



Design of the 3D Cadastre Model and Development of the Prototype in the Russian Federation

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Content

- Introduction
- Current Cadastral Model
- 3D Cadastre Model
- 3D Sample Data for the Prototype
- Prototype Development
- Conclusion

The project:

3D Cadastre Modeling in Russia

- Aim: to provide guidance in the development of a prototype and to create favorable legal and institutional conditions for the introduction of 3D cadastre modeling in Russia ...
- ... better registration of complex buildings, or other types of constructions, and subsurface networks (e.g. cables, pipelines)
- Partners: Federal Service for State Registration, Cadastre and Cartography (**Rosreestr**), the Federal Cadastre Center (FCC) 'Zemlya' and the Netherlands' **Kadaster**
- with participation of: Delft University of Technology, and Royal Haskoning BV and Grontmij Netherlands BV
- Pilot area – Nizhny Novgorod

Rosreestr

- 6,500 offices
- 60,000 staff members
- 80 million parcels registered
- together with RRRs and parties
- probably the world's largest cadastral system
- parcels and legal information online:
<http://maps.rosreestr.ru/Portal/>



Поиск

Введите кадастровый номер или адрес:
Например: 61:6:10104:12 или 61:6 или 61:6:*
Москва, Санкт-Петербург или Краснодар

[Расширенный поиск](#)

Найти



☒ Легенда ☐ Управление





ПОРТАЛ УСЛУГ

ПУБЛИЧНАЯ КАДАСТРОВАЯ КАРТА

Земельные участки 63 кадастровых округов.

Общее количество участков: 49 312 597. [Подробнее](#)

Поиск

Введите кадастровый номер или адрес:

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Москва, Санкт-Петербург или Краснодар

[Расширенный поиск](#)

Найти

Найден 1 участок

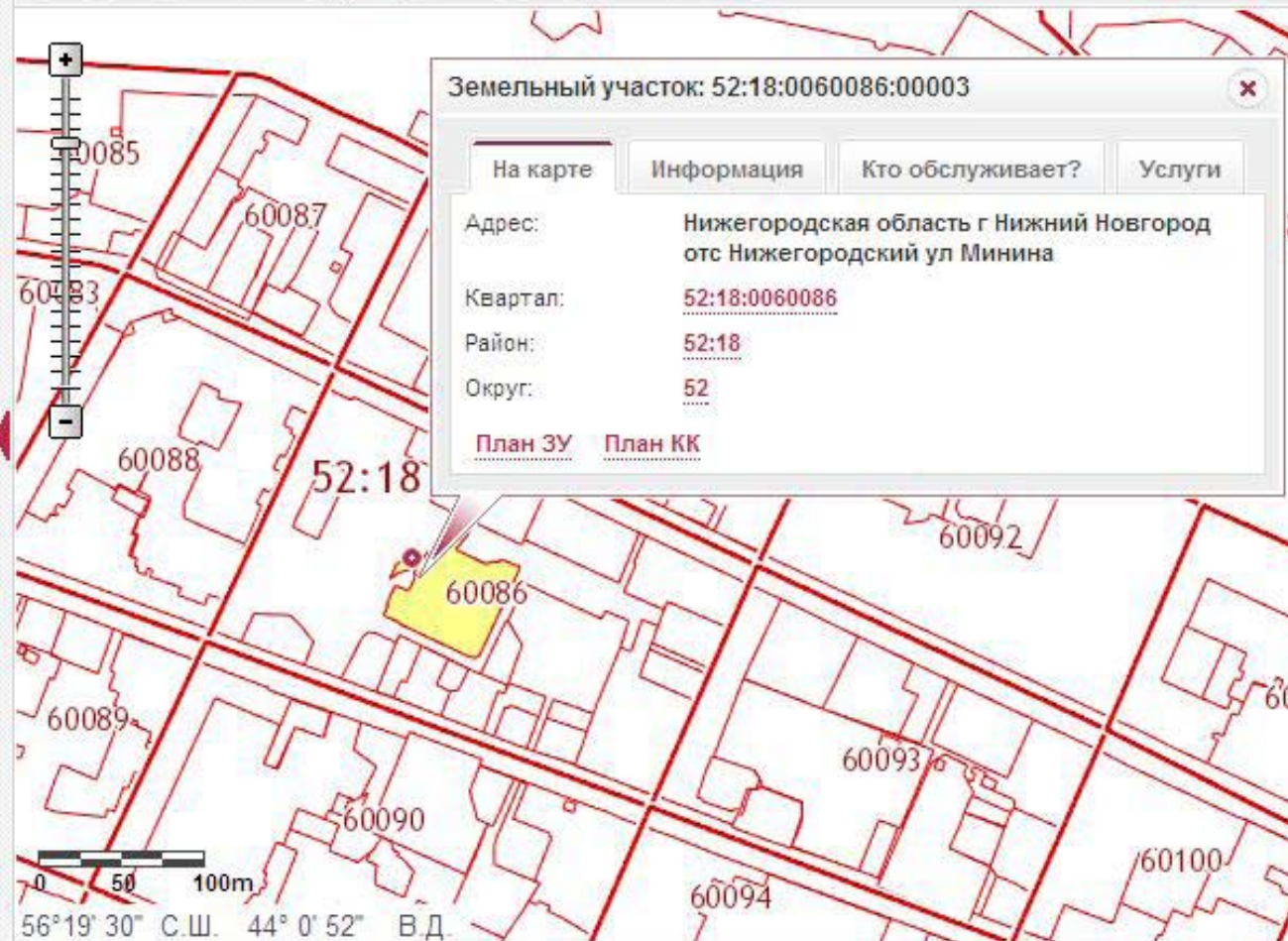
1. [52:18:0060086:00003](#)
Нижегородская область г Нижний
Новгород отс Нижегородский ул Минина



Легенда



Управление

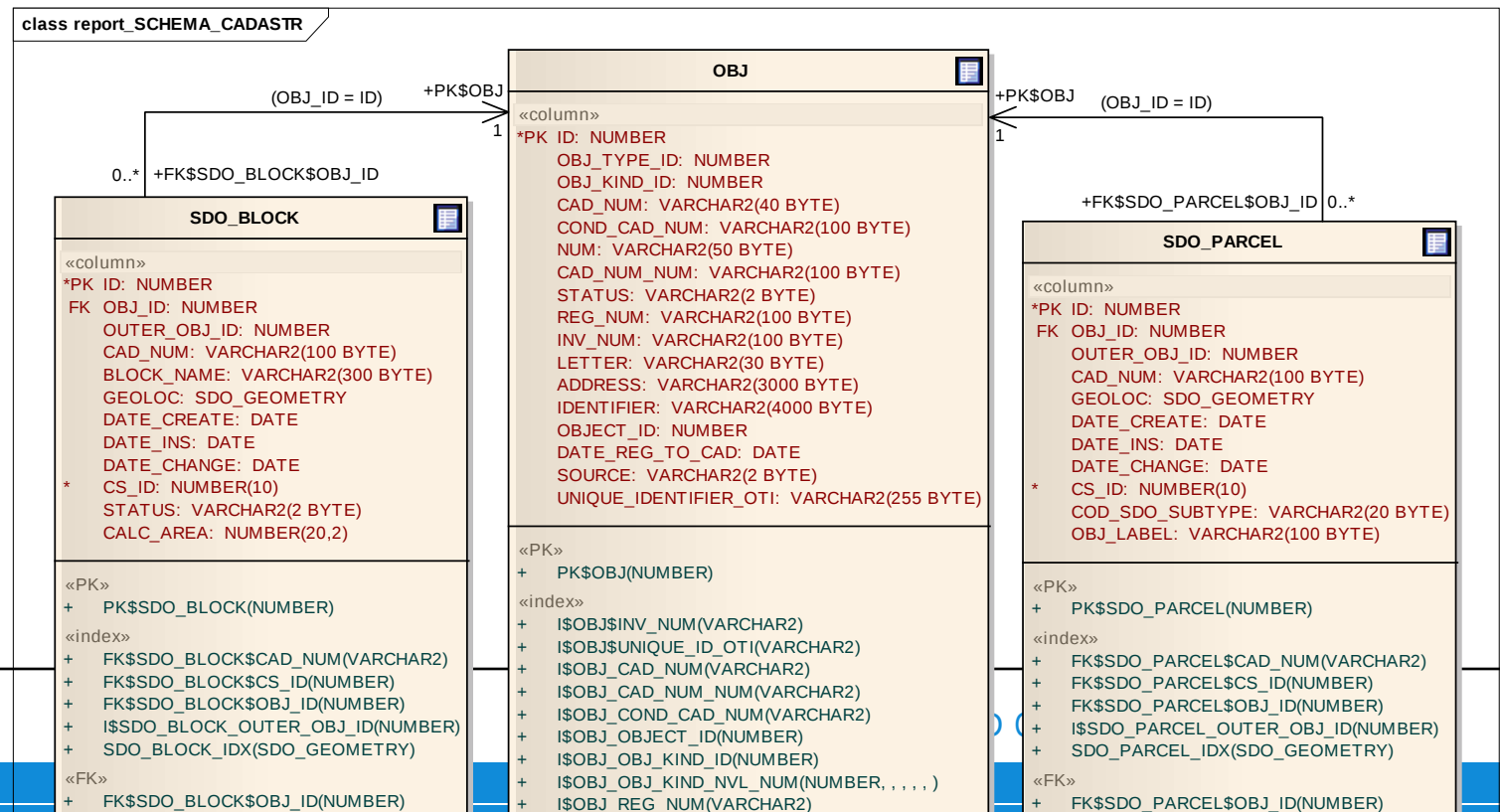


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The Russian Cadastre knows 5 types of cadastral objects

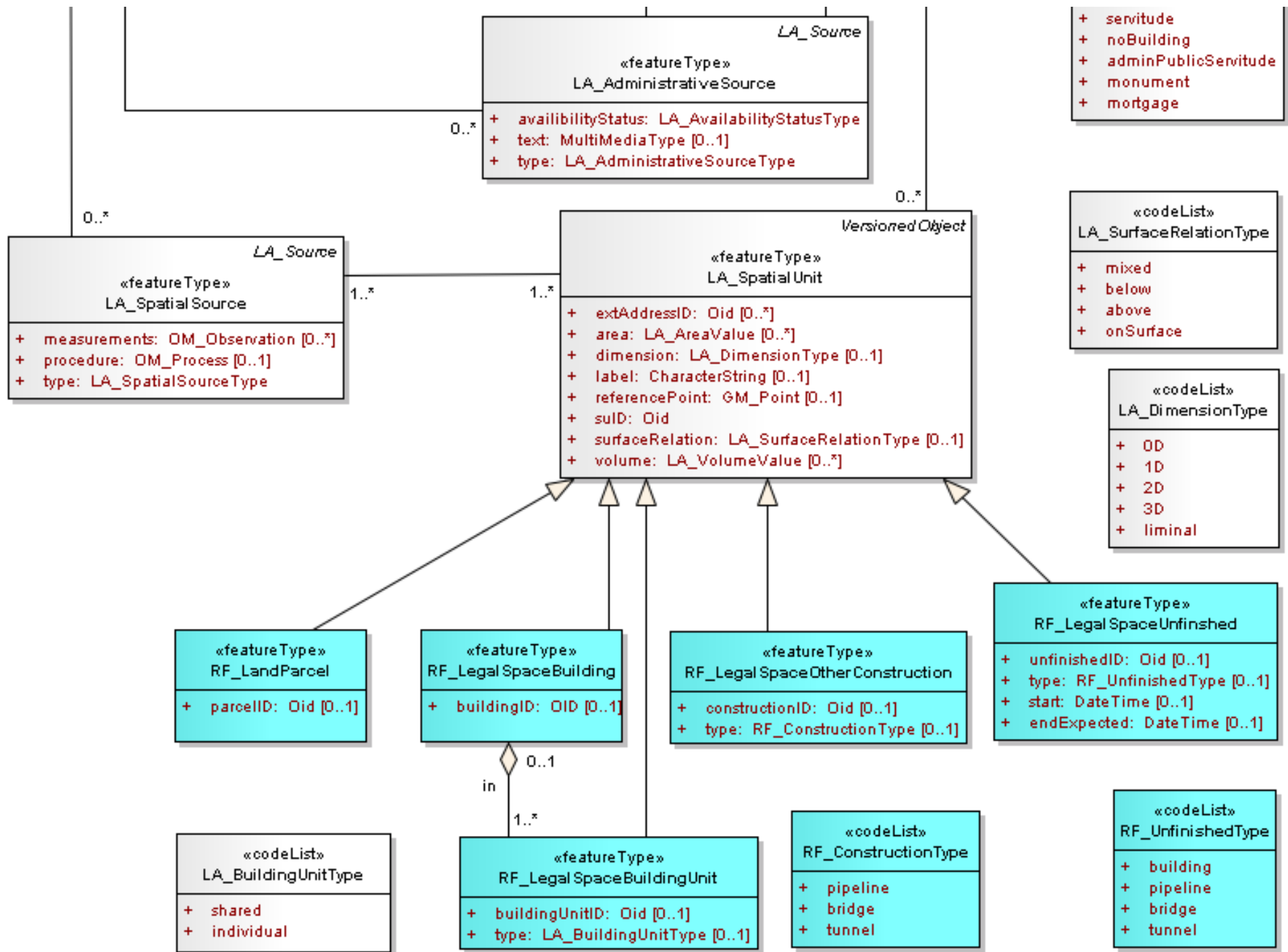
1. Land parcel
2. Building
3. Apartment unit
4. Other construction (bridge, pipeline, etc)
5. Unfinished objects (building, bridge, pipeline, etc)



Understanding the model → LADM

- Relationship between LADM concepts and the Cadastre and Registration databases of Rosreestr

LADM entity	Tables in the databases	
	Schema Cadastre	Schema Registration
LA_BAUnit	Obj,Reg	Oni_List
LA_Party	Right_Owner*, Encumbrance_Owner*	JRDP_List, PRSNF_List
LA_RRR	Right,Encumbrance	EGRP_*
LA_SpatialUnit	Entity_Spatial	-
LA_AdministrativeSource	Doc	EGRP_DocBS
LA_Source	EDoc_Info	-



Content

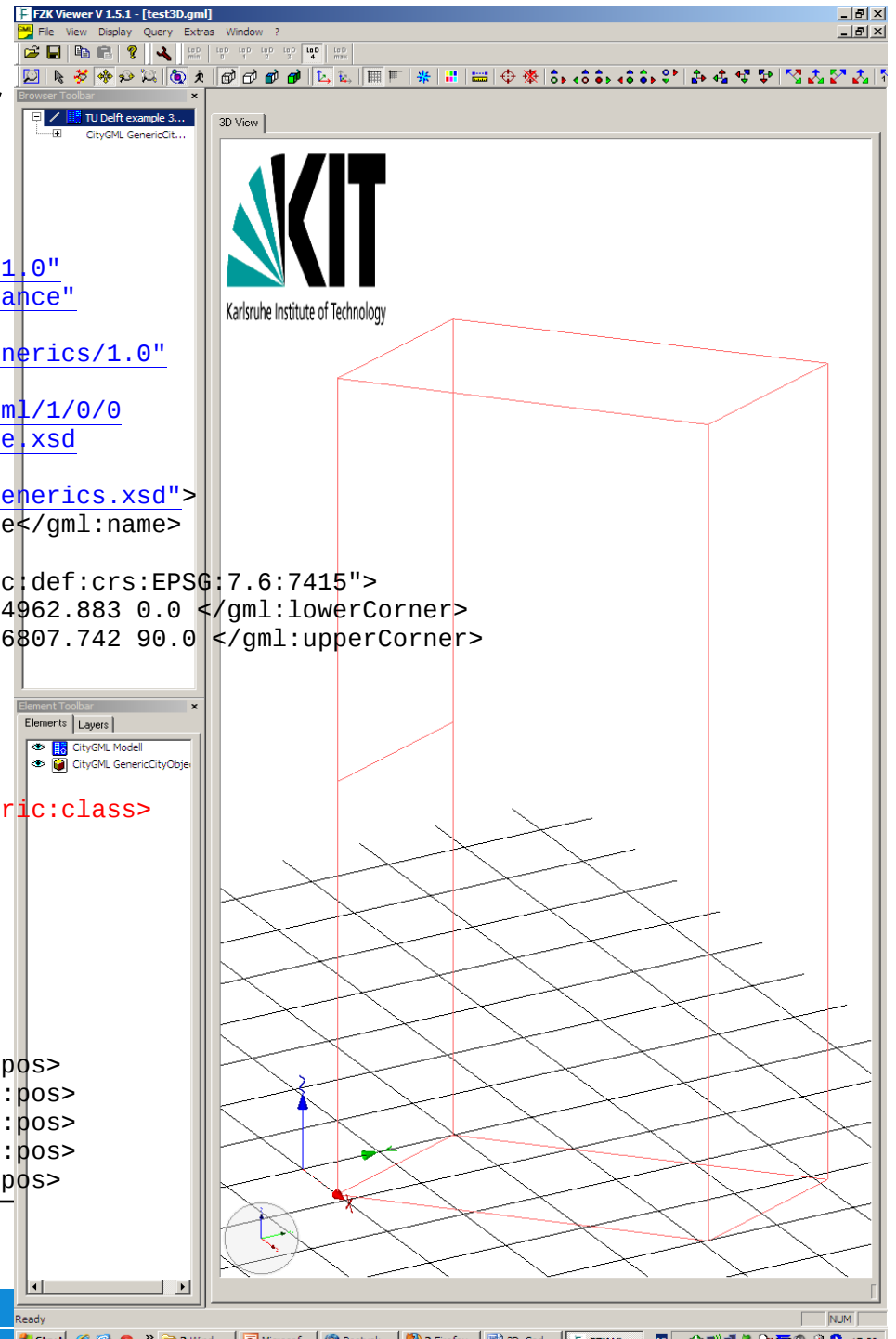
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3D Cadastre model 'extension'

- no need to change the legal/administrative part
- reference model the ISO 19152 (LADM)
- includes a 3D spatial profile
- 3D registration is based on two objects
 1. 3D polyhedron volume (flat planes) or
 2. 3D multicurve with diameter (curved surfaces around pipelines)
- no topology
- also no need to change spatial part (Oracle SDO_Geometry)
- XML encoding for registration (CityGML/LADM)

3D Solid CityGML LADM

```
<?xml version="1.0" encoding="utf-8"?>
<CityModel xmlns="http://www.opengis.net/citygml/1.0"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:xlink="http://www.w3.org/1999/xlink"
  xmlns:generic="http://www.opengis.net/citygml/generics/1.0"
  xmlns:gml="http://www.opengis.net/gml"
  xsi:schemaLocation="http://www.citygml.org/citygml/1.0/0
http://schemas.opengis.net/citygml/1.0/cityGMLBase.xsd
http://www.opengis.net/citygml/generics/1.0
http://schemas.opengis.net/citygml/generics/1.0/generics.xsd">
  <gml:name>TU Delft example 3D Parcel for Cadastre</gml:name>
  <gml:boundedBy>
    <gml:Envelope srsDimension="3" srsName="urn:ogc:def:crs:EPSG:7.6:7415">
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      <gml:upperCorner srsDimension="3">86082.217 446807.742 90.0 </gml:upperCorner>
    </gml:Envelope>
  </gml:boundedBy>
  <cityObjectMember>
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      <creationDate>2011-04-01</creationDate>
      <generic:class>LA_LegalSpaceBuildingUnit</generic:class>
      <generic:lod4Geometry>
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          <gml:exterior>
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                    <gml:LinearRing>
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                  </gml:exterior>
                </gml:Polygon>
              </gml:surfaceMember>
            </gml:CompositeSurface>
          </gml:exterior>
        </gml:Solid>
      </generic:lod4Geometry>
    </generic:GenericCityObject>
  </cityObjectMember>
</CityModel>
```



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Case 1: Teledom building

9/1 ul. Belinsky

- building has interesting **overhangs**, possible above neighbor parcel with shops and above public road/ footpath
- rights various units are individually recorded
 - basement (underground parking) + first 2 floors owned by bank
 - above this multi-floor columns (same at every floor) other owners
 - total 20 units in the building, with 10 different owners
 - **non**-residential units leased
 - lease longer than 1 year is registered

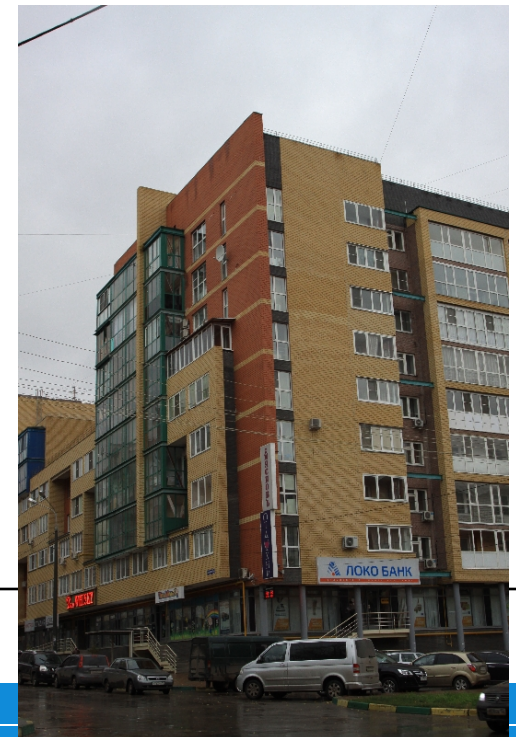


Case 1: Teledom building 9/1 ul. Belinsky



Case 2: Apartment complex, 66a Ulitsa Nevzorovyykh

- ownership rights 88 apartments & 7 nonresidential premises
- subterranean parking in common shared ownership
- 6 mortgages are registered for residential units, under **both contract and law**
- land parcel is common property of apartment complex
- land parcel is registered as **unfinished object**

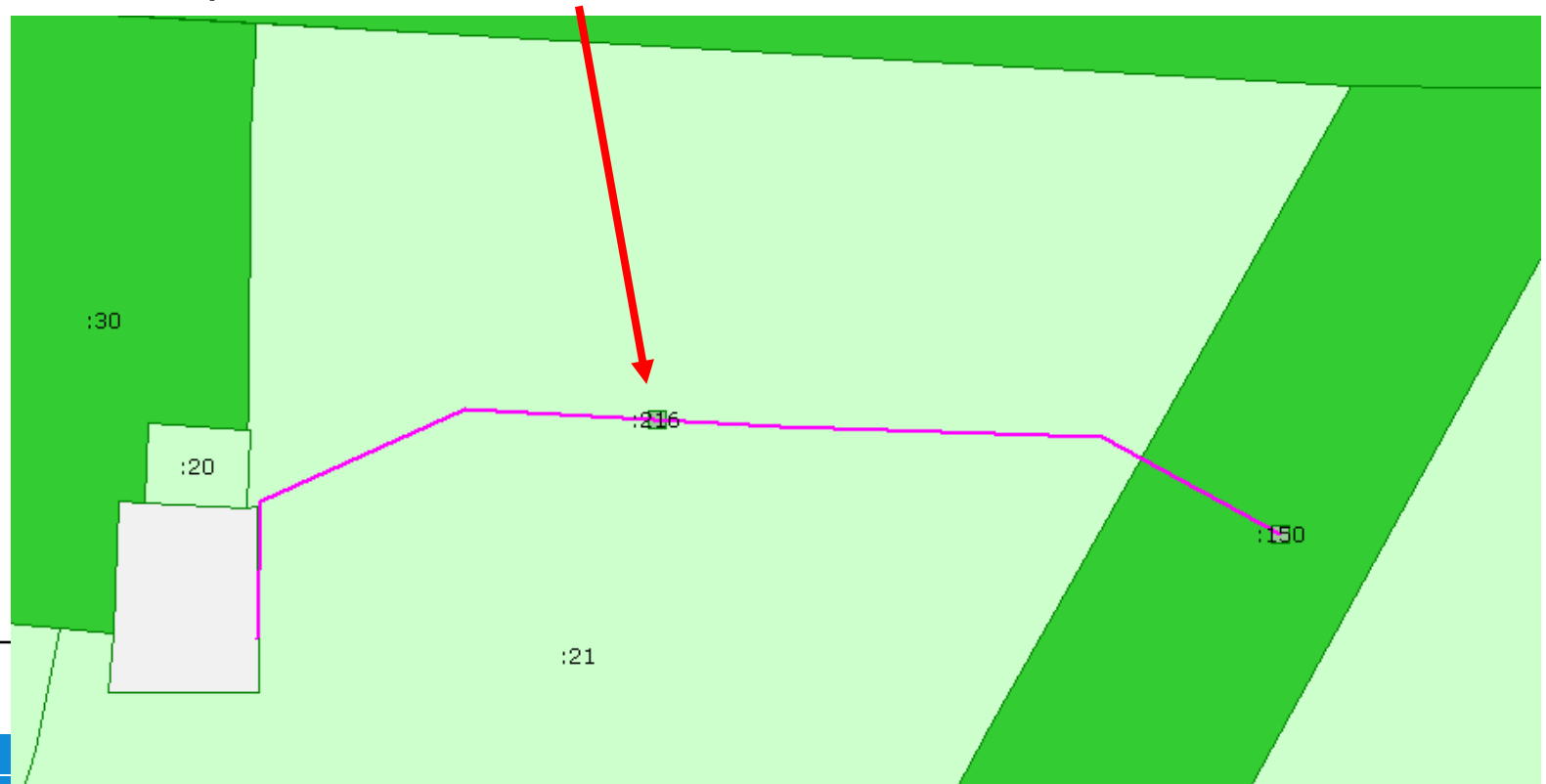


Case 2: Apartment complex, 66a Ulitsa Nevzorovykh



Case 3: short gas pipeline: Piskunov str. to Verhnevolzhskaya naberezhnaya, 7

- Pipeline length 72,73 m, Pipeline diameter 50 mm
- object got one owner: Nizhegorodoblغاز Co
- **crossing multiple parcels/different owners**
- Pipeline got two exits on surface (hatches), for which two special land parcels are allotted



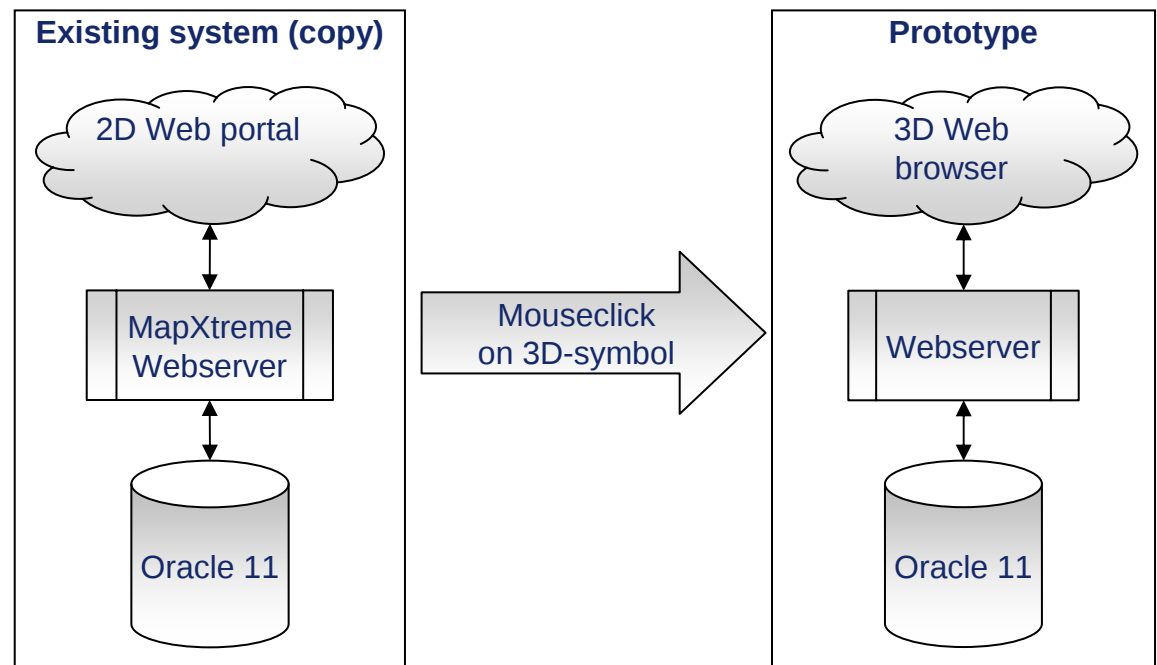
Content

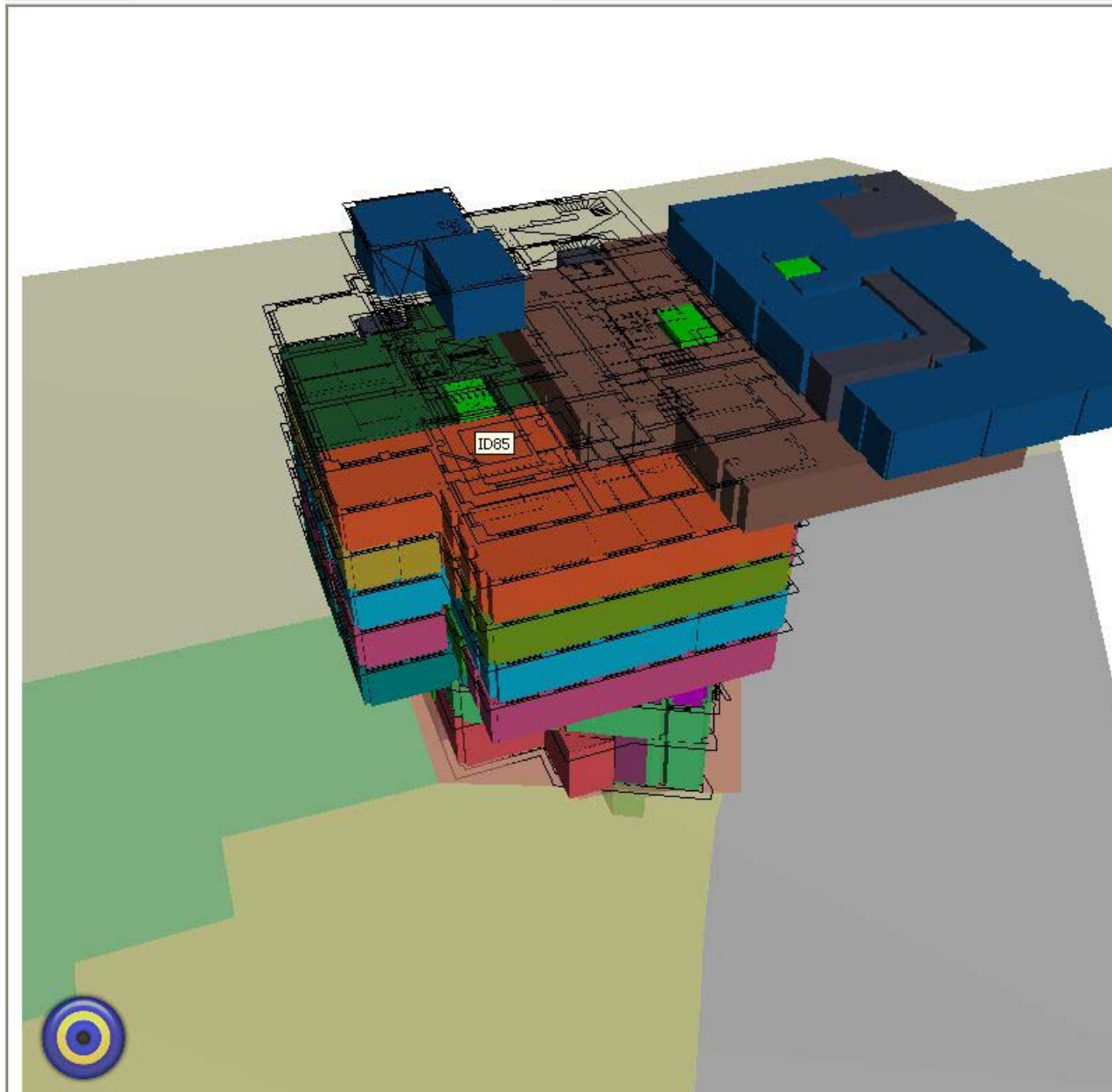
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Focus first prototype on visualization and user interaction

- MoSCoW method: M (MUST); S (SHOULD) C (COULD) W (WON'T) see paper for the choices

- Database
- Webserver
- 3D web browser: BS Contact based (X3D viewer) by Marian de Vries
- Fitting in 2D portal





Search results

Apartment_nr	P4
Floor_nr	1
Cadastral_nr_apartment_premise	52:18:0070012:45
3d object	ID405

Apartment_nr	P4
Floor_nr	2
Cadastral_nr_apartment_premise	52:18:0070012:45
3d object	ID356

Apartment_nr	P4
Floor_nr	3
Cadastral_nr_apartment_premise	52:18:0070012:45
3d object	ID302

Apartment_nr	P4
Floor_nr	4
Cadastral_nr_apartment_premise	52:18:0070012:45
3d object	ID223

Apartment_nr	P4
Floor_nr	5

Cadastral-nr apartment premise	52:18:0070012:45
Apartment-nr	
Floor	

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Conclusion

- Model impact was minimal (no changes legal/spatial model)
- Data capture in 3D was new (non-trivial)
- 3D web viewer also challenging, several alternatives tested
- Still usability remains an issue
- Next steps:
 1. More functionality in prototype; e.g. accepting new 3D parcels
 2. Conduct actual pilot
 3. Proposal for 'favorable legal and institutional conditions'