

ARESIBO

**Augmented Reality Enriched Situation awareness for
Border Security**

The problem

- **TOPIC:** Technologies to enhance border and external security
- **SCOPE:** Providing integrated situational awareness and applying augmented reality to border security.

Specific Challenge: Innovation for border and external security

- Novel and affordable technologies
- Accepted by citizens
- Customized and implemented according to the security practitioners' needs.

Current operational status

- Border and coast guards handle several formats of information under different non-interoperable displays.
- Information from several sources should be assessed by exploiting separate types of equipment.
- Relevant personnel operate on remote areas with limited telecommunication network capabilities.

Ambition: Research and innovation should lead towards cloud-based integrated systems

- Complete and highly-standardized interfaces
- Real-time information via a user-friendly manner
- Decision making and in communication with the C&C
- Enhanced concept of employment and interoperability standards via water, land and air operating resources.

The ARESIBO answer...

Concept

Objective: Develop a border security system at operational and tactical layer

- Enhanced situation awareness for both field and C2 operator
- Covering a wide range of multipurpose borderland operational tasks and coast guard functions
- Analysis of potential threats, search and rescue activities, joint planning of field operations
- Customized for land, sea borders as well as mixed environments
- Interoperability of networks, data & interfaces

Key Technologies

- Augmented Reality tools for improved user perception
- Networks for supporting remote areas
- Unmanned Ground Vehicles (UGV), Unmanned Aerial Vehicles (UAVs), Unmanned Underwater Vehicles (UUVs), and Unmanned Surface Vehicles (USVs)
- Augmented Intelligence capabilities
- Integration of diverse surveillance platforms
- Interoperability Layer for data and interfaces
- Decision-support tools
- Serious games for user training

External EU systems and DBs (e.g., CISE)



Interoperability of Data

National & Legacy systems



Fixed infrastructure & sensors

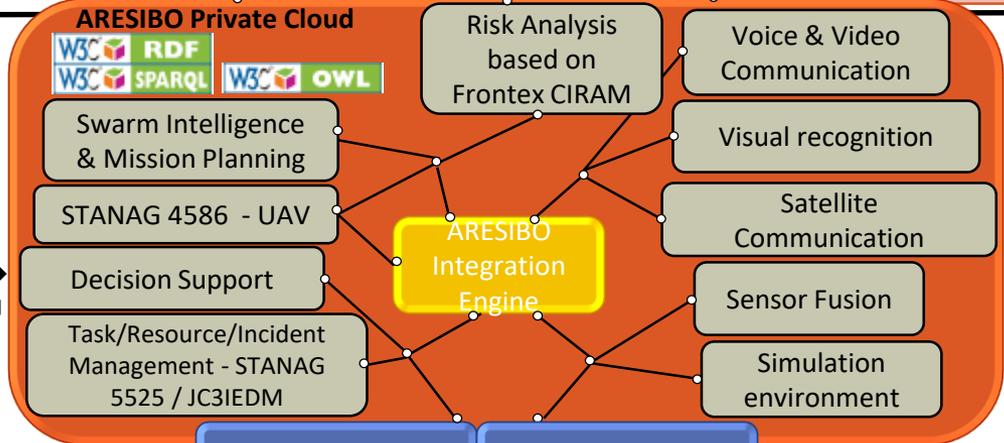


Interoperability of Data

Maritime Borders C2 – Tactical Layer

Land Borders C2 – Tactical Layer

Tech Pillar 3 – WP4
Augmented Intelligence



Interoperability of Networks

Tech Pillar 2 – WP5
Augmented Reality

Interoperability of Networks

C2 AR Interfaces

Serious games

Field AR Interfaces

Interoperability of Interfaces

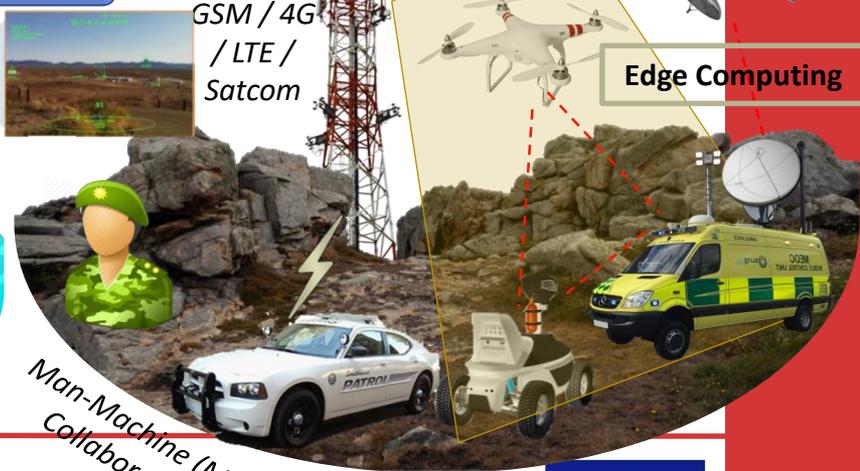
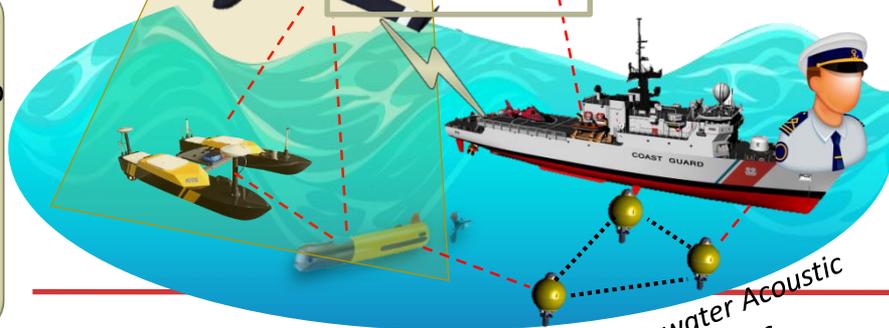
Tech Pillar 1 – WP3
Augmented Communication & Sensing

GSM / 4G / LTE / Satcom

Hybrid Intelligent Network

GSM / 4G / LTE / Satcom

Edge Computing



Maritime Borders – Operational Layer

Underwater Acoustic sensors

Man-Machine Collaboration (M2)

Land Borders – Operational Layer



Overall structure

Package list

- **WP1:** Project management
- **WP2:** Requirement analysis and pilot use cases
- **WP3:** Augmented communication and sensing for integrated situation awareness
- **WP4:** Augmented intelligence for integrated situation awareness
- **WP5:** Augmented reality for integrated situation awareness
- **WP6:** Integration of Aresibo platform
- **WP7:** Live trials and assessment
- **WP8:** Dissemination and exploitation
- **WP9:** Ethics

Milestone list

- **MS1:** Kick-off
- **MS2:** Preliminary system requirements
- **MS3:** System design
- **MS4:** Operational prototype
- **MS5:** Demo 1
- **MS6:** Demo 2
- **MS7:** Final Review

Augmented Comm. & Sensing

Objective #1: Stable connectivity between

- Field commanders (operational level) and the C2 commanders (tactical level)
- Field commanders and other field units
- UxVs and sensing infrastructure

Objective #2: Sensors and sensing optimization

Objective #3: UxVs and Swarm Intelligence

Objective #4: Voice/video communication

Objective #5: Cyber-security

Objective #6: Edge Computing

Technical developments reflected by **WP3**

Augmented Intelligence

Objective #1: Task/Resource/Incident Management (e.g. STANAG-5525/JC3IEDM)

Objective #2: Modeling UxVs (e.g. STANAG 4586)

Objective #3: Autonomous robotic missions

Objective #4: Simulation environment

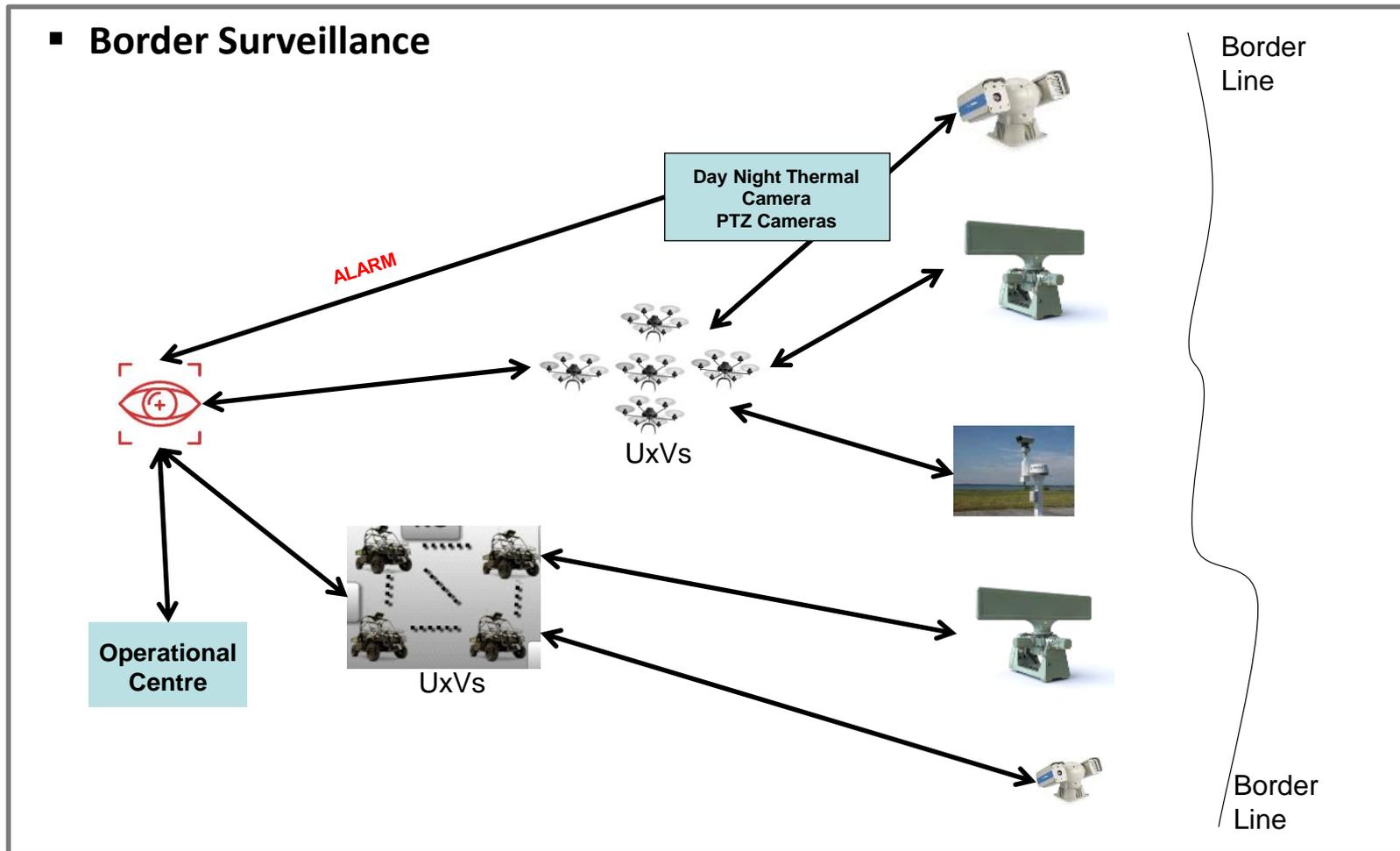
Objective #5: Decision-support

Objective #6: Data fusion and Risk analysis

Technical developments reflected by **WP4**

Mission example

▪ Border Surveillance



Augmented Reality

Objective #1: Capabilities at tactical and operational level

- In-field commanders and C2 operators

Objective #2: Operational assistance to the border and coast guard

- By decreasing the interaction cost to perform a task
- By reducing the cognitive load of the user
- By integrating multiple sources of information and minimizing attention switches.

Objective #3: Increased capabilities provided to the operator

- “Jump in” and assess current situation with enriched situation awareness
- See across time, which helps to understand current situation and provide an estimation
- Evaluate various situation scenarios based on real and simulated data.
- Serious Games

Technical developments reflected by **WP5**.



AR Indicative benefits

- The on-the-field teams and the C2 operators can produce information that could be circulated among the entire organisation and most significantly with the decision-making levels.
- The operators will no longer need to process the received data permitting them to concentrate on more significant tasks.
- The remote capability shall allow the operators to connect to the virtual briefing room to participate in the mission preparation by interacting on the same map with the same data from the “cloud”.
- The system will be able to present past, present and risk situations with lessons learnt and decision support.
- The teams can benefit from the previous mission results without the need to have a physical briefing in the C2 centre. They have an easily legible display of the current situation augmented by information and knowledge about the risks.
- They can optimise their mission and prepare/update their missions as well as the missions of the surveillance platforms.

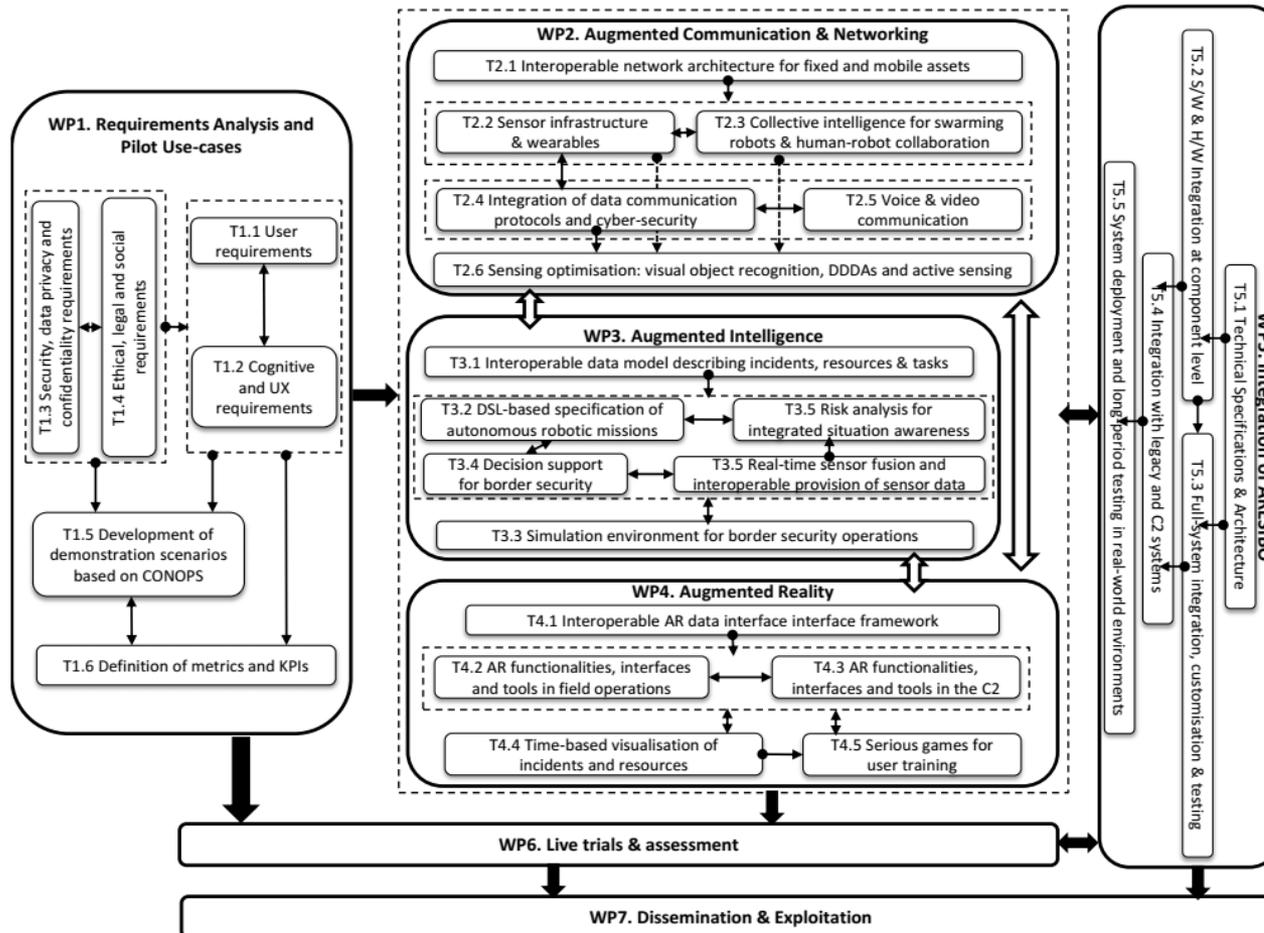
Validation

- Various evaluation tests using testbeds provided by partners within the consortium.
- Diverse terrains and several operational areas.
- Multiple simulation tests will be conducted.

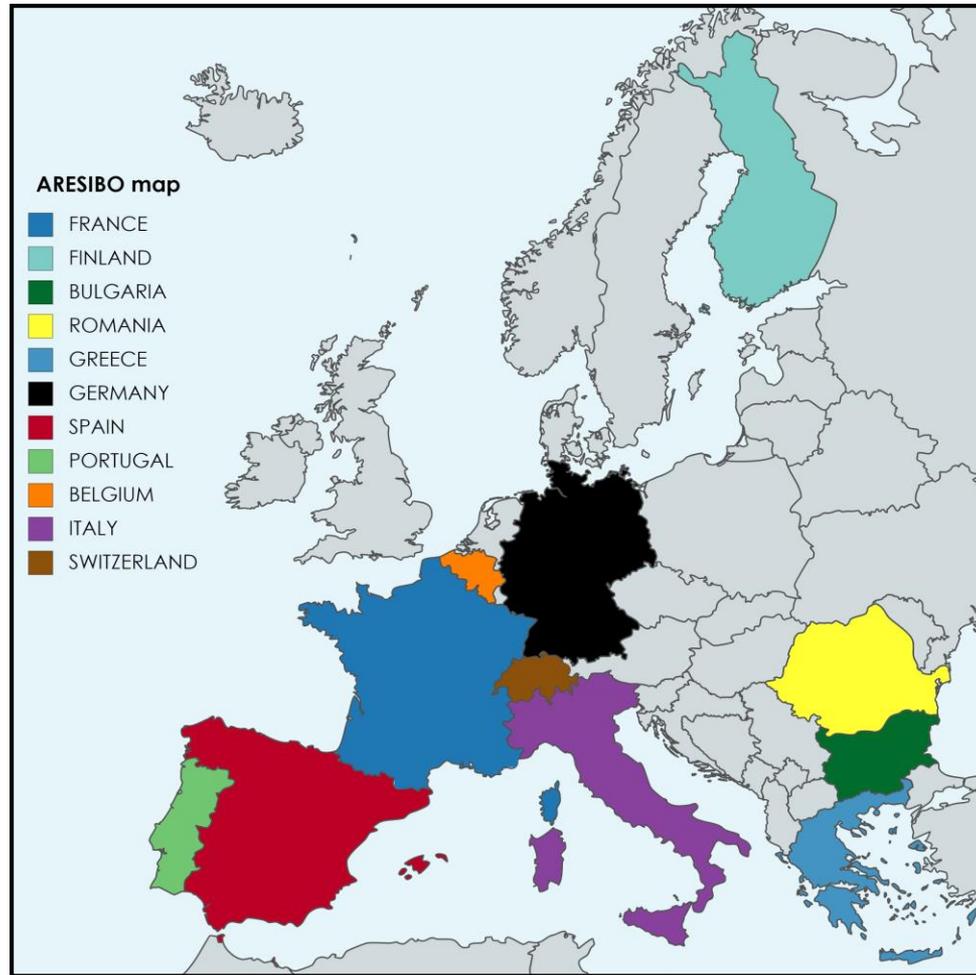
Pilot use cases: Demonstrations in under control environments

- **PUC-1:** Land-border trespassing
- **PUC-2:** Smuggling of goods
- **PUC-3:** Human trafficking
- **PUC-4:** Drug trafficking

Work Packages interplay



Geo distribution of partners



Exploitation and Dissemination

Exploitation of results

- Development of modules and tools
- Technical outcomes to be exploited by the technical partners

Dissemination of results

- Publications in scientific conferences and journals
- Visits of website and social media (<http://aresibo.eu/>)
- Downloads of publicly available online material
- Participation/attendance in workshops
- Demonstration of results in end-users group

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Thank You!

Questions?