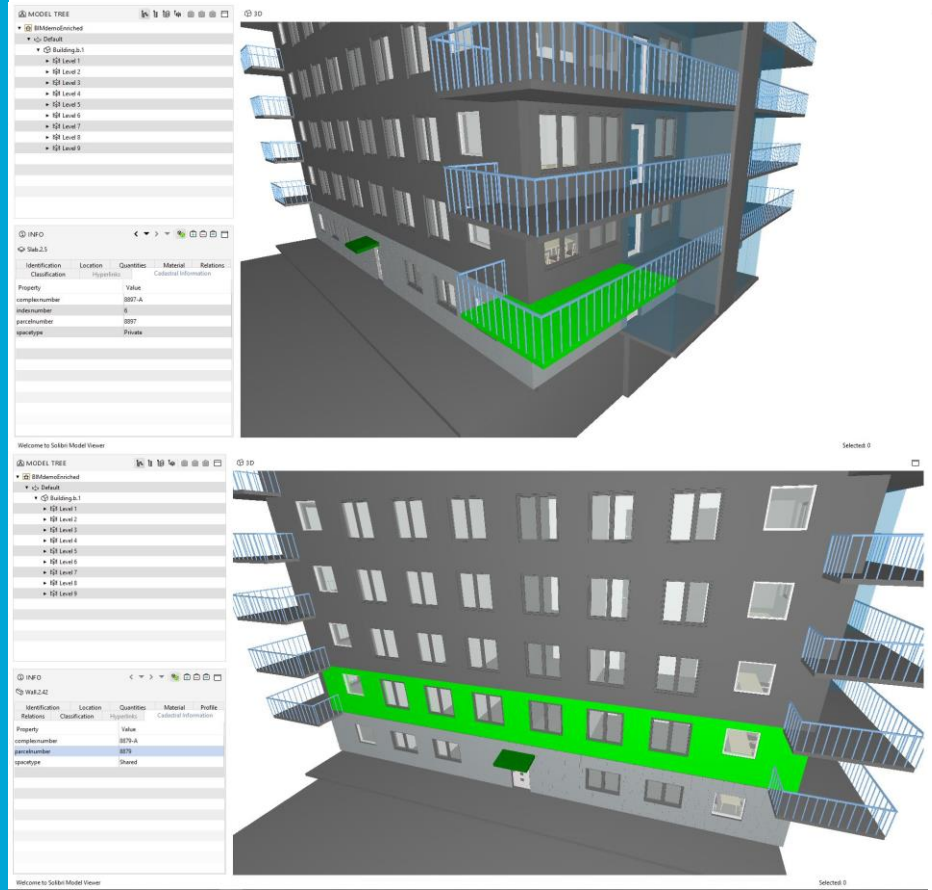

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Automatic extraction of Legal Space

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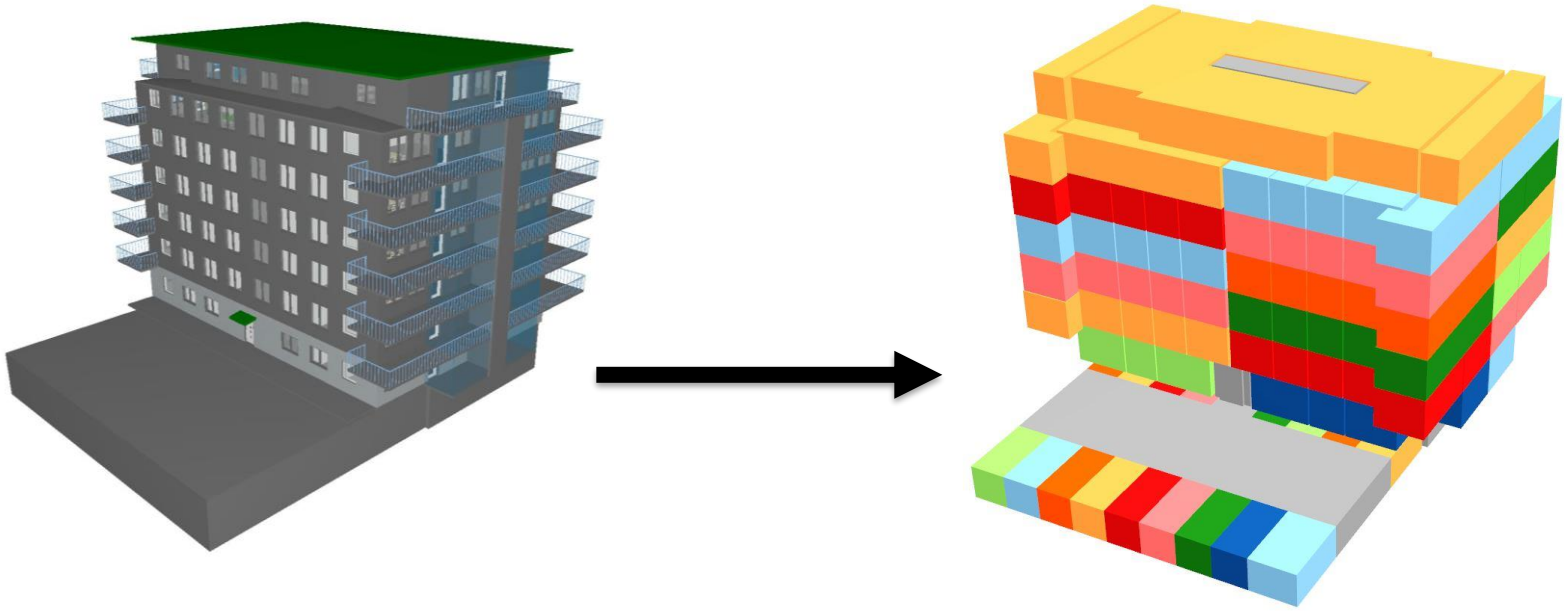

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Automatic extraction of Legal Space

- IFC BIM created according to the proposed solution
- FME workbench
- Legal Space in Database
- Can be visualised on cadastral parcel map

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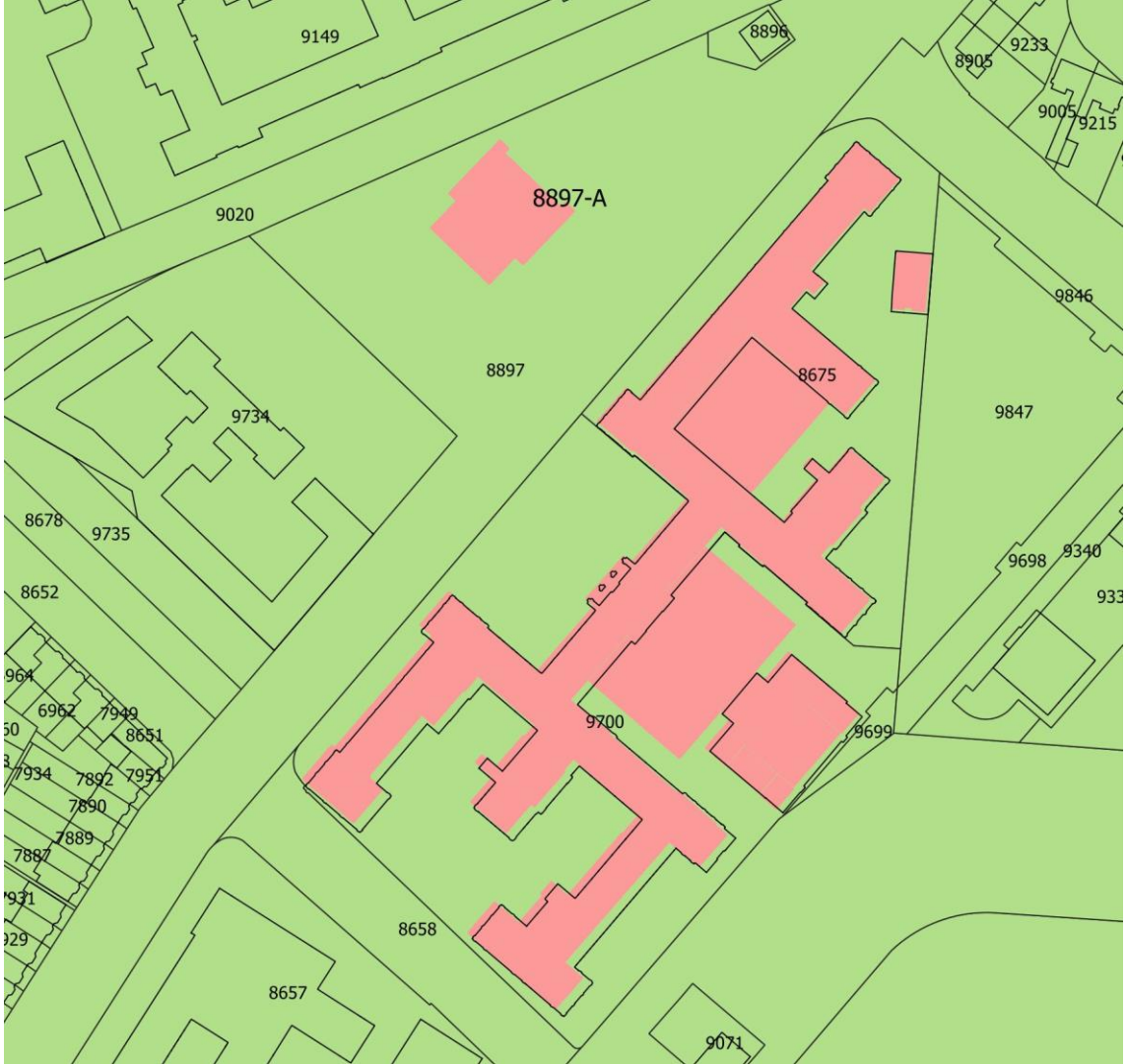

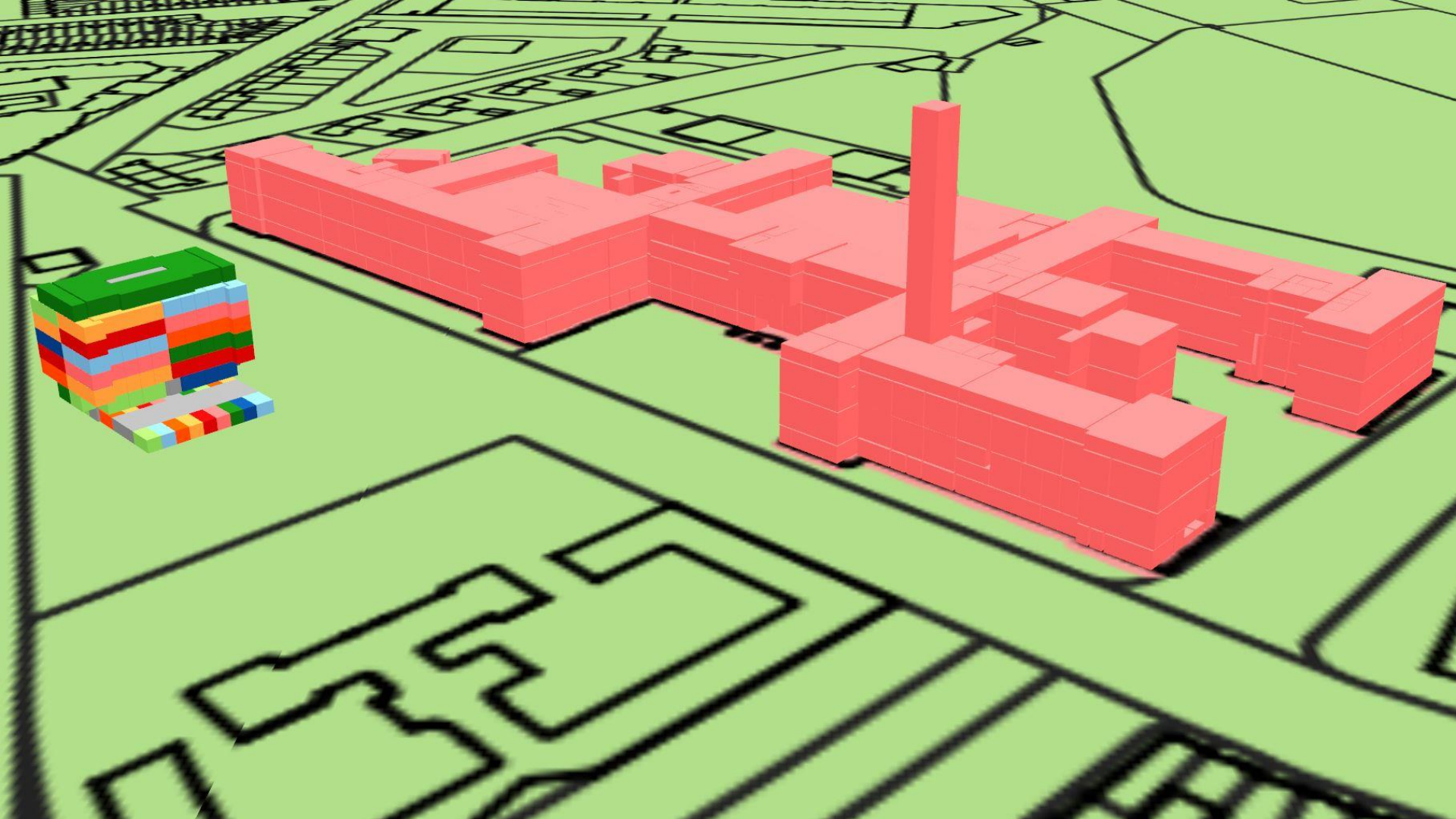

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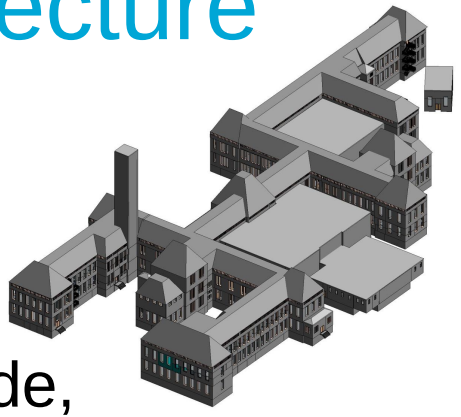

- Existing building
- Geo-referenced
  - **IfcSite**: RefLatitude, RefLongitude, RefElevation
    - Orientation
  - IfcProject, TruNorth attribute, IfcDirection
- RD + NAP possible

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Validation

- In IFC with ruleset
- In database (extracted legal space) checks for:
  - Overlap
  - Naming

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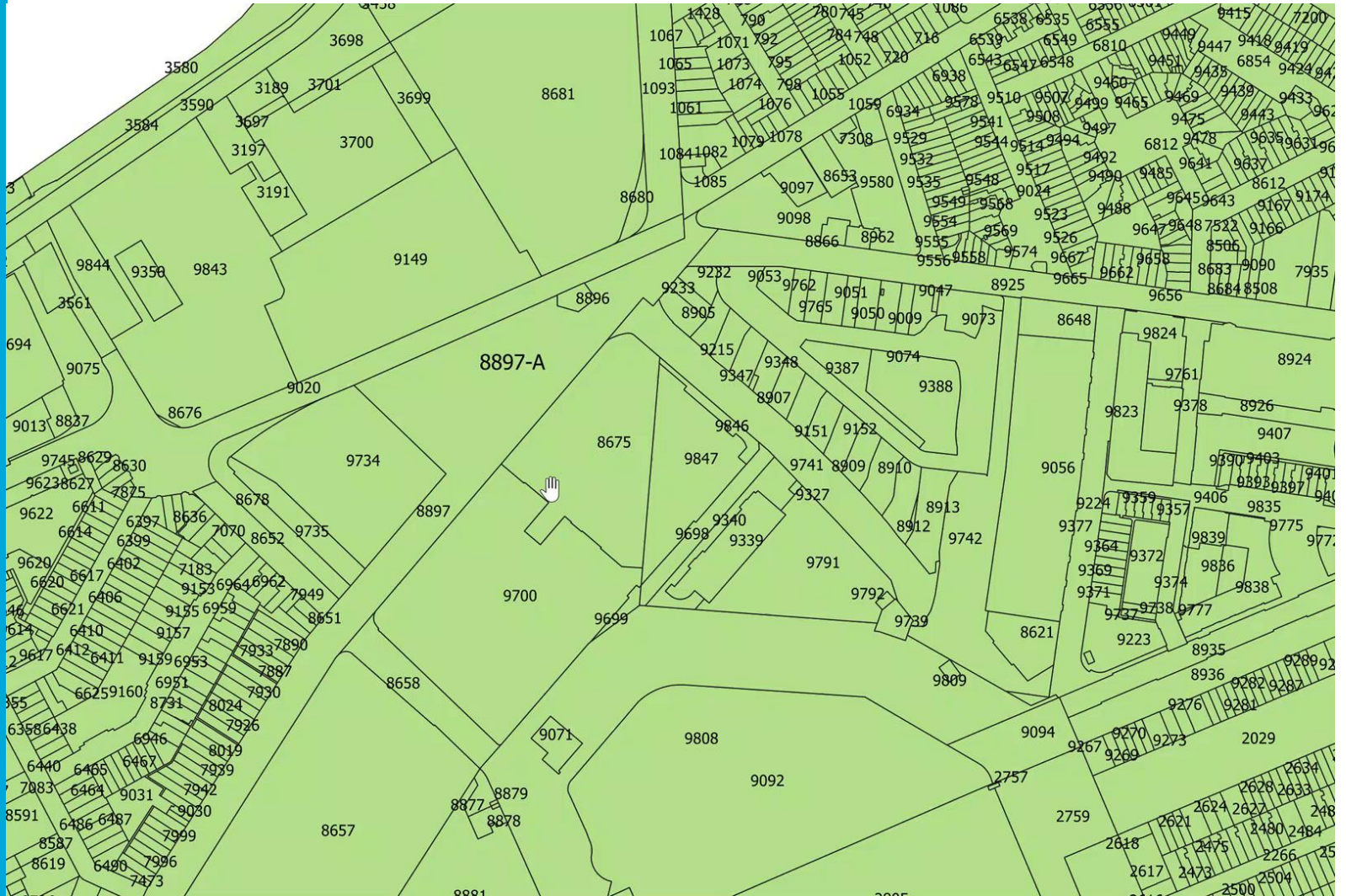

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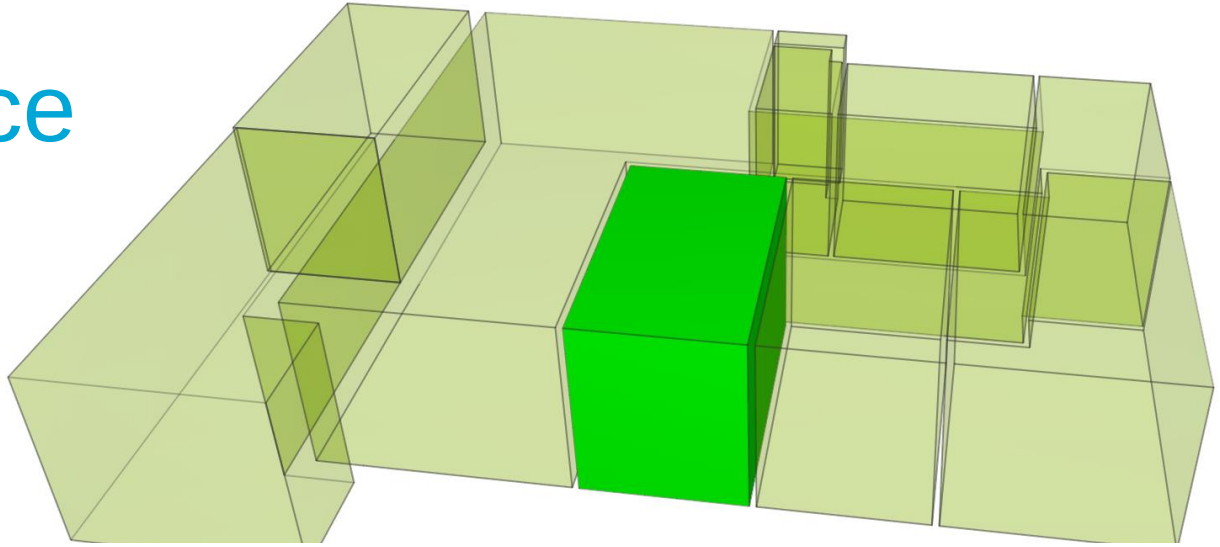

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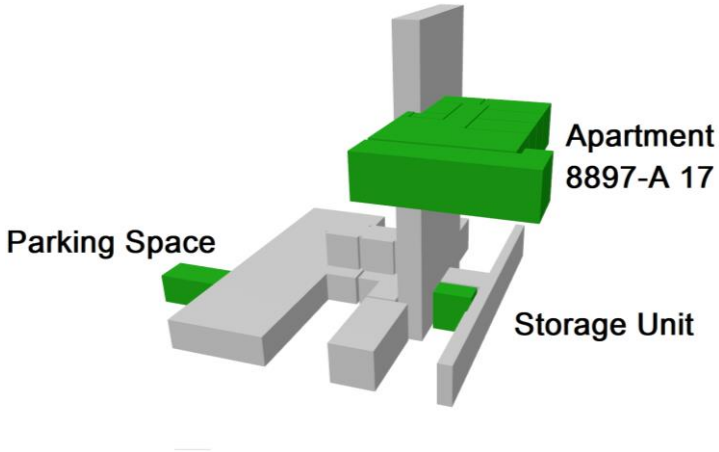
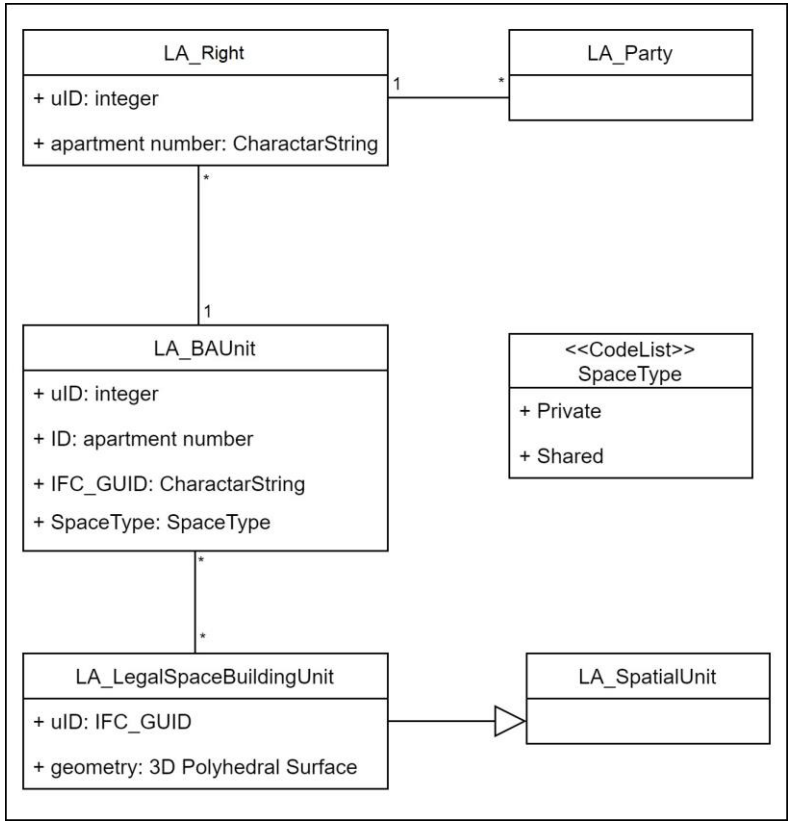
LADM / ISO 19152 mapping





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Web browser-based viewer

- Prototype
- Similiar Platform as in (Cemellini et al., 2018)
- http://pakhuis.tudelft.nl:8080/edu/cesium/apps/bimlegal/

Web browser-based viewer

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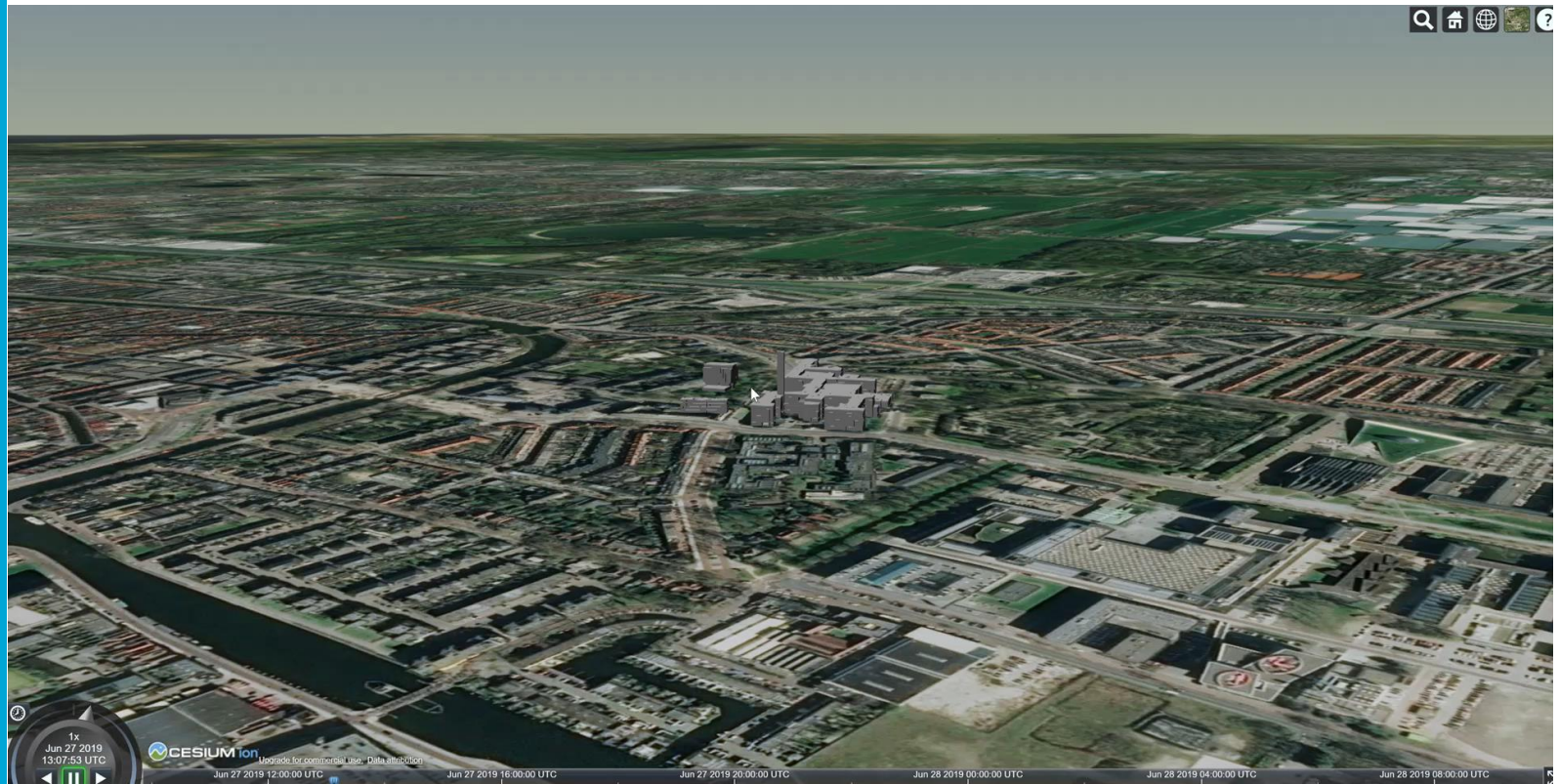

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Case study: Splitting apartment rights

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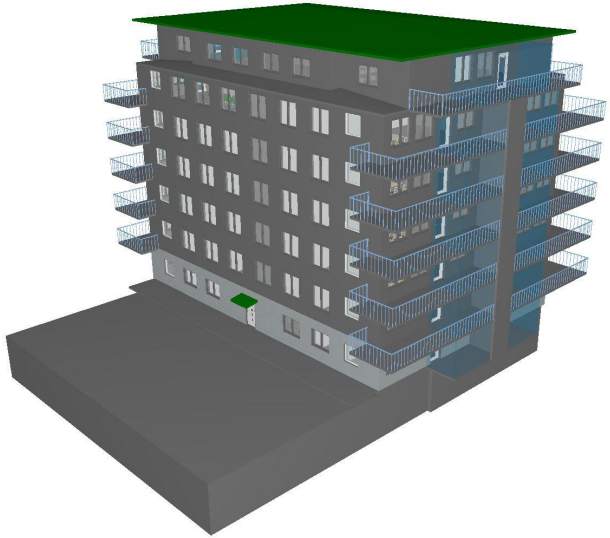

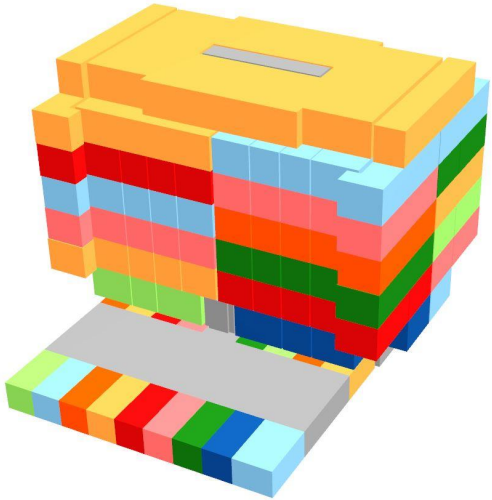

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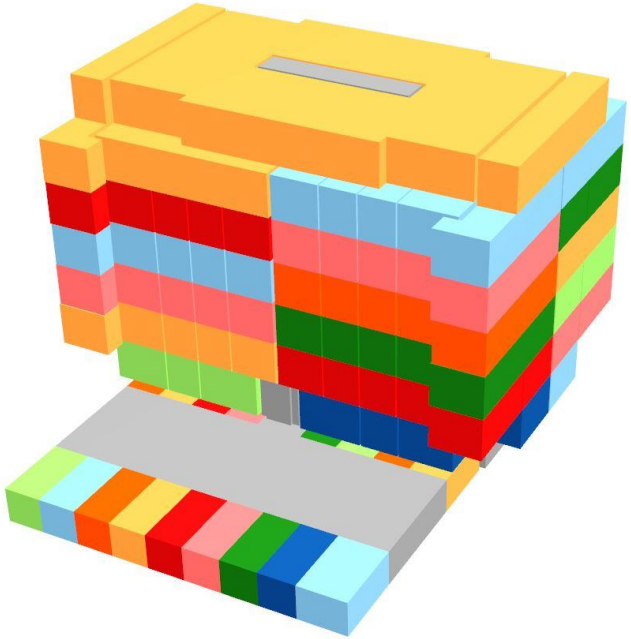

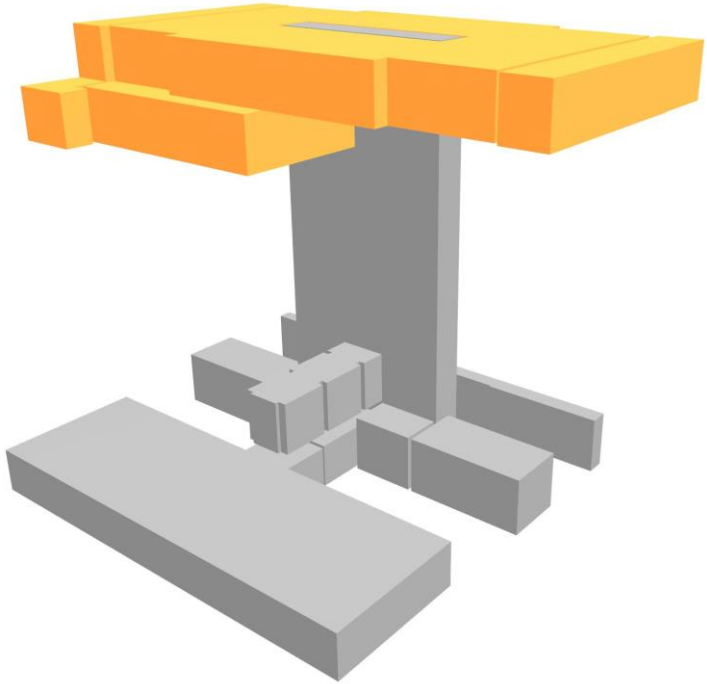

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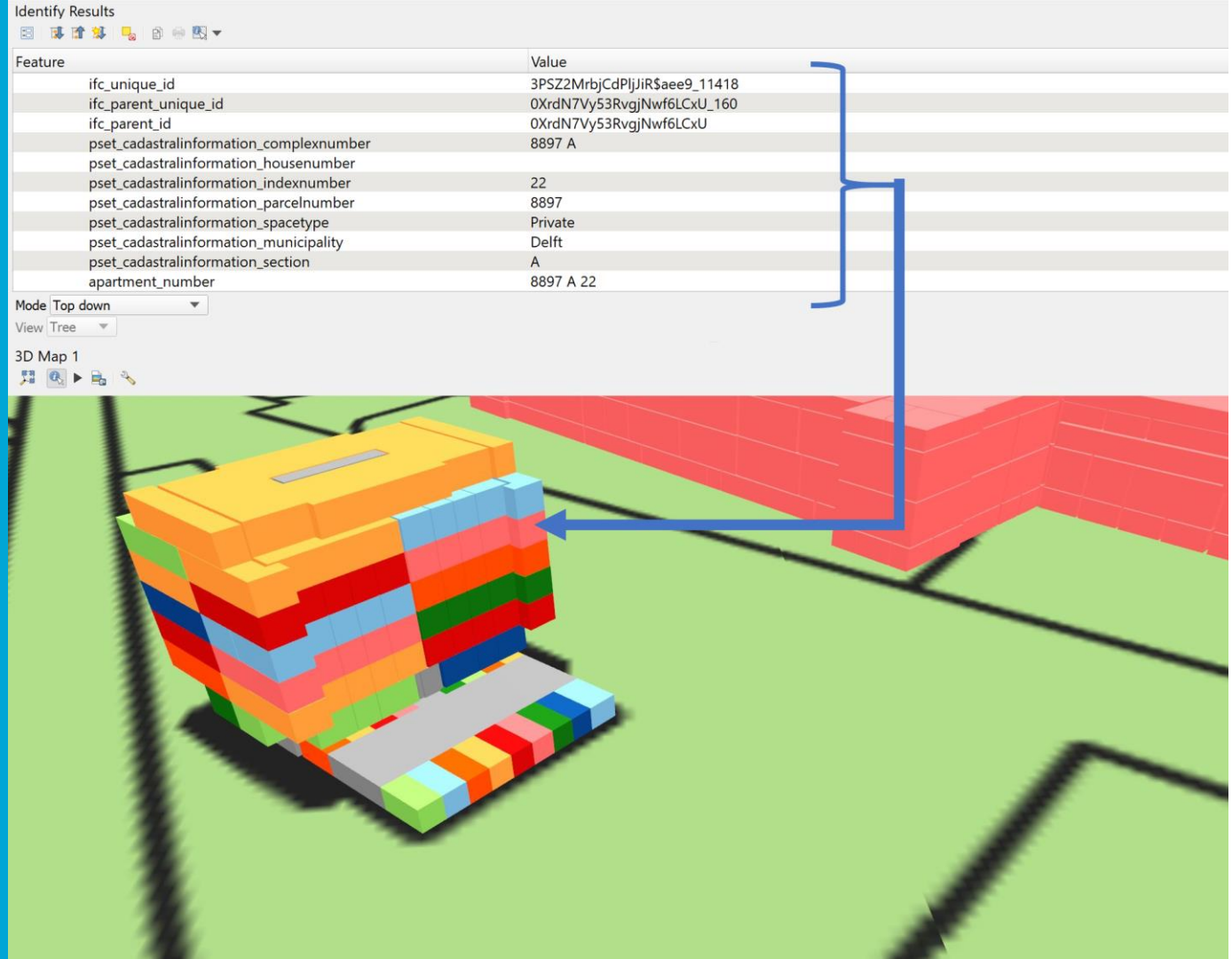

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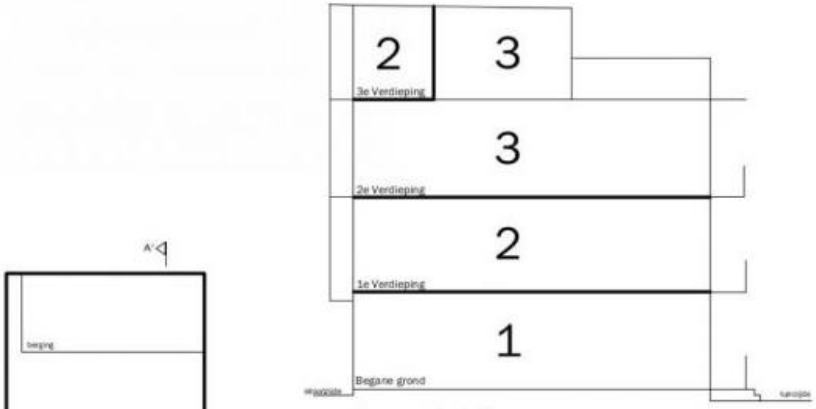

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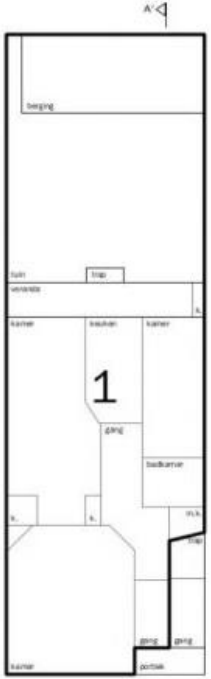

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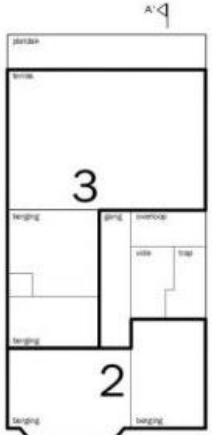

3e Verdieping
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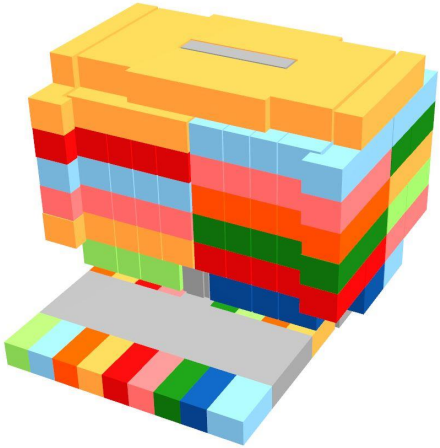

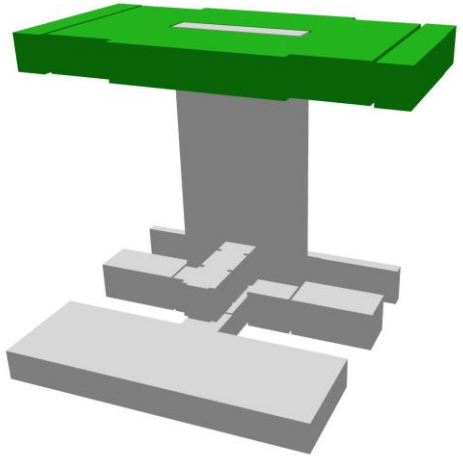

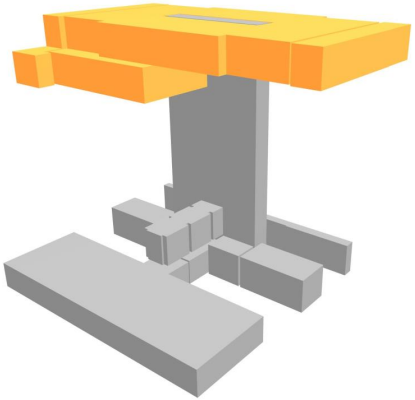

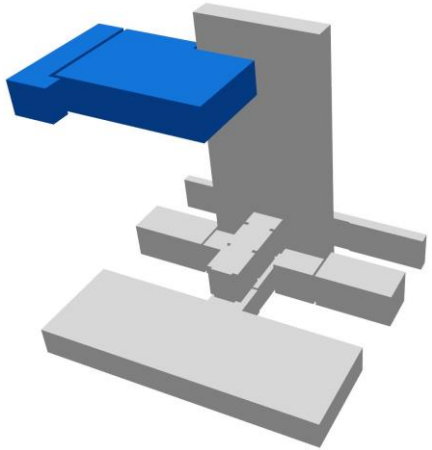

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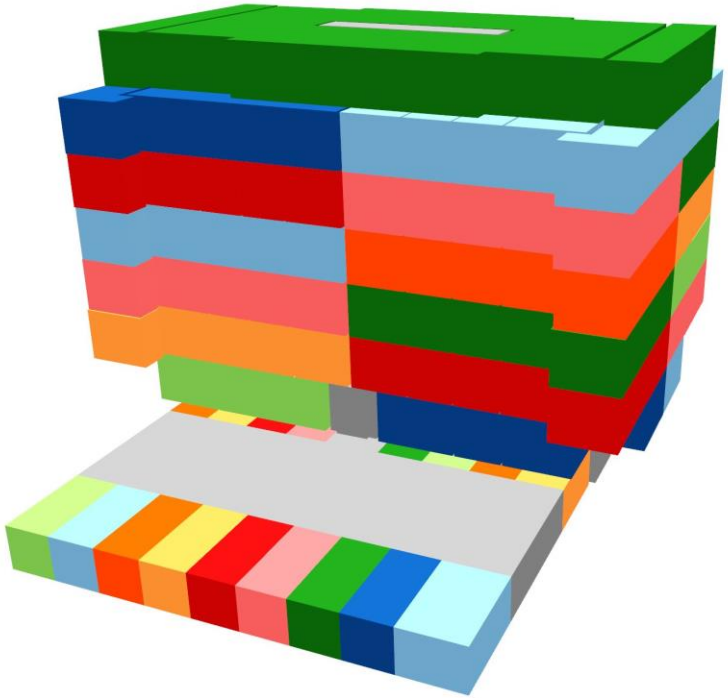

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Conclusions

- IFC BIM can be enriched with legal space by a Cadastral Information User Defined Property set
- Fits the existing legal framework and current practices
- First time 3D geometry in Dutch cadastral database
- Solution is extensible to other juridical systems

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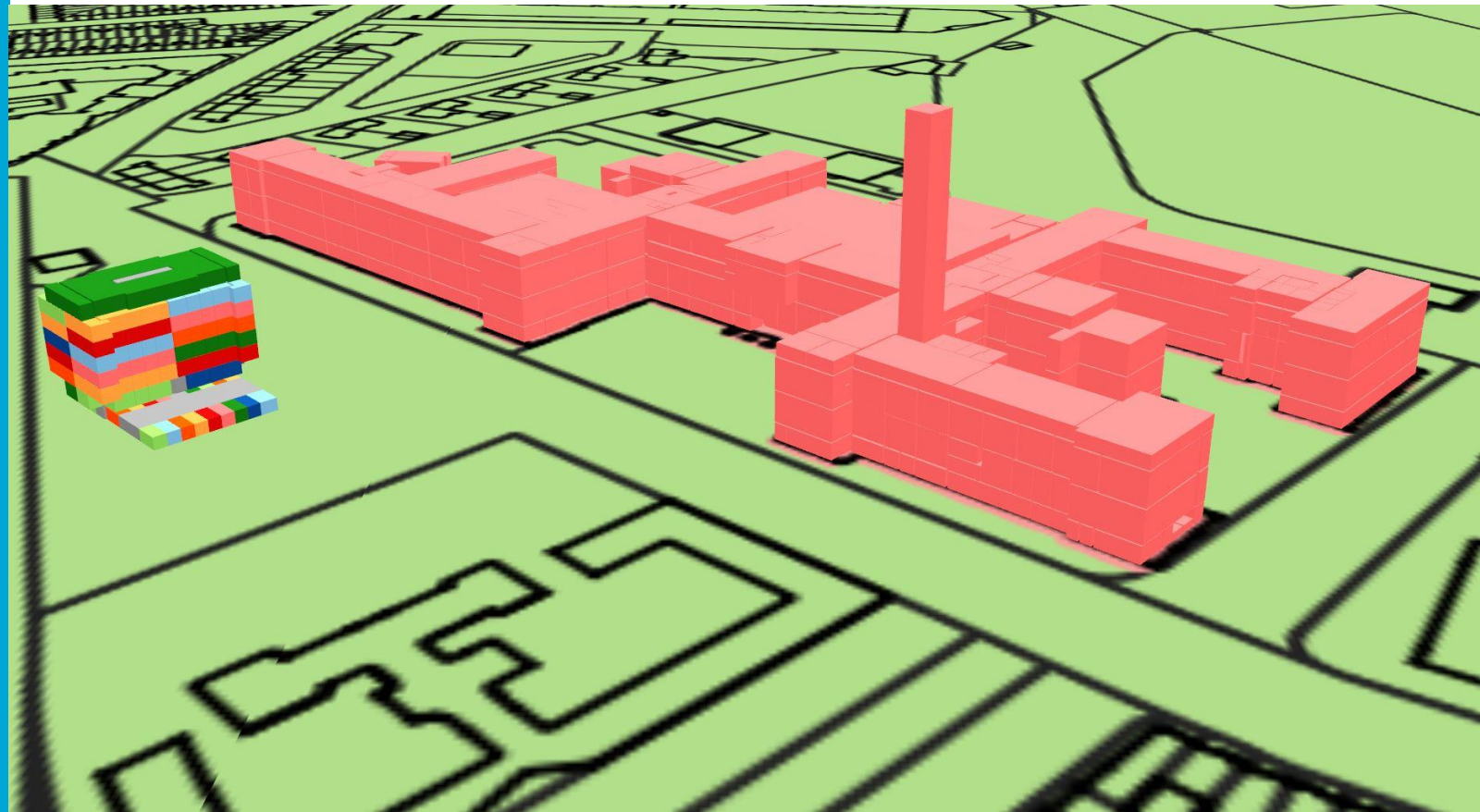
Case Study
Conclusions

Future Work

- Develop system architecture for data base transactions via web browser
- Have the *Pset_CadastralInformation* become an IFC common property set (standardized in the data format)
- What to do with source data (IFC file)
- What about ‘as-designed/as-built’ discrepancy

Questions?



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References

- Figure 1: Kadaster Logo. Retrieved from https://www.kadaster.nl/
- Figure 2: http://healthcare.wsp-pb.com/building-information-modelling-bim/
- Figure 3: https://offringa-bm.nl/splitsingstekening/
- Figure 4: Atazadeh, B., Kalantari, M., Rajabifard, A., & Ho, S. (2017). Modelling building ownership boundaries within BIM environment: A case study in Victoria, Australia. *Computers, Environment and Urban Systems*, *61*, 24-38.
- Figure 5: Stoter et al., 2016. First 3D Cadastral Registration of Multi-level Ownership Rights in the Netherlands. 5th International FIG 3D Cadastre Workdshop.
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  - Academic symbol: https://www.kisspng.com/png-square-academic-cap-computer-icons-portable-networ-5948017/download-png.html
  - BuildingSmart Logo: https://avatars2.githubusercontent.com/u/5180517?s=200&v=4
  - Law symbol: https://www.ukpreppersguide.co.uk/wp-content/uploads/2016/04/law-symbol-12-300x273.jpg
  - IDM symbol: https://www.bimloket.nl/upload/images/logos/BIM_BASIS%20ILS_logo.png
  - Document symbol: https://www.flaticon.com/free-icon/documents-symbol_35920
  - Map symbol: https://www.vectorstock.com/royalty-free-vector/folding-paper-map-icon-symbol-of-travelling-and-vector-19918721