



Russian-Dutch Project “3D Cadastre Modelling in Russia”

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Content

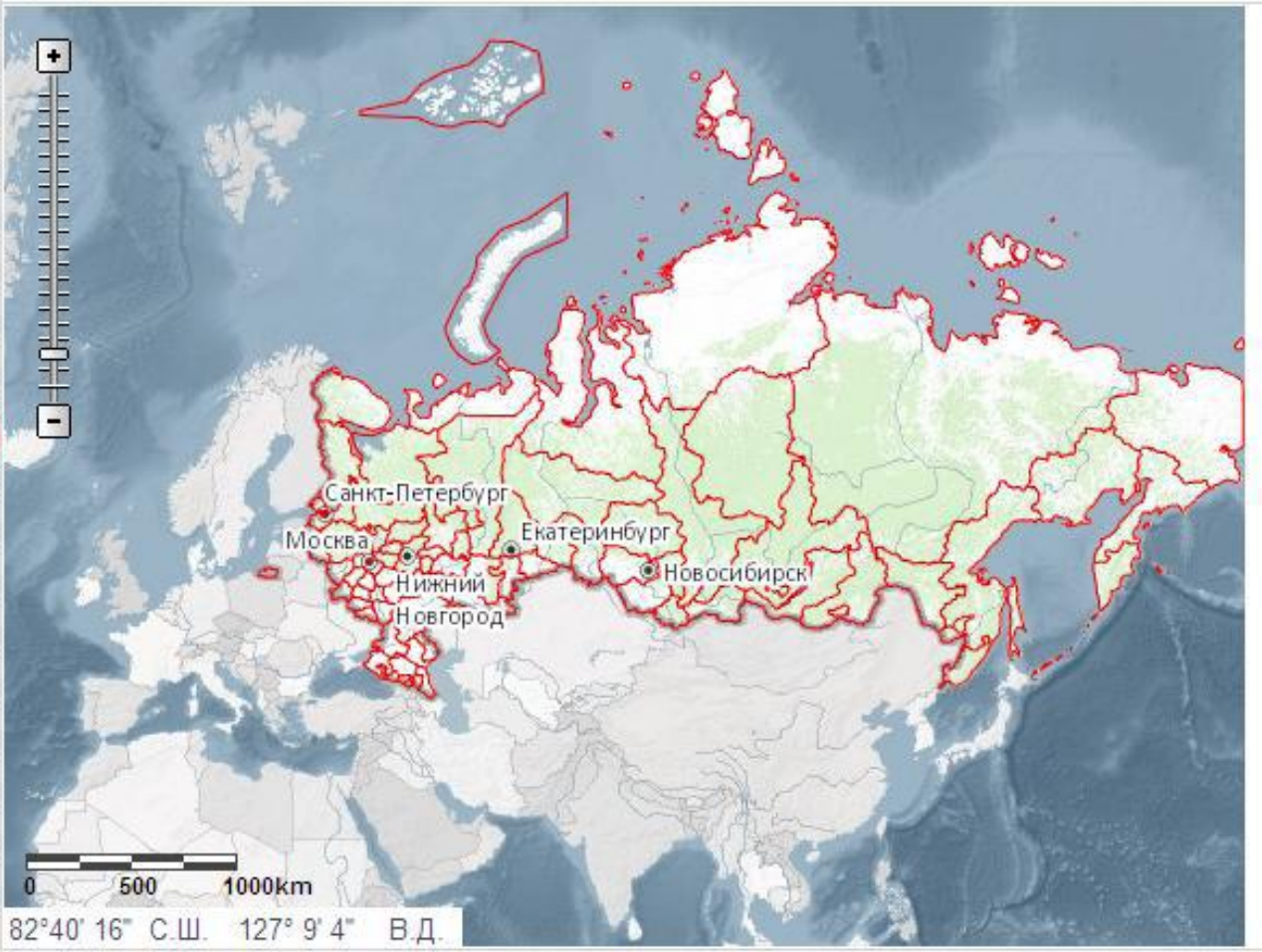
- **Project Context**
- Information Model
- Prototype
- Pilot and Evaluation
- Next Steps

The project June 2010-July 2012: 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

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

Navigation toolbar with icons for hand, search, left arrow, right arrow, mouse, scale, print, and legend. Legend is checked. Управле



- Currently 2D (Oracle spatial)
- Not covering well:
1. multilevel complexes
2. underground and elevated objects



Поиск

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

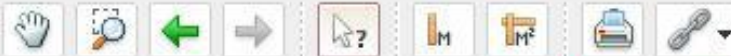
▶ [Расширенный поиск](#)

Найти

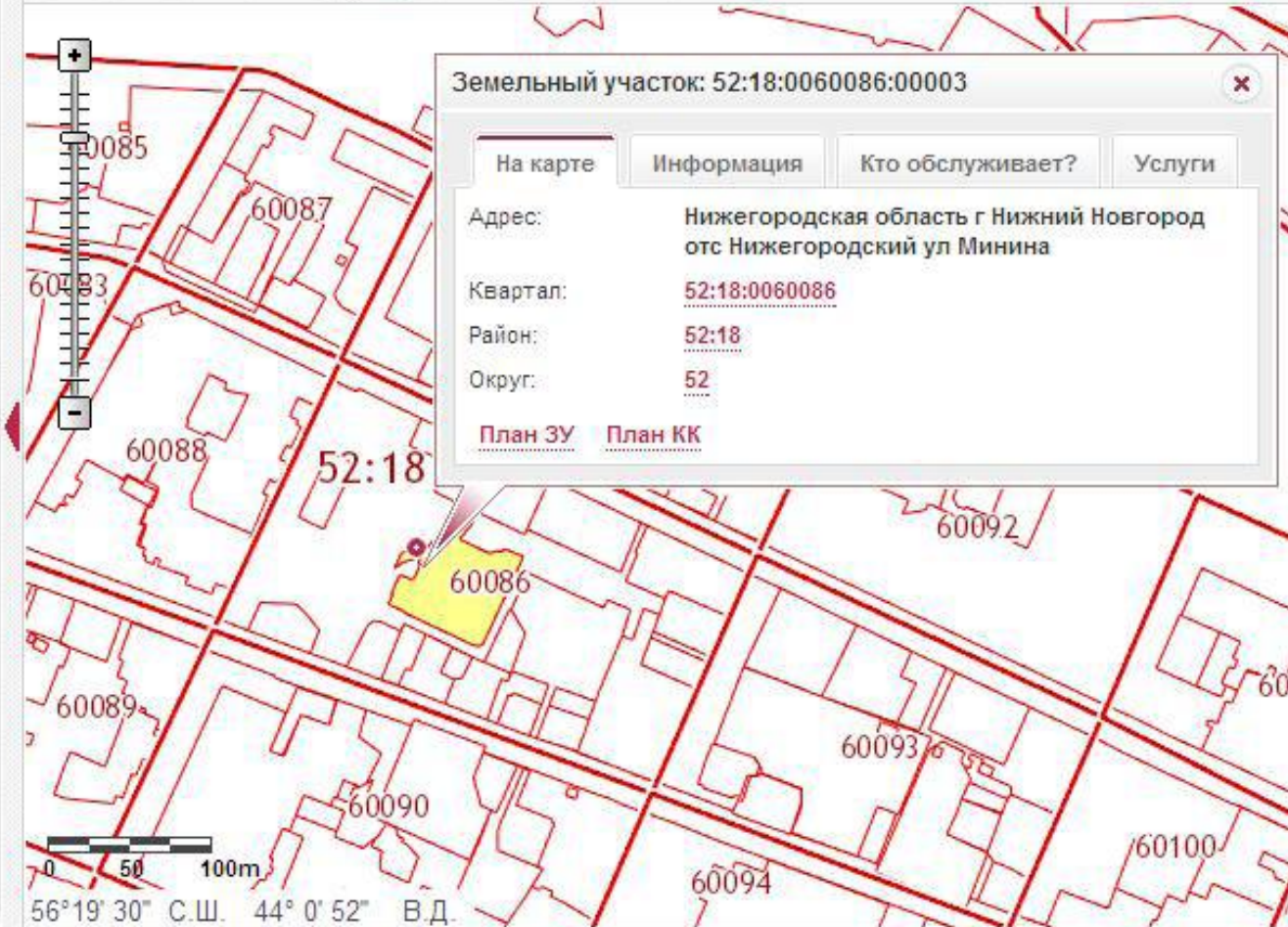
Найден 1 участок

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

Project goal:
 evaluate possibilities
 3D cadastre (for
 better reflection
 real world)
 with 3 test cases



Легенда Управление



Case 1: Teledom building

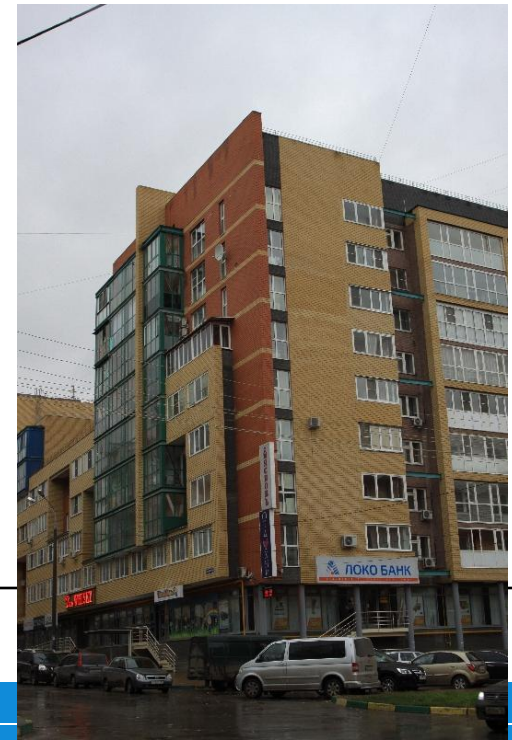
9/1 ul. Belinsky

- 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



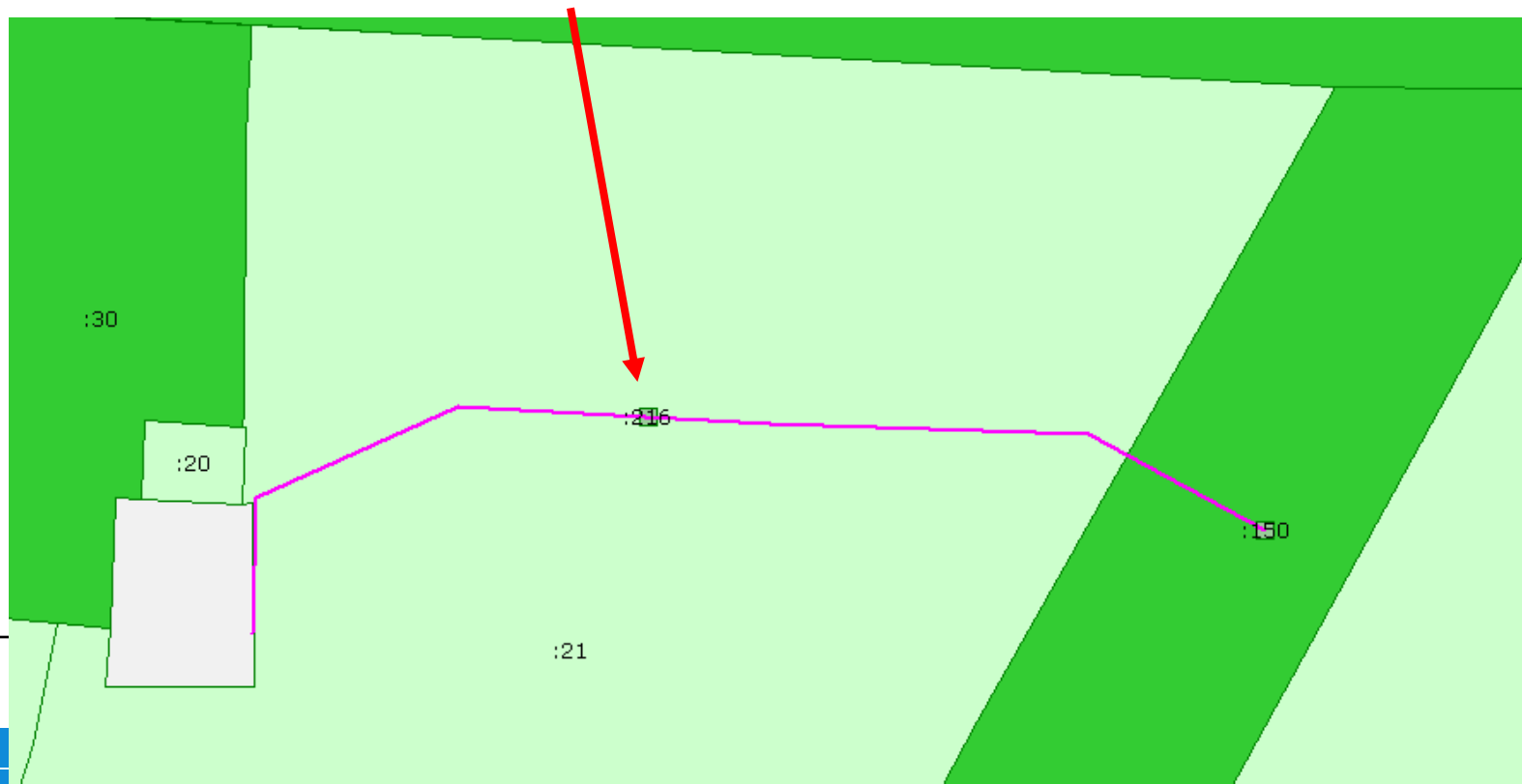
Case 2: Apartment complex, 66a Ulitsa Nevzorovykh

- 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 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

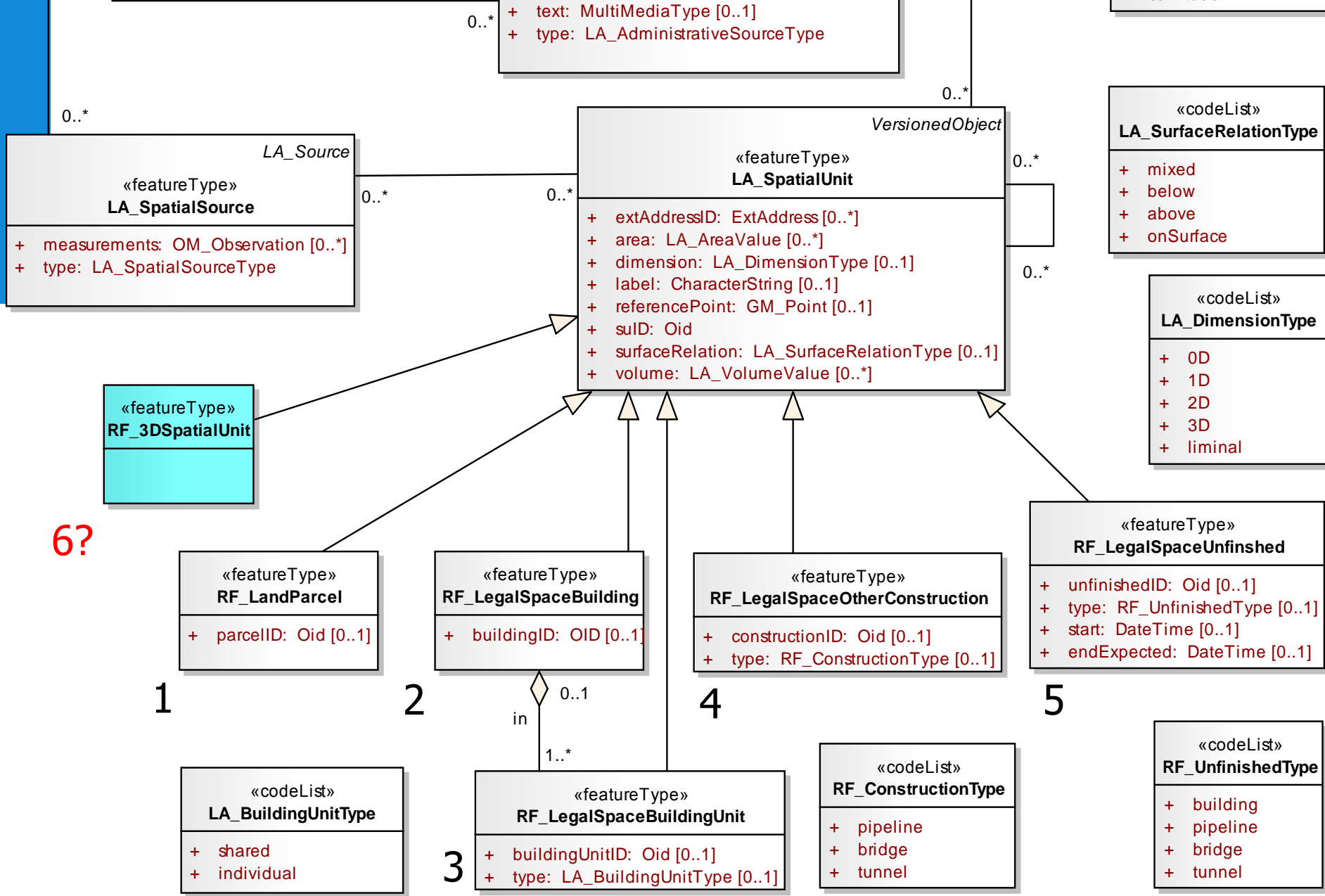


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The Russian Cadastre knows 5 types of cadastral objects

1. Land parcel
 2. Building
 3. Apartment unit
 4. Other construction (bridge, pipeline, etc)
 5. Unfinished objects (building, bridge, pipeline, etc)
- no need to change the legal/administrative part
 - reference model the ISO 19152 (LADM), includes 3D profile
 - 3D registration is based on two spatial representations
 1. 3D polyhedron volume (flat planes) or
 2. 3D multicurve with diameter (curved surfaces around pipelines)
 - also no need to change spatial part (Oracle SDO_Geometry)



6?

1

2

4

5

3

Prototype/pilot data

- topographic base map
- digital terrain elevation model
- cadastral data:
 - spatial: boundaries and
 - non-spatial: characteristics of cadastral blocks and land parcels
- state registration buildings, premises and structures
- technical documentation
(including technical passports with floor plans)

- 3D parcel geometry created in buildings
(starting with floor plans, using Google Sketchup at Russian side)



Components

Select Edit Statistics

Google

- 1_Этаж_3D
by Unknown
No Description
- 2_Этаж_3D
by Unknown
No Description
- 3_Этаж_3D
by Unknown
No Description

Отправка_МКД

Select

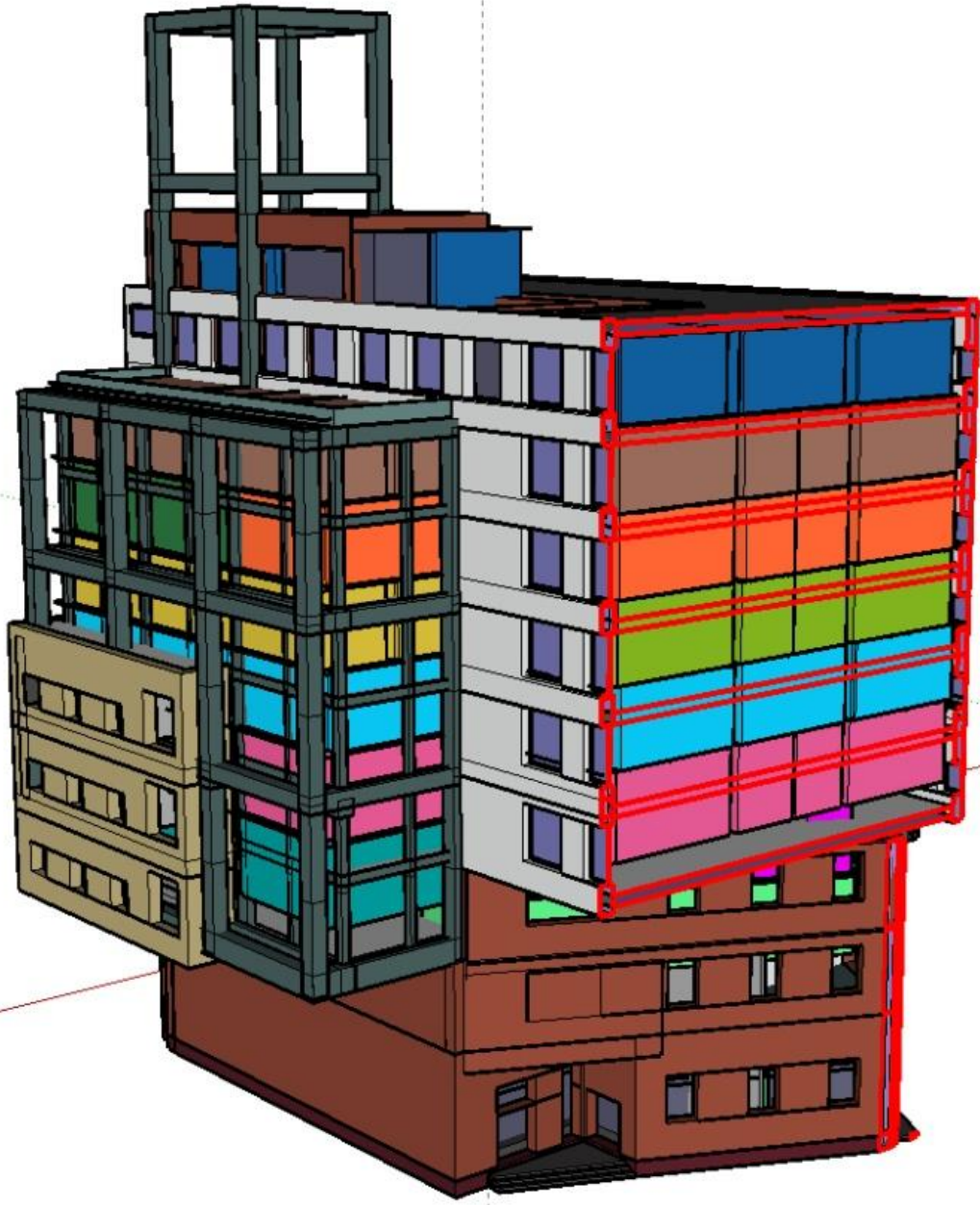
Google

- 2d план
by Unknown
No Description
- 3_Этаж_2D
by Unknown
No Description

Здание_Теледон

Entity Info

No Selection



Materials

Default

Select Edit

Библиотека_цветов

Select

Attributes for buildings (apartments)

- object number in model
- storey (floor) number
- cadastral number apartment
- cadastral number building
- cadastral number land parcel
- conditional number
- address/location
- object function
- object name
- type of right
- property category
- right holder
- restrictions of a right
- area of all parts building, m^2
- total internal area, m^2
- main internal area, m^2
- additional internal area, m^2
- average height, m
- volume, m^3
- number of rooms
- notes

Attributes for structures (gas pipeline)

- object name
- function
- cadastral or conditional number of a land parcel
- cadastral number of an object
- conditional number
- address
- length, m
- diameter, mm
- type of right
- property category
- restrictions (encumbrances) of right
- right holder
- notes

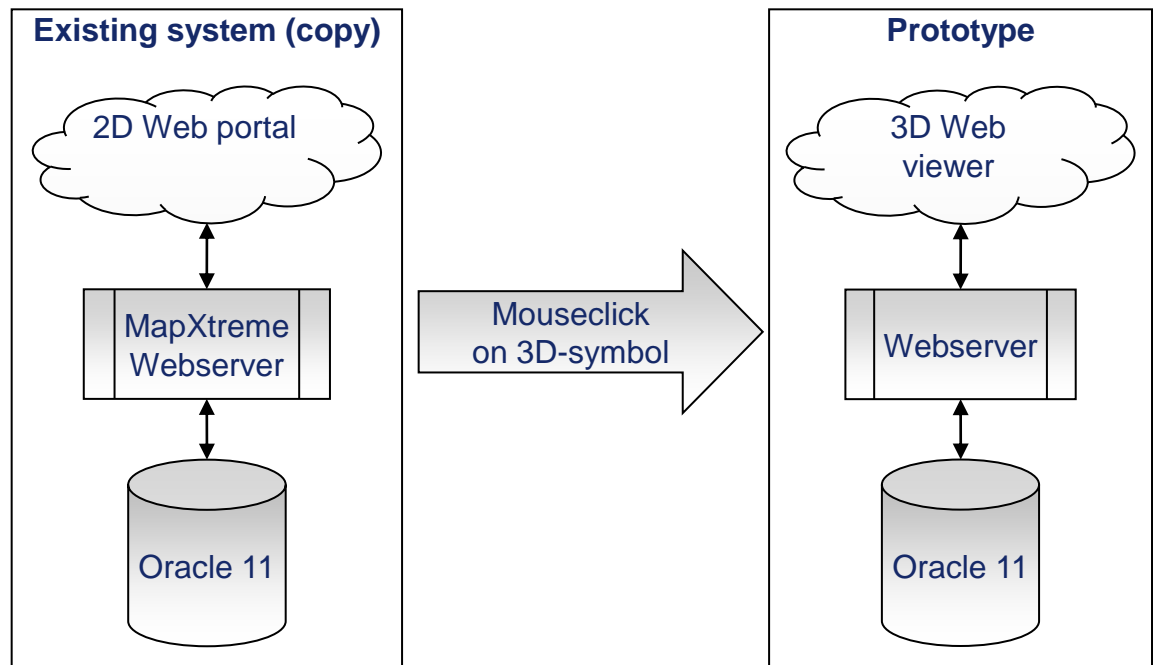
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Focus first prototype on visualization and user interaction

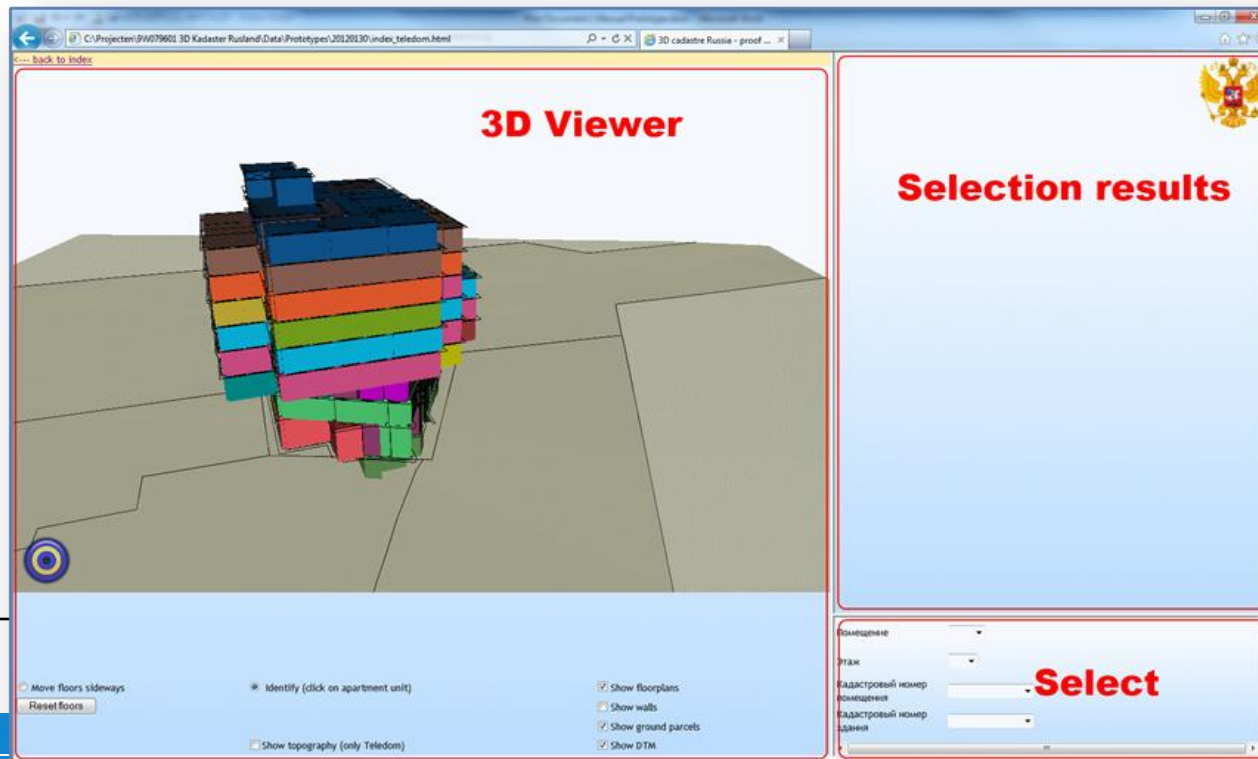
- MoSCoW method: M (MUST); S (SHOULD) C (COULD) W (WON'T)

- Database
- Webserver
- 3D web viewer:
BS Contact based
(X3D viewer)
- Fitting in 2D portal



User interface prototype

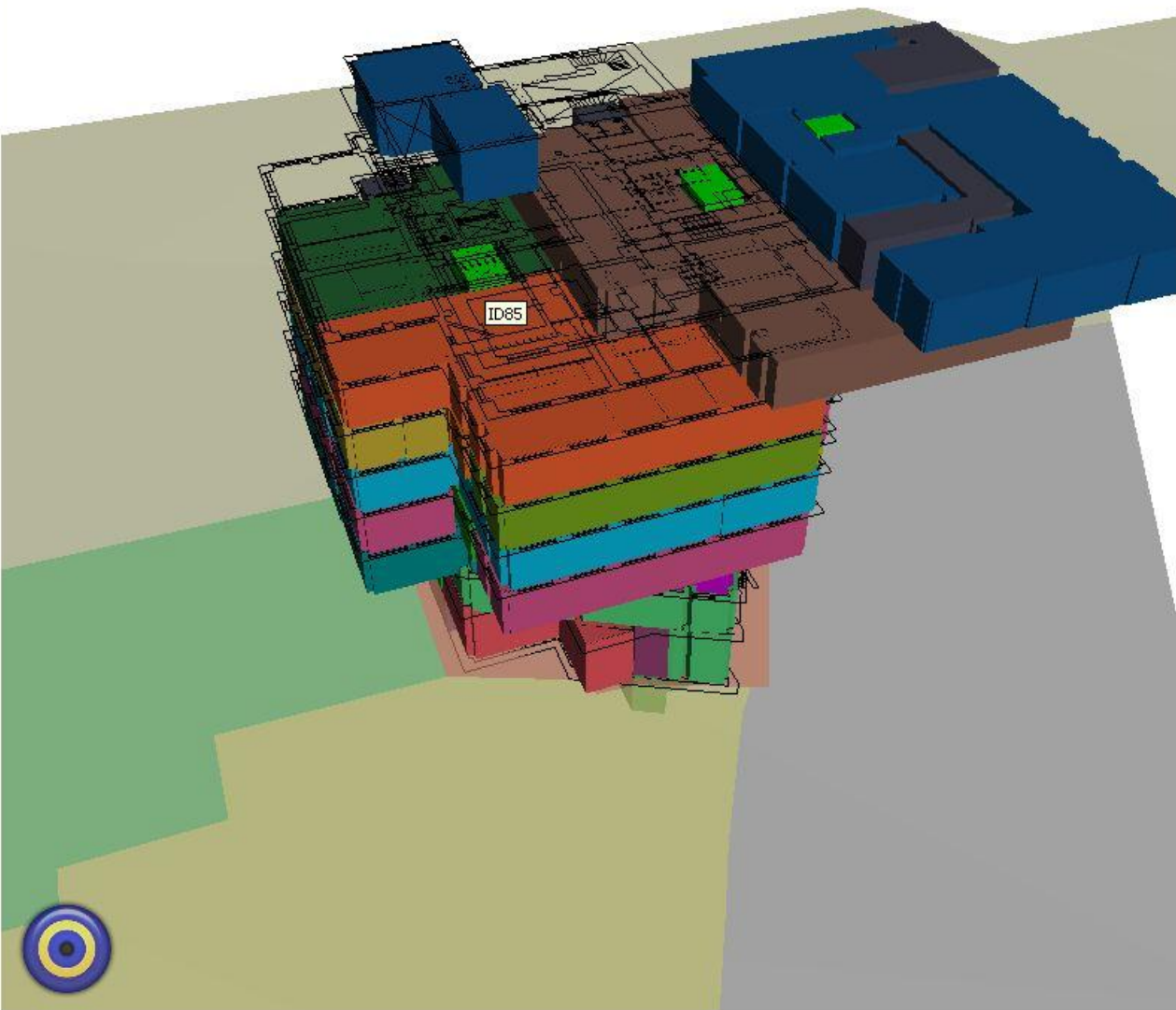
- Both (3D) spatial and thematic attributes
- Works with Internet Explorer and Firefox
- Three main parts of interface:
 1. 3D Viewer: standard (rotation, zooming, switching certain features on/off) and special functions (identify, and "move floors")
 2. Select window: specify selection criteria
 3. Selection Results window: view information of selected objects



Prototype functionality

- Start via existing 2D cadastral portal: maps.rosreestr.ru/Portal
- Display/interact with objects in 3D: rotate, zoom, select, etc.
- Slide out layers of 3D objects
- Display administrative data: show id, cadastral number,...
- Alphanumerical selection on multiple attributes:
owner name, id of cadastral object, address, type of right,...
- Configure 'hide / show' privacy data (depending on user)
- Show / hide layers (reference data): 2D cadastral map, DTM, topographic map, areal photograph, floor plans,...
- Link to photograph of selected 3D object
- Interface in Russian language

English version



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

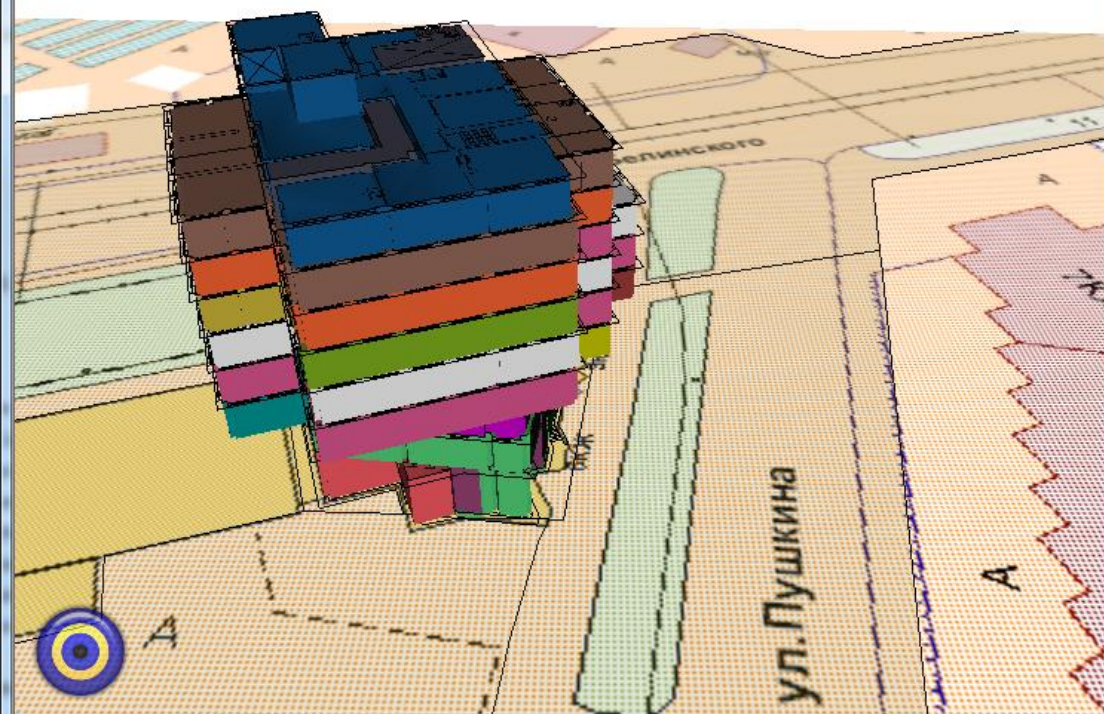
Apartment_nr	P4
Floor_nr	3
Cadastral_nr_apartment_premise	52:18:0070012:45
3d object	ID302

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	<input type="text"/>
Floor	<input type="text"/>

Russian version



Cadastral-nr 52:18:0070012:34

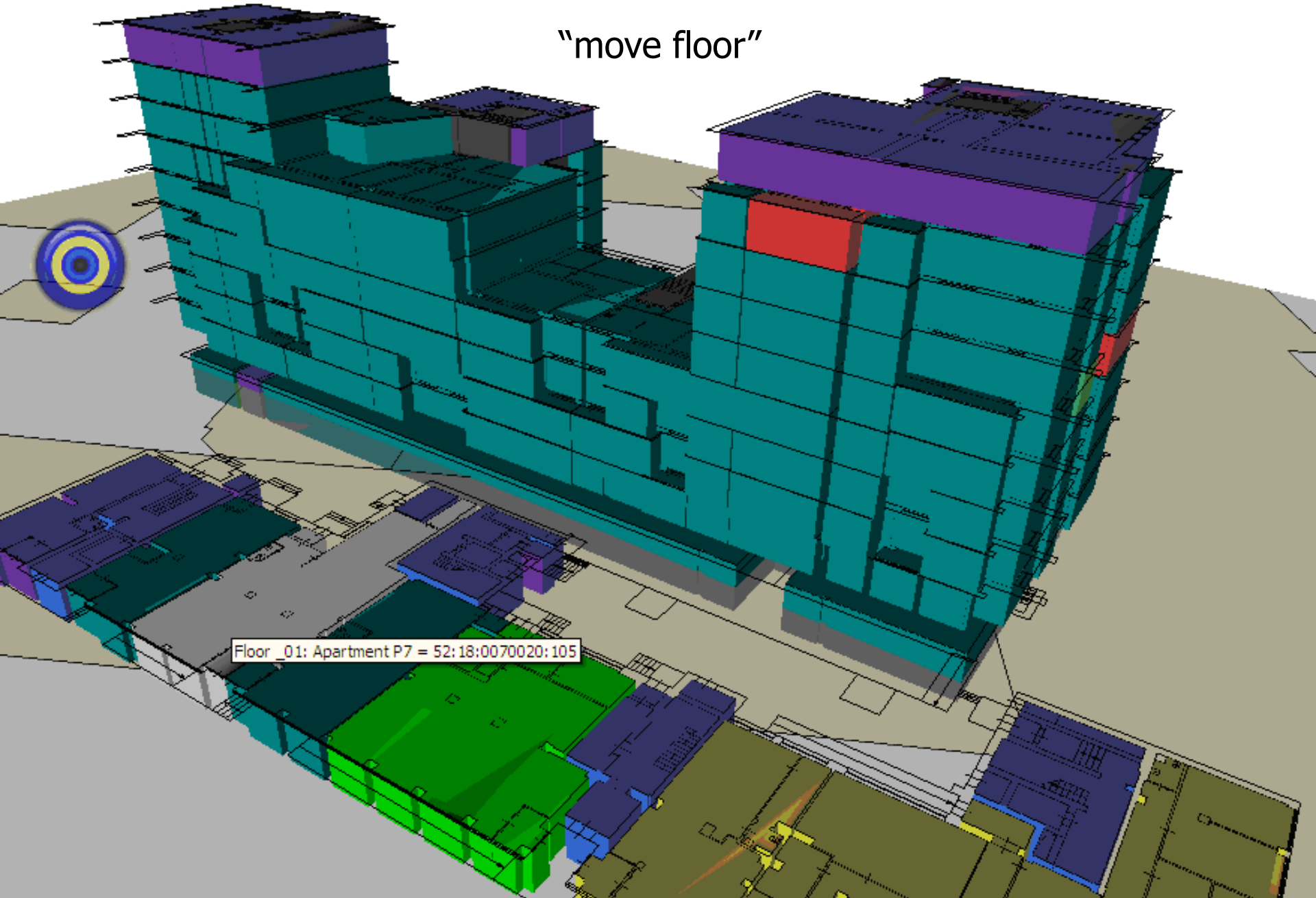
Помещение	P7
Этаж	5
Кадастровый номер помещения	52:18:0070012:34
Кадастровый номер здания	52:18:0070012:30
Кадастровый номер ЗУ	52:18:0070012:23
Условный номер	52-52-01/769/2010-295
Адрес	Нижегородская область, г. Нижний Новгород, ул. Белинского, д. 9/48
Местоположение	
Назначение помещения	нежилое
Вид права форма собственности	Собственность
Правообладатель	Общество с ограниченной ответственностью «Лига»
Ограничения обременения права	Ипотека, регистрация № 52-52-01/101/2010-057 от 14 сентября 2010 г., срок: до 01.01.2015 г.,
Площадь всех частей здания	706.1



- Move floors sideways
 - Identify (click on apartment unit)
 - Show floorplans
 - Show walls
 - Show ground parcels
 - Show DTM
 - Show topography (only Teledom)
-

Помещение	<input type="text"/>
Этаж	<input type="text"/>
Кадастровый номер помещения	<input type="text"/>
Кадастровый номер здания	<input type="text"/>
Кадастровый номер ЗУ	<input type="text"/>

“move floor”



Floor_01: Apartment P7 = 52:18:0070020:105

Case 3: short gas pipeline

Search results

Real_estate_object_name	Газопровод низкого давления
Cadastral_nr_real_estate_object	52:18:0000000:520
Registration_nr_techical_passport	52-52-01/754/2009-130
Cadastral_nr_parcel	52:18:0060085:21
Purpose_of_use	Нежилое
Address	Нижегородская обл., г.Нижний
Length_m	72.73
Diameter_mm	50
Depth_m	1.05
Right_type	Собственность
Right_holder	ООО «Нижегородоблгаз»
3d object	ID53

- When pipeline (purple) is selected, its attributes are displayed

Content

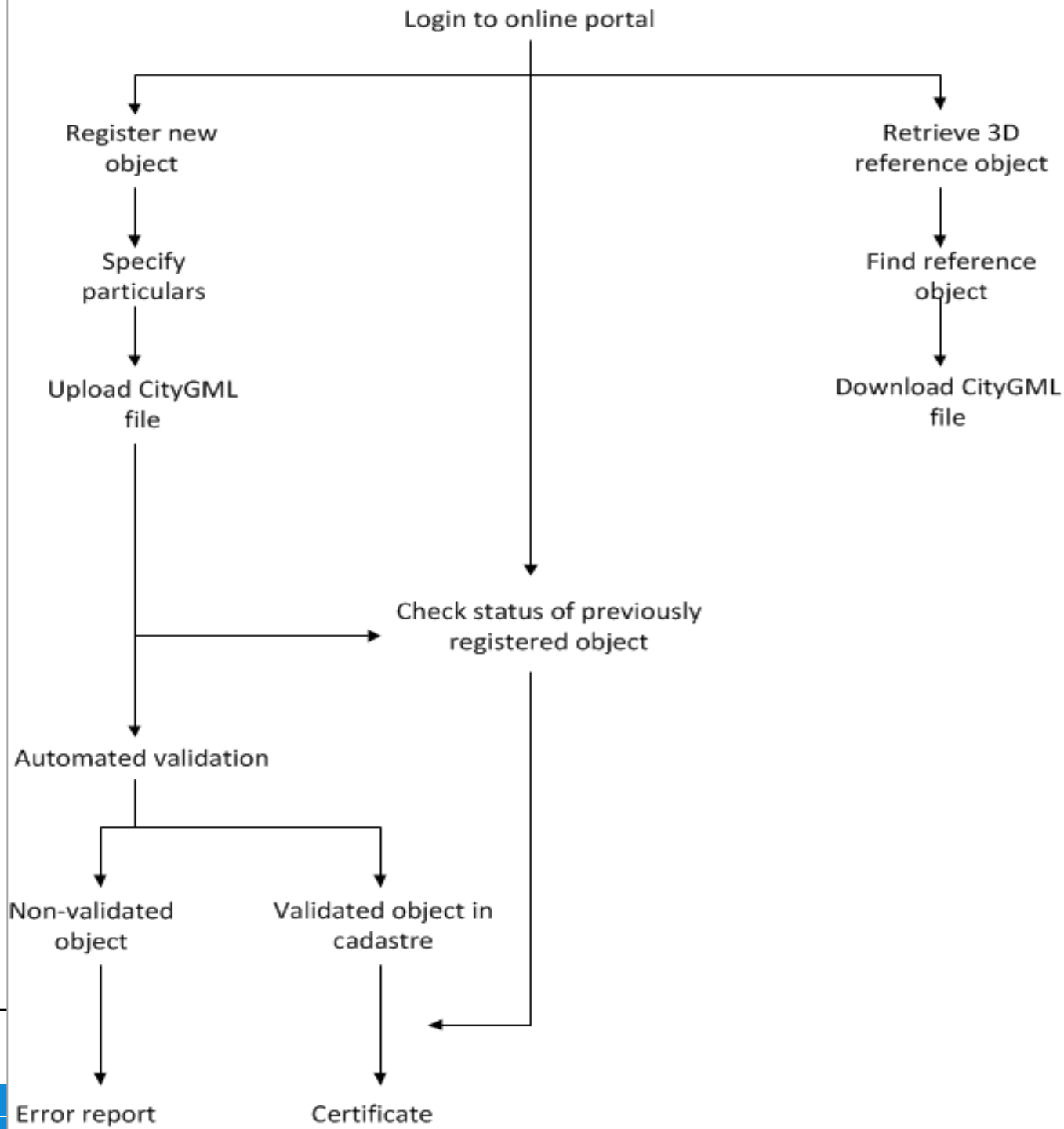
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Pilot goals

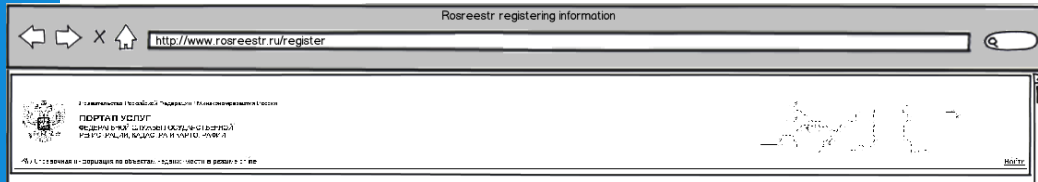
- Pilot results
 1. Better understanding benefits 3D Cadastre by stakeholders
 2. Insight project team opportunities/limitations
 3. Experience actual implementation
- Active (April 2012) and passive (online) pilot
<http://www.gdmc.nl/3drussia/pilot/>
- Participants provided input
- Prototype focus on dissemination/visualization
- Initial registration 3D objects via mock-up

Overall workflow

- Registration all mock-up



Registration mock-up



Registration of Cadastral Objects

Welcome to the online registration facility of Rosreestr

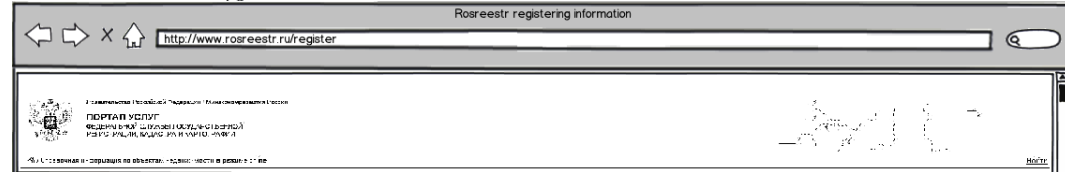
New 3D Object

Check status

You're not logged in yet. Will you please provide your username and password?

username
password

Log in



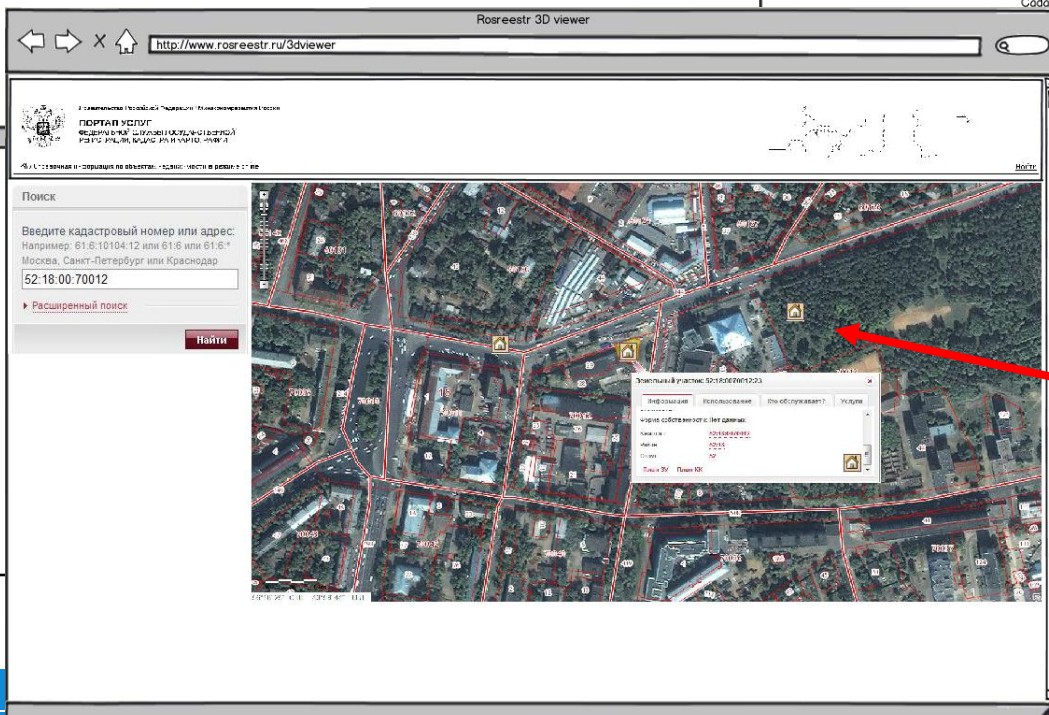
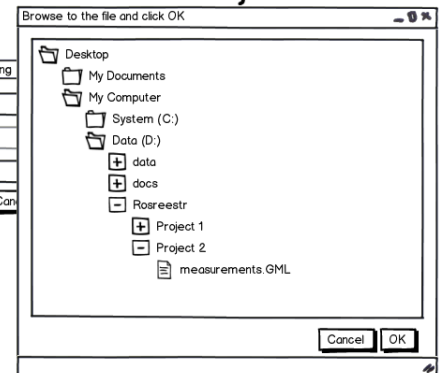
Registration of Cadastral Objects

Please provide the following information:

Type of object
Parcel id
Cadastral Engineer

file

Cancel



Note the 3D icons on the 2D map /portal

Evaluation of pilot

- Participants: (legal and spatial) specialists from Rosreestr
- Questionnaire with 44 questions, of which
 - 7 open questions; e.g. 'To what extent will the implementation of a 3D cadastre change the way you work?'
 - 37 propositions with three possible responses: disagree, agree or no opinion; e.g. 'The law provides enough possibilities to accommodate a 3D cadastre'
- Positive attitude of participants, suggestions
 - get in (better) contact with clients → so Rosreestr staff convinced
 - inform and train users → in order to obtain the real benefits

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Conclusion (1 / 2)

- Recommendations are drafted on legal, organisational and technical aspects (for 3D Cadastre real-world operation in Russia)
- With **conditions in place** and supported by **production systems** no additional costs are expected for registering **new** 3D objects
- Workflow does not change at Rosreestr
- Benefits are high: better description of object/ownership (RRRs) in complex situations (high real-estate values)

Conclusion (2/2)

- Model impact was minimal (no changes legal model)
- Data capture in 3D was new (non-trivial)... outside Rosreestr
- Detailed specification of submission data content and data format of 3D object for registration is crucial

- 3D web viewer also challenging, several alternatives tested
- Next steps:
 1. Realize production environment:
 - register new 3D parcels
 - validate 3D parcels (closed, no overlap)
 - store in Oracle 11g production database
 - improve web-based 3D query & viewing tool
 2. Operational test (real 3D transactions & registration, Skolkovo)

Final remark: 3D Object sources

- Direct survey in 3D, not tested in the current project
- Upgrade existing 2D floor plans to 3D volumes: manual in the prototype, in the future more automation
- New buildings designed (CAD) direct in 3D, with limited additional effort (and clear guidelines) result in 3D cadastral objects registration (this could be first tested; e.g. Skolkovo area).



Thank you!

- Any questions?

Acknowledgements

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- The Dutch Government is supporting this project '3D Cadastre Modelling in Russia (G2G10/RF/9/1)' via its 'EVD' Agency for International Business and Co-operation (of the Dutch Ministry of Economic Affairs, Agriculture and Innovation)
- This research is supported (at TU Delft side) in part by the Dutch Technology Foundation STW (project numbers 11300 and 11185), which is part of the Netherlands Organisation for Scientific Research (NWO) and partly funded by the Ministry of Economic Affairs, Agriculture and Innovation

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">
      <gml:lowerCorner srsDimension="3">84936.169 444962.883 0.0 </gml:lowerCorner>
      <gml:upperCorner srsDimension="3">86082.217 446807.742 90.0 </gml:upperCorner>
    </gml:Envelope>
  </gml:boundedBy>
  <cityObjectMember>
    <generic:GenericCityObject gml:id="Parcel_1">
      <creationDate>2011-04-01</creationDate>
      <generic:class>LA_LegalSpaceBuildingUnit</generic:class>
      <generic:lod4Geometry>
        <gml:Solid>
          <gml:exterior>
            <gml:CompositeSurface>
              <gml:surfaceMember>
                <gml:Polygon>
                  <gml:exterior>
                    <gml:LinearRing>
                      <gml:pos>85514.91 445173.489 0.0</gml:pos>
                      <gml:pos>85511.709 445170.399 0.0</gml:pos>
                      <gml:pos>85510.892 445172.368 0.0</gml:pos>
                      <gml:pos>85514.066 445175.521 0.0</gml:pos>
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