VITALISING ICT RELEVANCE IN AGRICULTURAL LEARNING

Location Intelligence and Trends in Geographic Information Systems: Use Cases from BiH

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VIRAL

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- Examples of integration with information systems
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Who am I to talk you about GIS?

- Professor at Faculty of Electrical Engineering, University of Sarajevo in Computer Science and Informatics.
- CTO and one of founders of GAUSS GeoInformation Systems Tuzla.
- Lead Researcher at Center for Geospatial Research Sarajevo.
- Member of organization:
  - IEEE - Institute of Electrical and Electronics Engineers
    - IEEE Computer Society
    - IEEE Geoscience & Remote Sensing Society (GRSS)
  - AIS Association for Information Systems
    - AIS SIGs: Geographic Information Systems (SIGGIS)
  - Association for Computing Machinery (ACM)
    - ACM SIGSPATIAL - Special Interest Group on Spatial Information

- Company: GAUSS d.o.o. Tuzla
  - Started in 1999.
  - Staff (20+) geodesy, informatics, geography, economy and technology
- Business:
  - Data Provider (Photogrammetry, LiDAR, Terestrial Survey, GNSS)
  - Application Developer (DesktopGIS, MobileGIS, WebGIS)
  - System Integrator (Corporative Solutions, Data Migration, Multi-Layers System Integration)
  - Training Provider (GIS, ORDBMS, GNSS)
- Partners:

precisely ORACLE Microsoft SPECTRA GEOSPATIAL OSGeo

- Solutions:

WebCity Inteligentna uprava | gauss WebPresenter | gauss UrbanPlanner | gauss LUPIS | gauss DocumentPlanner

- Center for Geospatial Research Sarajevo

GIS Center
Center for Geospatial Research Sarajevo

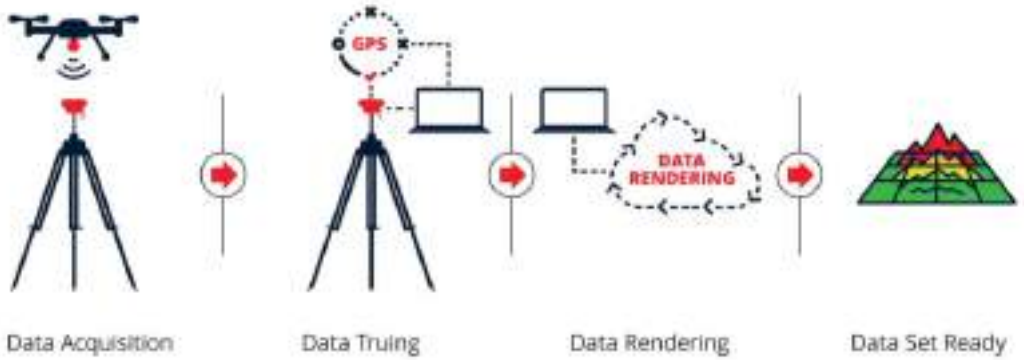
- Founded in 2011.
- 3 employed PhDs and 20+ external PhDs experts in Spatial Data from different fields
- Activities:
  - R&D cooperation with academic community and research institutions
    - Universities in Sarajevo, Tuzla, Burch International University
    - BH Academy of Sciences and Arts
    - International: Croatia, Slovenia, Serbia, Austria, Germany, Holland
  - First private research/development institute registered/recognized by BH Research Institution database
  - Conferences, forums and workshops ...
  - Full partner on ERASMUS+ project: GEOBIZ: www.geobiz.eu

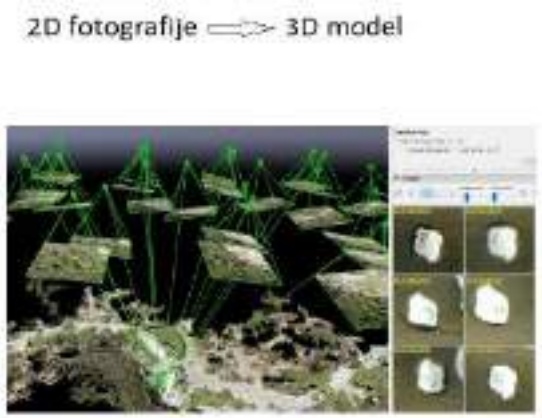
Spatial Data

- Administrative spatial units up to the level of the boundaries of inhabited places.
- Basic infrastructure to street level and important facilities.
- Natural characteristics (soil types, vegetation, climate, precipitation, forest mask, rivers, etc.)
- Demographic data up to the level of populated places (by age groups, types of households, etc.)
- Important objects and points of interest
- 3D models of cities, city street maps and other thematic data
- Open Linked Data, by government, satelite images provider, international vendors, ...

Fieldworks

- **Data Acquisition**
  - Base station setup and activation
  - Flight and shooting
- **Data Truing**
  - RTK or
  - Post-processing synchronization
- **Data rendering**
  - Creating point clouds
- **Data Set Ready**
  - Preparation of LIDAR point clouds in GIS





MobileMapper 60

SP20

Phantom 4 Pro RTK

P4 Multispectral

Matrice 210 RTK V2

dji ENTERPRISE

SP60 GNSS RECEIVER

Trimble RTX

SPECTRA GEOSPATIAL

ZEB Revo RT

ZEB Horizon

ZEB Discovery

GEO SLAM

Point cloud

Point cloud

Digital surface model

Digital elevation model (DEM

Ortophoto

Online examples

www.map.fipa.gov.ba – FIPA - Agencija za unapređenje stranih investicija u BiH

www.gis.fzs.gov.ba – Federalni zavod za statistiku

www.mostargis.ba – Grad Mostar

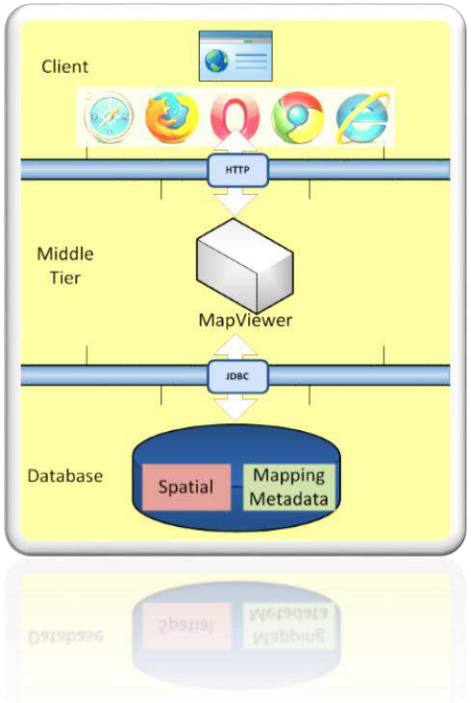
GeoPortal: GAUSS WebPresenter

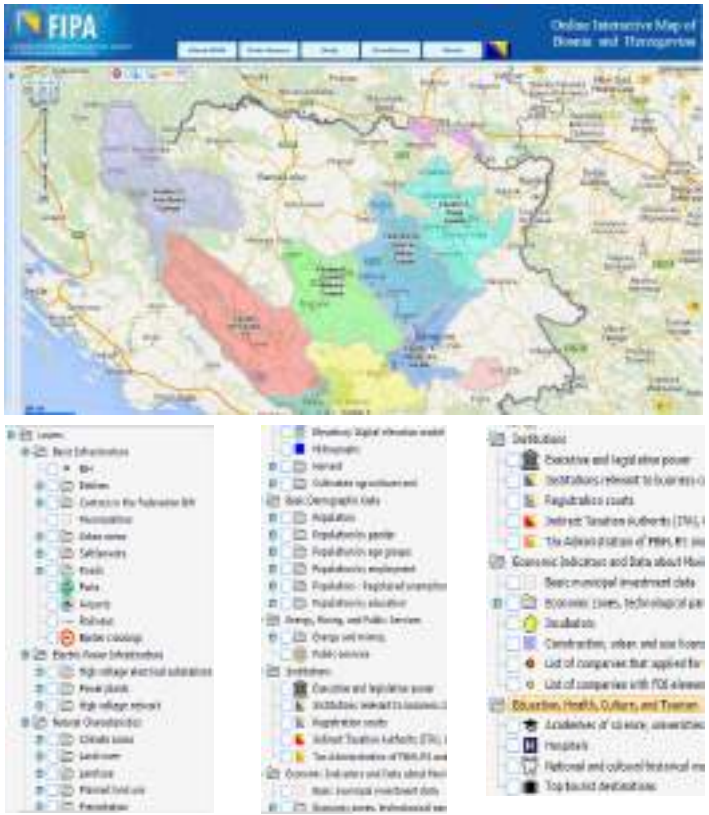
www.map.fipa.gov.ba

Geoportal as Interface for DW and BIS

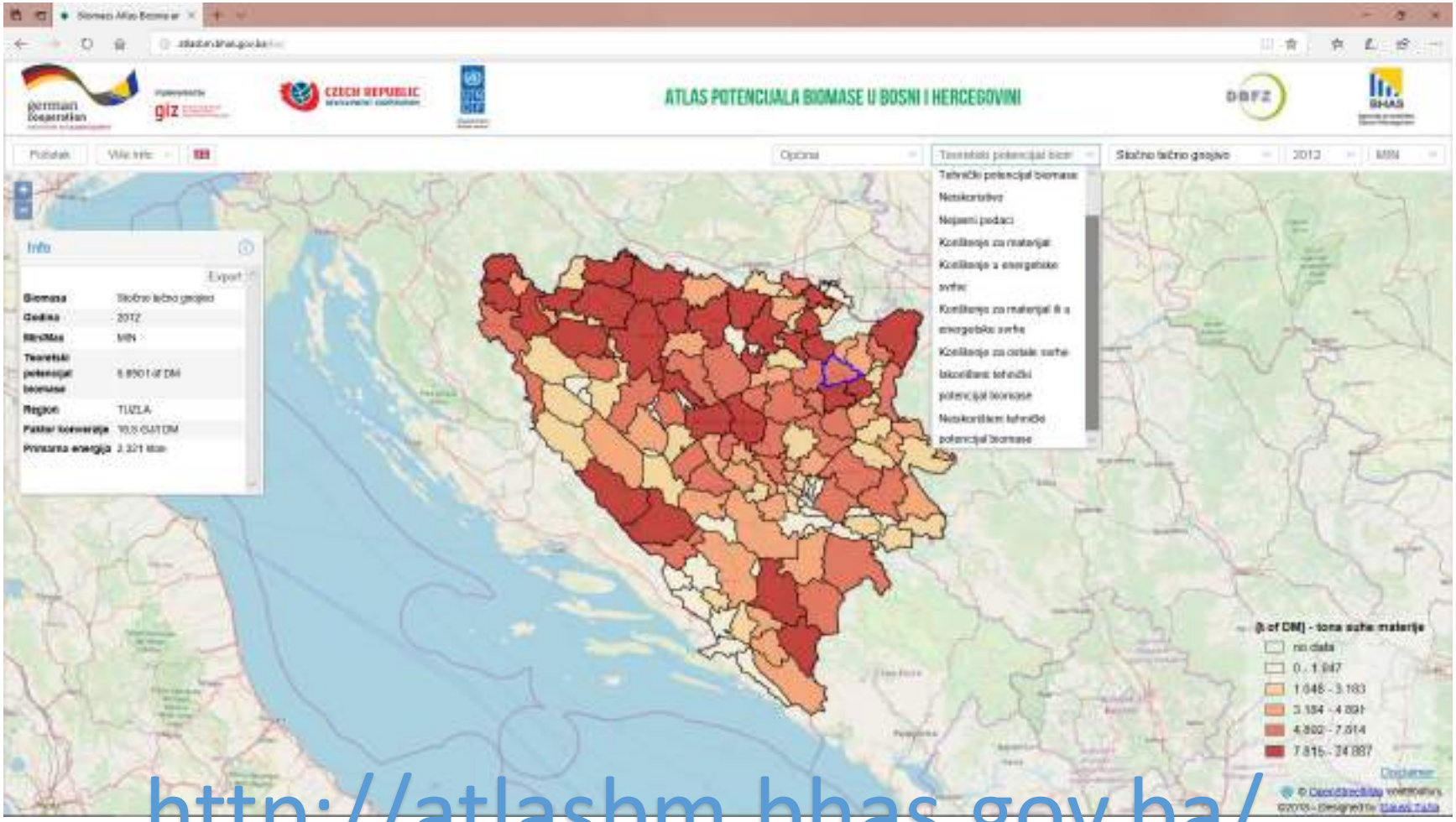
The primary purpose of the geoportal is distribution and visualization of spatial data over the Internet, but its interactive capabilities could bring its functionality far beyond.

- more organized data structure,
- better integration of disparate data,
- new spatially enabled analysis,
- reduced decision cycle time and
- improved decisions.





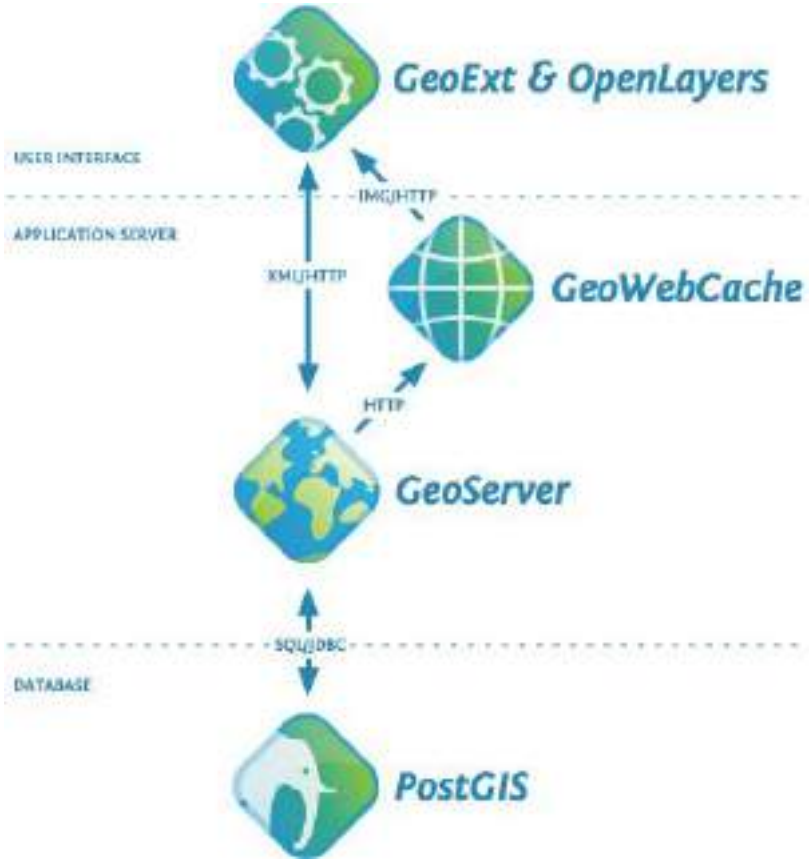
Biomass Atlas BiH



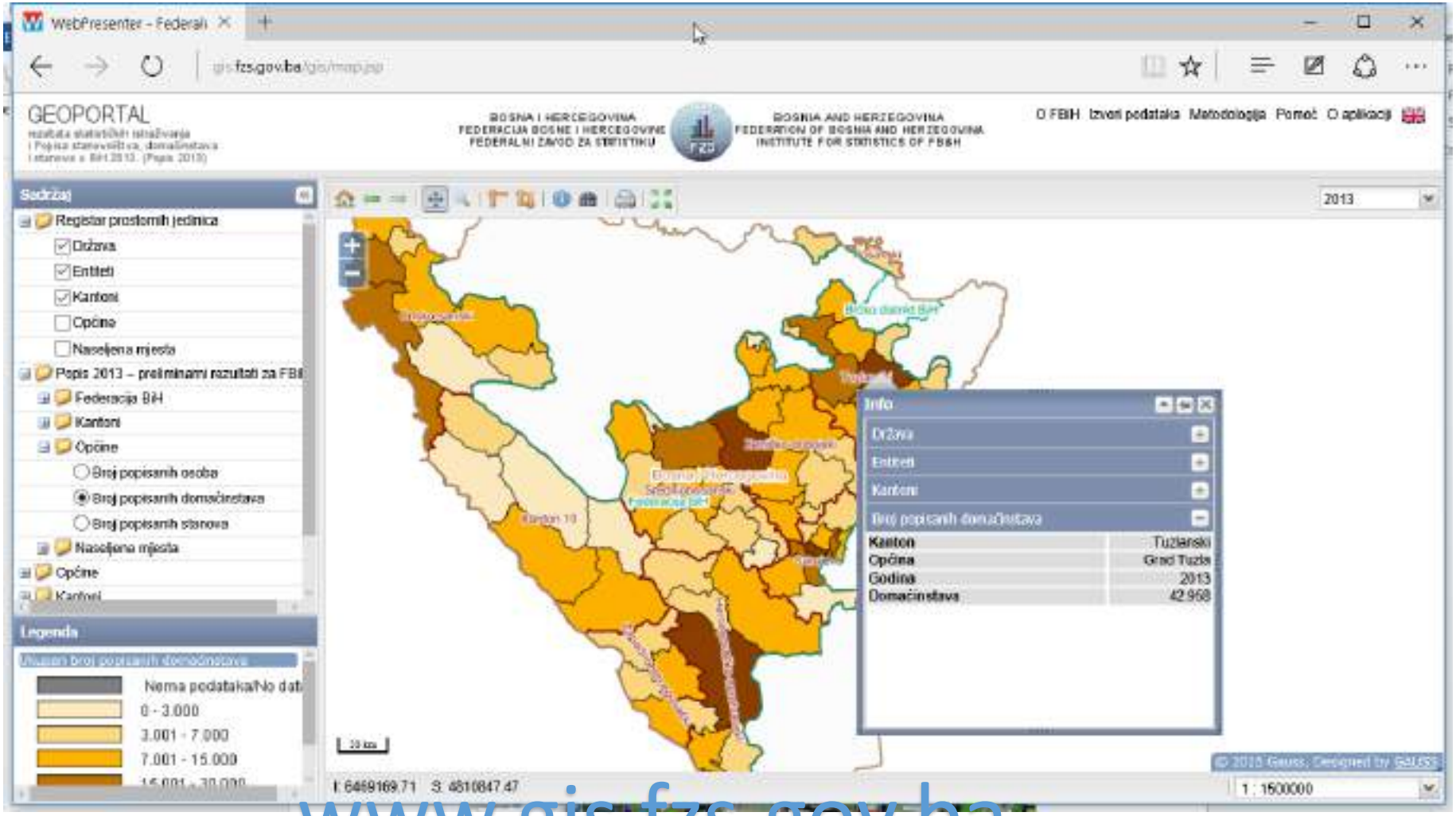
http://atlasbm.bhas.gov.ba/

OSS tehnology

- royalty free (re)use of software,
- access to the source code for audit and modification, and
- redistribute the software with no additional costs.



GeoPortal for statistics and census



www.gis.fzs.gov.ba

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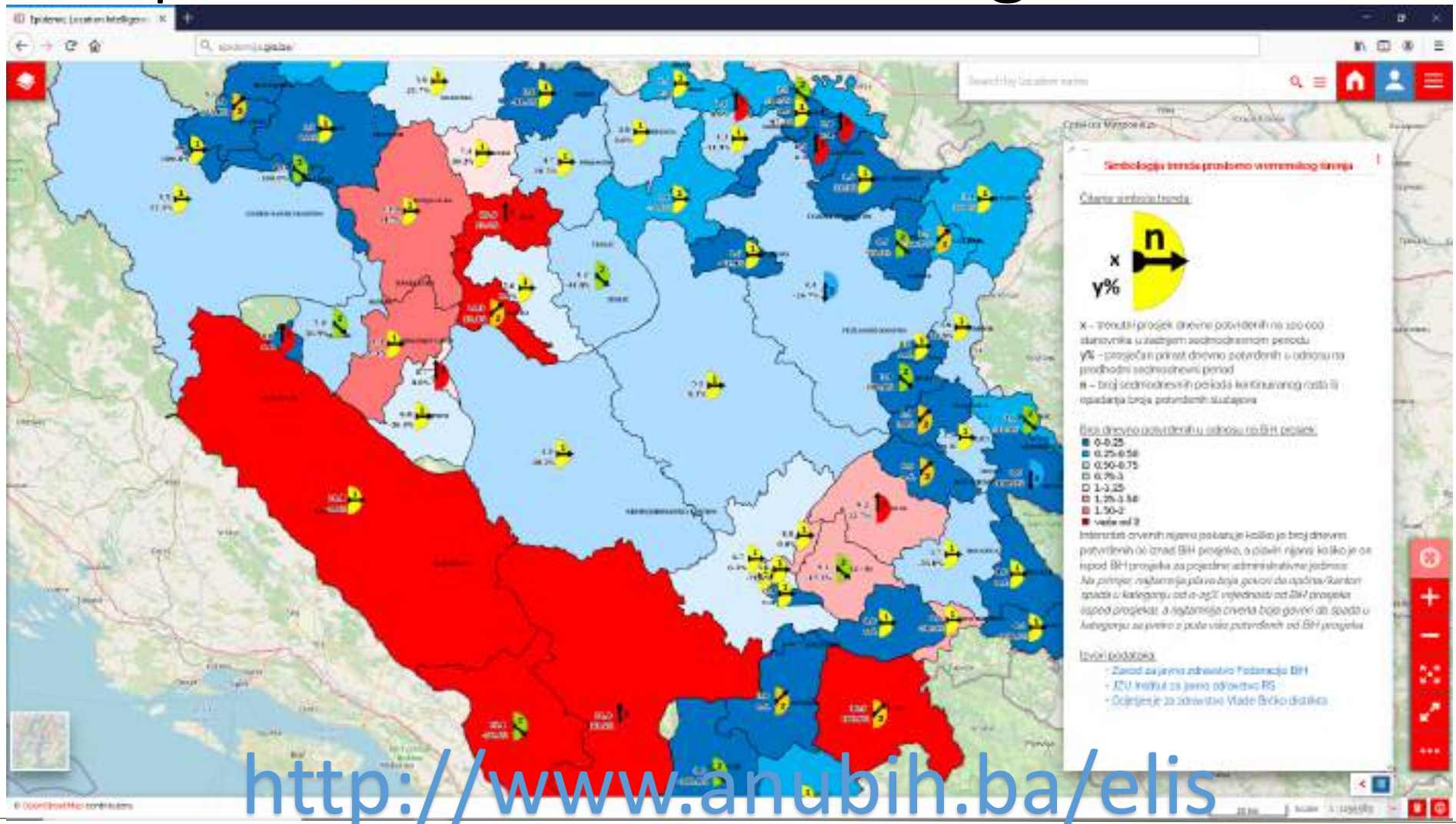
Sarajevo Canton Planning Institute

http://gispp.ks.gov.ba/webcity

GeoPortal of City Mostar

www.mostargis.ba

Epidemic Location Intelligence



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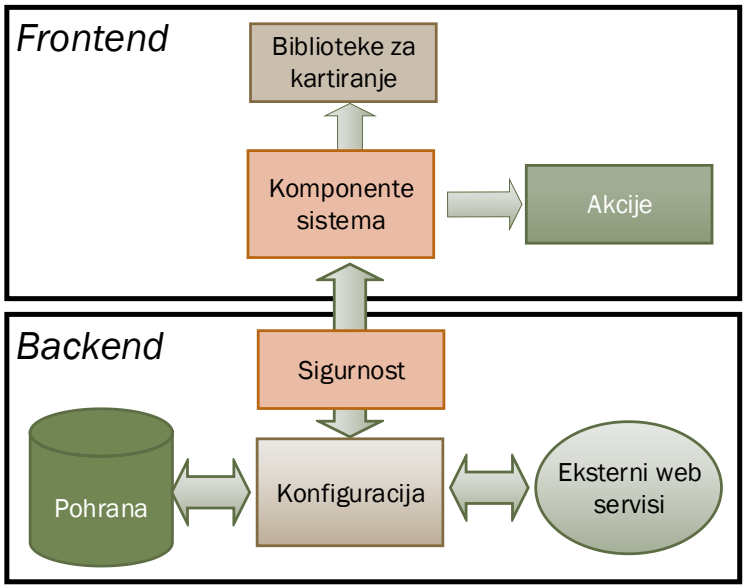
Epidemic Location Intelligence System BiH (ELIS)

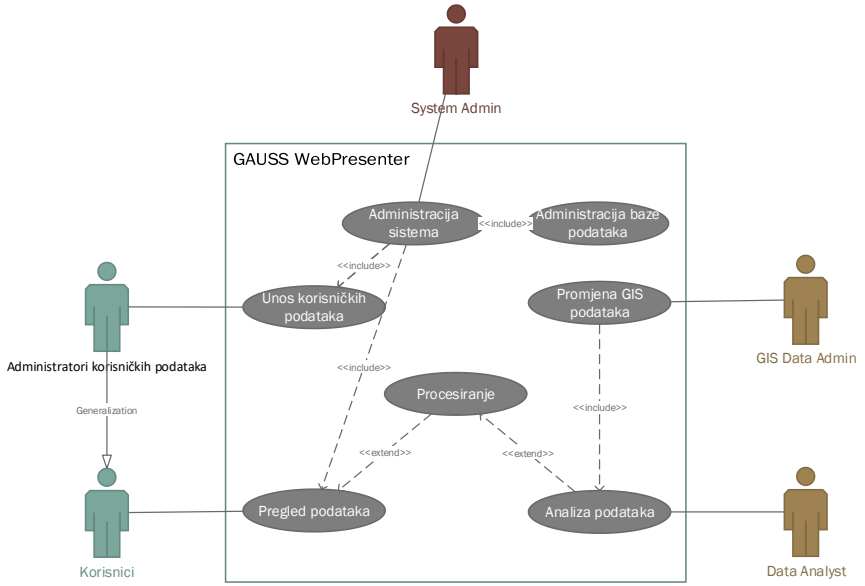
The main purpose of the Web portal is the presentation of spatial data to end users

The system is based on modern design principles and service-oriented architecture (SOA), so it allows complete separation of backend and frontend.

No limit on the number of system users, database layers and groups of layers on maps.

Responsive design, works on PC, tablet or mobile phone





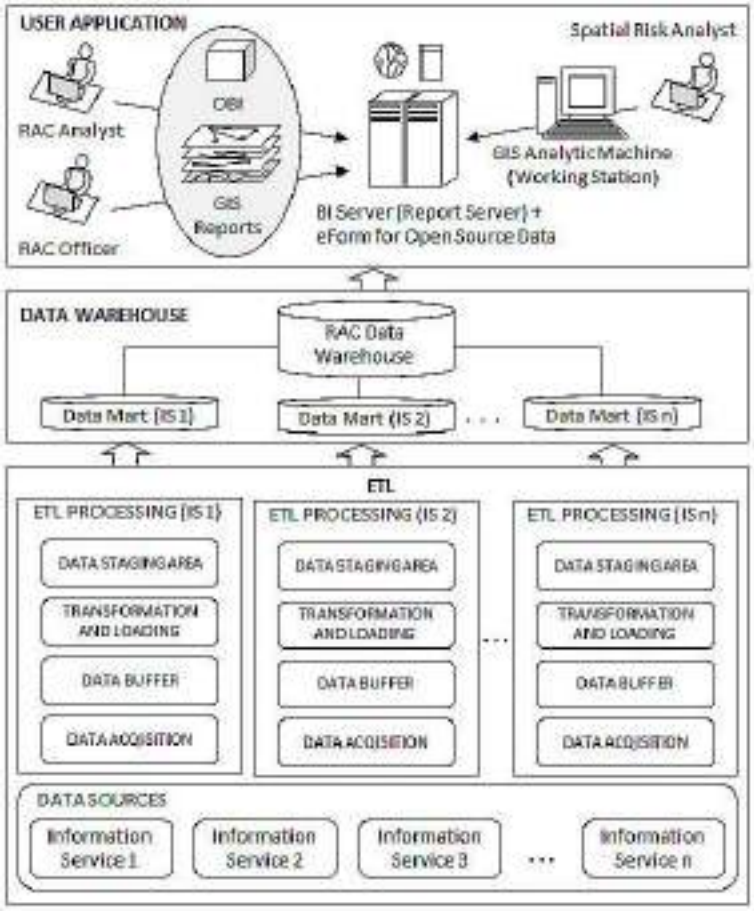
Examples of integration with information systems

Joint Risk Analysis Center (JRAC)

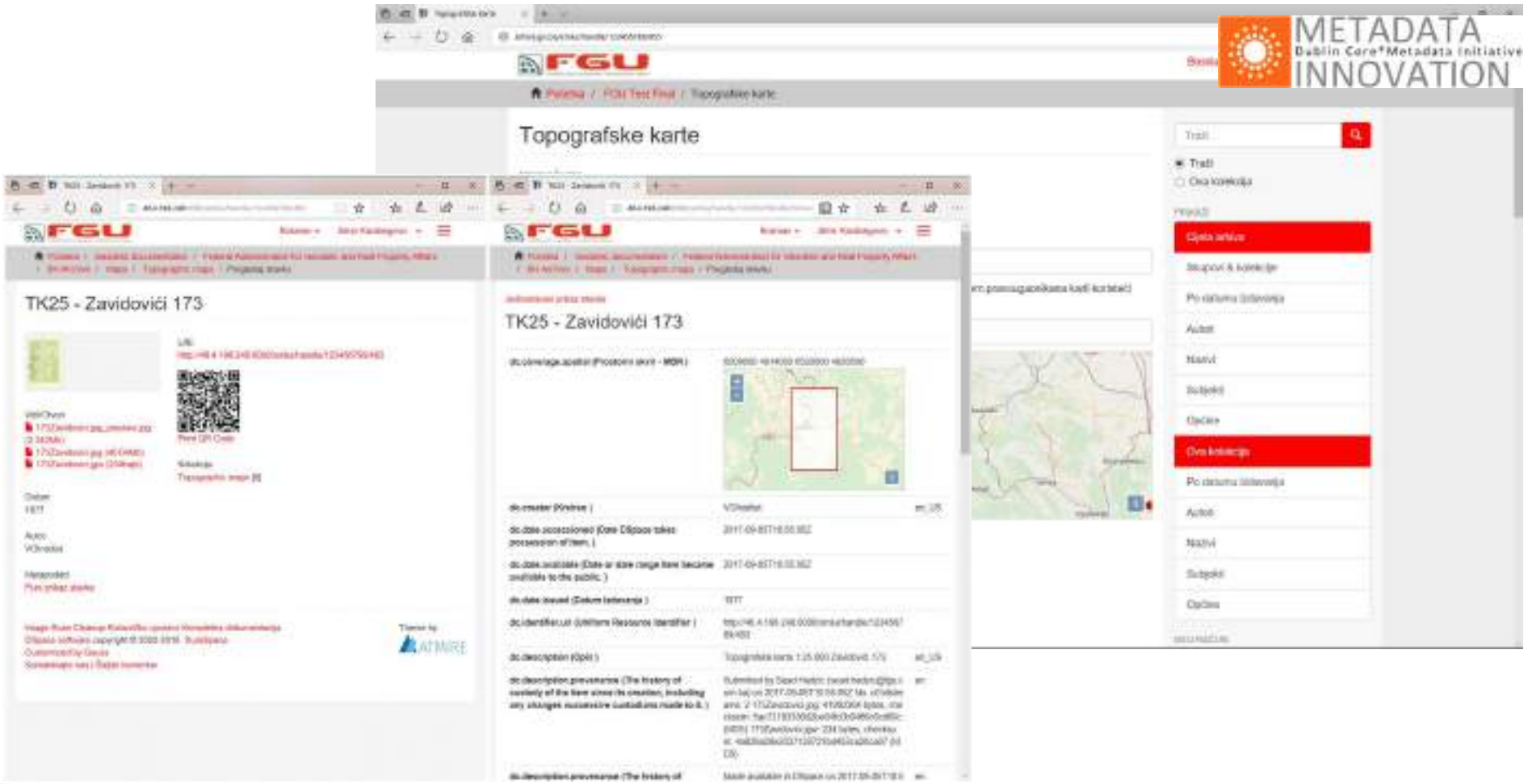
Spatial Component in BIS for Risk Analysis Architecture

Data warehouse (DWH) stores large amount of data and considers load strategy involving:

- extracting data from data sources,
- moving it into data warehouse structures,
- structuring the data for analysis purposes, and
- moving it into reporting structures (data marts).



IT System Digital Archive



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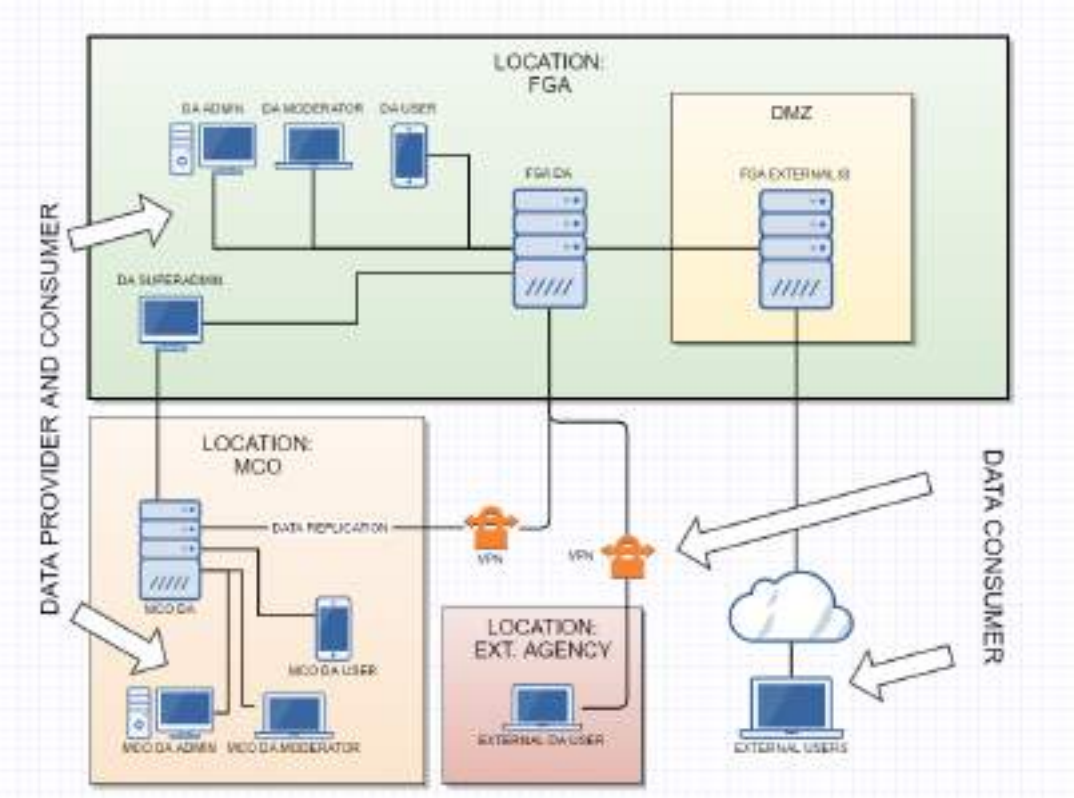
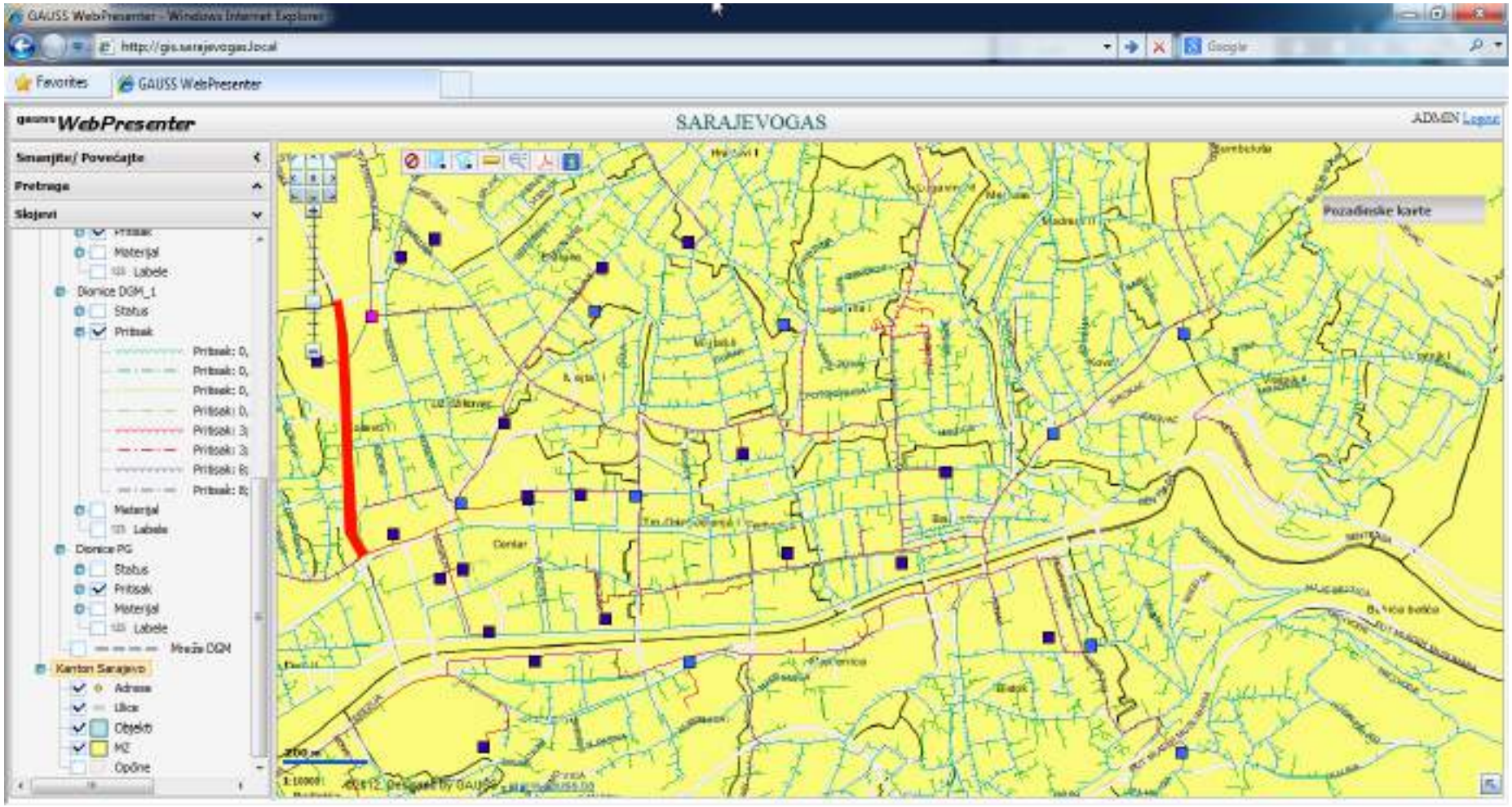
Digital Archive Saystem Architecture

- The system conforming to OAIS framework.
- Dublin Core metadata encoding
- SOA integration and interoperability
- Web services (REST API)
- The system use only OSS
- Distributed System support storing of content in multiple formats



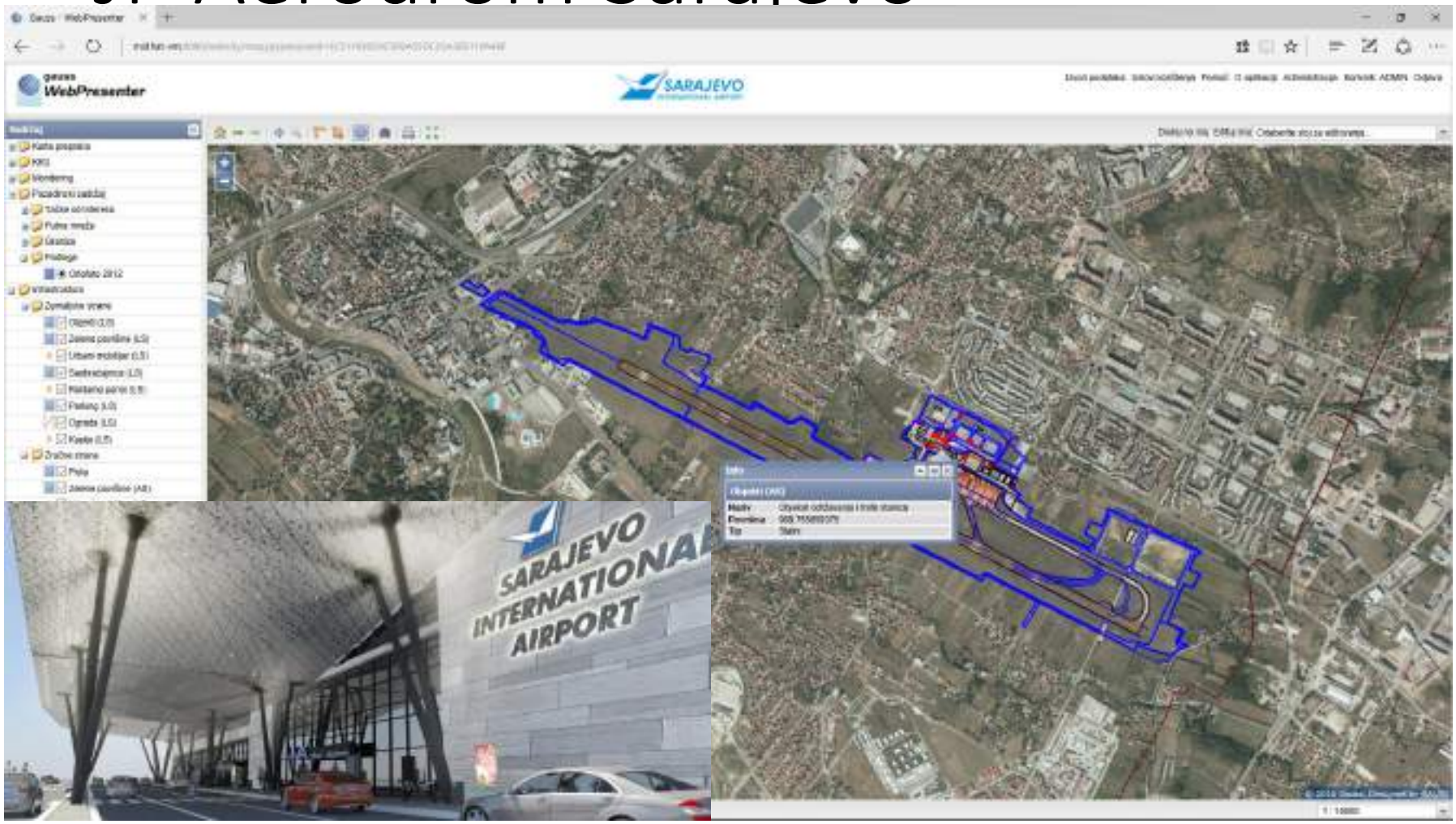
Integration with Technical Database



GIS with Technical Database and SCADA

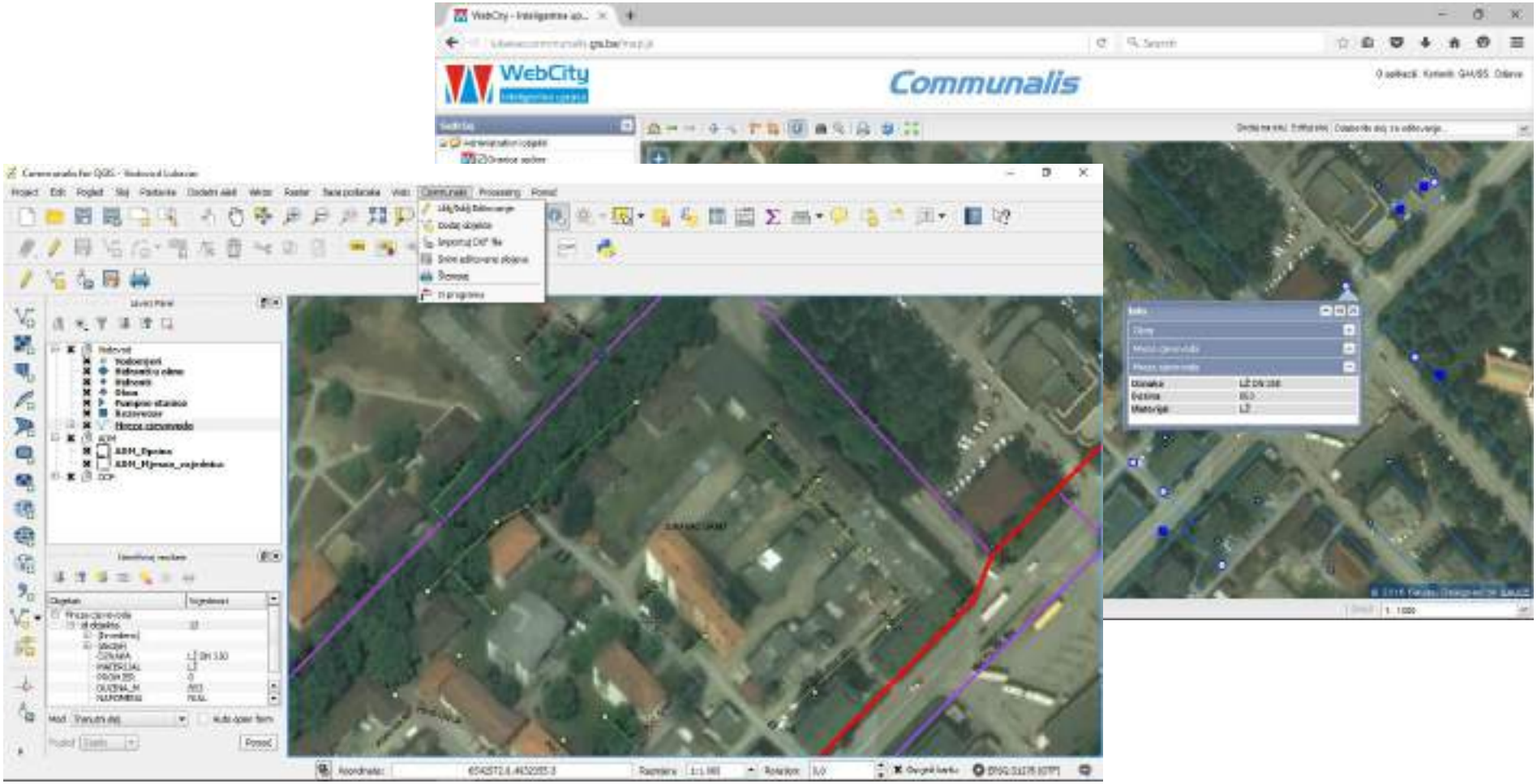
- GeoPortal is integrated with technical database, process control systems for connecting customers and damage statistics
- GANIS Gas Network Information System
- SAGAS data model based on DVGW (German Technical and Scientific Association for Gas and Water)
- www.sarajevogas.ba

JP Aerodrom Sarajevo

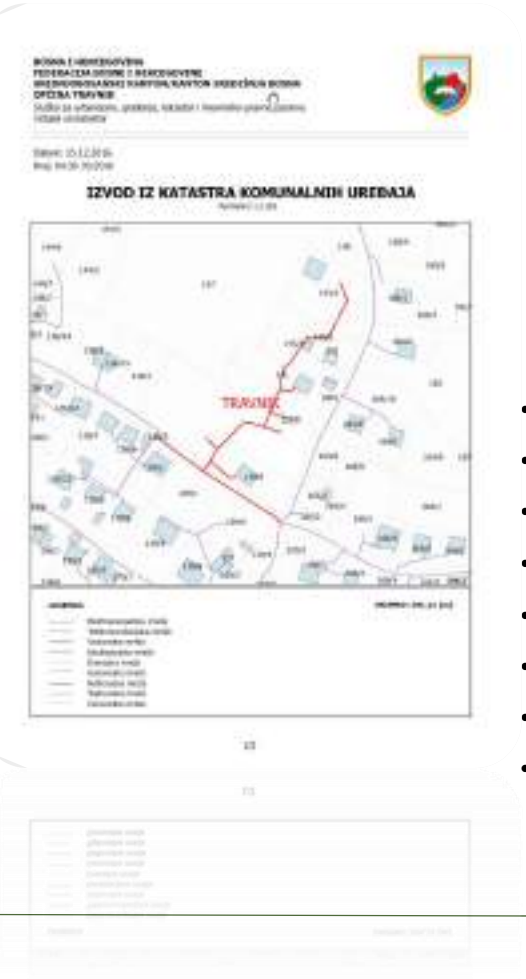


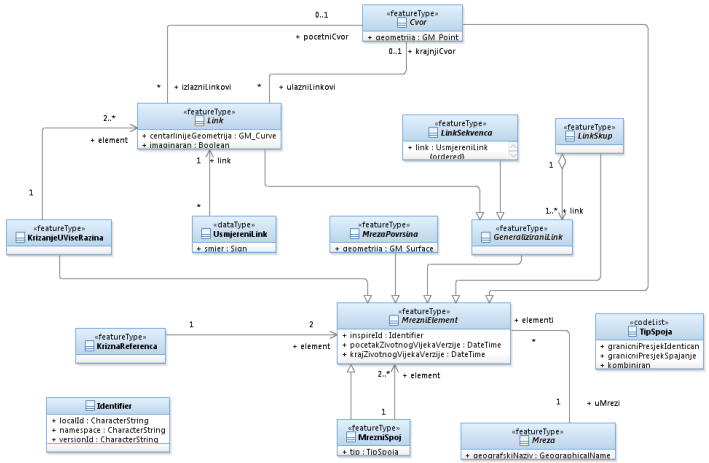
CLOUD EXAMPLES

GAUSS CommunalIS SaaS



Public Utility Data Model





- ISO/TS 19103: Geo. Information – Conceptual schema language
- ISO/TS 19107: Geo. Information – Spatial schema
- ISO/TS 19108: Geo. Information – Temporal schema
- ISO 19109: Geo. Information – Rules for application schema
- ISO/TS 19112: Geo. Information – Spatial referencing
- ISO/IEC 19501, Open Distributed Processing – UML
- INSPIRE Generic Conceptual Model
- INSPIRE Generic Network Mode

Conclusion

- Spatial data are available
  - Public and commercial
- GIS software is available
  - Open-source or commercial
- Field equipment is available
  - GPS, LiDAR, Drone
- GIS knowledge are present
  - IT companies and GIS experts
- Cloud computing is affordable
  - Subscription model vs big capital investment

Willing to help in:

- *academic curiosity,*
- *research idea, and/or*
- *commercial project*

Thank you !

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