

2.4.11. EDF-2022-DA-NAVAL-NCS: Naval Collaborative Surveillance

Budget

The Union is considering a contribution of up to EUR 65 000 000 for this topic under the call EDF-2022-DA

Number of actions to be funded: Up to one action may be funded for this topic

Objectives

General objective

In the context of a changing geopolitical landscape, European Military Forces are facing new and evolving threats that are smaller, faster and more diverse, with increased manoeuvrability, like for instance Ballistic Missiles (BMs), Hypersonic Glide Vehicles (HGV) and Hypersonic Cruise Missiles (HCM), and swarmed attacks in a sensor adverse environment (e.g., stealth target, high target mix, environmental clutter, electronic attack).

Anti-Air Warfare (AAW) in the naval domain requires new technological developments to ensure lasting superiority at sea of EU naval surface vessels. Successful engagement to counter new threats can only be done by significantly reducing times as regards detection, tracking, identification and engagement.

EU navies already operate a variety of high-end sensors and weapons controlled by several combat management system, interconnected through Tactical Data Links (TDL) and other communication means, or have these under development. However, communications used nowadays (e.g., TDL 16/22) do not provide the speed, precision, configuration and update rate that enable successful engagements of future threats. Key challenge is to move from these existing capabilities to a naval collaborative surveillance ability in the Above Water Warfare (AWW) domain, based on real-time Plot Level Data Exchange and Fusion (PLDEF), emanating from diverse and heterogeneous platforms (ships or aerial) and relying on adequate and resilient communication means.

This new Naval Cooperative Surveillance (NCS) capability is considered as a first step and the basis for a capability on effector coordination (i.e., Force Threat Evaluation and Weapon Assignment) and Naval Collaborative Engagement (NCE).

Specific objective

The objective is to develop a full NCS capability allowing a better tactical situational awareness shared within a coalition, in terms of performances (e.g., coverage, robustness, accuracy of the information produced) and architecture resilience (e.g., degraded combat system, sensor failure, sensor jammed, loss of telecommunications).

It must consist in particular, in defining an EU NCS protocol/interface standard for real time exchange of raw data originated from sensors (plot level), thus facilitating the AWW operations within a coalition of EU naval and air assets. It must consist, as well, in developing processing functions and algorithms to use the data exchanged through the protocol/interface standard. The NCS will achieve a more effective elaboration of the tactical picture, through plot merging, tracking, identification, etc. Such data processing functions and algorithms could be developed either jointly or nationally. They must take the form of demonstrators and prototypes, which will

be verified via demonstrations and testing. Further national implementation and deployment must comply with national legacies and strategies.

Furthermore, it is expected that the NCS has to be used in Global Navigation Satellite System (GNSS) denied areas. Therefore, the proposed NCS could also include a GNSS-independent mode that ensures successful operation when GNSS is vulnerable or unreliable. This GNSS-independent mode must result in minimal impact on the engageability of the tracks, still allowing for a NCE capability.

Scope and types of activities

Scope

The development of the NCS capability (i.e., NCS protocol/interface standard and data processing functions and algorithms) must be incremental. The following three broad levels of capability could be considered:

LEVEL 1: Define the NCS capability for plot exchange

This level 1 must define an EU protocol/interface standard that will allow European units within a naval force to share raw detection data in order to enrich the tactical situation. Each unit must perform its own tracking and fusion within NCS through national software modules. In this level also the GNSS-independent mode could be investigated, developed and tested.

This definition of the protocol/interface standard must be validated on board within real environments considering fast manoeuvring objects. Potential improvements will feedback the protocol/interface standard definition after such trials.

LEVEL 2: Extend to air assets and develop advanced NCS functions for situational awareness

This level 2 must extend the capability and the already defined protocol/interface standard to include air platforms with their own sensors, including unmanned platforms.

At this level, advanced functions and processing to set-up a better and unambiguous tactical situation, including identification and prevention of duplication of targets must be developed. New algorithms to select and prioritize plot dissemination within the network, to avoid data saturation of the network, must be defined and tested.

Coalition units might also operate TDL while embarking the new NCS capability. The coexistence of the tracks originated by the TDL network and the tracks originated by the new NCS capability, and the collaboration required between both for sharing common tactical situation awareness, must be studied.

Further national implementations and deployments should comply with national legacies and strategies.

LEVEL 3: Full advanced NCS capability

To improve the tactical situational awareness shared within the coalition, additional functions for the NCS capability must allow to:

Handle unit(s) when entering/exiting the coalition network and other required network management functionalities.

Prepare, and continuously update in real-time, the surveillance mission by planning operational

unit(s) locations and movements, as well as task operational unit(s) while in operations within the coalition network.

Include some level of sensor management, for example, to select the best combination of sensors available in the coalition for a given timeline per a given cell of the surveillance space with the aim to optimize the quality of the tactical situation awareness and minimize communications workload.

A preliminary NCE capability, also known as Multi-Platform Engagement Capability (MPEC) that goes beyond the above-described concepts must be considered. Studies and first analysis on Launch-On-Remote and Engage-On-Remote, could be proposed as a follow-up paving the way to a European NCE capability.

Types of activities

The following types of activities are eligible for this topic:

Types of activities (art 10(3) EDF Regulation)		Eligible?
(a)	Activities that aim to create, underpin and improve knowledge, products and technologies, including disruptive technologies, which can achieve significant effects in the area of defence (generating knowledge)	No
(b)	Activities that aim to increase interoperability and resilience, including secured production and exchange of data, to master critical defence technologies, to strengthen the security of supply or to enable the effective exploitation of results for defence products and technologies (integrating knowledge)	Yes (optional)
(c)	Studies , such as feasibility studies to explore the feasibility of new or upgraded products, technologies, processes, services and solutions	Yes (mandatory)
(d)	Design of a defence product, tangible or intangible component or technology as well as the definition of the technical specifications on which such design has been developed, including partial tests for risk reduction in an industrial or representative environment	Yes (mandatory)
(e)	System prototyping of a defence product, tangible or intangible component or technology (prototype)	Yes (mandatory)
(f)	Testing of a defence product, tangible or intangible component or technology	Yes (mandatory)
(g)	Qualification of a defence product, tangible or intangible component or technology	Yes (optional)
(h)	Certification of a defence product, tangible or intangible component or technology	Yes (optional)
(i)	Development of technologies or assets increasing efficiency across the life cycle of defence products and technologies	Yes (optional)

The following tasks must be performed as part of the mandatory activities of the project:

- Studies:
 - o The evolutions of the EU protocol/interface standard required for each of the foreseen NCS capability levels 1, 2 and 3.

- o Inventory of the available and planned communication and network capacities and constraints which could be used in a coalition, with a view to propose the most appropriate architecture and interface definition, considering the evolution of communication capabilities over the next decade and with a view to identify potential new needs:

- Data exchange needs must be characterized in terms of synchronization among participating units, time budget for data transfer, transmission rate, latency, discretion, range, confidentiality and resiliency.

- The communication operation architecture and preliminary solutions must be identified based on considering different coalition deployment, threat and interoperability scenarios requirements. They must consider FMN (Federating Mission Networking) spirals and integration impact.

NB: Available and planned communication and network capability must be considered as an input to this project, which should focus on how to use currently available communication and network solutions in an optimal way. Thus, the design of new communication and network capabilities is out of the scope of this topic.

- o Additional, studies activities could focus on NCE functional analysis and preliminary engineering (pre-feasibility).

- Design:

- o Generic NCS architecture for levels of capability 1, 2 and 3

- o Common Data Model for levels of capability 1, 2 and 3

- o EU NCS protocol/interface standard for the exchange of surveillance data (e.g., plot, strobe) originated by radar, infrared search and tracking system, radar ESM (Electronic Support Measures), between sensors interconnected through appropriate communication means and network.

- o Processing functions and algorithms of the exchanged data, which could be developed either jointly or nationally; in order to optimise the sharing of data while maintaining the highest level of tactical situation quality and tracking.

NB: the topic also comprises the design of NCS protocol/interface standard and processing functions and algorithms related to the optimal use of available and planned communication and network capability. Such designs could be implemented either in NCS specific equipment (e.g., CMS – Combat Management System) or in network specific equipment (e.g., network management system). In the last case, the topic could be limited to the production of requirement documents or extended to actual implementation.

- Prototyping:

Equipment (hardware and software) implementing the required NCS protocol/interface standard, data processing functions and algorithms, and interfaces to be used as a model to test performance in a realistic operational environment.

- Testing:

Based on realistic operational scenarios, tests in real environments must consist of operating the prototype on-shore and at-sea. Trials with land platforms under synchronised simulated scenarios must be used extensively too, aiming to decrease costs and simulate future scenarios, which are difficult or impossible to implement at sea. While testing at sea, onshore or on platforms, each equipment (prototype) must create its own

tactical situational awareness, and record the information products for further analysis. After testing completion, outcomes and feedback must be analysed to propose protocol changes when justified. Testing should involve a large number of actors (ships and air assets) from different Member States and associated countries, and take provisions for interoperability with NATO allies.

Functional requirements

The aim of the proposal should be to develop to an EU NCS for real time sharing of sensor data on plot level, showing the following main functional abilities:

- Develop a European NCS capability providing a dynamic and real-time sharing and fusion of heterogeneous raw data from naval and airborne sensors assets (potentially enhanced with land-based sensor information).
- Develop advanced management functions to achieve NCS and NCE, such as data transmission optimization, optimal positioning of naval assets, and dynamic management of multiple sensors.
- Optimize the overall NCS capability performance and resilience against advanced, evolving advanced threat set, like BMs, swarming, hypersonic targets or jamming.
- Prepare steps for further European collaborative Force Level capabilities including NCE.

The proposed NCS should support collaborative naval operations against modern threats and should be adaptable towards future threat evolutions.

The concept of operations for coordination of naval operations and provide naval support to joint and combined operations should be based on operational doctrines and systems of both Member States and associated countries, and strategic partners.

The architecture based on standards should be a non-intrusive and open for all Member States and associated countries.

The proposed solution should reuse previous works in this area as executed by contributing partners, in particular for demonstration and testing purposes.

Interoperability with allies, especially in the context of NATO, is a key priority, in relationship with the US Cooperative Engagement Capability (CEC). Furthermore, cooperation with the Maritime Theatre Missile Defence (MTMD) Forum should be sought where feasible. However, the proposal has to allow for growing on its own pace without any dependency on NATO, US or MTMD.

Expected impact

- A major steppingstone towards enhancing the strength of EU Naval Forces, contributing to European Strategic Autonomy and enhancing surface naval manoeuvrability and superiority.
- Significant reduction of the detection, recognition, identification and engagement times of combined defence while facing new and evolving air threats (e.g., smaller, faster and more diverse, and with increased manoeuvrability).
- Standardization to improve interoperability, and operational cooperation in coalition allowing assets utilization optimization, both leading to superiority of naval systems operated by EU navies in the AWW.
- Contribution to increase the industrial cooperation and integration of the EU defence companies including SMEs and mid-caps.