The 3D Cadastre Prototype and Pilot in the Russian Federation

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FIG Working Week 2012, Rome, Italy 6–10 May 2012,
TS08J – 3D Principles and Technology, Wednesday 9 May 2012, 14:00-15:30

Content

The project: 3D Cadastre Modeling in Russia

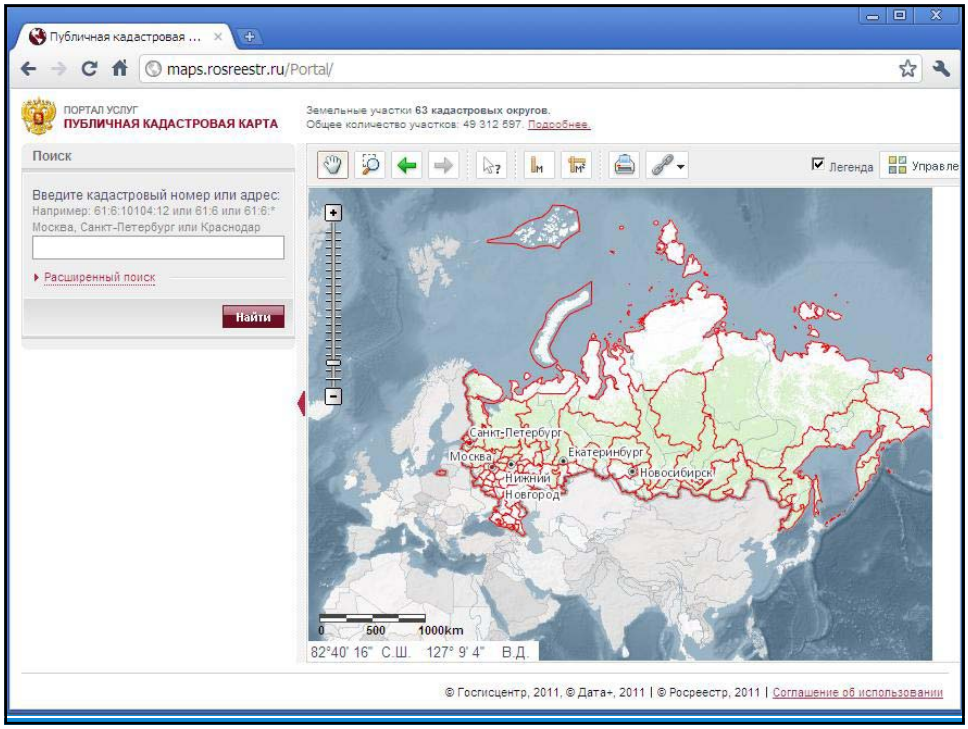
- Aim: to provide guidance in the development of a prototype and to create favorable legal and institutional conditions for the introduction of 3D cadastre modeling in Russia ...
- ... better registration of complex buildings, or other types of constructions, and subsurface networks (e.g. cables, pipelines)

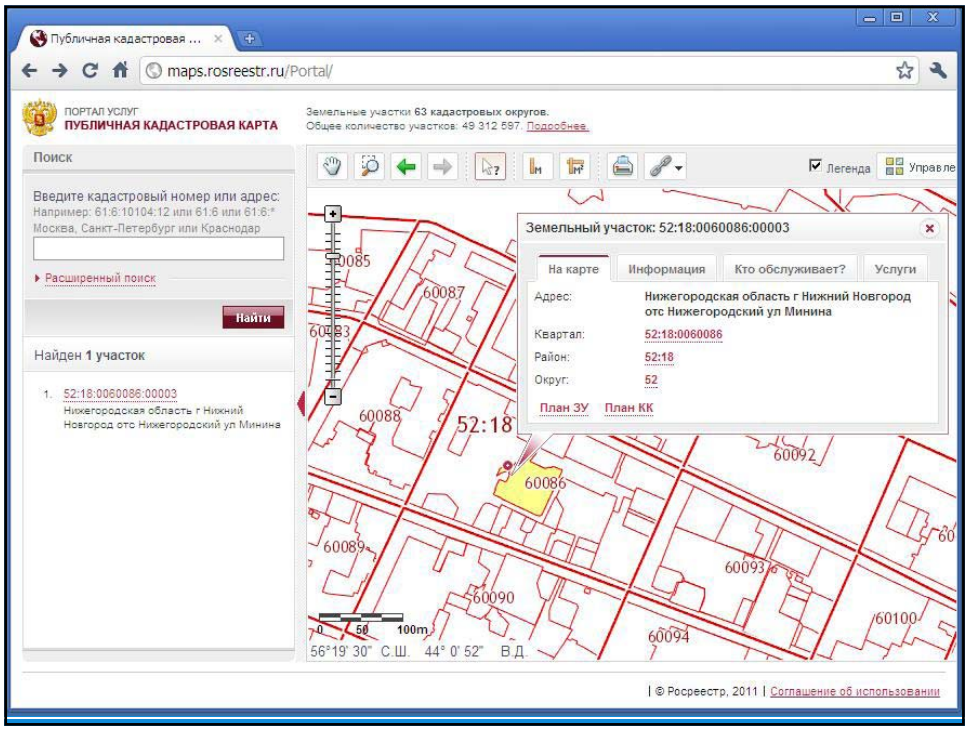
- Partners: Federal Service for State Registration, Cadastre and Cartography (Rosreestr), the Federal Cadastre Center (FCC) 'Zemlya' and the Netherlands' Kadaster
- with participation of: Delft University of Technology, and Royal Haskoning BV and Grontmij Netherlands BV

- 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/


Публичная кадастровая ...
maps.rosreestr.ru/Portal/
ПОРТАЛ УСЛУГ
ПУБЛИЧНАЯ КАДАСТРОВАЯ КАРТА
Земельные участки 63 кадастровых округов.
Общее количество участков: 49 312 597. Подробнее.
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
Управле
Санкт-Петербург
Москва
Екатеринбург
Новосибирск
Нижний Новгород
0 500 1000km
82°40' 16" С.Ш. 127° 9' 4" В.Д.
© Госисцентр, 2011, © Дата+, 2011 | © Росреестр, 2011 | Соглашение об использовании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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
Управле
Земельный участок: 52:18:0060086:00003
На карте
Информация
Кто обслуживает?
Услуги
Адрес: Нижегородская область г Нижний Новгород отс Нижегородский ул Минина
Квартал: 52:18:0060086
Район: 52:18
Округ: 52
План ЗУ
План КК
60085
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0 50 100m
56°19' 30" С.Ш. 44° 0' 52" В.Д.
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Content

- Introduction
- 3D Cadastral Model
- Prototype Development
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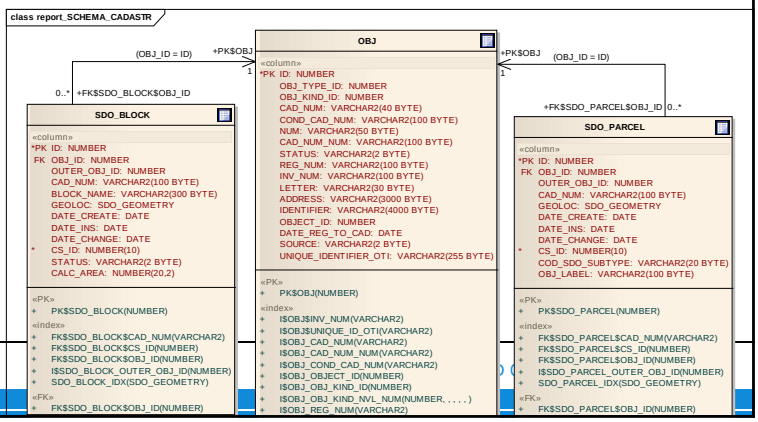
The Russian Cadastre knows 5 types of cadastral objects

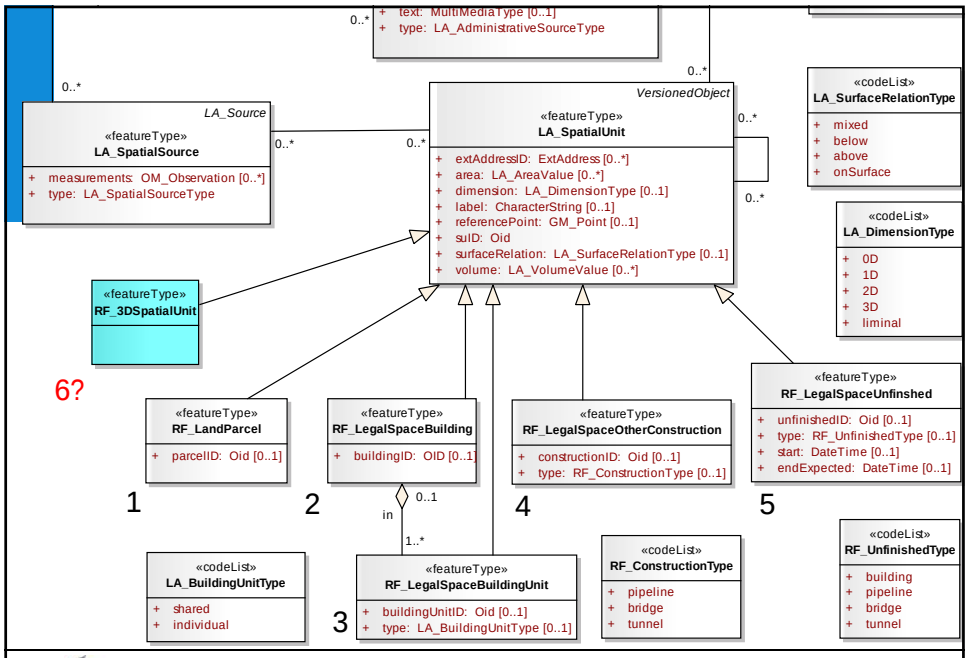
1. Land parcel
2. Building
3. Apartment unit
4. Other construction (bridge, pipeline, etc)
5. Unfinished objects (building, bridge, pipeline, etc)



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	-



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>
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   <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>
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           <gml:pos>85514.91 445173.489 0.0</gml:pos>
```

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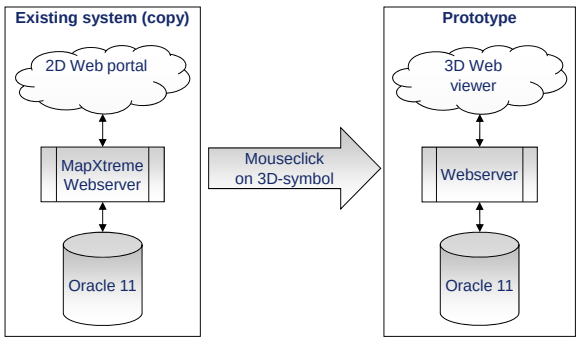
Focus first prototype on visualization and user interaction

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

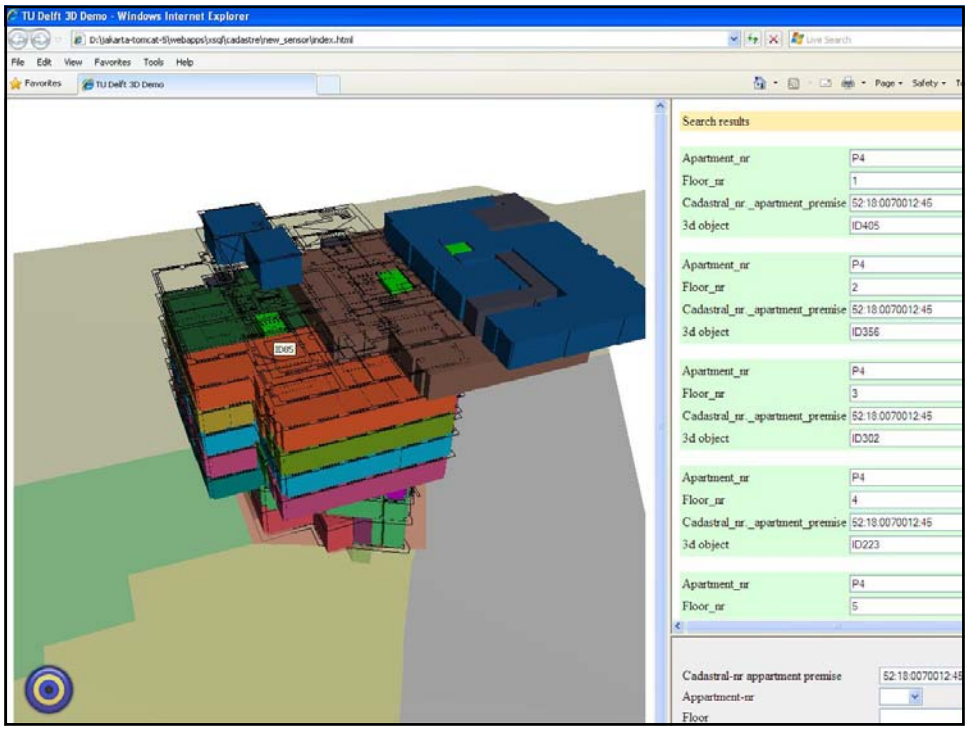
- Database
- Webserver
- 3D web viewer: BS Contact based (X3D viewer) by Marian de Vries

- Fitting in 2D portal



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



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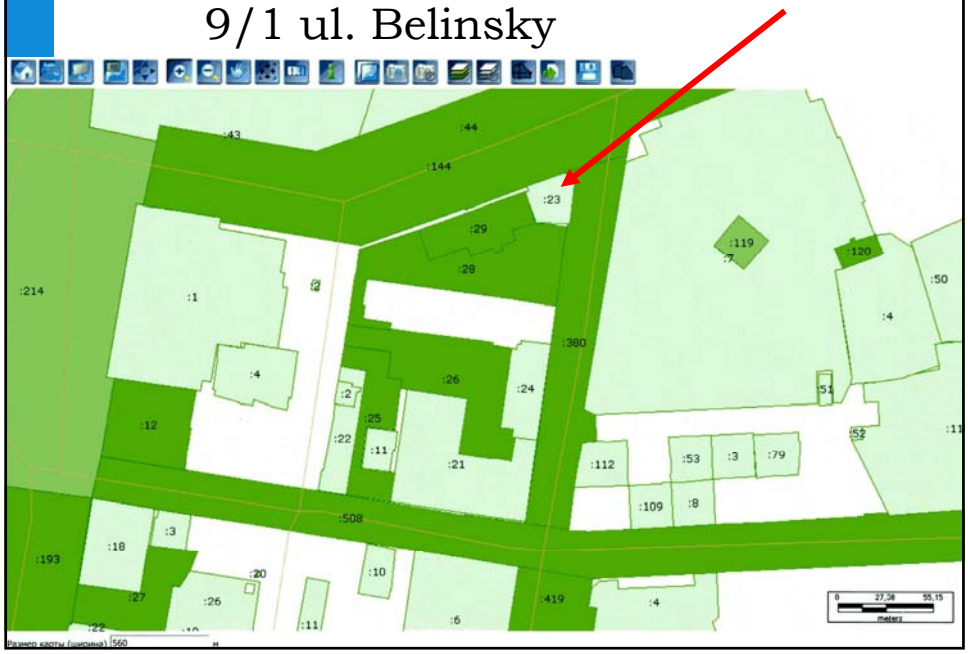
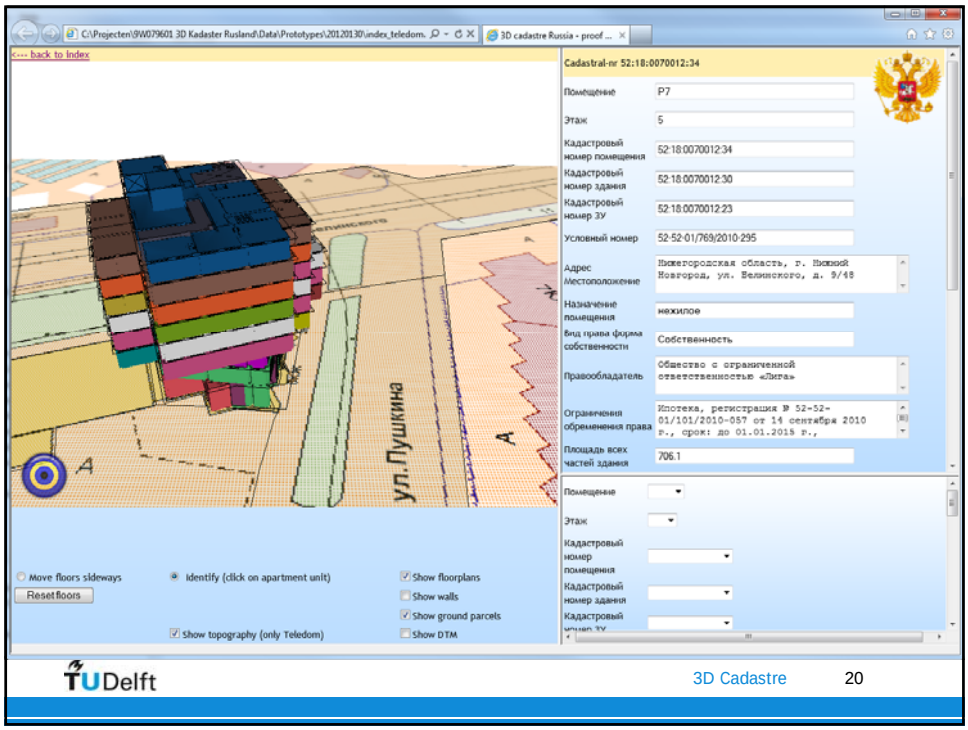
Case 1: Teledom building 9/1 ul. Belinsky

- 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

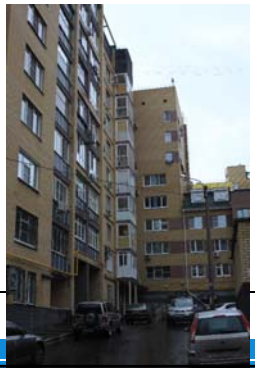
Case 1: Teledom building 9/1 ul. Belinsky





Case 2: Apartment complex, 66a Ulitsa 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



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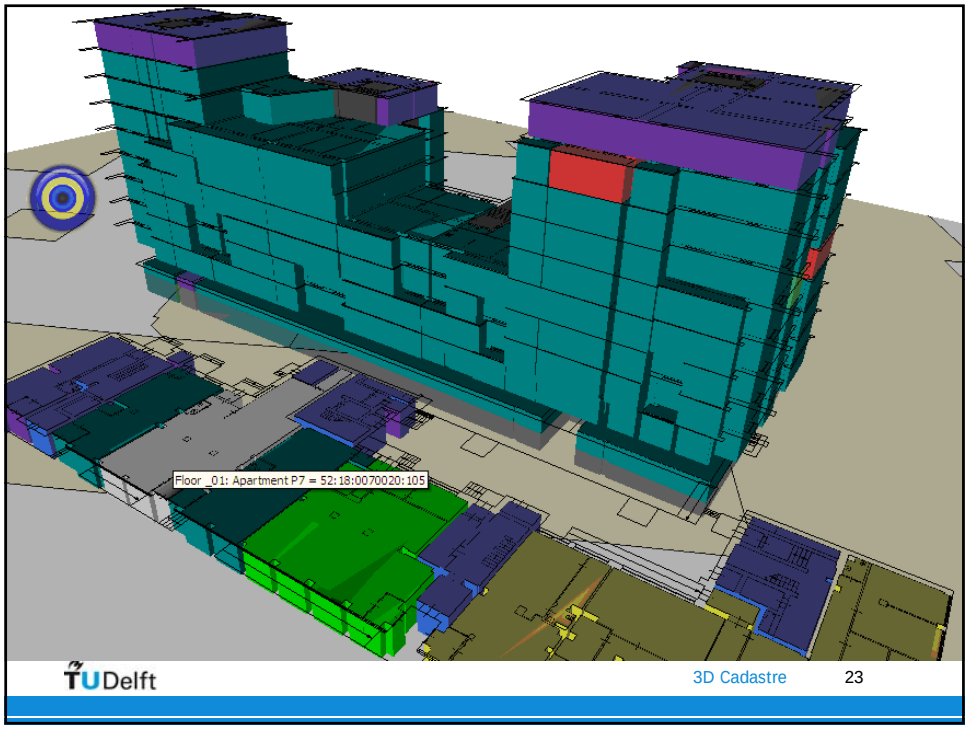
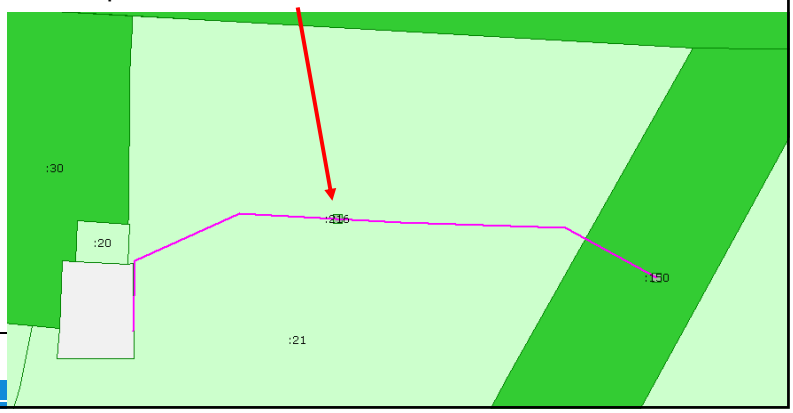


Case 3: short gas pipeline: Piskunov str. to Verhnevolzhskaya naberezhnaya, 7

- Pipeline length 72,73 m, Pipeline diameter 50 mm
- object got one owner: Nizhegorodoblgaz 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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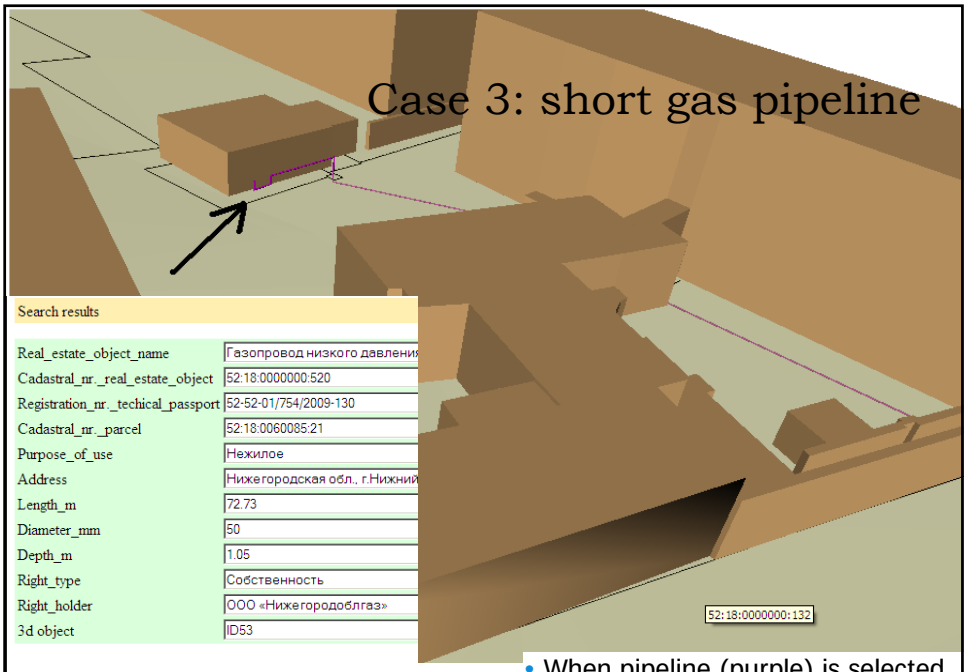

- When pipeline (purple) is selected, its attributes are displayed

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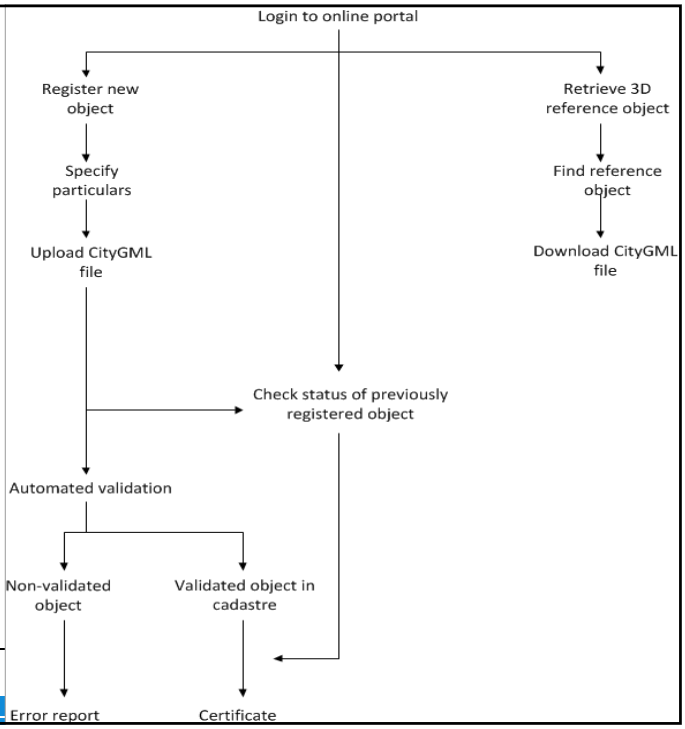
Pilot goals

- 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



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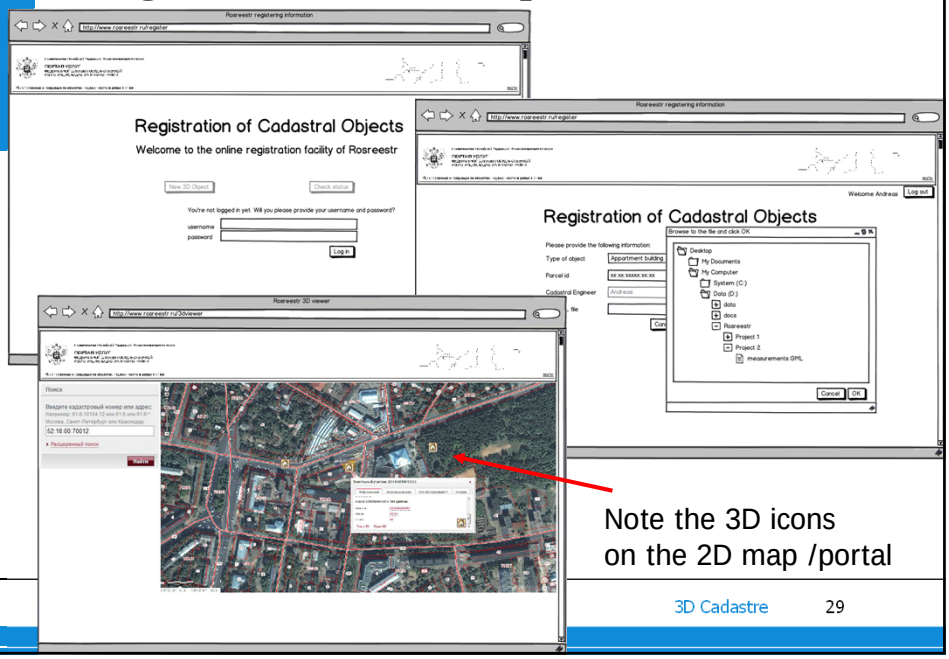
Registration mock-up



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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).

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Conclusion

- Model impact was minimal (no changes legal model)
- Data capture in 3D was new (non-trivial)
- 3D web viewer also challenging, several alternatives tested
- Next steps:
  1. Use proposal for 'favorable legal and institutional conditions'
  2. 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
  3. Operational test (real 3D transactions & registration, Skolkovo)

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