Annex 1

TERMS OF REFERENCE

Load and stress testing of the SAISE E-Day Application and CEC official website for the early Parliamentary Elections

Project title: Enhancing democracy in Moldova through inclusive and transparent elections (phase II)

Implementation period: May – July 2020

A. Background

Electoral support and capacity development are part of UNDP's democratic governance assistance worldwide, through which UNDP helps nations build democratic frameworks to improve representation, accountability, and transparency for the benefit of citizens.

UNDP has a long-standing partnership with the Central Electoral Commission (CEC) aiming at advancing the democratic electoral processes in Moldova by consolidating the transparency and efficiency of elections' management, modernization of electoral IT solutions and enhancing the inclusiveness and participation of voters. This partnership, which spans over 10 years, resulted in the establishment of a strong professional institution, development of a modern State Automated Information System "Elections" (SAISE), the enhancement of the State Register of Voters' accuracy and the design and implementation of effective long-term civic and voter education instruments.

Since 2017, the Project "Enhancing democracy in Moldova through inclusive and transparent elections" supports the Central Electoral Commission to enhance the transparency and inclusiveness of the electoral process in Moldova by ensuring a more independent and credible electoral administration and better informed and pro-active citizens. With the continuous UNDP assistance, the CEC demonstrated a high capacity of carrying out transparent, safe and "well-administered" elections (as attested by OSCE/ODIHR Observation Mission) throughout challenging electoral cycles, particularly the 2020 Presidential Elections, organized in the context of the COVID-19 pandemic.

Building on the sustainable results achieved during its first phase of implementation (2017 – 2020), the objectives of the current Project phase (2020 – 2023) are:

- Enhance the inclusiveness of the electoral process by increasing the functional and technical capacities of the State Automated Information System "Elections" (SAISE);
- Enhance the political participation of citizens by setting up and implementing the voters' information and civic education programs;
- Improve the legal and regulatory framework to respond to the EOM recommendations; and
- Strengthen the capacity for effective and coherent oversight and monitoring on political party financing.

Since 2014, UNDP's support for the CEC informational ecosystem was aimed at enhancing IT structures and processes, particularly of the Commission's core informational platform for elections management - SAISE.

In this context, the Project shall offer further specialized support to the CEC for enhancing IT structures and processes, including of the Commission's core informational platform for elections management - SAISE.

Developed in 2014, SAISE is a complex system with multiple modules responsible for most electoral processes, ranging from the pre-registration of voters, operation of the polling stations and aggregation of election results. Since then, during each election, the CEC and UNDP have come up with new useful tools for voters and electoral officials, but also for a smooth running of the electoral process.

B. Scope of services and expected outputs

The Project is looking to contract a specialized Company to perform three (3) load and stress tests of the SAISE E-Day Application, CEC official website and E-Day online reporting website (infographs), as follows:

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

This test is aimed to reproduce the E-Day Application behaviour during the Election Day. In case the problems are identified after Test no. 1 that 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 CEC web page, particularly the reporting page(s), during the Election Day and the following day. If the first and second stages of Test no. 2 will identify any problems, 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.

- ✓ **Test no. 3 / Load and stress test of E-Day online reporting web site (infographs):**

This test is aimed to reproduce the E-Day online reporting website (infographs) during the Election Day. In case if problems are identified after Test no. 3 that 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. This test will be held/launched in parallel with Test no.1.

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. Design of the architecture will be provided upon request.

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 6 Virtual Servers with 6 CPUs and 16 GB of RAM with OS Windows Server 2012 Std. preinstalled
- Network flow: internal traffic

Test no. 2:

- 2 NGINX Servers behind the load balancer
- 1x Cluster of DB Servers

- Type of connections flow: combined (external Internet traffic behind the balancer)

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

Test no. 3:

- 2 to 4 IIS Web Servers behind the load balancer
- 2 to 4 MS SQL Servers
- Type of connections flow: combined (external internet traffic behind the balancer)

Testing environment for Test Load generation will be provided by CEC as follows:

- 4 to 8 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, 2 and 3: Apache Jmeter

Note: these tools are best suitable and available in opensource format, based on CEC's prior experience and knowledge of the CEC IT personnel.

- 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:

Case 1 "search of IDPN and vote":

- Navigate to data entry page, enter full IDPN and start search. In case of successful search, press a button "A" (button name to be defined)
- Navigate to data entry page, enter full IDPN and start search. In case of unsuccessful search, press a button "B" (button name to be defined)
- Navigate to data entry page, enter incomplete IDPN and start search. Select from the available options and press button "A"
- Navigate to data entry page, enter invalid (non-existent) IDPN 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 for Case 1 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

Case 2 "send the report":

- Navigate to Data entry page
- Select type of elections
- Fulfil tabs randomly (data input model will be provided)
- Click button "A" for check the correction of data
- Click button "B" for sending the data

The workload model for Case 2 will assume:

- Average load on input the data - 500 requests per second (or 500 requests per second for stress test)
- 2,200 authorized users will be sending the reports (within 8 to 15 minutes)
- During the test, sporadic logins/logouts will be generated to emulate log out/log in requests

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 test's 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 home page
- Click menu "A" of the web page
- Click 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)

Test no. 3:

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 test's 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. 3:

Case 1:

- Navigate to data entry page
- Select type "A" (click on button) of the page 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 and 3 performed; ▪ Brief Report of the tests' results shall include, but not limited to: • Result synthesis, • List of identified deficiencies, • Recommendations for amending the applications and/or its infrastructure of the E-Day Application and E-Day online reporting web site (infographs).	by 21 June 2021
2.	▪ Load and Stress Test No. 2 performed; ▪ Brief Report of the tests' results shall include, but not limited to: • Result synthesis, • List of identified deficiencies, • Recommendations for amending the CEC's web page and/or its infrastructure.	by 21 June 2021
3.	▪ Final Activity Report – developed and approved by the CEC and Project; ▪ One Summary Report on test results of Tests no.1, 2 and 3 developed and submitted for approval to the CEC and Project. The Report shall include, but not limited to: • Result synthesis, • List of identified deficiencies, • Recommendations for amending the applications and/or its infrastructure of: E-Day application (test no.1), CEC's web page (test no.2). E-Day On-Line reporting web site (Info Graphs) (test no.3).	by 28 June 2021
4.	▪ 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 Project.	by 28 June 2021

E. Confidentiality statement

All data and information offered by the UNDP 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 UNDP 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's 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
- 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 shall fulfil 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 UNDP Senior Project Officer.

The Central Electoral Commission will provide the Company with access to information and materials necessary for the fulfilment 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 report and testing scripts of the testing stages) will be approved by the designated CEC representative and UNDP 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 report. Unit prices shall be **exclusive of VAT**.

H. Timeframe

Contractual assignments shall be initiated not later than the 20th of May 2021 and shall be fully completed not later that the 9th of July 2021.