TERMS OF REFERENCE

Load and stress testing of the SAISE E-Day Application and CEC official website

Project title: Enhancing democracy in Moldova through inclusive and transparent elections

Implementation period: August – November 2018

A. <u>Background</u>

"Enhancing democracy in Moldova through inclusive and transparent elections" (EDMITE Project) is a project that sets the overall goal to achieve an enhanced transparency and inclusiveness of the electoral process in Moldova through a modernized IT system, improved legislation and intensified public participation, addressing the root causes of the current challenges hampering the further development of the democracy and the advancement of the electoral process in the Republic of Moldova.

During 2012-2017, UNDP offered support to the Central Electoral Commission (CEC) in the areas of gender equality and human rights, institutional capacity development, further development and use of the modern and innovative State Automated Information System 'Elections" (SAISE), strategic development of the Center for Continuous Electoral Training (CICDE), political party finance legislation implementation and a transparent electoral reform processes. Moreover, substantial steps were taken in addressing challenges to the electoral process related to the data quality and data exchange possibilities among key registers owned by different government institutions. Based on the solid results achieved, UNDP continues to support the CEC and CICDE to ensure the finality and sustainability of the previous UNDP interventions through EDMITE project.

The EDMITE Project aims to contribute to: (1) achieving a more accurate State Register of Voters (SRV), improving the quality and accessibility data by re-engineering the Civil Status Service systems, fully developing the State Address Register and facilitating data exchange and interoperability between different central public institutions via governmental platform for data exchange MConnect; (2) enhancing the inclusiveness of the electoral process through developing a remote voting tool and adjusting the State Automated Information System "Elections" to keep up with the technical and political developments; (3) legal reform in the area of elections to erase ambiguities and respond to the technical developments; and (4) enhancing political participation of citizens by setting up and implementing the voter information and civic education programs.

The State Automated Information System "Elections" (SAISE) is an informational solution developed to automate the processes of preparing, carrying out, and totalizing elections' and referendums' results.

Being conceived from the very start as an information system meant to cover the totality of activity areas of the Central Election Commission of the Republic of Moldova, SAISE was widely operated mainly for its function of registering electronically the voters, sending the reports related to the minutes of the precinct electoral bureaus within the organized elections and presenting the preliminary results in real-time by publishing them on the CEC official webpage ([www.cec.md)](www.cec.md).

B. <u>Scope of services and expected outputs</u>

The EDMITE Project is looking to contract a specialized Company to perform two (2) load and stress tests of the SAISE E-Day Application and CEC official website, as follows:

✓ **Test no. 1 / Load and stress test of SAISE E-Day Application:**

This test is aimed to reproduce the E-Day Application behavior during the Election Day. Nevertheless, if the problems identified after Test no. 1 will involve any changes (including at the architecture level), the test shall be adjusted and repeated in line with the operated modifications/corrections. In total – a minimum of two (2) and maximum of four (4) tests stages are expected to be performed by the Company.

✓ **Test no. 2 / Load and stress test of the CEC's web page (www.cec.md), particularly the reporting page(s):**

This second test is aimed to reproduce the workload of the official web page of the CEC, particularly the reporting page(s), during Election Day and the following day. If the first and second stages of Test no. 2 will identify any problem, it will be necessary to adjust and repeat the test accordingly. In total – a minimum of two (2) and maximum of four (4) tests stages are expected.

Note: These tests shall also identify the best method of tuning the IIS and balancing this type of connections.

Specifically, the Company will have the following responsibilities:
- Create test scenarios for load and stress testing;
- Prepare test environment/ set up load generation and monitoring tools;
- Execute tests/ monitor execution process;
- Provide execution report and suggestions;
- Act on the CEC's requests in 24 hours timeframe (general) and in 2 hours timeframe (for high priority issues).

C. Specific Requirements for Testing

1. Platform for testing

The tests shall be carried out on the platform provided by the Central Electoral Commission within the premises of the CEC. A local network of testing environment will be created for testing and it will be connected to the server infrastructure accordingly. The following will be used at the level of technical infrastructure:

Test no. 1:
- 4 to 6 Webservers (ASPX) behind the load balancer;
- 2 to 4 MS SQL servers;
- Testing environment for Test Load generation will be provided by CEC as follows:
    - 2 to 4 Virtual Servers with 6 CPUs and 16 GB of RAM with OS Windows Server 2012 Std. preinstalled;
    - Network flow: internal traffic.

Test no. 2:
- 1 to 3 IIS Web Servers behind the load balancer;
- 2 to 4 MS SQL Servers
- Type of connections flow: combined (external Internet traffic behind the balancer), WebSocket connections based on signalR hubs;
- Testing environment for Test Load generation will be provided by CEC as follows:
    - 2 to 4 Virtual Servers with 6 CPUs and 16 GB of RAM (or more) with OS Windows Server 2012 Std. preinstalled;
    - Network flow: external – internet traffic;

2. Software recommended for testing

- Load generation tool for Test no. 1: Apache Jmeter;
- Load generation tool for Test no. 2: Apache Jmeter and/ or any WebSocket (for signalR hub)

Note: these tools are best suitable and available in opensource format.

- Monitoring tools: Standard Windows tools or other related tools (e.g. PERFMON, Zabbix, etc.)

Note: these tools shall be accordingly configured by the Company, in collaboration with the CEC, on the existing monitoring platforms.

3. Testing mechanism and used scenarios

Test no. 1:

The following test types/ test scenarios have been identified:
- Main Load Test - to be run for 14 hours with a varied load during the day;

Note: it is required to maintain a high number of open sessions (4,400) with a various number of requests generated (average of 300 requests per second).

- Stress Test - to be run for 2 hours (average 500 requests per second);
- 2-3 Tests for E-Day Report sending - each lasting 15-20 minutes for 2,200 user sessions;
- 2-3 Tests for Logins (peak/ normal test) - each lasting 15-20 minutes;
- 2-3 Tests for Logouts (peak/ normal test) - each lasting 15-20 minutes.

Test cases to be used for Test no. 1:
- Navigate to data entry page, enter full IDNP and start search. In case of successful search, press a button "A" (button name to be defined);
- Navigate to data entry page, enter full IDNP and start search. In case of unsuccessful search, press a button "B" (button name to be defined);

- Navigate to data entry page, enter incomplete IDNP and start search. Select from the available options and press button "A";
- Navigate to data entry page, enter invalid (nonexistent) IDNP and start search. In case of unsuccessful search, press a button "B" (button name to be defined);
- Navigate to reporting page and send a report.

The workload model will assume:
- Average load on citizens search – 500 requests per second (or 500 requests per second for Stress test);
- At the beginning of the day 4,400 clients will be logging in within 30 minutes timeframe;
- At the end of the day 2,200 clients will be sending reports (within 15 minutes);
- At the end of the day 2,200 clients will be logging off in parallel with another 2,200 sending reports (within 15 minutes);
- During the day sporadic logins/logouts will be generated to emulate lunch break.

Test no. 2:

The following test types/ test cases have been identified:
- Main Load Test - to be run for 16 hours with the peak load of 80,000 users having total of 80,000 ±18,000 established connections during these 16 hours;

Note: The step-up number of the connected users will be established before and/or during the preparation of the tests scripts.

- Stress Test - to be run for 2 hours with an average of 11-14 connected users per second (established connections).

Test cases to be used for Test no. 2:

Case 1:
- Navigate to data entry page;
- Select type "A" of the report for viewing;
- Press Button "A" (button name to be defined) – connection is established;
- Each user within 6-8 minutes, randomly press refresh button;
- Press again Button "A" (button name to be defined).

Case 2:
- Navigate to data entry page;
- Select type "B" of the report for viewing;
- Press Button "A" (button name to be defined) – connection is established;
- Within 2-3 minutes, randomly press refresh button;
- Press again Button "A" (button name to be defined).

D. Key deliverables and tentative timetable

No	Key deliverables	Tentative deadline
1.	- Load and stress Test no. 1 performed; - Report on test results developed and accepted by the CEC and EDMITE Project. The Report shall include, but not limited to: ⇨ *Result synthesis,* ⇨ *List of identified deficiencies,* ⇨ *Set recommendations for amending the E-Day Application after the testing.*	by 18.10.2018*
2.	- Load and stress Test No.2 performed; - Report on test results developed and accepted by the CEC and EDMITE Project. The Report shall include, but not limited to: ⇨ *Result synthesis,* ⇨ *List of identified deficiencies,* ⇨ *Recommendations for amending the web page and/or its infrastructure.*	by 18.10.2018*
3.	Testing scripts for all stages, as well as Virtual Machines created for the testing environment (with technical description on steps to be undertaken for future testing purposes) developed and approved by the CEC and EDMITE Project.	by 15.11.2018
4.	Final Activity Report – elaborated and approved by the CEC and UNDP Project.	by 30.11.2018

The exact delivery period of the 1st and 2nd reports (incl. expressed recommendations) will be specified by the end of the testing activities, and will not be set later than 3 weeks before the Election Day.

E. Confidentiality statement

All data and information offered by the EDMITE Project and CEC for the purpose of this assignment must be treated with confidentiality and must be used only for the purpose of activities stipulated by these Terms of Reference. All intellectual property rights that arise from the implementation of these Terms of Reference are attributed to UNDP. The content of materials obtained and used during the period of the contractual assignment cannot be disclosed to any third party without the written consent of the EDMITE Project.

F. Required qualifications of the Company

Interested bidders should meet the following institutional requirements:
- Be a legally registered entity or a consortium of firms;
- Note: if the applicant is a foreign entity, it should have local legal subsidiary or have at least one core auditor that is resident of the Republic of Moldova.
- At least five (5) years of proven technical knowledge and experience in designing and providing similar services;
- Proven experience in the implementation of at least 3 Stress Testing processes;
- Proven documentation, diplomas and/or basic standard procedures (issued by established certified organizations) for System Security, confirming certification for at least the Security Management Systems ISO/IEC 27001 standard;
- Proposed Project Team with the required academic and professional qualifications;
- Previous experience in the field of electoral systems will be considered a strong advantage.

The Project Team proposed by the bidder should meet the following requirements:
- Bachelor degree or higher in ICT.
- Consistent knowledge of testing mechanisms required in the Terms of Reference;
- Proven experience in the successful implementation of at least 3 similar projects, including in testing signalR (WebSocket) applications.
- Fluency in Romanian language (core staff). For managerial and support staff, the knowledge of English language will be considered an advantage.

G. Institutional arrangements

The Company will fulfill its contractual assignments under the guidance and direct coordination of the Informational Technology and Electoral List Management Department of the Central Electoral Commission, and under the supervision of the EDMITE Senior Project Officer.

The Central Electoral Commission will provide the Company with access to information and materials necessary for the fulfillment of the envisaged tasks (including requirements, user stories and access to analysts for implementation questions; and system architecture/ guidelines or preferences in implementation patterns). The EDMITE Project will provide administrative and logistic support, including for organizing the necessary meetings.

Deliverables (including reports and testing scripts of the testing stages) will be approved by the designated CEC representative and EDMITE Project. All documentation related to deliverables shall be provided by the Company in Romanian language.

Payments will be done in multiple tranches, upon presenting and approving the deliverables, as well as the activity reports. Unit prices shall be **exclusive of VAT**.

H. Timeframe

Contractual assignments shall be initiated not later than the **20th August 2018** and shall be fully completed not later that the **30th of November 2018**.