

## TECHNICAL REQUIREMENTS

regarding to acquisition of a specialized Software for operating spectrum monitoring stations with the possibility of storing data on a dedicated server (3 licenses)

	Guaranteed technical specifications	Deviations / Remarks/ (to be specified)
1. GENERAL NOTES		
The Technical Requirements is an integral part of the Standard Documentation and contains whole set of requirements which is the basis for Technical Proposal preparation by each bidder.  The imposed requirements will be considered as a minimum and mandatory. In this order, any submitted tender offer, which deviates from these Technical Requirements, will be taken into consideration only if the Technical Proposal implies the ensuring a qualitative level superior to the minimum requirements of these Technical Requirements. The offer containing technical characteristics of products inferior to those specified in the Technical Requirements will be considered inconsistent and will be rejected.		
2. OBJECT OF THE ACQUISITION		











The object of the procurement procedure is the supply (develop) and installation at three spectrum monitoring stations within the National Radio Monitoring System (hereafter - NRMS) of a specialized Software for operating the spectrum monitoring stations with the possibility of data storage on a dedicated server (hereafter – monitoring software).  The given procedure provides the purchase in the first tranche, three licenses from the total of 23 licenses of the monitoring software, expected to be purchased and implemented during the next 5 years.		
3. PURPOSE OF THE ACQUISITION		
The purpose of the acquisition of the monitoring software is to modernize the NRMS by replacing the existing ARGUS monitoring software application, so that in addition to the existing functionalities of the NRMS, additionally to be add:  - the possibility of integration the monitoring equipment from different manufacturers within the NRMS;  - aggregation of all measured results, regardless of radio frequency band, duration, time and place of monitoring, on a dedicated server;  - expanding the functionality and possibilities of NRMS, such as: automatic recognition of the received signal type, "machine learning" techniques, measurement/monitoring tasks calendar with automatic feedback of measurement results, etc.		
4. The Amount		
4. The Amount: - 3 full licenses of monitoring software.	We will be able to deliver the asked 3 licences and 1 life-long license for the central station.	









5. MINIMUM REQUIREMENTS		
<ul> <li>5.1 General Requirements</li> <li>Monitoring software must be compatible and work flawlessly with all existing of NRMS hardware. The detailed list of equipment will be presented to potential bidders upon request.</li> <li>The monitoring software must be compatible or, if necessary, allow receiving the necessary updates (submodules, options) to be compatible with all the monitoring equipment of the main manufacturers in the field (Rohde&amp;Schwarz, Narda, SAF Tehnika, etc.).</li> </ul>	We have integrated and developed drivers for the following devices: ● NARDA: SignalShark 3310, 3320, 3330, ● Rohde & Schwarz: DDF-550, DDF-255, EB-500, EM-550, EM-100, ESMB, GB-127, GB-127M, RD127, ZS-127, ● IZT: R3000 series, ● CRFS: RFeye Node 20-6, 50-8, 100-8, 100-18, ● CommsAudit: Spectra SRDF, CA4909-1, ● STMM: KM44 and KM88 switch, RK3 rotator, ● Compu-Consult: TELE-OPERATOR UTS v.16 DVB-T/T2 Dual LAN monitor, ● Boreas: Weather station.	Minimal PC requirements: CPU: minimum 8 core, 16 thread, minimum 3 GHz, RAM: 64 GB, SSD: NVMe, PCI-E Gen 3, 1 TB, Storage (for measurement data): minimum 8 TB (RAID 1), OS: Ubuntu 20.04 x64 or Windows 10 Pro 21H2 x64. The following drivers need to be integrated: UMS100, Magnetic Compass (VDO Logic) (COM), GPS receiver (COM), EB-200 (LAN), DF Unit - EBD195 (COM). For the Magnetic Compass (VDO Logic) (COM) and DF Unit - EBD195 (COM), we plan to use LAN-RS232 converter (SVALE SV-SNS01). We guarantee to develop integrations by 30.04. 2023.
• The monitoring software itself must combine a powerful monitoring tool	Guaranteed, Simon International already	
with easy and efficient operation.	meets this requirement, and it can be	
	delivered and install during 30 days.	











• The user interface of the monitoring software, should have an intuitive and easy-to-use graphical interface, to be user friendly.  "The monitoring software must perform the measurements and analysis of	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days. We decided that the system's user interface must run in all major Web browsers (Google Chrome, Mozilla Firefox, Microsoft Edge) and should not require other installation on the clientside. To develop the user interface, we chose a commercially supported, professionally maintained JavaScript framework (Sencha Ext JS) that allows the developers to build a browser-independent Web application. The Sencha Ext JS framework accelerates web application development with an enterprise-ready framework, an extensive, pre-built UI component library, and tools built to work together seamlessly.  Guaranteed, Simon International already	we only support if the measurement
	framework, an	
"The monitoring software must perform the measurements and analysis of the results in accordance with the ITU Spectrum monitoring handbook and the ITU-R recommendations:- SM.443-5 (Bandwidth measurement); - SM.1268-5 (Measurement of frequency deviation); - SM.377-4 (Frequency measurement); - SM.1880-2 (Measurement of spectrum occupancy). "	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	we only support if the measurement equipments supports this also











The monitoring software will include security elements that ensure access for authorized personnel and allow the identification of the person who performed the measurements.	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.
<ul> <li>The monitoring software must be compatible with Windows 10 and 11 (64-bit) operating systems.</li> <li>The monitoring software must support the IPv6 protocol.</li> </ul>	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.  Guaranteed, Simon International already
• Until the complete replacement of the existing software is completed, the monitoring software must allow operation in hybrid mode together with the existing ARGUS application, i.e. be able to import measurement results from ARGUS.	meets this requirement, and it can be delivered and install during 30 days.  Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.
• The monitoring software must be fully licensed without limitations in operation, such as limited duration for one of the options or for the entire application. No shareware, adware or similar applications are allowed.	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days. There is no limitation.
• The monitoring software interface must be in at least three languages: Romanian, English, Russian. If the interface does not have the possibility of being displayed in Romanian and Russian, the developer will assume the obligation to translate the interface into Romanian and Russian within 6 months at most.	Current interface is available in Hungarian and in English. we guarantee the interface in Romanian and Russian within six months









The monitoring software must allow lossless recording of all	Current interface is available in Hungarian
measurement results in a database on the local computer on which the	and in English. Simon International can:
monitoring software is running, as well as being automatically or	Connect automatically to the Central
manually transmitted to a dedicated server.	controller and reconnect in case of an error,
	and send the
	current measuring station configuration and
	status information,
	- Support the execution of direct and
	automated (scheduled) measurements, even if
	the central
	Station is not available (is offline),
	- Store and process the measurement results
	even if the central Station is not available (is
	offline),
	- Provide offline map data and services (based
	on locally stored OpenStreetMap data).
	measuring stations.
• The server will be used to save, store and analyze the measurement	Guaranteed, Simon International already
results and maintain the information about the approved frequencies.	meets this requirement, and it can be
	delivered and install during 30 days.











• The server must have a web interface (can be accessed through a web	Guaranteed, Simon International already
browser) without the need to install any additional applications on the	meets this requirement, and it can be
client computers.	delivered and install during 30 days. the
•	system's user interface must run in all major
	Web browsers (Google Chrome, Mozilla
	Firefox, Microsoft Edge) and should not
	require other installation on the client-side. To
	developthe user interface, we chose a
	commercially supported, professionally
	maintained JavaScript framework(Sencha Ext
	JS) that allows the developers to build a
	browser-independent Web application. The
	SenchaExt JS framework accelerates web
	application development with an enterprise-
	ready framework, anextensive, pre-built UI
	component library, and tools built to work
	together seamlessly.
The server interface must be in at least three languages: Romanian,	Current interface is available in Hungarian
English, Russian. If the interface does not have the possibility of being	and in English. we guarantee the interface in
displayed in Romanian and Russian, the developer will assume the	Romanian and Russian within six months
obligation to translate the interface into Romanian and Russian within 6	
months at most.	
• The server must allow the use of digital maps, which support TMS	Guaranteed, Simon International already
(Tiled Map Service) and WMS (Web Map Service) protocols.	meets this requirement, and it can be
	delivered and install during 30 days.
• The server will include security elements to ensure access only to	Guaranteed, Simon International already
authorized personnel, with the possibility of setting different levels of	meets this requirement, and it can be
privileges (reading, writing, modifying, etc.) for each individual user	delivered and install during 30 days.











• The server must have the connection interface with ATDI spectrum management applications (Manager, HTZ Communications, etc.) to access radio station information from the databases of these applications, import it and display at least the following fields, with the possibility of introducing other additional fields:  - Station owner;  - Radio communications service (e.g. broadcasting service, land mobile, landline, etc.);  - Transmitting frequency;  - Receiving frequency;  - Effective Radiated Power (ERP);  - Location;  - Geographical coordinates; The height of the transmitting antenna;  - Number of the notice, emission license and/or EMC contract;  - Date of the notice, emission license and/or EMC contract;	Currently not available	We guarentee to develop during 2023
The server must allow saving, storing and displaying the results of measurements and monitoring. Saving and storage must be possible to perform automatically and/or on demand.	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	
The server must allow the following measurement and monitoring data to be stored and displayed:Frequency;Electromagnetic field strength;The direction to the transmitter;The degree of spectrum occupancy;Signal bandwidth;Modulation measurements;Timestamp;Position;Station identifier;Settings used during measurements.	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	
The server must allow all data to be displayed simultaneously in the table and on the map.	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	











The server must be able to display color markers of signal levels.	Guaranteed, Simon International already	
The server mast se usie to display estar markers of signal reveis.	meets this requirement, and it can be	
	delivered and install during 30 days.	
The server must allow sorting of the data of interest by different	Guaranteed, Simon International already	
parameters as well as filtering by any field.	meets this requirement, and it can be	
	delivered and install during 30 days.	
The functionality of the map of authorized users must provide the	Currently not available	We guarantee to develop during 2023
possibility to view all authorized users, which are located in a certain	,	
location of interest (all authorized users are displayed on the map if the		
map marker is clicked).		
The server must allow importing and exporting data in .CSV format.	Guaranteed, Simon International already	
	meets this requirement, and it can be	
	delivered and install during 30 days.	
Server must provide functionality to provide saving and storing of sample	Guaranteed, Simon International already	
spectra.	meets this requirement, and it can be	
	delivered and install during 30 days.	
The monitoring software must include GIS program modules, with the	Guaranteed, Simon International already	
possibility of displaying the direction to the transmitter, the positions of	meets this requirement, and it can be	
the transmission sources, the spectrum monitoring stations overlaid on the	delivered and install during 30 days.	
digital map of the area.		
Map control must include:		
Selection of the map of interest;		
Select and display different types of information (monitoring results,		
authorized users) over the selected map;		
Possibility of zoom and panorama;		
Indication of the position on the map of the cursor, selectable by the user,		
in degrees, minutes, seconds;		
Possibility to measure distance and azimuth between two points;		
Screen and map printing.		











The application of the geographical information system must allow: Presentation of the location of all existing spectrum monitoring and DF (direction finding) stations in the NRMS (fixed stations and mobile stations); Presentation on the map of the direction of arrival of the signal with the specification of the azimuth to the signal source, provided by a DF station or several DF stations at the same time; Presentation on the map of the approximate location of the emission source, calculated by triangulation;	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	
The application of the geographical information system must allow: Cumulative presentation on the map of several directions of arrival of the signal transmitted by the detection receiver with the possibility of selecting the number of directions of arrival; Presentation on the map of the positions of the emission sources, of the monitoring stations with the possibility of sorting the objects and areas of interest; Use of digital maps, which support TMS protocols (Tiled Map Service) and WMS (Web Map Service);	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	
The application of the geographical information system must allow: Export of geographic data in formats KML, KMZ, etc.	Currently not available	We guarantee to develop during 2023









To allow setting all the necessary parameters of the monitoring receiver, by selecting: receiving frequency; frequency band; modulation type; IF bandwidth; used antenna; reference level (amplification, attenuation); measurement speed;	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.
detector type;	
filter bandwidth selection, etc.;	
Display the signal spectrum;	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.
To have the possibility of directing the reception antennas (changing azimuth, polarization, height) and switching all existing equipment (receivers, antennas) at the monitoring station;	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.
To receive the demodulated audio signal, ensuring hearing on headphones/speakers connected to the work computer and storing digital audio files;	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.
To command the DF equipment to obtain line of bearing results of the selected transmitter and plot the results on the digital map;	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.
To be able to define: "start/stop" frequencies, channel bandwidth and duration of the scan process;	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.









To allow simultaneous measurement for a single frequency of at least the following parameters: Frequency; Electromagnetic field strength level; Modulation parameters; Occupied bandwidth; The direction to the transmitter and the quality of determination; RDS parameters; Spectrogram of the signal; Audio demodulation.	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	
The process of measuring parameters and displaying their values in numerical format must take place instantly, without the need for additional manipulations, such as, for example, the use of markers.	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	
To allow sequential measurements of multiple frequencies based on a list of frequencies.	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	
Allow scheduled measurements and real-time (live) measurements;	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	
Have resources of verifying the acceptance of orders and notifying their status;	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	
To have additional functions such as: markers, max-hold, waterfall, etc.;	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	
To allow the mutual tracing of commands to all monitoring and DF stations (fixed and mobile) of the NRMS, in order to monitor (measure) one or more frequencies/frequency bands, as well as take over the obtained data from any of this stations;	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	









To allow mutual tracing of commands to all DF stations (fixed and mobile) of the NRMS, in order to locate (obtain the "line of bearing" results) the signal source, with the presentation of the obtained results, including their appearance on the map (the location of the used DF stations, the direction of receiving signal for each station and the location of the signal source);  To have facilities for creating tasks in automatic measurements and monitoring mode with the issuance of predefined alerts and measurement/monitoring results.	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.  Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	
5.5 Scanning functions		
The spectrum scan feature will allow:  Determining the degree of spectrum occupancy. This operation must allow spectrum occupancy to be investigated and the operator must be able to select one or several of the channel characteristics results.  Determination of unauthorized and non-compliant emissions. This operation must allow investigation of the scanned spectrum by automatically comparing the list of detected signals with the list of authorized emissions or with the predefined spectral mask in the	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.  Currently not available: We support detection based on a reference measurement and identify anomalies using machine learning compared to the reference	We guarantee to develop during the second half of 2023
respective frequency band.	compared to the reference	
5.6 Automatic signal type detection features		
5.6 Automatic signal type detection features	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	
The following signal detection modes must be available: by spectrum shape mode and "machine learning" mode.	Currently not available: We support detection based on a reference measurement and identify anomalies using machine learning compared to the reference	We guarantee to develop during the second half of 2023











In the detection mode by spectrum shape, the signal must be considered detected if the spectrum shape in a given channel corresponds to one of the predefined samples. The operator must be able to set the threshold, how close the shape of the signal and that of the sample must be to be considered as a detected signal.	Currently not available	We guarantee to develop during the second half of 2023
The monitoring software must include a sample set of generic spectrum shapes that allow most signals to be detected	Currently not available	We guarantee to develop during the second half of 2023
Monitoring software must include "machine learning" functionality to generate samples of spectrum shapes from measurement results.	Currently not available	We guarantee to develop during the second half of 2023
The detection time and field strength for each signal should be recorded and displayed.	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	
For each frequency channel in which the signal was detected, the following statistics should be visible: spectrum of all combined signals (except spectrum without signals), maximum values of electromagnetic field strength and occupied bandwidth, number of detections, field strength and the occupancy graph as a function of time.	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	
For each frequency channel where signal was detected, the owner should be shown and if location is available it should be shown on the map. The necessary license information must be extracted from the management database with the possibility of local additions.	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	
Signal detection results must be stored on the dedicated (centralized) server.	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	
5.7 Scheduled operations (automatic measurements)		









This mode shall allow the operator to schedule measurements for one or more monitoring and/or DF stations. Once scheduled no further connection to the station should be required until the results are retrieved. Scheduled operations must allow measurements of the following parameters:  Frequency Electromagnetic field strength Occupied bandwidth The direction to the transmitter The degree of occupancy.	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	
The application must provide resources to verify acceptance of planned operations and notify when results are available for presentation.	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	
Scheduling must allow: Establishing multiple tasks simultaneously. Setting the start/stop date and time and the duration of each task. Task priority type. Operator review of any scheduled operation, before or after transmission to the monitoring and DF station. Sending various types of alerts by e-mail in case of errors such as interrupting the measurement work, blocking the equipment, etc.	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	
5.8 Displays		
The monitoring software must allow the results to be displayed in tabular and/or graphical format.  Display formats must include at least: Spectrum display: Frequency domain panorama (signal level as a function of frequency) Spectrogram (frequency band versus time with color-coded level). View in 2D format (waterfall).	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	











Signal parameters (depending on receiver capabilities):FrequencyElectromagnetic field strength (with the possibility of indicating the maximum value)Modulation parametersOccupied bandwidthFrequency tolerance (offset)RDS parameters for sound broadcasting signals.	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	
The direction and location of the transmitter, where applicable: List of results The direction to the transmitter on the displayed map Localization (triangulation) results, including cumulative display of measured directions and establishment of average direction, calculated with maximum likelihood.	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	
Spectrum occupancy: Occupancy as a function of frequency or channel in various time intervals Electromagnetic field strength as a function of frequency or channel.	Currently not available: Channel based ocupancy calculation is only partially implemented. Channel based filed strength calculation must be implemented	We guarantee to develop during 2023
Unauthorized emissions. Tabular presentation of unauthorized transmitters based on a list (spectral masks) of authorized transmitters.	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	
5.9 Alerts		
The monitoring software must allow the setting and transmission of alerts in case of exceeding predefined values such as: change (increase/decrease) with predefined values of the signal level, frequency/amplitude modulation; the appearance of a new signal or the disappearance of an existing one. Alert notification must be sent by email.	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	
5.10 Reports		











The results of measurements and monitoring must be presented as reports in tabular and/or graphical format. The available standard reports must be able to be modified as needed. Possibility to create reports by combining several files with the measured results. Reports must be compatible with Word, Excel, etc.	Currently not available: "We export data in CSV or Excel format.  If needed we can implement customized reports."	We can implement customized report if needed
6. WARRANTY AND TECHNICAL SUPPORT		
The warranty period must be at least 24 months for all components of the monitoring software and will start from the date of signing the acceptance report without objection, under the conditions stipulated in the purchase contract.  During the entire warranty period, the supplier has the obligation to ensure, without additional costs and without any conditions, the following: resolving all functionality errors (bugs, non-conformances and others); periodic delivery and implementation of updates; technical support for the staff who will use the monitoring software.	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	
In case if during the warranty period the supplier will implement a new version of the monitoring software, which will be incompatible with the previous version, and the previous version will no longer have technical support and updates, the supplier will deliver and implement the new version at no additional cost. During the warranty period, at NSRFM request, the supplier will develop and deliver any update, driver, option necessary for the integration of new equipment, without any additional conditions and costs. With the purchase of new licenses in the following installments, the warranty period of these licenses will also extend to previously purchased licenses.	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	
7. POST WARRANTY		











The supplier has the obligation to ensure, after the expiration of the warranty period, under the terms of a subsequent contract, the availability of updates and technical support for a period of at least 10 years for all the components of the offered monitoring software.  8. SOFTWARE INSTALLATION AND PERSONNEL TRAINING	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	
The supplier will install and set up all monitoring software components at 3 monitoring stations and the necessary applications for the organization of the dedicated server.  The supplier will organize staff training on the architecture, composition and use of the monitoring software at the NSRFM headquarter or online.	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	
9. ELIGIBILITY CRITERIA FOR TENDERERS  The tenderer will provide documents establishing the experience and capacity, as follows:  The bidder will have a minimum 3 years of experience in providing similar software applications;  The bidder/developer must have at least 5 years of experience in the development of specialized software in the domain of radio frequency spectrum monitoring.	We meet the requirement: attached reference description	
10. METHOD OF EVALUATION OF OFFERS  The Bidder must provide for testing and evaluation a "demo" version (without any functional restrictions) of the monitoring software with a license validity of at least 14 days and provide the necessary support for its installation and testing.	Guaranteed, Simon International already meets this requirement, and it can be delivered and install during 30 days.	











Semnat Numele, prenumele: Nicolai Iasîbas În calitate de: Director

Ofertantul Lokmera SRL Adresa: str. Mitropolit Gurie Grosu 9, Chişinău, MD-2028, Republica Moldova







