Modernization of Government Services

in the Republic of Moldova

Project ID No. P148537

Terms of Reference

for design, development, and deployment
of the information system of State Register of Legal Entities
of the Public Services Agency of the Republic of Moldova

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2. General

2.1. Background

The Government of Moldova is determined to fundamentally change the way how public services are provided in Moldova through a variety of interventions for modernization of service delivery, which combat corruption, foster a customer care culture, enhance access, as well as increases efficiency in the Moldovan public administration.

Therefore, one of the main objectives of the Administration Reform Strategy 2016-2020 and Government's working program for years 2016-2018 is the modernization of public services.

Moldova has made considerable progress both in terms of public administration reform, exceeding indicators average of countries in Europe and Central Asia and countries with middle and low income, as well as the size of Government modernization that uses information and communication technology (ICT), the Government of creating a world-class ICT infrastructure that allows the development and supply of electronic services to the highest quality standards.

Even though some progress has been made over the last decade, citizens still view corruption as a significant problem. While business process and e governance reform efforts have somewhat improved business services, such measures have not yet been applied to administrative services.

Businesses and citizens continue to face many constraints in the interaction with the state, one of the most important of which is corruption perceived by 40 percent of companies as a major impediment to business (according to the World Bank, EBRD Business Environment and Enterprise Performance Survey 2013). Institutional reforms aimed at reducing corruption are also at the forefront of the EU's requirements for Moldova's progress. The most important challenges ahead are strengthening the rule of law, reforms in public administration, including professionalism and anti-corruption efforts and improving competitiveness and the business environment.

Although the Government has launched the reform of public services in 2014-2016 and has committed to digitize and provide online access to all public services by 2020, re-engineering and process optimization remains a problem that prevents achieving this.

Also, there is room for rationalization to over 580 existing public services by withdrawing from use the obsolete services.

To meet these challenges, the Government, in accordance with the Public Administration Reform (PAR) Strategy for the years 2016-2020 (especially the component "Modernization of Public Services") is undergoing a major transformation exercise (qualitative and quantitative) of administrative public services, provided by central public administration authorities through: a) removing outdated public services or merging several services in one; b) increasing access to local public services through various channels; c) reducing the number of documents required for public services, and the delivery time; e) ensuring a high level of satisfaction with the quality of government service delivery.

The Government of Moldova, via e-Governance Agency as implementing agency is carrying out a World Bank-funded PAR operation, planned for 2017-2023 - Modernization of Government

Services Project – (MGSP)[1] as part of which the first batch of 3 (three) services (determination of disability and work capacity, issue of unemployment benefit and issue of driving license) are being reengineered[2].

Major results of the project include better quality, accessibility, and increased efficiency of selected governmental administrative services through the public service modernization and creation of digital platforms and services.

This document represents requirements for the modernization and/or replacement of the existing information system of State Register of Legal Entities (SRLE) under the Public Services Agency (PSA) of the Republic of Moldova.

Requirements presented herein are based on the target (TO BE) model of reengineered public services, provided by the SRLE.

2.2. Definitions

The following definitions, abbreviations and acronyms are used throughout the document unless, in the particular case, stated otherwise.

Agile

Agile software development is a set of practices to enable iterative software development process by dividing whole development project into a set of small activity sets. Thus, each activity set brings to the client a piece of functionality ready to assess, test and/or use. In this document we engage SCRUM as one of agile project management methodologies.

BPM

Business Process Management

BPMS

Business Process Management System — an information system that automates business processes

Client

For the purpose of this ToR the client is the Public Service Agency[3].

DB

Database

DTS

Detailed technical documentation, created by Consultant, that contains detailed description of IS technical implementation.

EBRD

European Bank for Reconstruction and Development

EGA

[1] Modernization of Government Services in the Republic of Moldova (http://projects.worldbank.org/P148537?lang=en)

[2] http://egov.md/ro/transparency/acquisitions/contract-award-notice-consulting-firm-perform-re-engineering-three

[3] As per the provisions set in the the Government Decision. 354/2020, pt.14.

e-Governance Agency. The e-Governance Agency will be responsible for all administrative and procedural aspects of the selection process, contract management and financial management, including payment, general project management responsibilities.

GB
Gigabyte

ICT
Information and communications technology

IDNO
Unique identifier of legal entity in Moldova

IDNP
State identifier of a natural person in Moldova

IS
Information System

LE
Legal entity (or legal person, or juridical person) – entities such as commercial and non-commercial organisations, corporations, firms, government agencies, etc.

MB
Megabyte

MCloud
The MCloud platform is a common government information infrastructure that operates on the basis of cloud computing technology hosted in the consolidated data centre infrastructure.

MConnect
Moldova's governmental system interoperability platform, the technological solution developed by the Government of the Republic of Moldova to ensure interoperability and data exchange between information systems.

MPass
Moldova's governmental single authentication and access control service. Ensures single sign-on and other related functionality.

Product
In general, includes as developed information system as results of all accompanying activities like documentation, manuals, etc.

PAR
Public Administration Reform

PSA
Public Services Agency of the Republic of Moldova

RM
Republic of Moldova

SRLE
Information System State Register of Legal Entities under the Public Services Agency of the Republic of Moldova

Consultant
The company that will design, develop and deploy the information system.

UI
User interface, a part of IS intended for interaction between the human user and the system.

WB
World Bank

WP
IS user workplace

Work Package
The work package(s) defines the releases and iterations (Sprints in Scrum) that are contained in that stage. The content of work packages will be broken down or transformed into lower level plans, such as release plans and iteration plans, which may be in the form of backlogs.

3. Project implementation approach

The scope of work is to design, develop, configure, and implement the information system SRLE (fully referred also as ”system”) as a fully functional product with all functionalities in place, according to the specifications iteratively identified and defined by the client (the indicative set of requirements is listed in sections “Software requirements specification (SRS)” and “Annexes” below and following the development approach described below.

The development of the solution will follow Agile iterative software development principles. Since there are many dialects of agile software development and to avoid misunderstandings, this section provides key principles to be used in development of the solution.

3.1. Iterative development

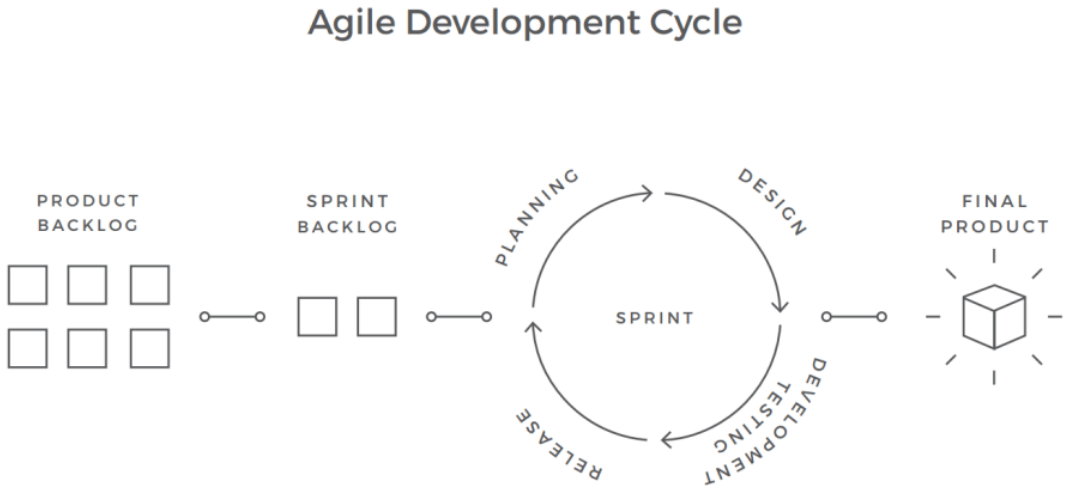
In contrast to waterfall software development approach, the solution shall be developed in iterations named sprints. This means that the implementation of different functionalities will take place in phases with some modules being in production while others still being in development. The priorities of functionalities included in a sprint will be determined by the client. Sprint duration will be determined by the client together with the Consultant.

3.2. Agile development

The development shall follow agile principles by allowing change and flexibility in implementation. Client will maintain the master list of generic requirements for the solution– product backlog, which consists of ordered business and technical requirements as seen by the client. Items in product backlog are ordered by the client by their priorities. Client is free to manage the product backlog by adding new items to it, removing items and reordering them as he/she desires. At the beginning of each sprint, the topmost N items that fit into a sprint are taken, and a sprint backlog is built out of them. Items in sprint backlog are further detailed and distributed to developers. Sprint backlog is not changed during the sprint.

Overall agile development cycle is presented in picture[4] below:

[4] Picture source: https://dihfahsih.blogspot.com/2019/07/documentation-is-very-vital-before-you.html



3.3. Working product in each iteration

Each sprint ends up in a working product which is presented to the client for acceptance in the last day(s) of sprint. The working product shall meet the agreed readiness criteria (i.e., it must be fully functional, fully tested, accompanied with relevant unit tests, accompanied with relevant documentation where necessary, complete commented source code supplied etc.). In case the deliverables contain defects for reasons not imputable to the client, the Consultant shall fix them without impacting the time schedule and at no additional costs, including possible visits to client site. Working products from different sprints can be combined into a release deployed in production at client's discretion. Any incidents reported by the client after the release, shall be solved by the Consultant according to the agreed Service Level Agreements (SLAs) as defined in section "Warranty and Support".

To ensure that the development team is in position to deliver on time working products, a client representative – typically named the Product Owner in agile methodologies – will be permanently available to the team for answering eventual questions, thus not slowing down the implementation pace.

The Consultant will appoint a Scrum Master from the team of key or non-key experts for the entire duration of the project.

The Scrum Master will be responsible for the day-to-day liaison with the client; she/he must ensure the internal coordination and guidance of the project experts and the project coordination with external counterparts.

The Scrum Master must also ensure the availability of suitable experts in accordance with the project planning documentation.

3.4. Reporting requirements

The following reports will be provided during project implementation:

a) Sprint Report, including release notes, detailed structure and duration of tasks implemented during the sprint, speed, issues and outstanding issues, proposed actions to be taken;

b) Product Backlog for the next Sprint, including detailed structure and estimated duration of tasks proposed to be implemented in the next sprint, resources expected to be provided by the client and/or actions to be taken by the client;

c) Training reports, submitted after each training session, which will include:

- List of participants;
- Agenda of the training session;
- Training materials (presentations, labs, etc.);
- Trainee's test results.

3.5. Client involvement

In contrast with commonly used waterfall model for procurement and implementation of information systems for the government, the client designated person – Product Owner – will be heavily involved in the development process. The Product Owner will have three core responsibilities:

- Maintenance of product backlog – the Product Owner will maintain the product backlog up to date, so it reflects prioritized list of desired functionalities. The process of definition of the backlog is under the Product Owner supervision and is realized by the Business Analyst (key expert from the Consultant's team).
- Answering to questions coming from developers – the Product Owner will be at all time available to the development team for answering their eventual clarification questions, thus avoiding complex and formal communication within the project. This is essential to ensure the team has all the information on time to deliver a working product at the end of the sprint.
- Acceptance of working packages – delivered working packages are presented to the client for acceptance at the end of each sprint. The client shall accept the working package or notify the Consultant of any defects during the following sprint.

Although it is not strictly necessary, the Product Owner may participate in team stand up meetings listening for progress and eventual blockers for an immediate reaction.

Product Owner also decides on product releases, as per release plan.

Also, as per the principles of agile project management methodology, the client will define the Product Vision Statement and Product Roadmap in order to track progress and to ensure the appropriate product development.

During the development process, the communication related to definition of the backlog, answering to questions coming from developers will be in Romanian.

3.6. Required technology stack

To preserve e-Government investments, the solution is required to be developed using the latest versions of the following technology stack:

- Programming language is C#.
- ORM is Entity Framework Core.
- Web framework is ASP.NET MVC Core.
- RDBMS is SQL Server.
- Container engine is Docker.
- Container orchestration is Kubernetes.
- Cache server and session store is SQL Server or Redis.

During the development process, the Consultant or the Client may propose use of additional components required for the development and proper functionality of the solution in production. Upon the Client's approval of such components, the costs for them shall be added through amendments to the contract.

During the project implementation E-Governance Agency will offer the development environment that includes:

1) Supervised Azure subscription with AKS and other PaaS services in-cluster and out-of-cluster (such as SQL Server) as required by the project with required access rights assigned
2) Supervised Azure DevOps organization associated with the subscription and Consultant users invited as guest with required access rights assigned
3) Connectivity from Azure to on-prem services involved in the project
4) Access to on-prem Kubernetes cluster(s) for production deployment

3.7. Consultant 's requirements

The Consultant shall furnish documentary evidence (including information about the completed contracts and contact information of clients from whom the references could be taken) to demonstrate that it and its key experts meet experience requirements listed below.

3.7.1 The consultant Qualifications

The consultant minimum qualifications requirements are:

- Minimum 5 years of experience in developing ICT solutions/systems.
- Minimum 2 ICT projects of similar complexity successfully implemented during the last 5 years.
- Experience developing ICT solutions/systems for State/Public Institutions (Central and/or Local) *will constitute a strong advantage*.
- Experience developing ICT solutions/systems for company/corporate registries *will constitute a strong advantage*.
- Experience in software development using agile software development principles (as described in the scope of work and development approach section of the ToR) *would be an advantage*.

- Demonstrated experience using required technology stack *would be an asset*.

The Consultant shall furnish documentary evidence (including information about the completed contracts and contact information of clients from whom the references could be taken or whom the Client may, when necessary, visit to familiarize themselves with the systems put into operation by the Consultant) to demonstrate that it meets the qualifications requirements.

3.7.2. Consultant's Staffing

The performance of the proposed assignment will require Key Professional Staff and Non-Key Staff. The Consultant should provide qualified staff, both key-experts and non-key experts considering the assignment requirements and implementation time frame. The number and level of effort for all experts shall be listed in the technical proposal and their costs included in the financial proposal. ***The minimum estimated staff input is 1200 person/working days from which at least 960 days are foreseen for the key experts***. Staff inputs may be adjusted during the contract implementation, subject to actual needs and additional system functionalities to be developed.

The entire team of the proposed experts MUST jointly meet all the listed requirements:

- Proven experience in web UI design and development using responsive frameworks, progressive web apps
- Proven experience in database design, development, and optimization
- Experience in systems' integration, API design and development using SOAP/REST
- Experience with unit testing
- Experience in DevOps practices
- Experience in system analysis.
- Experience as a Scrum Master in at least three projects.

Qualification of Key Experts

Key experts represent specific knowledge and/or expertise required for the successful project implementation. Although the Consultant will form project implementation team at its discretion, the Consultant shall provide the following key experts with proved competencies:

- Key expert 1. Project Manager
- Key expert 2. Business analyst
- Key expert 3. Senior software developer / software architect
- Key Expert 4. Software developer
- Key Expert 5. Software developer
- Key Expert 6. Software developer
- Key Expert 7. Software Tester
- Key Expert 8. Trainer

For proposed key experts the CVs need to be submitted, demonstrating the minimum qualifications requirements, as detailed below. Reallocation of competences among key experts and/or split of key expert competences is only allowed upon receipt of prior consent of the client.

Key expert 1. Project manager

Project Manager will be responsible for administrative activities coordination, such as team composition management, financial relations, reporting submission, organizational tasks for implementation stage and any other activities not covered by any other Developer Team member.

Minimum qualifications requirements:

- University degree in Computer Science or another relevant domain;
- At least 5 years of experience of IT software development and implementation projects;
- Managing implementation of at least 3 similar projects in the last 5 years, including at least one project based on agile approach (engaging techniques like SCRUM, TDD, FDD etc.);
- Experience in IS project implementation in governmental or public sectors;
- Understanding basics of PMI / IPMA / PRINCE2 project management fundamentals, certification constitutes a strong advantage;
- Fluency in English, ability to communicate in Romanian and/or Russian languages.

Key expert 2. Business analyst

Minimum qualifications requirements:

- University degree in Computer Science or another relevant domain;
- At least 5 years of business analysis experience in IT / software development projects;
- Fluency in English and Romanian languages;
- Understanding of business process management (BPM) technologies;
- Understanding of legal entity registration system of the Republic of Moldova constitutes a strong advantage.
- Understanding of enterprise lifecycle constitutes a strong advantage.

Key experts 3. Senior software developer / software architect

Minimum qualifications requirements:

- University degree in Computer Science or another relevant domain;
- At least 7 years' experience in software development;
- Experience in at least 3 projects of similar size in public sector during past 5 years, in at least one of them being responsible for software architect and/or senior software developer tasks;
- Understanding of modern development technologies, including web technologies and development of thin-client applications;
- Experience in development of high availability and high-performance software, as well as use of high-availability application architecture;
- At least 3 years of experience in software development using required technology stack;
- Understanding of system integration, interoperability and containerization;
- Participation in at least one project implemented using agile approach during past 3 years;
- Ability to communicate in English and Romanian languages.

Key experts 4, 5 and 6. Software developer:

Minimum qualifications requirements:

- University degree in Computer Science or other relevant field;
- At least 5 years' experience in software development;
- Participated in the last 3 years in at least 2 software development projects implemented using the Agile method;
- At least 3 years of experience in software development using required technology stack;
- Certifications in any technology in the required technology stack is an advantage;
- Ability to communicate in English and Romanian.

Key Expert 7. Software Tester:

Minimum qualifications requirements:

- University degree in Computer Science or other relevant field;
- At least 3 years' experience in software testing;
- Proven experience in software test analysis and design;
- Proven experience in automated testing;
- Proven experience in performance testing (load and stress testing);
- Proven experience in information systems security testing is an advantage;
- Certification in testing or any technology in the required technology stack is an advantage;
- Ability to communicate in English and Romanian.

Key Expert 8. Trainer:

Trainer's participation is expected during the release stage and is to be limited to the following three main areas: (I)User Guides drafting; (II) e-learning materials development; (III) training of the system users.

Minimum qualifications requirements:

- University degree in Computer Science or another relevant domain;
- At least 5 (five) years of overall professional experience in training users in using information systems;
- Experience in performing trainings in at least 3 (three) projects of similar complexity;
- Experience in development of training courses and content for e-learning platforms;
- Experience in development of user guides and other training materials;
- Excellent speaking and writing in Romanian.

Although the Consultant may offer any development technology stack, programming languages and databases, that meet criteria of business and technical requirements of this document, the task of Senior software developer / software architect is to ensure that the chosen technologies are in line with overall requirements for governmental systems.

Qualification of Non-key experts

During the development and implementation of the system, besides key-experts, non-key experts are required to join the team. In order to demonstrate the availability of such experts, the CVs for non-key experts should be included in the consultant's proposal.

Such CVs will not be evaluated but used to demonstrate that the Consultant has access to experts with the required profiles. The proposed non-key experts will only have to be listed in the technical proposal and indicate their costs in the financial proposal.
On Client's request, the Consultant shall be able to provide additional effort of non-key experts (e.g. IT staff for system development and implementation) to cover additional tasks during the project implementation. It must clearly indicate the experts' profile and tasks assigned so that the applicable daily fee rate in the budget breakdown is clear.
Fields of specialization required for the non-key experts are listed below:

- Software developer (at least 2 different persons);
- Database specialist;
- Technical writer;

The profiles of the non-key experts for this contract are as follows:

- Fluency in both written and spoken English and Romanian;
- For Senior experts, a proven experience of not less than 5 (five) years is required in the areas relevant to their assignment;
- For Junior experts, a proven experience of not less than 2 (two) years is required in the areas relevant to their assignment;
- Experience in at least one relevant project to their assignment.

3.8. Timing

The tasks defined under the current assignment are estimated to be performed in 12 months – 9 months for development and 3 months of maintenance period. If new functionalities will be identified by the Client during the maintenance period, these functionalities may be implemented in additional iterations (sprints), upon availability of budget. The Consultant must provide a 12-months Warranty.

3.9. Purpose

The main purpose of the development of the information system is to provide the Public Service Agency with an efficient, reliable, and modern software solution to be used as a single mechanism ensuring automation of the entire life cycle of a legal entity from the moment the founders decide on its registration until the completion of the liquidation and/or transformation procedures.

3.10. Scope

To develop IS that ensures operation of the following:

- State register of legal entities and State Register of individual entrepreneurs, including **electronic archives**[5];
- workplaces for PSA employees in SRLE performing manual tasks, investigations, generating reports;
- workplaces for technical staff of SRLE performing IS management, configuration, administration and maintenance;
- self-service portal of SRLE for the authorised user access;

[5] Digitization of the paper based archive of the PSA Department for registration and licensing of legal entities is planned to take place in 2022, also in the framework of the MGSP project.

- information portal for the general public access;
- two-way integration with other systems using MConnect;
- tools enabling data upload from digitised paper-based sources and archives, including signed documents.

The Consultant shall also ensure deep analysis of requirements and agree details with the client, prepare project related and system accompanying documentation, as well as provide trainings for staff representatives.

The Consultant shall ensure data cleansing and migration from the current existing system(s) into the new developed solution (see section “Data migration”).

At the development phase the Consultant shall provide support team to assist client’s IS users and proper incident management according to “BR501: Support at the development phase” and “BR502: Development phase SLA”.

The Consultant shall ensure PSA ability to provide continuous and uninterruptible services to the public during solution development, testing, implementation and data migration.

NOTE: Due to the fact that supplier must develop project backlog during the first month of the project, and this implies less work for developers, supplier must plan full team involvement starting with second month.

3.11. Product perspective

The information system should be expandable by adding new functional modules, including those developed by third-party developers and/or connected as services using MConnect. Further development of the system is seen in expanding the capabilities of the automatic decision-making mechanism, reducing the number of manual operations and integration with other public and private systems connected to MConnect.

Complete digitisation of the existing paper-based registries and archives is one of the main objectives for the further development.

3.12. User interfaces

All user interfaces must be thin client interfaces. To access any IS function, including administrative functions, standard web-browser (see “TR301: UI browser requirements”) without any custom-made add-ons shall be sufficient.

Consultant has to provide trainings on the use of user interface for all key groups of users according to section 4.1.4. “Trainings”.

3.13. External interfaces

IS shall provide intersystem access using MConnect compatible interface. Interface shall be scalable to allow adding new functions and request/response message types, as well as message versioning.

3.14. Communications interfaces

All external communication interfaces are based on HTTPS protocol both for system-to-system and human-to-system purposes and shall engage appropriate security and encryption (see “TR106: Communication protocols”).

3.15. Product functions

The basic functions of the IS are:

- automate LE registration, transformation and termination processes;
- provide public and private bodies, as well as the general public, access to the accurate and up to date LE related information;
- ensure reliable history of all actions and events related to LE with full guarantee of protection against any alterations, deletions or other manipulations, including the logging of all business events related to its use;
- represent a single resource for evidence and attribution of names for all types of LE.

These functions have to be implemented according to business and technical requirements, specified in sections “Business requirements” and 4.2 “Technical requirements”.

3.16. User characteristics

User access rights shall be based on business roles in accordance to “BR106: Role-based access”.

3.17. Usability requirements

UI usability has to comply, at least, to the Jakob Nielsen's list of ten heuristics for usability.

Other specific UI usability requirements can be found in section 4. “Annexes”.

3.18. Performance requirements

IS at the time of deployment shall be designed to meet performance requirements as specified in section “Performance”.

Preliminary versions, based on interim sprint deliverables, shall meet performance requirements agreed for a particular sprint.

3.19. Design constraints

IS shall be assumed as one of many e-Government system components that are being concurrently developed by many Consultants but at any given time may be at different level of readiness and accessibility.

The design of the IS should provide the possibility of working with an arbitrary number of external systems with different levels of accessibility, as well as maintaining adequate operability when any of the external systems are temporarily inaccessible.

From other side, IS design should ensure peaceful degradation of its own accessibility and performance, and IS should maintain adequate remaining level of functionality and accessibility should some of its parts fail.

In conjunction with the agile implementation approach this also means, that IS shall be accessible as soon as its first functional component is ready, and then extend in functionality upon development progresses.

3.20. Standards compliance

All documents must be supplied in Office Open XML files (DOCX, XLSX and PPTX), ISO/IEC 29500 compliant[6].

All video material must be provided in MPEG-4 Part 14 (MP4) files, ISO/IEC 14496-14[7] compliant.

All IS data (system and user), must be kept in Unicode UTF-8 (ISO 10646) encoding.

All IS dictionaries must be based on international standards should such standards exist, and use identifiers, codes and abbreviations specified therein. This includes, but not limited to, lists of countries (ISO 3166), currencies (ISO 4217), languages (ISO 639) and so on.

All intersystem interfaces must be compatible with MConnect according to its actual version specification (latest version to be provided by eGA).

In addition, if it's not explicitly stated otherwise, IS itself and all accompanying items (documents, file formats etc.) also must comply with all standards included in specific requirements in section 4. "Annexes".

3.21. Verification

Verification of IS operability shall be based on test scenarios and use cases as specified in "BR204: Technical documentation (DTS)". Interim test scenarios shall be prepared at the beginning of each sprint, and then may be used at later stages to verify proper operability.

Verification of meeting other project requirements shall be made using check-lists.

All interim and final test scenarios and checklists must be prepared by the Consultant and passed to the client, forming a part of IS technical documentation (see "BR204: Technical documentation (DTS)").

[6] https://www.iso.org/search.html?q=29500
[7] https://www.iso.org/search.html?q=14496-14

4. Annexes

4.1. Business requirements

4.1.1. Functional requirements

BR101: New TO BE approach

The IS shall implement and automate TO BE approach described in the "State Registration of Legal Entities TO BE" report[8].

BR102: Round-the-clock operation

IS shall provide 24/7 round-the-clock operation and shall ensure all its routine technical and business operations without the need to interrupt user access and/or activities in the system.

BR103: Process-based operation

IS shall provide approach based on business rules and business processes. Those rules and processes should to be configurable by users, and rule/process amendments shall not require any changes of IS program code.

There can be processes running in fully automated mode and those that require human interactions.

Processes may be initiated manually, automatically (by timer, conditions etc.) or by request via intersystem interface (from example, by request of the court, tax office etc.).

The full list of business processes (scenarios) to be configured in the IS shall be agreed with the client at the time of system implementation. Basic examples are:

- new LE registration;
- LE data amendments;
- LE transformations (including merges, transformations and acquisitions);
- LE termination and erasing.

An example of getting use case from the formalised business process along with implementation of this business process using technical architecture proposed in section Architecture and technologies" are presented in "UC001: Simple online company registration".

BR104: Multi-lingual interface

System interface (UI) shall be multi-lingual and initially support at least three languages: Romanian (ISO 639-1: "RO"), Russian (ISO 639-1: "RU") and English (ISO 639-1: "EN"). Adding new languages should be possible on the configuration level, without the need of IS program code amendments.

[8] The report can be accessed here https://eguv-my.sharepoint.com/:f:/g/personal/beatricia_revenco_egov_md/Eg2ePlupzQJFswtHj5uDHIQBQRfw7TYLbN0npF23twbh-A?e=FiinAW

IS shall support multi-lingual user data as well, for example ability to hold field values in Cyrillic and Latin alphabet. Based on business configuration some data fields may contain several language values simultaneously.

BR105: Use of national ID

The only LE identifier in the system is its IDNO, and the only Moldovan citizen identifier is his/her IDNP. All internal links must be IDNP/IDNO based.

BR106: Role-based access

All access rights in the system are based on business roles, individual access rights are not permitted. The following access right management properties shall be implemented:

- a user may belong to one or several roles, and any number of users may have the same role or a set of same roles;
- effective user rights are formed as combination of all user rights inherited from all his business roles;
- atomic right is a right on a system business or technical function, that cannot be further divided into separate subfunctions without the inevitable need to combine these subfunctions in a single business role;
- administrators are users assigned to roles, which provide access to administrative functions;
- administrators can create any number of roles and assign any number of any atomic rights to a role;
- external interfaces that let users get access to the IS must support both (a) user authentication and (b) governmental identity provider MPass;
- external intersystem interfaces shall get access to the IS based on technical user credentials associated with the interface: those should be assigned administrator-configurable roles the same way as for human users.

For human users, IS roles to apply shall be defined by their MPass roles.

BR107: Eternal record storage

Data in the system includes elements that can never be removed and should support virtually eternal storage. In particular, any LE related activities made (registered) shall be kept in a way and form that does not affect the original data, but represents all changes that have been applied.

BR108: Task queues for performers

IS shall support queue management for all business roles and/or individual users. User shall be clearly notified that an operation requires its intervention or any activity from his/her side.

BR109: Templates

All output forms (messages, letters, documents, certificates etc.) shall be based on user configurable templates. IS shall support template versioning, and automatically switch to new

template version as soon as its activation time comes. All previous versions of all templates shall remain available in archive.

BR110: Data amendments

The IS shall ensure mechanism of amendments: neither change (including mistake correction) can be made in any piece of committed data, but a new version of data element is created every time when something is being changed. At the same time mechanism of amendments adds a permanent history record, fixing the nature of and reason for change, its content, performer and artifacts.

The correctness and validity of any element of information at any time can be checked by applying the entire sequence of all changes in their chronological order to the original version of this element of information.

The so-called event sourcing approach may be applied, deriving actual data element state from its initial state and all subsequent amendments done.

BR111: Customer portal

Customer portal is a self-service point for SRLE clients. Besides cases when in-person presence is mandated by law, all operations regarding entity management can be done online, including name check, starting and closing entities, amending any entity details and related documents, initiating and cancelling transformations, etc.

Registration using MPass is required to access customer portal functions. Unlike users of SRLE workplaces that can access any LE data based on privileges associated with their roles, privileges of customer portal users are limited by those associated with user IDNP and respective IDNO associated with that IDNP.

Customer portal shall comply with all user interface requirements (see section “User interface”).

Customer portal via hyperlinks and references shall be integrated with SRLE information website (“BR112: Information website”) and public services portal[9].

Design and structure of the Customer portal shall be developed by the Consultant and agreed with the client.

BR112: Information website

Information website provides legal entity information for general public, including fuzzy searching of legal entities. It does not require authorisation, and via hyperlinks and references is integrated with customer portal (“BR111: Customer portal”), public services portal and other information resources.

Customer portal shall comply with all user interface requirements (see section “User interface”).

Design and structure of the Customer portal shall be developed by the Consultant and agreed with the client.

[9] https://servicii.gov.md/

BR113: Report generation tool

The system will allow back-end users to define parameters for generating reports.

The reporting module will allow reports to be printed and exported in HTML, MS Excel, MS Word, XML and PDF formats.

The SI will also offer report subscription functionality, by receiving reports generated by e-mail at regular intervals, prepared based on criteria defined in the subscription.

BR114: Payment methods

IS shall be capable providing expandable variety of payment methods for SRLE clients paying for SRLE services. At least bank transfers and MPay platform payments shall be available at the IS deployment stage.

BR115: Digital archive management

IS shall ensure digital archive data management functionality (i. e. ability to access, populate and edit) for authorised users with respective privileges. IS shall support this functionality both in manual (using AWP) and automated (via API) mode.

UC001: Simple online company registration

This example case demonstrates online company registration by the single applicant (natural person) with the use of standard template documents. This scenario comes from TO BE version of the "Company registration (online)" process[10].

Use case (human actors only):

1. Applicant logs into SRLE portal and starts new company registration process, indicating he is the sole owner and that he agrees using standard template documents. Registration status is "Initial data entry".
2. Applicant submits his application. Registration status at the portal changes to "Awaiting payment".
3. Applicant receives invoice to pay registration fee, and he sees option to pay using MPay service at the portal.
4. Applicant makes payment using any chosen payment method.
5. Applicant receives notification about successful company registration and link to the portal to get additional information. Registration status at the portal is "Registered".
6. Applicant accesses all his company related information and documents using his login credentials at the SRLE portal, while all publicly accessible information is available at the SRLE public web without registration.

Logical steps being performed using proposed architecture (see section "Architecture and technologies".):

[10] See process No PD21033103, code LOPA, ver. 5 in the TO BE report attached.

1. Applicant logs into SRLE portal (U15) and starts new company registration process, indicating he is the sole owner and that he agrees using standard template documents.
2. Portal U15 interacts with the validator U01 to check applicant data and chosen company name (validator U01 uses public information registry U08 and LE registry U09 as data sources, as well as registry U05 for applicable rules and parameters).
3. Portal U15 interacts with validator U01 to get service fee amount and to reserve chosen company name.
4. IS creates and sends invoice to the applicant (using U06àU07àU92).
5. Portal U15 offers to pay using MPay payment service (hyperlink to MPay); applicant follows the MPay link or choses another method to perform payment.
6. IS receives payment information from MPay (it comes from MPay to validator U01àU02àU03). IS processes payment information, creates company record with IDNO at LE registry U09, creates and attaches standard template documents and notifies applicant about successful registration using U06àU07àU92 chain.
7. According to rules of U05 IS informs all relevant state bodies about new company registration (by sending information using U06àU07 to, for example, tax service IS U91, bureau of statistics U093 etc.).

4.1.2. Documentation

Documentation to be provided in unencrypted redistributable electronic form, suitable both for screen reading and printing, in Romanian language. Documents must be supplied in Office Open XML files (DOCX, XLSX and PPTX), according to section “Standards compliance”.

BR201: User manuals

The following user documentation shall be provided:

- User manuals for users accessing the system directly (using IS workplace)
- System Functional Description
- Access Matrix

BR202: Administrative manuals

The following administrative documentation shall be provided:

- User administration manual
- System administration manual
- Business environment (business roles, profiles etc.) configuration manual
- Updated versions of use cases (should they change during project implementation)

BR203: Service documents

The following service documentation shall be provided:

- System installation and configuration manual

- Backup and restore manual
- Housekeeping manual
- FAQ and diagnostic (error localization and fixing) / recovery manual
- Maintenance SLA (“BR504: Technical support SLA”)
- Risks & Issues Log

BR204: Technical documentation (DTS)

The following technical documentation shall be provided:

- Detailed technical documentation (DTS) – full developer’s copy including architecture documentation and models
- Migration plan
- Resource requirements for each component instance
- Pre-requisite standard software component requirements (like OS, drivers arc.)
- Professional requirements (list of required competences) for administrators and technicians who will manage and support the IS
- Test scenarios (including acceptance tests and diagnostic tests) and checklists
- Full package of documented source codes (SRLE technical staff should be able compiling these source files in fully executable system)

BR205: API and integration documentation

The following API and integration documentation shall be provided:

- API / integration manual
- samples of files and/or messages of all types
- sandbox (prototype) of API requester / responder

BR206: Video tutorials

The following video tutorials for all Actors – internal system users shall be provided:

- IS interface, login/logout, user settings
- All routine user use cases (except system administrator’s tasks)

4.1.3. Legal and copyright

BR301: Software licensing

The Consultant grants to the client the rights to run and use entire solution with all included software components with no constraints and/or limitations on time, location, number of users, capacity of servers, volume of data and any others. Estimative number of cores for serves is 180. Estimative number of system users – 1200, e-Fillers - 50000. Estimate number of concurrent users - 500, including customer portal users.

Should the Consultant use in its solution any licensed third-party software components and/or licensed technologies, provision of all required licenses shall be arranged by the Consultant and included in project offer budget. All licenses shall be produced in client's name and shall have perpetual validity (being not limited in time of use). If a license has any volume restriction (like number of users, processors, storage space etc.), all its volume related parameters shall be sufficient for full-scale solution operations for at least three years from the time of deployment.

The client SHALL have the right to make changes and analysis of the source code, including automated source code analysers, to detect vulnerabilities, security breaches and/or performance issues.

BR302: Business logics

The license should clearly state that all intellectual and property rights on business logics and use cases of the system belongs exclusively to the client, including all algorithms, formulas, use cases etc.

The client preserves the right of business logic processing, amendments, duplication and/or migration to any other system.

BR303: User data

All and any piece of information except the IS source code and third party provided components form user data. It includes all pieces of information that is put into the system after its deployment by any means and in any form. User data belongs exclusively to the client.

The client preserves the right of user data processing, amendments, duplication and/or migration to any other system.

BR304: Source code

At the end of development Consultant shall supply full and actual version of all source codes of all IS components he has developed.

Should the source code include libraries or other components, that are not publicly available commercial off the shelf products, the Consultant shall provide their source codes too, as well as provide list of resources these components were taken from and indicate licences enabling to use them for the purpose of the project and further source code amendments.

For frameworks, libraries and components that are freely available, the source code shall use corresponding package managers and refer to long-term support (LTS) versions. All prerequisite software must be based on public container repositories.

4.1.4. Trainings

BR401: Training for technicians

This training is intended for client's technician responsible for system acceptance and further inhouse maintenance. Training should include at least the following tasks related to IS:

- IS architecture
- IS technology stack
- Hardware requirements

- Third party software requirements, if any
- IS installation/reinstallation
- IS technical security and reliability features
- IS integration with other systems and/or data sources
- All technical configuration possibilities, configuration files and/or tables
- System, configuration and user data backup and restore
- All routine IS maintenance and housekeeping procedures
- IS error, fault and maloperation detection and localization
- IS recovery procedures
- IS documentation and manuals

Consultant should inform the client in advance about prerequisite competences technicians should have prior to attend this training.

BR402: Training for administrators

This training is intended for client's administrators responsible for system business configuration, user and access rights management, daily user support and business investigations related to IS. Training should include at least the following tasks related to IS:

- IS architecture
- IS user interface
- IS security and reliability features
- Routine administrative tasks
- System configuration management
- System user and access rights management
- Audit logs
- Configuration error, fault and maloperation detection and localization, possible user complaints and ways to resolve them
- Business configuration export/import and recovery
- IS documentation and manuals

Consultant should inform the client in advance about prerequisite competences administrators should have prior to attend this training.

BR403: Training for users

This training is intended for key client's IS users, as well as those who're responsible for providing further trainings ("train the trainers"). Training should include at least the following tasks related to IS:

- IS user interface
- Main IS features
- User environment and its configuration possibilities

- Key usage scenarios
- Documentation and where to find further information

This training should not require any IT background from attendees, basic computer usage related knowledge should be sufficient.

4.1.5. Warranty and Support

BR501: Support at the development phase

Due to agile development approach the "Working product in each iteration" principle is used. The Consultant shall provide client with technical support on functions developed during completed sprints according to "BR502: Development phase SLA", as well as provide assistance to client's IS users.

BR502: Development phase SLA

SLA between the client and Consultant at the development phase shall include reaction time (when Consultant starts working with the problem) and recovery time:

- for critical incidents (IS unavailable for the public use to retrieve LE related information): 30 minutes reaction time and 2 hours recovery time
- for non-critical incidents affecting the public use of the IS: 1 hour reaction time and 4 hours recovery time
- for telephone requests waiting time before a call is answered should not exceed 10 minutes during working hours (09:00 – 18:00 Chisinau time)
- for email requests response time should not exceed 2 business hours

BR503: IS warranty

IS warranty period is 12 (twelve) calendar months from the date of system acceptance by the client. During the warranty period the Consultant shall free of charge fix all defects reported by the client and solve all incidents reported by the client according to the agreed SLA (see "BR504: Technical support SLA").

BR504: Technical support SLA

SLA between the client and Consultant shall include reaction time (when Consultant starts working with the problem) and recovery time:

- for critical incidents (IS unavailable for the public use to retrieve LE related information): 15 minutes reaction time and 1 hour recovery time
- for non-critical incidents affecting the public use of the IS: 1 hour reaction time and 4 hours recovery time
- for other non-critical incidents: 1 hour reaction time and 2 days recovery time

4.1.6. Data migration

BR600: Migration plan

The data migration process to the new system will be carried out on the basis of a migration plan approved by the PSA, which will specify the data structure, data migration mechanisms, description of the data restoration process in case of failed migration or migration with partial loss of data.

BR601: Completeness of data

Except otherwise agreed with the client, all data elements stored in all existing SRLE systems, including historic information, shall be migrated to the new system.

BR602: Data harmonisation

Migration shall include data harmonisation, including:

- cleansing: removing information garbage not related to anything, as well as unnecessary data element duplicates, except deliberately created duplicates for performance and other reasons;
- standardisation: transforming data elements of the same nature to the same format (for example, all dates, currencies, amounts etc.).

BR603: Transformation to events

Migration of the information related to informational objects will be performed using amendments mechanism (see "BR110: Data amendments") in the same manner as for the new information: recording of the initial object status followed by applied changes.

Upon successful migration the final (actual) state of each object in the new system shall match one in the existing system(s).

BR604: Managing inconsistencies

All migration mechanisms (scripts etc.) shall perform data integrity and consistency checks before recording any piece of information in the new system. Responsible person at the client's side shall be notified should any inconsistency is discovered, and user interface of the migration mechanism shall let him/her to make a decision and restore consistency.

BR605: Iterative migration

Migration mechanisms that ensure business object data migration (in particular, entity related information) shall be designed in a manner that allows repeating execution:

- data fully migrated at previous cycles shall not be migrated again;
- data not yet migrated shall be migrated in full;
- amendments to data already migrated shall be properly applied in the new system, adding missing pieces of information;
- pieces of information with discovered inconsistencies sent for review (see "BR604: Managing inconsistencies") and skipped at this migration cycle.

BR606: Migrated data volumes

Migration mechanisms shall be designed in a manner that allows migration of large volumes of data in a sort time. In particular, volume of the active (actual) data excluding dictionaries in existing systems is estimated to be ~20GB in over than 85 DB tables.

4.2. Technical requirements

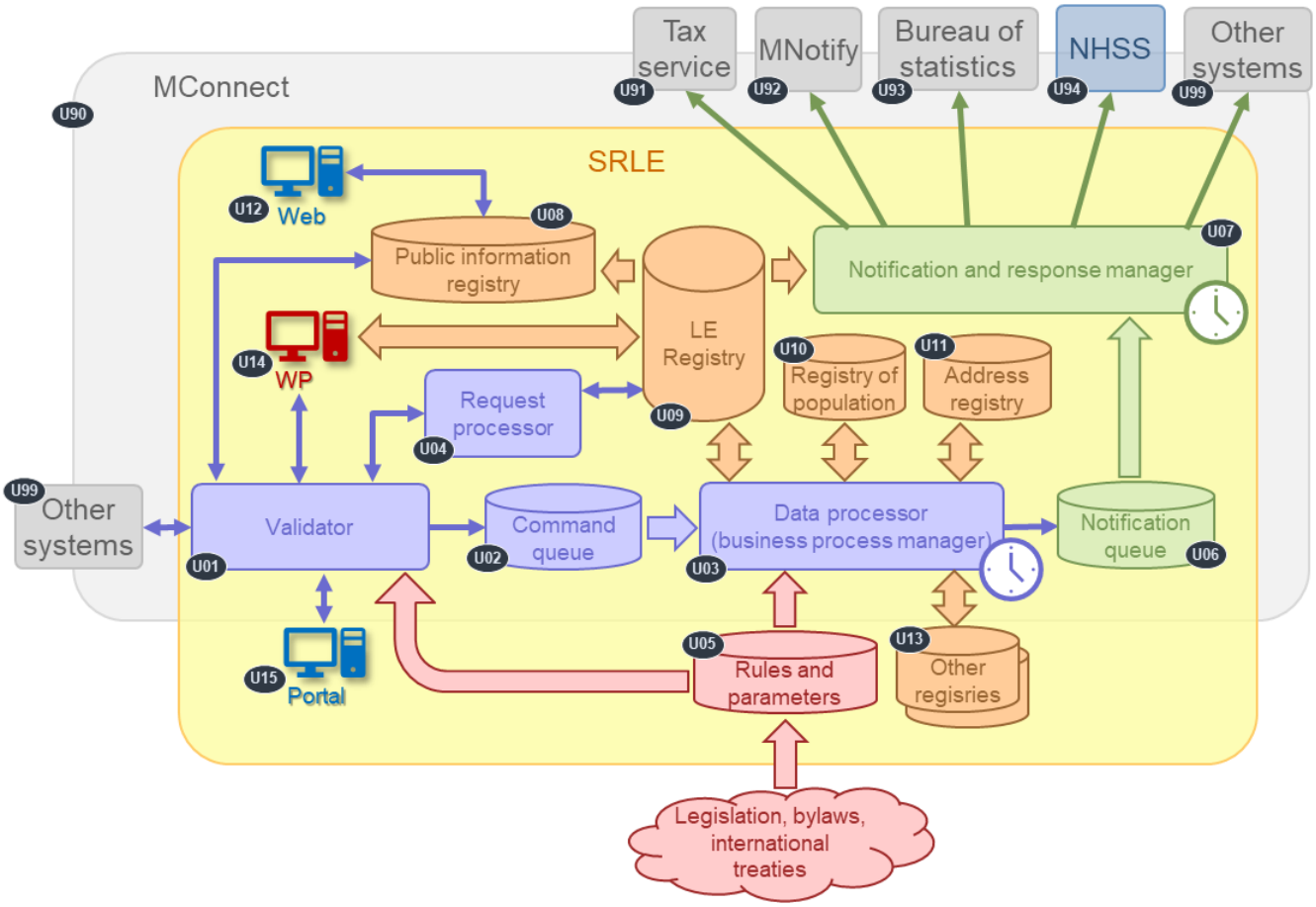
4.2.1. Architecture and technologies

TR101: Modular approach

IS solution shall be build using modular principles. Interaction of units shall allow unit replacement/upgrade without the need to redesign interacting units. SOA architecture is an advantage.

Units shall be reusable. Some units may be adopted from existing solutions already in use by the client.

Recommended high level IS architecture is presented in figure below.



Proposed architecture includes the following units:

Unit	Name	Description
U01	Validator	Validator is the main incoming message filter. Since the IS has to be integrated with various external and/or internal systems or modules developed at different time by different developers, there might come broken, unsupported and invalid messages (requests). Validator performs structural and logical message analysis and, at hight level, does one of the following: - pass synchronous command to request processor U04 and then return its response to sender; - put asynchronous command to command queue U02 and return acceptance code to sender; - return error code to sender on error.
U02	Command queue	Command queue is the place where asynchronous commands are awaiting processing by U03.
U03	Data processor (business process manager)	This is the main logical part of the system, acting in accordance with the business logics, rules and parameters kept at U05 and business data kept in various data sources, in particular: - process commands from the queue U02; - perform scheduled tasks; - perform activities should a U05 rule change; - perform activities should a registry data change; - manipulate data in LE registry U09; - put response data and notifications to the notification queue U06.
U04	Request processor	Performs synchronous request processing and immediate data return to validator U01. It is mainly designed for real-time information request processing, while all “heavy” operations are put in command queue U02 for further sequential processing.
U05	Rules and parameters	This is the main business configuration storage. It holds both processing rules (configurable by administrators) and varying rule parameters (uploaded upon legal requirement change or by SRLE discretion). Validator U01 may use some of the rules and/or parameters performing structural and logical message checks, thus providing faster response for the requesting party and reducing load of data processors U02 and U04.
U06	Notification queue	Serves as a main outgoing message queue. May keep notifications, data requests to other IS and responses for asynchronous requests received from other IS.

Unit	Name	Description
U07	Notification and response manager	This unit ensures sending of messages from notification queue U06 to other systems via MConnect U90.
U08	Public information registry	Mirrors part of the LE registry U09 data that has to be made publicly available. Improves overall system security and performance.
U09	LE registry	Main SRLE database, holds all information of all LE in the Republic of Moldova. It is recommended to divide it into operational (up to date) and historical (whole amendment history) parts, as well as dedicate separate storage for closed LE (those excluded from the registry).
U10	Registry of population	Population registry if managed by PSA and hold information of all RM citizens, inhabitants and some other categories of persons.
U11	Address registry	Registry of all RM postal addresses, including their types and details.
U12	Web	Web-portal to access publicly available information from the registry of legal entities. At SRLE discretion access of some information elements may require authentication, while others are available without registration.
U13	Other registries	A set of other registries used by SRLE to perform their activities, including reverence lists and dictionaries. Consultant has to propose and agree with the client which of the existing registries will be integrated with and which shall be replaced (incorporated into the new IS).
U14	WP	Unified web-based (“thin client”) automated workplace for SRLE staff members. Shall automatically adapt according to configured business processes defined in U05 and particular user rights.
U15	Portal	Web-portal for registered users that ensures provision of all online LE-related services, like establishing a new company, making amendments of legal entity details etc.
U90	MConnect	Government bus that integrates all RM government information systems (may provide services for non-government systems, too). All interactions with all external systems at U01 and U07 are performed using MConnect.
U91	Tax service	IS of the State Tax Service of the Republic of Moldova.
U92	MNotify	MNotify is a governmental electronic notification service of recipients, through various channels, regarding the events occurred upon delivery of public services or other events relevant to recipients.
U93	Bureau of statistics	IS of the National Bureau of Statistics of the Republic of Moldova.
U94	NHSS	IS of the National House of Social Security of the Republic of Moldova.

Unit	Name	Description
U99	Other systems	IS of other entities that may integrate with the SRLE IS using MConnect U90 bus.

Please refer to the "SRLE TO BE" report for more details regarding current version of business processes to be ensured by the IS. Consultant shall note that those processes may change at any time and provide process management engine unit U03 flexible enough to reflect those changes (see also "BR103: Process-based operation").

TR102: Structured history

All historic data for all past periods created in all past versions of IS should be kept in a form that allows its proper interpretation and representation regardless of current version of the IS.

TR103: Transformable data formats

All information in the IS shall be stored in a form allowing automated export and transformation. Preferable, the information should be in the text format, in case the storing of files (like images, scan copies etc.) be inevitable, they shall be stored only in those open standard file formats that allow unattended automated transformation to other formats without the loss of information stored therein.

IS may accept upload of files in other formats and must allow for their transformation into one of the agreed open standard file formats before saving.

TR104: Open standards

The IS architecture shall be based on relevant open standards, proprietary standards shall not be used.

TR105: Scalability, high availability and disaster recovery

The IS architecture shall support high availability, scalability and ability to work simultaneously on multiple sites.

The IS is intended to operate in MCloud environment and has to conform with MCloud backup and disaster recovery procedures.

TR106: Communication protocols

All external communication interfaces are based on HTTPS protocol both for system-to-system and human-to-system purposes. Appropriate data protection, security and encryption shall be ensured (see section "Security and maintenance").

TR107: Logs

IS shall log its activities and events in a structured form, enabling log data created in any previous IS version proper interpretation and representation in any other later version of the system. Logged fields from all IS components shall have the same format and meaning.

Event log records shall include at least the following information:

- the type of the event
- timestamp when the event took place
- event level
- system component that produced the event (event source)
- user and/or interface and/or IP that triggered the event
- information object identifier that has or may be affected
- textual details about the event

The system shall differentiate events and actions it logs into at least the following levels:

- Critical
- Error
- Warning
- Info
- Debug

Critical and Error level events shall be logged only for non-recoverable error that require human intervention. Besides logging, IS shall have administrator notification mechanism for Critical and Error level events.

System logging has to be configurable and IS shall be able to send log records to one or several log storage locations, including local and remote databases, file systems, web-services including MLog service etc.

TR108: Hardware

The IS implementation project does not include delivery of any hardware components. Upon completion IS will be deployed at the governmental cloud environment (MCloud).

TR109: System operation modes

The IS shall support at least operational and maintenance modes. While operational (normal) mode enables all system functions, maintenance (restricted) mode shall prevent non-administrative users from logging in to the system, as well as disable all functions except administrative and related to IS maintenance or upgrade.

IS shall ensure graceful change of operation modes: while switching to maintenance mode IS shall stop accepting new requests, complete all started operations that cannot be queued for further execution, then notify and log off all non-administrative users, and then change its mode.

IS updates that don’t require downtime shall be performed according to TR413.

TR110: Integration

IS shall be integrated with other systems, both data providers and data consumers, using governmental MConnect gateway.

Internal PSA systems, like registry of population and registry of addresses, for performance reasons may be integrated directly avoiding MConnect, but in this case IS shall “locally” use the same (MConnect) integration protocol to allow further switch to MConnect when required.

The IS shall perform request processing the same way regardless of the interface being used: requests made via consumer portal, SRLE user workplace and received using MConnect shall be processed with the same components and according to the same logic, ensuring data control and verification functionality.

4.2.2. Performance

TR201: Standard load

The IS performance shall be ensured at standard load, that includes:

- 100 concurrent human users using WP;
- 200 intersystem information requests per minute and 20 intersystem data manipulation requests per minute.

TR202: Volumes of data

The IS performance shall be ensured for 250 000 legal entities in database of active LE, with the lifetime history for each LE.

TR203: Data duplication

IS has to be designed to avoid data duplication except for performance and security reasons. If duplication is considered, IS shall avoid availability of concurrent versions of the same data, retrieved from different sources.

TR204: Interoperability modes

Ensuring interoperability, IS shall support both synchronous and asynchronous request processing modes. IS shall give a favor to asynchronous (or reactive where appropriate) mode for data processing and synchronous mode for provision of information.

Where applicable user workplace shall support a sort of asynchronous mode for “heavy” operations as well, for example in a form of scenarios like “create me this report and notify when ready”, or “create this certificate and send to user by e-mail”.

TR205: User interface performance

The following interface performance criteria, covering both the registrars workplaces and of the customer portal, shall be met:

- 95% of all information requests shall be complete within 3 seconds;
- 95% of all data manipulation requests shall be complete within 5 seconds;
- 95% of all document (output form) preparation requests shall be complete within 5 seconds;
- 95% of all workplace pages shall load in 1 second if accessed using internal PSA SRLE local area network.

The IS shall display progress indicator for all operations lasting 3 seconds or more, providing estimated remaining waiting time.

IS shall let user to interrupt any information retrieval operation and any document preparation operation that lasts more than 3 seconds.

TR206: Intersystem interface performance

The following interface performance criteria shall be met:

- 95% of all synchronous requests shall be complete within 3 seconds;
- 95% of all asynchronous change requests shall be responded within 1 second and completed (processed) if no user interaction is required within 10 seconds;
- 95% of all asynchronous data preparation requests shall be responded within 1 second and completed (processed) within 10 seconds.

4.2.3. User interface

TR301: UI browser requirements

IS workplace is a thin client: any popular web browser shall be used for accessing the system if it meets the following requirements:

- the brand of this browser is Chrome, Opera, Firefox, Edge, Safari, IE or other if its market share in Europe is at least 5%;
- the version of the browser is still supported by its developer, or the market share in Europe for this version is at least 10% among all versions of that brand.

Specific properties of operating systems shall not be used, so that any browser meeting criteria above must ensure full IS workplace functionality regardless of operating system type it works on.

TR302: Wizard-based approach

The IS where applicable should ensure wizard-based approach, that step by step leads user through operation scenario.

95% of all routine LE management operations in the system shall be completed in no more than 10 steps (mouse clicks).

TR303: Input data validation

All input data shall be validated using against formal and logical rules both on client and server side. Appropriate messages should guide user upon mistakes.

IS should also prevent entry of any control or invisible characters, and remove them from the data elements (for example, when user use copies formatted text from external source). Nevertheless, all displayable UNICODE characters shall be preserved and must be properly displayed and/or put in output forms.

TR304: Accessibility

User interface shall conform at least to Level A of Web Content Accessibility Guidelines 2.0[11].

TR305: Responsive/Adaptive design

The system user interface shall automatically adapt to various display proportions and resolutions. Minimal display width that shall be displayed without horizontal scrolling is 1024px.

TR306: Help and hints

User Interface elements shall support hints and help elements. Texts of those hints and help elements should be adjustable by administrators.

4.2.4. Security and maintenance

TS401: Industry recognised algorithms

The IS must engage only industry standard mathematically proven algorithms and/or methods while processing, storing and communicating information.

TS402: Legislative compliance

The system shall be secure by design and comply with the relevant requirements specified in GD 201 from 28.03.2017[12].

TS403: Least privilege principle

The IS modules and components shall rely on the least privilege principle and run under such a limited privilege account.

TS404: Secure communication channels

All IS communication with external systems or users takes place over encrypted communication channels.

User WP (browser) shall always use encrypted protocol HTTPS (RFC 2818) and refuse connection should it is not available.

TS405: Minimum web-application security

As a minimum the IS shall be secure against OWASP Top ten listed vulnerabilities[13].

TS406: User authentication

The IS should use MPass as a main user authentication mechanism for system administrators and as the only one available to other users.

IS may provide concurrent industry recognised authentication mechanisms for administrative and technical purposes (intersystem interfaces etc.).

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[11] https://www.w3.org/TR/WCAG20/
[12] http://lex.justice.md/md/369772/
[13] https://www.owasp.org/index.php/Category:OWASP_Top_Ten_Project

TS407: User sessions

IS shall enable human user session management. User session should be terminated after certain configurable period of inactivity. Upon termination, user has to authenticate again and upon successful authentication should see the same screen (UI location) he saw at the moment of latest activity.

Default session expiration timeout is 30 minutes.

TS408: Unauthorised access attempts

The IS shall detect unauthorised access attempts, log them, and send configurable notifications to administrator based on failure type. The IS shall prevent unauthorised access by temporary disabling user account and/or IP address after certain unsuccessful login attempts from the same name and/or IP address (number of attempts and timeout should be configurable).

The IS should not disclose the reason of login rejection, but should either display message that this attempt is recorded and there are legal consequences for unauthorised access (if direct login is used), or return generalised reject reason code (if used third party authentication, like MPass).

TS409: Data integrity

IS data integrity shall be ensured. The IS shall engage mechanisms that prevent direct data manipulation (alteration, deletion or insertion), for example by running SQL requests. All histories shall be protected using industry recognised mechanisms, for example in a blockchain.

Should prevention be not possible in particular situation, the IS shall make it impossible to hide the fact of manipulation and provide reliable notification mechanism for administrators.

TR410: Automated routine maintenance tasks

All routine system maintenance and housekeeping tasks, except those that require human decisions not transferrable to logical rules, shall be automated and inattentively run in the background at the low system load time.

TR411: Monitoring and performance indicators

The IS shall expose performance and health-check metrics for third party monitoring tools (like Zabbix or Prometheus).

TR412: Start-up and shutdown

IS shall ensure graceful start-up and shutdown of its components.

When starting up, the system shall run internal integrity and security checks. System starts in maintenance mode should any significant problem is detected.

When shutting down any system component shall not affect any work in progress; first it shall stop accepting new requests, complete all started operations that cannot be queued for further execution, then notify and log off all active users, and then actually shut down.

TR413: Upgrades

System upgrades shall be automated, including database upgrade scripts or code and data transformation (migration) scripts.

Whenever possible, high-availability application architecture shall be applied ensuring seamless software upgrade without interruption of data processing and user activities. When ongoing update is impossible, the system update procedure shall only start when IS is in its maintenance mode. System can be switched back to operational mode only when upgrade procedure completes successfully or rolled back.

Consultant shall provide instructions for setting up and rolling back any system update. Updates that are irreversible (there are no feasible scripts and/or code to perform complete update roll-back and return to the previous version) shall require complete IS and its data backup before execution.

TR414: Health-check API

The system shall expose readiness and health-check API via a HTTP GET requests. The health-check shall check the health of as many system components as possible. In case of health check error, a human-readable error message shall be returned.

TR415: IS installation

The IS and all its components has to be provided in a single package for installation by the client on the fresh and clear environment (see “BR304: Source code”).

A script to compile source codes and build production (executable) version of the IS must be provided. This script must include built-in package integrity and component versioning.

TR416: Personal data access monitoring

IS shall keep personal data access audit trails for all manual and intersystem (API) access channels. IS shall provide access audit reports (customisable) to authorised IS users with respective privileges.

⁂