DEFENSIE
LA DÉFENSE

Royal Higher Institute for Defence

Defence-related Research Action - DEFRA

ACRONYM: DEP5GforNAV

Title: Deployable 5G networks for advanced naval applications

Duration of the project: 1/12/2022 - 1/12/2025

Key words: 5G, communication networks, network technology, maritime, navy

Budget: 848.906 €

of which RHID contribution: 735.805 €

PROJECT DESCRIPTION

Context

Future naval communication can potentially rely on 5G networks to connect the main command vessel with other platforms (smaller ships, drones, coastal infrastructure…) and individual operators. Naval communication differs in several ways from 'conventional' terrestrial 5G communications: reliance on strong line-of-sight, little to no multipath channels, mobility of ship-bound base stations.

General objective

The objective of the project is to solve key issues and identify opportunities for ship-bound, mobile 5G communication networks. For ship-bound communications, the focus lies on decent coverage with limited number of users. A typical maritime scenario will have less users than conventional cellular 5G networks, but the reliability and latency requirements are more stringent than for conventional 5G networks. Another important aspect of ship-bound communications is the need for medium-to-long range, with cell size that can go from a few km up to 30 km or even higher depending on the scenario.

The project will provide the scientific groundwork and technological blueprint for concrete implementations of maritime deployable networks for the Belgian Navy, with Quality of Service (QoS) adapted to military requirements.

Methodology

This project will address several research questions in the context of maritime ship-bound networks: general architecture of a private 5G network for naval communications, medium-to-long range coverage of ship-bound 5G networks, network mobility and robustness to EM warfare of ship-

bound 5G networks, localization of UEs in a 5G maritime network and requirements for data encryption in maritime scenarios.

In order to make the research relevant for Defence, a number of realistic maritime use cases have been identified by the partners and the Navy, each offering specific challenges and scientific questions:

- Deployable 5G Network between current coastal patrol vessels (CPV) and the command-and-control centre on the coast;
- Deployable 5G Network between a CPV mothership and rigid inflatable boats (RIBs) deployed in a crisis situation);
- Meshed 5G network for (intra) fleet communications between (e.g.) CPVs, frigates, minesweepers and opportunity vessels;
- Expeditionary deployable 5G network for harbour protection (missions abroad/NATO context).

For the first two use cases, a full lab and in-field experimentation will be performed in the project. For the latter two use cases follow-up projects will be described, building on the scientific analysis and lessons learned from the experimentation in the other use cases.

The project will be executed by e-BO Enterprises (EBO), a fast-growing Belgian SME with a proven track-record in offshore communication and data integration (civilian and military), and knowledge institution Université libre de Bruxelles (ULB) as the academic partner.

Potential impact of the research on Defence

Deployable maritime 5G networks with their high connection speeds and very low latency, offer great opportunities for naval applications but yet have to be explored in depth. The technology will, on the relatively short term, enable superior communication functionalities such as interoperable mission critical 'push to talk' (MCPTT) and enhanced on the spot video streaming. These capabilities are essential for the patrolling operations that the Belgian Navy is performing in the traffic heavy Belgian EEZ and are also critical for missions abroad where deployable communications systems can prove to be vital.

Deployable 5G will, in the farther future, also be instrumental in advanced (big) data processing for the maritime environment for example for computer vision (AI) based automated ship recognition and anomaly detection in ship behaviour (pattern). Ship-bound 5G networks can provide the data communication layer for maritime sensor systems on unmanned (surface) vessels or large vessels can act as mobile base stations for UAVs.

Expected results and valorisation perspectives

As a step towards concrete valorisation of results, we will describe in detail within the project a number of follow-up projects (low and high TRL) based on the results and interaction with end-users (Navy, other authorities). This can be expanding the marine experiments for the remaining use cases as well as actual integration in real life systems through a broader pilot environment with focus on full operational functionalities.

Through the project, the partners will also provide an assessment framework and policy recommendations for future 5G navy investment choices with multiple scenarios.

Potentially a Belgian 5G system could be the basis for an international collaboration program, for example among north-sea based allies with similar challenges, leading to new products and solutions with Belgian participation. Projects results will be directly instrumental to further clarify operational/technical requirements for a number of concrete and potential investments described in the updated Belgian MOD strategy or 'STAR'.

Project data will be made available for R&D purposes. The consortium foresees dissemination of results within the community through one or more dedicated workshops.

CONTACT INFORMATION

Coordinator
Ronny Dewaele, Strategic Product manager, project coordinator
e-BO Enterprises
ronny.dewaele@ebo-enterprises.com

Partners
François Quitin, Professor electrical engineering
Université libre de Bruxelles (ULB), BEAMS-Embedded Electronics lab
Francois.Quitin@ulb.be

LINK(S)

To be delivered