

TERMS OF REFERENCE

for the development of
the Address Register Information System

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Introduction

Based on the strategy on address system implementation and legislative framework, currently under endorsement by Parliament, this project aims the development of Address Register Information System (ARIS) for the Republic of Moldova, under the Agency of Land Relations and Cadaster (ALRC) and “Public Services Agency”.

In this regard, Address Register Information System is a component part of the National Geographic Information System and represents a register that contains classifiers of administrative-territorial units of Republic of Moldova (districts, cities (municipalities), villages (communes), localities, including disbanded cases) and basic elements of urban infrastructure (streets, segments, buildings, entrances, isolated premises) qualified as addresses of physical objects.

ARIS shall contain the identifier for objects of evidence and their basic characteristics (name, formation date, liquidation date, etc.), as well as borders of administrative-territorial units, streets axial lines and buildings position, entrances position and exact address localization.

ARIS is intended for identifying elements of urban and rural infrastructure, considered physical objects, which are objects of evidence for departmental and interdepartmental information systems and that establish links with postal address system, used by information systems, as well as juridical and physical persons in daily life.

Along with information from National Geospatial Data Fund (<http://www.geoportal.md>) and from automated information system “Cadastrul bunurilor imobiliare”, ARIS shall ensure spatial localization and identification of any kind of object of the address in the basic spatial Model of the terrain.

By developing Address Register Information System the following objectives are aimed:

- development of organizational and informational base for a centralized evidence of administrative-territorial units and for localities address plans;
- providing public authorities with timely, veridical and complex information for conduction of operative and multilateral researches, evaluation and argumentation of administrative acts;
- granting aid to central and local public authorities in promoting efficiently state policies in administrative-territorial organization of the country;
- streamline decision-making procedure, that can provide answers to inquiries and spatial data analysis functions, which present analysis results in a concrete and suitable for viewing form;
- development of an integrated platform for departmental and interdepartmental information systems;
- reduction of volume of data that is permanently stored, by optimizing structures of textual and graphic information.

Direct beneficiaries of ARIS will be central and local authorities, public institutions, business environment and citizens, that by virtue of their activity and objective requirements, must have access to an accurate and updated database on address system of Republic of Moldova.

The address register will provide official address data to all public and private institutions to ensure uniformity of data, **based on the principle of “single registration (source) - multiple use” of data.** The address data from the official address register must be supplied to the State Register of Population, the State Register of Business Entities, the State Register of Voters, the Emergency Centre 112, banks, utility companies and other stakeholders as well as open public.

Present document, intended for further elaboration of ARIS (after development stage), defines goals, tasks and functions of IT solution, organizational structure, regulatory and legal constraints, functional and nonfunctional requirements necessary for development and operation of the information system.

Chapter 5 Requirements for the IT System is divided in 2 parts: Requirements for phase 1 and Requirements for phase 2. Requirements for phase 2 are mandatory for this tender but Requirements for phase 1 are for information about the system that was developed during development stage and will be continued with the next stages. For each phase, Final delivery artefacts are indicated.

1. General Information

Address Register Information System is an IT solution that will have an immediate positive impact on the activity of public authorities, institutions and business environment of Republic of Moldova. It is an IT solution aimed towards providing necessary information and informational needs of actors whose activity depends directly on the quality of address data of Republic of Moldova. ARIS is a key informational resource of *Agency of Land Relations and Cadaster* and that shall

expose access interfaces for all relevant information systems of Republic of Moldova (*State Population Register, State Register of Legal Entities, Fiscal Register, State Register of Voters*, as well as for some specific information systems of business environment) in order to provide data in accordance with law.

1.1. Terminology of the document

The totality of Acronyms and Abbreviations used in this document are defined in Table 1.1.

Table 1.1. Acronyms and Abbreviations used in the Document

No.	Abbreviation/Acronym	Description
1.	ARIS	Address Register Information System
2.	ALRC	Agency of Land Relations and Cadaster
3.	BPMN	Business Process Model and Notation
4.	CEC	Central Election Commission
5.	CPA	Central Public Authority
6.	CSW	Catalog Service for the Web
7.	DB	Database
8.	GIS	Geographical Informational System
9.	IT	Information technology
10.	ITC	Information technology and communications
11.	ITS	IT system
12.	KPI	Key performance indicators
13.	LPA	Local Public Authority
14.	NFC	National Fund of Cartography
15.	OLAP	Online Analytical Processing
16.	RDBMS	Relational Database Management System
17.	SAISE	State Automated Information System "Elections"
18.	SDD	Software design document
19.	SDI	Spatial Data Infrastructure
20.	PSA	Public Services Agency
21.	SRS	Software Requirements Specification.
22.	SRV	State Register of Voters
23.	TLS/SSL	TLS Protocol or its predecessor, SSL Protocol, are cryptographic protocols that ensure reliable communication between two hubs of the computer network.
24.	WMS	Web Map Service
25.	WFS	Web Feature Service

All terms frequently used in this document are displayed and explained in Table 1.2.

Table 1.2. Definitions of notions used in the Document

No.	Term	Description
1.	Address	Totality of words, numbers, orthographic signs, placed in a certain order, indicating the exact geographic position of the addressable object

No.	Term	Description
2.	Credentials	A set of symbols that establish the users' and systems identity and authentication within information systems.
3.	Data	Elementary information units about people, subjects, facts, events, phenomena, processes, objects, situations, etc. presented in a way that enables their notification, commenting and processing.
4.	Database	A collection of data organized as per the design structure describing the basic characteristics and relation among entities.
5.	Data integrity	Data status when they maintain their content and are interpreted unambiguously in cases of random actions. It is deemed that the data maintained their integrity if they have not been altered or deteriorated (deleted).
6.	Information and Communications Technology	Common term that includes all technologies used for information exchange and processing.
7.	Information object	Virtual representation of existing tangible and intangible entities.
8.	Information system	A system for information processing along with the associated organizational resources such as human and technical resources, which deliver and disseminate the information.
9.	Information resource	Set of documentary information in the IT system, maintained as per the requirements and legislation in force.
10.	IT system	The totality of software and hardware that ensures data automatic processing (the automated component of the information system).
11.	Logging	A function of recording the information on events. The records about events entered into the information systems include details about the date and time, user, and action carried out.
12.	Metadata	The way of assigning semantic value to the data stored in the database (data about data).
13.	Reliability of data	Level of correspondence of data stored in computer memory or documents to the actual condition of system objects mirrored by these data.
14.	Software design document	IT System guidance document comprising detailed description of the following visions: data structures and their constraints, IT System architecture covering all concepts of the IT System, IT System interface comprising the design of all components of the IT System user interface, IT System functionalities covering a detailed description of all IT System implementation scenarios.
15.	Software Requirements Specification	A document that contains detailed descriptions of all scenarios of users' interaction with the IT application.

1.2. References and Legal Aspects for the IT Subsystem Development

The processes concerning the creation, implementation and operation of ARIS shall not contravene the field-related regulatory acts in effect regarding the **"Public Services Agency"** activity and the development of IT solutions intended for the Moldovan public authorities.

This category comprises the following legal and regulatory acts:

1. **Concept of the State Automated Information System „Address Register“.**
2. *The Address Register of the Republic of Moldova*, draft version of Law.
3. *Government Decision No. 1518 of 17.12.2003 on creation of automatized information System "State Register of administrative-territorial units and streets from the territory of Moldova"*, "Monitorul Oficial al Republicii Moldova" No. 1-5 of 01.01.2004.

4. *Government Decision No. 710 of 20.09.2011 on approving the Strategic Program for Technological Modernization of Governance (e-Transformation)*, "Monitorul Oficial al Republicii Moldova" No. 156-159 of 23.09.2011.
5. *Government Decision No. 656 of 05.09.2012 on approving the Interoperability Framework Program*, "Monitorul Oficial al Republicii Moldova" No. 186-189 of 07.09.2012.
6. *Government Decision No. 1090 of 31.12.2013 on electronic governmental service of authentication and access control (MPass)*, "Monitorul Oficial al Republicii Moldova" No. 4-8 of 10.01.2014.
7. *Government Decision No. 405 of 02.06.2014 on integrated electronic governmental service of digital signature (MSign)*, "Monitorul Oficial al Republicii Moldova" No. 147-151 of 06.06.2014.
8. *Government Decision No. 708 of 28.08.2014 on electronic governmental service of logging (MLog)*, "Monitorul Oficial al Republicii Moldova" No. 261-267 of 05.09.2014.
9. *Government Decision No. 916 of 06.08.2007 on the Concept of Governmental Portal*, "Monitorul Oficial al Republicii Moldova" No. 127-130/952 of 17.08.2007.
10. *Government Decision No. 330 of 28.05.2012 on creation and administration of single governmental portal for public services*, "Monitorul Oficial al Republicii Moldova" No. 104-108 of 01.06.2012.
11. *Law No. 133 of 08.07.2011 on Protection of Personal Data*, Official Gazette No. 171-175 of 14.10.2011.
12. *Government Decision No. 1123 of 14.12.2010 on approving the Requirements for the assurance of personal data security during their processing within the information systems of personal data*, Official Gazette No. 254-256 of 24.12.2010.
13. *Government Decision No. 701 of 25.08.2014 on approval of Methodology of publishing open governmental data*, "Monitorul Oficial al Republicii Moldova" No. 256-260 of 29.08.2014.
14. *Law No. 264-XV of 15.07.2004 on electronic document and digital signature*, "Monitorul Oficial al Republicii Moldova" No. 132-137/710 of 06.08.2004.
15. *Government Decision No. 945 of 05.09.2005 on Centers for Certification of Public Keys*, "**Monitorul Oficial al Republicii Moldova**" No. 123-125 of 16.09.2005.
16. *Government Decision No. 320 of 28.03.2006 on approving the Regulation on applying digital signatures in public authority electronic documents*, "**Monitorul Oficial al Republicii Moldova**" No. 51-54 of 31.03.2006.
17. *Government Decision No. 735 of 11.06.2002 on Special Telecommunications Systems of the Republic of Moldova*, "**Monitorul Oficial al Republicii Moldova**" No. 79-81 of 20.06.2002.
18. *Law No. 467-XV of 21.11.2003 on Informatization and state information resources*, "**Monitorul Oficial al Republicii Moldova**" No. 6-12/44 of 01.01.2004.
19. Standard of the Republic of Moldova SMV ISO CEI 15288:2009, "*Systems and Software Engineering. Processes of the system life cycle*".
20. *Technical Regulation "Processes of software life cycle" RT 38370656-002:2006*, "**Monitorul Oficial al Republicii Moldova**" No. 95-97/335 of 23/06/2006.
21. Other laws, regulatory acts and standards in force in the ITC area.

The international guidelines and recommendations listed below should be implemented in order to define ARIS concept and ensure its further development:

- *INSPIRE Metadata Implementing Rules: Technical Guidelines based on EN ISO 19115 and EN ISO 19119*, http://inspire.ec.europa.eu/documents/Metadata/MD_IR_and_ISO_20131029.pdf
- *INSPIRE Data Specifications on Address Data Model: D2.8.I.5 Data Specification on Addresses- Technical Guidelines*, http://inspire.ec.europa.eu/documents/Data_Specifications/INSPIRE_DataSpecification_AD_v3.1.pdf
- INSPIRE Download services, View services, Discovery Services, Transformation services, <http://inspire.ec.europa.eu/index.cfm/pageid/5>

- Michael O. Leavitt, Ben Shneiderman, *Research-Based Web Design & Usability Guidelines*, U.S. Government Printing Office, http://www.usability.gov/guidelines/guidelines_book.pdf
- *Recommendations of the World Wide Web Consortium (W3C)* (<http://www.w3c.org>) on the quality of websites, the possibilities to have proper information visualization, using widely used Internet WEB browsers, and compatibility with different IT platforms;
- *Recommendation of the W3C* (<http://validator.w3.org>) on website testing. All pages generated by ARIS shall be tested as per these recommendations.

1.3. Basic Principles of the IT System

In order to ensure the attainment of the objectives set for the IT solution, the following general principles shall be taken into account while designing, developing and implementing ARIS:

- Principle of Legality: implies the establishment and operation of Information Systems in compliance with the national legislation in effect and with the international rules and standards recognized in this area;
- Principle of split-level architecture: involves independent design of ARIS components in compliance with interface standards between levels;
- Principle of service-oriented architecture (SOA): involves dividing the application operation into smaller and distinct units – called services – that can be assigned into a network and can be used together to create applications designed to the implementation of IT System business functions.
- Principle of reliable data: stipulates that data shall be entered into the system through authorized and authenticated channels only;
- Principle of information security: implies ensuring an adequate level of integrity, selectivity, accessibility and efficiency to protect the data against losses, alteration, deterioration and unauthorized access.
- Principle of transparency: implies designing and implementing as per the modular principle, having used transparent standards in the area of IT and telecommunications;
- Principle of expansibility: stipulates the possibility to expand and supplement the Information System with new functions or improve the existing ones;
- Principle of first person/single center priority: implies the appointment of a high-rank responsible person who has sufficient rights to take decisions and coordinate the activities aimed at Information System establishment and operation;
- Principle of scalability: implies ensuring constant IT performance when increased volume of data and stress for the Information System;
- Principle of usage simplicity and complacency: implies the design and implementation of all applications, hardware and software resources available to the System users, based exclusively on visual, ergonomic and logical principles of design;
- Principle of data integrity, fullness and reliability: implies the implementation of mechanisms that enable preserving the data content and their clear interpretation under cases of accidental influence, and elimination of data distortion or accidental liquidation, delivery of data volume sufficient to perform the IT System business functions and ensure advanced matching of data with the real status of objects they represent and belong to a specific sector of the IT System.

In particular, the following essential principles shall be complied with by the Information System Architecture:

- implementing a WEB based client-server solution with authorized access to interface and data;
- ensuring adequate security for the Information System to protect the information and subsystem components against their illegal use or disclosure of personal data or of information with limited access;
- recognizing information as an asset and ensuring its proper management;
- developing and implementing Information Systems that enable their use for other processes or ensure opportunities for developing new functionalities;

- minimizing the number of various technologies and products that offer the same or **“Public Services Agency”**;
- ensuring high-speed processing of service requests/inquiries addressed to the Public Services Agency or of other *LPA* or *CPAs* requiring services;
- ensuring recovery capacities following disasters (ensuring physical and logical security) as a component of the implementation plan.

1.4. *Purpose, Objectives and Tasks of the IT System*

The main purpose of **„ARIS”** is to produce a performance platform for creation, storage, modification, visualization and providing address data. Solution that will serve as a single address book for Moldova based on the principle of a unique storage and free distribution on necessity.

Given solution provides a state-level interoperable environment that corresponds to the principles and ideas promoted by e-Government Center.

The development of “ARIS” will contribute to achieve the following aims:

- Implement a unique state-level evidence of data on addresses;
- the development of a unique mechanism to add, modify, delete data for all territorial administrative units;
- the development of a unique high-performance repertoire of address data provision;
- create an interoperability framework among the **“Public Services Agency”** IT applications, external IT Systems that provide and use *ARIS* data;
- implement an efficient collaboration mechanism among all actors involved in registration and management procedures on addresses data;
- reduce the required time and the laboriousness of the process of collecting, processing and managing the data addresses of the Republic of Moldova;
- ensure data access control and maximum security and confidentiality to data collections and users;
- provide informational support to filed-related analysis, forecast and research activities.

2. IT System Architecture

ARIS shall provide a WEB interface that is accessible through a widely-used Internet browser (*Microsoft Internet Explorer, Mozilla FireFox, Opera, Google Chrome or Safari*). From the functional standpoint, it is envisaged to develop a reliable and scalable solution both for the increased number of competitor users and for the increased volume of information managed by it based on MVC-type architecture.

It would be opportune to build the ARIS using open, non-proprietary (and portable) solutions specific for WEB applications (*XML, XSL, XHTML, WSDL, SOAP, LDAP, J2EE, etc.*), which would allow easy development of components for portal-type systems.

As ARIS is not an isolated IT solution and it would interact with external IT Systems, the developed application shall offer support for its integration with other IT subsystems (SOA architecture).

In order to ensure an adequate information security level, the delivered application shall enable the implementation of secured connections amongst client stations and application server to grant safe information transfer (via VPN channels and TLS/SSL sessions).

The IT solution shall be developed on the basis of advanced Internet/Intranet technologies. The interaction of all IT Subsystem actors and hubs is displayed in Figure 2.1.

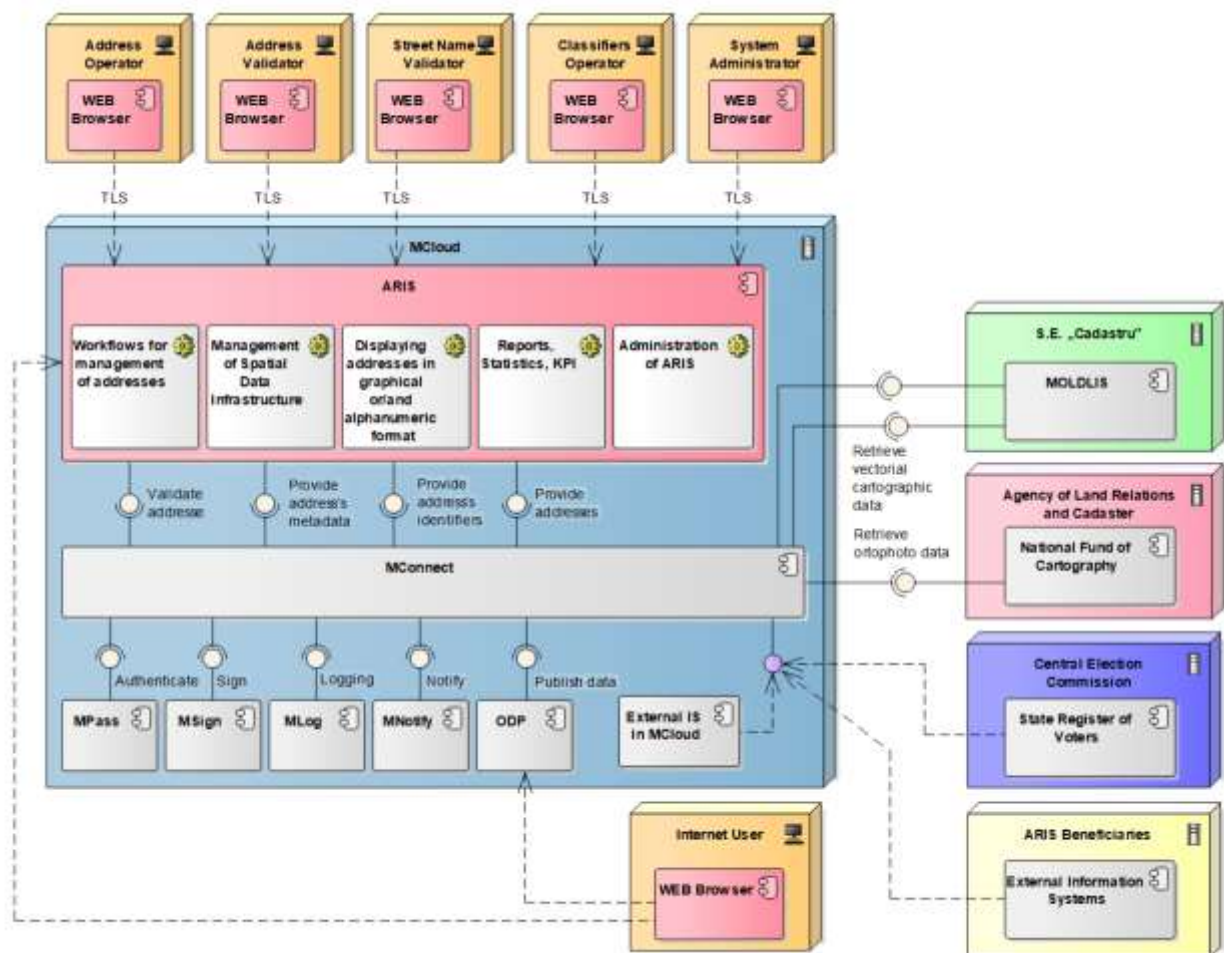


Figure 2.1. ARIS Architecture.

According to Figure 2.1, the solution of pooling the resources aiming to ensure ARIS functionalities comprises 6 categories of distinct nodes:

- MCloud – ICT infrastructure of the joint governmental technological platform that builds up the governmental cloud (*MCloud*), hosting a series of IT Systems with which ARIS should interact or which services would be used by ARIS (*MPass, MSign, MLog, MNotify etc.*). The inclusion of *MConnect* service bus in

the architecture would enable integration with the services of other IT systems hosted outside the *MCloud*. The technologic platform will host *ARIS*.

- **“Public Services Agency” Data Center** – data center infrastructure of **“Public Services Agency”** hosting the totality of information systems that *ARIS* will interact to achieve its functional objectives (*MOLDLIS* – for vector cartographic data retrieving and implementation of the security module).
- **CEC Data Center** – the CEC ICT infrastructure that hosts *SRV* with which *ARIS* should interact with the aim to receive address data.
- **ALRC Data Center** – data center infrastructure of *Agency of Land Relations and Cadaster* hosting the totality of information systems that *ARIS* will interact to achieve its functional objectives (*National Cartographic Data Fund* – for cartographic orthophoto data retrieving).
- **ARIS Beneficiaries** – technical infrastructure of beneficiaries of *ARIS* hosting information systems that will retrieve data from *ARIS* through exposed services provided by *ARIS*. These information systems will be hosted both by own data centers (e.g. *Fiscal Register*, *State Register of Population*, *State Register of Legal Entities*, etc.) and by common governmental infrastructure *MCloud*.
- **Client Computers** – computers from where the users (depending on their rights and roles) shall be granted access to *ARIS* functionalities.

In order to have access and use *ARIS*, client computers shall use as client applications at least two of the most popular Internet web browsers (compatibility with *Microsoft Internet Explorer* is mandatory). The interface and functionalities assigned to each individual user **will depend on the user's level, rights and roles**.

From the functional standpoint, there are 6 generic categories of system users, namely *System Administrator*, *Address Operator*, *Address Validator*, *Street Name Validator*, *Classifiers Operator* and *Internet User*. **Regardless of the users' access level**, all connections of users to *ARIS* (except for *Internet users*) shall be carried out via safe means.

In order to ensure optimal functionality, *ARIS* will use the following categories of interfaces delivered by *MCloud* and *MConnect* platform services:

1. **Authenticate Service**, which interacts with the governmental platform service *MPass* applied to **implement users' authentication procedures via the digital certificate**;
2. **Sign Service**, which interacts with the governmental platform service *MSign* designed to apply and validate the digital signature, including mobile signature.
3. **Logging Service**, which interacts with the governmental platform service *MLog* designed to log the critical business events of *ARIS*.
4. **Notify Service**, which interacts with the governmental platform service *MNotify* designed to notify *ARIS* actor about critical business events of *ARIS*.
5. **Publish Data Service**, which interacts with the governmental open data portal designed to publish public data and reports provided by *ARIS*.
6. **Authenticate/ Authorize**, which interacts with *MOLDLIS* designed for implementing Security procedures implemented by **“Public Services Agency”** through *MOLDLIS*.
7. **Retrieve vector cartographic data**, which interacts with *MOLDLIS* managed by **“Public Services Agency”** to retrieve vector cartographic data of addressable objects.
8. **Retrieve orthophoto data**, which interacts with *National Fund of Cartography* managed by *Agency of Land Relations and Cadaster* to retrieve orthophoto data of addressable objects.

Because *ARIS* is an information system that will be intensely used by majority of state owned information systems and by business environment, which deals with addresses, it will expose a list of services. For providing textual information, SOAP services shall be created. For providing graphical information – WFS/WMS/WCS services. Web services shall be secured. Access control shall be managed by *System Administrator*.

Viewing of web services via catalogue of web services will be used by other information systems (e.g. *MODLIS* in Public Services Agency or 112 Emergency Center).

Query/Process/Transformation of web services will be done via *MConnect Enterprise Service Bus* for further provisioning of services to other information system in Republic of Moldova. Implementation of standards-based web-services in order to assure compatibility with *MConnect* ESB (WSO2).

Web portal for searching of address data will be provided for the usage by open public or external commercial organizations. As ARIS would interact with other national Computer Subsystems or with external IT solutions, the developed application shall offer the necessary support for integration with other computerized subsystems through secured GIS and alphanumerical web services.

ARIS shall expose the following WEB services:

1. Validate address – WEB service provided to external information systems for checking the availability and status of address objects relevant to external business activity.
2. **Provide address's metadata address** – WEB service provided to external information systems for accessing nomenclature of address objects in order to reuse data in own business activities.
3. **Provide address's identifiers** – WEB service provided to external information systems for delivering identifiers' lists of address objects. After interrogation registration data of objects of addresses or geospatial data will be used.
4. Provide addresses – WEB service provided to external information systems for delivering address registering details (including geospatial registering data). After interrogation registration data of address objects or geospatial data will be used. This is the key service of ARIS that shall provide a detailed level of address objects depending upon concrete requests of external information systems.

As shown in figure 2.1. ARIS shall provide to its users the following functionalities:

1. MODULE FOR ADDRESS MANAGEMENT includes the following basic components:
 - Flows and forms for creation of address objects will provide the totality of necessary functionalities for perfecting electronic forms for adding new address objects and workflows intended for processing and approval of requests for adding objects of new addresses.
 - Flows and forms for modification of address objects will provide the totality of necessary functionalities for perfecting electronic forms for modifying existing data of address objects in ARIS and workflows intended for processing and approval of requests for modifying of existing data of address objects in ARIS.
 - Flows and forms for removal of address objects will provide the totality of necessary functionalities for perfecting electronic forms for removal of address objects in ARIS and workflows intended for processing and approval of requests for removal of address objects in ARIS.
 - Flows and forms for adding names of streets will provide the totality of necessary functionalities for perfecting electronic forms for adding new street names and workflows intended for processing and approval of requests for adding new street names.
 - Flows and forms for modifying street names will provide the totality of necessary functionalities for perfecting electronic forms for modifying existing street names in ARIS and workflows intended for processing and approval of requests for modifying of existing street names in ARIS.
 - Flows and forms for removal of street names will provide the totality of necessary functionalities for perfecting electronic forms for removal of existing street names in ARIS and workflows intended for processing and approval of requests for removal of existing street names in ARIS.
 - Primary data validation component will provide a mechanism of primary check of correctitude of data perfected by local public authorities within electronic forms related to address business events.
 - ARIS **authorized user's dashboard** will deliver the necessary functionalities for providing a dashboard mechanism and from which, based on roles, users, according to their duties, shall receive, notify and access details of ARIS business events.
2. MODULE FOR SPATIAL DATA INFRASTRUCTURE MANAGENEMT includes the totality of necessary functionalities for retrieval and usage of vector cartographic data and orthophoto retrieved from relevant

external information systems. Also, this component of *ARIS* shall deliver functionalities intended for introducing of geospatial data for created and / or modified address objects to authorized users.

3. MODULE FOR PRESENTING ADDRESS SYSTEM that includes the following components:
 - WEB Services for data exchange with external information systems. The service shall provide the totality of alphanumeric and GIS data related to requested address objects by authorized external information systems.
 - Interface for viewing the Address system in textual format will be used by the anonymous users for defining search and filtering criteria in order to get lists of relevant address objects.
 - WEB GIS interface represents a mode of presenting information from *ARIS* on an interactive map, accessible for authorized users in order to perform business events relevant to address objects and anonymous users, for exploring address objects of Republic of Moldova.
4. MODULE FOR GENERATION OF REPORTS AND STATISTICS ensures functionalities for generation and saving in DOCX, XLSX, PDF, etc. formats of reports and statistics. Information system shall deliver mechanisms for generation of system reports (necessary for informational audit and for anticipating possible security issues) and reports related to implemented business processes (necessary for analysis and monitoring of administration processes of address system of Republic of Moldova). A particular case of reports and statistics represents outputs generated by GIS mechanisms.
5. MODULE FOR DISSEMINATION OF PUBLIC INFORMATION ensures automatic export on Open Public Data Portal (<http://www.date.gov.md>) of reports, statistics and nomenclatures of public character provided by *ARIS*. Another option is represented by public interface of *ARIS* that shall publish documents of public character generated by *ARIS* and a WEB GIS solution of dynamic exploring of address system of Republic of Moldova.
6. MODULE OF INFORMATION SYSTEM MANAGEMENT includes the following basic components:
 - Component of global configuration of the information system - general parameters of functioning of information system will be configured.
 - Component of management of resources of the information system - it will be possible to manage all functional components of the application, defining of status, transitions of resources that may occur (dynamic configuration of workflows under which electronic forms of *ARIS* shall be perfected and processed), defining of access rules based on users groups and configuration of logging rules of business events.
 - Component of management of users shall ensure the management of all users profiles with access rights to information system resources which are involved in processes of management of address objects. Information system will allow the dynamic configuration of users' access to information system resources through a mechanism of dynamic defining of rights and users roles (dynamic defining of access rules to users interface facilities and to data).
 - Component of management of users groups ensures configuration of users groups based on their specific available functionalities and on roles within workflows implemented in *ARIS*.
 - Component of management of nomenclatures and classifiers (metadata) will consist of a mechanism that will allow administration of structure and content of a complex nomenclature system (national and internal of *ARIS*) that allows referencing of contained information in the database and adapting the database content and reports on legislative or procedural modifications intended for management of address system of Republic of Moldova.
 - Component of management of notifications will deliver the totality of functionalities for automatic notification via Email or internal mechanisms of *ARIS* to authorized users or entities that take part in business processes implemented in *ARIS*.
 - Component of dashboard management will deliver the totality of functionalities for calculations and real-time displaying of key performance indicators to users of *ARIS* and ensure quick access to **critical records related to position's duties of authorized users.**

- Component of monitoring activities of users. Through logging modules of the users activity events. This is intended for ensuring some elementary measures of security and for anticipating some possible problems in this domain. The mechanism of logging of users activity records the following events:
 - i. connection to the system;
 - ii. disconnection from the system;
 - iii. adding / modifying of data;
 - iv. data accession;
 - v. data suppression.
 - Component of generation of Database backups of information system that shall allow creation of automatic backups of dataset of *ARIS* for ensuring physical security of data.
7. MODULE OF DOCUMENTATION ARIS shall provide functionalities for displaying information system usage documentation in an accessible and convenient manner. This shall not be different by its principles from Help mechanisms, integrated in well-known desktop solutions.

3. Involved parts and Roles of the IT System

3.1. IT System Business Roles

The following entities are interested or shall be involved in the process of *ARIS* development and operation:

- **UNDP Project “Improving the Quality of Moldovan Democracy through Parliamentary and Electoral Support”** – as an institution that would finance and monitor *ARIS* development and implementation activities.
- **“Public Services Agency”** – as an institution that will administrate *ARIS* and will coordinate activities of designing, developing and publishing of information system. **“Public Services Agency”** will be the Owner and Possessor of *ARIS*, using it to keep records and manage all mobilization resources of the Republic of Moldova.
- Agency of Land Relations and Cadaster – as an institution that implements state policies in the domain of land relations, cadaster, geodesy, cartography, geo-informatics. Is the owner of National Cartographic Data Fund and will provide *ARIS* with the totality of orthophoto information necessary for the functioning of Register.
- Academy of Sciences of Moldova – as an institution that will have authorized access and will use *ARIS* for validating street names, proposed by local public authorities and requested to be used in national system of addresses.
- Central Election Commission – as a permanent public authority established to implement the electoral policy and ensure sound organization and conduct of elections. The *CEC* key IT resource – *SAISE* – will interact with *ARIS* to automatically receive and use the data on addresses of voters to assign them to polling stations.
- Local Public Authorities – as the registrar of *ARIS*. Local public authorities will be the key institution that will request approval of operation of creation, modification and removal of address objects situated on its geographic area of competence.
- **S.E. “Center for Special Telecommunications”** – as an entity that administers the *MCloud* common government platform that will hosts *ARIS* and IT systems with which *ARIS* would interact or platform services implemented under *ARIS*.
- E-Government Center – as a body empowered to develop and implement the e-Transformation policy, *MCloud* platform and interoperability framework *MConnect* applied for the interaction of *ARIS* with external IT systems.
- Ministry of Information Technology and Communications – as the main body of policy and rules regarding the development and implementation of state information resources.
- Central Public Authorities, Public Institutions, business environment and their information systems – as consumers of data on addresses of Republic of Moldova for exercising their functional objectives.
- Citizens of Republic of Moldova – as anonymous users of *ARIS* and indirect beneficiaries of the Register as a result of public services that depends on veridical data on addresses of Republic of Moldova quality improvement.

3.2. IT System owner

The owner of Address Register Information System will be *Agency of Land Relations and Cadaster*. *Agency of Land Relations and Cadaster* is a central public authority body subordinated to Government of Republic of Moldova that implements state policies in the domain of land relations, cadaster, geodesy, cartography and geo-informatics. In address system domain, *Agency of Land Relations and Cadaster* runs the following activities:

- develops and implements state policies in the area of addresses;
- develops and ensures the implementation of regulations and instructions in the area of addresses;
- coordinates at the central level the activities related to the establishment and development of the State Register of Addresses;

- provides the local public authority with an up-to-date mapping data, which is necessary for establishing the *Address Register Information System*;
- ensures the financing of maintaining and developing the *Address Register Information System*.

3.3. *IT System holder*

“Public Services Agency” shall be the IT solution holder that would provide the technical administration of *ARIS*. As owner of *ARIS*, Public Services Agency will perform activities intended for administration and ensuring the veracity of data collection on addresses of Republic of Moldova and will ensure the proper functioning of the information system.

3.4. *IT System Purchaser*

The *Address Register Information System* will be purchased by the UNDP Project **“Improving the Quality of Moldovan Democracy through Parliamentary and Electoral Support”** on behalf of the Public Services Agency. Although Public Services Agency is the direct Beneficiary of the IT solution, the ICT consultants contracted by the UNDP Project **“Improving the Quality of Moldovan Democracy through Parliamentary and Electoral Support”** will be involved at all *ARIS* development stages, its commissioning and final acceptance.

3.5. *IT System Registrar*

The capacity of Registrar of the *ARIS* will be assigned to all users holding the role of *Address Operator* designated by relevant subdivisions of the Level 1 Local public Authority and Level 2 Local Public Authority. As registrar of *ARIS*, local public authorities of all levels have the following powers regarding address system:

- name, rename the circulation routes and/or areas of public circulation within the borders of the administrative-territorial unit;
- appoint address numbers to the addressable objects located within the borders of the administrative-territorial units;
- register the names, renames and address numbers of the circulation routes and/or areas of public circulation in the *Address Register Information System*;
- update the data in the *Address Register Information System*;
- set, replace and maintain the street indicators.

3.6. *Users and their roles within the IT System*

Human roles or IT systems that interact with *ARIS* are displayed in Figure 3.1. As can be seen in this Figure, 6 main categories of human actors and 2 categories of IT Systems would be interacting under this application.

1. Internet User – human actor who accesses the public web interface of *ARIS* directly or via Open Data Portal (<http://www.date.gov.md>) to explore address system of the republic of Moldova. This category of actors has the following distinct roles:
 - accesses reports, statistics, KPI of public character generated by *ARIS*;
 - formulates interrogations to the database and extracts registered data of address objects;
 - use WEB GIS interface of *ARIS* in order to formulate interactive interrogations on map or visualization of address object location.

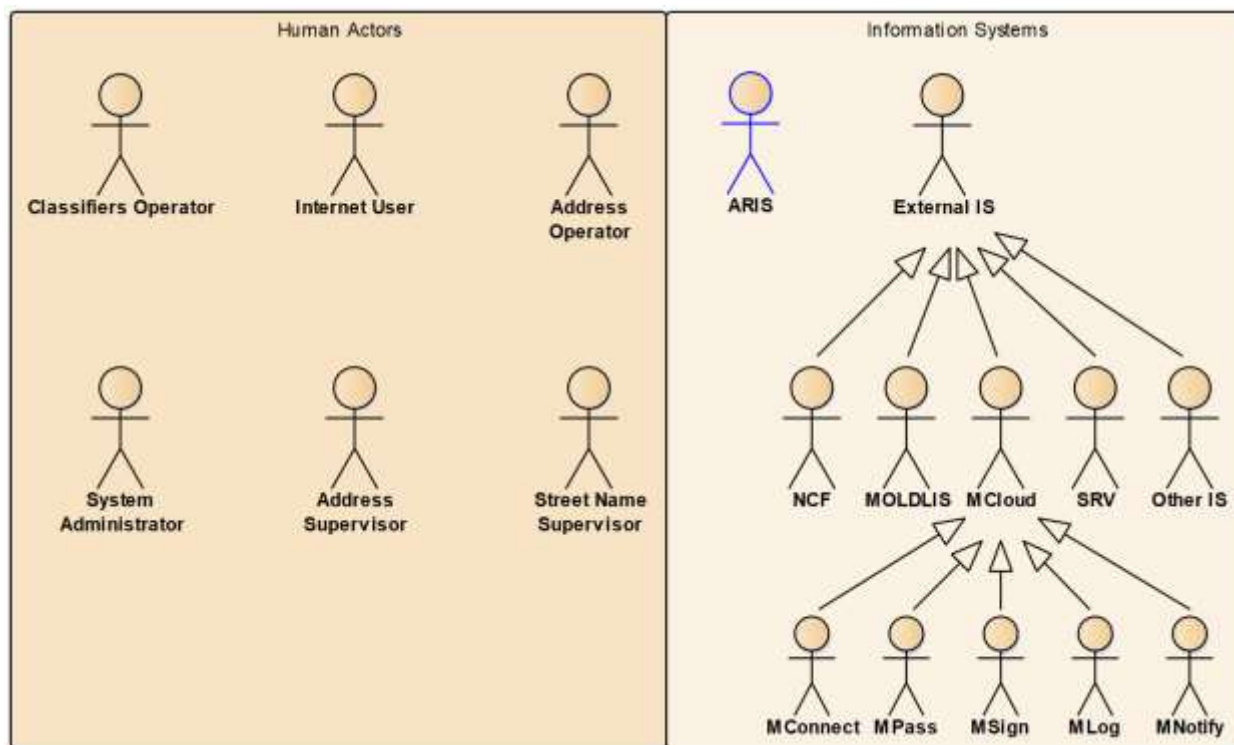


Figure 3.1. The actors of ARIS.

2. Address Operator – human actor who perfects the totality of requests of adding, modifying or removal of address objects and who defines geospatial parameters of these objects. Managed objects depend upon the level of local public authorities of *Address Operator* (Level 1 LPA or Level 2 LPA). This category of actors has the following roles:
 - has access to Internet User functionalities;
 - has access to personal dashboard for monitoring and accessing notifications addressed to his role;
 - perfects business events regarded to addresses (fills electronic forms of requests for adding / modifying / removal of address / address name, defines geospatial data of address objects, etc.);
 - generates standard documents based on electronic data forms perfected;
 - manages documents on business events of address objects;
 - generates reports and statistics relevant to his own access rights and user interface.
3. Address Supervisor – human actor who approves the totality of requests of adding, modifying and removal of address objects perfected by users with the role of *Address Operator*. This category of actors has the following roles:
 - has access to Internet User functionalities;
 - has access to personal dashboard for monitoring and accessing notifications addressed to his/her role,
 - approves / rejects requests of *Address Operator*.
 - generates standard documents based on electronic data forms perfected;
 - manages documents on approval of business events of address objects;
 - generates reports and statistics relevant to his own access rights and user interface.
4. Street Name Supervisor – human actor who approves the totality of requests of adding, modifying and removal of street names perfected by users with the role of *Address Operator*. This category of actors has the following roles:

- has access to Internet User functionalities;
 - has access to personal dashboard for monitoring and accessing the totality of notifications directed at his address;
 - approves / rejects requests on street names perfected by *Address Operator*.
 - generates standard documents based on electronic data forms perfected;
 - manages documents related to approval process of business events of streets;
 - generates reports and statistics relevant to his own access rights and user interface.
5. Classifiers Operator – human actor who manages metadata system of ARIS. This category of actors has the following roles:
- has access to Internet User functionalities;
 - manages classifiers content of *ARIS*;
 - manages nomenclatures content of *ARIS*;
 - manages configuration variables content of *ARIS*;
 - manages the metadata totality of *ARIS*.
6. System Administrator - human actor, assigned to manage the system users, monitor the system operation, configure the *ARIS*, start/stop/restart the IT System components. If the technological environment has sufficient capacity to perform administration works, then their implementation into the system is optional. This category of actors shall have the following distinct roles:
- use unconditionally all functionalities of the IT System, except for amending the logging files;
 - generate reports, statistics and performance indicators designed to monitor the system, support the analysis, forecast and decision-making processes;
 - manage and configure roles, rights of access and profiles of the IT System authorized users;
 - carry out system configurations, including workflows, electronic forms and document templates based on which the information stored in the database is exported;
 - manage the *ARIS* metadata (configurations, ways of access, credentials for accessing external services, Nomenclatures, Classifiers, Variables, etc.);
 - administer the application server;
 - administer the database in production;
 - make database back-ups.

The *ARIS* implementation implies the interaction of six categories of information systems as follows:

1. *ARIS* – IT System intended to keep records on the addressable objects of the Republic of Moldova which is the subject of development and implementation of this document.
2. External IT Systems – represent all external IT systems that belong to public authorities, state institutions and business entity of the Republic of Moldova delivered by primary data *ARIS*. This category comprises the following IT Systems:
 - A. *NFC (National Fund of Cartography)* – information system of *Agency of Land Relations and Cadaster* that provide all relevant orthophoto data for *ARIS* needs.
 - B. *MOLDLIS* – information system of *Public Services Agency* used for implementing procedures of authentication / authorizing *ARIS* (security module implemented by *Public Services Agency*) and receiving cartographic vector data, necessary for proper functioning of *ARIS*.

Note: integration with *MOLDLIS* shall be executed during implementation phase of the project.

- C. MCloud – a common governmental ICT infrastructure (where *ARIS* will be hosted), which is operated **based on “Cloud Computing” technology that makes available the interoperability framework for *ARIS*** to integrate the following services and IT Systems hosted in *MCloud*:
- MConnect – the interoperability governmental framework supporting the interaction with other applications – data providers or receivers, which are consolidated and managed in *ARIS*.
 - MPass – governmental platform service used to exercise control on the access to information systems hosted in *MCloud* and ensure the authentication procedures via a digital certificate or mobile identity.
 - MSign – governmental platform service used when applying and validating the digital signature, including mobile signature.
 - MNotify – governmental platform service used for notifying ***ARIS’s*** actors on business events.
 - MLog – governmental platform service used for logging critical business events of *ARIS*.
 - ODP (*Open data portal*) – governmental portal for open data through which *ARIS* will publish data of public nature.
- D. SRV (*State Register of Voters*) – Central Electoral Commission information system that directly responsible for creation of the voters lists and distribute of the voters to corresponding polling stations. *SRV* should have access to an efficient system of address management for a correct assignation of voters to polling stations.
- E. Other IS – external information systems of public authorities, public institutions and business environment (e.g. *Fiscal Register, State Register of Populations, S.E. Moldtelecom*, etc.) that need access to registration data of address objects in order to achieve their operating objectives.

4. Functional Model of the IT System

4.1. Informational Objects of ARIS

Having analyzed the modeled domain (automation of the management and registration processes of addresses) it is possible to present all informational objects to be taken into account in the process of *ARIS* development. Figure 4.1 presents the informational objects which serve as bases for designing and developing the *ARIS*.

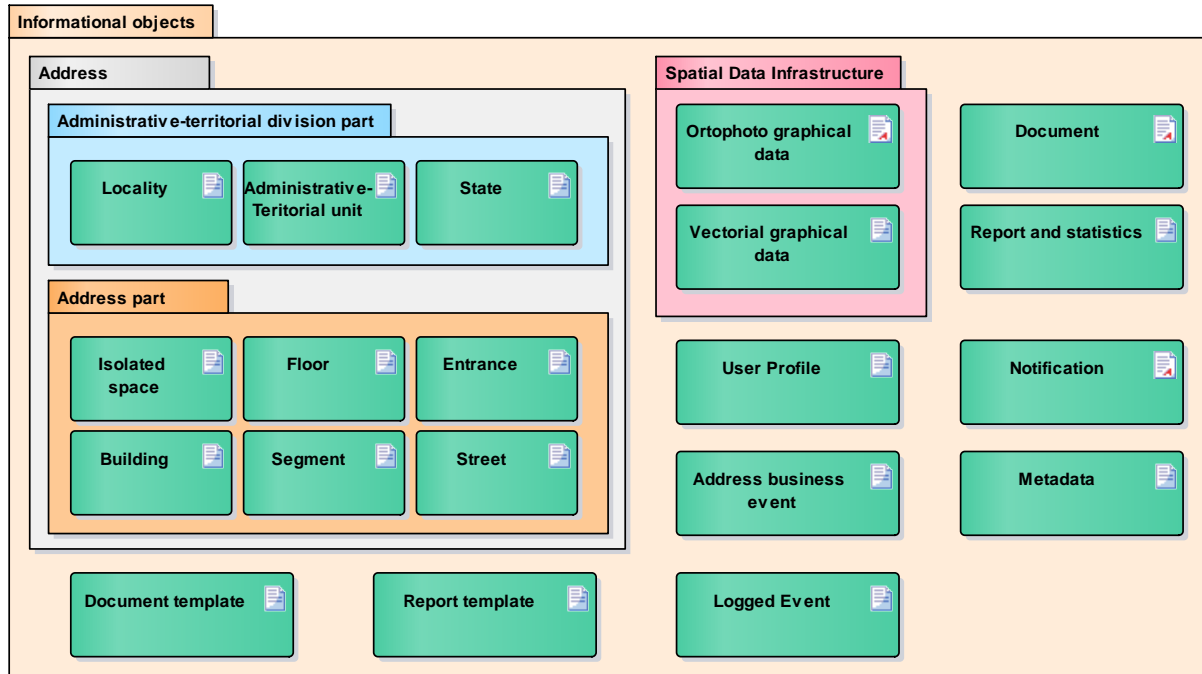


Figure 4.1. ARIS Informational Objects.

According to Figure 4.1, the IT solution comprises 11 categories of informational objects, of various complexities, to be taken into account in the process of *ARIS* design and implementation (nomenclature of information objects may be supplemented or amended during the writing of the technical project of *ARIS*):

1. Address.
2. Profile.
3. Spatial Data infrastructure.
4. Address business event.
5. Document.
6. Report and statistics.
7. Notification.
8. Metadata.
9. Document template.
10. Report template.
11. Logged event.

Objects shall be identified within the IT System by using, for each of them, a single identification number.

1. Address.

This is a central complex informational object, which contains all information related to the addresses of the Republic of Moldova. The informational object Address comprises 2 categories of complex informational objects: *Administrative-territorial Division part* and *Address part*.

1.1. Administrative-territorial Division part and Address part

The administrative-territorial division of the country is represented as spatial objects, with related nomenclature tables. The administrative-territorial division consist of state boundary, administrative-territorial unit (with possibility to add other layers in the future, in accordance with law) and localities.

1.1.1. Locality

Represents an informational object that contains the totality of information on locality component regarding address. *ARIS* shall contain the following categories of data on locality:

- identifier of the locality;
- locality level ID;
- CUATM code of the locality;
- name of the locality;
- parent ID;
- status of locality;
- GIS data;
- activation date;
- deactivation date;
- other relevant data.

Note: in the old system GIS data for this object where represented as polygons. Developed ARIS system implements GIS data as a relation of segments, each segment supports its own attributes.

1.1.2. Administrative-territorial unit

Represents an informational object that contains the totality of information on the component of administrative-territorial unit regarding address. Information system shall allow entering of a dynamic hierarchy of administrative-territorial units (e.g. district, county, development region, etc.) *ARIS* shall contain the following categories of data on administrative-territorial units:

- identifier of the administrative-territorial unit;
- administrative-territorial unit level ID;
- complete name of the administrative-territorial unit (e.g. *Unitatea Teritorial Administrativă Găgăuz-yer*);
- short name of the administrative-territorial unit (e.g. *UTAG*);
- parent ID;
- status of administrative-territorial unit;
- GIS data;
- activation date;
- deactivation date;
- Other relevant data.

Note: in the old system GIS data for this object where represented as polygons. Developed ARIS system implements GIS data as a relation of segments, each segment supports its own attributes.

1.1.3. State

Represents an informational object that contains the totality of information on state component regarding address. *ARIS* shall contain the following categories of data on state.

- identifier of the state;
- name of the state;
- official identifier of state;
- GIS data;

- Other relevant data.

Note: in the old system GIS data for this object were represented as polygons. Developed ARIS system implements GIS data as a relation of segments, each segment supports its own attributes.

1.2. Address part

The address information is represented as spatial object, with related alpha-numerical data and nomenclature tables. Address information consists of Isolated space, floor, entrance, building, segment, street and other data.

1.2.1. Isolated space

Represents an informational object that contains the totality of information on Isolated space component regarding address. It is a compartment of address that needs to be filled only in case of buildings with isolated spaces. *ARIS* shall contain the following categories of data on Isolated space:

- identifier of Isolated space;
- isolated space level ID;
- name / numbering of Isolated space;
- parent ID;
- status of Isolated space;
- activation date;
- deactivation date;
- Other relevant data.

1.2.2. Floor

Represents an informational object that contains the totality of information on floor component regarding address. It is a compartment of address that needs to be filled only in case of multi-levels buildings. *ARIS* shall contain the following categories of data about the floor:

- identifier of floor;
- floor level ID;
- name / numbering of floor;
- parent ID;
- status of floor;
- activation date;
- deactivation date;
- Other relevant data.

1.2.3. Entrance

Represents an informational object that contains the totality of information on entrance component regarding address. A building may have one or multiple entrances. *ARIS* shall contain the following categories of data on entrance:

- identifier of entrance;
- entrance level ID;
- name / numbering of entrance;
- parent ID;
- status of entrance;
- GIS data;
- activation date;
- deactivation date;
- Other relevant data.

1.2.4. Building

Represents an informational object that contains the totality of information on building component regarding address. In some cases, the address is identified with the building (*e.g. individual houses*). *ARIS* shall contain the following categories of data on building:

- identifier of building;
- building level ID;
- name / numbering of building;
- parent ID;
- status of building;
- GIS data;
- activation date;
- deactivation date;
- Other relevant data.

1.2.5. Segment

Represents an informational object that contains the totality of information on segment component regarding address. *ARIS* shall contain the following categories of data on segment:

- identifier of segment;
- name / numbering of segment;
- identifier of the street that segment belongs to;
- status of segment;
- GIS data;
- activation date;
- deactivation date;
- Other relevant data.

1.2.6. Street

Represents an informational object that contains the totality of information on street component regarding address. In some cases, the street may be absent (*e.g. small villages*). Street names shall be retrieved from a common thesaurus approved in advance by the user with the role of *Street Validator*. *ARIS* shall contain the following categories of data on street:

- identifier of the street;
- street level ID;
- complete name of the street;
- short name of the street (*e.g. Acad. S. Rădăuțanu* for *Academician Sergiu Rădăuțanu*);
- parent ID;
- status of street;
- activation date;
- deactivation date;
- Other relevant data.

2. Profile of ARIS authorized user.

This is a complex informational object comprising all data related to subjects and entities, which interact with *ARIS* or are the object of management and registration processes through the *ARIS*. 2 categories of profiles can be identified:

It represents an informational object that contains all data related to the authorized users of the IT System who have the right of access to user interface within the limit of their roles and rights assigned under the *ARIS*.

To this end, the informational object shall contain the following categories of information:

- user identifier;
- user IDNP code;
- user last name;
- user first name;
- **user's address;**
- E-mail;
- contact phone;
- login;
- password;
- authentication strategy (user + Password, Digital Certificate, Mobile Identity etc.);
- subdivision/entity where he works;
- status of account (active/inactive);
- access validity period;
- **user's roles;**
- other relevant data.

3. Spatial Data Infrastructure.

Complex informational object that provides the totality of geospatial data applicable by *ARIS*.

ARIS Spatial data infrastructure consists of 2 categories of informational objects: *Orthophoto graphical data* and *graphical vector data*. For its functionality *ARIS* will retrieve in totality *Orthophoto graphical data* from *National Fund of Cartography*. In the case of *graphical vector data*, used for defining outlines and the location through vector means, a part will be retrieved from *MODLIS* and another part will be created within *ARIS* through UC02.

3.1. Orthophoto graphical data.

This informational object represents the totality of images obtained by satellite or airplane photography retrieved from *National Fund of Cartography* used for addresses and elements representation as layers.

3.2. Graphical vector data.

This informational object represents the totality of vector images retrieved from *MODLIS* or shaped by means of *ARIS* used for localization and representation of addresses, taking into account contained geospatial data.

4. Address business events.

This is an informational object that corresponds to the totalities of electronic forms prepared through UC02 use case under the processes of address registration and management. The information content of these forms is different, depending on the prepared business event.

ARIS shall provide a sufficient set of electronic forms capable to register the following events related to informational object of *ARIS*:

- creation of new addresses (including massive creation of addresses);
- removal of addresses, including massive removal of addresses (deactivation or physical removal);
- modification of addresses (including massive modification of addresses);
- filling of geospatial data related to managed addresses:
 - registering of geospatial position of address object;
 - defining of outlines of address object, etc.

5. Document.

This is an informational object that covers all documents attached to the address business event forms or prepared through facilities delivered by UC02 and UC03 under the registration and management processes of addresses. Any informational object of *Document* type contains a minimal set of data designed for its identification and registration:

- document identifier;
- document type;
- issuing authority/person identifier;
- document registration number;

- document registration date;
- document content (scanned text/image).

6 Report and statistics.

This represents a complex informational object comprising all predefined Reports (physically incorporated) or generated instantly by *ARIS*, designed for all types of authorized users with the aim to register and manage addresses objects or manage and monitor the activity of all authorized users of the IT system. It is possible to present the following categories of reports implemented under *ARIS*:

- Predefined complex reports on the basis of predefined templates:
- **Generated** documents on the basis of predefined templates:
- Statistics and KPIs of *ARIS* (aggregated values retrieved from the information content of the *ARIS* database);
- *ARIS* system reports:

Taking into account their type, the reports will be accessible from interfaces with restricted access for the authenticated and authorized users. This informational object is described by the following categories of attributes:

- identifier;
- report title, KPI;
- reference period;
- report content, KPI.

7. Notifications.

This represents a category of complex informational objects used for notification with or without confirmation of *ARIS* authorized users. A notification shall comprise the following specific information:

- identifier of notification (order number assigned automatically by the *ARIS*).
- business event related to the notification;
- reference of access to the business event (file, form or document) that sent the notification (where appropriate);
- timestamp of the notification delivery;
- notification delivery strategy (E-mail or internal messenger, *ARIS* application);
- subject of the notification;
- content of the notification;
- sender of the notification;
- recipient of the notification;
- other relevant data.

8. Metadata.

This represents a category of complex informational objects comprising all Classifiers, Nomenclatures and Metadata used under *ARIS*. It shall comprise the following categories of data:

- external classifiers/nomenclatures (fully retrieved from external institutions or external information systems);
- *ARIS* internal classifiers/nomenclatures:
- configuration variables for *ARIS* (ways of access, global variables, etc.);
- configurations of access to external WEB services;
- other categories of metadata.

9. Document template.

This is a complex informational object designed to store a standard structure, predefined for the documents applied in the management and registration processes of mobilization resources. Based on the predefined templates it would be possible to generate and print out all documents prepared through UC11.

The informational object *Document template* is described by the following categories of attributes:

- template identifier;
- template name;

- version;
- status;
- parameters of document layout.
- parameters for inserting the document content.

10. Report template.

Complex informational object intended for data processing, extraction and displaying the contained data from *ARIS* database. Contains the totality of rules for data processing, extraction and displaying of information from *ARIS* in a convenient / user-friendly way.

The informational object *Report template* is described by the following categories of attributes:

- template identifier;
- template name;
- version;
- status;
- parameters of report layout.
- parameters of processing and insertion of report content.

11. Logged event.

This is a complex informational object designed to conduct the ICT audit and implement the information security policy. Any accessing or change of data: creation, updating, deletion, changing the status, etc. shall be logged in a special log file, with the recorded timestamp, the application, the event and the user who carried out the action. When the change does not involve physical removal of data for each registration, it would be possible to see the name of the user who made the last change.

Logging events shall have the following data:

- identifier of the logged event;
- document id of the event;
- identifier of the user who generated the event;
- category of the logged business event;
- timestamp of event logging;
- component of IT application (module) that generated the business event;
- record affected by the business event;
- details of the event.

4.2. Functionalities of the IT System

The functionalities provided by *ARIS* and the actors who can benefit from them are displayed in Figure 4.2. According to Figure 4.2, *ARIS* actors have access to 15 use cases that provide the following functionalities:

UC01: View addresses and public data

Use case provided to anonymous users through which users will access functionalities of reaching reports, statistics and KPI of public character regarding address system of Republic of Moldova.

Public access interface will allow Internet Users to formulate search / filter criteria on address objects and receiving, based upon selected criteria, lists of address objects requested (e.g. districts, localities, streets, certain addresses, etc.)

Public interface will offer a WEB GIS solution through which Internet Users will have the possibility of searching, visualizing, exploring addresses on interactive maps.

Use case UC01 will be provided via 2 alternatives:

- A dedicated public interface provided by *ARIS*;
- Open Data Portal.

In the case of Open Data Portal, *ARIS* will automatically publish files that contains data of public character on address system of Republic of Moldova (reports, nomenclatures, etc.).

UC02: Address business event management

This is a complex use case that will deliver all electronic forms necessary to document all business events related to the registration and management processes of addresses. *ARIS* will not allow any direct replacement of data in the database. Any change shall be carried out through a specialized electronic form. Depending on their entitlements and roles, the IT System users will have access to the relevant set of electronic forms.

The use case UC02 is a feature characteristic for the role of *Address operator* that represents one of the most important feature of the system. *Address operator* is a base level actor that taking into account legislation is represented by local authorities: has the basic role of adding primary information to *ARIS*, also to maintain this Register (modifying, address canceling). The primary recorded information will serve as a unique source of addresses for other organizations, institutions and other information systems. *Address operator* will interact with population in order to offer documents needed for address legalization, e.g. certificates.

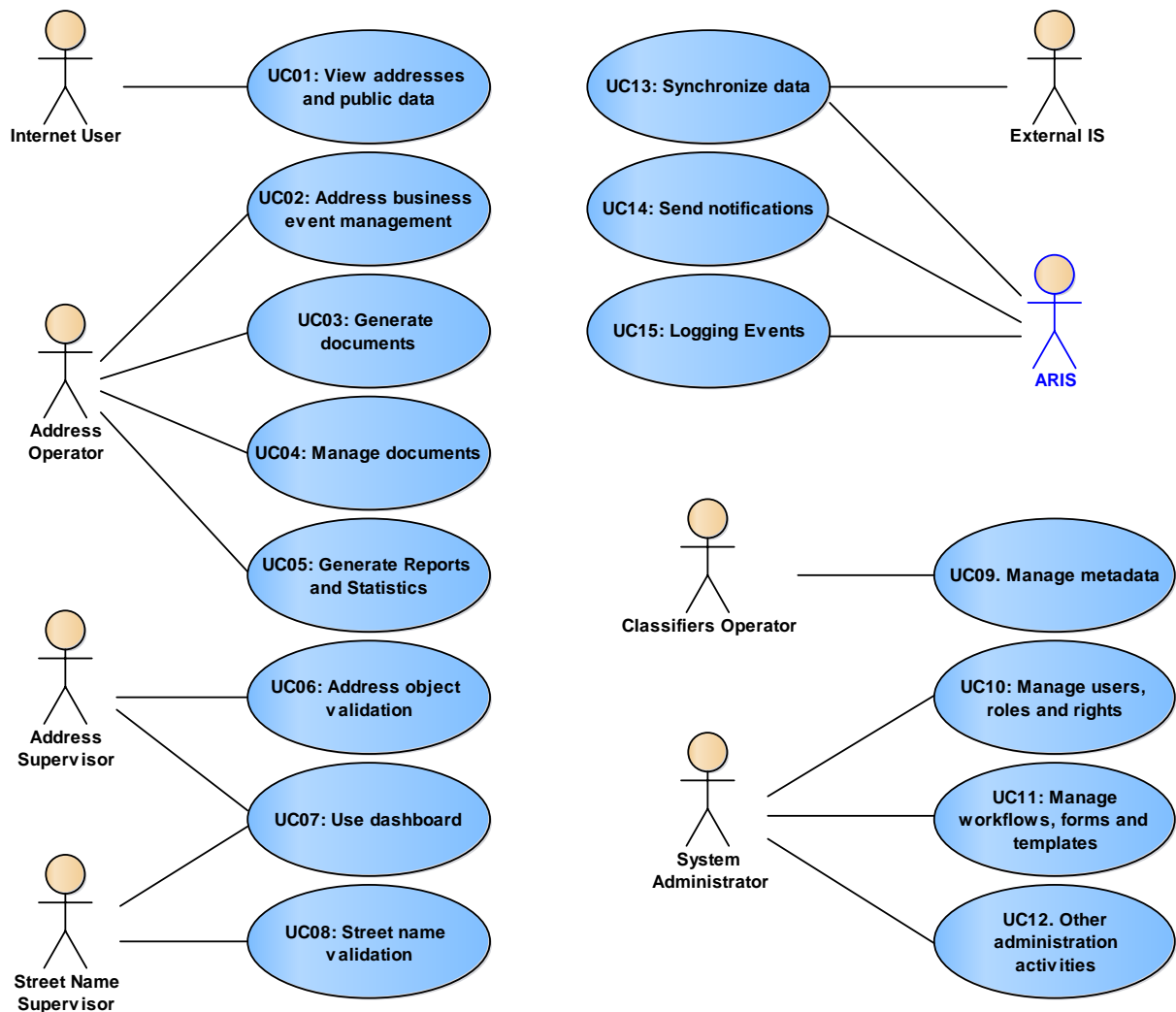


Figure 4.2. Use cases of ARIS.

The most common operations of address data are:

- Address informational object adding – is based on a document confirming the legality of the conduct of operation. The document is attached in electronic format, where for a certain geospatial location is created a new unique address. Besides legal document, textual attributive information of address and address geospatial location is needed. Lack of any of these three conditions will not allow storage of the object in Register or will allow storage of the object in Register with a status of “object in work”
- Address informational object modifying – is based on a document confirming the legality of the conduct of an operation. The document is attached in an electronic format. This operation is required because of the need of modifying the textual attributive information and / or the geospatial location of the addressable object. All previous information on address will be kept in the system and when required past reports shall be generated and information about the object shall be available

- Address informational object cancelling or Address informational object elimination - is based on a document confirming the legality of the conduct of operation. The document is attached in an electronic format. Address informational object cancelling may be applied when for e.g. a house is demolished and there is no more need of address storage. Any operation of address informational object cancelling is a logical operation in ARIS application, changing only the status without elimination of the object from Register. All previous information on address will be kept in the system and when required reports from past shall be generated and information about the object shall be available.
- Elimination of the incorrect address informational object - is based on a document confirming the legality of the conduct of operation. The document is attached in an electronic format. Elimination of the incorrect address has the purpose of addressable object elimination from the Register, operation that may be only logical. Eliminated object shall not appear in past reports. More frequently, this operation will be used when address operators made an error.

Upon insertion and / or change of addressable objects, a number of validations in the system defaults textual data will **be done, in order to rule out operator errors such as, address number should not contain specific symbols e.g.: „@#\$%^.** At the level of geospatial data is required to include a verification of objects topology such as for current level and for other levels. The system shall include a classifier managed by a *Classifiers Operator*, which will specify the set of rules for topology checking between different levels. For example, geospatial location of localities cannot overlap, but at the same time a street cannot be part of two or more localities.

UC03: Generate documents

This functionality is available to users with the role of *Address Operator*, *Address Supervisor*, *Street Name Supervisor*, *Classifier Operator* and *System Administrator* through which all documents shall be generated on the basis of predefined templates with data populated from the ARIS DB content.

ARIS will provide functionalities for download of the generated documents in printable format or editing format, ensuring the storage mechanisms, as well as applying the digital signature.

UC04: Manage documents

Use case that aims to create interface for adding, extraction, modification or removal of documents relevant to business events or addressable objects. The document management must have the following minimum requirements:

- *Create*: capture, identification and classification of documents.
- *Maintain*: documents controls and security; documents versioning and long-term preservation;
- *Disseminate*: search, retrieve and render functionality;

This functionality will allow the effective operation with documents (metadata and images) from data base ARIS

UC05: Generate report and statistics

It is a functionality characteristic for the roles: *Address operator*, *Classifier operator*, *Address supervisor*, *Street names supervisor*, which will facilitate quick access to a grouped set of information, following a number of conditions. It is necessary to set out the following options of reports:

- *Static* – reports with fields with input parameters and a default output data format. Actor can access the report, input parameters (that may be or may be not) and receives the generated report results according to a predetermined template. Static reports are used most frequently and have the role for a quick access to visualization data, printing or exporting in open formats.
- *Dynamic* – report generator easily configurable for simple users. These users, in specific cases, depending on the need will create their own report where will define input parameters and output report format. Configured report will be saved for users / user groups for a subsequent access. Dynamic reports have the role for a quick access to visualization data, printing or exporting in open formats.
- *Internal* – static and dynamic reports, created for analysis of processes carried out, the informational base of the system, analysis of the activity of authorized users. This kind of report is accessible for system Administrator with the possibility for visualization, printing or export.
- *Security and audit reports* by configurable criteria, including history of objects changed and reports on data usage;
- *Statistical report* on ARIS web services usage;
- *Logging report* – to keep a log of all created reports, issued data, indication to who was presented, when and for what purposes and the user who generated the report.

Reports are generated for geospatial and textual information with the possibility to modify and configure style of symbols, texts names and other components (header / body / footer) colors / styles thickness and geospatial data visualization etc.

It is necessary to provide a system for storing and accessing the reports depending on the access rights. The result reports can be viewed, printed or exported to formats such as Open Office, xml, pdf, Google KML, GML, etc.

UC06: Address object validation

It is a functionality characteristic for the *Address supervisor* for checking of newly created or modified objects. It is a necessary operation especially in the first period of the life cycle of *ARIS* in order to avoid operator errors.

Address supervisor will have a graphical interface where the system will display the list of new or modified objects. When accessing an addressable object, attributive textual information, geospatial, documents attached to this object and a report on the accuracy of the data generated by the system will be displayed. When saving an addressable object, a data validation is ongoing, approved results will be available later in the report generated by the system.

The role of *Address Supervisor* has a predefined independent role, but if necessary can be offered to *Address Operator*, depending on further requirements of *ARIS* holder.

UC07: Use dashboard

This represents a functionality through which the authorized user of the *ARIS* will be warn and be able to view and access rapidly all business events related to his interactions with the IT system and job duties (system notifications, workflow events, etc.).

Likewise, he will have direct access to functionalities related to the notified business events (accessing directly the business event form, printing out the documents generated as a result of received changes, etc.). The user interface of the *ARIS* main page would serve as a Dashboard where user-related elements and notifications would be displayed.

UC08: Street name validation

It is a functionality characteristic for *Street Names supervisor* which provides verification, acceptance or rejection of new or changed street names. According to Draft Law: *Academy of Sciences* is the responsible body for final approval of street names.

Without the approval of *Street names supervisor*, the street will have an undetermined status and will be not available for use by address operator. Totality of rules for the validation of street names is described in Draft Law.

UC09: Manage metadata

This is a use case that provides all functionalities intended for the *Classifiers Operator* through which he administers all Nomenclatures, Classifiers and configurations that form the *ARIS* metadata system (including the Metadata that define the *ARIS* user interface configuration).

UC10: Manage users, roles and rights

It describes the functionalities intended for *System Administrator* through which they administer profiles and roles of IT System authorized actors, including the external actors who review and insert data for which the authentication is done on the basis of user name + password + IP address, digital certificate or mobile identity, of external IT systems etc.

Likewise, this Use Case will deliver all functionalities necessary to define the users' rights of access to user interface components or Data Base content and specify the component peculiarities of user interface components in their interaction with the authorized users.

UC11: Manage workflows, forms and templates

This represents a use case intended for IT *System Administrators*, which describes all functionalities available to them to update workflows, electronic forms and standard document templates usable for each type of input or output document (configure the heading zone, footnotes, static and dynamic contents, formatting, graphical aspects, etc.).

A document template shall comprise an inserted beacon through which it could be populated with content information extracted from the database.

UC12: Other administration activities

This represents a use case intended for *Administrator*, which describes all functionalities accessible to them designed to administer and audit the *ARIS*: **maintaining the list and integrity of users' credentials who have access to the administration space**, retrieval of reports from the system logs to be subject to review and tracking potential logical and physical security issues of the *ARIS*, using the procedures for backup/restore etc.

The *ARIS* administration Use Case will implement all functionalities aimed at ensuring the IT System viability and integrity.

UC13: Synchronize data

Use case through which *ARIS* will execute upon request or automatically with a certain periodicity the launch of procedures of retrieval or delivery of data necessary for functioning or regarding address system of Republic of Moldova. *ARIS* will use external interface for retrieval of data necessary for implemented business processes (orthophoto data, vector graphics and document management) and will provide interfaces through a third-part informational services that requests data on address objects from Republic of Moldova. Interaction with external information systems will be realized through interoperability framework platform *MConnect*.

UC14: Send notifications

This is a use case through which the *ARIS* authorized users will be notified (internal messenger or E-mail) on the occurred business events that might affect them. The users shall receive notifications through their personal dashboard and E-mail messenger. The *Address Register Information System* will ensure functionalities of direct access to business event details (electronic file, electronic form or document to be printed out) directly from the notification.

UC15: Logging Events

This is a use case through which the business events generated by the *ARIS* functional components will be logged. Any event generated under business processes implemented in *ARIS* will be logged and saved in the corresponding tables of the database. The logging mechanism shall be developed on the basis of standards and best practices implemented in the industry. The IT System will deliver functionalities to configure the strategy for logging of business events, including: business events subject to logging, logging calendar (determined period for logging or undetermined). The logging mechanism shall integrate with *MLog* to logging sensible business event.

4.3. *ARIS* workflows

The developer will conceptualize and validate the totality of workflows of *ARIS* at the stage of information system projection and technical project conceptualization.

The following indicative workflows needs to be conceptualized:

- Workflow intended for address objects creation that will deliver the totality of necessary functionalities for perfecting electronic forms designed for adding of new address objects.
- Workflow intended for address objects modification that will deliver the totality of necessary functionalities for perfecting electronic forms designed for modification of existing addresses in *ARIS*.
- Workflow intended for address objects removal that will deliver the totality of necessary functionalities for perfecting electronic forms designed for removal of existing addresses in *ARIS*.
- Workflow intended for approval / rejection of requests of adding / modification / removal of address objects.
- Workflow intended for requests on adding street names that will deliver the totality of necessary functionalities for perfecting electronic forms designed for adding of new street names.
- Workflow intended for modification of street names that will deliver the totality of necessary functionalities for perfecting electronic forms designed for modification of existing street names in *ARIS*.
- Workflow intended for removal of street names that will deliver the totality of necessary functionalities for perfecting electronic forms designed for removal of existing street names in *ARIS*.
- Workflow intended for approval / rejection of requests on adding / modification / removal of street names.
- Workflow intended for interactions between *ARIS* and external information systems for WEB interfaces exposal designed for delivery of data on address objects contained in *ARIS*.

4.4. User Interface of IT System

ARIS shall offer an ergonomic interface, intuitive and accessible to all types of users via a web browser optimized for the resolution of 1360x768. The System shall have an agreeable, balanced and distinct graphical design, responsive to all **devices used (desktop PC, notebook, tablet, Smartphone)**. For users' simplicity, the IT solution shall have a system of online contextual help at the level of each WEB interface.

Depending on the user category (their rights and roles) the IT system will deliver a personalized interface to each category of users.

Users of the IT system shall have at least 7 basic levels of access to user interface (sets of rights and roles assigned to them, and the IT System Administrator would be able to configure the optimal number of access groups through system mechanisms delivered by the application):

- Access Level for Internet User – characteristic access level for anonymous users of ARIS that shall have access to the totality of information of public character through *Open Data Portal* or accessing public interface of ARIS. Public access means also access of data in GIS format, with browsing addresses on map.
- Access Level for the Address Operator of Level 1 LPA – characteristic access level for local public authorities of level 1 users that shall pass authentication using user name and password, or using digital certificate / mobile identity and will have authorized access to the totality of functionalities of perfecting forms for creation, modification or removal of address objects located in the area of jurisdiction of local public authorities of level 1, that operator is responsible for. Also, this category of users shall have access to functionalities for generating documents and relevant reports on address system and business events of local public authorities of level 1.
- Access Level for the Address Operator of Level 2 LPA – characteristic access level for local public authorities of level 2 users that shall pass authentication using user name and password, or using digital certificate / mobile identity and will have authorized access to the totality of functionalities of perfecting forms for creation, modification or removal of address objects located in the area of jurisdiction of local public authorities of level 2 (setting of borders of local public authorities of level 2, setting of borders of local public authorities of level 1 that are component part of authorities of level 2, etc.) Also, this category of users shall have access to functionalities for generating documents and relevant reports on address system and business events of local public authorities of level 2.
- Access Level for the Address Supervisor – characteristic level of access for authorized users of *Public Services Agency* that shall pass authentication using user name and password, or using digital certificate / mobile identity and will have authorized access to the totality of functionalities for approval / rejecting of requests forms on addresses perfected by users with the role of *Address Operator*. Also, this category of users shall have access to functionalities for generating documents and relevant reports for own access rights.
- Access Level for the Street Name Supervisor – characteristic access level for authorized users of *Academy of Science*, that shall pass authentication using their user name and password, or using digital certificate / mobile identity and will have authorized access to the totality of functionalities for approval / rejection of request forms on adding street names in ARIS. Also, this category of users shall have access to functionalities for generating documents and relevant reports for own access rights.
- Access Level for the Classifiers Operator – characteristic access level for authorized users of *Public Services Agency* that shall pass authentication using user name and password, or using digital certificate / mobile identity and will have authorized access to the totality of functionalities for administration of ARIS metadata system (classifiers, nomenclatures, variables of configuration, etc.)
- Access Level for the System Administrator – a level of access common for the user with the highest level of access to the IT System resources. This level, due to its role to administer the IT solution smooth operation, will ensure access to all functionalities of user interfaces and to the database content delivered by the user interface.

ARIS shall deliver a user interface in Romanian language. The data content of the IT system will be input in 3 language versions: Romanian, English and Russian. The procedures of searching information and records shall be performed via simple search (specification of search series) or via more complex search forms allowing filtering the information (QBE

forms). Regardless of the type of searched information, the user shall utilize the same method of queries and retrieval of information for any section of the IT system.

In addition to the searching module implemented based on QBE principle, which would offer the possibility to define visually sophisticated queries, the interface shall offer the possibility to refine the search results by ensuring the possibility to filter the data in the list containing the search results.

The IT system user interface shall ensure filtering the records that match the search criterion presented by users depending on their rights of access.

Indexed values (values from Classifiers, Nomenclatures) shall have the option to be filtered by picking up the value from predefined lists. For numerical types of fields or calendar data there should be the possibility to filter as per the exact value of the searched characteristic (*example: 23.09.2016 – all records with the specified date*) or by logical criteria (*example: <01.04.2015 – all records with the date older than 01.04.2015, >07.06.2013 – all records with the date more recent than 07.06.2013*).

Also, it should be granted the possibility to filter the result according to the mask (for example, filtering by address identifier) as per the sample: 258151224* – **all the records that begin with the series of characters "258151224"**, *CEL MARE – **all the records that end with the series of characters "CEL MARE"** or *MARII ADUN* – **all the records that comprise the series of characters "MARII ADUN" in their contents**.

The content of any table with results or electronic format, depending on the type of information comprised, shall have the possibility to be exported in any of the following format: CSV, RTF and PDF.

ARIS shall provide to relevant users a WEB GIS interface. The Web GIS **ARIS's** component will have several layers of access: for power users (e.g. ALRC, "**Public Services Agency**"), for key government stakeholders and for the open public:

- The web GIS component for power users must integrate all functionality for data entry, data quality control, queries and analysis;
- The web GIS component for key government stakeholders must integrate all visualization, query and analysis functionality; Part of the web GIS application is public API(s) to enable integration within systems;
- The web GIS component for the open public must integrate visualization functionality with basic search capabilities for address search based on key address attribute data (e.g. Localities, settlements, street names, street numbers, etc.).

The web GIS visualization functionality must include basic functionality for map display and map navigation (pan, zoom in, zoom out, center map display, zoom to full extend), basic tools such measure line, polygon, must have a map legend for all layers of symbols, switch on/off layers functionality, printing functionality, scale bar, quick navigation functionality with a drop-down list of localities, etc. Must have option to save current user layout (as a map template) to be opened in the next session or to share it.

4.5. Reporting, Audit and Statistics Mechanism of the IT System

The IT System should have implemented functionalities designed to auditing/logging widely used in this area. This is configurable for logging technical and business events. The IT System shall deliver a mechanism to generate predefined and ad hoc reports capable to ensure a pertinent review or assessment of the management and registration processes of mobilization resources.

ARIS shall deliver an OLAP mechanism intended for dynamic generation of various and ad hoc reports where to configure the cubes for data analysis, including the configuration of the data aggregation method (average, median, maximum, minimum, element quantification, etc.).

The ARIS reporting system shall define 4 categories of reports:

- Analyze reports – a category of reports (as a rule, implemented physically in the IT System content) aimed to audit and analyze the ARIS information content. Given reports will be generated based on configurable templates. The Developer shall integrate at least 25 categories of such reports, which layouts would be granted at the time of performing the business analysis.

- Documents generated on the basis of a predefined template – a template is created for each type of documents to be populated with information relevant for the document (*e.g. request of adding street name, request of adding / modification / removal of address, etc.*);
- Performance Indicators – a set of KPIs based on which the performance of mobilization resources management and registration could be assessed (assessment indicator of the country level of provision with human and material mobilization resources);
- Monitoring reports – a category of reports designed for users with decision-making roles to assess the interaction methods of authorized users with the *ARIS*. This category of reports will organize and display the content of log files based on which the IT system vulnerabilities could be reviewed and prevented;

The reporting mechanism peculiarities are described in a series of sections of this Document, such as:

- Section 4.1. (informational object Reports);
- Section 5.1.1.3. (functional requirements set for use case UC03: Generate documents);
- Section 5.1.1.5. (functional requirements set for use case UC05: Generate Reports and Statistics);
- other Sections of this Document.

5. Requirements for the IT System

This chapter is divided in 2 parts: Requirements for phase 1 and Requirements for phase 2.

Requirements for phase 1 are for information purposes to understand functionalities of the system that was developed during development stage and will be continued with the next stages.

Requirements for phase 2 are mandatory for this tender.

5.1. Requirements for phase 1

5.1.1. Functional Requirements for the IT System

5.1.1.1 UC01: View addresses and public data

The functional requirements related to the component of public access on *ARIS* are defined in Table 5.1.

Table 5.1. Functional requirements set for use case UC01

Identifier	Mandatory	Functional Requirement Description
FR 01.01	M	<i>ARIS</i> shall provide anonymous access (public) to its compartments via two options: <ul style="list-style-type: none">■ dedicated public interface of <i>ARIS</i>;■ Open Data Portal (http://date.gov.md).
FR 01.02	M	Information of public character includes: reports, statistics and KPI registration data of address objects.
FR 01.03	M	The public <i>ARIS</i> interface will deliver 3 regimes of data exploration: <ul style="list-style-type: none">■ downloading of reports, statistics and generated by <i>ARIS</i> documents;■ registration data of address objects exploration in alphanumeric format;■ registration data of address objects exploration through WEB GIS interface.
FR 01.04	M	Public interface shall provide mechanisms for data search via a module for searching / filtering (choosing values from a predefined nomenclature or global search), the result should be in alphanumeric format.
FR 01.05	M	Public interface shall provide mechanisms for data searching via geospatial data (choosing values from a predefined nomenclature or defining relevant areas on map), the result should be presented on map.
FR 01.06	M	The web GIS visualization functionality must include basic functionality for map display and map navigation (pan, zoom in, zoom out, center map display, zoom to full extend), basic tools such measure line, polygon, must have a map legend for all layers of symbols, switch on/off layers functionality, printing functionality, scale bar, quick navigation functionality with a drop-down list of localities, etc. Must have option to save current user layout (as a map template) to be opened in the next session or to share it.
FR 01.07	M	<i>ARIS</i> shall ensure functionalities of exporting the results in an editable format (e.g. the export of a list of street names that correspond to selected search criteria).

5.1.1.2 UC02: Address business event management

The functional requirements related to the mechanism for preparing electronic forms related to business events of the registration and management processes of addressable objects are defined in Table 5.2.

Table 5.2. Functional requirements set for use case UC02

Identifier	Mandatory	Functional Requirement Description
FR 02.01.	M	ARIS shall provide mechanisms of searching address objects via a module for searching / filtering (choosing values from a predefined nomenclature or global search), the result should be in alphanumeric format.
FR 02.02.	M	ARIS shall provide mechanisms for data searching via geospatial data (choosing values from a predefined nomenclature or defining relevant areas on map), the result should be presented on map.
FR 02.03.	M	ARIS will deliver electronic forms designed to record business events related to addressable objects.
FR 02.04.	M	As business events related to addressable object could serve acts, orders, dispositions and other categories of documents involving the change of registration data and records addressable objects.
FR 02.05.	M	All updates operated to registration data and records on addressable objects will be prepared exclusively through UC02.
FR 02.06.	D	The statuses and transitions through which an electronic form for preparing a business event related to addressable objects could go through are configured via use case UC11.
FR 02.07.	M	ARIS will ensure access to authorized users to the list of electronic forms designed to record business events related to addressable objects depending on the roles they hold.
FR 02.08.	M	Any electronic form designed to prepare a business event related to addressable object will have associated a document template to be configured through UC11 and populated on the basis of data comprised by the form.
FR 02.09.	M	The IT System will enable inserting in the electronic form several addressable objects at the same time (mass register, mass change etc.).
FR 02.10.	M	<p>The following are part of the category of addressable objects:</p> <ul style="list-style-type: none"> ■ buildings, including the unfinished and the future ones (if the address had been attributed before the entry into force of the present law); ■ main entries into buildings; ■ isolated premises, including the future ones; ■ parks; ■ public markets; ■ recreation or rest areas; ■ sport fields; ■ authorized car parking lots; ■ other authorized objects where human activity can be carried out.
FR 02.11.	M	<p>The system should have a flexible mechanism for creating the address line based on a predetermined template. The user should have the possibility for each concrete case to decide to add or not an element to the address. The address of the object shall contain the following elements:</p> <ul style="list-style-type: none"> ■ name of the state; ■ name of the administrative-territorial unit of the second level; ■ name of the administrative-territorial unit of the first level; ■ name of the village (in case of communes); ■ name of the circulation route or name of the area of public circulation to which the addressable object has an exit; ■ distance of object location on a certain road (for the objects located outside the built-in area of localities); ■ the number of building and number of the entrance (condominium entrance) (for addresses attributed before the

Identifier	Mandatory	Functional Requirement Description
		<p>entry into force of the present law) or the number of entry (for addresses attributed after the entry into force of the present law);</p> <ul style="list-style-type: none"> ■ number of premises.
FR 02.12.	M	<p>The system will allow the adding, modifying and cancelling of all component parts of an address:</p> <ul style="list-style-type: none"> ■ state; ■ administrative-territorial unit of the second level; ■ administrative-territorial unit of the first level; ■ name of the village (in case of communes); ■ name of circulation route or name of the area of public circulation to which the addressable object has an exit; ■ distance of object's location on a certain road; ■ the number of building or the number of entry. <p>The data has to be in compliance with data specification for INSPIRE spatial data theme Addresses.</p> <p>Mappings between the system and INSPIRE application schema for each applicable feature type have to be indicated.</p>
FR 02.13.	M	<p>The system will leave the possibility to configure of component parts and interdependent parts of an address, without the need of a special configuration by programmers. For example, the change of "raion" into "județ" – a new layer will be added in the Register. It will be necessary only to configure the system.</p>
FR 02.14.	M	<p>The system will deliver a unique interface for editing of textual and graphical information of addressable object</p>
FR 02.15.	M	<p>The system will allow the defining of access rights for users depending on their geographical area of activity and will exclude the possibility of accessing data from other geographical areas</p>
FR 02.15.	M	<p>The history for each addressable object will be preserved. A service for accessing a certain moment from the past shall be developed, in order to check information about the object, or that there was not such object in the system.</p>
FR 02.16.	M	<p>The system will allow adding of past objects, before the creation of addressable object, in this manner the possibility of recovering information about a past address is created.</p> <p>Example: <i>str. Ștefan cel Mare</i> was registered on 01.01.2000, before 90's it was named <i>str. Lenin</i>. In such way the historical information can be stored.</p>
FR 02.17.	M	<p>Any electronic form designed to prepare a business event related to addressable object will define following types of operations with addressable objects:</p> <ul style="list-style-type: none"> ■ create objects; ■ modifying objects; ■ cancelling objects; ■ elimination of incorrect object.
FR 02.18.	M	<p>Each operation of editing of an addressable object shall be possible only if a scanned or electronic document is attached to electronic form of business event related to addressable object.</p>
FR 02.19.	M	<p>Taking into account the actual configuration of the data collection, pre-processing, quality control work-flows and database structures the data input on the addressable objects business events must have the following minimum requirements:</p>

Identifier	Mandatory	Functional Requirement Description
		<p>a) Manual data entry into the databases via on-line interfaces (customized web applications) with main functional capabilities implemented on them:</p> <ul style="list-style-type: none"> ■ Web interface for manual entry of data (on-line forms), for both geographic and attribute information, including point, line and polygon features. The web interface for the attribute information must be based on predefined nomenclature list (drop down /search menus) of street names, street number, floors, isolated spaces, etc. If the data is available in the database user can select from the drop down/search list: ■ Select/Enter settlement name (e.g. village); ■ Select/Enter street names, assigned to the selected village; ■ Select/Enter building number, assigned to the selected street; ■ Select/Enter floor number, assigned to the selected entrance number; ■ Select/Enter Isolated space number, assigned to the selected floor number. ■ If data is not available, the user can edit the nomenclature list, add missing data and then select the newly added data and assign it to a new address. <p>b) The web interface for geographic data must support at least the follow operations:</p> <ul style="list-style-type: none"> ■ Add/edit features – add/edit features manually by indicating coordinates, by draw on the map or by the import of geographic data generated in other GIS based software (one or more objects at the same time); ■ Clipping features – used to cut out a piece of object; ■ Merging features – create possibility to merge two or more objects from the same layer; ■ Intersecting – integrate two spatial data sets while preserving only those data common for both objects; ■ Buffering graphics and features; ■ Querying attributes and geographic data; ■ Topology – topology had to be supported for objects from the same layer and/or from different layers; ■ Web interface for entering metadata records (as database attributes or XML documents); ■ Web interface for attaching documents, related to address information. <p>c) In addition to the above-mentioned customized web interfaces, it is also possible to establish a password-protected multi-user access to DBMS and Web Service Catalog with a variety of standard software applications (e.g. QuantumGIS). Loading data queries into such powerful applications could provide not only an interactive data editing functionality, but also a wide range of analytical functions, including statistical analysis, data summarizing and creation of sophisticated graphical outputs.</p>
FR 02.20.	M	All operations involving addressable objects shall be logged.
FR 02.21.	M	Database software (DBMS) of the system must have full RDBMS capabilities of storing both GIS data objects and attribute data tables, as well as support of OGC standards and functions for password-protected multi-user data access and editing of attributes and GIS objects (standard EPSG projections, internal topology support for vector objects, spatial indexing and spatial queries, geo-processing functionality) along with SQL querying and replication capabilities.

Identifier	Mandatory	Functional Requirement Description
FR 02.22.	M	A set of rules for checking of inputted information quality (textual / geospatial data) shall be developed in SRS.
FR 02.23.	M	When a graphical object is edited, an automatic check of the quality of introduced data and a report shall be created.
FR 02.24.	M	Editing of an addressable object is complete when there are no errors approved by <i>Address supervisor</i> .
FR 02.25.	M	Elimination of an approved addressable objects is a logical operation, physically the object will remain in the database with all its characteristics. This operation cannot be completed, if in present there are active links of other informational objects.
FR 02.26.	M	Placing or modifying of addressable objects with time data that is intersecting is not possible. Example: "str. Stefan cel mare 45" cannot be identified for the date 01.01.1992 as "str. Lenin 45" is the name of the street for that date During geospatial information editing, it will be checked the type of object: point, line, polygon and multi-polygon. Objects other than this set will not be saved.
FR 02.27.	M	For geospatial data, the topology of object shall be checked.
FR 02.28.	M	The visualization of all historical versions of an object shall be developed, including all attributive textual and graphical information, and all legal documents.
FR 02.29.	M	The system must support versioning of informational objects, classifiers and other information.
FR 02.30.	M	The system must support continuity and "no deletion" of informational objects and classifiers
FR 02.31.	M	The system shall have the option of exporting graphical information about the objects in open source formats, e.g. Google KML, ShapeFile, etc.
FR 02.32.	M	When modifications are cancelled by "Address supervisor" , the system will return all the information in the initial form.
FR 02.33.	M	The system allows validation of topological objects. First, new objects are validated between them and after that are validated with existing objects from Register.
FR 02.34.	M	The form will include content-related constraints and restriction to limit mechanical errors.
FR 02.35.	M	On the basis of content information from the electronic form for recording the business event related to addressable objects, <i>ARIS</i> will enable generating a file in editable format to print out a hard copy of the act related to the form.
FR 02.36.	M	The IT System will deliver a mechanism for checking the accuracy of preparing the electronic form for recording the business event related to addressable objects (obligation of data content, accuracy of inserted type of data, integrity of entered data, etc.).
FR 02.37.	M	Electronic form for recording the business event related to addressable objects must have front end validation on a field level, with a proper notification for the user. Additional server-side validations must be developed when saving the data. Validations can include: obligatory fields, drop down menus, spatial validation of addresses within building boundaries etc.
FR 02.38.	M	<i>ARIS</i> must provide topological validation of geometry of all point, line and polygon features into the system.
FR 02.39.	M	<i>ARIS</i> must generate automated reports for quality control, based on geographical or attribute selection.

Identifier	Mandatory	Functional Requirement Description
FR 02.40.	M	Only an electronic form for recording the business event related to addressable objects that passed successfully the procedure for checking the accuracy of its preparation will be sent to the <i>Address Supervisor</i> or <i>Street Name Supervisor</i> for approval.
FR 02.41.	M	The IT System will deliver functionalities for applying the <i>Address Operator</i> digital signature on the electronic form for recording the business event related to addressable objects prepared by him according on national legislation on registries.
FR 02.42.	M	<i>MSign</i> service of the joint governmental platform <i>MCloud</i> will be used as a mechanism for applying the digital signature.
FR 02.43.	M	<i>ARIS</i> will deliver functionalities for sending the electronic form for recording the business event related to addressable objects to the <i>Address Supervisor</i> or <i>Street Name Supervisor</i> for approval.
FR 02.44.	M	<i>ARIS</i> shall notify automatically the <i>Address Supervisor</i> or <i>Street Name Supervisor</i> on receiving an electronic form for recording the business event related to addressable objects for consideration and approval (the form shall be approved through UC14).
FR 02.45.	M	An electronic form for recording the business event related to addressable objects can be edited repeatedly when it was rejected by the <i>Address Supervisor</i> or <i>Street Name Supervisor</i> .
FR 02.46.	M	Once the electronic form for recording the business event related to addressable objects has been signed and approved, <i>ARIS</i> shall spread relevant adding, changes or deletion to specific addressable objects.
FR 02.47.	M	In case of a form that includes several addressable objects, changes will be spread in object.
FR 02.48.	M	The IT System will ensure logging of the totality business events on editing and processing the electronic form for recording the business events related to addressable objects.

5.1.1.3 UC03: Generate documents

The functional requirements related to the component of generating standard documents on the basis of data comprised by the *ARIS* are defined in Table 5.3.

Table 5.3. Functional requirements set for use case UC03

Identifier	Mandatory	Functional Requirement Description
FR 03.01.	M	<i>ARIS</i> will deliver to authorized actors a mechanism for generating standard documents populated with data from the <i>ARIS</i> database.
FR 03.02.	M	The IT System will enable generating documents related to the business events on addressable objects.
FR 03.03.	M	The IT System will enable generating documents on the basis of the electronic form content of business events prepared through UC11.
FR 03.04.	M	The documents to be printed out will be generated on the basis of templates configured through UC11.
FR 03.05.	M	The amount/totality and the format of documents will be approved on elaboration of design stage
FR 03.06	M	<i>ARIS</i> will enable automatic generation of documents related to notifications received by relevant users (<i>example: notifications sent to the Street Name Validator to approve street name</i>).

Identifier	Mandatory	Functional Requirement Description
FR 03.07.	M	ARIS shall generate at least PDF, MS WORD documents with digital signature applied.
FR 03.08.	M	Authorized users will have access to categories of documents that may be generated based on own access rights and own role.
FR 03.09.	M	ARIS will ensure logging of all events for document generation and printing.

5.1.1.4 UC04: Manage documents

The functional requirements related to the mechanism of reports retrieval specific for ARIS are defined in Table 5.4.

Table 5.4. Functional requirements set for use case UC04

Identifier	Mandatory	Functional Requirement Description
FR 04.01.	M	The Document Management module will be used for searching, retrieving, viewing and printing documents, as well as give the possibility of editing metadata and properties of the actual documents. All registered documents are searchable from document archive by document ID. Searching for documents shall also be possible from all systems using search in documents metadata and from the search list, selection of actual documents. The document storage will be managed by the Document archive of ARIS
FR 04.02.	M	All generated documents will be stored directly in ARIS.
FR 04.03.	M	ARIS shall provide functions for uploading, downloading, searching, visualizing managed documents.
FR 04.04.	M	Document Management subsystem is responsible of data crash and data recovery information
FR 04.05.	M	The system shall provide functionalities to electronic signing of the documents.

5.1.1.5 UC05: Generate Reports and Statistics

The functional requirements related to the mechanism of reports retrieval specific for ARIS are defined in Table 5.5.

Table 5.5. Functional requirements set for use case UC05

Identifier	Mandatory	Functional Requirement Description
FR 05.01.	M	The IT System must be able to offer a number of management, statistic and ad hoc reports, so that the relevant roles could manage and keep records on address system.
FR 05.02.	M	Reports are generated for geospatial and textual information with the possibility to modify and configure style of symbols, texts names and other components (header / body / footer) colors / styles thickness and geospatial data visualization etc.
FR 05.03.	D	The reporting mechanism will contain an OLAP solution designed to configure the dynamic generation of ad hoc reports.
FR 05.04.	M	The System shall put at the disposal of administrative roles a standard number of configurable reports and it must be easy to authorize the production of ad hoc reports when needed.
FR 05.05.	M	The System shall create reports based on different parameters or filters from available data. Dynamic queries based on selection of layer/table, selection of one or more attribute fields, selection of operator (>, <, <>, >=, <=), entry of

Identifier	Mandatory	Functional Requirement Description
		data values. The user must have the functionality to save a query within his own profile for later usage.
FR 05.06.	M	<p>ARIS shall include a configurable reporting mechanism regarding Address Objects, User events, Audit trails. The report tool shall allow:</p> <ul style="list-style-type: none"> ■ to select objects included in the report; ■ to store templates of reports for use by other users; ■ to select textual and geospatial data displayed in reports; ■ to dynamically select the layout of data (table, lines, fields); ■ to indicate summarizing or grouping functions for data in tables; ■ to indicate on page layout the location place of textual and graphical data; ■ to define a map area to be printed together with textual data; ■ to define map layers, labels and legend to be printed in report.
FR 05.07.	M	Reports shall contain functionalities of exporting information in different formats of data, at least: csv, xls, xml, Google kml, GML, pdf, ShapeFile.
FR 05.08.	M	Reporting system of ARIS must support a thematic maps creation for representation of spatial and attribute vector and raster data, with support for export in TIFF, JPEG and PDF formats.
FR 05.09.	M	<p>Reporting system of ARIS must support min following spatial analysis functionality:</p> <ul style="list-style-type: none"> ■ selection of objects from one layer, located within objects from another layer; ■ selection of objects from one layer located outside objects from another layer; ■ selection of objects from one layer within a certain distance from objects of another layer(s); ■ overlay / intersect / clip of two (or more) object layers in order to identify cross-sections.
FR 05.10.	M	Reporting system of ARIS must support functionality for identification of an object, based on point, line, polygon drawing.
FR 05.11.	M	Reporting system of ARIS must create and execute queries in the form of a report builder or configurator, created by users without any programming.
FR 05.12.	M	Reporting system of ARIS must support object version history with the possibility to add old historical data for current objects (ex: add history data available before address register starts to work for object which is currently registered).
FR 05.13.	M	Reporting system of ARIS must support querying based on date/time on history data.
FR 05.14.	M	ARIS shall allow to store all reports and documents in the archiving system, with a link to the information on objects included in the documents.
FR 05.15.	M	The system shall provide functionality to create tasks to generate reports at specific time with specific parameters. The generated documents shall be sent via email to a specified list of email addresses.
FR 05.16.	M	For long term period, system reports shall be done in background.
FR 05.17.	M	<p>The ARIS shall allow to generate flexible, multiple filters for selection of data, to store this filters and to select data using these filters.</p> <p>The reporting tool shall display any columns from: technical parameters, calculated values, values per unit of area.</p>
FR 05.18.	M	The reporting tool shall allow to define page setup and to print report or to export them with possibilities of application of digital signature.

Identifier	Mandatory	Functional Requirement Description
FR 05.19.	M	The Developer will implement up to 20 predefined reports on the addressable objects requested by the <i>Public Services Agency</i>
FR 05.20.	M	The System shall offer a number of management, statistic and ad hoc reports that the administrative roles could monitor the system operation and status.
FR 05.21.	M	The reports managed through in UC16 are intended for the functions of IT audit and do not include reports related to the <i>Public Services Agency</i> business activities.
FR 05.22.	M	This reporting is necessary for the entire system, including: <ul style="list-style-type: none"> ■ nomenclatures and classifiers; ■ entries; ■ user activity; ■ permissions of access and security.
FR 05.23.	M	The reports will be generated on the basis of the following logged categories of events: <ul style="list-style-type: none"> ■ successful authentication of users; ■ unsuccessful authentication of users; ■ notifications sent; ■ actions on data (access, add, change, delete).
FR 05.24.	M	The System will enable the aggregated retrieval of reports or their detailing per individual user, institution, subdivision or per certain groups of users.
FR 05.25.	M	The Developer will implement up to 10 predefined reports for the IT audit requested by the <i>Public Services Agency</i> . For the audit reports that can be generated through the system means, it is not required to be implemented into the <i>ARIS</i> user interface.
FR 05.26.	M	The System shall have a mechanism to define the set of reports and data available to each category of users.

5.1.1.6 UC06: Address object validation

The functional requirements related to the mechanism for validation of the address objects of *ARIS* are defined in Table 5.6.

Table 5.6. Functional requirements set for use case UC06

Identifier	Mandatory	Functional Requirement Description
FR 06.01.	M	<i>ARIS</i> will provide specific interface with functionalities for checking, approving or declining changes of addressable objects
FR 06.02.	M	<i>Address Operator</i> shall use the set of electronic forms necessary for developing action projects on address objects (creation, modification, removal) based on use case UC 02.
FR 06.03.	M	Once <i>Address operator</i> has changed addressable object, the system automatically will check the changes in order to detect errors and will generate a report about it.
FR 06.04.	M	The system shall notify <i>Address Supervisor</i> about the request (new event, address object modification that needs validation) via email and in the Dashboard.
FR 06.05.	M	<i>Address Supervisor</i> will have the option to verify generated reports, all textual, graphical information and all documents attached

Identifier	Mandatory	Functional Requirement Description
FR 06.06.	M	<i>Address Supervisor</i> will have the option to accept or reject requests and to specify the reason for the reject, in case he declined changes of addressable object
FR 06.07.	M	The approval or rejection implies preparing a Note, selecting the status (<i>Approved</i> or <i>Rejected</i>), its confirmation and applying the digital signature of the user with the role of form approval/rejection (<i>Address Supervisor</i>).
FR 06.08.	M	The IT System will implement the governmental service <i>MSign</i> for applying the digital signature when approving/rejecting an address object change.
FR 06.09.	M	Address object will be finally added/changed/deleted in <i>ARIS</i> only after approval of <i>Address Supervisor</i> .
FR 06.10.	M	The IT System will ensure logging of all business events on validation of address objects.

5.1.1.7 UC07: Use dashboard

The functional requirements related to the Dashboard intended for the users authenticated and authorized to use *ARIS* are defined in Table 5.7.

Table 5.7. Functional requirements set for use case UC07

Identifier	Mandatory	Functional Requirement Description
FR 07.01.	M	The IT System will deliver to authorized users a Dashboard through which they will be notified on important business events and have rapid access to event details.
FR 07.02.	M	It is possible to list the following categories of business events displayed on the Dashboard: <ul style="list-style-type: none"> ■ system notifications; ■ notifications on the need to involve the user in <i>ARIS</i> workflow activities; ■ notifications on the forms or documents waiting to be approved by decision-making roles. ■ other relevant events.
FR 07.03.	M	The Dashboard of the <i>ARIS</i> user will display only business events related to the roles and data available to the user.
FR 07.04.	M	The Dashboard of the user with the role of <i>System Administrator</i> will display all business events related to <i>ARIS</i> functionalities (all notifications displayed on the Dashboard of all <i>ARIS</i> users and notifications dedicates exclusively to the user with the role of <i>System Administrator</i>).
FR 07.05.	M	The Dashboard will group the business events, having displayed them as indicators with aggregated values (<i>example: Unread system notifications – 20; Street Names for approval – 5; Address Objects for approval – 4; etc.</i>), which will comprise hypertext reference for accessing the details.
FR 07.06	M	<i>ARIS</i> will display detailed records of the Dashboard in specialized windows or zones on the main page of user interface, which will comprise hypertext reference for accessing the details.
FR 07.07.	M	When accessing hypertext reference related to aggregated values or detailed records of the Dashboard, <i>ARIS</i> will ensure access to detailed information related to them or to the requested functionality (<i>example: business event of address object form, direct approval/rejection of forms sent for consideration and approval etc.</i>).

Identifier	Mandatory	Functional Requirement Description
FR 07.08.	M	The Dashboard of the <i>ARIS</i> will comprise a specialized zone (favorite) where the user shall display references to content information he is working with. Such content information can be of two types: <ul style="list-style-type: none"> ■ address objects; ■ prepared electronic forms.
FR 07.09.	M	<i>ARIS</i> shall offer functionalities to each user for individual configuration of the Dashboard aspect and content.

5.1.1.8 UC08: Street name validation

The functional requirements related to the mechanism for validation of the street names of *ARIS* are defined in Table 5.8.

Table 5.8. Functional requirements set for use case UC08

Identifier	Mandatory	Functional Requirement Description
FR 08.01.	M	<i>ARIS</i> will provide specific interface with functionalities for checking, approving or declining changes of street name
FR 08.02.	M	Address operator will make a request through the user interface of <i>ARIS</i> to create or change a street name
FR 08.03.	M	The system shall notify <i>Street name supervisor</i> about the request via email and in the Dashboard.
FR 08.04.	M	<i>Street Name supervisor</i> will have the option to accept or reject requests and to specify the reason for the reject, in case he declined changes of addressable object
FR 08.05.	M	The approval or rejection implies preparing a Note, selecting the status (<i>Approved</i> or <i>Rejected</i>), its confirmation and applying the digital signature of the user with the role of form approval / rejection (<i>Street Name Supervisor</i>).
FR 08.06.	M	The IT System will implement the governmental service <i>MSign</i> for applying the digital signature when approving/rejecting an address object change.
FR 08.07.	M	Street name will be finally added/changed in <i>ARIS</i> only after approval of <i>Street name supervisor</i> .
FR 08.08.	M	The IT System will ensure logging of all business events on validation of street names.

5.1.1.9 UC09: Manage metadata

The functional requirements related to the mechanism for managing the *ARIS* Classifiers, Nomenclatures and Metadata are defined in Table 5.9.

Table 5.9. Functional requirements set for use case UC09

Identifier	Mandatory	Functional Requirement Description
FR 09.01.	M	The System shall have a mechanism to manage the Nomenclatures, Classifiers comprised by all <i>ARIS</i> metadata.
FR 09.02.	M	The System of metadata will cover all system configurations, parameters and constant values necessary for the <i>ARIS</i> operation.
FR 09.03.	M	The metadata of <i>ARIS</i> will be multilingual (Romanian, Russian and English as minimum).

Identifier	Mandatory	Functional Requirement Description
FR 09.04.	M	Subsystem classifiers are a system-wide used codes, which shall provide services of access / placing / deactivation codes to the dictionary. It is managing the history of the classifiers as well; inactivated but earlier used classifiers are available too. Most of codes which are used in other subsystems shall be managed by subsystem Classifiers, accessible by web services.
FR 09.05.	M	<p>A classifier may be the status of an addressable object (information taken from current system, it is not a must to be used in the new system):</p> <ul style="list-style-type: none"> ■ Project entry; ■ Active entry; ■ Extinct entry; ■ Incorrect entry. <p>This information is common for addressable objects and any change of records in the classifiers will influence the change of attributive information on addressable objects.</p>
FR 09.06.	M	Information from <i>ARIS</i> has close ties with the period when it was valid. For each classifier will be created a history of changes with values for a defined period of time. For example, a street classifier has: 1) str. - street 2) bd. - boulevard 3) str-la – lane; for the date 01.01.2000, in Address Register is registered str. Stefan cel Mare 54; all documents that were offered at that point of time is address: str. Stefan cel Mare 54, when the classifier is changed into “strada” the record will be “strada Stefan cel Mare 54” for the present time, but for 01.01.2000 will remain „str. Stefan cel Mare 54”. The history of the object will be saved.
FR 09.07.	M	It is necessary to display classifiers of historical records.
FR 09.08.	M	References on classifiers shall be maintained according to updated version of the classifiers, in a manner that a field of an active record has one single reference to classifiers
FR 09.09.	M	It shall be possible to display the classifiers of historical records, but it shall not be possible to select any obsolete classifier
FR 09.10.	M	<i>ARIS</i> shall totally integrate classifiers and external nomenclatures delivered by <i>NBS</i> and external information systems (<i>MOLDLIS</i> , and <i>National Fund of Cartography</i>)
FR 09.11.	M	The rights of operating changes will be limited for official and external metadata. For this category of metadata, the changes will be operated only when they are done by the CPAs which administer them.
FR 09.12.	M	The System will not allow deleting any category of metadata if it is used at least by one database record.

5.1.1.10 UC10: Manage users, roles and rights

The functional requirements related to the component of user administration, configuration of access to user interface and content of *ARIS* database are defined in Table 5.10.

Table 5.10. Functional requirements set for use case UC10

Identifier	Mandatory	Functional Requirement Description
FR 10.01.	M	The IT System will have a mechanism for dynamic definition and management of users, their roles and rights.
FR 10.02.	M	The IT System will contain a default category of users created by the Developer and credentials for it are provided upon delivery for the category of Super user.

Identifier	Mandatory	Functional Requirement Description
FR 10.03.	M	The IT System will enable blocking/activating the user access.
FR 10.04.	M	ARIS will deliver its own solution for authentication through the mechanism of user name + password and will enable the alternative use of <i>MPass</i> service for the authentication with the digital certificate or mobile identity.
FR 10.05.	M	The IT System will enable defining the way of connecting the user to the system (digital certificate, mobile identity, user name + password, IP address or their combinations).
FR 10.06.	M	<p>The following categories of data will be managed under the users' profiles:</p> <ul style="list-style-type: none"> ■ user name; ■ user surname; ■ Email; ■ contact phone; ■ login; ■ password; ■ authentication strategy (user + password, digital certificate); ■ status (active/deactivated/blocked); ■ access validity period; ■ user's roles; ■ other relevant data.
FR 10.07.	M	ARIS will deliver a mechanism to define, for users, the rights of access to data depending on the categories or types of electronic forms prepared and the geographical area of addresses.
FR 10.08.	M	A user account can be physically deleted only when there is no logged event produced by the deleted user or data introduced or modified by him.
FR 10.09.	M	The mechanism for administering the users' rights and roles will enable establishing the principles of access to user interface and to the information content of the IT System for each individual user or group of users.
FR 10.10.	M	ARIS will display user interface and the DB content only on the basis of rights and roles held by the users.
FR 10.11.	M	The IT System will enable configuring an unlimited number of roles.
FR 10.12.	M	A role is defined by a generic title, short description, active/inactive status and list of privileges. The inactive roles are not displayed when configuring the rights of access to the application or the users' rights.
FR 10.13.	M	Once introduced and activated, the role will be available to be applied in users' management modules (attachment of roles to users) and management of ARIS components (attachment of roles with access to user interface components (resources) and configure the way of access for them).
FR 10.14.	M	ARIS will not allow deleting a role if it is attached at least to one user or to a user interface component.
FR 10.15.	M	Historical List of created and issued roles and use time frame should be kept in historical logs and accessible by security reports.
FR 10.16.	M	<p>ARIS will deliver a mechanism to record user interface components (resources) to deliver a mechanism for defining the users' rights of access to user interface.</p> <p>As component shall be considered any modular entity of the application (form, menu, menu option, field, etc.), which degree of details is sufficient for configuring the rights of access, transitions of workflows and actions accessible to users.</p>
FR 10.17.	M	ARIS will enable configuring the hierarchy of user interface components, at the root level being placed the application basic modules, while the subordinated

Identifier	Mandatory	Functional Requirement Description
		levels shall not be limited in their depth, the hierarchy being determined by their architecture.
FR 10.18.	D	Any component of the <i>ARIS</i> user interface will contain data on their generic title, short description, actions available to users (business events they can generate) and roles with access to user interface component or action.
FR 10.19.	M	Any component of the <i>ARIS</i> user interface will contain data on the statuses through which the data managed via components could pass, transitions through component statuses (workflow configuration).
FR 10.20.	M	The IT System will be able to define permissions related to actions (business events) available to users with access to user interface components. <i>ARIS</i> will enable configuring the following categories of actions available to users: <ul style="list-style-type: none"> ■ view records; ■ add records; ■ change records; ■ delete records; ■ other relevant actions.
FR 10.21.	M	The IT System will enable configuring the strategy for logging business events generated by each component (resource) of the user interface.
FR 10.22.	D	<i>ARIS</i> shall be prepared to be integrated with Security module of <i>MOLDLIS</i> for a centralized management by Public Services Agency of users, roles and rights.

5.1.1.11 UC11: Manage workflows, forms and templates

The functional requirements related to the component of configuring workflows, electronic forms designed to insert data and document templates to be populated with data and generated by *ARIS* are defined in Table 5.11.

Table 5.11. Functional requirements set for use case UC11

Identifier	Mandatory	Functional Requirement Description
FR 11.01.	M	<i>ARIS</i> will deliver a mechanism to configure workflows for all scenarios related to the processes of preparing and processing the electronic forms related to address management.
FR 11.02.	M	The workflow management shall be carried out by using the system graphical interface where the user usually works.
FR 11.03.	M	The workflows shall be defined through the specification of statuses through which the electronic form should go and the processing steps (workflow stages or transitions) realized by users with specific roles.
FR 11.04.	M	A workflow shall be designed as a sequence of activities.
FR 11.05.	M	The number of steps to be included in a workflow shall not be limited. In this way the IT solution will be adjustable to changes of work methodology of address business processes.
FR 11.06.	D	A workflow shall have associated a coordinator (supervisor). The Coordinator shall be able to receive warning messages (notifications) generated by the unrolled flow. The user who launches a form for processing under a workflow shall be able to specify who the flow supervisor is.
FR 11.07.	D	The System will offer a mechanism to configure the electronic forms necessary for preparing the documents related to the business processes for addresses management.
FR 11.08.	M	The System will offer mechanisms to configure document templates related to the acts generated on the basis of electronic forms prepared (templates

Identifier	Mandatory	Functional Requirement Description
		will have a well-defined structure to allow changing the aspect of the retrieved document).
FR 11.09.	M	The System will have an exclusively visual mechanism to configure statuses and transitions through which the electronic forms could go.
FR 11.10.	M	The Developer will configure and implement templates to generate all documents specific for address management business processes (up to 20 documents).

5.1.1.12 UC12. Other administration activities

The functional requirements related to *ARIS* administration activities are defined in Table 5.12.

Table 5.12. Functional requirements set for use case UC12

Identifier	Mandatory	Functional Requirement Description
FR 12.01.	M	The System shall allow the <i>System Administrator</i> role to retrieve, display and reconfigure the <i>ARIS</i> parameters and system settings.
FR 12.02.	M	The System shall allow the <i>System Administrator</i> role to: <ul style="list-style-type: none"> ■ allocate functions to users and roles; ■ allocate one or more users to one role.
FR 12.03.	M	<i>Administrator</i> shall access system logs (view, search, export etc.).
FR 12.04.	M	<i>Administrator</i> shall prepare back-ups and restore the system functionality on the basis of such back-ups;
FR 12.05.	M	<i>Administrator</i> shall carry out all activities to secure the IT System proper functioning.
FR 12.06.	M	The System shall allow the <i>System Administrator</i> role to create topological rules between one or more than one layers with different geometries (points, lines and polygons). Topological rules must meet the requirements of the data model and must have functionality to generate errors as violations of the errors and tools to correct the identified errors.

5.1.1.13 UC13: Synchronize data

Functional requirements of procedures for the synchronization of *ARIS* database with the databases of external IT systems are defined in Table 5.13.

Table 5.13. Functional requirements set for use case UC13

Identifier	Mandatory	Functional Requirement Description
FR 13.01.	M	<i>ARIS</i> shall use and expose services for the interaction with external information systems.
FR 13.02.	M	<i>ARIS</i> will perform actions to synchronize with the <i>MOLDLIS</i> to retrieve vector graphical data needed to represent address objects on the map.
FR 13.03.	M	<i>ARIS</i> will perform actions to synchronize with the <i>National Fund of Cartography</i> to retrieve Orthophoto graphical data needed to represent address objects on the map.
FR 13.04.	M	<i>ARIS</i> will provide metadata on address objects to external information systems via specialized WEB services (administrative-territorial units, localities, streets, buildings, entrances, etc.)

Identifier	Mandatory	Functional Requirement Description
FR 13.05.	M	ARIS will provide mechanisms of validation of address to external information systems via specialized WEB services (admissibility check or address existence)
FR 13.06.	M	ARIS will provide address identifiers corresponding to search criteria requested by external information systems via specialized WEB services.
FR 13.07.	M	ARIS will provide addresses corresponding to search criteria requested by external information systems via specialized WEB services.
FR 13.08.	M	ARIS will provide geospatial data corresponding to search criteria requested by external information systems via specialized WEB services.
FR 13.09.	M	All synchronization events described by the functional requirements FR 13.02 - FR 13.08 will be logged.

5.1.1.14 UC14: Send notifications

The functional requirements related to the mechanism for ARIS notification are defined in Table 5.14.

Table 5.14. Functional requirements set for use case UC14

Identifier	Mandatory	Functional Requirement Description
FR 14.01.	M	The IT System will offer 3 strategies for notification: <ul style="list-style-type: none"> ■ notification via E-mail; ■ notification via the user's Dashboard. ■ notification via both categories mentioned above.
FR 14.02.	M	The authenticated users (regardless of their roles) will have the opportunity to configure their preferred notification means.
FR 14.03.	M	The authorized users will receive notifications on business events related to their job duties (need to approve a form, changes in the addresses, approval/rejecting a business event form etc.).
FR 14.04.	M	Notifications stored in the user's Dashboard will have reference of direct access to the file/ form/document related to notifications.
FR 14.05.	M	ARIS shall notify the System Administrator on all issues affecting the performance and availability of the IT System.
FR 14.06.	M	Administrator will have functionalities for preparing a form to draft and send notifications to a group of persons.
FR 14.07.	M	Those physical or legal persons, whose information is stored in the ARIS, will be able to receive notifications at their Email in case of some business events prepared through UC11 (when are mentioned in the prepared form) or in case of customized notifications prepared by the <i>Administrator</i> .

5.1.1.15 UC15: Logging Events

The functional requirements related to the mechanism of logging the events into the ARIS are defined in Table 5.15.

Table 5.15. Functional requirements set for use case UC15

Identifier	Mandatory	Functional Requirement Description
FR 15.01.	M	The IT System will contain a mechanism for logging all business events related to the use of the system.
FR 15.02.	M	The <i>System Administrator</i> will be able to configure all logging strategies related to business events through use case UC10.

Identifier	Mandatory	Functional Requirement Description
FR 15.03.	M	The ARIS shall keep logs of user actions – record time and action made by the user. It shall be configurable (e.g. per user, object, etc.) with several levels of auditing of user actions.
FR 15.04.	M	Depending on the component accessed by the user (data to configure it), ARIS will deliver the rules for logging the business events generated by a specific component of the Application.
FR 15.05.	M	In case of usage of own log system is important to foreseen the integration with service provided by electronic governmental solution MLog. The recommended way is to keep both log system to work together.
FR 15.06.	M	The ARIS shall keep the logs of use of internal and external web-services
FR 15.07.	M	<p>ARIS must keep a log of error messages and warnings. All data from disparate modules shall drain into a single, centralized log with automatic processing and analysis.</p> <p>Messages should be informative, structured, contain all the necessary data on the location of the error, the time of an operation, include text SQL query, and the values of the variables passed in cases where this is possible</p> <p>The system shall keep a log of all changes to the databases, including:</p> <ul style="list-style-type: none"> ■ database transactions made by the ARIS system; ■ database changes made by Database Administrator.
FR 15.08.	M	No user can change the log, not even Database Administrator, except for authorized person.
FR 15.09.	M	<p>The following categories of events shall be logged:</p> <ul style="list-style-type: none"> ■ user authentication; ■ user disconnection; ■ add/change/delete/access a record; ■ business events specific for the ARIS (add address, modify address, delete address, approve address, approve street name, generate a document, accessing specific data, etc.); ■ generate/access a report; ■ query the database; ■ other specific business events.
FR 15.10.	M	<p>The logged event will save the following categories of data (depending on the type of the logged event:</p> <ul style="list-style-type: none"> ■ identifier of the user who generated the event; ■ category of the logged event; ■ timestamp of event logging; ■ resource of the IT application that generated the business event; ■ record affected by the business event; ■ action performed by the user.
FR 15.11.	M	The system shall keep logs for at least 6 months and then archive it.
FR 15.12.	M	The IT System will deliver a mechanism to generate reports related to logged events.

5.1.2. Non-functional requirements of the IT System

5.1.2.1 General requirements

General system requirements are defined by the policies and strategies developed and adopted in the Republic of Moldova. It is worth mentioning that these acts are stemming from the industry best practices and comprise both organizational and technical measures. General system requirements specific for ARIS are defined in Table 5.16.

Table 5.16. The totality of general system requirements specific for ARIS

Identifier	Mandatory	Description of requirements
TGEN 001	M	The system interface shall be Multilingual (Romanian, Russian and English) with mechanism to add new language without reprogramming, through attachable resource files.
TGEN 002	M	The content of the database will be inputted in Romanian, Russian and English.
TGEN 003	M	The user's Interface shall be optimized to 1360x768 resolution.
TGEN 004	M	ARIS shall have the possibility to adjust the user's interface (shall deliver a responsive interface) depending on the device used (<i>notebook, netbook, desktop PC, tablet</i>).
TGEN 005	M	The system offers an accessible and intuitive interface to human users.
TGEN 006	M	The user's Interface elements shall comply with Level A of Web Content Accessibility Guidelines (WCAG) 2.0.
TGEN 007	M	ARIS will ensure functionalities necessary to use the digital signature and mobile signature for all categories of actors.
TGEN 008	M	The IT System shall have integrated functions for searching and filtering after Metadata files/documents, profiles of mobilization resources or of authorized users (search records, documents, notifications, acts, etc.), search by the calendar, search by business events of mobilization processes, etc.). The procedures of information and records retrieval shall be performed via simple search (specification of search series) or via more complex search forms allowing filtering the information (QBE forms). Regardless of the type of searched information, the user shall utilize the same method of queries and retrieval of information for any section of the software.
TGEN 009	M	In addition to the searching module implemented based on QBE principle, which would offer the possibility to define visually sophisticated queries, the user interface shall offer the possibility to refine the search results by ensuring the possibility to filter the data in the list containing the search results.
TGEN 010	M	The IT system user interface shall ensure filtering the records that match the search criterion presented by users depending on their rights of access.
TGEN 011	M	The content of any table with search results shall have the possibility to be exported in any of the following format: XLS, CSV and PDF.
TGEN 012	M	ARIS shall offer API interfaces to interact with external IT systems.
TGEN 013	M	ARIS will ensure compatibility with <i>W3C XForms standard</i> .
TGEN 014	M	The IT system shall be optimized in the minimum data transfer between the client computer and server (<i>e.g. implement AJAX with JSON</i>), having focused on avoiding the redundant requests as much as possible.
TGEN 015	M	ARIS shall have at its basis at least a three-level architecture (with a distinct level for data) based on SOA.
TGEN 016	M	The ARIS potentially variable information (parameters, ways if data storage, ways of connection with external services, etc.) shall be configurable and would not require solution recompilation or direct interventions into the DB.
TGEN 017	M	The IT System shall use open standards for formats and communication protocols.
TGEN 018	M	The services exposed to the public by ARIS shall be technologically neutral (Operation System, Internet Explorer, etc.).

5.1.2.2 Security and Protection Requirements

The System shall comply with the technical requirements imposed on Information Systems by the Moldovan Standard SMV ISO/CEI 27002:2014 Information technology — Security techniques — Code of practice for information security controls (second edition).

ARIS also shall comply with Requirements for the assurance of personal data security during their processing within information systems of personal data approved by Government Decision No. 1123 of 14.12.2010 on approving the Requirements for the assurance of personal data security during their processing within the information systems of personal data, Official Gazette No. 254-256 of 24.12.2010.

The IT solution shall comply in full with the security requirement defined in Table 5.17.

Table 5.17. Requirements for ARIS security and protection

Identifier	Mandatory	Description of Security and Protection Requirement
SR 001	M	The IT System guarantees full storage and integrity of <i>ARIS</i> DB content.
SR 002	M	Public information is made available to anonymous users.
SR 003	M	Access to functions granted to unauthorized and non-authenticated users shall be monitored using protection means against overstressing the service by one or several network hubs.
SR 004	M	The Security subsystem shall provide functionality for single sign on, users' rights, password registry, etc. for all users of the system. The sub-system is also available for all other subsystems to check in the system for authorization rights.
SR 005	M	ARIS shall include a comprehensive security framework
SR 006	M	ARIS shall include security related data transmission, including: <ul style="list-style-type: none"> ■ Service endpoint (respondent) authentication; ■ Client principal (initiator) authentication; ■ Message integrity; ■ Message confidentiality; ■ Replay detection.
SR 007	M	ARIS shall adopt means which will make possible the encryption of data in database, messages and communication channels.
SR 008	M	ARIS shall provide monitoring functions based on unified methods to monitor user interactions regarding use of services and data manipulation.
SR 009	M	ARIS shall ensure a regular review of user information on access. At least every 6 months, Security unit reviews information on access in order to disclose any unauthorized access or data leaking.
SR 010	M	Access to editing of information objects and generation of documents from the system shall be limited by the objects identified in the application submitted by client. This should not limit viewing access of different objects.
SR 011	M	All users (including end-users, administrators, developers) shall have a unique identifier (user ID), which must not contain signs of user access level.
SR 012	M	The user ID administration shall include: <ul style="list-style-type: none"> ■ recognition of each user; ■ the authentication of each user; ■ obtain authorization from the responsible manager to issue of the user ID; ■ ensuring that the user ID is issued specifically to a certain person; ■ cancelling user account after a specified time period of inactivity (idle for no more than 2 months);

Identifier	Mandatory	Description of Security and Protection Requirement
		<ul style="list-style-type: none"> ■ implementation of backup copies of user IDs; ■ setting the organizational structure of users. (Creating of organizational structure: the formation of lists of users and roles, departments and organizations; ■ access control features (Setting permissions).
SR 013	M	Before granting access to the system, users should be informed that the use of information (especially personal data) is monitored and that their unauthorized use can be prosecuted in accordance with applicable law.
SR 014	M	All users of ARIS are responsible for their ID's and passwords: <ul style="list-style-type: none"> ■ users can choose and change their own passwords; ■ users are unable to access account after 5 incorrect authentication attempts; ■ previous user passwords are stored and re-use is prevented; ■ passwords are not visible on the screen; ■ passwords are stored in encrypted form, using one-way encryption algorithm (function hash).
SR 015	M	ARIS shall include a mechanism for restoring lost passwords.
SR 016	M	ARIS working session regarding registers and personal data shall be logout automatically after more than 15 minutes of user inactivity, which prevents any further access until the user unlocks the session by repeating the procedure of identification and authentication.
SR 017	M	All fields of forms filled in by users must be validated by type of both the client and server.
SR 018	M	When the system communicates with other systems digital certificates shall be used for identity.
SR 019	M	For sensible transactions, immediately after their execution, will be used the time stamping service.
SR 020	M	The System shall be secured against <i>OWASP Top 10 vulnerabilities</i> .
SR 021	M	The System shall ensure confidentiality of data transmitted-received via communications channels. System data exchange is done only via secure channels.
SR 022	M	Access to the ARIS shall be monitored.
SR 023	M	Interaction with IT Systems shall be performed through an authentication procedure using the digital certificate.
SR 024	M	Access to functions for non-anonymous users shall be granted by their authentication, using user + Password or digital certificate (via <i>MPass</i>).
SR 025	M	The System will deliver strong mechanisms to secure the procedure safety for users' authentication and authorization .
SR 026	M	All users' actions shall be recorded into electronic logs.
SR 027	M	The System shall make a periodic signal that tells about its functional status.

5.1.2.3 Software, Hardware and Communication Channel Requirements

The Developer shall state the cost of licensing of the suggested software components (which the *Public Services Agency* does not have), as well as the sum of licensing costs for:

- doubling the number of users;
- doubling the number of processing units (CPU or CPU kernels);
- doubling the number of similar nodes.

Table 5.18 contains the requirements for software, hardware and communications technology assurance of ARIS.

Table 5.18. Requirements for software, hardware and communications technology assurance of ARIS

Identifier	Mandatory	Description of requirements for software, hardware and communications technology solutions
SHC 001	M	The System shall have the possibility to be installed on both dedicated servers and on virtual solutions.
SHC 002	M	The system architecture should be in line with the Cloud First strategy promoted by the e-Government Center.
SHC 003	M	It is necessary to demonstrate the capacity of virtualization via the delivery of a system image to the Beneficiary that could be uploaded and become operational with minimum configurations on one of the virtualization solutions available on the market.
SHC 004	M	The System shall be accessed through communication channels of at least 128kbps.
SHC 005	D	The system shall be implemented using open source license to the maximum possible extent,
SHC 006	M	The Developer shall state explicitly in the offer the software platform based on which the <i>ARIS</i> has been built and the software platform required for the <i>ARIS</i> functioning.
SHC 007	M	If the software platform used to develop and operate the <i>ARIS</i> is based on commercial IT solutions, requiring license procurement, the Developer will include in the price offer the delivery of all licenses required for <i>ARIS</i> development and operation (the Developer shall purchase on behalf of the <i>Public Services Agency</i> all licenses required for the development and operation of the IT System).
SHC 008	M	If the software platform used to develop and operate the <i>ARIS</i> is based on commercial IT solutions, requiring license procurement, the Developer will include in the price offer the overall amount charged for licensing when: <ul style="list-style-type: none"> ■ doubling the number of users; ■ doubling the number of processing units (CPU or CPU kernels); ■ doubling the number of server application hubs/DB.
SHC 009	M	All software must be provided with unlimited duration license(s), allowing upgrading to new versions of third party products during warranty period.
SHC 010	M	All software must be provided with an unlimited number of concurrent users (e.g. Web based)
SHC 011	M	All software must be provided for an unlimited number of users for any infrastructure component (i.e. application server, plug-in, etc.) needed for full operation.
SHC 012	M	The system shall have a modular architecture, which shall follow n-layer architectural pattern with clear separation between layers. System components shall be loosely coupled and have clear communication interfaces
SHC 013	M	The system shall expose its functionality as API through Web Services. The API shall be clearly and comprehensively documented.
SHC 014	M	The system implements public available parts of the service as Web Parts to be integrated in Government Portal.
SHC 015	M	The system shall be logically decoupled through abstract interfaces from modules implementing functionalities such as logging, notifications, authentication, scheduling if such modules are in scope of current system. These modules will work also with <i>MCloud</i> shared platform level modules.
SHC 016	M	The system must be highly configurable and shall not be tied in any way to specific physical resources, such as locations on disks or types of devices. The

Identifier	Mandatory	Description of requirements for software, hardware and communications technology solutions
		configuration shall allow changes of important parameters preferably without the need to restart the running system
SHC 017	M	The Contractor must license all software to the Beneficiary allowing designated personnel to perform diagnostics, installation, update / upgrade and repair / debug activities without any external assistance. Beneficiary should receive support for at least for three years from Contractor in any part of the system.
SHC 018	M	The System shall be tolerant to errors by offering support for clustering and fail over for the whole platform and own components.
SHC 019	M	It is advisable to ensure that the service parts exposed to the public are technologically neutral.
SHC 020	M	The WEB Explorer is the recommended generic software for the operation and interaction with ARIS.
SHC 021	M	The System shall be compatible with at least 2 the most recent versions of the following WEB browsers: <i>Microsoft Internet Explorer, Mozilla Firefox, Google Chrome, Safari and Opera.</i>
SHC 022	M	Compatibility with Microsoft Internet Explorer is mandatory.
SHC 023	M	ARIS shall incorporate a Heart-beat service to periodically communicate the system normal work status.
SHC 024	M	The System shall include configurable means for technical logging.
SHC 025	M	The System shall be able to produce at least the following levels of technical logging: info; warning; critic; error.
SHC 026	M	The Developer shall list the means to be used for system troubleshooting.
SHC 027	M	The Developer shall prepare means that facilitate the system administration functions: starting the system components; <ul style="list-style-type: none"> ■ stopping the system components; ■ restarting the system components, ■ creating a DB back-up, ■ recovery of data using the indicated back-up, ■ refreshing the system operational memory.
SHC 028	M	The System shall operate in TCP/IP networks and, especially, in HTTPS.
SHC 029	M	The Developer shall suggest other network services and utilities necessary for system operation.

5.1.2.4 Spatial Data Infrastructure requirements

The requirements set for Spatial Data Infrastructure implemented in ARIS are defined in Table 5.19.

Table 5.19. Requirements for RDBMS

Identifier	Mandatory	Description of the accepted initiative
SDI 001	M	SDI of ARIS must support ISO19139:2007 metadata dataset collections profile compatible with the INSPIRE Metadata Implementing Rules guidance based on ISO 19115 / ISO 19119.
SDI 002	M	SDI of ARIS must support INSPIRE Data Specifications on Address Data Model
SDI 003	M	SDI of ARIS must support INSPIRE Download services, View services, Discovery Services, Transformation services.

Identifier	Mandatory	Description of the accepted initiative
SDI 004	M	<p>ARIS must support SDI services, as defined by the OGC Standards with support for minimum:</p> <ul style="list-style-type: none"> ■ Web Map Service (WMS) v1.1.1 (or later); ■ Web Feature Service (WFS) v1.1.0 (or later); ■ Web Coverage Service (WCS) v1.0.0 (or later); ■ Catalog Service Web Profile (CSW) v2.0.0 (or later).
SDI 005	M	ARIS must provide a password-protected access to WMS and WFS for desktop-based or web-based GIS software clients.
SDI 006	M	<p>ARIS must support SDI services web-based management interface with min support for:</p> <ul style="list-style-type: none"> ■ Setting up different levels of access for different categories of users for CSW service; ■ On-line editing of metadata and uploading of metadata files in XML format for CSW service; ■ On-line metadata search and discovery by using an attribute (search) query interface and spatial query (web map search interface) for CSW service; ■ On-line set-up and configuration of WMS, WFS and WCS services; ■ On-line preview and retrieval of SDI datasets in the form of GIS data files (for WMS, WFS and WCS) with support for min SHP and GML as vector layer(s) file formats and min GeoTIF as raster layer(s) file formats.
SDI 007	M	<p>ARIS must support Web Map Publishing (WMP) with min support for:</p> <ul style="list-style-type: none"> ■ managing and portrayal of SDI services and datasets with support for standard web technologies (e.g. JavaScript, XML, etc.); ■ authentication and authorization services with user, group and service administration capabilities using web-based user interfaces; ■ web-based management interface for web mapping content and design of customized web mapping applications.
SDI 008	M	SDI of ARIS must provide services for integration with other external systems throughout <i>MConnect</i> .

5.1.2.5 RDBMS requirements

The requirements set for Relational Data Base Management System used for ARIS are defined in Table 5.20.

Table 5.20. Requirements for RDBMS

Identifier	Mandatory	Description of the accepted initiative?
DBMS 001	M	RDBMS must be delivered under open source license (<i>GNU Public License or similar</i>), which must also apply to all database custom code (SQL scripts, types, functions, triggers, packages etc.) provided during supply delivery and created during customization and integration
DBMS 002	M	RDBMS must support remote connectivity options (connectors, drivers, etc.) for direct read/write access by external desktop-based or web-based software client(s)
DBMS 003	M	Native 64-bit RDBMS version supporting native 64-bit Server OS environment must be installed
DBMS 004	M	RDBMS must support a full-scale automatic replication

Identifier	Mandatory	Description of the accepted initiative?
DBMS 005	M	RDBMS must support full-scale back up/recovery capabilities using standard SQL data format(s) as well within native internal functionality.
DBMS 006	M	RDBMS must support full-scale self-maintenance capabilities with min support for automatic re-indexing, clean-up of temporary records and recovery of storage space.
DBMS 007	M	RDBMS native GIS application extension compliant with the OGC Simple Features Specifications for SQL must be installed (e.g. <i>PostGIS</i>)
DBMS 008	M	RDBMS and RDBMS native GIS application extension must provide a back-end support for the introduction and implementation of the SDI, supporting min CSW, WMS and WFS services.
DBMS 009	M	RDBMS must support clusterization with load balancing.
DBMS 010	M	RDBMS must support internal audit capabilities to manage and control users' actions and use of privileges.
DBMS 011	M	RDBMS must support data protection capabilities such as SSL and data encryption. In some cases data encryption equivalent shell be supplied by developer.

5.1.2.6 Documentation requirements of the IT System

The IT solution shall be accompanied by a full package of documentation of the IT system (according *Technical Regulation "Processes of software life cycle" RT 38370656-002:2006*) comprising the sections included in Table 5.21.

Table 5.21. Documentation requirements of ARIS

Identifier	Mandatory	Description of documentation requirements of ARIS
DOC 01.01	M	The Developer shall prepare and deliver the IT System Technical Design (SRS+SDD).
DOC 01.02	M	The Developer shall prepare pre-acceptance test plan for functional testing.
DOC 01.03	M	The Developer shall prepare and deliver the System Architecture Documentation with the description of models in UML language, to include a sufficient level of details in terms of Architecture in several cross-sections (including the data logical and physical model).
DOC 01.04	M	The Developer shall prepare and deliver API documentation exposed to be integrated with other IT Systems.
DOC 01.05	M	The Developer shall deliver all electronic mediums necessary to describe and validate the interfaces in WSDL language.
DOC 01.06	M	The Developer shall deliver the source code for applications and components developed under the Project.
DOC 01.07	M	The Developer shall deliver interfaces for automatic interoperation with external systems specified (technically) and documented (in human text).
DOC 01.08	M	Based on the test results, where appropriate, the required adjustments and changes will be operated to all delivered documents.

5.1.3. Final Product and Deliverables for phase 1

The final product (*State Register of Addresses*) at the end of development stage (phase 1) is composed of software artefacts and system documentation with performed and accepted functional testing.

Artefacts related to the *ARIS* deliverables are displayed in Table 5.22.

Table 5.22. Deliverables for ARIS (phase1)

Identifier	Mandatory	Deliverable Brief Description
DELIV 01.01	M	Technical design (SRS+SDD).
DELIV 01.02	M	Complete source code of modules and components necessary to compile the delivered software. The source code must be well documented with comments, buildable, with all plugins, libraries, development environment, etc.
DELIV 01.03	M	Final product packed for easy installation in the proposed technological environment.
DELIV 01.04	M	Document on system configuration and deployment (guidelines for deployment).
DELIV 01.05	M	User's Manual.
DELIV 01.06	M	Administrator's Manual (including a contingency plan).
DELIV 01.07	M	Technical specifications for the published and used interfaces.
DELIV 01.08	M	Test plan and the results of testing sessions (functional).
DELIV 01.09	M	All the diagrams (UML diagrams, BPMN diagrams, Entity relationships diagrams etc.) producing during the development processes of ARIS shall be delivered in an Sparx Enterprise Architect .EAP file format (http://www.sparxsystems.com/products/index.html).
DELIV 01.10	M	Totality of artefacts copied on electronic medium (CD or DVD).

5.2. Requirements for phase 2

This requirements arises in connection with the fact that the program module for the Address Register already exists and was developed earlier under the previous UNDP Project.

- In connection with mentioned above, the bidder must have the necessary knowledge and resources to carry out work on the analysis and modification of the program code of this application. Bidder must have the knowledge and capabilities to set existing program code in appropriate development environment, compile, build, and deploy the application on a test and production environment.
- Be able to carry out the adaptation, modification of that application program code, if required in connection with the work tasks within the framework of this project.
- Be able to provide warranty support for Address Register application in a whole, inclusive application code, migration code and data, within the framework of testing, piloting and production operation.

To understand what resources and knowledge are necessary to continue phases of this project we provide list of used layers of development and application frameworks:

Layer	Application	Plugins/Libraries	Licensing
Development IDE	Eclipse Neon Camunda Modeler 1.11.2	-	Open Source
Frontend	Camunda BPM 7.6.0 CMMN 1.1	OpenLayers 4.4.2 Angular JS 1.6.0	Open Source
Backend	Geoserver 2.12.0	-	Open Source
Backend	WSO2 ESB 5.0	-	Open Source
Backend	SpringBoot 4.0	-	Open Source

Backend	Ogr2ogr/GDAL 1.7.2	-	Open Source
Database	PostgreSQL 10.0	Postgis 2.2.6	Open Source

5.2.1. Data migration requirements

The requirements for existing data migration are indicated in Table 5.23.

Table 5.23. Data migration requirements

Identifier	Mandatory	Artefact Brief Description
MIGR 001	M	The objective of the Data migration process is to migrate, convert and test all existing data that is necessary for testing and for the operation of the new application.
MIGR 002	M	<p>The Contractor shall develop a Migration Strategy which identifies sources and targets of the data migration and describes an overall approach to migrate, convert and test all existing data. The Migration Strategy shall address all important issues, e.g.:</p> <ul style="list-style-type: none"> • Elaboration of List of all low-level data sources (Mapping Document) with Detailed description of: • Location of Data sources, migration rules and/or data transformation actions. Location of data target in ARIS • Each Data Source must have unique identifier. All data sources must be described in same format. • Format of mapping document must be unified for all data sources and to be elaborated and presented on initial stage, before developers to start creation of migration tools • checking and testing data migration; • migrating and converting of historical data; • inconsistency among data import; • managing fractional, corrupt, etc. data records; • data cleaning via the removal of unnecessary or repetitive data • converting of the classifiers in new system; • indicating status of the migrated data to distinguish them from new records.
MIGR 003	M	<p>The developer shall study the existing data models in all systems from which data shall be migrated and the new data model and shall propose a detailed design of module for data conversion and migration.</p> <p>All common data for target database shall be set in the initial Clean database on the beginning of migration. (this may include existing users, user roles, classifiers, etc.)</p>
MIGR 004	M	The Contractor shall develop a Migration Plan which describes the method of the data migration, identifies software tools and defines and schedules stages and activities of the migration.
MIGR 005	M	<p>The Contractor shall develop the necessary software tools, e.g. scripts to implement the migration. These tools provides the following functionality:</p> <ul style="list-style-type: none"> • transfer data from existing system to ARIS;

Identifier	Mandatory	Artefact Brief Description
		<ul style="list-style-type: none"> • checks quality (consistency, completeness, integrity and semantic correspondence, etc.) of the migrated data; • create statistical reports – number of objects before and after migration; control numbers, areas by appropriate sections and/or administrative units, or by TCO service coverage; Exact reports form to be elaborated and presented for approval; • stores data quality attributes at ARIS; • create reports. List and format of reports shall be coordinated with beneficiary; • the readiness status of each migration process is traceable by operators for each migration data source described in MIGR 002.
MIGR 006	M	The Contractor shall elaborate manuals for IT professionals regarding the use of migration tools. This manual must include migration workflow diagram with all possible steps and conditions that required to do, including quality controls and repetitive dependent actions to fulfill to successful result.
MIGR 007	M	The Contractor shall train IT professionals regarding the approach to migration and use of migration software tools.
MIGR 008	M	Description of main data models are provided in annexes 2 and 3 to RFP
MIGR 009	M	Volume of migrated data is about 3013082 records and 22449 related documents.

5.2.2. Requirements for Knowledge transfer services

Besides the artifacts related to the *ARIS* deliverables, all the services needed for knowledge transfer indicated in Table 5.24. will be provided.

Table 5.24. Knowledge transfer services deliverables

Identifier	Mandatory	Artefact Brief Description
KTS 001	M	Training of users and Administrators (20-40 hours for each user category): 2 System Administrators; 2 Classifiers Operator 2 Address Validators; 2 Street Validators; 20 LPA Level 1 Address Operators; 10 LPA Level 2 Address Operator.
KTS 002	M	Bidder will be solely responsible for provision of all training related services, products, equipment and documentation
KTS 003	M	Assistance during the system pilot testing period.
KTS 004	M	Assistance in testing the system acceptance.
KTS 004	M	Assistance in system bringing in the production.

Identifier	Mandatory	Artefact Brief Description
KTS 005	M	Solving the deficiencies identified during the pilot period and acceptance testing.
KTS 006	M	Post-implementation technical support (after the system bringing into the production) for a 12-month period, including corrective, adaptive and preventive maintenance, in compliance with ISO/IEC 14764.

5.2.3. IT related aspects and field-related initiatives

During the implementation stage Developer will assure satisfaction of the requirements set for IT related aspects and field-related initiatives currently in force on the territory of the Republic of Moldova what are defined in Table 5.25.

Table 5.25. Requirements for IT related aspects and field-related initiatives

Identifier	Mandatory	Description of the accepted initiative
INI 001	M	<i>ARIS</i> will run on the <i>MCloud</i> platform
INI 002	M	The IT System will use the <i>MPass</i> service as a mechanism for users' authentication and authorization.
INI 003	M	The IT System will use the <i>MSign</i> service as a mechanism for digital signature application and validation.
INI 004	M	The IT System will use the <i>MLog</i> service as a mechanism for logging for the critical business events.
INI 005	M	The IT System will use the <i>MNotify</i> service as a mechanism for notifying the authorized users.
INI 006	M	The IT System will use the interoperability platform <i>MConnect</i> as an interaction mechanism with IT systems of other Moldovan authorities.
INI 007	M	<i>ARIS</i> will use PKI services offered by the single technological platform <i>MCloud</i> .
INI 008		<i>ARIS</i> will perform actions to synchronize with the <i>MOLDLIS</i> to use security module implemented in <i>MOLDLIS</i> (needed for authentication and authorization processes).
INI 009	M	<i>ARIS</i> will identify a set of at least 10 performance indicators which will be automatically published by the single technological platform monitoring services.

5.2.4. Maintenance Requirements of the IT System

The Developer shall ensure post-delivery maintenance period and technical support comprising the sections included in Table 5.26.

Table 5.26. Maintenance period and technical support of ARIS

Identifier	Mandatory	Description of maintenance period and technical support
GMS 001	M	The Developer shall offer maintenance and technical support the warranty period (12 months following the final acceptance of the IT System).
GMS 002	M	Support covers system software and data issues.

Identifier	Mandatory	Description of maintenance period and technical support
GMS 003	M	The maintenance period and technical support for the warranty period shall meet the National Standard SM ISO/CEI 14764:2005 - Information Technology. Software Maintenance.
GMS 004	M	The Developer shall provide the Beneficiary with a Help Desk service available in all business days throughout the year.
GMS 005	M	The Beneficiary will be able to call the Help Desk service at a national phone number (matching the numbering of contact phones in the Republic of Moldova).
GMS 006	M	The communication language of Help Desk service is Romanian.
GMS 007	M	The Beneficiary shall report all technical issues that could occur through a ticketing mechanism, E-mail or instant message.
GMS 008	M	The Developer shall ensure support to document the technical issues and their traceability for the Beneficiary.
GMS 009	M	Help Desk shall be implemented via three-level support regime: <ul style="list-style-type: none"> ■ 1st level support, by a super-user who can give rapid help to users at <i>Public Services Agency</i> who experience a problem with the system. This requires a person who has very good knowledge of the system, who can understand the problem and give advice on what to do. ■ 2nd level support by an analyst who can analyze problems that cannot be solved by the experienced user, or analyze the need for improved functionality in depth and prepare related specifications for subsequent changes to the source code; ■ 3rd level support by a developer who can make changes to the source code for correction of errors and for new functionality.
GMS 010	M	The deadline for reaction and remedy for the reported issues should be at most 8 working hours following their reporting.
GMS 011	M	For major complexity issues the remediation period shall not exceed 72 hours.
GMS 012	M	The Developer shall prove its ability to provide post-delivery technical support in compliance with the requirements of GMS 001-GMS 010.

5.2.5. Performance requirements

Performance tests are relevant after migrations of data. During that testing at least following requirements will be tested. Specific performance requirements of *ARIS* are defined in Table 5.27.

Table 5.27. Performance requirements set for the IT System

Identifier	Mandatory	Description of Performance Requirements
PERF 001	M	The average server reply time shall not exceed 3 seconds at system load indicated in (PERF 002, PERF 003). Reply time shall be logged for several time-consuming events. List of such events shall be elaborated at design stage with beneficiary.
PERF 002	M	The system must be capable to allow activity of over 1100 authorized users of category <i>Administrator, Level 1 LPA Operator, Level 2 LPA Operator, Address Validator, Street Validator and Classificatory Administrator</i> . Number of service consumers and appropriate load for each consumer will be defined at analytical and design stage with beneficiary.
PERF 003	M	The System shall enable the competing activity of at least 200 concurrent users and servicing of at least 300 simultaneous queries with constant response time indicated in PERF 001.

Identifier	Mandatory	Description of Performance Requirements
PERF 004	M	Data collection of the information system will host more than 2 million of addresses and will perform annually more than 20 000 transactions of addresses update.
PERF 005	M	Prior to the delivery of IT solution, <i>ARIS</i> performance test shall occur.
PERF 006	M	Performance testing shall include at least two components: <i>system load testing</i> and <i>system stress testing</i> . Test cases shall be elaborated by contractor in coordination with beneficiary. Test system shall be loaded with data conform PERF 004.

5.2.6. Documentation requirements of the IT System

The IT solution shall be accompanied by a full package of documentation of the IT system (according *Technical Regulation "Processes of software life cycle" RT 38370656-002:2006*) comprising the sections included in Table 5.28.

Table 5.28. Documentation requirements of ARIS

Identifier	Mandatory	Description of documentation requirements of ARIS
DOC 001	M	The Developer shall prepare and publish interactive guidance materials included in the user's Interface of the ARIS .
DOC 002	M	The Developer shall update and deliver the IT System Technical Design (SRS+SDD) after acceptance testing observations if required.
DOC 003	M	The Developer shall prepare the final acceptance test plan.
DOC 004	M	The Developer shall prepare and deliver user's Manual.
DOC 005	M	The Developer shall prepare and deliver Administrator's Manual.
DOC 006	M	The Developer shall prepare and deliver the Guide on system installation and configuration (to include at least guidelines for code compilation, installation of application, hardware and software requirements, platform description and configuration, application configuring, and disaster recovery procedures).
DOC 007	M	The Developer shall prepare and deliver the System Architecture Documentation with the description of models in UML language, to include a sufficient level of details in terms of Architecture in several cross-sections (including the data logical and physical model).
DOC 008	M	The Developer shall prepare and deliver API documentation exposed to be integrated with other IT Systems.
DOC 009	M	The Developer shall deliver all electronic mediums necessary to describe and validate the interfaces in WSDL language.
DOC 010	M	The Developer shall deliver the source code for applications and components developed under the Project.
DOC 011	M	The Developer shall deliver the Administrator' Manual that describes administration functions, including the functions exposed directly from the system, as well as the manual procedures necessary to maintain and secure proper functioning of the IT application.
DOC 012	M	The Developer shall deliver the user's Manual that describes the IT solution parts exposed for different roles of human users.
DOC 013	M	The Developer shall deliver interfaces for automatic interoperation with external systems specified (technically) and documented (in human text).
DOC 014	M	All documentation must be in Romanian language.
DOC 015	M	Based on the test results, where appropriate, the required adjustments and changes will be operated to all delivered documents.

5.2.7. Final Product and Deliverables for phase 2

The final product (*State Register of Addresses*) is composed of software artefacts and system documentation, as well as of knowledge transfer to the system Owner and Administrator. Some artefacts are newly developed in phase 2 some artefacts will be updated as needed after findings during the acceptance testing or implementations issues.

Artefacts related to the *ARIS* deliverables are displayed in Table 5.29.

Table 5.29. Deliverables for ARIS

Identifier	Mandatory	Deliverable Brief Description
DELIV 02.01	M	Technical design (SRS+SDD).
DELIV 02.02	M	Complete source code of modules and components necessary to compile the delivered software. The source code must be well documented with comments, buildable, with all plugins, libraries, development environment, etc.
DELIV 02.03	M	Final product packed for easy installation in the proposed technological environment.
DELIV 02.04	M	Migration of existing data of Address Register.
DELIV 02.05	M	Document on system configuration and deployment (guidelines for deployment).
DELIV 02.06	M	User's Manual.
DELIV 02.07	M	Administrator's Manual (including a contingency plan).
DELIV 02.08	M	Training documentation (designed to trainers who would train the <i>Public Services Agency</i> and <i>LPA</i> in operating the IT solution). Training materials must be provided on min 1 (one) electronic media and in min 1 (one) duplex printed bonded hard-copy per trainee. Training materials must be delivered in adequate quantities for all trainees at least three days before the training begins Training materials must include min training syllabus overall description, detailed description of theory (lectures) and step-by-step instructions (exercises), training sample data if needed (electronic media only).
DELIV 02.09	M	Technical specifications for the published and used interfaces.
DELIV 02.10	M	Special libraries and tools necessary for the compilation of system components (Developer will demonstrate the possibility of compiling the source code on the platform offered in <i>MCloud</i>).
DELIV 02.11	M	Test plan and the results of testing sessions (acceptance, performance, security).
DELIV 02.12	M	All the diagrams (UML diagrams, BPMN diagrams, Entity relationships diagrams etc.) producing during the development processes of <i>ARIS</i> , shall be delivered in an Sparx Enterprise Architect .EAP file format (http://www.sparxsystems.com/products/index.html).
DELIV 02.13	M	Totality of artefacts copied on electronic medium (CD or DVD).

6. Implementation stages of the IT System

The designing, building, testing and implementation of *ARIS* must be done in accordance with the following schedule, accordingly 2 phases of the project:

A. Phase 1

1. IT System development stage, which shall be subdivided into phases coordinated with the *Public Services Agency* as follows:
 - a. The Developer performs business analysis, drawing up and description of business processes in BPMN 2.0.
 - b. The Developer proceeds with analyzing the Terms of Reference, domains of activity and with due approval of the direct Beneficiary (*Public Services Agency*) proposes its vision with regards to developing the information system bearing on a technical Project composed of two documents: SRS and SDD (*1 month*);
 - c. The Developer proceeds with developing a program code and integration of modules developed into a prototype version of the information system (the first presentation to the involved parties shall follow meant to demonstrate existence of all functionalities described in the Scope of work), which subsequently will be improved until signing of the final acceptance of the information subsystem. This stage will not exceed *4 months*;
 - d. The Developer proceeds with testing the system in laboratory mode (in-house testing) and prepares a set of accompanying documentation (presented shall be the functionalities of the system complete with corrections and adjustments made during the previous sub-stage; also presented shall be a set of technical documentation, etc.). The duration of the stage in question shall be *2 weeks*. The testing procedure shall mandatory comprise the following stages:
 - o joint verification of all test scenarios to meet of the functional requirements of the IT System;
 - o based on the test results, where appropriate, the required adjustments and changes will be operated, having prepared an improved version of the IT System.

B. Phase 2

2. ARIS Data migration Stage will transfer the totality of existing data from current version of information system designed and implemented for address management by *Public Services Agency*. All needed data conversions are part of data migration process (for example, changing the polygon data objects to multisegment object). All ARIS features shall be available on migrated objects. This stage will not exceed 1 month.
3. ARIS Implementation Stage will begin with the approval of the Minutes of acceptance by the owner of the IT system in the submitted variant and the signing of the statement of acceptance in experimental operation. Implementation of the IT solution shall last for maximum 1.5 months. The testing procedure shall mandatory comprise the following stages:
 - a. joint verification of all test scenarios in the production environment with migrated data to meet of the functional requirements of the IT System;
 - b. stress and load testing scenarios will be applied to the ARIS with the purpose of checking the level of its compliance with the *Public Services Agency* expectations;
 - c. based on the test results, where appropriate, the required adjustments and changes will be operated, having prepared an improved version of the IT System.
 - d. testing of all requirements related to security (OWASP TOP 10 and so on).
4. Training stage shall start concomitantly with the implementation of the IT solution and shall cover training of 2 system users assigned to act as *Administrators*, 2 system users assigned to act as *Address Validator*, 2 system users assigned to act as *Street Validator*, 20 system users assigned to act as *LPA Level 1 Address Operator* and 10 users assigned to act as *LPA Level 2 Address Operator*.
5. Commissioning of the ARIS begins with the signing of the IT System Commissioning Statement and starting of its operation.

6. ARIS maintenance stage is the period during which the system Developer is assuming the obligation relative to the Owner to grant assistance in maintaining the capacity of the information system to provide services as well as in upgrading the software, while maintaining its integrity. In case of *ARIS* we believe that the initial 12-month period shall be sufficient.

7. Management Arrangement

The contractor will work under the guidance of the Cadaster Department of the Public Services Agency and in close cooperation with EDMITE Project for both substantive and administrative aspects of the assignment and under the direct supervision of the Electoral Specialist, EDMITE Project, Senior Project Officer and UNDP IT Strategic Adviser.

Language

All discussions with the beneficiaries of the project will be conducted in Romanian and Russian. All the relevant documentation, information solution interface and training and technical support will be conducted in Romanian.

Key Deliverables of the Work

The final product is composed of software artefacts, system documentation, and knowledge transfer to the holder and the system administrator.

The system's artefacts include:

	Deliverables	Tentative timeframe
1.	Work Plan submitted, discussed and accepted by the Beneficiary	24 March 2018
2.	ARIS Data Migration Stage completed and approved by the Beneficiary	1 May 2018
3.	ARIS Implementation Stage completed, including: <ul style="list-style-type: none"> joint verification of all test scenarios in the production environment with migrated data to meet of the functional requirements of the IT System; stress and load testing scenarios applied to the ARIS with the purpose of checking the level of its compliance with the Public Services Agency expectations; required adjustments and changes to improve the IT System based on stress tests results; testing of all requirements related to security. 	25 June 2018
4.	Training Stage of the relevant staff conducted	20 July 2018
5.	Commissioning of the ARIS conducted	25 September 2018
6.	Maintenance stage started and accepted by the Beneficiary	30 November 2018

8. Eligibility

Successful bidder must meet the following qualification requirements for the company:

- Company must have permanent branches in the Republic of Moldova (in case the bidder is a foreign company) or an equal local Consortium Partner (not Subcontractor!). The leading Company will ensure the fulfilment of at least 65% of the deliverables;
- Minimum 5 years of working experience in developing IT systems;
- Minimum 1 system on spatial data infrastructure (GIS) developed;
- Valid certification in ISO 27001 (in case the bidder is a consortium, all the companies that are part of the consortium must hold a valid ISO 27001 Certificate);

Criteria for the evaluation of the corporate competencies:

- The experience in the development of information systems, like address register (excluding development of webpages) for central public authorities of the Republic of Moldova or other countries in the region would be an advantage.

The bidder shall submit the technical bid with clear CVs (based on the template indicated in the present RfP) of the project staff and the qualifications of each staff proposed. The staff holding the following key positions shall be presented explicitly:

- 1 Project Manager/ Business Analyst, in case the bidder is a foreign company, this specialist must be local ;
- 1 Technical Leader/ System Architect, in case the bidder is a foreign company, this specialist must be local;
- 1 System Analyst;
- 1 Senior Developer;
- 1 Developer;

Qualifications and requirements of proposed staff:

Project Manager/ Business Analyst:

- **Master's degree or equivalent (5 years university education) in ICT;**
- Minimum 5 years of experience in the proposed position;
- Experience in ICT proved through the implementation of at least 2 information systems (the information systems in which the person was involved should be detailed explicitly in his/her CV);
- Experience of working in IT system development methodology for the government sector of the Republic of Moldova or other countries of the region would be an advantage;
- Proved working experience with GIS standards and infrastructure, also in technologies related to GIS: minimum 1 Web based GIS system implemented (the information system(s) in which the person was involved should be detailed explicitly in his/her CV);
- Proved certification in Project Management (Prince, PMI, etc.) would be a strong asset;
- Excellent knowledge of Romanian, Russian and English languages.

Technical Leader/ System Architect:

- **Licensed in ICT, Master's degree would be an advantage;**
- Minimum 4 years of experience in IT systems architecture ;
- Experience in ICT proved through the design of system architecture for at least 1 Web based GIS system (the system(s) in which the person was involved should be detailed explicitly in his/her CV);
- Experience of working in IT system architecture for the government sector of the Republic of Moldova or other countries in the region would be an advantage;
- Excellent knowledge of Romanian, Russian and English languages.

System Analyst:

- **Licensed in ICT, Master's degree would be an advantage;**
- Minimum 4 years of experience in the proposed position;
- Experience in ICT proven through the development of documentation based on the national legislation and standards on state registers (SMV ISO CEI 15288);
- Excellent knowledge of Romanian, Russian and English languages.

Senior Developer:

- **Licensed in ICT, Master's degree would be an advantage;**
- Minimum 4 years of experience in the proposed position;
- Experience in ICT proved through the development of at least 2 information systems on GIS (the information systems in which the person was involved should be detailed explicitly in his/her CV);
- Excellent knowledge of Romanian, Russian and English languages.

Developer:

- **Licensed in ICT, Master's degree would be an advantage;**
- Minimum 3 years of experience in the proposed position;
- Proved working experience in technologies related to GIS;
- Proved certification in DBMS and web development would be an advantage;
- Knowledge of Romanian, Russian and English languages.

QA Engineer:

- **Licensed in ICT, Master's degree would be an advantage;**
- Minimum 2 years of experience in the proposed position;
- Proved ISTQB or equivalent certification will be an advantage;
- Knowledge of Romanian, Russian and English.

The UNDP Moldova is committed to workforce diversity. Women, persons with disabilities, Roma and other ethnic or religious minorities, persons living with HIV, as well as refugees and other non-citizens legally entitled to work in the Republic of Moldova, are particularly encouraged to apply.

Annex 1 - Database model documentation of the old system

1. Model details

Model name: Cadaster (Old)

Version:2.3

Database engine:PostgreSQL

2. Tables

2.1. Table dictionary_table

2.1.1. Columns

Column name	Type	Properties	Description
description1	varchar(1000)	null	
id2	int4	null	

2.2. Table I_ateleveln

2.2.1. Columns

Column name	Type	Properties	Description
id_ateleveln	numeric(3)		
I_iometatab_id	numeric(10)		
graphics	numeric(1)		
gname	varchar(100)		
rname	varchar(100)		
ename	varchar(100)		
status	numeric(3)		
cachemap	varchar(50)	null	
unique_fullname	numeric(1)	null	

2.3. Table I_ateleveln_role

2.3.1. Columns

Column name	Type	Properties	Description
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id_lateleveln	numeric(3)		
m_role_num	numeric(6)		

2.4. Table I_atev

2.4.1. Columns

Column name	Type	Properties	Description
id_lateo	numeric(11)		
idv_latev	numeric(11)		
id_lateleveln	numeric(3)		
gname	varchar(1000)		
rname	varchar(1000)		
ename	varchar(1000)		
gshortname	varchar(100)		
rshortname	varchar(100)		
eshortname	varchar(100)		
startade	timestamp		
enddate	timestamp	null	
starteventid	numeric(11)		
endeventid	numeric(11)	null	
status	numeric(3)		

2.5. Table I_codesv

2.5.1. Columns

Column name	Type	Properties	Description
id_codeso	numeric(11)		
idv_codesv	numeric(11)		
gname	varchar(1000)		
rname	varchar(1000)		
ename	varchar(1000)		

startade	timestamp		
enddate	timestamp	null	
starteventid	numeric(11)		
endeventid	numeric(11)	null	
status	numeric(3)		

2.6. Table I_doctypev

2.6.1. Columns

Column name	Type	Properties	Description
id_Idoctypeo	numeric(11)		
idv_Idoctypev	numeric(11)		
gname	varchar(1000)		
rname	varchar(1000)		
ename	varchar(1000)		
startade	timestamp		
enddate	timestamp	null	
starteventid	numeric(11)		
endeventid	numeric(11)	null	
status	numeric(3)		

2.7. Table I_iometatab

2.7.1. Columns

Column name	Type	Properties	Description
I_iometatab_id	numeric(10)		
tabname_o	varchar(50)	null	
col_name_ido	varchar(50)		
tabname_vt	varchar(50)		
col_name_idvt	varchar(50)		
tabname_vg	varchar(50)	null	

col_name_idvg	varchar(50)	null	
tabname_vgw	varchar(50)	null	
col_name_vgw	varchar(50)	null	
l_iometatab_id_type	numeric(10)	null	

2.8. Table I_locationv

2.8.1. Columns

Column name	Type	Properties	Description
id_llocationo	numeric(11)		
idv_llocationv	numeric(11)		
gname	varchar(1000)		
rname	varchar(1000)		
ename	varchar(1000)		
gshortname	varchar(100)		
rshortname	varchar(100)		
eshortname	varchar(100)		
startade	timestamp		
enddate	timestamp	null	
starteventid	numeric(11)		
endeventid	numeric(11)	null	
status	numeric(3)		

2.9. Table I_luts

2.9.1. Columns

Column name	Type	Properties	Description
I_luts_id	numeric(10)		
I_luts_name	varchar(50)	null	
I_luts_code	numeric(10)	null	
I_luts_val	varchar(100)	null	

2.9.2. Indexes

Index name	Columns	Description
ADDRESSCAD_IDX_L_LUTS_NAME	I_luts_name (ASC)	
ADDRESSCAD_L_LUTS_CODE	I_luts_code (ASC)	

2.10. Table I_message

2.10.1. Columns

Column name	Type	Properties	Description
I_msg_id	numeric(10)		
I_msg	varchar(254)		
I_lan	varchar(2)	null	

2.11. Table I_objstatus

2.11.1. Columns

Column name	Type	Properties	Description
status	numeric(1)		
gname	varchar(100)		
rname	varchar(100)		
ename	varchar(100)		

2.12. Table I_segmentv

2.12.1. Columns

Column name	Type	Properties	Description
id_lsegmento	numeric(11)		
idv_lsegmentv	numeric(11)		
gname	varchar(1000)		
rname	varchar(1000)		
ename	varchar(1000)		
gshortname	varchar(100)		

rshortname	varchar(100)		
eshortname	varchar(100)		
startade	timestamp		
enddate	timestamp	null	
starteventid	numeric(11)		
endeventid	numeric(11)	null	
status	numeric(3)		

2.13. Table I_separatorv

2.13.1. Columns

Column name	Type	Properties	Description
id_Iseparatoro	numeric(11)		
idv_Iseparatorv	numeric(11)		
divisor	varchar(1)		
startade	timestamp		
enddate	timestamp	null	
starteventid	numeric(11)		
endeventid	numeric(11)	null	
status	numeric(3)		

2.13.2. Indexes

Index name	Columns	Description
ADDRESSCAD_PK_BCDIVISOR	id_Iseparatoro (ASC)	

2.14. Table I_service_zone

2.14.1. Columns

Column name	Type	Properties	Description
mi_prinx	numeric(11)		
mi_style	varchar(2000)	null	

geoloc	geometry(2147483647)		
mlt_id	varchar(4)		

2.14.2. Indexes

Index name	Columns	Description
ADDRESSCAD_IDX_L_SERVICE_ZONE_MLT_ID	mlt_id (ASC)	

2.15. Table I_streetv

2.15.1. Columns

Column name	Type	Properties	Description
id_Istreeto	numeric(11)		
idv_Istreetv	numeric(11)		
gname	varchar(1000)		
rname	varchar(1000)		
ename	varchar(1000)		
gshortname	varchar(100)		
rshortname	varchar(100)		
eshortname	varchar(100)		
startade	timestamp		
enddate	timestamp	null	
starteventid	numeric(11)		
endeventid	numeric(11)	null	
status	numeric(3)		

2.16. Table I_structurelevel

2.16.1. Columns

Column name	Type	Properties	Description
id_Istructurelevel	numeric(11)		
idv_Istructurelevel	numeric(11)		

gname	varchar(1000)		
rname	varchar(1000)		
ename	varchar(1000)		
gshortname	varchar(100)		
rshortname	varchar(100)		
eshortname	varchar(100)		
startade	timestamp		
enddate	timestamp	null	
starteventid	numeric(11)		
endeventid	numeric(11)	null	
status	numeric(3)		

2.17. Table I_structurev

2.17.1. Columns

Column name	Type	Properties	Description
id_Istructureo	numeric(11)		
idv_Istructurev	numeric(11)		
gname	varchar(1000)		
rname	varchar(1000)		
ename	varchar(1000)		
gshortname	varchar(100)		
rshortname	varchar(100)		
eshortname	varchar(100)		
startade	timestamp		
enddate	timestamp	null	
starteventid	numeric(11)		
endeventid	numeric(11)	null	
status	numeric(3)		

2.18. Table I_subordin

2.18.1. Columns

Column name	Type	Properties	Description
id_lsubordin	numeric(11)		
idv_lsubordin	numeric(11)		
curlevelid	numeric(11)		
uplevelid	numeric(11)		
startade	timestamp		
enddate	timestamp	null	
starteventid	numeric(11)		
endeventid	numeric(11)	null	
status	numeric(3)		

2.19. Table I_unitv

2.19.1. Columns

Column name	Type	Properties	Description
id_lunito	numeric(11)		
idv_lunitv	numeric(11)		
gname	varchar(1000)		
rname	varchar(1000)		
ename	varchar(1000)		
gshortname	varchar(100)		
rshortname	varchar(100)		
eshortname	varchar(100)		
startade	timestamp		
enddate	timestamp	null	
starteventid	numeric(11)		
endeventid	numeric(11)	null	
status	numeric(3)		

2.20. Table r_eventsdocument

2.20.1. Columns

Column name	Type	Properties	Description
id_event	numeric(11)		
id_tdocuments	numeric(11)		

2.21. Table spatial_ref_sys

2.21.1. Columns

Column name	Type	Properties	Description
srid	int4		
auth_name	varchar(256)	null	
auth_srid	int4	null	
srttext	varchar(2048)	null	
proj4text	varchar(2048)	null	

2.22. Table t_checkaddresslist

2.22.1. Columns

Column name	Type	Properties	Description
id	numeric(38)		
user_id	numeric(38)		
ido	numeric(38)		
startreportdate	timestamp		
endreportdate	timestamp	null	
status	numeric(38)		
id_upload	numeric(38)		

2.23. Table t_checkaddresstatus

2.23.1. Columns

Column name	Type	Properties	Description
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ido	numeric(11)		
checkstatus	numeric(2)		
checkdate	timestamp		
m_user_num	numeric(11)		
gfullname	varchar(2000)	null	
postnumber	varchar(200)	null	
codevalue	varchar(200)	null	
oradbname	varchar(100)	null	
newname	varchar(2000)	null	
structurenumber	varchar(200)	null	
message	varchar(2000)	null	
idupload	numeric(38)		

2.24. Table t_df_list_codunic

2.24.1. Columns

Column name	Type	Properties	Description
codunic	varchar(4)		

2.25. Table t_documents

2.25.1. Columns

Column name	Type	Properties	Description
id_tdocuments	numeric(11)		
id_Iddoctypeo	numeric(11)		
docnumber	varchar(1000)		
docissuedate	timestamp		
doccomment	varchar(4000)	null	
fo_id	numeric(38)		
docdbentrydate	timestamp		
m_user_num	numeric(38)		

2.26. Table t_events

2.26.1. Columns

Column name	Type	Properties	Description
id_event	numeric(11)		
eventdate	timestamp		
m_user_num	numeric(11)		

2.27. Table t_file_objects

2.27.1. Columns

Column name	Type	Properties	Description
fo_id	numeric(38)		
flow_id	numeric(38)		
name	varchar(90)		
filename	varchar(400)	null	
title	varchar(255)	null	
mime_type	varchar(48)	null	
doc_size	numeric(38)	null	
dad_charset	varchar(128)	null	
created_by	varchar(255)	null	
created_on	timestamp	null	
updated_by	varchar(255)	null	
updated_on	timestamp	null	
last_updated	timestamp	null	
content_type	varchar(128)	null	
blob_content	bytea	null	
language	varchar(30)	null	
description	varchar(2000)	null	
file_type	varchar(255)	null	

file_charset	varchar(128)	null	
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2.27.2. Indexes

Index name	Columns	Description
ADDRESSCAD_UQ_T_FILE_OBJECTS	name (ASC)	

2.28. Table t_gname_restrict_list

2.28.1. Columns

Column name	Type	Properties	Description
gname	varchar(2000)	null	
ido	int4	null	

2.29. Table t_topoerr

2.29.1. Columns

Column name	Type	Properties	Description
id_lateleveln	numeric(3)		
lastchangedate	timestamp	null	
lastchangeuser	varchar(254)	null	
mi_style	varchar(254)	null	
mi_prinx	numeric(10)		
geoloc	geometry(2147483647)	null	
table_mi_prinx	numeric(10)	null	

2.30. Table t_tvgrw_list

2.30.1. Columns

Column name	Type	Properties	Description
ido	int4	null	
mi_prinx	int4	null	
id_lateleveln	int4	null	
codunic	varchar(6)	null	

municipiul	varchar(50)	null	
uat	varchar(50)	null	
localitatea	varchar(50)	null	
codstr	int4	null	
streetname	varchar(63)	null	
codcadastral	varchar(4)	null	
codtip	int4	null	
nrcasa	varchar(20)	null	
sapdestination	varchar(200)	null	
postid	varchar(20)	null	
buildingid	int4	null	
segmentid	int4	null	
codloc	varchar(20)	null	
mi_style	varchar(2000)	null	
geoloc	geometry(2147483647)	null	
registerdate	date	null	
registeruser	varchar(200)	null	
lastchangedate	date	null	
lastchangeuser	varchar(200)	null	
canmodifiyuser	varchar(200)	null	

2.31. Table tobj

2.31.1. Columns

Column name	Type	Properties	Description
ido	numeric(11)		
idvt	numeric(11)		
idvg	numeric(11)	null	
id_leveln	numeric(3)		
gfullname	varchar(2000)	null	

rfullname	varchar(2000)	null	
efullname	varchar(2000)	null	
status	numeric(3)		

2.31.2. Indexes

Index name	Columns	Description
ADDRESSCAD_IDX\$\$_OBC80001	ido (ASC), idvt (ASC)	
ADDRESSCAD_TOBJ_ATELEVE_IDX	id_lateleveln (ASC)	
ADDRESSCAD_TOBJ_STATUS_IDX	status (ASC)	

2.32. Table tvg

2.32.1. Columns

Column name	Type	Properties	Description
ido	numeric(11)		
idvg	numeric(11)		
id_lateleveln	numeric(3)		
geoloc	geometry(2147483647)		
startade	timestamp		
enddate	timestamp	null	
starteventid	numeric(11)		
endeventid	numeric(11)	null	
status	numeric(3)		

2.32.2. Indexes

Index name	Columns	Description
ADDRESSCAD_TVG_TEST	idvg (ASC), ido (ASC)	
ADDRESSCAD_TVG_ATELEVE_IDX	id_lateleveln (ASC)	
ADDRESSCAD_TVG_IDO	ido (ASC)	
ADDRESSCAD_TVG_STATUS_IDX	status (ASC)	

2.33. Table tvgmas

2.33.1. Columns

Column name	Type	Properties	Description
mi_prinx	numeric(11)		
id_lateleveln	numeric(3)		
codadm	varchar(6)	null	
codstr	numeric(11)	null	
segmentid	numeric(11)	null	
streetname	varchar(63)	null	
nrcasa	varchar(20)	null	
postid	varchar(20)	null	
buildingid	numeric(5)	null	
codloc	varchar(20)	null	
geoloc	geometry(2147483647)	null	
registerdate	timestamp	null	
registeruser	varchar(200)	null	
lastchangedate	timestamp	null	
lastchangeuser	varchar(200)	null	
canmodifiyuser	varchar(200)	null	
mi_style	varchar(200)	null	
status	numeric(1)		
errmessage	varchar(4000)	null	
codunic	varchar(10)	null	
parentobject	numeric(11)	null	
fulladdress	varchar(2000)	null	
houzenumber	numeric(11)	null	
blockseparator	numeric(3)	null	
blocknumber	varchar(20)	null	

geoloc_pt	geometry(2147483647)	null	
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2.34. Table tvgw

2.34.1. Columns

Column name	Type	Properties	Description
ido	numeric(11)	null	
mi_prinx	numeric(11)		
id_lateleveln	numeric(3)		
codunic	varchar(6)	null	
municipiul	varchar(50)	null	
uat	varchar(50)	null	
localitatea	varchar(50)	null	
codstr	numeric(11)	null	
streetname	varchar(63)	null	
codcadastral	varchar(4)	null	
codtip	numeric(3)	null	
nrcasa	varchar(20)	null	
sapdestination	varchar(200)	null	
postid	varchar(20)	null	
buildingid	numeric(5)	null	
segmentid	numeric(11)	null	
codloc	varchar(20)	null	
mi_style	varchar(2000)	null	
geoloc	geometry(2147483647)		
registerdate	timestamp		
registeruser	varchar(200)		
lastchangedate	timestamp	null	
lastchangeuser	varchar(200)	null	
canmodifiyuser	varchar(200)	null	

2.35. Table tvt

2.35.1. Columns

Column name	Type	Properties	Description
ido	numeric(11)		
id_lateleveln	numeric(3)		
idvt	numeric(11)		
gname	varchar(2000)		
rname	varchar(2000)	null	
ename	varchar(2000)	null	
id_objlut	numeric(11)		
uplevelid	numeric(11)		
upioid	numeric(11)		
postaddrindicator	numeric(1)		
postindex	varchar(200)		
postnumber	numeric(4)		
id_lseparatoro	numeric(11)	null	
postblocknum	varchar(5)	null	
area	numeric(11,4)		
id_codeso	numeric(11)	null	
codevalue	varchar(200)	null	
startade	timestamp		
enddate	timestamp	null	
starteventid	numeric(11)		
endeventid	numeric(11)	null	
status	numeric(3)		
porch	numeric(2)	null	
leveltype	numeric(38)	null	
levelnumber	numeric(38)	null	

2.35.2. Indexes

Index name	Columns	Description
ADDRESSCAD_IDX\$\$_OBC80002	ido (ASC), idvt (ASC)	
ADDRESSCAD_IDX_GNAME_IDO	gname (ASC), ido (ASC)	
ADDRESSCAD_IDX_IDO	ido (ASC)	
ADDRESSCAD_IDX_TVT_UPIOID	upioid (ASC)	
ADDRESSCAD_TVT_ATELEVE_IDX	id_lateleveln (ASC)	
ADDRESSCAD_TVT_STATUS_IDX	status (ASC)	

2.36. Table ty_tree_list

2.36.1. Columns

Column name	Type	Properties	Description
upioid	int4	null	
ido	int4	null	
gname	varchar(4000)	null	
status	int4	null	
id_lateleveln	int4	null	
id_objlut	int4	null	
gfullname	varchar(2000)	null	
exp	int4	null	

2.37. Table ty_tvgw_structure_list

2.37.1. Columns

Column name	Type	Properties	Description
codstr	int4	null	
nrcasa	varchar(20)	null	
postid	varchar(20)	null	
buildingid	int4	null	
segmentid	int4	null	

codloc	varchar(20)	null	
mi_prinx	int4	null	
mi_style	varchar(2000)	null	
canmodifiyuser	varchar(200)	null	
geoloc	geometry(2147483647)	null	
id_lateleveln	int4	null	
ido	int4	null	
tvgr_ido	int4	null	
tvgr_id_lateleveln	int4	null	

2.38. Table layer

2.38.1. Columns

Column name	Type	Properties	Description
topology_id	int4		
layer_id	int4		
schema_name	varchar(2147483647)		
table_name	varchar(2147483647)		
feature_column	varchar(2147483647)		
feature_type	int4		
level	int4		
child_id	int4	null	

2.38.2. Alternate keys

Key name	Columns	Description
layer_schema_name_table_name_feature_column_key	schema_name, table_name, feature_column	

2.39. Table topology

2.39.1. Columns

Column name	Type	Properties	Description
id	serial		
name	varchar(2147483647)		
srid	int4		
precision	float8		
hasz	bool		

2.39.2. Alternate keys

Key name	Columns	Description
topology_name_key	name	

3. Views

3.1. View geography_columns

SQL:SELECT current_database() AS f_table_catalog, n.nspname AS f_table_schema, c.relname AS f_table_name, a.attname AS f_geography_column, postgis_typmod_dims(a.atttypmod) AS coord_dimension, postgis_typmod_srid(a.atttypmod) AS srid, postgis_typmod_type(a.atttypmod) AS type FROM pg_class c, pg_attribute a, pg_type t, pg_namespace n WHERE ((t.typname = 'geography'::name) AND (a.attisdropped = false) AND (a.atttypid = t.oid) AND (a.attrelid = c.oid) AND (c.relnamespace = n.oid) AND (NOT pg_is_other_temp_schema(c.relnamespace)) AND has_table_privilege(c.oid, 'SELECT'::text));

3.1.1. Columns

Column name	Type	Properties	Description
f_table_catalog	name(2147483647)		
f_table_schema	name(2147483647)		
f_table_name	name(2147483647)		
f_geography_column	name(2147483647)		
coord_dimension	int4		
srid	int4		
type	text		

3.2. View geometry_columns

SQL:SELECT (current_database())::character varying(256) AS f_table_catalog, n.nspname AS f_table_schema, c.relname AS f_table_name, a.attname AS f_geometry_column, COALESCE(postgis_typmod_dims(a.atttypmod), sn.ndims, 2) AS coord_dimension, COALESCE(NULLIF(postgis_typmod_srid(a.atttypmod), 0), sr.srid, 0) AS srid, (replace(replace(COALESCE(NULLIF(upper(postgis_typmod_type(a.atttypmod)), 'GEOMETRY'::text), st.type,


```
'GEOMETRY'::text), 'ZM'::text, ''::text, 'Z'::text, ''::text)::character varying(30) AS type FROM ((((((pg_class c JOIN
pg_attribute a ON (((a.attrelid = c.oid) AND (NOT a.attisdropped)))) JOIN pg_namespace n ON ((c.relnamespace =
n.oid))) JOIN pg_type t ON ((a.atttypid = t.oid))) LEFT JOIN ( SELECT s.connamespace, s.conrelid, s.conkey,
replace(split_part(s.consrc, ''::text, 2), ''::text, ''::text) AS type FROM pg_constraint s WHERE (s.consrc ~*
'%geometrytype(% = %'::text)) st ON (((st.connamespace = n.oid) AND (st.conrelid = c.oid) AND (a.attnum = ANY
(st.conkey)))) LEFT JOIN ( SELECT s.connamespace, s.conrelid, s.conkey, (replace(split_part(s.consrc,
' = '::text, 2), ''::text, ''::text)::integer AS ndims FROM pg_constraint s WHERE (s.consrc ~* '%ndims(%
= %'::text)) sn ON (((sn.connamespace = n.oid) AND (sn.conrelid = c.oid) AND (a.attnum = ANY (sn.conkey)))) LEFT
JOIN ( SELECT s.connamespace, s.conrelid, s.conkey, (replace(replace(split_part(s.consrc, ' = '::text, 2),
''::text, ''::text), ''::text, ''::text)::integer AS srid FROM pg_constraint s WHERE (s.consrc ~* '%srid(% = %'::text))
sr ON (((sr.connamespace = n.oid) AND (sr.conrelid = c.oid) AND (a.attnum = ANY (sr.conkey)))) WHERE ((c.relkind =
ANY (ARRAY['r'::"char", 'v'::"char", 'm'::"char", 'f'::"char"])) AND (NOT (c.relname = 'raster_columns'::name)) AND (t.typname
= 'geometry'::name) AND (NOT pg_is_other_temp_schema(c.relnamespace)) AND has_table_privilege(c.oid,
'SELECT'::text));
```

3.2.1. Columns

Column name	Type	Properties	Description
f_table_catalog	varchar(256)		
f_table_schema	name(2147483647)		
f_table_name	name(2147483647)		
f_geometry_column	name(2147483647)		
coord_dimension	int4		
srid	int4		
type	varchar(30)		

3.3. View raster_columns

```
SQL:SELECT current_database() AS r_table_catalog, n.nspname AS r_table_schema, c.relname AS r_table_name,
a.attname AS r_raster_column, COALESCE(_raster_constraint_info_srid(n.nspname, c.relname, a.attname), ( SELECT
st_srid('01010000000000000000000000000000000000000000000000000'::geometry) AS st_srid)) AS srid,
_raster_constraint_info_scale(n.nspname, c.relname, a.attname, 'x'::bpchar) AS scale_x,
_raster_constraint_info_scale(n.nspname, c.relname, a.attname, 'y'::bpchar) AS scale_y,
_raster_constraint_info_blocksize(n.nspname, c.relname, a.attname, 'width'::text) AS blocksize_x,
_raster_constraint_info_blocksize(n.nspname, c.relname, a.attname, 'height'::text) AS blocksize_y,
COALESCE(_raster_constraint_info_alignment(n.nspname, c.relname, a.attname), false) AS same_alignment,
COALESCE(_raster_constraint_info_regular_blocking(n.nspname, c.relname, a.attname), false) AS regular_blocking,
_raster_constraint_info_num_bands(n.nspname, c.relname, a.attname) AS num_bands,
_raster_constraint_info_pixel_types(n.nspname, c.relname, a.attname) AS pixel_types,
_raster_constraint_info_nodata_values(n.nspname, c.relname, a.attname) AS nodata_values,
_raster_constraint_info_out_db(n.nspname, c.relname, a.attname) AS out_db,
_raster_constraint_info_extent(n.nspname, c.relname, a.attname) AS extent,
COALESCE(_raster_constraint_info_index(n.nspname, c.relname, a.attname), false) AS spatial_index FROM pg_class c,
pg_attribute a, pg_type t, pg_namespace n WHERE ((t.typname = 'raster'::name) AND (a.attisdropped = false) AND
(a.atttypid = t.oid) AND (a.attrelid = c.oid) AND (c.relnamespace = n.oid) AND ((c.relkind)::text = ANY
((ARRAY['r'::character(1), 'v'::character(1), 'm'::character(1), 'f'::character(1)])::text[])) AND (NOT
pg_is_other_temp_schema(c.relnamespace)) AND has_table_privilege(c.oid, 'SELECT'::text));
```

3.3.1. Columns

Column name	Type	Properties	Description
r_table_catalog	name(2147483647)		
r_table_schema	name(2147483647)		
r_table_name	name(2147483647)		
r_raster_column	name(2147483647)		
srid	int4		
scale_x	float8		
scale_y	float8		
blocksize_x	int4		
blocksize_y	int4		
same_alignment	bool		
regular_blocking	bool		
num_bands	int4		
pixel_types	_text(2147483647)		
nodata_values	_float8(17,17)		
out_db	_bool(1)		
extent	geometry(2147483647)		
spatial_index	bool		

3.4. View raster_overviews

SQL:SELECT current_database() AS o_table_catalog, n.nspname AS o_table_schema, c.relname AS o_table_name, a.attname AS o_raster_column, current_database() AS r_table_catalog, (split_part(split_part(s.consrc, ' '::text, 1), ' '::text, 2))::name AS r_table_schema, (split_part(split_part(s.consrc, ' '::text, 2), ' '::text, 2))::name AS r_table_name, (split_part(split_part(s.consrc, ' '::text, 3), ' '::text, 2))::name AS r_raster_column, (btrim(split_part(s.consrc, ' '::text, 2)))::integer AS overview_factor FROM pg_class c, pg_attribute a, pg_type t, pg_namespace n, pg_constraint s WHERE ((t.typname = 'raster'::name) AND (a.attisdropped = false) AND (a.atttypid = t.oid) AND (a.attrelid = c.oid) AND (c.relnamespace = n.oid) AND ((c.relkind)::text = ANY ((ARRAY['r'::character(1), 'v'::character(1), 'm'::character(1), 'f'::character(1)])::text))) AND (s.connamespace = n.oid) AND (s.conrelid = c.oid) AND (s.consrc ~ '%overview_constraint%'::text) AND (NOT pg_is_other_temp_schema(c.relnamespace)) AND has_table_privilege(c.oid, 'SELECT'::text));

3.4.1. Columns

Column name	Type	Properties	Description
o_table_catalog	name(2147483647)		

o_table_schema	name(2147483647)		
o_table_name	name(2147483647)		
o_raster_column	name(2147483647)		
r_table_catalog	name(2147483647)		
r_table_schema	name(2147483647)		
r_table_name	name(2147483647)		
r_raster_column	name(2147483647)		
overview_factor	int4		

4. References

4.1. Reference layer_topology_id_fkey

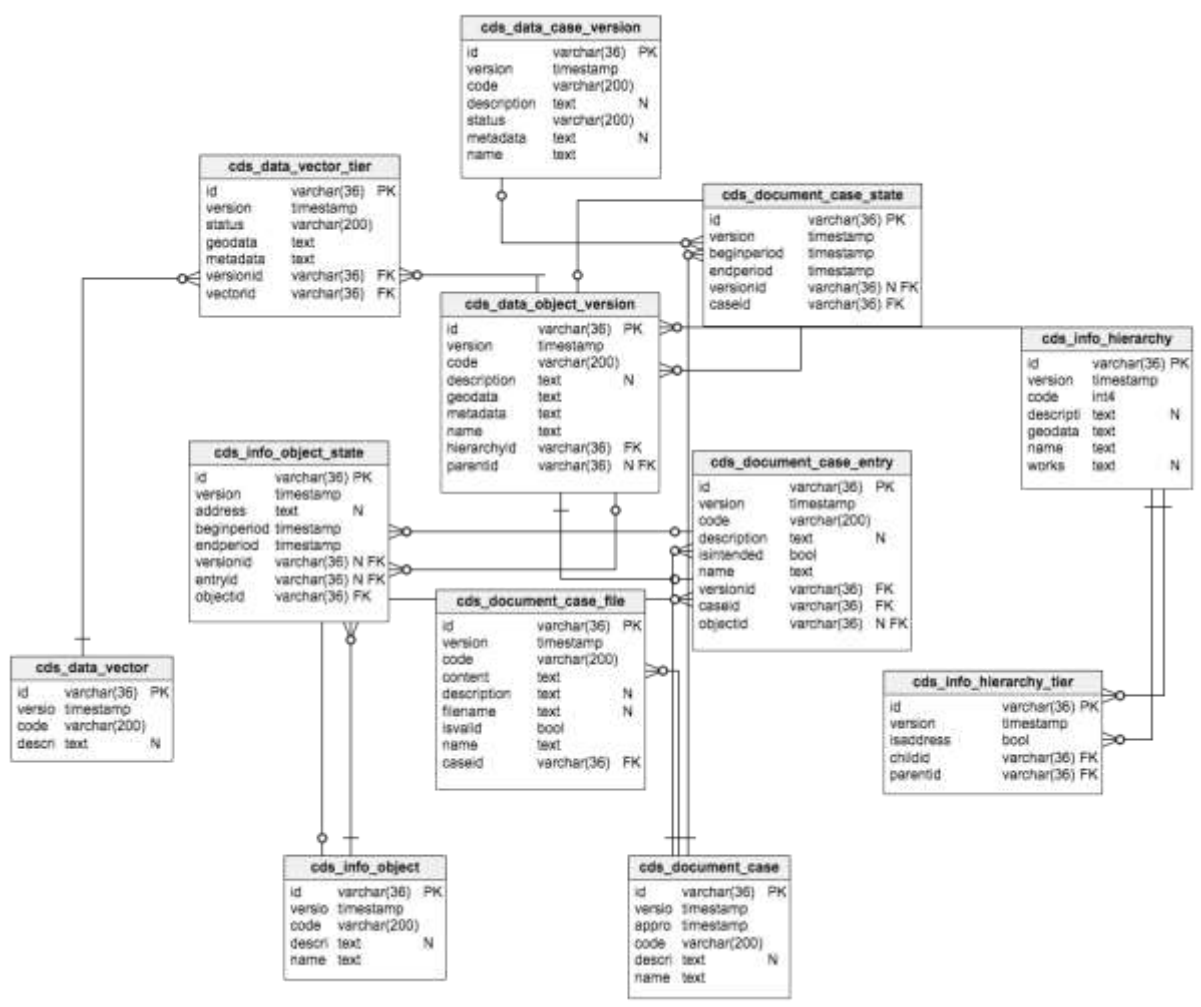
topology	0..*	layer
id	<->	topology_id

5. Sequences

Sequence name	Starts with	Description
topology_id_seq	1	

Annex 2 - Database model documentation for the developed system

1. Model details



2. Tables

2.1. Table cds_catalogue

2.1.1. Description

Catalogue – used to store all types of dictionaries that will be used after that to configure layer definition attributes.

2.1.2. Columns

Column name	Type	Properties	Description
id	varchar(36)		Unique identifier generated by system for a catalogue.
version	timestamp		@DateTime value for catalogue expressed in milliseconds.
code	varchar(200)		Unique code identifier filled by user.
description	text		Catalogue description.
name	text		Catalogue name.
values	text		JSON object structure where is actually stored the content - key-value pairs for a simple catalogue structure or tree key-value structure for more complicated dictionaries.

2.1.3. Alternate keys

Key name	Columns	Description
uk_catalogue_code	code	Alternative key used by system to find a catalogue type instead of or together with id.

2.2. Table cds_data_case_version

2.2.1 Description

Data case version – used to store version of created cases with different data changes regarding case information during the case lifecycle.

2.2.2. Columns

Column name	Type	Properties	Description
id	varchar(36)		Unique identifier generated by system for a document case version.
version	timestamp		@DateTime value for a document case version expressed in milliseconds.

code	varchar(200)		Unique code generated by system for a document case version.
description	text	null	Description of document case version.
status	varchar(200)		@Enumerated values which describe the state of document case. Accepted values(Draft, Completed, Rejected, Approved).
metadata	text	null	Other information related to a version of document case.
name	text		Name of document case version.

2.1.3. Alternate keys

Key name	Columns	Description
uk_datacaseversion_code	code	Alternative unique key used by system to find a document case version instead of or together with id.

2.3. Table cds_data_object_version

2.3.1 Description

Data object version – used to store defined versions of an address object with all the properties that are filled by user and updated during the document case lifecycle. At each step the status are changed until the object is going to be approved and registered in system for a definite period of timeline.

2.3.2. Columns

Column name	Type	Properties	Description
Id	varchar(36)		Unique identifier generated by system for an address object version.
version	timestamp		@DateTime value for an address object version expressed in milliseconds.
code	varchar(200)		Unique code generated by system for an address object version.
description	text	null	Description of address object version.
geodata	text		Code of address object version generated by frontend module and used in order to find objects on map instance.
metadata	text		Attributes related to an address object filled by user.
name	text		Name of address object.

hierarchyid	varchar(36)		Identifier of address object type.
parentid	varchar(36)	null	Parent reference identifier.
addressable	bool		Determine if object will be part of address string or not.

2.3.3. Alternate keys

Key name	Columns	Description
uk_dataobjectversion_hierarchyid_code	hierarchyid, code	Alternative key used by system to find an address object version instead of or together with id; Constraint – hierarchyid and code should be a unique combination.

2.4. Table cds_data_vector

2.4.1. Description

Data vector – used to store non-address objects(it's one of two normalization tables for cds_data_object_version, objects that are shown on map instance with a graphic representation but cannot be named as address objects - segments).

2.4.2. Columns

Column name	Type	Properties	Description
id	varchar(36)		Unique identifier for a non-address object version.
version	timestamp		@DateTime value for an non-address object version expressed in milliseconds.
code	varchar(200)		Unique code identifier generated by system for non-address object.
description	text	null	Description of non-address object (ex: segment of border) version.

2.4.3. Alternate keys

Key name	Columns	Description
uk_datavector_code	code	Alternative key used by system to find a non-address object version instead of or together with id.

2.5. Table cds_data_vector_tier

2.5.1. Description

Data vector tier – used to store non-address objects(it's second of two normalization tables for cds_data_object_version, objects that are shown on map instance with a graphic representation but cannot be named as address objects – segment with all data filled by user on front-end side).

2.5.2. Columns

Column name	Type	Properties	Description
Id	varchar(36)		Unique identifier generated by system for a detailed non-address object version.
version	timestamp		@DateTime value for a detailed non-address object version expressed in milliseconds.
status	varchar(200)		@Enumerated values which describe the state of detailed non-address object version. Accepted values(New, Updated, Deleted).
geodata	text		Code of detailed non-address object version generated by frontend module and used in order to find objects on map instance.
metadata	text		Attributes related to a detailed non- address object version filled by user.
versionid	varchar(36)		@DateTime value for a detailed non-address object version expressed in milliseconds.
vectorid	varchar(36)		Reference identifier of non-address object version.

2.5.3. Alternate keys

Key name	Columns	Description
uk_datavectortier_versionid_vectorid	versionid, vectorid	Constraint – versioned and vectored should be an unique combination.

2.6. Table cds_document_case

2.6.1. Description

Document case – used to store document cases(main table).

2.6.2. Columns

Column name	Type	Properties	Description
id	varchar(36)		Unique identifier generated by system of document case.

version	timestamp		@DateTime value for document case expressed in milliseconds.
approve	timestamp		@DateTime value for document case at approval, expressed in milliseconds.
code	varchar(200)		Unique code identifier generated by system for document case.
description	text	null	Description of document case.
name	text		Document case name.

2.6.3. Alternate keys

Key name	Columns	Description
uk_documentcase_code	code	Alternative key used by system to find a document case instead of or together with id.

2.7. Table cds_document_case_entry

2.7.1. Description

Document case entry – used to store entry definition of an address object which defines traces for that object during the case lifecycle. There is a field `isintended` which tells if an address object will be approved as a last version or not.

2.7.2. Columns

Column name	Type	Properties	Description
id	varchar(36)		Unique identifier generated by system of document case entry.
version	timestamp		@DateTime value for document case entry, expressed in milliseconds.
code	varchar(200)		Unique code identifier generated by system for document case entry.
description	text	null	Document case entry description
isintended	bool		Reference value for a case entry which helps system to decide on creating or not an address object. Address object will be created if true and skipped if false.
name	text		Document case entry name.
versionid	varchar(36)		Reference identifier for data object version.
caseid	varchar(36)		Reference identifier for document case.

objectid	varchar(36)	null	Reference identifier for Object(Existing Address Object in Register) – in case of update.
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2.7.3. Alternate keys

Key name	Columns	Description
uk_documentcaseentry_caseid_code	caseid, code	Constraint – caseid and code should be an unique combination.
uk_documentcaseentry_versionid	versionid	Constraint – version of document case entry should be unique.

2.8. Table cds_document_case_file

2.8.1 Description

Document case file – used to store uploaded files/documents during address object registration process.

2.8.2. Columns

Column name	Type	Properties	Description
id	varchar(36)		Unique identifier generated by system for document case file(uploaded documents)
version	timestamp		@DateTime value for document case file, expressed in milliseconds.
code	varchar(200)		Unique code identifier generated by system for document case file.
content	text		Content of uploaded document.
description	text	null	Description of uploaded document.
filename	text	null	Document filename.
isvalid	bool		Value used for invalidate an old version of document.
name	text		Document name.
caseid	varchar(36)		Reference identifier of document case.

2.9. Table cds_document_case_state

2.9.1 Description

Document case state – used to store intermediate case states for timeline history.

2.9.2. Columns

Column name	Type	Properties	Description
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id	varchar(36)		Unique identifier generated by system for document case state.
version	timestamp		@DateTime value for document case state, expressed in milliseconds.
beginperiod	timestamp		@DateTime value for document case state, expressed in milliseconds. This value set timeline begin period for an address object.
endperiod	timestamp		@DateTime value for document case state, expressed in milliseconds. This value set timeline end period for an address object.
versionid	varchar(36)	null	Reference identifier for a version of address object.
caseid	varchar(36)		Reference identifier of document case.

2.9.3. Indexes

Index name	Columns	Description
ix_documentcasestate_caseid_beginperiod	caseid (ASC), beginperiod (ASC)	
ix_documentcasestate_caseid_endperiod	caseid (ASC), endperiod (ASC)	

2.10. Table cds_info_hierarchy

2.10.1. Description

Info hierarchy – used to store configurations for address object hierarchy types:
 -layers that should be loaded on map
 -kind of parent types
 -attribute configurations that generates dynamic forms to be filled by user
 -case report configurations
 -map interactions(buttons)

2.10.2. Columns

Column name	Type	Properties	Description
id	varchar(36)		Unique identifier generated by system for info hierarchy. This table contains configurations of possible address objects.
version	timestamp		@DateTime value for info hierarchy, expressed in milliseconds.

code	int4		Human readable code for hierarchy levels.
description	text	null	Info hierarchy description.
geodata	text		All configurations related to an hierarchy level(object attributes, layers, reports, possible parents) are stored in a json structure.
name	text		Info hierarchy name.
works	text	null	Reference to a list of works to be executed for a hierarchy level.

2.10.3. Alternate keys

Key name	Columns	Description
uk_infohierarchy_code	code	Alternative key used by system to find a document case instead of or together with id.

2.11. Table cds_info_hierarchy_tier

2.11.1. Description

Info hierarchy tier – used to store level references as child-parent and to define if a level should be part of address string by default or not.

2.11.2. Columns

Column name	Type	Properties	Description
id	varchar(36)		Unique identifier for info hierarchy tier(possible parent-child relations).
version	timestamp		@DateTime value for info hierarchy tier, expressed in milliseconds.
isaddress	bool		Determine if child object from a defined parent-child relation will be part of address string or not.
childid	varchar(36)		Info hierarchy identifier reference as child.
parentid	varchar(36)		Info hierarchy identifier reference as parent.

2.11.3. Alternate keys

Key name	Columns	Description
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uk_infohierarchytier_parentid_childid	parentid, childid	Constraint – parented and childid should be an unique combination.
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2.12. Table cds_info_object

2.12.1. Description

Info Object – used to store approved/registered address objects(main table).

2.12.2. Columns

Column name	Type	Properties	Description
id	varchar(36)		Unique identifier generated by system for info object(approved address objects).
version	timestamp		@DateTime value for an address info object, expressed in milliseconds.
code	varchar(200)		Unique code identifier generated by system for info object.
description	text	null	Info object description.
name	text		Info object name.

2.12.3. Alternate keys

Key name	Columns	Description
uk_infoobject_code	code	Alternative key used by system to find a info object instead of or together with id.

2.13. Table cds_info_object_state

2.13.1. Description

Info object state – used to store approved/registered address objects with their state versions on case timeline. This is table exposed as API to manage main operations.

2.13.2. Columns

Column name	Type	Properties	Description
id	varchar(36)		Unique identifier generated by system for info object state.
version	timestamp		@DateTime value for info object state, expressed in milliseconds.
address	text	null	Complete address string generated by system based on number of parents,

			cds_info_hierarchy_tier.isaddress and cds_data_object_version.addressable values.
beginperiod	timestamp		@BeginDateTime – timeline range active period, expressed in milliseconds.
endperiod	timestamp		@EndDateTime – timeline range active period, expressed in milliseconds.
versionid	varchar(36)	null	Reference identifier for an address object version.
entryid	varchar(36)	null	Reference identifier for document case entry.
objectid	varchar(36)		Reference identifier for info object.

2.13.3. Indexes

Index name	Columns	Description
ix_infoobjectstate_objectid_beginperiod	objectid (ASC), beginperiod (ASC)	
ix_infoobjectstate_objectid_endperiod	objectid (ASC), endperiod (ASC)	
ix_infoobjectstate_versionid	versionid (ASC)	

3. References

3.1. Reference fk_documentcasestate_datacaseversion

cds_data_case_version	0..*	cds_document_case_state
id	<->	versionid

3.2. Reference fk_dataobjectversion_dataobjectversion

cds_data_object_version	0..*	cds_data_object_version
id	<->	parentid

3.3. Reference fk_datavectortier_dataobjectversion

cds_data_object_version	0..*	cds_data_vector_tier
id	<->	versionid

3.4. Reference fk_documentcaseentry_dataobjectversion

cds_data_object_version	0..1	cds_document_case_entry
id	<->	versionid

3.5. Reference fk_infoobjectstate_dataobjectversion

cds_data_object_version	0..*	cds_info_object_state
id	<->	versionid

3.6. Reference fk_datavectortier_datavector

cds_data_vector	0..*	cds_data_vector_tier
id	<->	vectorid

3.7. Reference fk_documentcaseentry_documentcase

cds_document_case	0..*	cds_document_case_entry
id	<->	caseid

3.8. Reference fk_documentcasefile_documentcase

cds_document_case	0..*	cds_document_case_file
id	<->	caseid

3.9. Reference fk_documentcasestate_documentcase

cds_document_case	0..*	cds_document_case_state
id	<->	caseid

3.10. Reference fk_infoobjectstate_documentcaseentry

cds_document_case_entry	0..*	cds_info_object_state
id	<->	entryid

3.11. Reference fk_dataobjectversion_infohierarchy

cds_info_hierarchy	0..*	cds_data_object_version
id	<->	hierarchyid

3.12. Reference fk_infohierarchytier_infohierarchy_childid

cds_info_hierarchy	0..*	cds_info_hierarchy_tier
id	<->	childid

3.13. Reference fk_infohierarchytier_infohierarchy_parentid

cds_info_hierarchy	0..*	cds_info_hierarchy_tier
id	<->	parentid

3.14. Reference fk_documentcaseentry_infoobject

cds_info_object	0..*	cds_document_case_entry
id	<->	objectid

3.15. Reference fk_infoobjectstate_infoobject

cds_info_object	0..*	cds_info_object_state
id	<->	objectid