

Enhancing Cadastral Land Information System Towards SOA in Republic of Kosovo

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Key words: Service Oriented Architecture, NSDI, KCLIS, Kosovo

SUMMARY

A land information system gives support to land management by providing information about the land, the resources upon it and the improvements made to it. The operation of this system includes the acquisition, data collection, processing, storage and its maintenance, which afterwards will facilitate the retrieval, analysis and dissemination of this information.

Kosovo Cadastral Agency is responsible authority for Kosovo Cadastre Land Information System (KCLIS), which has been conceived of as an integrated multi-purpose system that is composed of a number of key conceptual modules and is as a base system for NSDI in Kosovo. This system is already in operation, and is divided into five main components. Altogether, these components cover all management of real estate information, but there is a need for improvements related to the integration between the components and need for more flexibility in operation. World Bank (WB) in coordination with from Norwegian Government are supporting the Kosovo Cadastral Agency (KCA) with donations for different components of cadaster development, where is foreseen also the strengthening of the national information infrastructure within the area of cadastre information. The objective of the project is that by the mid of 2017, the existing system to be upgraded to new SOA oriented system; it means data migrations from existing system to the new one is completed and all components are decoupled.

This article explains the latest developments on enhancing Kosovo Cadastral Land Information System towards Service Oriented Architecture (SOA). The overall business needs to be covered by the new enhanced system comprise: workflow definitions, case management, technical data, valuation data, legal data, documents, import and export and services for dissemination of cadaster data. Users shall experience a unified user friendly web based system with a common central database. New enhanced system shall be buildup of independent and essential modules; each module will exclusively be responsible for managing a part of the cadaster information.

PËRMBLEDHJE

Sistemi i informacionit të tokës mbështetë menaxhimin e tokës duke siguruar informata mbi tokën, resurset mbi të dhe përmirësimet që i janë bërë. Operimi i këtij sistemi përfshinë përvetësimin, mbledhjen e të dhënave, procesimin, ruajtjen dhe mirëmbajtjen e tyre, e cila pastaj do ta lehtëson rikthimin, analizimin dhe shpërndarjen e këtij informacioni.

Agjencia Kadastrale e Kosovës është autoritet përgjegjës për Sistemin e Informacionit të Kadastrit të Tokës në Kosovë (SIKTK), i cili është konceptuar si një sistem i integruar shumë-qëllimësh, i cili përbëhet nga një numër kyç i moduleve dhe është sistem bazë për NSDI në Kosovë. Ky sistem është aktualisht funksional, dhe është ndarë në pesë komponentë kryesorë. Së bashku këto komponentë mbulojnë të gjithë menaxhimin e informacionit mbi pronën e paluajtshme, por ka nevojë për përmirësime lidhur me integrimin ndërmjet komponentëve dhe nevojën për më shumë fleksibilitet në operim. Banka Botërore (BB) në bashkëpunim me Qeverinë Norvegjeze janë duke e mbështetur Agjencinë Kadastrale të Kosovës (AKK) me donacione për komponentë të ndryshëm në zhvillimin e kadastrit, ku është paraparë edhe fuqizimi i infrastrukturës kombëtare të informacionit, brenda fushës së informacionit kadastral. Objektivi i projektit është që deri në mes të vitit 2017, sistemi ekzistues të avancohet në një sistem të ri me Arkitekturë të orientuar drejtë shërbimit (SOA); çfarë nënkupton që migrimi i të dhënave nga sistemi ekzistues në sistemin e ri është përfunduar dhe të gjitha komponentët funksionojnë si të pavarura.

Në këtë punim do të shpjegohen zhvillimet e fundit në avancimin e Sistemit të Informacionit të Kadastrit të Tokës në Kosovë drejt Arkitekturës së orientuar në shërbime (SOA). E gjithë fusha e kadastrit duhet të mbulohet nga sistemi i ri i avancuar, i përbërë nga: definicionet e rrjedhës së punës, menaxhimin të rasteve, të dhënat teknike, vlerësimi i të dhënave, të dhënat ligjore, dokumentet, importi dhe eksporti dhe shërbimet e shpërndarjes së të dhënave kadastrale. Një sistem i ri më i zhvilluar duhet të krijohet me module të pavarura dhe thelbësore; çdo modul do të jetë përgjegjës ekskluzivisht për menaxhimin e një pjese të informacionit kadastral.

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1. INTRODUCTION

During the last 5-7 years, Kosovo Cadastral Agency has identified the need for a comprehensive cadastral and land information system (LIS) to support its core business processes. This has been confirmed by the Government of Kosovo in its decision 05/70 (25 June 2009). For this purpose, the Kosovo Cadastral Land Information System concept has been developed step-by-step.

Kosovo has many projects going on where land information is need, especially cadaster textual data. In last two years there were a significant increase of requests from different Kosovo governmental institutions towards Kosovo Cadastral Agency to provide different type of land information. Since the demand for the data is increasing more and more, Kosovo Government was urged into taking concrete actions. The Government of Kosovo (GoK) has adopted the e-Government Strategy and established Inter-ministerial Committee for Land Administration and NSDI, whose one of the assignments is to coordinate and establish data standards for Spatial Data Infrastructure.

In other side, public administration reform strategy Approved by Government of Kosovo requests setting electronic systems in public administration and their integration according to rationalization of administrative processes, including the recommendations of Interoperability Framework. Interoperability framework of the Republic of Kosovo emerges as an obligation by the current situation of electronic governance and information technology, and derives from the obligations undertaken under the e-Government Strategy and Action Plan implementing this strategy. This framework is also necessary for European integration, namely European interoperability.

Kosovo Cadastral Agency is responsible authority for Kosovo Cadastre Land Information System (KCLIS), which has been conceived of as an integrated multi-purpose system that is composed of a number of key conceptual modules and is as a base system for NSDI in Kosovo. This system is already in operation, and is divided into five main components. Altogether, these components cover all management of real estate information, but there is a need for improvements in technical and operational standards which must be met in order to satisfy the SOA requirements, ensure the recommendations of Interoperability Framework and integration between the own components in order to have more flexibility in operation.

The project's result in providing cadastre data in a service oriented way will not have immediate impact by only ensuring the workflow for cadastre business, but it also will adapt the requirements coming form new laws about dissemination of textual data on national Geoportal.

2. KCLIS - An Organizational Opportunity

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KCLIS is first of all a legal system for administration of property information. In addition, KCLIS shall provide spatial data (NSDI) to support the services which are expected to be provided by KCA and the MCO's. These new and extended KCA roles are described in the KCA Business Plans from 2009 -2017

The KCLIS concept is already in operation, and is implemented by following systems

- KCLIS-T – management of cadastre text information
- KCLIS Graphical – management of map features (raster and vector)
- KCLIS Cadastre Map – management of cadastre spatial information
- ARIS – Address registry
- KCA Geoportal – web portal for dissemination of data mainly from KCA

Altogether, these systems covers all management of real estate information, but there is a need for improvements related to the integration between the systems and need for more flexibility in operation.

SOA - Service oriented architecture principles are applied for the implementation of KCLIS. Except of KCLIS-T, all systems are developed as independent system managing a specific logical part of the information and communicating with each other by services. Accordingly, a stepwise implementation is possible.

The KCLIS-T system was partly developed before the KCLIS concept was defined. The KCLIS-T covers management of cadastre textual data, case management data and documents. In the KCLIS concept, these logical modules will be implemented as separate independent systems.

Conceptually, KCLIS can be looked upon as a unified system that is composed of a number of modules. On the conceptual level, the decomposition is shown in the diagram below.

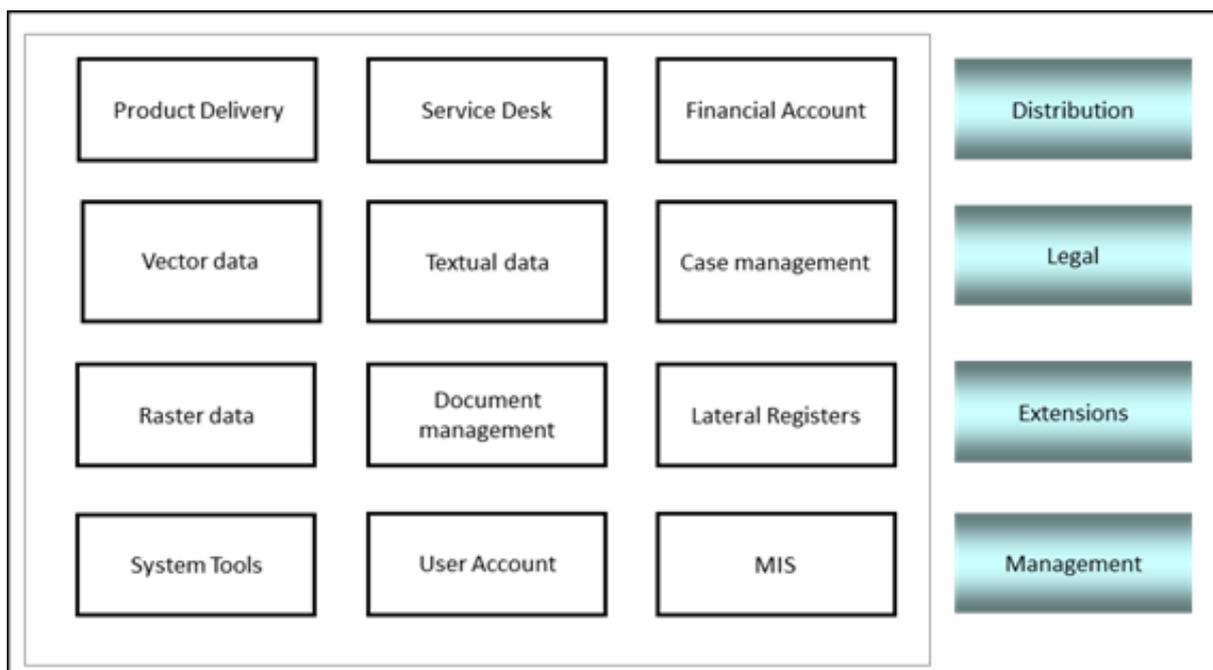


Figure 1. *KCLIS conceptual modules*

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On the implementation level, the diagram below shows how the different modules, indicated by outer red or blue polygons, are realized as separate, independent KCLIS components or subsystems:

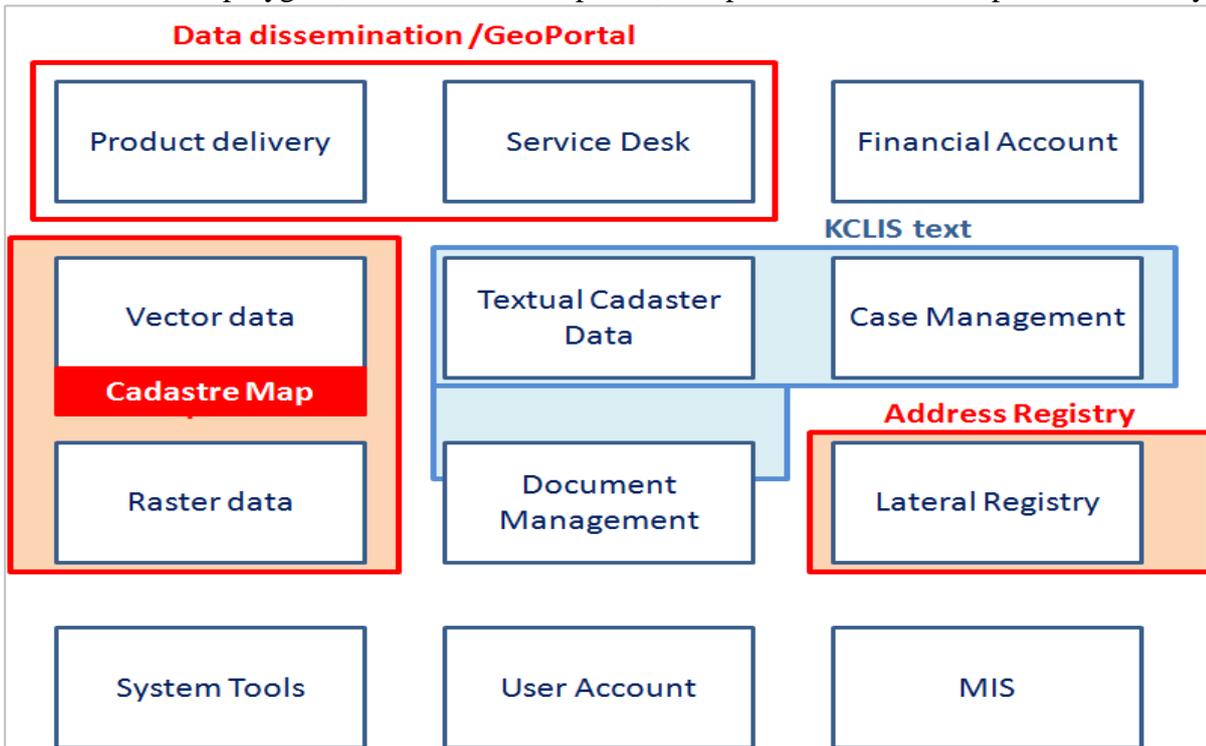


Figure 2. *KCLIS implementation*

Each component is responsible to manage a defined part of the information in KCLIS.

- The KCLIS text component combines the Textual Cadastre Registry Module, the Document management Module and the Case Management Module.
- The Address Registry Information System (ARIS) was delivered by the end of 2012. ARIS contains two of the KCLIS components.
- The KCLIS Graphical system is managing vector and raster maps and support other systems for background maps.
- The KCLIS Cadastre Map system is a separate system managing spatial data about cadaster.
- The KCA Geoportal is a web portal for dissemination of data from KCA

3. CURRENT KCLIS INFRASTRUCTURE

Data management within the existing systems at KCA is done by authorized users at the MCOs and KCA, where workstations are connected to the governmental communication network. The data management systems is placed in safe area protected by a firewall from Internet access. Data dissemination through the GeoPortal and Internet do not access the systems used for data production and management directly, but they communicate with identical systems outside the firewall (open area) which holds replicated and filtered copies of the datasets. Data from the safe area is replicated to the system components in the open area. Currently, Address data, Cadastre Map and background maps and orthophotos are replicated to open area. Each system component is

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exclusive responsible for a defined part of the cadastre data. All necessary exchange of data between modules is implemented by web services (WS), except KCLIS-T which is partly integrated by API.

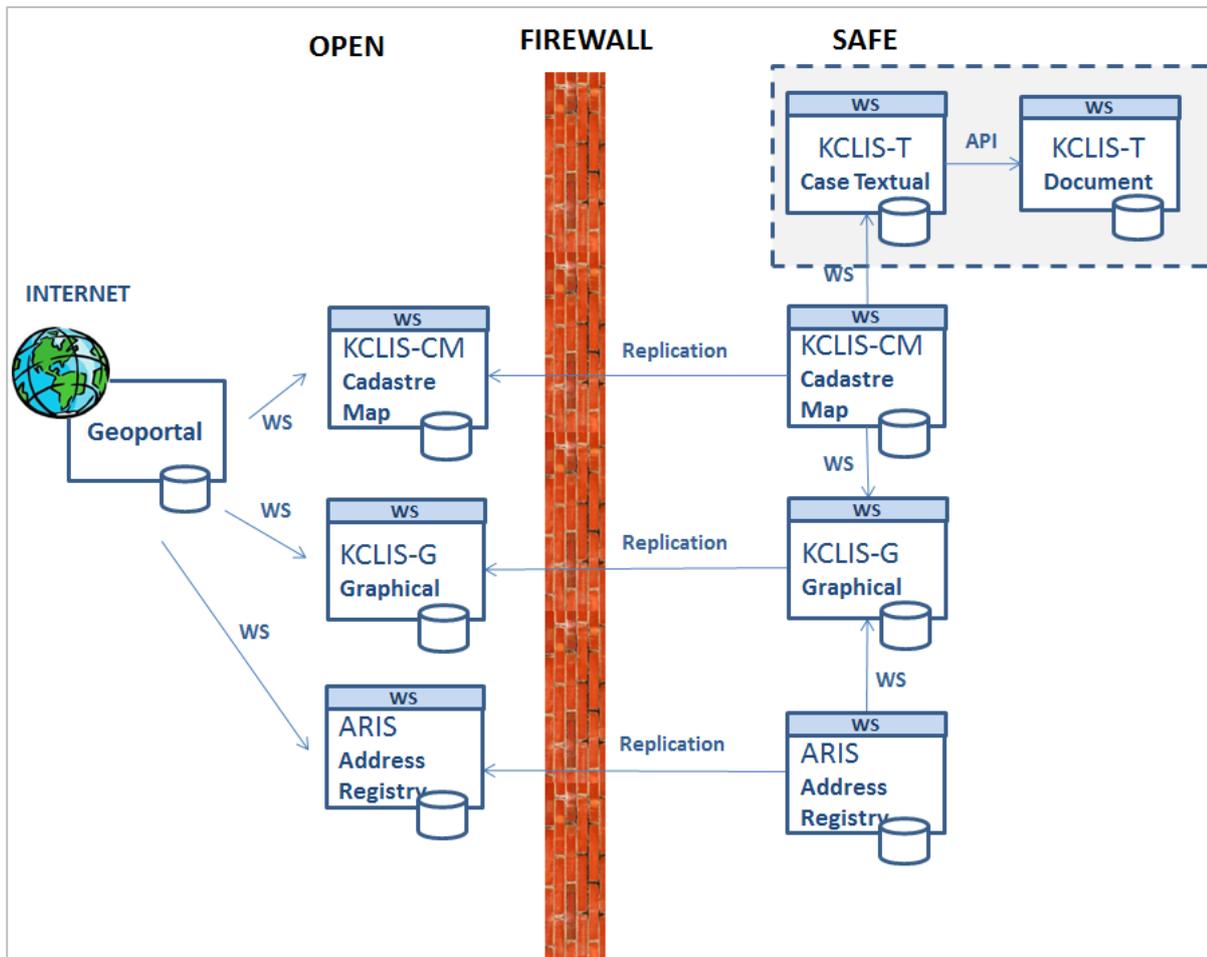


Figure 3. Main infrastructure of the existing KCLIS.

In addition to the KCLIS-T software, there is another separate software module (CRTool) which is used in the cadastre reconstruction projects. Parts of data from the KCLIS-T database (usually includes all data from a cadastral zone) are exported to CRTool. During the cadaster reconstruction project, the data is changed in local systems, and after a period and final approval, they are imported back to KCLIS-T.

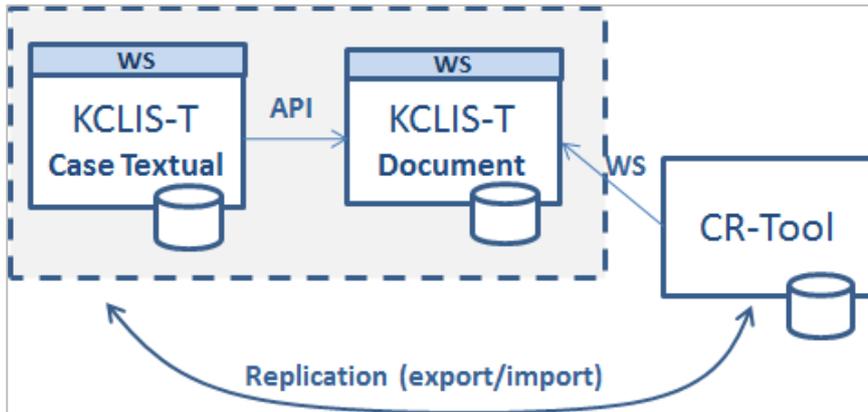


Figure 4. *KCLIS-T and CRTool data exchange*

4. ENHANCING KCLIS TOWARDS SOA PRINCIPLES

Over the last 10 years, SOA has become a well-known and accepted method for integration of software modules within a single software system. In the context of KCLIS infrastructure, the SOA principles will also be applied to the integration of independent systems. The Architecture Principles which will be applied for enhancing of KCLIS is based on Service Oriented Architecture (SOA) principles, namely:

- Each subsystem operates independently of other system modules.
- Each subsystem completely controls the data for which it is responsible.
- The subsystem communicate with each other and with various other clients via interoperability services.

Even if, many changes are going to be done in infrastructure level, users from MCO and KCA will still experience a unified and user friendly web based system which is able to get access to information to external systems.

The main changes that are going to be done in KCLIS:

- Existing KCLIS-T subsystem to be divided into three subsystems
 - CASE – which shall be responsible for management of business rules, workflows, and cases
 - DOC – which shall be responsible for management of all cadastre related documents
 - TEXTUAL – which shall be responsible for management of textual information related to cadastral objects.
- The new system components shall communicate and exchange data by web services
- Selected (filtered) textual data, case management data and documents may be replicated to OPEN area, to be disseminated by the Geoportal
- The CASE shall support generic case and workflow functionality. Accordingly, the system can be used other business processes at KCA and the MCO's
- The CASE shall be able to receive applications submitted by use of the Geoportal
- The DOC shall support functional in a way that the system can be used for all document management at KCA and MCO's, including documents from massive scanning.

- The new components shall provide the same services which is supported in the existing KCLIS-T and KCLIS-DM
- The new TEXTUAL and CASE shall include functionality to control and store addresses which are consistent with address information in the Address Registry.
- The new TEXTUAL and CASE shall include functionality to control Person ID's by online access to the Civil Registry
- The new TEXTUAL shall include functionality to control and store addresses which are consistent with address information in the Address Registry
- The new TEXTUAL shall include functionality to control Company IDs by online access to Business Registry and NGO Registry
- The new TEXTUAL shall include functionality to view historical cadastre information from earlier systems used in Kosovo (IPRR, KCID and Bormen)

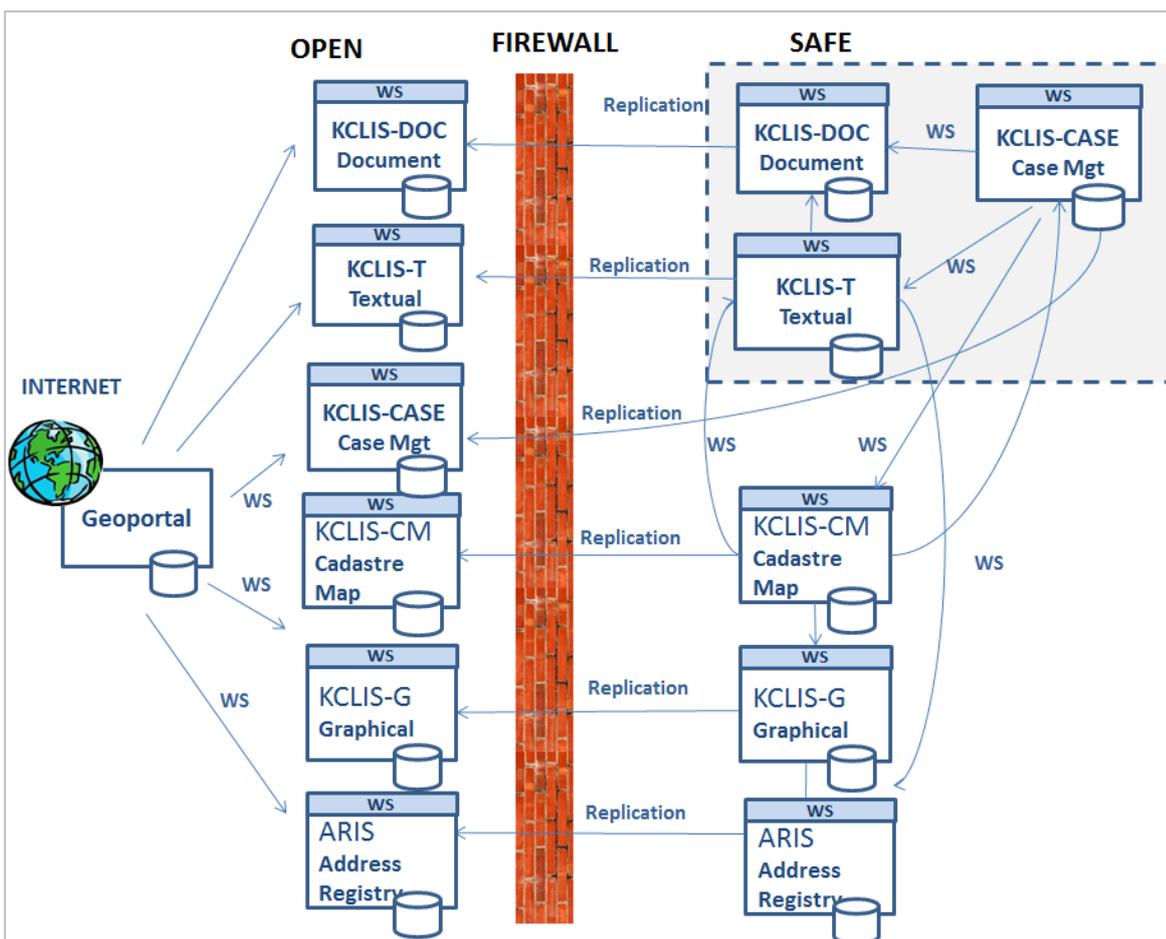


Figure 5. *KCLIS new infrastructure*

4.1 Interoperability

The integration and communication between actual systems will be implemented by use of services. The components in KCLIS will deal with two types of interoperability services, namely:

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- Invocation services (GUI service)
- Web services

4.2 Linkage with external systems

Every part of information in KCLIS is somehow linked to a natural or legal persons. In order to make sure that only valid data about natural and legal persons are going to be provided on the system, linkage to external systems is needed. Currently, there are three external systems identified to be linked with KCLIS. Those external systems are going to validate and provide data for businesses, persons and NGOs.

Linkage with external systems is not going to be only for retrieve data for natural or legal persons. Because KCA Geoportal is serving also as National Geoportal, it's foreseen dissemination of data about businesses, NGOs and other entities.

4.2.1 Linkage with Kosovo Business Registration Agency (KBRA)

Interaction with KBRA (Kosovo Business Registration Agency) is going to done by validating business registration number against KBRA web services in cases when dealing with managing textual cadaster data. Dissemination of data provided by KBRA on Geoportal is foreseen, as it's a win-win situation for both parties – KCA and KBRA.

4.2.2 Linkage with Civil Registration Agency (CRA)

Previous migrations from older systems that had different approach of organizing cadaster data came with some problems and challenges to validate natural person data. In Kosovo the Civil Registration Agency of the Ministry of Internal Affairs is responsible for the functioning of the civil status system in a technical and legal way. Interaction with CRA is going to be done by validation natural person id against CRA web services in cases when dealing with managing textual cadaster data.

4.2.3 Linkage with Department for Registration and Liaison with NGO (DNGO)

Existing systems doesn't validate NGO data. Even, they are treated as businesses when dealing with managing textual cadaster data. During last year, Department for Registration and Liaison with NGO of Ministry of Public Administration of Kosovo has developed the technical infrastructure to manage register of NGOs. KCA will request from DNGO to developer proper infrastructure to enable interaction between KCLIS and DNGA system. Same as with KBRA, Geoportal will be used to disseminate NGO data.

5. CONCLUSION

Kosovo Cadastral Agency is the central authority for the maintenance of cadastral database, property registers, mapping and GIS. It is also the central authority for geospatial data infrastructure. The rights, responsibilities and overall mandate of the KCA is regulated by the Law on Cadastre and other legal acts. Dealing with everyday requests to offer data to different institutions, be open to citizens and offer needed infrastructure to MCOs and other parties is a real challenge. Existing KCLIS infrastructure helped KCA a lot when dealing with these challenges. Parts of the system that are already developed based on SOA principles has proved that they are more flexible, easy to integrate with internal and external systems, easy to extend and easy to maintain. This has led KCA to enhance KCLIS towards SOA in order to:

- manage how the different workflow and actual resources related to management for all cadastre information in Kosovo, carried out by the MCO's and KCA
- manage of applications and cases related to management of cadastre information
- manage of technical information about cadastral objects
- manage of valuation and taxation information about cadastral objects
- manage of all legal information cadastral objects (rights and parties) related to the cadastral objects
- manage of all digital documents related to cases and cadastral objects
- provide functionality for import and export of data according to standard formats
- provide services which can be used by other systems to search for and show cadastre information

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