BIM Models as Input for 3D Land Administration Systems for Apartment Registration.

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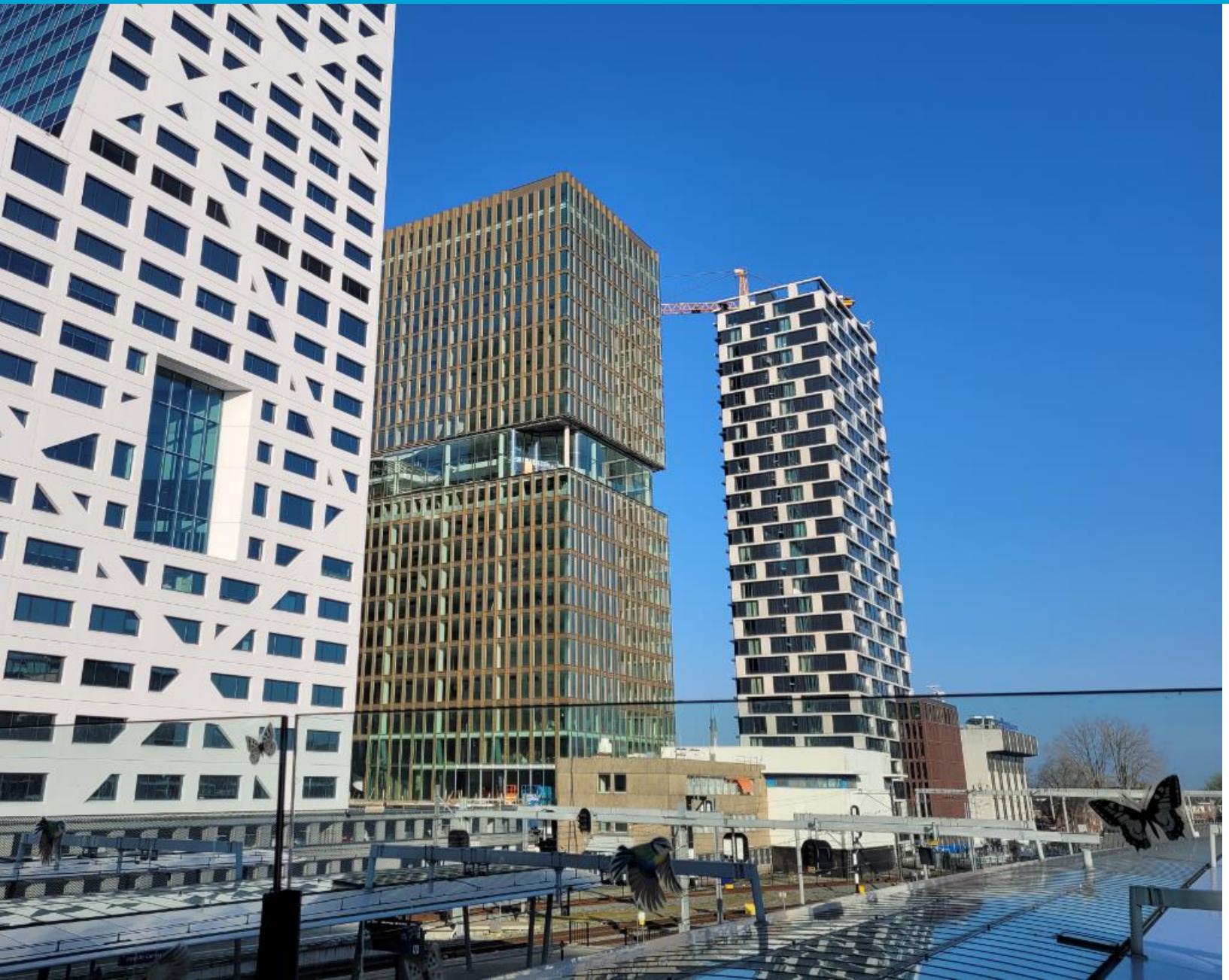
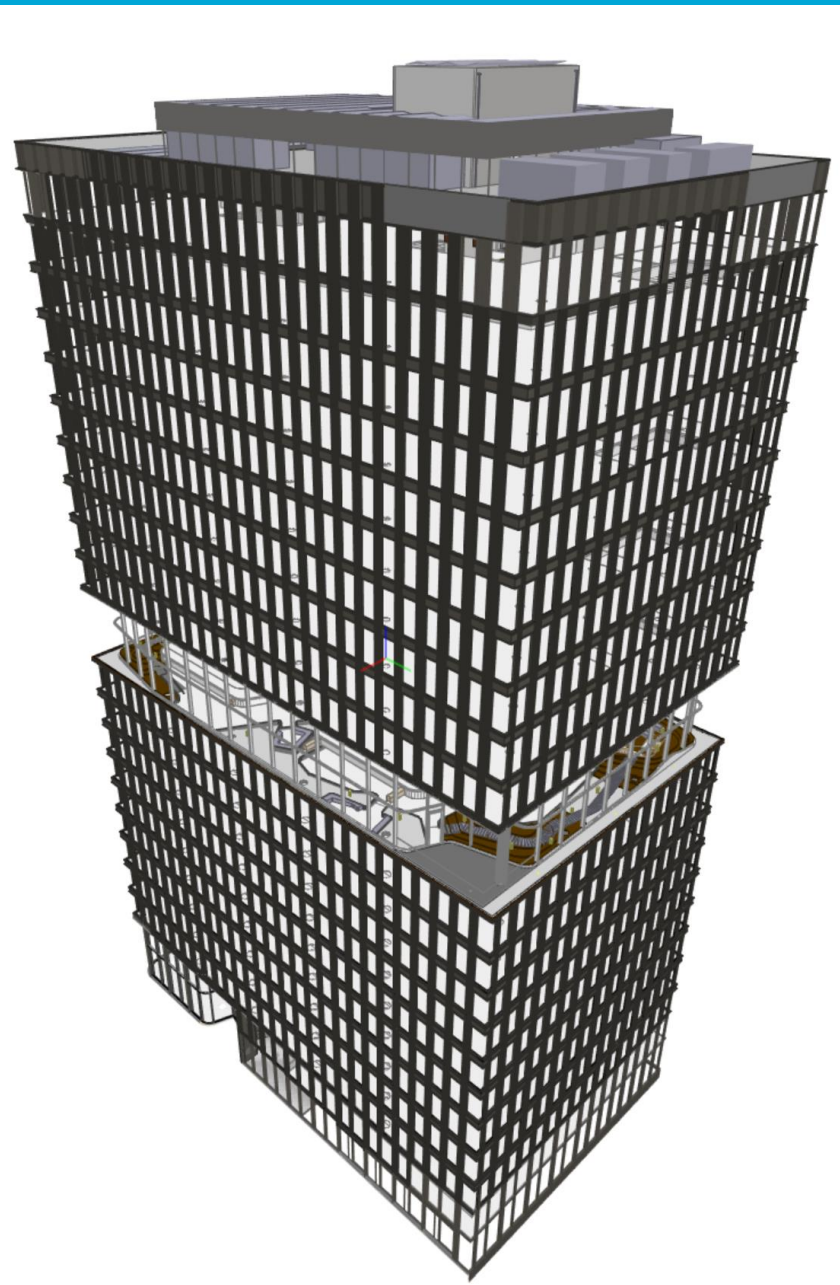
Introduction





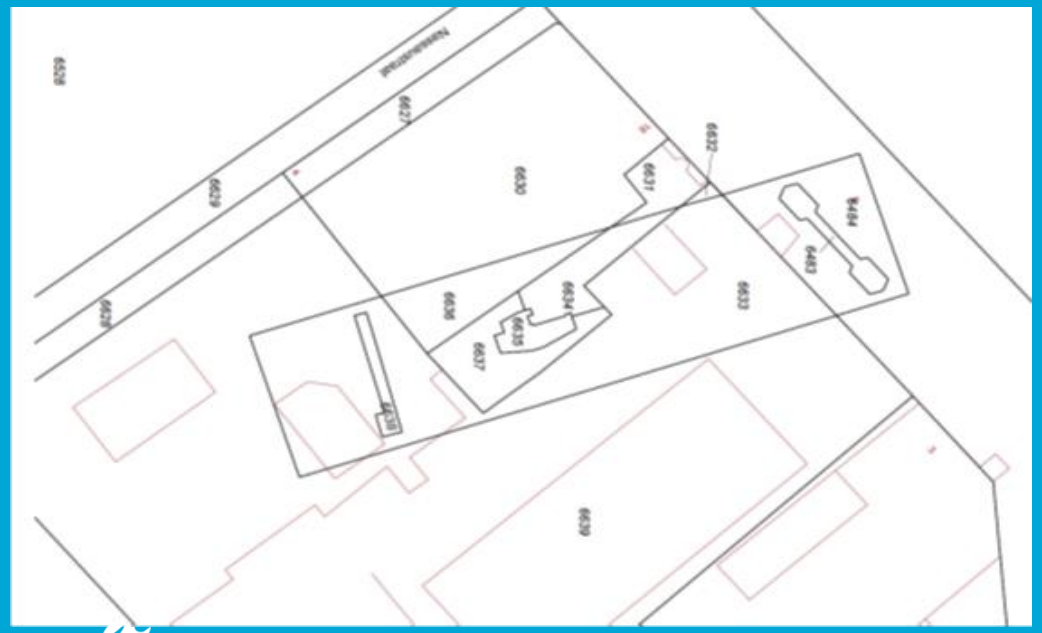
Contents

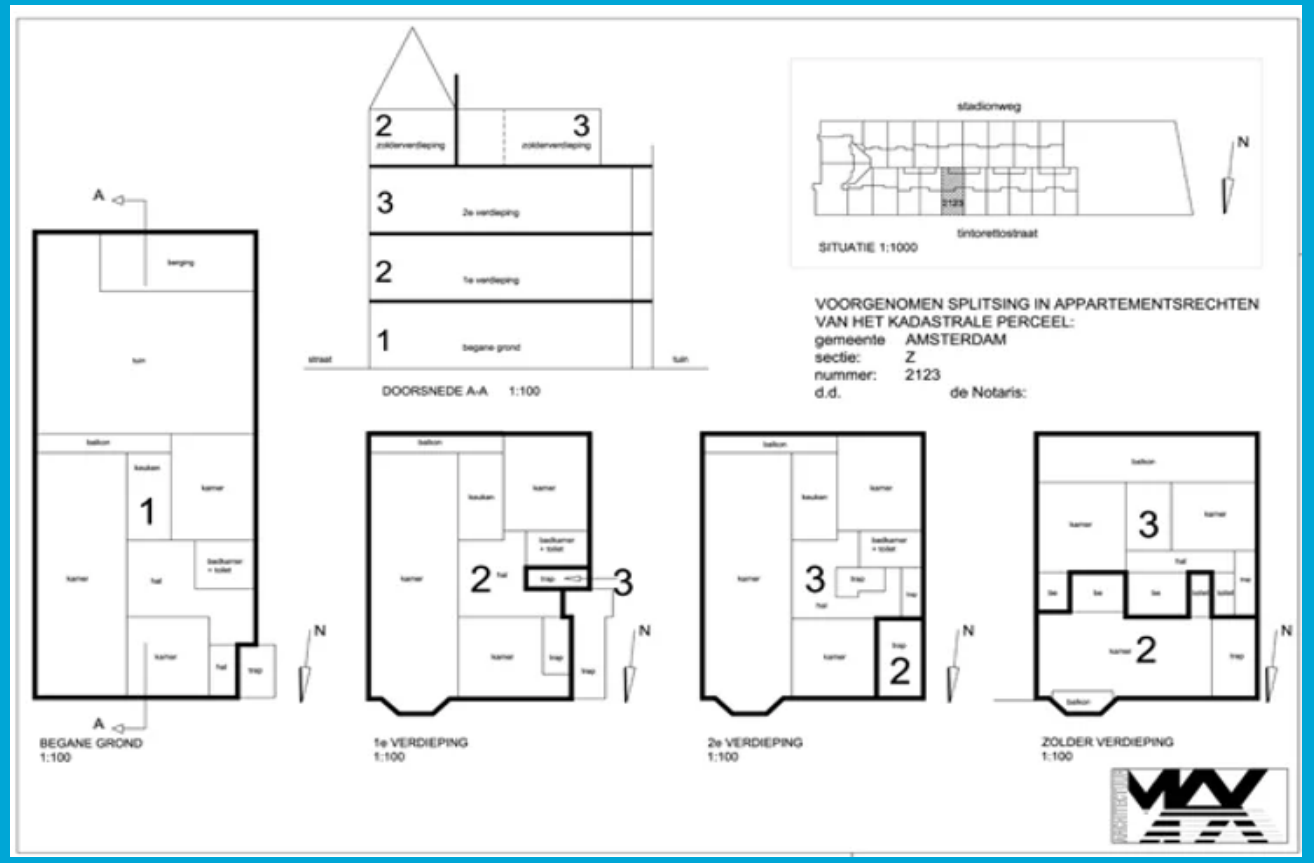
Research Questions

How should BIM/IFC-models be designed to effectively be reused as input for 3D LAS?

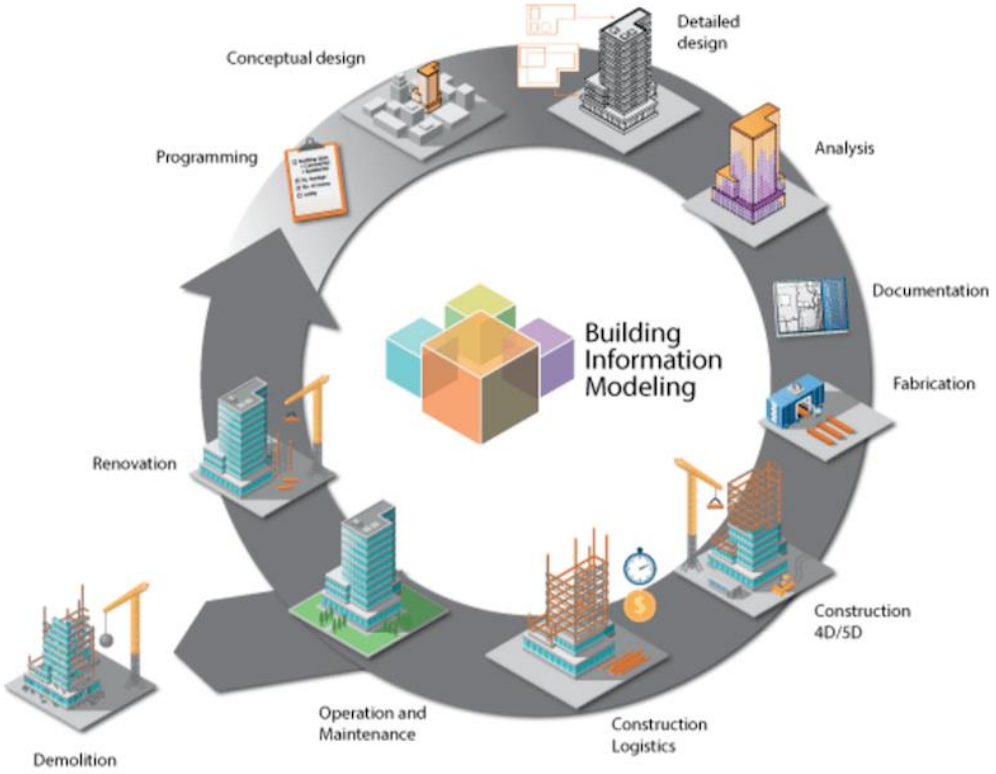
1. Which **technical complications** are encountered?
2. Which **solutions** are recommended for those complications?
3. What are the different interests and benefits of **user groups?**
4. Which of the technical complications are encountered when **testing real-life BIM/IFC-models** as input for 3D LAS?

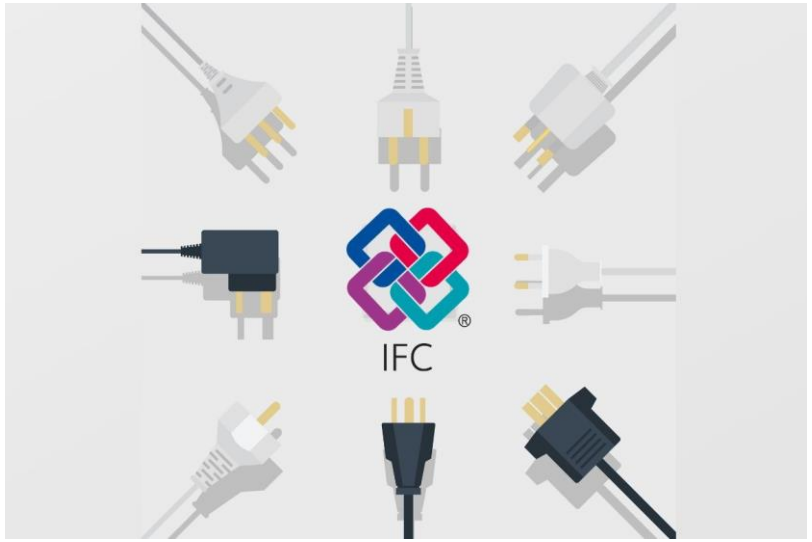
Background – the Dutch LAS



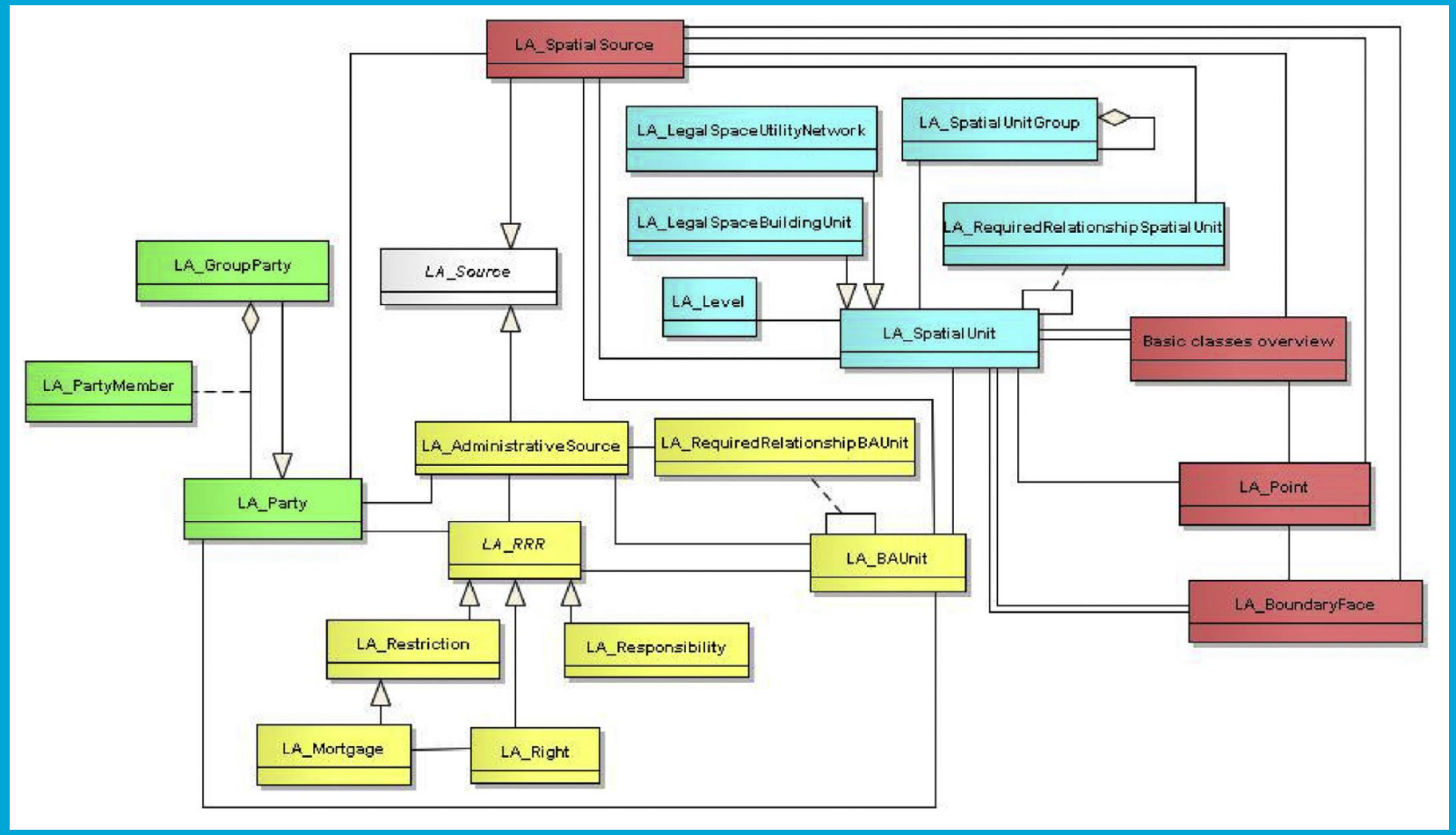


Background – BIM/IFC-models





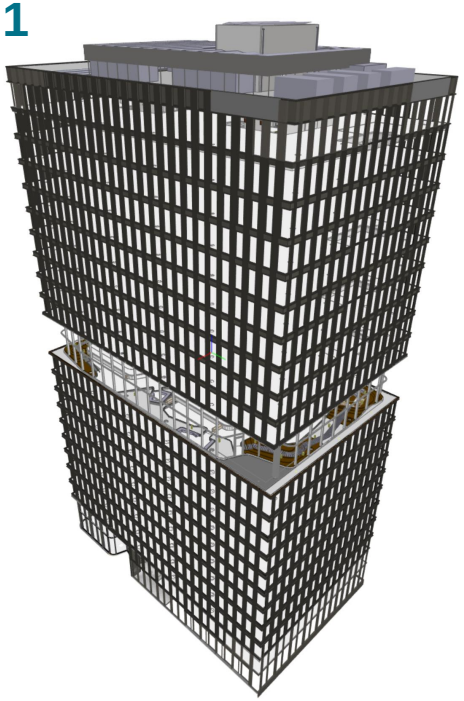
Background – LADM



Case studies – collected BIM/IFC-models

Name	Supplier	Location
1. Central Park	Municipality of Utrecht	Utrecht
2. Westflank	Municipality of Utrecht	Utrecht
3. Pontsteiger	Menno Mekes	Amsterdam
4. Schependomlaan	Virtual Systems	Nijmegen
5. Central Library	Virtual Systems	Rotterdam

1



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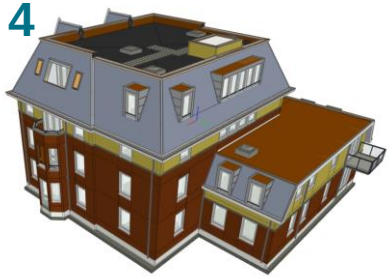

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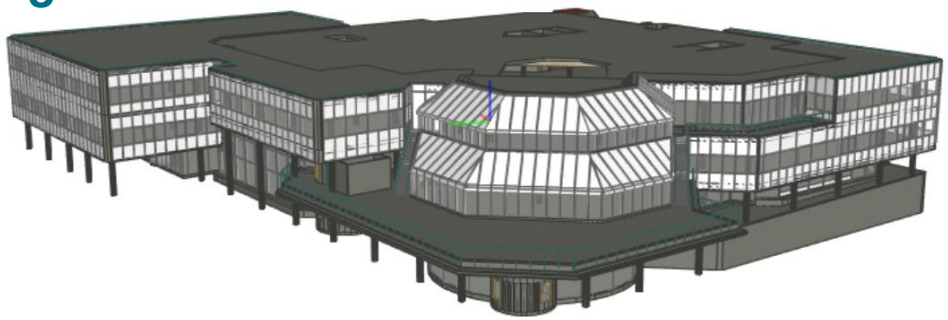
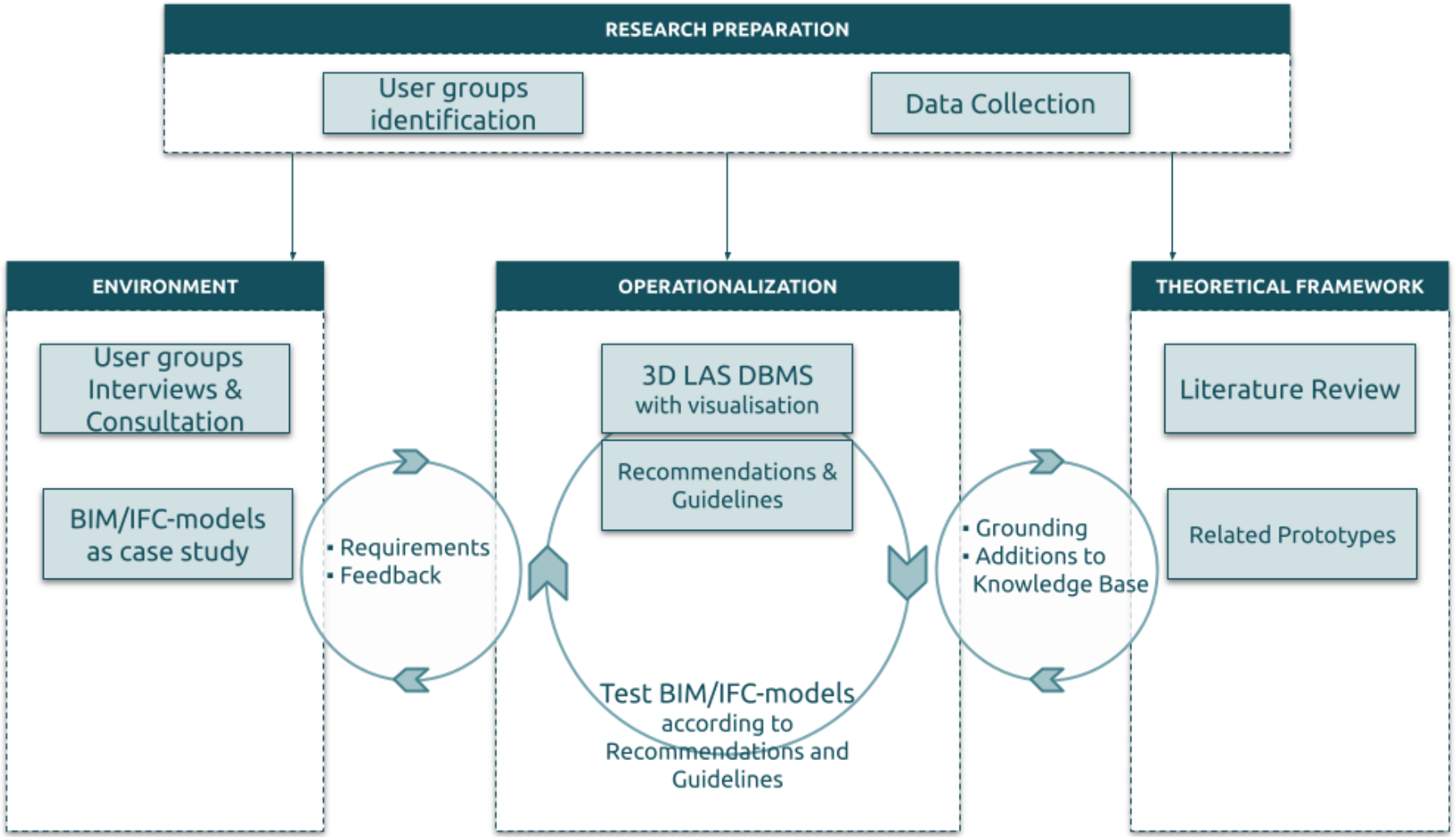
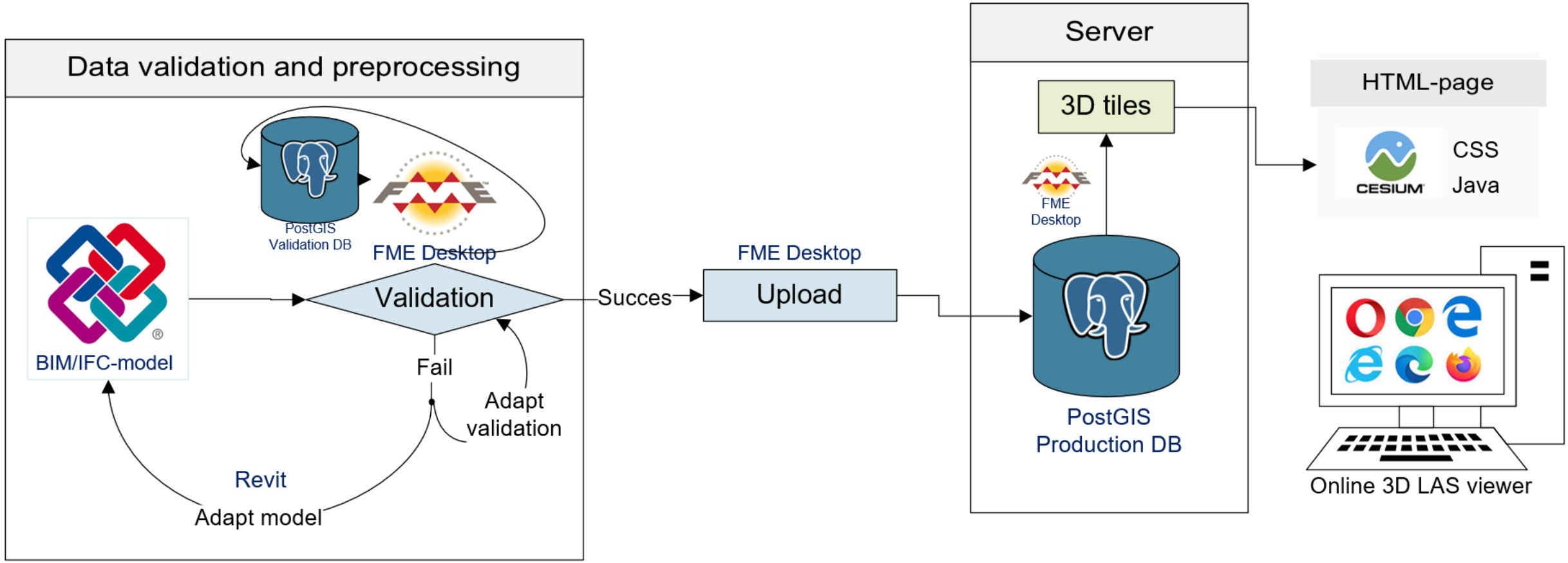


Research Methods

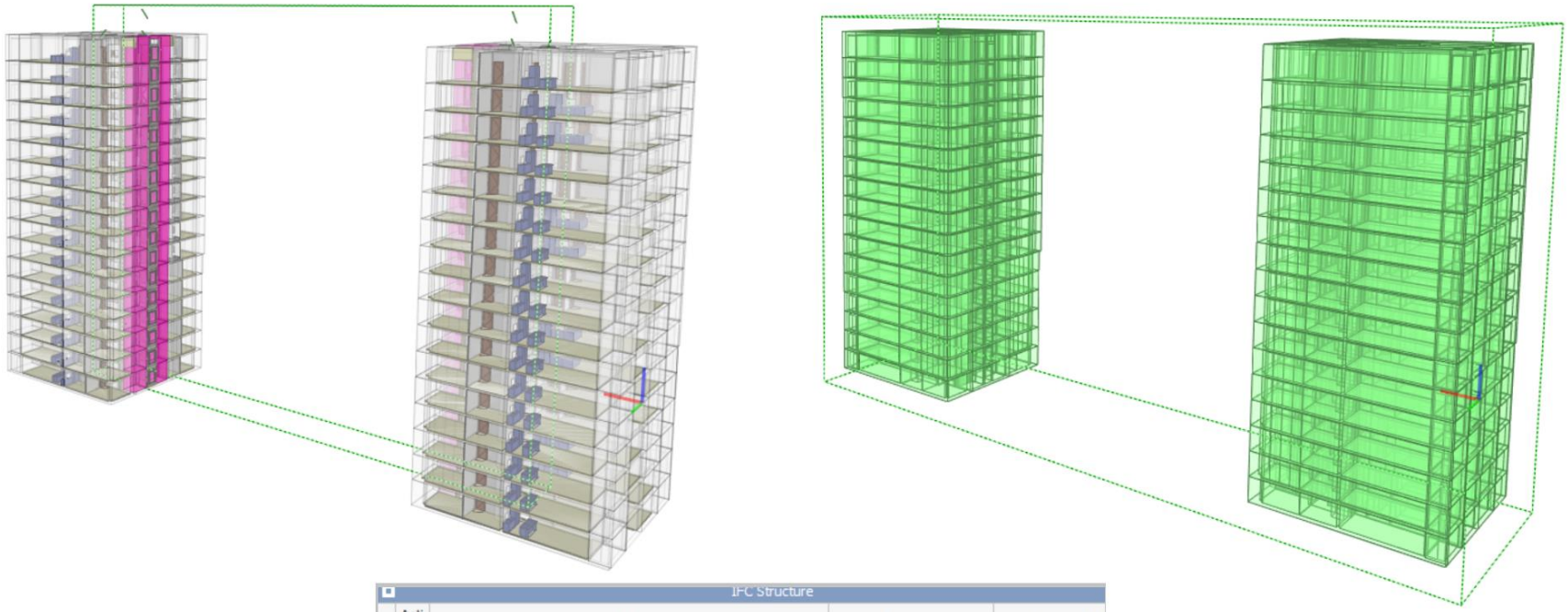


Validation Rules

1. The availability of **uniquely identifiable volumes**, including the representation of rooms as IfcSpace, to define legal units which can be linked to the RRR's of the legal unit
2. Valid geometries
3. The IfcSpace volumes to contain **no overlaps or gaps**, as spaces should be mutually exclusive
4. The ability to **georeference** the BIM/IFC-model


Data validation and preprocessing
PostGIS
Validation DB
FME Desktop
BIM/IFC-model
Validation
Fail
Adapt
validation
Revit
Adapt model
Succes
FME Desktop
Upload
Server
3D tiles
FME
Desktop
PostGIS
Production DB
HTML-page
CESIUM
CSS
Java
Online 3D LAS viewer

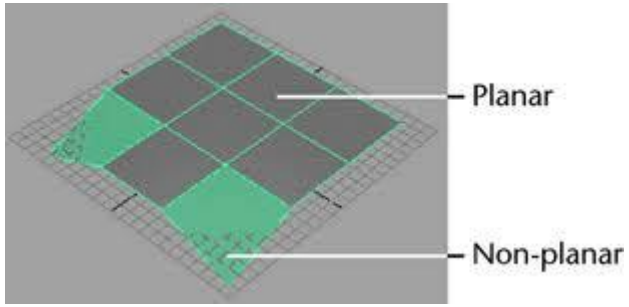
1. Legal space



IFC Structure

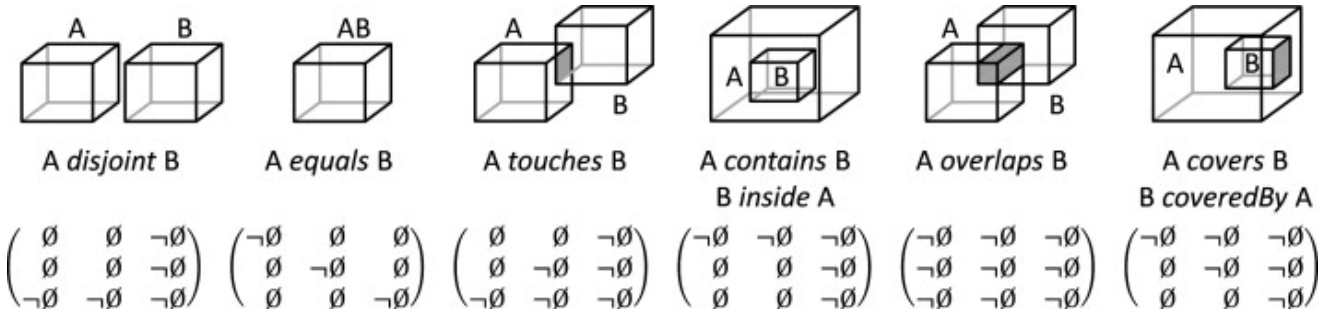
Active	Type	Name	Description
	IfcBuildingElementProxyType	lift 11	
	Material layer	00_vrije_ruimte_lift	
☑	Space	V.17.034	lifthal huur
■	Space	V.17.035	lift
☐	Building Element Proxies		
☐	Building Element Proxy	00_GM_vrije-ruimte_lift...	
	Material layer	00_vrije_ruimte_lift	
	IfcBuildingElementProxyType	lift 12	
	Material layer	00_vrije_ruimte_lift	
■	Space	V.17.036	trappenhuis
☐	Building Element Proxies		

2. Valid Geometries

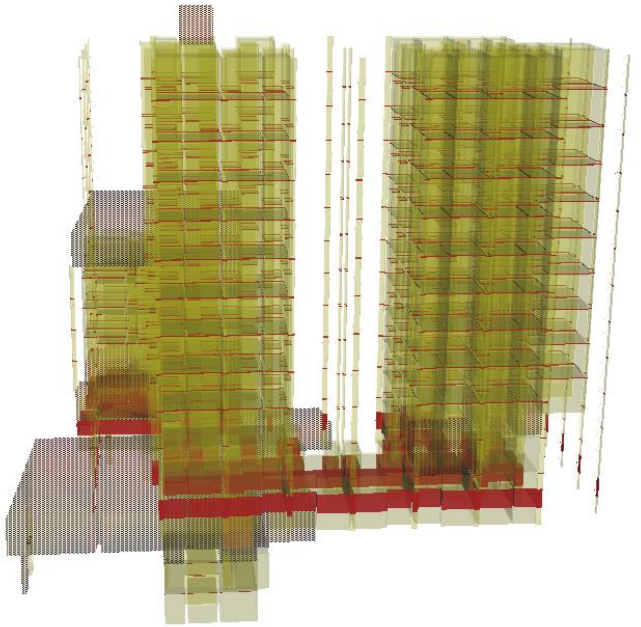


OGC®
Making location count.

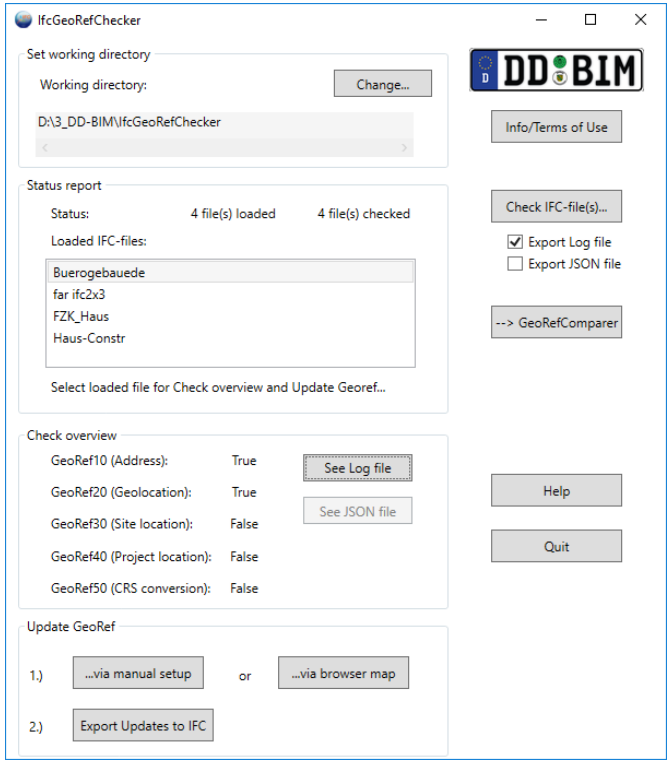
3. Spatial Relations




```
SELECT concat(t1.globalid, t2.globalid) AS id_comb,
   t1.globalid AS gid_1,
   t2.globalid AS gid_2,
   t1.basename,
   st_3dintersection(t1.geom, t2.geom) AS intersectgeom
FROM "LA_LSBU" t1
   CROSS JOIN "LA_LSBU" t2
WHERE t1.globalid <> t2.globalid
  AND t1.basename::text = t2.basename::text
  AND st_3ddistance(t1.geom, t2.geom) < 10::double precision
  AND geometrytype(t1.geom) IS NOT NULL
  AND geometrytype(t2.geom) IS NOT NULL
```



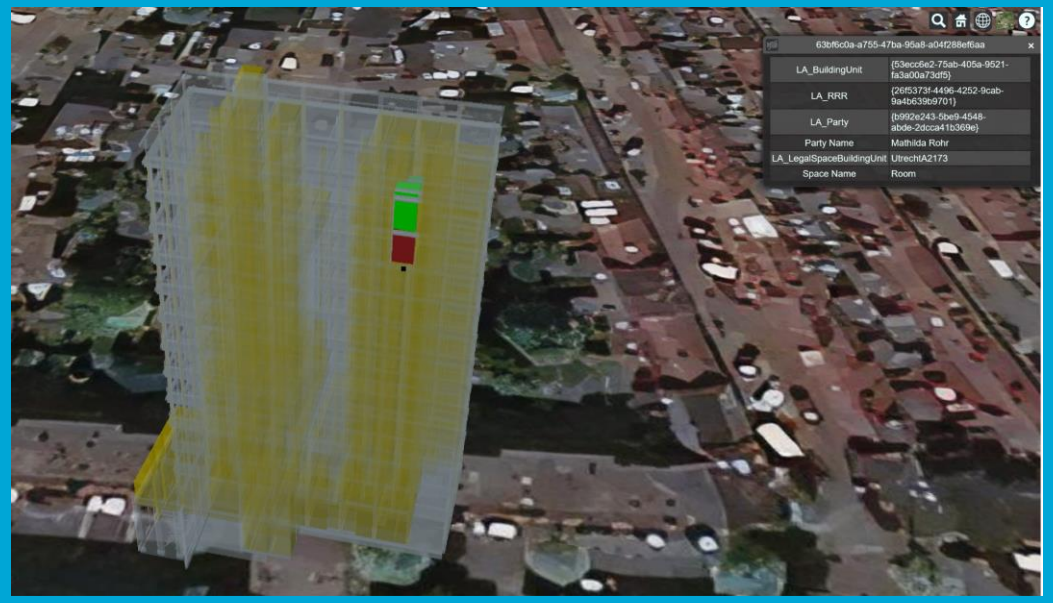
4. Georeferencing



Results

		a) Legal Spaces					b) Valid Geometries				c) Overlaps	d) Georeferencing				
BIM/IFC-model	**IFC version**	Contains IfcSpace	Unique GlobalId's	LAS propertyset	Groups	Implied relation in name	OGC pass	Passed	Repaired	Failed	Overlaps	LoGeoRef10	LoGeoRef20	LoGeoRef30	LoGeoRef40	LoGeoRef50
1. Central Park	2x3	No	Yes	No	No	No	100%	97%	3%	> 1%	-	False	True	True	False	False
2. Westflank	2x3	No	Yes	No	No	No	100%	80%	20%	> 1%	No	True/False	True	False	False	False
3. Pontsteiger	2x3	Yes	Yes	No	Yes	Yes	100%	96%	4%	> 1%	Yes	True/False	True	False	False	False
4. Schependomlaan	2x3	Yes	Yes	No	No	Yes	100%	84%	16%	> 1%	No	True/False	True	False	False	False
5. Central Library	2x3	No	Yes	No	No	No	100%	97%	2%	1%	No	True/False	True	False	False	False

Prototype



http://broekhuizen.link/ces/3dlas.html
https://github.com/superjumpylion/BIMIFCto3DLAS

Discussion & Conclusion

Recommendations and Guidelines

- Rooms have to be included in the BIM/IFC-model as IfcSpace
- IfcSpace should contain a propertyset which include the apartment index number, cadastral parcel number, complex number, space type and municipality.
- Attributes for georeferencing should be included in the BIM/IFC-model. It is recommended that IFC4 files with attributes for georeferencing are preferred above the IFC2x3 files. For existing IFC 2x3 models it is necessary to enrich the IFC files with attributes complying to LoGeoRef30 and/or LeGeoRef40

Future Research

Questions?

Acknowledgements

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TU Delft

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