



# Development of 3D Cadastre in Hungary

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Sensing**

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- Problems in development of 3D cadastre and registration
- Hungarian situation
- Current developments in 3D Cadastre in Hungary

# Introduction I.

- Many countries in Europe and all over the world, especially in metropolitan area, there is scarcity of vacant land on surface for development
- In big cities there are many real estate development under and above ground creating engineering constructions as valuable properties without registration in the land registry, cadastre
- There are many countries with condominiums creating residential, commercial, industrial properties but as unique properties are not legally registered

# Introduction II.

- There is growing interest by investors for registration of the these objects as properties in the cadastre and land registry, creating secure ownership and mapping facilities of them
- On the other hand the traditional cadastre, land registry haven't been prepared to register 3D rights and objects above and under surface
- Development of 3D registration requires comprehensive solution (legal, technical and institutional)

# Introduction III.

- In Hungary we developed a Unified Land Registry System in 1972
- Condominium registration is a part of the Unified Land Registry as a kind of 3D registration
- New Act on Surveying and Mapping Activities passed by the Parliament in May 2012 has created the possibility of development of a full 3D Cadastre

# Problems in development of 3D cadastre and registration

## LAND REGISTRY

- Legal difficulties to register ownership and other rights of real objects under and above the surface
- Legal changes in the land registry law didn't follow the rapidly growing demands concerning the registration of real objects under and above the surface
- Registration of objects as properties in strata requires comprehensive tools, simultaneous solution in the legal and mapping sides
- The simultaneous solution can guarantee the data consistency

# Hungarian Situation

- Growing number of objects, potential properties have been constructed under and above the surface in Budapest capital and big cities
- Public utilities became privately owned without any registration in Land Registry
- Growing number of overcrossing traffic lines, bridges
- The legal and mapping registration of these objects is not possible except in two cases
  - Condominium
  - Underground object, cellar with direct access to public domain

# Hungarian Situation II.

## CONDOMINIUM REGISTRATION

- In case of condominiums there is no problem to register any objects, condominium units as property under or above the surface within the construction or building
- It's essential that every registered property has a unique identity number
- The identity number of properties in condominium are based on the parcel number of the land
- When we form condominium for registration of condominium units, map and legal documents are required
- The “map” is a scaled lay out plan about each level of the building with identifying of each unit (property)

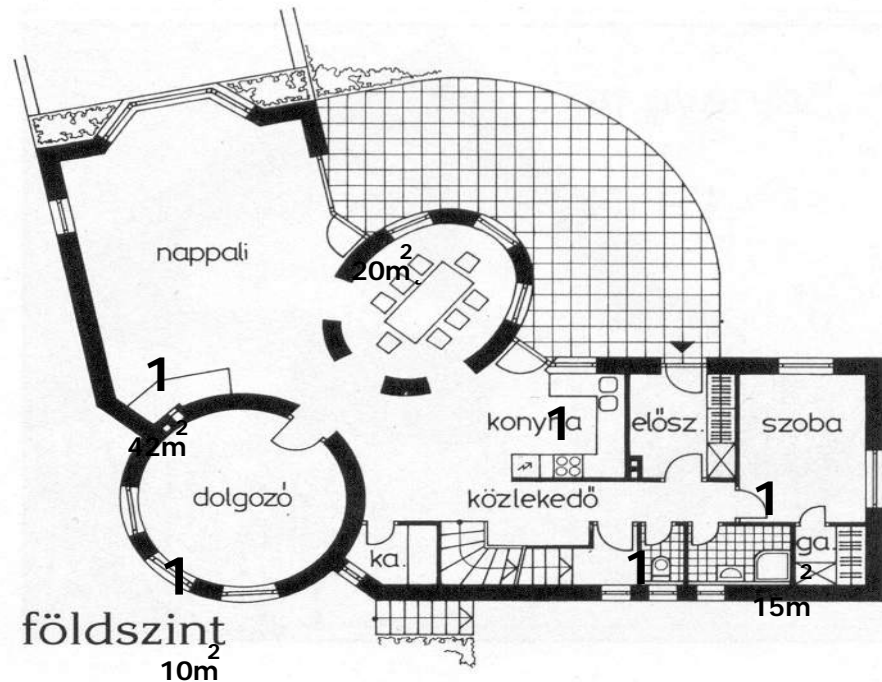


# Hungarian Situation III.

Layout plan and ID number of condominium unit

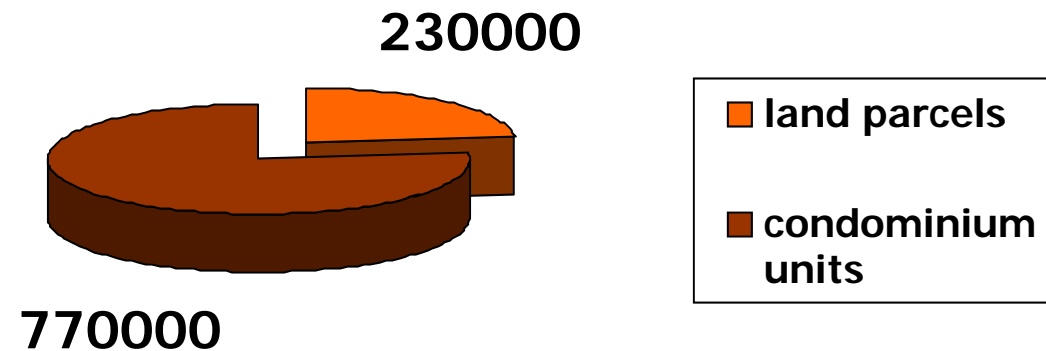


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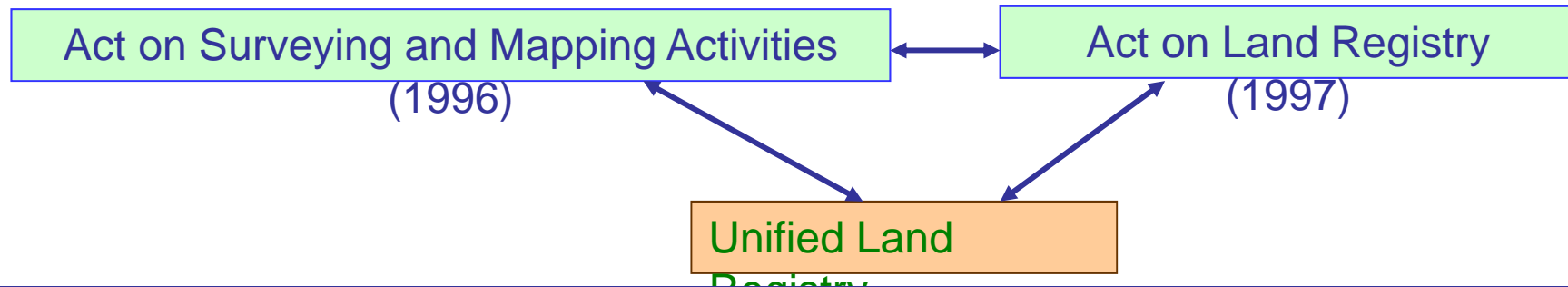


# Hungarian Situation IV.

- Hungarian Land Registry is a multipurpose nature system
- Condominiums, condominium units as properties are registered in the land registry
- In Budapest Land Registry about one million properties have been registered



# Legal Framework



## New Act on Surveying and Mapping Activities (2012)

- Traditional Paper Maps->Databases (including Remote Sensing, DEMs, LIDAR etc.)
- Unified Land Registry Database (Cadastral Maps + Land Records)
- A copy of each (surveying or mapping related) database, which was created partly or fully from public funds, must be delivered to FÖMI, without any financial or other compensation
- Improving geodetic point protection (the owner of property will pay)
- National Spatial Data Infrastructure (not INSPIRE!!)
- 3D Cadastre: “Under-ground and above-ground passes objects, structures, which has homogenous owners relationships should be taken into account as a property, which must be registered in Land Registry.”
- New Act has come into force on 1st January 2013, except 3D Cadastre rules, which will take place on 1st of January 2014

# 3D Cadaster

Hungarian Civil Code: „Ownership right on a real-property extends to the air-space above it and to the subsurface below it until utilization is possible”

Helge Onsrud  
(Norway):

„From Heaven to  
Hell”



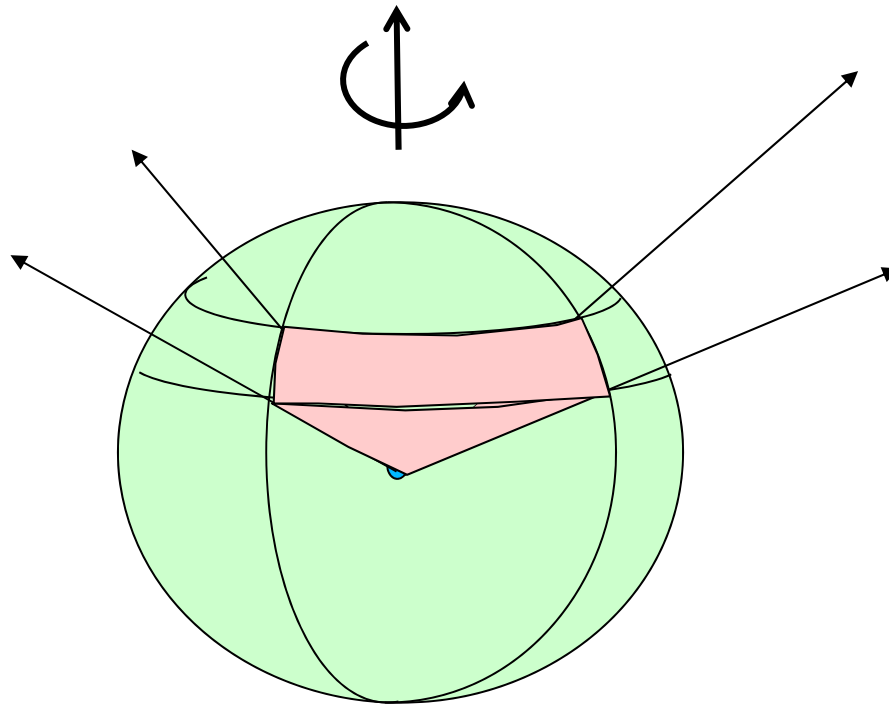
**Ownership**



# Legal Spaces in 3D Cadastre

Peter van Oosterom and Rod Thomson has elaborated an axiomatic definition of 3D parcels (3D Cadastre Workshop 2011, Delft, The Netherlands)

3D Cadastre speciality



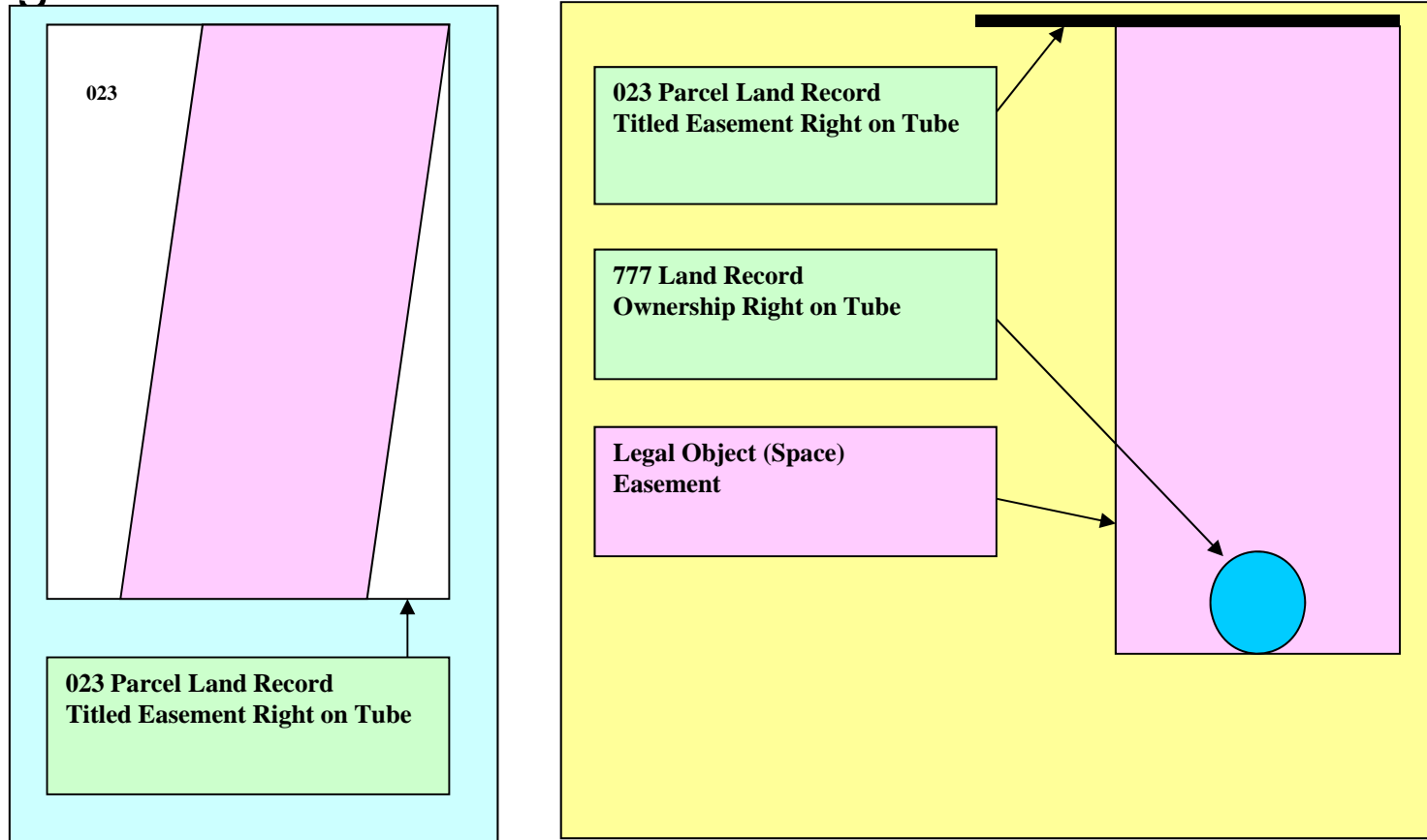
Unbounded (infinite) legal spaces in 3D Cadastre

# Facts on 3D Cadastre

- There is no real 3D Cadastre in the World
- Developments related to 3D Cadastre can be divided into 4 level:
  - 3D Cadastre Legal Framework
    - Very poor today
    - Must make distinction between 3D objects and their legal spaces
  - Initial Registration of 3D objects
    - Changing is needed from Area-based to Volumetric meaning
  - 3D Data Management
    - GIS systems are supporting 3D data, because the amount of 3D data have increased last years, but the real 3D data management (editing, analysing, modification, query) is poor in GIS
  - Displaying, Classification and Serving 3D objects

# 3D Cadastre Conception in Hungary

## Legal Issues

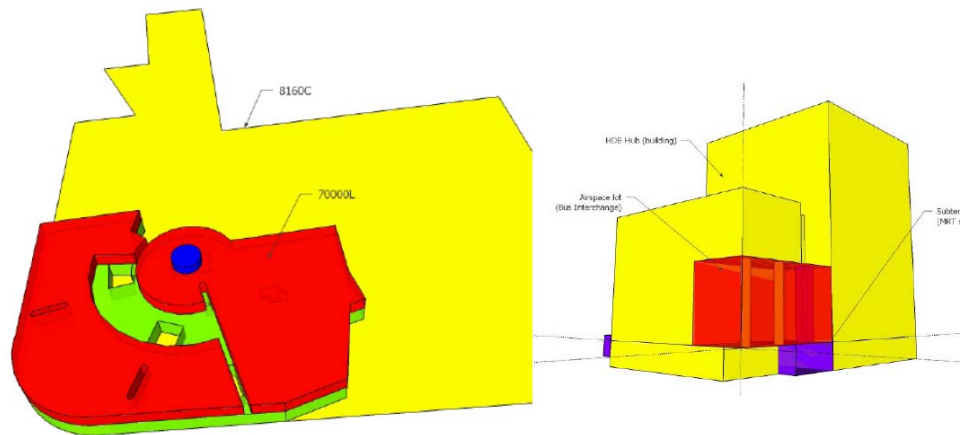


An Ownership Right on the Tube can generate and Easement on another Property?

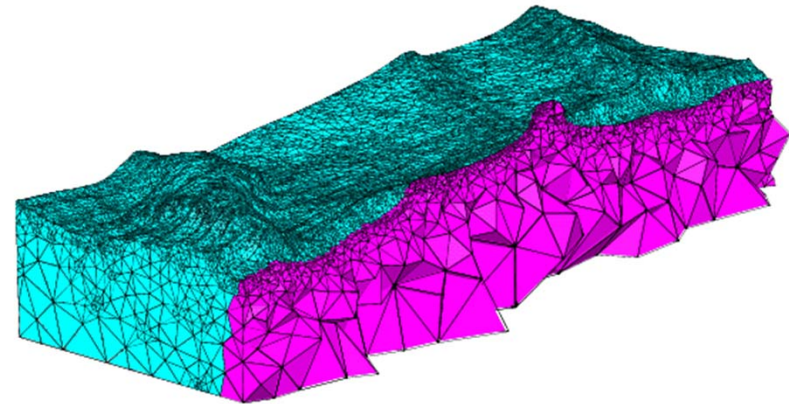
# 3D Cadastre Conception in Hungary

## Technical Issues

Vector solution (edges, 3D topology etc.) ?



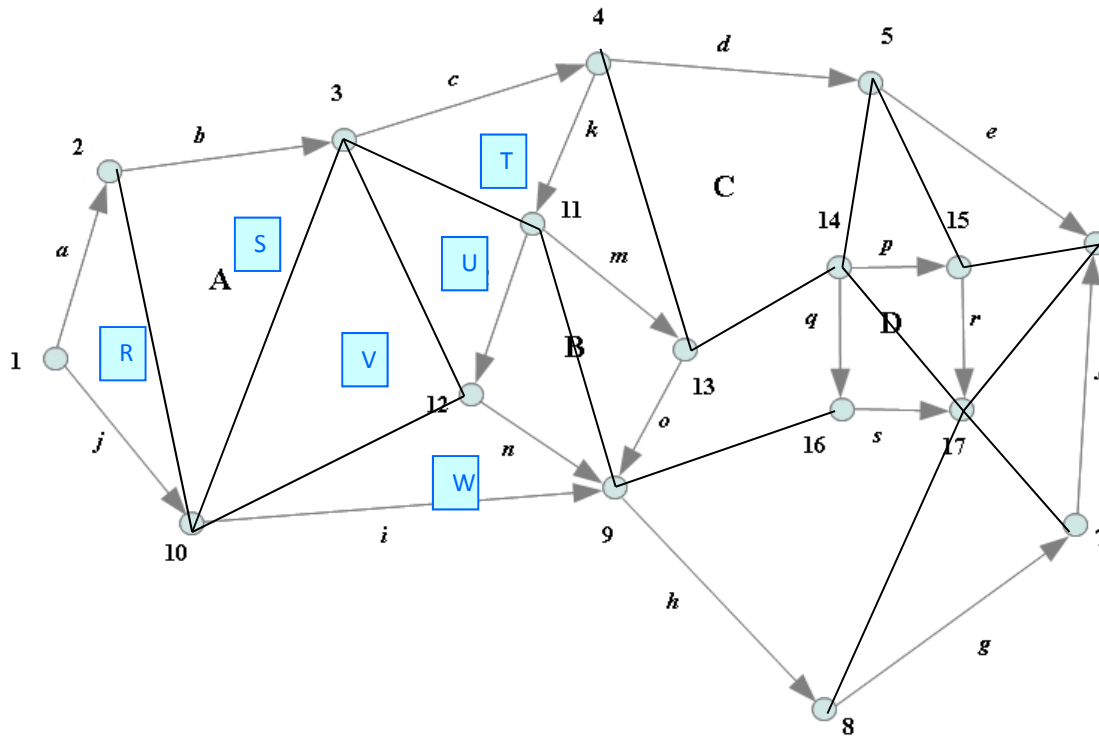
Tesselation ?





# 3D Cadastre Conception in Hungary

## Tessellation



Constrained Delaunay triangulation (in 3D decomposition of space to tetrahedral meshes)

Advantages:  
Optimal and unambiguous  
Automatizeable

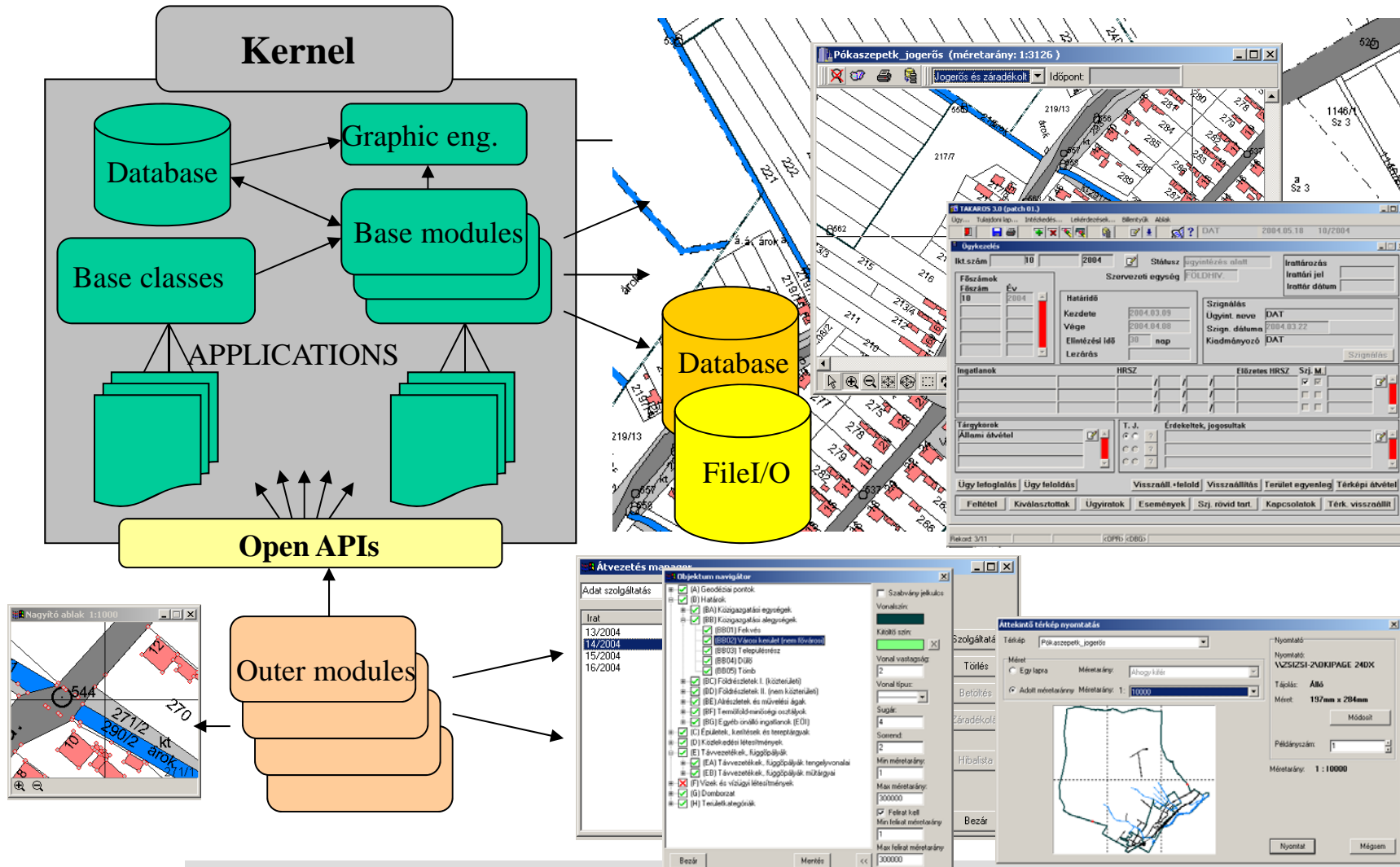
E.g.: Face „A” is a composition of R,S,T,U,V,W triangles

# 3D Cadastre Conception in Hungary

## Vector solution

- **Basis: MSZ 7772-1 Standard (Digital Base Map – Conceptual Model, DAT Standard) in Cadastral Domain since 1996 and DAT Guidelines since 1997**
- **DAT Standard contains 3D geometric primitives**
- **DAT Standard integrated with Land Record Data is the datamodel of operating IT system of Hungarian Land Administration (DATR)**
- **Extension of DAT Standard with special 3D geometric constructions (e.g. shell, space) is possible for solving 3D Cadastre problems**

# DATR Architecture



# DATR Characteristics

- DATR is an object-oriented integrated information system for the unified registry (both cadastral maps and legal part)
- DATR has developed by FÖMI en bloc (both professional and informatic side)
- DATR has open APIs for customization of the system
- DATR has interfaces for ORACLE and MySQL RDBMSs
- Customization of the system is very easy to any legal and technical environment
- DATR data model acts as a country profile for ISO 19152 Standard (LADM, Land Administration Domain Model, approved by ISO 1st November 2012)

# Conclusion

- Unified System is best environment to introduce 3D Cadastre
- Institutional changes are needed to operate 3D Cadastre
- New legislation on Hungarian Cadastre has established the opportunities for future development of a 3D Cadastre
- Modeling of 3D Cadastre geometric situations has not been solved yet completely in Hungary, but there are promising results



# Thank you for your kind attention

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