



## Massive Collection of Cadastral Data in Greece Using Web-enabled GIS Technologies

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## ABSTRACT

- ◆ Cadastre operates in Greece for the last seven years.
- ◆ The IT system was developed by the middle of 2002 where the first database system was actually established.
- ◆ The GIS system began to develop at the end of 2002 based on ArcGIS and ArcSDE 8.2.
- ◆ Many in-source applications were developed to provide all the necessary functionality.
- ◆ At the end of 2008 the Greek Cadastre collected about 6.5 million rights using custom made web based applications thus providing advanced services to users and contractors.

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## Data categories of Greek Cadastre

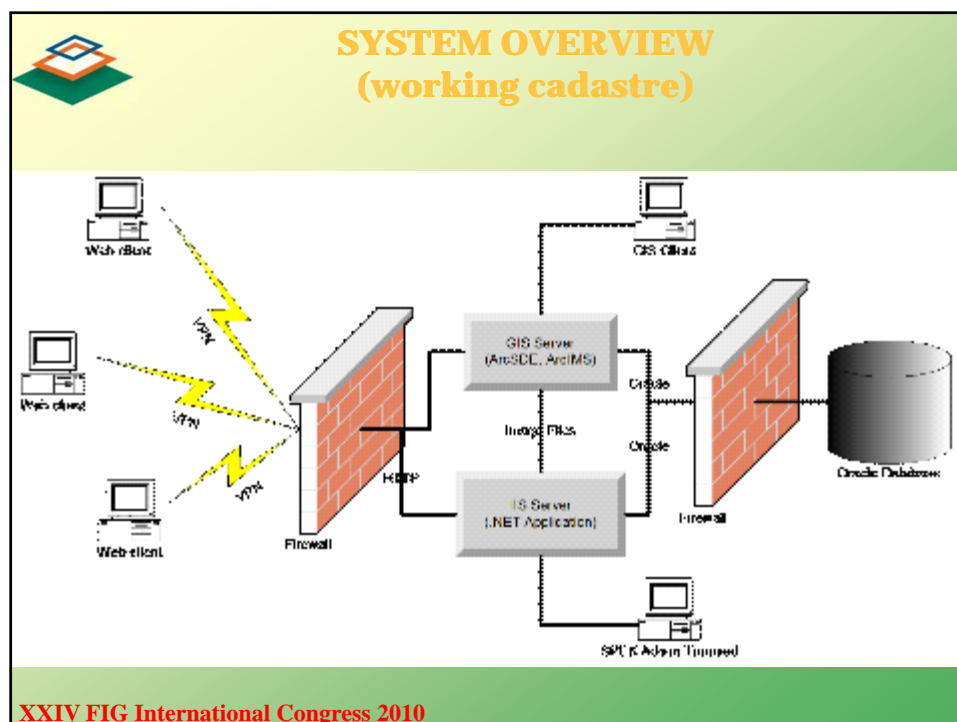
Descriptive data

- ◆ Registrable rights
- ◆ Beneficiaries
- ◆ Legal deeds
- ◆ Applications

Spatial data

- ◆ Municipality Boundaries
- ◆ Land parcels
- ◆ Buildings
- ◆ Mines
- ◆ Exclusive use areas
- ◆ Easements
- ◆ Orthophotographs
- ◆ Digital terrain models
- ◆ Survey maps

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## GIS (working cadastre)

- ◆ GIS and descriptive database systems were developed separately.
- ◆ Both kinds of data are stored and handled by the same database, which is ORACLE 9.2.
- ◆ GIS uses ESRI'S ArcGIS 8.2, ArcSDE 8.2 and ArcIMS 4.01.
- ◆ All Data are stored and handled according to which municipality they belong to.
- ◆ Restrictions and rules apply to each different dataset, all of which are handled by applications developed in house.


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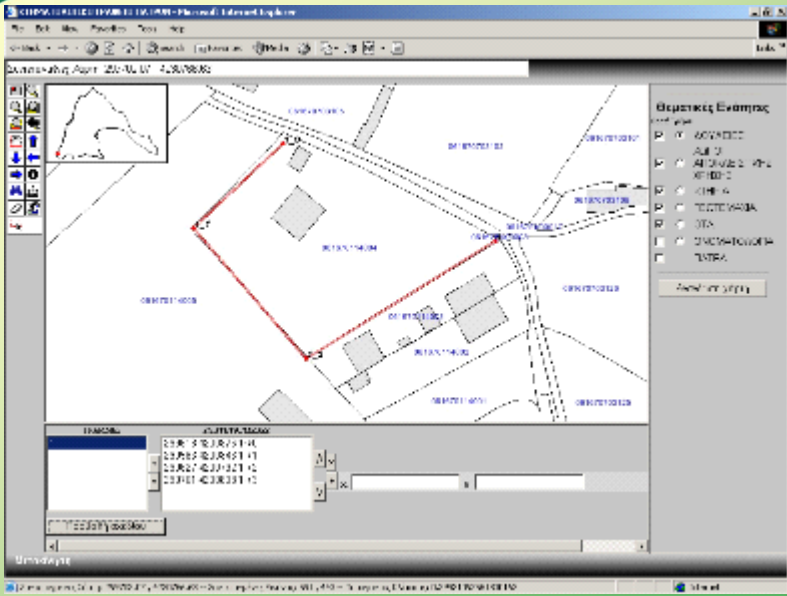


## SOFTWARE APPLICATIONS (working cadastre)


- ◆ All the software developed in-house can be categorized into the following general categories:
  - Quality control software
  - Data Loading software
  - Data management and editing software
  - Product Creation software
  - Internet Software

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 **WEB APPLICATION (working cadastre)**



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 **COLLECTION OF NEW DECLARATIONS (2008)**

- ◆ Scope of project was the collection of citizen's rights along with a point that would indicate their property's position on map
- ◆ There were several procurements in order to assign contracts that would cover 107 municipalities of Greece.
- ◆ The contractor used software developed by Ktimatologio S.A. to both enter the deed information and pinpoint the property on map.
- ◆ The software run at the declaration offices located all over Greece
- ◆ Concurrent users of declaration offices reached 2.500 at peak times

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## COLLECTION OF NEW DECLARATIONS

- ◆ There were mechanisms to allow offline entering of information in case of network failure
- ◆ Internet site was also developed to allow citizens to declare their properties without being obliged to visit a cadastral office.
- ◆ All the data were entered into a central live system.

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## COLLECTION OF NEW DECLARATIONS

### **Supply of powerful IT infrastructure:**

- ◆ Primary Site (availability 99.99%)
  - ◆ Lampertz Data Center
  - ◆ 50 Application servers (4-core Xeon@3 GHz,8-16 GByte Memory)
  - ◆ 12 database servers (8-core itaniumII 1.6GHz, 32 GByte Memory, one 8-node RAC and two 2-node RAC)
  - ◆ 120TB STORAGE SYSTEM
  - ◆ Sophisticated Network Equipment
  - ◆ Application Firewall
- ◆ Disaster Recovery Center (availability 99.999%)
  - ◆ Similar architecture running at half computing power
- ◆ Complex network connecting 100 points in Greece

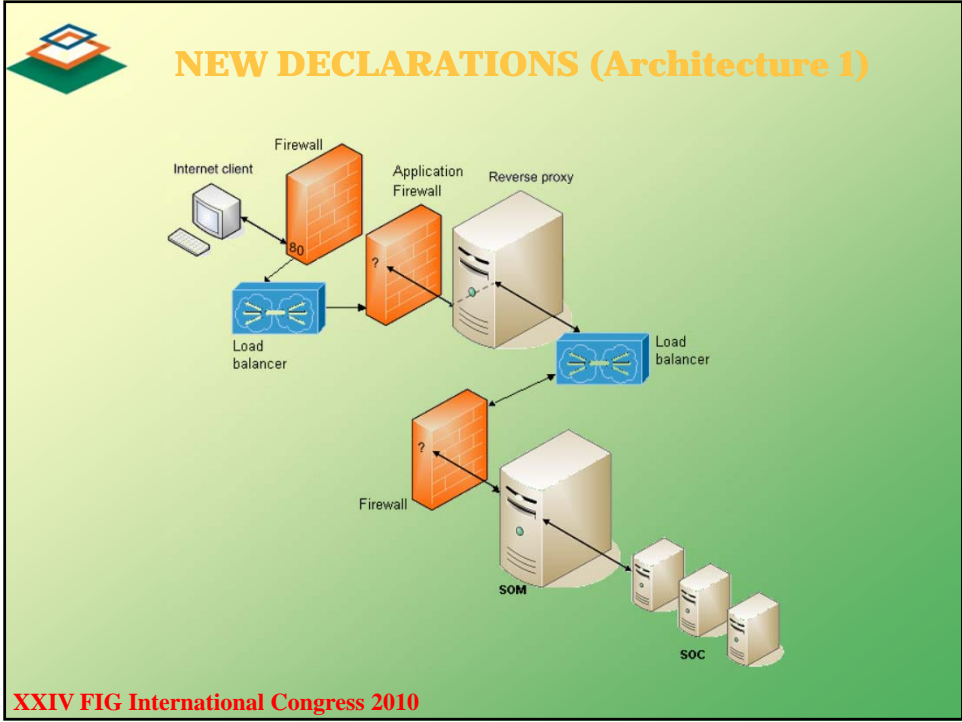
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## NEW DECLARATIONS (Architecture 1)


- ◆ Two different subsystems were created. One for the **GIS** and one for the **descriptive** information.
- ◆ The users only used one software regardless of the breakdown that was applied in the architecture
- ◆ The two subsystems were communicating in both database and application levels.

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## NEW DECLARATIONS (Architecture 2- Cadastre Declaration Offices (CDO))



- There were more than 2.500 users at the CDO
- There were CDO with more than 100 users
- In some cases the bandwidth could not exceed 64KBit per client for both GIS and descriptive data
- The client should be able to display an orthophotograph along with the road axes so that the citizen could locate his property

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## NEW DECLARATIONS

- ◆ The orthophotographs could not be handed out to the CDO because of various copyright and legal issues
- ◆ Bandwidth was not enough for over the Internet transfer of base map pictures to the clients
- ◆ Speed was essential for the every day running of the CDO because there were thousands of people waiting to declare their property
- ◆ The CDO needed to use their own spatial data as layers onto the base map.

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## NEW DECLARATIONS

- ◆ For all of the above reasons KTIMATOLOGIO developed it's own GIS client (KMGIS) from scratch based on C++ and .NET technology.
- ◆ The base maps were delivered to the CDO in an encrypted and compressed form that could only be read by KMGIS
- ◆ KMGIS needed to logon to the central system, take a dynamically created decryption key and use that to decrypt the base map.
- ◆ KMGIS consumed custom made web services based on ArcGIS server in order to search, geocode, input and edit data etc.

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## NEW DECLARATIONS

- ◆ KMGIS had support for custom made geo-databases (ACCESS,SQL SERVER,ORACLE) on which the contractors could load their own spatial data, display and query them in KMGIS.DXF was also supported.
- ◆ KMGIS created and maintained all necessary information on the database.

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**NEW DECLARATIONS (KTRGIS)**

The screenshot displays the KTRGIS software interface. At the top, there is a menu bar with options like 'FILE', 'EDIT', 'VIEW', 'DATA', 'HELP', 'ABOUT', 'HELP', 'ABOUT', 'HELP'. Below the menu bar, there are several input fields and buttons. A list of declarations is visible, including 'KTRGIS', 'KTRGIS', 'KTRGIS', 'KTRGIS', 'KTRGIS', 'KTRGIS', 'KTRGIS', 'KTRGIS', 'KTRGIS', 'KTRGIS'. The main window shows a 3D aerial view of a city street with a yellow line indicating a declaration boundary. A red box highlights a specific area on the street. The text 'KTRGIS' is overlaid on the image in a large, stylized font.

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## NEW DECLARATIONS (INTERNET)

- ◆ Declaration of property was also supported over the Internet for every citizen.
- ◆ The user should first register with a username and password
- ◆ The deeds that accompanied the declarations, could be sent via either Post mail or be uploaded via the web site.
- ◆ The users could locate their property on to a map that provided geocoding, street name and point of interest searching capabilities.

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## NEW DECLARATIONS (INTERNET)

The screenshot displays a web application interface for property declarations. The interface is divided into several sections:

- Header:** Contains navigation links such as 'HOME', 'ABOUT US', 'CONTACT US', 'FAQ', 'SERVICES', 'REGISTER', 'DECLARATION', 'DECLARATION HISTORY', 'DECLARATION STATUS', 'DECLARATION HISTORY', 'DECLARATION STATUS', and 'DECLARATION HISTORY'.
- Main Content Area:** Features a satellite map of a city street grid. The map shows several streets with yellow labels and red lines indicating property boundaries. The map is titled 'DECLARATION HISTORY'.
- Search Bar:** Located below the map, it contains the text 'SEARCH FOR YOUR PROPERTY' and a search button.
- Sidebar:** Contains a search bar and a list of links including 'Request', 'Information', 'Registration', 'Data Transfer', and 'Help'.

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## NEW DECLARATIONS (INTERNET)

- ◆ Security was a big concern
- ◆ The system was online with the central database but there were several steps in order to access it.
- ◆ For example the GIS website did not have access to the database but to another web service only available to local LAN that exposed all the necessary functions.

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## NEW DECLARATIONS (INTERNET)

- ◆ More than 140.000 rights were declared over the Internet
- ◆ 20.000 were from citizens that lived abroad
- ◆ The site will continue to support the second phase of the project which includes the actual parcel creation.

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## Current and Future Plans

- ◆ KTIMATOLOGIO already develops stand alone software with full editing and viewing functionality that would allow access to it's encrypted basemap and ArcGIS server based services.
- ◆ Addon for commercial GIS software (ESRI, AUTODESK and COM interfaces) has being developed in order to provide access to base map and services

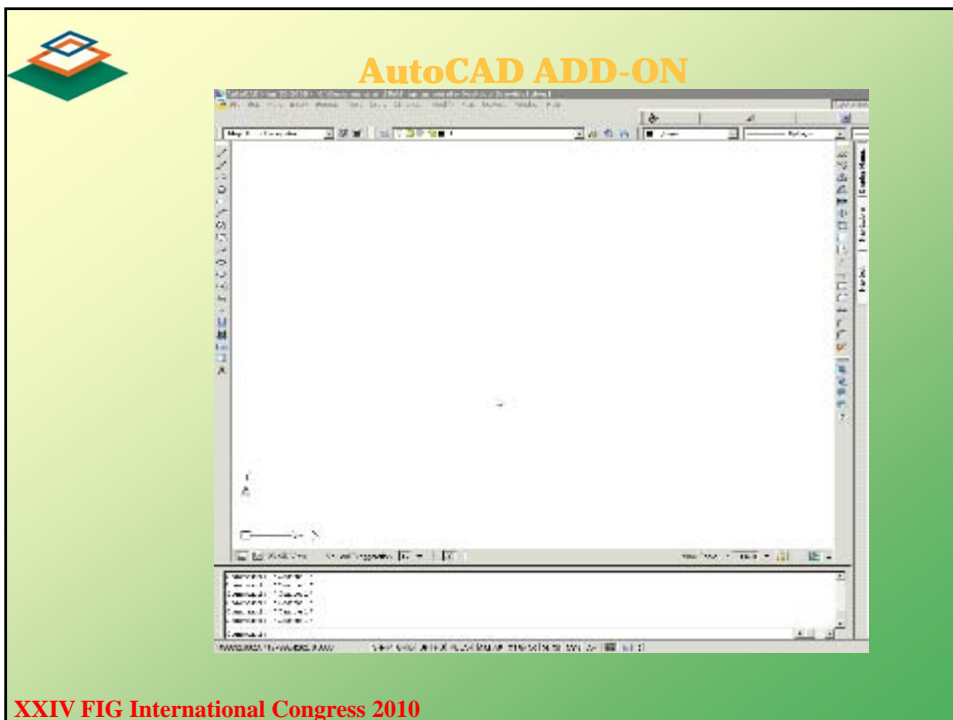
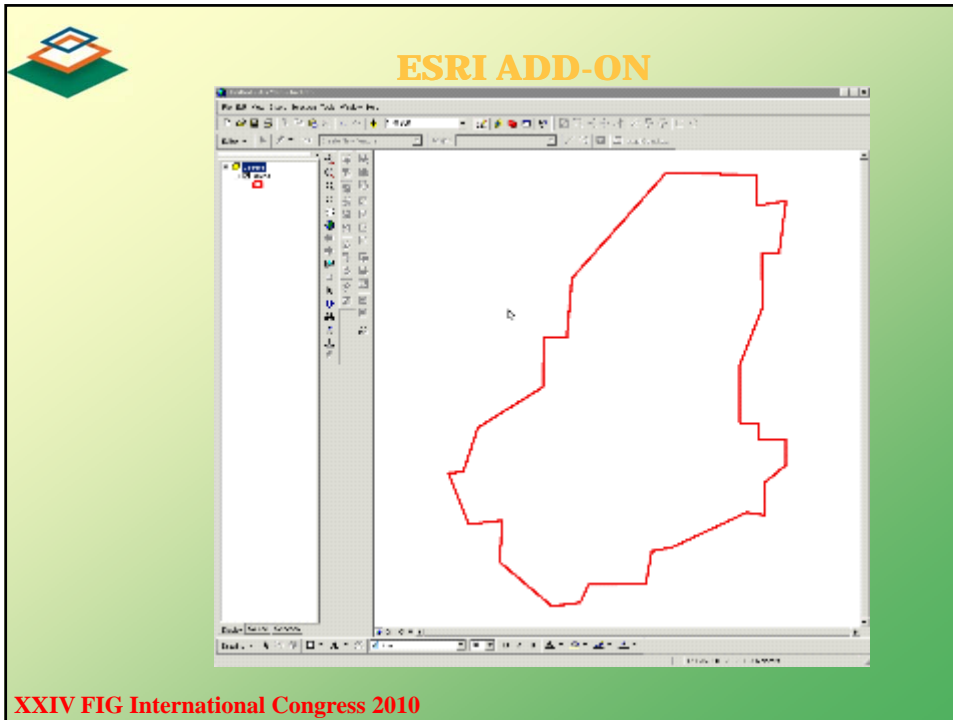
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## STANDALONE APPLICATION



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