Non-competitive call targeting specific beneficiaries named in the work programme for ESSOR[1] (Direct award)

EDIDP regulation provides in its article 15 (1) the possibility in certain duly justified and exceptional circumstances, that Union funding may also be granted in accordance with Article 195 of Regulation (EU, Euratom) 2018/1046.

Named beneficiaries will be invited to submit a proposal against each following topics:

- **EDIDP-ESSOR-1:** High data rate wide band software defined radio (ESSOR OC1[2]);
- **EDIDP-ESSOR-2:** Custodianship centre, NBWF[3], UHF[4] SATCOM[5] and 3DWF[6] for "interoperable communication activities based on different waveforms at tactical level compliant with ESSOR and SCA[7] architecture software defined radio platforms";
- **EDIDP-ESSOR-3:** Joint Advanced Data Links (JADL) for "new generation of EU-MIDS[8] terminals compliant with ESSOR and SCA architecture software defined radio platforms".

[1] European Secure SOftware defined Radio
[2] Operation Capability 1
[3] Narrow Band WaveForm
[4] Ultra-High Frequency
[5] Satellite Communication
[6] Three-Dimensional WaveForm
[7] Software Communication Architecture
[8] Multifunctional Information Distribution System

ESSOR-1: High data rate wide band software defined radio (ESSOR OC1)

EDIDP-ESSOR-1

Specific Challenge

Nations involved in coalition operations, such as Common Security and Defence Policy (CSDP) operations and missions, have stressed the importance of improved interoperability capabilities for the land domain. Recent events in Eastern Europe and Middle East have in particular highlighted the lack of resistance of legacy tactical communications to electromagnetic threats and the need for simultaneous voice and data exchange between participants of different nations, a capability that still does not exist at tactical level. With the digitalization of the battlefield, a new paradigm in terms of connectivity is required.

There is a need for coalition terrestrial network with high flexibility, high data rate, real time interconnection of a wide range of ground assets, and high level of security, in order to contribute to the Capability Development Plan (CDP) priorities related to the land and information superiority domains.

The only success to create such a system was the European led effort ESSOR, which demonstrated the feasibility of implementing an interoperable waveform on radios from different European manufacturers. This work was contracted to the consortium a4ESSOR, which owns the Intellectual Proprietary Right (IPR) on the results, and regroups national high level and experienced industries from Spain, Finland, Poland, Italy and France, and probably soon Germany.

The challenge for European countries is now to leverage on this unique know-how to deliver an operational waveform which can be deployed on radios from different manufacturers to benefit quickly the coalition effort on the battlefield, while ensuring operational and technological autonomy of EU member states.

Scope

Proposals shall develop an interoperability waveform, called ESSOR OC1, addressing the new needs of coalition operations, especially regarding high data rate and high connectivity. The waveform shall be implemented on several Europeans radios. The proposal shall also grant the right to EU member states and NATO countries, for their governmental purposes, to use and have used ESSOR OC1 product.

Targeted activities

The proposal for EDIDP should cover:

- Development of a base waveform (ESSOR OC1) compliant with the ESSOR SDR[9] architecture in UHF band which will be able to fulfil operational requirements of high data rate tactical terrestrial network;
- Implementation of the target waveform (ESSOR OC1) onto several European SDR radios, and associated field testing;
- Preparation of the evolution of the waveform (ESSOR OC1) through a study encompassing waveform upgrades and associated cost estimations;

[9] Software Defined Radio

- Dissemination of information related to ESSOR OC1 waveform and ESSOR architecture, allowing international standardisation.

Main high level requirements

The ESSOR OC1 shall fulfil the following requirements:

- Compliant with the ESSOR SDR architecture and methodology;
- Compliant with US standard MIL-STD-498;
- Compliant with NATO standard AQAP-2210;
- High data rate capacity, allowing high throughput and low-latency data communication from commanders to soldiers;
- Ad-hoc network routing, allowing simultaneously mobility and connectivity of troops on the battlefield, up to 200 radios participants;
- Security features, allowing to protect the confidentiality, integrity and availability of communications;
- IP-based interconnection, allowing communication services between IP[10] users of heterogeneous networks;
- Push to talk voice service, allowing secure, resilient and low-latency voice communication;
- Radio silence mode, allowing an operator of the waveform not being detected by electromagnetic threats while still receiving communication;
- Cohabitation feature, allowing multiple high data rate networks to be deployed on the field while optimizing spectrum usage.

Expected Impact

- Increase military efficiency on combat level by assuring coalition exchange;
- Increase EU leadership on SDR technology;
- Provide higher performances by leveraging on state of the art technology;
- Provide the right connectivity level required by CIS[11] systems used in future coalition deployment such as collaborative combat;
- Master the privacy of the information exchanged;
- Improve situational awareness, resilience and security of EU operations;
- Reinforce interoperability of EU member states armed forces.

[10] Internet Protocol
[11] Communication and Information Systems

ESSOR-2: Custodianship centre, NBWF, UHF SATCOM and 3DWF for "interoperable communication activities based on different waveforms at tactical level compliant with ESSOR and SCA architecture software defined radio platforms"

EDIDP-ESSOR-2

Specific Challenge

Nations involved in coalition operations, such as Common Security and Defence Policy (CSDP) operations and missions, have stressed the importance of improved interoperability capabilities for the land domain. Recent events in Eastern Europe and Middle East have in particular highlighted the lack of resistance of legacy tactical communications to electromagnetic threats and the need for simultaneous voice and data exchange between participants of different nations, a capability that still does not exist at tactical level. With the digitalization of the battlefield, a new paradigm in term of connectivity is required.

The proposed set of activities will contribute to the Capability Development Plan (CDP) priorities related to the land, air and information superiority domains in particular with respect to the need for improved connectivity between a wide range of ground and air assets.

ESSOR – NBWF (Narrow Band WaveForm)

It is widely recognised that the coverage of modern battlefield needs requires a combination of wide and narrow bad waveforms. Today, in a coalition context, ESSOR HDR[12] waveform is covering the wide band need for higher echelon (company and above), but there is still a need for long range resilient communications at soldier level. Previous attempts to create an interoperable NBWF have been unsuccessful and some developments are currently on-going in international standardisation fora.

The challenge for European countries is now to quickly deploy, based on the SDR paradigm, the result of this standardisation process on radios from different manufacturers to benefit quickly the coalition effort on the battlefield, while ensuring operational and technological autonomy of EU member states by reducing time to market for European industries.

ESSOR – SAT UHF WF (Satcom UHF WaveForm)

The satellite communication is an important asset for tactical operations, enabling users to communicate on-the-move and under all weather conditions and cover, when long distances or terrain obstructions have to be addressed.

The ESSOR UHF SATCOM waveform (referred to as "IW ESSOR Secure Mode") is the answer to this need, aiming to develop the STANAG 4681 base waveform and define/implements additional OrderWire (OW) and voice & data COMSEC[13] modes for European up-to-secret satellite communications. The SATCOM UHF waveform is a BLOS[14] agile satellite communication solution that does not imply infrastructures or dedicated

[12] High Data Rate
[13] Communication Security
[14] Beyond Line Of Sight

modems, providing for low satellite resources usage and wide coverage in the form of a full software waveform to be hosted in SDR tactical platforms.

ESSOR - 3DWF (3-D WaveForm)

There is a need for air to air and air to ground interoperable communications able to perform high throughput data exchange, networking and voice communication in the UHF band. So far, this capability does not exist as common standardized solution. Only voice communications are possible with the SATURN equipment.

The challenge is to develop the appropriate waveform, to have it recognise in international fora and to ensure its implementation in European national radios.

Custodianship centre

Implementation of SDR waveforms in Europe is mastered by the consortium a4ESSOR that regroups national champions from Spain, Finland, Poland, Italy and France, as well as Germany probably. Consequently, any waveform and its associated implementation on radios must follow the rules defined by the ESSOR programme in order to assure interoperability and through life management.

To guarantee the sustainability of the SDR waveforms and to increase their long-term availability, a custodianship center must guarantee the overall consistency of the SDR eco-system and be the recognized certification authority providing confidence that implementation of SDR waveforms into tactical radio is made on a proper way.

The challenge is now to establish such a custodianship center and define its appropriate governance and set of rules to grant over time this interoperability.

Scope

This proposal shall include:

- The initial development for a Narrow Band WaveForm (ESSOR NBWF), a Sat com UHF WaveForm (ESSOR SAT UHF WF) and a UHF WaveForm (ESSOR 3DWF);
- The definition of a custodianship centre for SDR waveforms.

The proposal shall also grant the right to EU member states and NATO countries, for their governmental purposes, to use and have used common waveforms product based on specific licence agreements.

Targeted activities

The proposal for EDIDP shall cover feasibility studies and preliminary design.

In particular, for the ESSOR-NBWF, ESSOR SAT UHF WF and ESSOR-3DWF, the proposal should cover:

- The development of CONOPS[15] and waveform specification compliant with the ESSOR SDR architecture;
- Simulation and derisking activities.

For the custodianship centre, the proposal should cover:

[15] CONcept of OPerationS

- The definition of the different elements constituting such a center: dedicated tools, evaluation processes, certification and RF[16] interoperability test conception, configuration management, documentation management, as well as different possibilities for the associated governance;
- Certification activities for ESSOR radios and waveforms.

Main high-level requirements

The ESSOR-NBWF shall fulfill the following requirements:

- Compliant with the ESSOR architecture and methodology;
- Compliant with US standard MIL-STD-498;
- Compliant with NATO standard AQAP-2210;
- Electronic Protection Measures (EPM);
- Compliant with relevant NBWF international standard;
- Free of any control regime by third countries (such as ITAR[17]).

The ESSOR-SAT UHF WF shall fulfill the following requirements

- Compliant with the ESSOR Architecture and methodology;
- Compliant with NATO standard AQAP-2210;
- Electronic Protection Measures (EPM);
- Tactical usage of SDR radios for secure satellite communication without infrastructure;
- Harmonised coalition COMSEC Orderwire;
- Compliant with relevant sat international standard;
- Free of any control regime by third countries (such as ITAR).

The ESSOR-3DWF shall fulfill the following requirements

- Compliant with the ESSOR architecture and methodology;
- Compliant with US standard MIL-STD-498;
- Compliant with NATO standard AQAP-2210;
- Designed for air to ground communication and for air to air communication between highly mobile platforms;
- Free of any control regime by third countries (such as ITAR);
- Adaptive performances;
- Dynamic quality of service;
- Multiplexing voice and data;
- Ad-hoc and automatic self-forming and self-healing;
- Low latency & high throughput ;
- Anti-jam modes;
- Theatre network capable;
- Operative UHF frequency range: [225 - 400 MHz];

[16] Radio Frequency
[17] International Traffic in Arms Regulations

- Compatibility with legacy waveforms;
- Multi-hop relay capable;
- Efficient use of assigned spectrum within existing spectrum allocation.

The ESSOR custodianship centre shall:

- Guarantee the life-cycle governance of the ESSOR products through a focus on processes, rules, policies and methodology to:
    - Define the configuration management (maintenance, evolutions);
    - Define the data management (registry, repository, licensing, releasing);
    - Define a management for the SDR training and R&D[18].
- Define evaluation and certification process, policies and tools for the ESSOR Architecture and SCA;
- Define interoperability testing and certification assessment, policies, governance and tools for radiofrequency (RF).

Expected impact

- Increase military efficiency on combat level by assuring coalition exchange;
- Increase EU leadership on SDR technology;
- Provide higher performances by leveraging on state of the art technology;
- Provide the right connectivity level required by CIS systems used in future coalition deployment such as collaborative combat;
- Master the privacy of the information exchanged;
- Improve situational awareness, resilience and security of EU operations;
- Reinforce interoperability of EU member states armed forces;
- Assure long-term viability of the ESSOR products;
- EU-type marking guaranteeing compliance of SDR implementation with ESSOR rules.

[18] Research and Development

ESSOR-3: Joint Advanced Data Links (JADL) for "new generation of EU-MIDS terminals compliant with ESSOR and SCA architecture software defined radio platforms"

EDIDP-ESSOR-3

The European Secure Software Defined Radio (ESSOR) is a PESCO project that aims to develop common technologies for European military radios. The adoption of these technologies as a standard will guarantee the interoperability of EU forces in the framework of joint operations, regardless which radio platforms are used, thereby reinforcing the European strategic autonomy. The ESSOR project, governed by the ESSOR framework MoU[19], will provide a secure military communications systems, improving voice and data communication between EU forces on a variety of platforms. This call is dedicated to feasibility and definition stages of various types of SDR based terminals and associated advanced waveforms for various platforms.
The results of these actions will not be subject to control or restriction by a third country or by a third-country entity, directly, or indirectly through one or more intermediate undertakings, including in terms of technology transfer.
In particular, the new generation of EU-MIDS terminals will be developed by:

- Leveraging on more than 20 years of know-how of European companies;
- Developing an autonomous EU crypto-chain;
- Developing and producing modules, components and subset of terminals through European companies.

Specific challenge

Operations in coalition, such as Common Security and Defence Policy (CSDP) operations and missions, rely on air information superiority through data exchange between various platforms. With the multiplication of air assets, among which the European MALE RPAS and future generation of aeronautical drones and fighter systems, the collaborative combat dimension will become key. A new paradigm in terms of connectivity is required (increased range, timely sharing of critical information, reinforced security, higher data rate, combat cloud, improved connectivity between a wide range of assets).
Specific challenges are to ensure operational and technological autonomy of EU member states while preserving interoperability with the US and NATO, and to contribute to the Capability Development Plan (CDP) priorities related to the air and information superiority domains.
Till now and for the next decades, Link-16 (L16) will remain the main interoperability communication system for platforms. This standard is evolving and new capabilities have been developed by the US. Furthermore, new types of L16 equipment are becoming widely adopted by new platforms like rotary wings aircrafts and network-enabled weapons. These new generation L16 terminals are currently developed by the US industry only and can be acquired only under strict US regulated acquisition process. The Size, Weight and Power

[19] Memorandum of Understanding

(SWaP) of the current L16 equipment made by European industry are not adapted to fit in those platforms. These activities propose to foster competitiveness of European industry in Europe to be able to propose similar and interoperable types of equipment in the 2025-2030 timeframe and with enhanced features in the 2030-35 timeframe.
Nevertheless, L16 cannot fulfil all use cases and will not be fitted to support exchange of large amount of data. Therefore, alongside L16, a wideband network providing very high bitrate is needed to enable collaborative combat and advanced sensor data exchange. A standard for very high data rate exchanges already exists but is limited to point to point communication. The US have already developed and deployed several systems fulfilling part of these requirements. Therefore, what is now at stake for EU member states is to have similar capabilities in the 2030-35 timeframe. The outcomes of the ESSOR programme in the land domain should be extended to the airborne domain in order to ensure convergence.

Scope

The proposal shall address the feasibility and definition stages of future integrated terminals based on the ESSOR architecture as well as the development of two waveforms. The aim is to secure EU member states autonomy in coalition air operations.
The scope of the activities shall cover:

- A common family of HW[20] terminals, including standardised crypto modules without dependencies with third parties, to fit a wide variety of defence platforms;
- An extension of L16 (eL16) and an advanced intra-flight datalink (EU-WBAN for EU Wide Band Aeronautical Network).

Targeted activities

The proposal for EDIDP shall cover feasibility studies and preliminary design of future eL16 and EU-WBAN systems, including:

- Feasibility studies, system specifications, Detailed Requirements Review (DRR) and architecture definition. This phase shall include HW platforms, cryptographic subsystem and the two waveforms;
- A roadmap with financial and technical proposal related to future activities in this field eligible to the European Defence Fund.

Main high-level requirements

Products life-cycle development processes shall be compliant with applicable aeronautical, engineering and quality standards.
The System shall fulfil the following general requirements:

- Enhanced-L16:
    - Compliant with the ESSOR SDR architecture;
    - Capability to handle multi-levels of security;
    - SWaP compatible with targeted platforms;
    - State-of-the art capabilities L16 terminals;
    - Backward compatibility with legacy L16 systems used by EU member states;

[20] HardWare

    - New capabilities required by CONOPS of coalition networks.
- EU-WBAN:
    - Compliant with the ESSOR SDR architecture;
    - Capability to handle multi-levels of security;
    - Very high data rate networking waveform for uncontested air environment;
    - Performances, frequency compatibility, interoperability constraints and hardware implementation required by CONOPS of coalition networks.
- Rationalised hardware resources (including independent crypto chains) between eL16 and EU-WBAN modules with the objective to derive an integrated terminal;
- Data-forwarding between EU-WBAN and e-L16.

Expected impact

- Preserve EU know-how on L16 in terms of industry competitiveness;
- Gain EU technological independence;
- Provide higher performances by leveraging on state of the art technology;
- Provide the right connectivity level required by CIS systems used in future coalition deployment such as collaborative combat, tactical cloud and distributed computing;
- Master the privacy of the information exchanged;
- Improve situational awareness, resilience and security of EU operations;
- Reinforce interoperability of EU member states armed forces.