SPECIAL EDITION

Newsletter, June 2015

www.perseus-fp7.eu

Editorial

Welcome to this special edition of the PERSEUS newsletter.

As a project, PERSEUS stops operating in June 2015 and is holding its final conference in Brussels. We are using this opportunity to issue our final newsletter as a larger "special edition", giving our readers an overview of the project and key lessons learned.

How did it start?
PERSEUS was selected as a demonstration project in the FP7 Security call FP7-SEC-2010-1.
The call text indicated that « *A key aspect of the implementation of the EU Integrated Border Management is the development of a European Border Surveillance System (EUROSUR). This proposed demonstration project,* ***although it is an initiative of technological nature,*** *is considered to potentially* ***pave the way towards*** *a more pro-active approach in the future EUROSUR* ***cooperation mechanisms***".

Built-in flexibility
PERSEUS started operating in 2011, with an initial group of partners from the public and private sectors and an ambition to build a system of systems, as envisioned in the integrated maritime policy. From this initial ambition, PERSEUS focused on users' needs, encapsulating these needs into national and trans-national scenarios in maritime surveillance and working its way back from scenarios to capabilities that could then be integrated differently across existing systems to deliver the functions of a system of systems, while taking into account the national specificities.
From different maturity levels in terms of detection capabilities to different operating structures at country level, PERSEUS created, very early on, an approach built on flexibility – **flexibility for the users** to select capabilities, **flexibility for the solution providers** to inter-operate with legacy systems.

In parallel, the PERSEUS project itself had flexibility built in to **accommodate new technologies and services** from outside solution providers, to **welcome new users** – and during the lifetime of PERSEUS, new users and providers joined us and integrated their assets into the PERSEUS exercises.

Users – the pillars of PERSEUS
Since 2011, PERSEUS issued 6 newsletters and this special edition walks you through these newsletters to revisit what **maritime surveillance users** from France, Greece, Italy, Portugal and Spain told us during our 4 and a half years of collaboration. For instance, in a 2014 interview, Greek users highlighted that "One of the biggest success of PERSEUS was the assembly of several joint "Research - Industrial - Operational" teams with a common view of targets and objectives."

Delivering capabilities ready for uptake
PERSEUS demonstrated that the integration of new capabilities with legacy systems can be achieved. It also demonstrated that this integration considerably enhances national and trans-national maritime surveillance. Furthermore, a detailed cost-benefit analysis concluded that this integration is also feasible from a return on investment point of view, enabling Member States to select which capabilities are the most relevant and adequate within their own context. PERSEUS results are ready to move from demonstration to actual uptake, - check out pages 10 to 15 for a few examples of capabilities that are already on the market or going to market in the coming months, pages 8 and 9 to see how campaigns helped validate them through live exercises and pages 16 and 17 for the cost benefit analysis results.

Putting research funds at work
PERSEUS demonstrated that the use of research funds have enabled not only new technology development, but that the concept of the demonstration project as initially envisaged by the European Commission in 2009 is an **effective approach to build and foster a level of collaboration** between maritime surveillance stakeholders from the public and private sectors that had never been achieved before.

We would like to thank the European Commission for the PERSEUS opportunity– this was a joint and large public and private investment, with the 32 PERSEUS partners providing 15 M€ and the European Commission FP7 programme 27 M€. The legacy of PERSEUS more than justifies the investments made – maritime surveillance authorities have learned to work together in operational and trans-national contexts, the PERSEUS data model is used to interconnect systems and ready for further evolutions, 40 systems and assets have been analysed, enhanced, tested and integrated in different operational contexts, the "system of systems" concept has moved from a theoretical view to a reality in which information is **exchanged to create new knowledge on which authorities can act.**

As envisioned in the initial call for proposals, PERSEUS has not only paved the way towards a more pro-active approach in the future EUROSUR cooperation mechanisms – it has delivered tools, approaches and processes to implement this approach, as well as a proven methodology on which to build future evolutions.

We would like to thank the PERSEUS project officer Paolo Salieri – PERSEUS was an incredibly challenging project, and the level of results and collaboration that PERSEUS achieved would not have been possible without Mr. Salieri's positive approach, continuous support and unlimited availability.

Protection of European Seas and Borders through the Intelligent Use of Surveillance

32
Partners

13
Countries

2
real-life campaigns in the Mediterranean

6
maritime surveillance exercises

Content

PERSEUS: 4 and a half years of successful collaboration

After 4 and a half years, PERSEUS proves to be a successful project, with 1 data model for maritime surveillance validated and used between countries, 150 recommendations built on the lessons learnt, 40 technologies, systems and capabilities tested in real operations and ready for uptake, a quantitative and qualitative analysis to help priorize this uptake, and a community of end users effectively collaborating together at trans-national level.

The PERSEUS project has been implemented in 5 main steps:

2011 - Architecture Definition

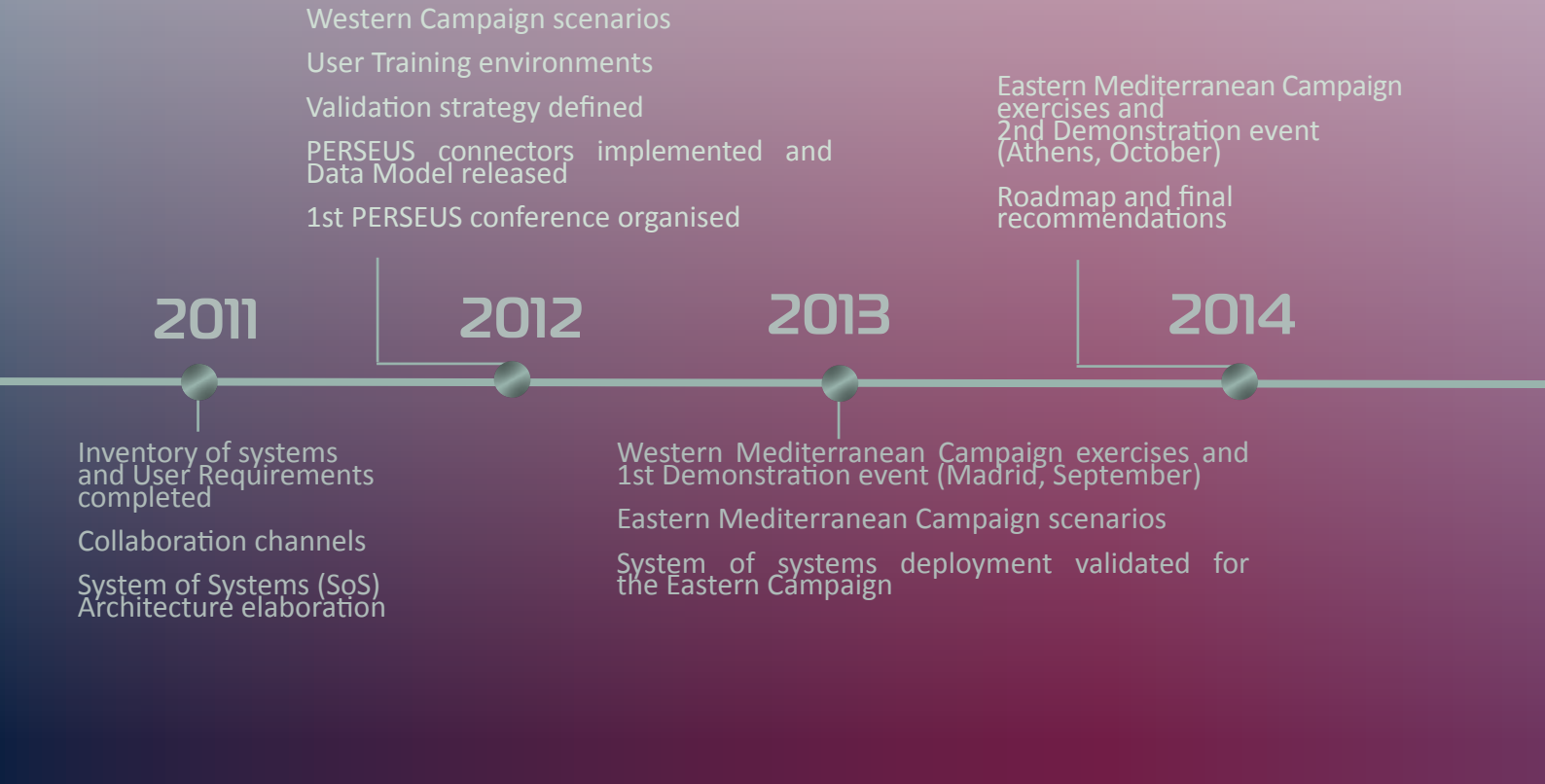
The first important milestone for the project was the **elaboration of the system architecture** and the definition of the requirements, an activity that was organised with a **strong user involvement**.

2012 - Architecture Implementation and 2013 scenarios definition

In 2012, we started with the complete **definition of the scenarios** with the assets and systems to be deployed in each country participating to the exercises which took place in 2013 in the context of the Western Campaign.
The PERSEUS scenarios focused on showing new capabilities and innovations that could be achieved with an Integrated Maritime Surveillance system of systems. During 2012, PERSEUS conducted also an **extensive work on the data model** with a complete definition of all the information required to ease a trans-national interfacing of systems. We also defined the External Applications Interfaces, enabling the exchange of data, information and intelligence with 3rd party information providers and control and command systems outside of the PERSEUS project.
In March 2012, the project welcomed new users as full partners - initiating a process that lasted for 7 months - and organised its first PERSEUS stakeholders' conference: more than 120 attendees representing the whole range of stakeholders involved in maritime surveillance participated over the two days event organised in Brussels when the project advances and plans for the coming years were presented.

2013 - PERSEUS going live: the Western Campaign

PERSEUS went live in the Western Mediterranean, with three sea, air and land based exercises extending from Spain to Italy. The exercises involved physical assets, deployed across different regions of the European sea line and beyond. This required a detailed description not only of the actual flow of information that PERSEUS aimed to test, but also a close collaboration with the users to avoid interference with their on-going operations. The exercises also gave us a great opportunity to **show PERSEUS at sea**, with the first edition of the **PERSEUS Demonstration Events**: two-day events designed to allow users and interested stakeholders to attend live exercises and **view interactive demonstrations** of new capabilities.
The first PERSEUS demonstration event took place in Spain on the 24th September 2013, hosted by Guardia Civil during a PERSEUS live exercise focused on the context of irregular migration. PERSEUS also run a long duration exercise, over 6 months, testing the interconnection of users and the exchange information between systems in France, Italy, Portugal and Spain - exercising the PERSEUS data model, creating an integrated European Situational Picture communicating with air, sea and ground based assets.



In 2013, the 4 Western Campaign exercises were completed, the user base grew by including 3 new users (from Greece, Italy and Portugal) as well as a technology provider (from Spain).
The Western Campaign provided valuable lessons, setting the standard and ground for the 2014 Eastern Campaign in the area of the Aegean Sea and Samos Island channel with the support of the Greek technology partners and users.

2014 - Moving the PERSEUS exercises to the Eastern Mediterranean region: applying the lessons learnt from the Western Campaign

Based on the results from the Western Campaign, PERSEUS defined technical standards and recommendations for the future European integrated maritime border control system focusing on border control and irregular migration, crime and illegal trafficking. A broad community of users, with different levels of participation in the project, evaluated the system and validated its compliance with their requirements. Users were crucial throughout PERSEUS and their involvement was key in ensuring that PERSEUS analyses and verifies the feasibility of the European maritime policy in real-life environments.
Eastern Campaign exercises took place in September and October, and the 2nd Demonstration event took place during this campaign.

2015 - Towards a full exploitation of results

PERSEUS organised a final conference, one-day event dedicated to presenting its major results.
Check our online Web site - the PERSEUS results are online, live exercises have been filmed, our 6 newsletters will link you to our users, technologies and experiences.

Véronique Pevtschin, Engineering Ingegneria Informatica, providing an overview of the PERSEUS project.
Panel speakers (seated from left to right): Paolo Salieri, DG Migration and Home Affairs, PERSEUS Project Office; Fernando Barbero , Indra, PERSEUS project Coordinator; Oliver Seiffarth, DG Migration and Home Affairs

Screenshot taken during Exercise 3 - Irregular Migration which took place in the context of the Western Campaign

Spanish Ministry of Interior Jorge Fernández Díaz opened the 1st PERSEUS Demonstration event in Madrid (2013) and participated to the showcase

Ministry of Aegean and Maritime Affairs attending the 2nd PERSEUS Demonstration event in Athens (2014)

2015

- PERSEUS Final event
- Cost Benefit Analysis
- Procurement
- Lessons learnt

PERSEUS - Facts and Figures

MAIN USERS ACTIVITIES
Elaborating scenarios based on their needs and experiences

Participating with systems and assets to the live exercises

Validating the PERSEUS system of systems capabilities using scenario based approach

USER CENTRIC APPROACH

Users are at the heart of PERSEUS: continuous interaction with French, Greek, Italian, Portuguese and Spanish users was crucial to guarantee the development of usable solutions that contribute to an integrated EU Maritime Surveillance environment.
The User centric approach was adopted to ensure adherence of the solutions delivered in PERSEUS to the real market, addressing gaps at tactical, strategical and operational levels.

13 Users in the Observation Panel (UOP)
Involved in needs and scenario validations

11 Users in the Steering Committee (USC)
Active in PERSEUS exercises

LIAISON WITH EU

PERSEUS was conceived before the establishment of EUROSUR and hence, some of the elements that integrated the initial approach of the project did not match the final goals and terms of the EUROSUR regulation. Therefore, PERSEUS worked closely with the EU bodies and agencies to continuously align PERSEUS' approach to the EUROSUR regulation's evolution, from its proposal to its adoption. Ensuring that PERSEUS results remain fully relevant to EUROSUR. In order to keep such a level of coopearation with EU bodies and Agencies, PERSEUS participated to **10** informal meetings with the FP7 Border Surveillance Implementation Group during which a series of relevant results emerged, including the draft of the **CONOPS** - Concept of Operations - for the **detection of small vessels**.

TECHNOLOGICAL ADVANCES

40
different technologies, products, systems and services related to maritime surveillance were analysed, tested and integrated in real-live exercises expanding from Portugal and Spain to Greece.
PERSEUS represents a **unique experience of research in the area of maritime surveillance**.
Surveillance airplanes and drones of different sizes and coverages, coastal stations, mobile units, ad hoc communication networks, software applications implementing new **operational functionalities** such as task orders, collection plans, event dispatching and reports. a new concept of specialised autonomous underwater vehicles, information services - all these assets have, for the first time, operated together to achieve a new operational level in maritime surveillance.
PERSEUS represents a remarkable step forward - nothing as ambitious had been achieved in this domain so far.

SCENARIO BASED APPROACH

The elaboration of the exercise scenarios was one of the major tasks that fostered a **consistent development** and demonstration of maritime border surveillance solutions. The participation of users, including Guardia Civil, the Hellenic Ministry of Defence, the Hellenic Coast Guard, Força Aerea Portuguesa, Guarda Nacional Republicana, the Portuguese Navy, the Guardia Costiera has been key for a successful development, not only of the PERSEUS demonstration as such, but more importantly of the PERSEUS architecture, system configuration and data model which carry over PERSEUS results into the future.
Since the beginning of the PERSEUS project, a stepwise roadmap was used to define a solution as closely aligned as possible to the needs expressed by the users. PERSEUS proposed solutions based on real elements that integrate a series of representative scenarios building a **realistic and affordable architecture.**
The main objective of PERSEUS' **validation activities** was to assess the performance of the system of systems during the exercises, following a **methodology based on a series of metrics** of effectiveness **agreed between users and providers**. This helped maintain an operational standpoint, and identify gaps and lessons learned for future upgrades in the area of Maritime Border Surveillance with a **clear traceability to real needs.**

Therefore, the validation of the PERSEUS system of systems was done by the users to determine the actual level of enhancement delivered by the PERSEUS capabilities. This **actual measure of the users' satisfaction** with the PERSEUS results in operational contexts is one of the most valuable outcomes of the project

STEPS FOR THE DEFINITION OF THE EXERCISES

1/ Users drafted a realistic sequence of events as an example of the activities that take place in a maritime border surveillance operation.
2/ Based on this, the exercise coordinators and the consortium partners elaborated detailed exercise sequences which allowed a reliable demonstration of the PERSEUS system of systems concepts.
3/ The final outcome of this analysis was a set of scenario scripts based on the experience of the systems currently used by users in the execution of their normal operational activities, further enriched by the integration of PERSEUS capabilities.
4/ These scripts were adapted in a storyline of events describing system operation and enhanced with details derived from the system environment, which allowed the evaluation of the context of activity.
5/ Finally, in parallel to this Scenario Definition a validation plan was defined based on the enhancements that are expected to be implemented in the PERSEUS Project.

PERSEUS planned, organised and executed **2 campaigns and 6 exercises**

the **Western campaign** from September 2013 to February 2014.
The campaign included four different exercises:
Exercise 1 focused on transnational collaboration,
Exercises 2 and 3 tested technologies in cross-border crime and irregular migration scenarios and
Exercise 4 tested tracking technologies along the Mediterranean basin.

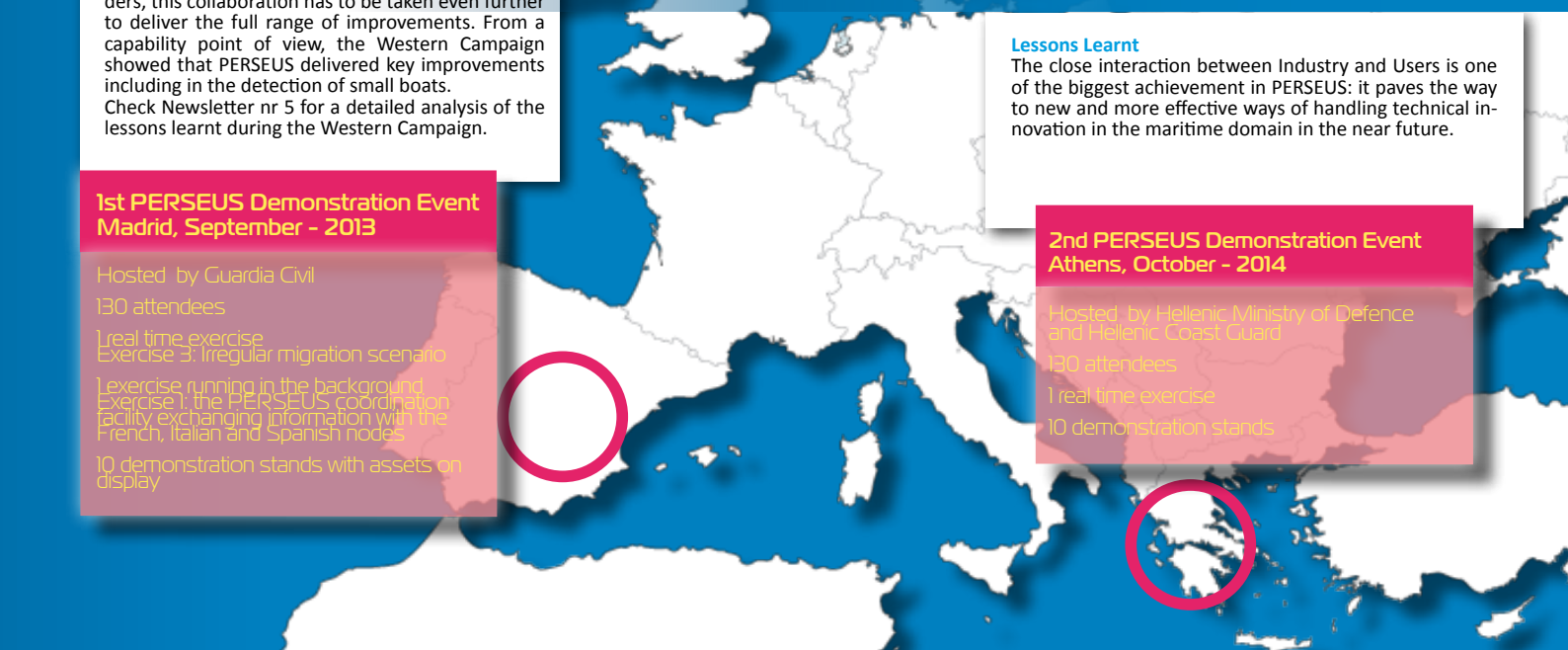
the **Eastern Campaign** from September to October 2014.
Two exercises were performed in the area of the Eastern Mediterranean.

Lessons Learnt

Multi-national interconnection between users and systems proved to be feasible, and delivered concrete operational improvements. Even if the campaign was elaborated through a structured and strong collaboration between users and technology providers, this collaboration has to be taken even further to deliver the full range of improvements. From a capability point of view, the Western Campaign showed that PERSEUS delivered key improvements including in the detection of small boats.
Check Newsletter nr 5 for a detailed analysis of the lessons learnt during the Western Campaign.

Lessons Learnt

The close interaction between Industry and Users is one of the biggest achievement in PERSEUS: it paves the way to new and more effective ways of handling technical innovation in the maritime domain in the near future.



1st PERSEUS Demonstration Event
Madrid, September - 2013

- Hosted by Guardia Civil
- 130 attendees
- 1 real time exercise
  Exercise 3: Irregular migration scenario
- 1 exercise running in the background
  Exercise 1: the PERSEUS coordination facility exchanging information with the French, Italian and Spanish nodes
- 10 demonstration stands with assets on display

2nd PERSEUS Demonstration Event
Athens, October - 2014

- Hosted by Hellenic Ministry of Defence and Hellenic Coast Guard
- 130 attendees
- 1 real time exercise
- 10 demonstration stands

PERSEUS WESTERN CAMPAIGN

Paolo Salieri, PERSEUS Project Officer during the Almeria PERSEUS exercises

FAP participating to the PERSEUS exercises

Engineering Interconnecting the Italian node

PERSEUS Western Campaign run from September to November 2013 with a succession of one and two days live exercises as well as a long duration information exchange exercise.

The campaign included 3 live exercises taking place at sea, and 1 long duration exercise.
The long duration exercise focused on information exchange and run over a period of 6 months, with the generation and dissemination of a European Situational Picture (ESP) combining forwarded National Situational Pictures (NSPs), appending and merging information from other external and internal sources. This exercise covered a large geographical region, the West Mediterranean Basin from Atlantic approaches to Italy including North Western Africa. Its aim was for participating countries at national levels to exchange useful, timely, structured and standardized information layers to acquire a common understanding of the maritime situation over the West Mediterranean Basin and to then be able to further enrich their own National Situational Picture with additional inputs of direct relevance to their operations.
The live exercises run for one to two days each, during a campaign that started in Spain in September 2013 and completed its operations in November 2013.
The exercises validated a number of capabilities and levels of collaboration, and tested international strategic exchanges between National Coordination Centres and with land, sea and air assets as well as information services, in accordance with EUROSUR rules and the PERSEUS Data Model. It validated a number of key features, delivering

- continuity of vessel tracking from Atlantic Ocean to Italy through the multi-National and multi-agencies exchanges of tactical information and tracks between 4 countries – Portugal, Spain, France and Italy - based on PERSEUS recommended standards;
- national demonstrations showing the implementation of PERSEUS architecture and innovations at each level of the chain of surveillance and of the chain of command and control.

Check out full details of the Western Campaign exercises in newsletters 4 and 5, of the Eastern Campaign in newsletter 6

PERSEUS EASTERN CAMPAIGN

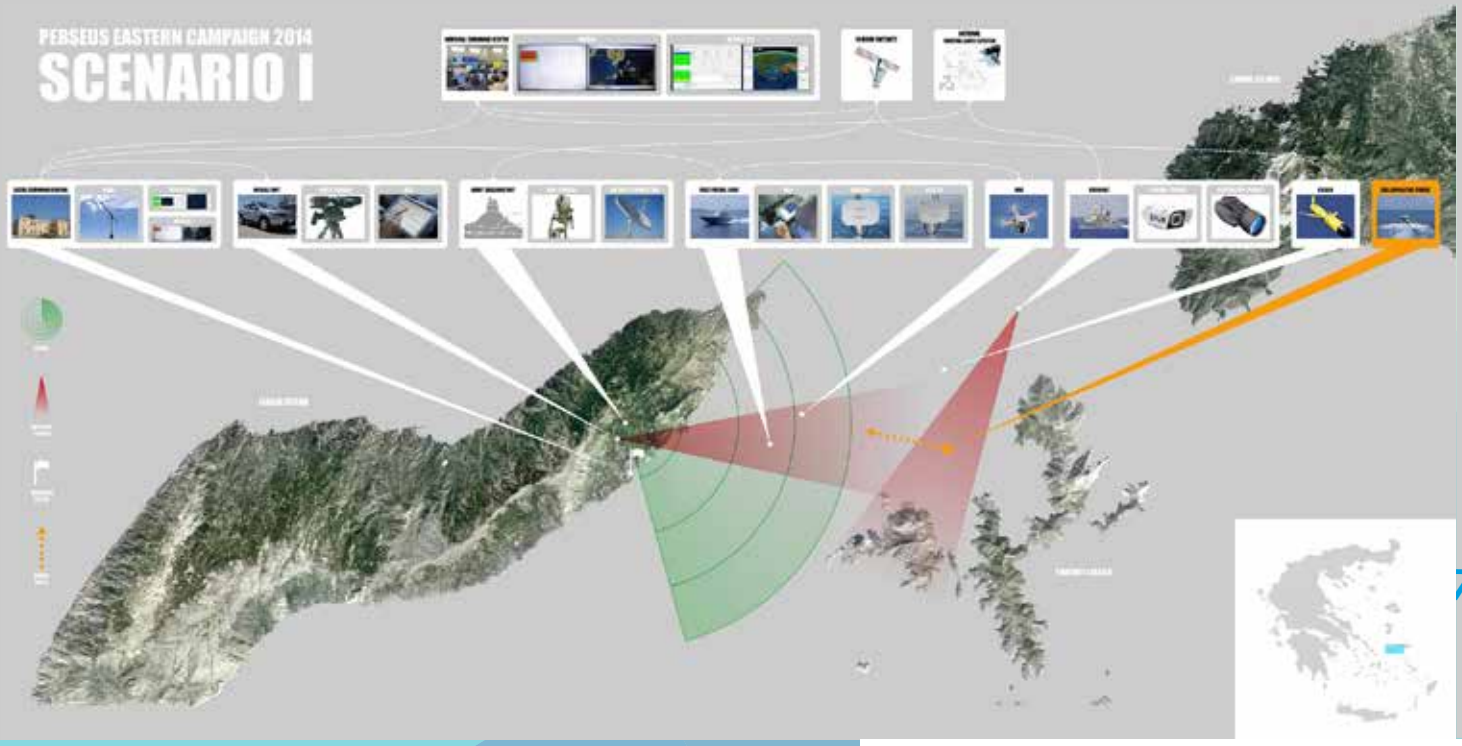


Figure - Eastern Campaign Scenario I

Figure - Eastern Campaign Scenario II

The Eastern Campaign started in 2014.
The first scenario was carried out in two different geographical locations and two different operational workflows implemented as scenarios.
The main objective was to demonstrate how a Member State could quickly deploy a capability that is aligned to the target performances.

Scenario I addressed the problem of irregular migration flows coming from the East, through the short straits between the Greek islands and Turkey and simulated an episode where traffickers embark irregular immigrants on a high-speed small boat at Fournoi island and attempt to cross the narrow strait heading to IKARIA without being spotted by patrol vessels or surveillance radars. The objective of this scenario was to test and demonstrate an improved capability to detect high-speed small targets (rubber boats) crossing the Greece-Turkey straits and facilitate timely reaction.

Scenario II addressed the problem of smuggling of goods. It simulated an episode where smugglers load illegal cargo on a sailing boat at a small inlet of Rhodes island and then drift Westbound, towards Crete, Peloponnesus with final destination the Southern Italian Coast. The objective of the scenario was therefore to demonstrate an improved capability to detect, identify and continuously monitor small vessels - like sailing boats and cruisers not obliged to carry AIS - travelling west-bound and covering long distances. Several detections occured one after the other, using different assets like surveillance radars, Patrol aircrafts/ helicopters, Patrol vessels, UAVs and the challenge is to recognize the same vessel identified in previous detections and increase situational awareness along the way.

Incremental integration and testing of new operational capabilities through PERSEUS campaigns

Maritime surveillance in Europe is performed by numerous systems belonging to several entities from different countries which were, and still are, developed largely independently from one another.

From the start, PERSEUS' ambition was to **enhance these systems** to make them **interoperable**, paving the way for the level of collaboration required to effectively achieve integration in maritime surveillance whilst at the same time introducing new capabilities to advance needs such as the detection of small vessels. In a first phase, the approach and methodology of PERSEUS, based on widely accepted models and tools, led to the definition of an "ideal" European metasystem at horizon 2018/2020 in accordance with EUROSUR and CISE guidelines. Then, 3 major milestones as **3 incremental steps** of operational capabilities were defined for PERSEUS, taking the ideal system as a target. These milestones were **validated through dedicated campaigns**:

- Western Mediterranean campaign exercises between Spain and Portugal based on real scenarios of illegal immigration and smuggling (September and October 2013),
- Western Mediterranean campaign transverse (multi-national and multi-organisations) exercise led from France and involving Portugal, Spain, France and Italy to demonstrate operational capabilities to warrant the continuity of the action at sea between European Member-States (November 2013),
- Eastern Mediterranean campaign to demonstrate how the PERSEUS solution can be quickly implemented without a large substrate of legacy systems (September and October 2014) involving Greece and Italy, with the support of assets from other PERSEUS partners.

Across these 2 campaigns and supporting exercises, PERSEUS tested and enhanced a total of 40 different systems and assets, interconnecting 17 during the Western campaign in 2013 and 23 in the Eastern campaign in 2014.
These 3 major milestones also implemented the PERSEUS data model in 3 incremental versions to **maximize the interoperability between heterogeneous and multi-national systems** both at strategic level and at tactical level. The implementation of the PERSEUS data model, based on the EUROSUR data model for the exchanges between National Coordination Centres (NCC) and integrating the most widely used standards like IVEF and ASTERIX for the tactical exchanges, was a major success in PERSEUS as it demonstrated that the **legacy systems could be easily interconnected** and could reach a **first interesting level of interoperability without huge development efforts**.

Western Mediterranean campaign exercises

As a first milestone in the system of systems implementation, these exercises were performed essentially between Spain and Portugal. The new operational capabilities implemented and tested successfully were:
At Strategic/multi-National level: the capability to exchange alerts and events between Spain and Portugal with two different organisations, one more centralized – Spain with Guardia Civil where the NCC has a clear operational role – and the other one – Portugal - more distributed where the NCC is a collaborative entity between several ministries and involving Coast Guards, Navy and Air Force. The two PERSEUS NCC capabilities developped in the two countries incorporated a first level of Intelligence capability to orient the surveillance. The system in Spain also incorporated the capability to identify suspicious behaviours to support classification and the access to services such as weather information.
At tactical level, in Spain, the innovative capabilities were implemented on the structure of SIVE, the Guardia Civil surveillance systems (as this system is state-of-the art and already integrated). They consisted in a new version of the tactical system on board the CN 295 aircraft with real time exchanges with the Ground system, the Spanish ATLANTE UAV and the Portuguese Antex – A02 that provided a good support to define the concept of operation and of integration of UAVs in the maritime surveillance domain. The Spanish off-shore patrol vessels were also integrated in the surveillance system to exchange information in real time. In addition, a low-cost radar was tested with an interesting capability to detect low flying aircraft.

Western Mediterranean campaign transverse exercise

The main capabilities tested in this exercise were:

1. To complete the international capabilities (at strategic and tactical level) to demonstrate and test the continuity of action at sea in the whole Western Mediterranean basin (on a scenario starting in Portugal, then involving Spain, France and Italy). The exercise proved that **PERSEUS provides the capability to exchange information and to collaborate through the various existing Command and Control capabilities**. The tests also illustrated the flexibility of the system to adapt to different organisations where the operations can be led from a national level (Spain, Italy), from a regional level (France) and through various organisations (Portugal).
2. To implement a PERSEUS vision of a possible future French surveillance system based on SPATIONAV (the other state-of-the-art legacy system in Europe). The focus was put on the integration of airborne surveillance capabilities, both at local and regional level and on enhanced Command and Control capabilities at regional level (decision support).

Eastern Mediterranean campaign exercises

The exercises performed in Greece were aimed at demonstrating the final versions of PERSEUS solutions through 2 main axes:

- Quick implementation of an integrated system in an area where different heterogeneous systems exist but are not inter-connected;
- Demonstration of innovative capabilities at each level of the system.

The situation in Greece was the most interesting in terms of system complexity since the operations involve 3 main actors: the Ministry of Interior in charge of the NCC, the Hellenic Coast Guards in charge of the operational mission and the Hellenic Ministry of Defence that possesses most of the surveillance systems and platforms. The key difference with the Western campaign in which PERSEUS involved mainly monolithic national systems (SIVE and SPATIONAV) is that the system deployed in Greece was largely **distributed** with a collaborative National level and highly capable Local Coordination Level that were equipped with all the means to command and control the operations locally under a national supervision.

Thus, a large amount of new capabilities were tested and validated operationally:

At National/Strategic level: development of 2 complementary Command and Control systems (ORASYS and OCULUS) that could elaborate and display a synthesis of the Surveillance picture and of the on-going operations. These 2 systems illustrated also the need to implement flexible solutions so as to provide an interesting interoperability level between 2 different entities equipped with different systems.

At local level (LCC), different configurations of the centres were implemented around the local Command and Control capabilities at various locations to test different innovating capabilities:

- At Ikaria island: integration of legacy radars, video cameras, under-surface gliders with passive sensors;
- At Rhodes island: integration of video capabilities;
- In Crete: integration of a light maritime surveillance, the MRI and integration of the capability to detect mobile phones to support ships identification and tracking;
- In Aktio Air Base: a full LCC configuration integrating the Local C2 ORASYS (connected to the NCC in Athens), a local integrated surveillance system, an intelligence workstation, one maritime surveillance aircraft (SAMSARA), a Greek unmanned airborne system (PEGASUS) and 2 tactical UAVs, one fixed wing (DVF 2000) and one helicopter (Copter 4). Aktio was also the first opportunity to test the optimized planning and tasking of the mobile sensors to optimize the surveillance according to the intelligence information (pre-border intelligence picture) and to illustrate the real time queuing between the various layers of surveillance platforms.

An invaluable operational feedback

Beside the system and technical aspects of PERSEUS implementations, the most important aspect of the project has been the **active involvement of the end-users and stakeholders**. In all the countries involved in the campaigns, the political and operational entities remained highly committed and motivated during the project lifetime and the concrete results of the demonstrations have been integrated both at International level (Frontex Concept of Operation) and at National level, where the results of the tests and the innovative technological capabilities will be taken into account and will influence the roadmaps for future system developments.

PERSEUS Data Model - exchanging information in an integrated maritime surveillance system

The PERSEUS Data model is one of the most important outcomes of PERSEUS, delivering the capability to exchange data in a common framework by consolidating all potential information exchanges required to create an integrated maritime surveillance space.

The first version of the data model was implemented in October 2012 through PERSEUS connectors, with the first developments at Engineering Ingegneria Informatica and DCNS, followed by connectors at Indra and Cassidian deployed, tested and validated during the Western Campaign in 2013 and the Eastern Campaign in 2014.

Therefore, the data model remained an on-going work during the lifetime of PERSEUS, with iterative improvements based on the feedback received during 2013 and 2014 when the final version of the data model was defined.

The ***connectors*** implemented the data model in terms of interoperability between different maritime surveillance systems and have been validated through the creation of integrated maritime situation pictures across wide geographical areas.
For these implementations, the Interface Control Document (ICD) level has been added complementing the data model with **implementation guidelines enabling the coding of the PERSEUS connectors**.

Thanks to the testing and validation phases during the PERSEUS Campaigns, the data model has been further expanded and updated based on the needs that have emerged, including the support for an enhanced taxonomy, the addition of information to the vessel track layer etc.

Delivering the PERSEUS External Application Interfaces

The data model is complemented by the **PERSEUS External Application Interfaces (EAI)**, defining the application/network protocols, formats, and associated technologies, enabling the exchange of data, information and intelligence with 3rd party information providers and other Command & Control Systems, Reporting Systems, etc.
Together, the data model and the EAI form the **PERSEUS interoperability framework**: this enables the exchange of data, information and intelligence with 3rd party information providers and other Command & Control systems beyond the PERSEUS consortium. It was released externally in December 2012.

Key facts

The PERSEUS Data Model and the Campaigns
the PERSEUS Data Model specifications and guidelines have been used during the two PERSEUS campaigns, to allow the national systems involved in the exercises to exchange pre-defined information.

Paving the way to CISE
The PERSEUS data model is expected to serve as basis for the further development of a common maritime information sharing environment, using and integrating a complex array of information provided by the European and national agencies. By means of its large scale demonstrations, PERSEUS has already set the standards and grounds for the future development of EU maritime surveillance systems, thus paving the way towards the achievement of a Common Information Sharing Environment (CISE).

The PERSEUS Data Model - extending the outreach of C^2 systems
The PERSEUS Data Model represents a first concrete example of multi-sectoral maritime surveillance. Today, thanks to the PERSEUS Data Model, C^2 "vertical" systems can handle "objects" that are not typical of the domain for which they have been realised (maritime security, maritime safety, etc.).

Capability: SAAB - Secure AIS

In the PERSEUS project two vessels (OPVs) were equipped with R5 Supreme Secure AIS transponders and two aircrafts (MPAs) were upgraded to R4A Airborne Secure AIS.
The Saab Secure AIS concept uses a dedicated internal transceiver for BFT functionality while maintaining full performance on the public AIS 1 & 2 channels.
It also enables the user to send text messages or it can work as an arbitrary data link between external systems.
This data link functionality has been used in a number of unique features such as situational picture download as below;

- An A/C equipped with Saab´s Secure Airborne AIS Transponder (R4AS) receives AIS data
- The desired AIS data can be downloaded via the Secure Link (Interrogation from ship or base station)
- No action from A/C personnel required
- Full AIS based situational awareness!

Figure - BFT tool for tracking and secure communication

Download of situational data can also be extended with radar tracks. This means that the aircraft radar information can be downloaded and displayed also on surface units.
The Secure AIS data link can also be used for generic file transfer, e.g. exchange of low resolution pictures.
The R4A Secure Airborne AIS systems installed in the MPAs during the PERSEUS project **increased the coverage area of a ground based AIS system** within VHF range of the aircraft to also include the aircrafts coverage area. This can be utilized by the OPV. The coverage of an airborne AIS transponder is fully dependant on its altitude. At 6000 meters a coverage radius of up to 240 nm (445km).
The Secure AIS Data Link can operate on any 25 kHz channel in the band 155 -163 MHz and supported embedded crypto solutions are currently DES, AES and Blowfish.
One of the core strengths of the AIS technology is its robustness and ability to exchange data between AIS equipped assets independently of any additional infrastructure.
Next generation AIS called VDES opens the way to high speed Secure data transfer. VDES R&T will be tested in the EU funded program STM Validation programme during 2016 - 2018.

AIS: Automatic Identification System
BFT: Blue Force Tracking
OPV: Ocean Patrol Vessel
MPA: Maritime Patrol Aircraft

Capability: NATO - Cutting-edge systems for persistent, autonomous and real-time maritime surveillance

The Centre for Maritime Research and Experimentation (CMRE), which is part of the NATO Science and Technology Organisation (STO), has provided innovative concepts in the field of unmanned passive surveillance as PERSEUS project outputs. CMRE's objectives were the detection, classification and tracking of fast boats, which generally have small radar signatures and do not carry AIS, and, hence, are difficult to be detected with conventional surveillance technology.

Within this framework, CMRE's main task was to design, develop and demonstrate at sea **innovative concepts of continuous, real-time passive underwater acoustic systems,** integrated into appropriate unmanned mobile platforms, namely an underwater glider and a WaveGlider. Furthermore, looking toward the future of persistent, autonomous, networked, continuous real-time monitoring of the world's maritime areas of interest, CMRE conducted investigations on other potential technologies.

Passive acoustic surveillance

A cutting-edge passive acoustic system was designed, developed and integrated into autonomous vehicles. Passive underwater acoustic technologies applied to autonomous mobile underwater platforms allow for: minimum environmental impact, covertness, persistence, wide area coverage, near real-time continuous ('24/7') monitoring and the availability of several functionalities ranging from the detection to simultaneous classification of multiple acoustic noise sources.

To this purpose, two concepts were developed, integrated, tested in-lab and finally successfully demonstrated at sea.

First concept: The underwater glider for acoustic surveillance

The problem of monitoring surface vessels in a defined sea area was first addressed through a passive acoustic payload hosted onboard an underwater glider.

An underwater glider is an autonomous vehicle following a saw-tooth path through the water column by varying its buoyancy and moving its centre of mass. Its wings play a crucial role by creating lift forces which, when combined with buoyancy changes, provide the glider with the capability of horizontal movement. Hence, its motion is extremely quiet and is characterized by very low power consumption. Able to host a wide variety of sensors, an underwater glider can be programmed to patrol a sea area for a long time, periodically surfacing to transmit its data to shore while downloading new instructions to continue its mission.

CMRE designed and developed an advanced underwater acoustic measurement system and ad-hoc data processing algorithms aimed at automatic detection, localization, tracking and classification of vessels passing in an area of interest. For PERSEUS, an acoustic aperture in the form of a compact volumetric array was designed and installed on the nose of a Slocum underwater glider (cf. Figure below, also: http://www.webbresearch.com/), augmented with a hydrophone placed towards the rear end of the vehicle, therefore spatially separated from the nose array, this in order to enable long-baseline measurements. The acoustic payload module hosted on the glider was fully designed and developed at CMRE and implements real-time detection and localization of motor boats. The CMRE project objectives were achieved through the real-time implementation of ad-hoc array processing methods based on the exploitation of time coherence among the signals received on each hydrophone of the antenna. The maximum detection and localization range experimentally measured covered an area of the order of 3 km^2.

For classification, a supervised, statistical pattern recognition algorithm is fed with a set of numerical features extracted from the boat signature. Further than the class "generic vessel", three classes were considered: small motor boat, mid-sized motor boat and ship/ferry.

Figure - Example of experimental result achieved at sea during PERSEUS final demo (Eastern Campaign, Sept. 2014). During one of its missions (glider track in yellow line) the glider detected and localized a small boat crossing the area (boat trajectory: true in red, estimated in white).

After the detection of a target is over, the glider surfaces to communicate processing results to its control room and to PERSEUS Command & Control. At the present, a Slocum glider equipped with such a payload has an endurance of the order of weeks.

The prototype of this system was successfully demonstrated during the Eastern Campaign (Exercise 5 – Scenario 1) in the Ikaria channel, Greece in September 2014 (see Fig. on the left). Output results were integrated into PERSEUS local and National C2 stations.

Second concept: Acoustic surveillance by using a WaveGlider

CMRE recently adapted the acoustic surveillance payload described above in order to place it on board a Liquid Robotics WaveGlider (www.liquidr.com). Having a float component, a WaveGlider is slightly less covert than an underwater glider. However, due to its peculiar propulsion mechanism, fully driven by sea waves, and to the solar panels hosted on its float, the persistence of a WaveGlider is nominally unlimited.

Further, its continuous communication link to shore, through

either radio or Iridium links (depending on its distance from the C2 station), allows faster response (in the order of a few minutes maximum from the appearance of a boat in the "field of view" of the system) than an underwater glider.
The detection/tracking part of the payload was hosted in the WaveGlider's towfish, while its surface component (hosted on the float), integrates the target's trajectory with in-stride GPS data and communicates processing results to a C2 station through radio link or satellite communication in near real-time (see Figure below). This capability was successfully shown in La Spezia waters in April 2015 and during the final demo in Gran Canaria in May 2015 (as detailed in a dedicated Section). System performance is comparable to that achieved with the underwater glider.

Overall conclusions

Underwater acoustic surveillance with highly persistent mobile robots has been proven – for the first time – at a technology demonstrator level. Real-time detections have been made both on-board the underwater glider and the WaveGlider, and the detection/tracking results have been disseminated to both CMRE and the PERSEUS National Control Centre (NCC). Also, target classification algorithms have been applied successfully in near real-time during at-sea demonstrations (both in the Eastern Campaign and the Western Campaign).

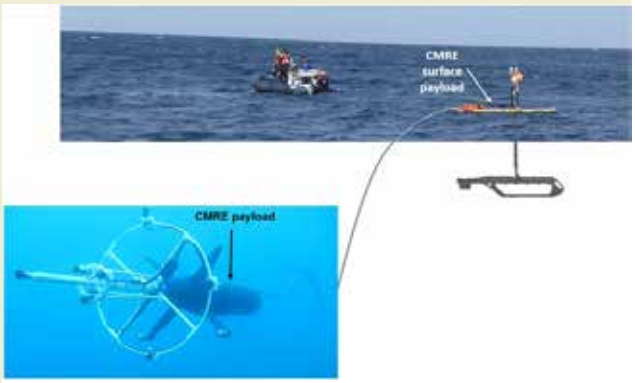


Figure - WaveGlider with CMRE's real-time underwater acoustic surveillance payload.

Future concepts: technology watch activities

Looking at the future of persistent, autonomous, networked, continuous real-time monitoring of the world's maritime areas of interest, CMRE has conducted a technology watch and some modest experimentation. The objective was to explore the efficacy of providing a shoreline surveillance capability to detect small boats and light aircraft. It is desirable that the capability should be able to provide surveillance for weeks at a time and that it should be discreet in operation, so that it may develop a picture of the pattern-of-life against which anomalous behaviours may be detected. It is expected that the solution shall form part of a layered approach that will include a wide range of diverse platforms and technologies; it is critical that these systems interoperate to enable cross-cuing, for example.
The CMRE has used both underwater and Wave Gliders for oceanographic survey and it is possible that if these platforms can be made to work in shallow coastal waters with a suite of above- and underwater surveillance sensors, the required capability may be achieved. The sensors should aim at discerning the location, movement, identity and intent of vessels in the scene and given the likely power constraints, passive sensing is preferred. It is likely that vessels of interest will be feature-sparse, as they aim remain undetected through covertness; conversely most other vessels are likely to be feature rich. The sensing scheme should exploit the wide range radiative features of maritime traffic in order to overcome the limitations of any single mode of sensing and reduce the false-positive detection/classification rate. Daylight and thermal cameras provide visual and thermal images of vessels; radio detection and direction finding can be used to receive AIS, VHF and intercept radar transmissions; and finally passive sonar will exploit vessel radiated noise.
The CMRE has conducted some at sea experimentation to **better understand the small boat detection effectiveness of inexpensive cameras** such as GoPros, compacts, mobile phones etc. It was found that detection of a small boat could be made at 3500 m using a 12 MP camera with a 60 degree field of view. Thus 6 cameras could be used to provide a permanent all-round look. During the same trial, **a radar intercept device (Mervielle) detected a small boat out to 6000 m and gave an approximate indication of bearing.**
Clearly any initial capability based on glider surveillance will follow pre- programmed routes or be remotely controlled, i.e. human centred. A significant current limitation is the bandwidth of commercial satellite data rates which restrict the transmission of e.g. GoPro images to an order of minutes. But providers like Iridium are promising data rates in excess of 120 kbits/s in the very near future which should improve this situation. To arrive at a final (machine centred) capability, significant challenges remain in: sensor data fusion, platform autonomy and pattern-of-life machine learning.

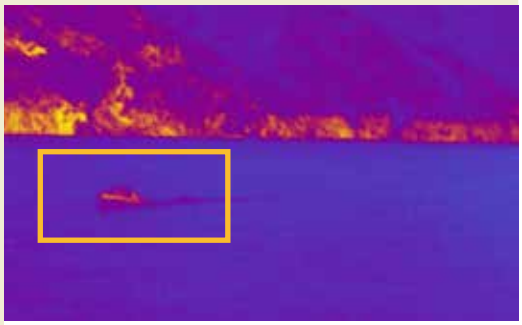


Figure - Fast boat detection with a low-cost thermal camera

Capability: INOV - Developing and supplying all Portuguese end users with the PERSEUS Portuguese system node

The Portuguese system node in PERSEUS was developed and supplied by INOV to all Portuguese end users – Portuguese National Guard, Portuguese Air Force and Portuguese Navy.

Its architecture design included a National Control Centre (NCC), three Regional Control Centre (RCC) and two Local Control Centres (LCC) connected hierarchically using a private communications network from PERSEUS. The user interaction component was provided using web based technologies which allowed for an easier system deployment and also enabling a rich usage for all end-users.

Figure - PERSEUS Control Centre Screenshot

The system allowed, as its main operational capability, to dynamically share all the relevant information received from several national and international sources to all the interested (and connected) end users. This was particularly relevant when watching special events unfold like the live demos that were done in PERSEUS.

The Portuguese end-users and INOV participated in the Western campaign in the exercises 1 to 4. Their participation involved several assets and systems including piloted aircrafts, UAVs, surface vessels, sensor based systems like the AIS, SIVICC and human resources for the live trials.

Capability:
DFRC - deploying innovative technology to detect small vessels

As part of the PERSEUS project's maritime surveillance demonstrations, DFRC deployed its innovative technology, SeaSearch, of onshore proprietary mobile phone detectors, at ports and on the coasts of the Mediterranean and Aegean Seas, from 2013 to 2014.

SeaSearch high accuracy tracker-software engines spotted vessels using a small number of measurements ("plots").

Small vessels without AIS have been also detected, thanks to mobile phone signals transmitted passively by the persons on board.

The detection range measured in Greece during the trial sessions in October 2014 reached 200 km with SeaSearch Wi-Fi sensor.

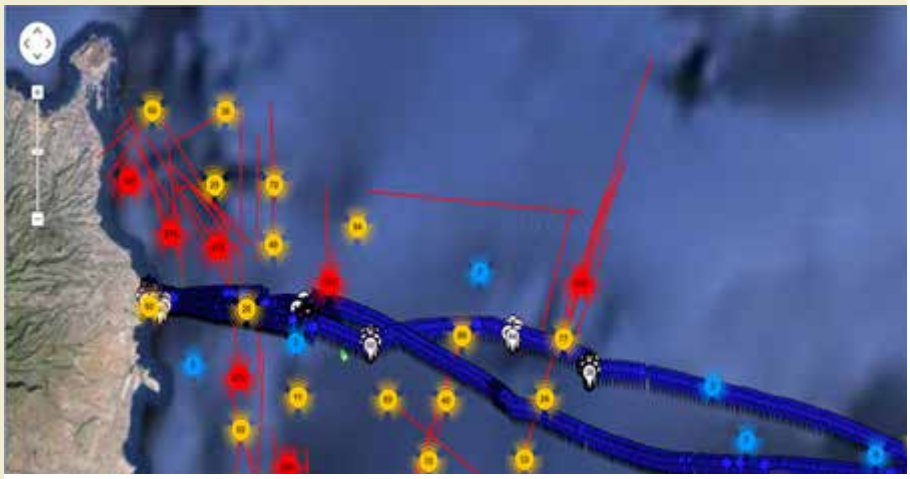
By integrating space data from PERSEUS partners, DFRC's data fusion engines then correlated anonymous mobile phone data, position data, and boat identification data, generating the enhanced Maritime Situation Awareness Pictures.

These **Maritime Situation Awareness Pictures** focus on providing advanced and reliable alerts when smuggling, illegal fishing, human trafficking and other abnormal activities are detected, **even performed by small vessels without AIS.** SeaSearch is easily deployable, operating 24/7, agnostic to vessel's size and offers full integration capabilities in any existing Maritime Situational Awareness Picture system.

Capability:
Plocan - participating to the PERSEUS Western Campaign with the WaveGlider Asset

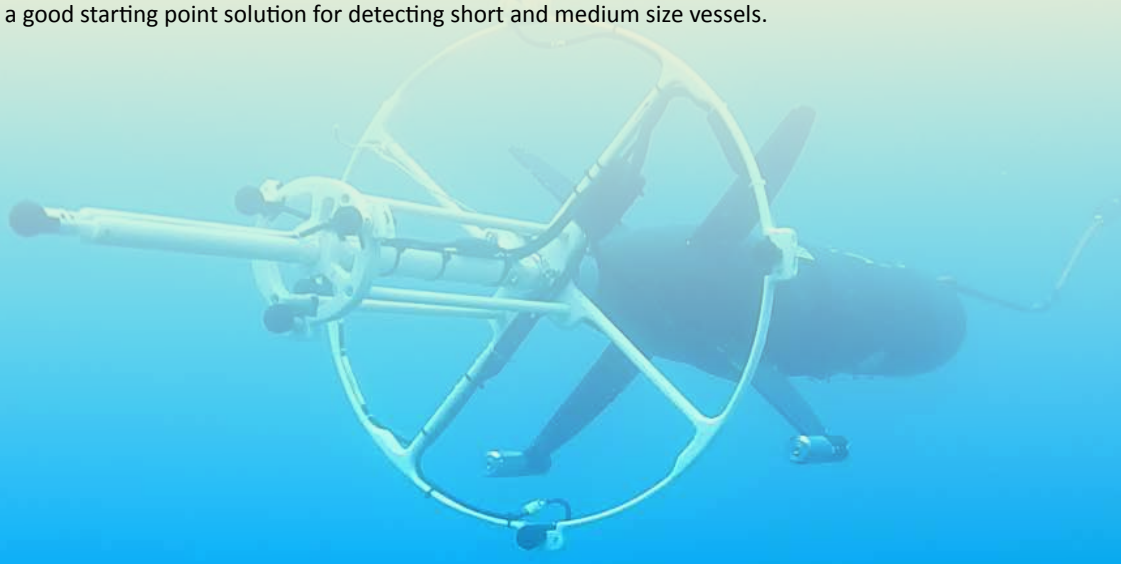
In the scope of the PERSEUS project, PLOCAN performed some exercises at sea to test the technology solution proposed to detect short and medium size vessels.
Those tests shaped the participation to the PERSEUS Western Campaign. The technology used on those tests includes an autonomous surface vehicle Wave Glider SV-3, suited by Liquid Robotics and a passive acoustic module (PAM) system developed by CMRE for the PERSEUS project.
The Western Campaign was composed by three exercises. The first one was planned in order to test the operational and communication capabilities of the vehicle offshore. Those were tested on a 5 days mission at the south-east of Gran Canaria.

During the mission the Wave Glider transmitted periodically – every second minute - information regarding navigation and weather conditions measured using its mounted sensors. Especially important for the aims of the project was the transmission of the AIS data received by the Wave Glider while on route which gives information related to the sea traffic around its path. The Wave Glider was deployed on the 25th of March, and successfully recovered on the 30th of March, after covering more than 80 nm.



Screenshot of the piloting web control interface showing AIS information received by the Wave Glider across the 80 nm path.

Once the vehicle was successfully tested, a second set of exercises were performed in order to test the detection capabilities of the PAM system developed by the CMRE. The system developed is composed by an array of hydrophones attached (towfish) to the wave glider float, an autonomous communication system coupling both IRIDIUM and RF technologies and a processing system capable of detecting position, speed and type of vessel detected. The detection exercises were performed simulating real detection cases using a target rubber boat at La Spezia waters.
Finally, the whole system was calibrated during several days at the Canary Islands waters in order to perform the Western Campaign of PERSEUS, which constituted the final demonstration exercise of the project. It took place on the 14th of May 2013 at PLOCAN facilities, with the presence of Indra, Guardia Civil and Isdefe. During the Western Campaign, several detections were performed simulating real detection scenarios using both short and medium length vessels. The operation details were followed in real-time by the different stakeholders from the PLOCAN pier and the PLOCAN control room located in our lab.
The successful results of these exercises revealed that the system composed by the wave glider and the passive acoustic module constitutes a good starting point solution for detecting short and medium size vessels.



Cost Benefit Analysis of PERSEUS – how can PERSEUS capabilities improve maritime surveillance?

During its 4 and a half years, PERSEUS built and tested EU maritime surveillance integrating existing national and communitarian installations and enhancing them with innovative technologies. The innovations range from services providing new information possibilities such as the detection of small boats to techniques enhancing coordination capabilities between countries or exchanging information between civilian and military authorities.

PERSEUS partners tested 40 different systems and assets, 17 during the Western campaign exercises and 23 during the Eastern campaign. In addition, two exercises running over 6 months period focused on information exchange, while the other exercises involving sea, land and air assets run over one day each. The systems and assets, provided by 19 PERSEUS partners, belonged to 4 categories,

- Services & databases: providing new information capabilities;
- Command and Control (C^2) Systems: Workstations providing new C^2 and coordination capabilities;
- Legacy element/legacy upgrade: providing an exchange of information between civilian and military authorities;
- Platform/sensors: providing new acquisition capabilities.

Preparing for the future, PERSEUS worked since the beginning on procurement and cost benefit analysis that together help support Member States prioritise where, why and how to invest.

The procurement work, presented in newsletter n°6 and available online as one of the key results of PERSEUS, analysed the different legal contexts across Member States and procurement approaches. The added value is to clearly identify different procurement channels that Member States can use, with the advantages and drawbacks of each of the channels (presented in the project deliverable D43.4). In addition, innovative models for procurement and for ownership and financing have been identified, and an analytical framework was developed to support selection of the most appropriate models.

The Cost Benefit Analysis (CBA) is a socio-economic appraisal method that determines if a project is beneficial for society. In this approach, the Cost Benefit Analysis (CBA) complements the procurement work by identifying the main project benefits, quantifying and monetising those benefits, calculating the project costs and balancing the costs and benefits.

The detailed CBA analysis is presented in the PERSEUS deliverable D26.4 which provides quantitative analysis of the different dimensions of PERSEUS, including an analysis of the robustness of the CBA results versus the different assumptions made about a typical PERSEUS configuration. This article presents a very high level overview of this analysis.

The baseline for the CBA is the situation without PERSEUS. The baseline scenario is compared with the scenario in which new maritime surveillance capabilities, tested in PERSEUS, are implemented. By identifying the differences in benefits between the baseline scenario and the situation in which new techniques are introduced the benefits and drawbacks are determined.

The point of view of the CBA in this approach is exclusively European meaning that all costs and benefits for Europe were taken into account, but not potential benefits or costs that arise outside of Europe.

One Command and Control System for 5 countries (with software upgrade, event management, situational picture, data exchange, etc.
A data fusion engine, such as the one proposed by PERSEUS (which fuses different inputs such as mobile phone location data, AIS, Earth Observation data to detect abnormal activities at sea)
Suspicious vessel database
An Unmanned Aerial Vehicle (UAV) for 5 countries (providing real-time imagery and video to the user)
50 Offshore Patrol Vessels (OPV) on which communications and software is upgraded, secured AIS installed
One surveillance radar platform
50 Gliders

Costs of a typical PERSEUS cooperation configuration

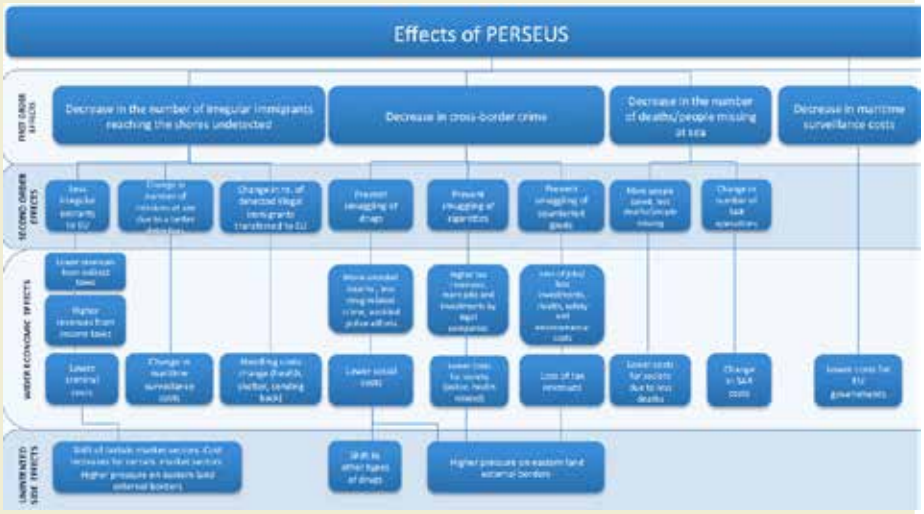
To analyse the costs of PERSEUS, a detailed analysis was done for each of the 40 services and assets, including the investment and maintenance costs and the economic lifetime. A typical PERSEUS configuration was then defined in the baseline scenario as shown in the table on the left, with a collaboration across 5 countries.

The analysis of costs made for this typical system was divided into investment, maintenance and upgrade. The investment cost was evaluated close to 100 M€. The maintenance costs comprise around € 5 million/year, or 5% of the investment costs. This led us to incur a **100 to 120 M€ overall maintenance and replacement** costs for a 20 year period of 2015-2034.

Effects of PERSEUS

To analyse the socio-economic benefits, the three main goals, or so-called first order effects, of PERSEUS were identified as:

1. Improve detection of irregular migration at sea resulting in fewer irregular migrants reaching the shores undetected;
2. Improve maritime safety resulting in a decrease in the number of people missing at sea;
3. Increase internal security of the EU as a whole by contributing to the prevention of cross-border crime (such as smuggling of drugs, cigarettes, counterfeit goods, etc,). Resulting from the increased cooperation between organisations/ countries a fourth first order effect of PERSEUS was identified:
4. Decrease maritime surveillance costs.



Based on these first order effects of PERSEUS, effects on society and the economy have been identified, based on literature analysis and modelling techniques. More specifically, the different levels include

- First order effects: direct benefits of PERSEUS resulting from its goals
- Second order effects: results that emerge from the first order effects
- Third order effects: the effects on society and the economy
- Indirect effects: unintentional side effects of PERSEUS

Unit costs have been determined, when possible, to convert these effects into monetary terms. The goal of the CBA was therefore to analyse the scale of each of the challenges faced in maritime surveillance without PERSEUS and analyse the potential effect of PERSEUS capabilities on modifying this scale.
The table below provides an example of quantifying one of the third order effect.

Third order effects of a decrease in cross-border crime:	European impact
1% decrease in the smuggling of cannabis	+€ 43-217 million/year
1% decrease in the smuggling of heroin and cocaine	+€ 650 million/year
1% decrease in the smuggling of cigarettes	+€ 11 million/year due to higher tax revenues + other non-quantified benefits (lower police costs, more legal jobs, health and safety effects)
1% decrease in the smuggling of counterfeit goods	+€ 0.32 million/year due to higher tax revenues + other non-quantified benefits (lower police costs, more legal jobs, health, environmental and safety effects)

Another example resulting from the CBA analysis relates to the cost of maritime surveillance, with a 1 % decrease in maritime surveillance costs in the Mediterranean leading to a European level economy of 26.5 M€ on an annual basis.

Interpreting the CBA results

The results of the CBA are indicative results: not all benefits (both positive and negative) can be quantified in monetary terms. The same is true for the costs. However, the starting assumptions in maritime surveillance rely on a reality both in terms of capabilities and collaboration levels that have been tested extensively by actual maritime surveillance operators through live exercises, during the lifetime of PERSEUS.
What the CBA analysis does demonstrate is that overall, even at first order effect level, the benefits of investing, across different Member States, in an integrated and collaborative maritime surveillance approach far outweigh the costs.

> The benefits of investing across different Member States in an integrated and collaborative maritime surveillance approach far outweigh the costs.

PERSEUS on the Road

During PERSEUS' lifetime, dissemination activities played a crucial role in providing **visibility** to the project results, raising awareness and encouraging **active participation** from relevant stakeholders and users.
The overall dissemination strategy was defined when the project started and was further updated by detailing specific actions set up based on the dissemination targets.
Dissemination activities supported PERSEUS by aligning activities to the achievements of the technological capabilities and exercises, through printed information, online activities, demonstration events and conferences.

- *Newsletters, Publication and Press visibility*, **40 press articles and 7 Newsletters**
- *Website* - **online PERSEUS presence** with full access to results, videos and activities.

MAIN OUTPUT

	2011	2012	2013
	M1 - M18 *User community creation and implementation*	**M19 - M24** *Excercises, Architecture, data model definition*	
NEWSLETTERS	2 NEWSLETTERS SEPT. 2011 nr. 1 FEB. 2012 nr. 2   WHAT CAN I FIND? NR. 1 Interview - Paolo Salieri, "European Commission PERSEUS's position in research" NR. 2 Interview - Oliver Seiffarth, EC Interview - Erik Berglund, Frontex Interview - Guardia Civil, Spain Interview - Frontier Police, Italy	2 NEWSLETTERS SEPT. 2012 nr. 3 SEPT. 2013 nr. 4   WHAT CAN I FIND? NR. 3 1st PERSEUS conference PERSEUS data model defined Join PERSEUS NR. 4 PERSEUS data model implemented Western Campaign defined
EVENTS AND CONFERENCES	+ 13 MAJOR EVENTS PERSEUS CONFERENCE (MARCH 2012)	+ 4 MAJOR EVENTS 1ST PERSEUS DEMONSTRATION EVENT (24/09/2013 - MADRID)
ONLINE VISIBILITY AND PRESS	PERSEUS WEBSITE SET UP +21 PRESS ARTICLES AND THIRD PARTIES REFERENCES (PRINTED AND ONLINE)	PERSEUS WEBSITE CONTINUOSLY UPDATED (+NEW PAGES DEICATED TO SPECIFIC EVENTS) + 15 PRESS ARTICLES AND THIRD PARTIES REFERENCES (PRINTED AND ONLINE)
GRAPHICS	PROJECT LOGO, TEMPLATES, PROJECT PRESENTATION (PPT), 2 POSTERS	PERSEUS OFFICIAL VIDEO (PRESENTED AT THE PERSEUS DEMONSTRATION EVENT)

- *Events and PERSEUS Conferences* - PERSEUS participated to **20 events** and **organised 4 major events**: 2 conferences (one at the start of PERSEUS in 2012 and a final conference in 2015) and 2 demonstration events in parallel to live exercises, giving attendees the chance to experience hands-on PERSEUS at work.

The large community of stakeholders that PERSEUS created in the context of the maritime community, is one of the major project results, extending beyond the initial (already large) group of partners to incorporate new technology providers and users during the lifetime of PERSEUS.

2014

M25 - M36

Campaigns and exercises deployment

2 NEWSLETTERS

MARCH 2014
nr. 5

WHAT CAN I FIND?
NR. 5
Western Campaign report
Eastern Campaign defined
1st PERSEUS demonstration event

+ 4 MAJOR EVENTS

2ND PERSEUS DEMONSTRATION EVENT (15/10/2014 - ATHENS)

PERSEUS WEBSITE CONTINUOSLY UPDATED (+NEW PAGES DEDICATED TO SPECIFIC EVENTS)

+ 4 PRESS ARTICLES AND THIRD PARTIES REFERENCES (PRINTED AND ONLINE)

2015

M37 - M48

Evolving towards elaborating on these lessons to prepare for exploitation and procurement

2 NEWSLETTERS

MARCH 2015
nr. 6

WHAT CAN I FIND?
NR. 6
Eastern Campaign report
Procurement channels
Interviews: Greek users

JUNE 2015
SPECIAL EDITION
nr. 7

PERSEUS FINAL EVENT (25/06/2015 - BRUSSELS)

PERSEUS RESULTS (WEB)

PERSEUS FINAL VIDEO

CONFERENCE DISSEMINATION MATERIAL

PERSEUS Dissemination

Elaborating a **strategy**, providing **support to the implementation** and **monitoring results**

KEEP FOLLOWING US!

Project Coordinator

Fernando Barbero, Indra at fbarbero@indra.es

Specific domains

User management and User Steering Committee
David Rios, Isdefe at drios@isdefe.es

PERSEUS Data Model Compliance Service
Carmela Occhipinti, Engineering at carmela.occhipinti@eng.it

Technology Watch
David Carmona Munoz, Indra at dcmunoz@indra.es

Privacy, data protection and societal impacts
Peter Burgess, Prio at peter@prio.no

Dissemination, speaking opportunities and press
Véronique Pevtschin, Engineering at veronique.pevtschin@eng.it

Collaborations and Technical Coordinator
Philippe Chrobocinski, Cassidian at philippe.chrobocinski@cassidian.com

Communication and Dissemination channels
Barbara Pirillo, Engineering at barbara.pirillo@eng.it

PERSEUS Editorial Board members

The PERSEUS newsletter is published with the support of an Editorial Board which is open to PERSEUS Partners

Barbara Pirillo	Engineering Ingegneria Informatica
David Carmona	Indra
Peter Burgess	PRIO
Philippe Chrobocinski	Cassidian
Rafael Zurita	Isdefe
Dick Mans	Ecorys
Véronique Pevtschin	Engineering Ingegneria Informatica
Iwona Maciejewska	DFRC

European Commission Project Officer

PERSEUS is a demonstration project selected under security call FP7-SEC-2009-1, theme SEC-2010.3.1-1 European-wide integrated border control system - phase II.
The PERSEUS Project Officer is **Paolo Salieri**, DG-Migration and Home Affairs at paolo.salieri@ec.europa.eu.

FRANCE
- Cassidian
- DCNS
- Intuilab
- Sofresud
- Ministry of Interior

SPAIN
- Indra
- Isdefe
- EADS Casa
- Boeing Research & Technology Europe
- Meteosim
- Guardia Civil
- Plocan

NETHERLANDS
- Ecorys

NORWAY
- PRIO

PORTUGAL
- INOV
- Força Aerea Portuguesa (FAP)
- Ministerio da Administracao Interna

IRELAND
- Skytek
- Cork Institute of Technology

ITALY
- Engineering Ingegneria Informatica

GREECE
- Demokritos
- Satways
- Hellenic Coast Guard
- Hellenic Ministry of Defense
- Center for Security Studies (KEMEA)

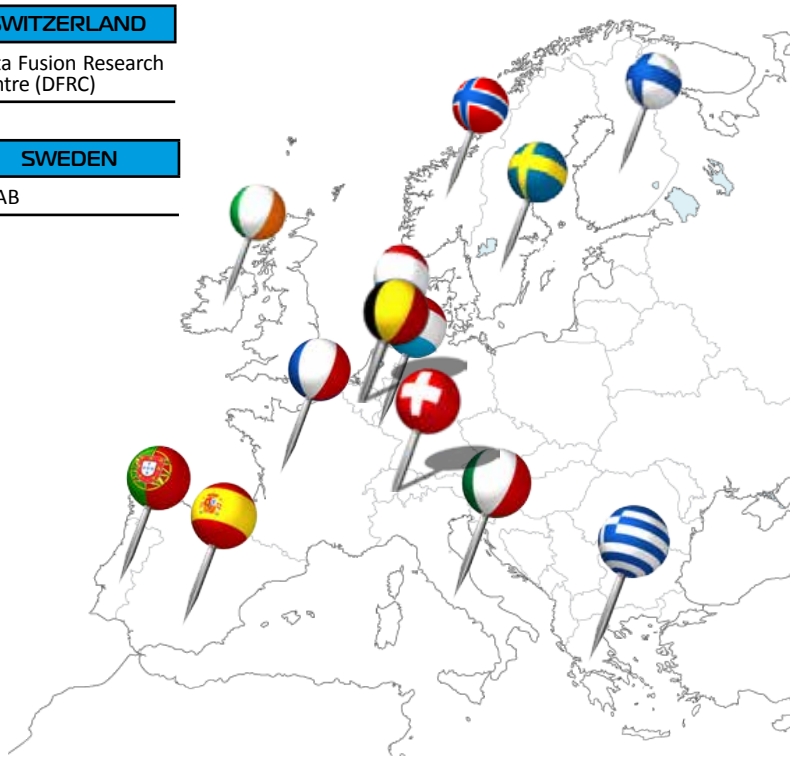
LUXEMBOURG
- LuxSpace
- SES Astra

SWITZERLAND
- Data Fusion Research Centre (DFRC)

SWEDEN
- SAAB

FINLAND
- Ajeco Oy
- Laurea

BELGIUM
- NATO STO-CMRE



Newsletter designed by Barbara Pirillo