

ROBORDER

Autonomous Swarm of Heterogeneous Robots for
Border Surveillance

This project has received funding from
the European Union's Horizon 2020
research and innovation programme
under grant agreement No 740593



ROBORDER as a project

Project information

ROBORDER

Grant agreement ID: 740593

[Project website](#)

Status
Ongoing project

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1 May 2017 28 February 2021

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H2020-EU.3.7.3.
H2020-EU.3.7.7.

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€ 7 999 315,82



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Greece



Problem in Border Management

- Border authorities face important challenges in patrolling and protecting the borders.
- Low levels of situational awareness
- Numerous and diverse aspects should be considered
 - Heterogeneity of threats
 - Wideness of the surveyed area
 - Adverse weather conditions
 - Wide range of terrains
 - Complex operational environments

Context and Vision for Border Surveillance

- The overall framework for the ROBORDER project includes multiple domains
 - Border surveillance
 - Marine pollution detection
 - Situational awareness
- Vision
 - Develop and demonstrate a fully-functional autonomous border surveillance system
 - Unmanned mobile robots equipped with multimodal sensors
 - Enhanced detection capabilities for early identification of criminal activities and marine pollution events

ROBORDER's Objectives

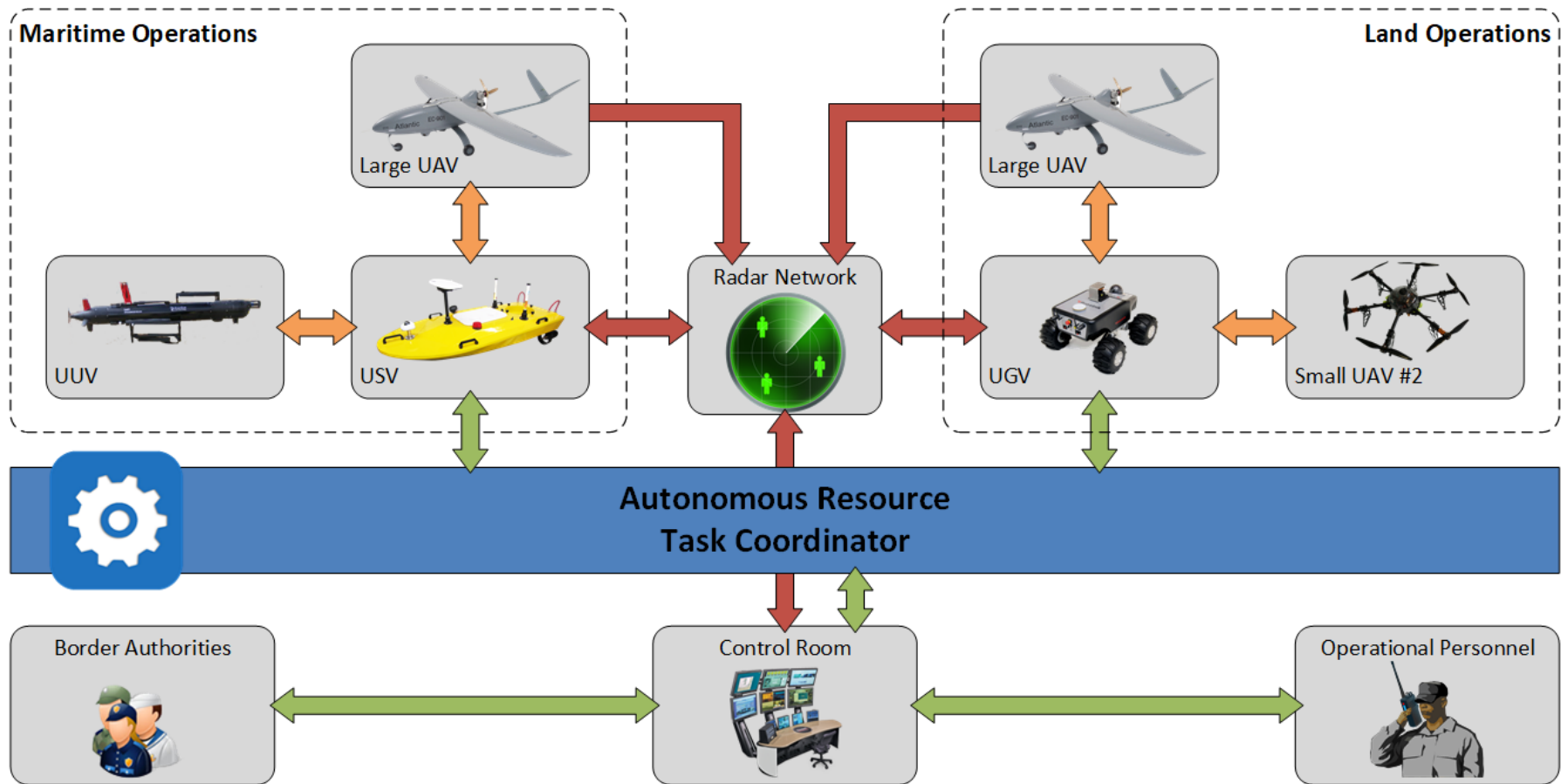
■ Main objectives

- Autonomous border surveillance system with unmanned mobile robots
- Incorporate multimodal sensors as part of an interoperable network
- Wide range of operational and environmental settings
- Enhanced static networked sensors
- Complete and situational awareness picture
- Early identification of criminal activities and hazardous incidents

■ Innovation objectives

- Adaptable sensing, robotics, and communication technologies
- Tele-operation of autonomous agents through a 3D user interface and decision support

ROBORDER Architecture

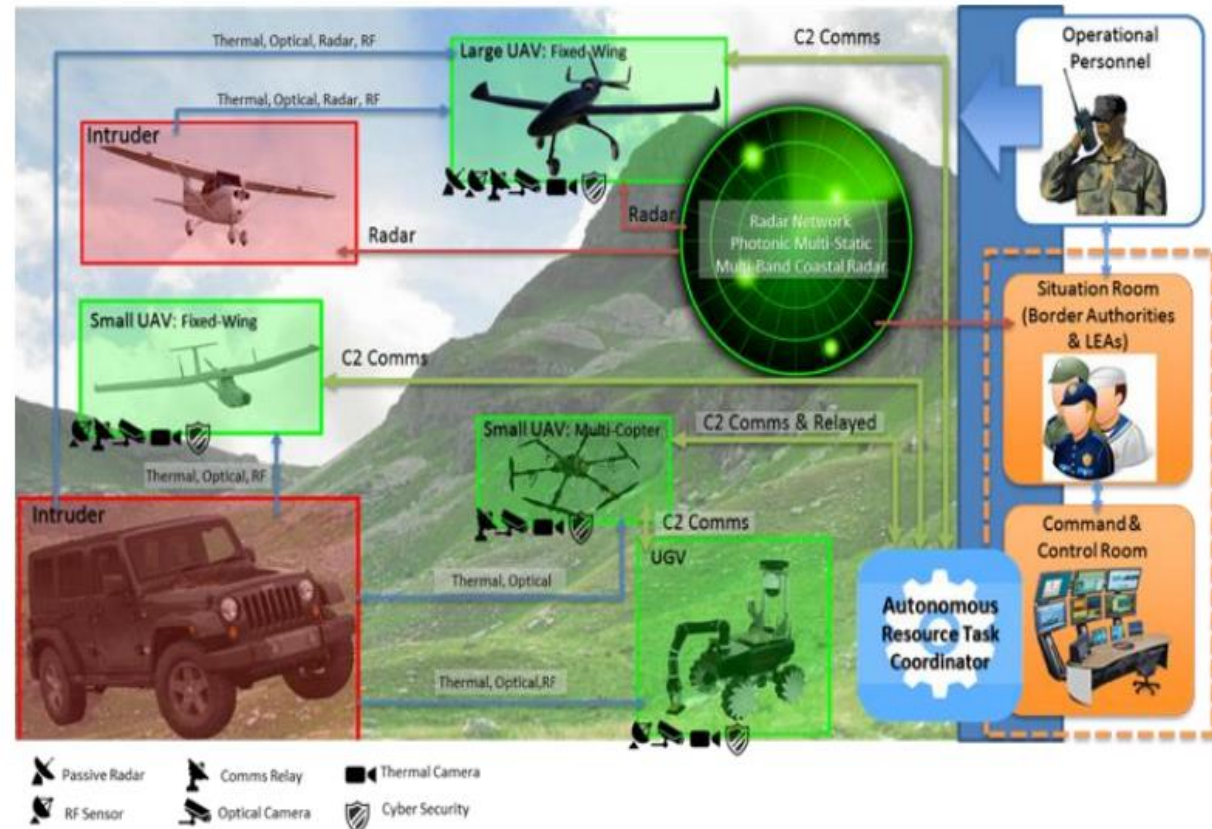


Use Case Scenarios

- **Early identification and tracking of illegal activities**
 - Detecting unauthorized sea border crossing
 - Detecting unauthorized land border crossing and signals trespassers
 - Detecting unauthorized land border crossing
 - Tracking high-tech smugglers
 - Detecting the terrorist attack coming through cross border
 - Early and effective identification of passive boats moving offshore
 - Tracking organized crime activity in remote border areas
- **Early identification and tracking of illegal communications**
 - Detecting jamming attacks
- **Detection of pollution and other accidents occurred in the borders**
 - Detecting pollution accidents

Demonstrators

- **Unauthorized land border crossing**
 - Patrol hardly accessible territories
 - Tracking illegal activities to mitigate personal risks



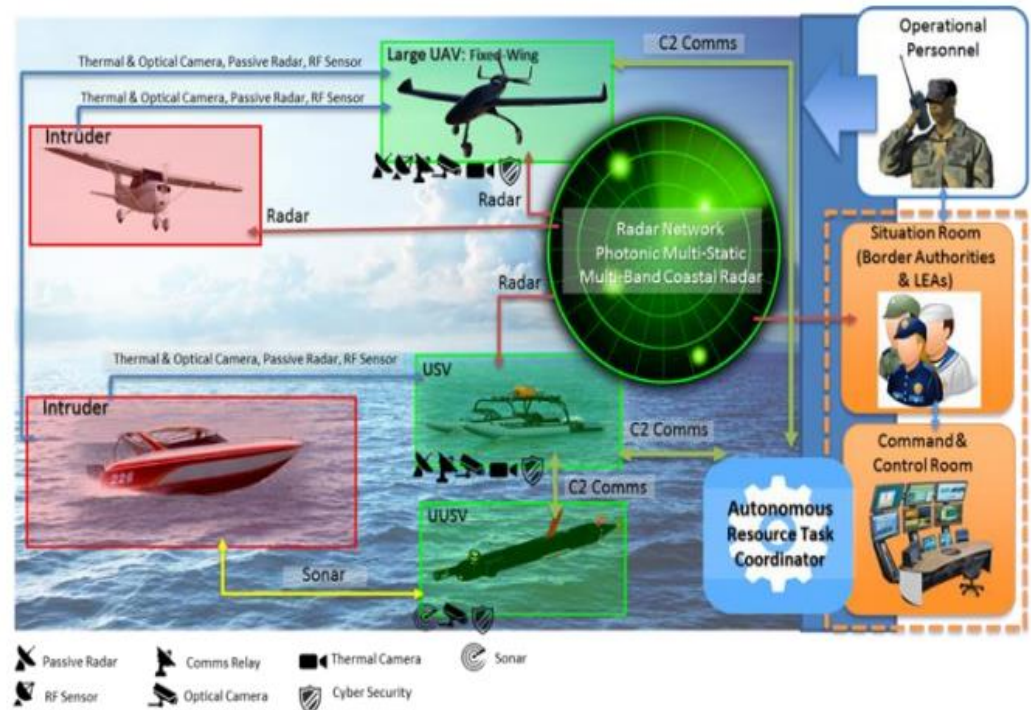
Demonstrators

■ Unauthorized sea border crossing

- Monitoring sea passages and islets
- Plethora of sensors: Coastal radars, optical cameras etc.
- Interaction of mobile devices with static infrastructure

■ Detecting pollution accidents

- Tracking pollutants spilled at sea
- Determining key environmental conditions



Impact

- Expected impact
 - Enhance the protection of human lives exposed at land and sea
 - Enable response time within minutes
 - Improve identification and tracking illegal activities
 - Influence positively anti-drug and anti-smuggling operations
 - Perform improved search and rescue operations
 - Improve environmental protection for governmental agencies
- Expected results
 - Provide an overall border security solution
 - Effective operation of heterogenous multi-asset system by a single operator
 - Photonic radar network and UAV onboard passive radar
 - Threat recognition and identification of cyber physical attacks

Work plan

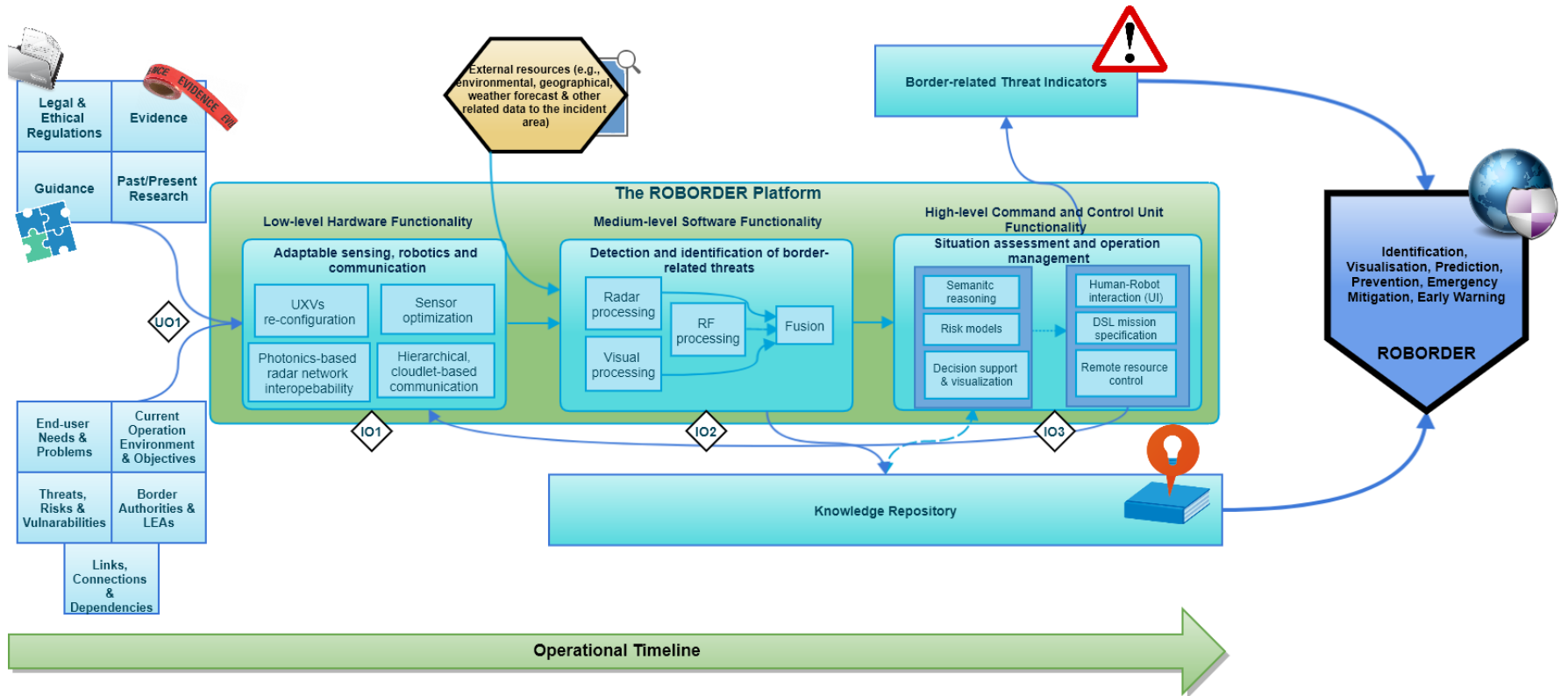
IO1 Adaptable sensing, robotics and communication technologies for different operational and environmental needs						IO2 Detection and identification of border-related threats					IO3 Tele-operation of autonomous agents through a 3D user interface and decision support					
IA1.1	IA1.2	IA1.3	IA1.4	IA1.5	IA1.6	IA2.1	IA2.2	IA2.3	IA2.4	IA2.5	IA3.1	IA3.2	IA3.3	IA3.4	IA3.5	IA3.6
WP2 Sensing, robotics and communication technologies						WP3 Detection and identification of border-related threats					WP4 Command and control unit functionalities					

IO4 ROBORDER platform development and integration	UO1 User requirements definition, end-user evaluation and validation			IMO1 Dissemination and collaboration		IMO2 Exploitation and sustainability model		
	UA1.1	UA1.2	UA1.3	IMA1.1	IMA1.2	IMA2.1	IMA2.2	IMA2.3
WP5 Integration of ROBORDER platform	WP1 User requirements and pilot use cases			WP6 Demonstrations and evaluation		WP7 Dissemination and exploitation		

WP8 Management and Coordination

WP9 Ethics Requirements

Operational timeline



Evaluation and Outcomes

- Prototype and final system
 - User-oriented evaluation (end-users group etc.)
 - System-centric evaluation (metrics, indicators etc.)
- Outcomes
 - Final system dealing with 3 use cases
 - Fully operational and autonomous border surveillance system
 - Enhanced detection and classification capabilities
 - CISE-compliant representation model and semantic reasoning
 - Decision support and situational awareness

Exploitation and Dissemination

- Exploitation of results
 - Development of proper modules and tools
 - Modules to be exploited by the technical partners
 - Business plan to exploit the final system
- Dissemination of results
 - Publications in scientific conferences and journals
 - Visits of website (<http://roborder.eu/>)
 - Downloads of publicly available online material
 - Participation/attendance in workshops
 - Demonstration of results in end-users group

RO**BORDER**

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