PASSport Project

Safety and Security in port areas

European Maritime Days

Ravenna, 20/05/2022

Time	Agenda Item
09:30	**Welcome - Port of Ravenna Authority** Dr. Paolo Ferrandino, general secretary Autorità di sistema portuale del mare Adriatico centro-settentrionale
09:45	**Keynote speech by EUSPA** Dr. Manuel Lopez Martinez, EUSPA officer, Market department
10:00	**Stakeholders' consultation** Ing. Marco Nisi, Head of Space based Integrated services, Sistematica S.p.A. Dr. Luca Lupi, Head of Unit Institutional Relations, International Programs, Simplified Logistics Zone and intermodality, Autorità di Sistema Portuale del mar Tirreno Centro Settentrionale
10:30	**PASSport context and solution presentation based on EGNOS/Galileo and Copernicus** Ing. Marco Nisi, Head of Space based Integrated services, Sistematica S.p.A.
10:45	**PASSport project. Presentation of the 5 pilot campaigns** ✓ **Kolobrzeg:** Dr. Lucjan Gucma Head of Marine Traffic Engineering Department, Maritime University of Szczecin ✓ **Hamburg,** Dr. Michael Bergman, Owner, Executive Advisor - BM Bergmann-Marine ✓ **Valencia,** Dr. Rafael Company Peris, Project Manager, Fundation Valencia Port ✓ **Le Havre,** Dr Loic Gourmelen, Chef de groupe adjoint Transport et Trafic CEREMA Dr. Emilie Miquel, Projet Manager M3s ✓ **Ravenna** Dr. Andrea Minardi, IT and Security responsible, Autorità di sistema portuale del mare adriatico centro-settentrionale
11:30	**Digital Twin Project** Dr. Andrea Minardi, IT and Security responsible, autorità di sistema portuale del mare adriatico centro-settentrionale
11.45	**Labyrinth Project** Prof Luis Enrique Moreno Lorente, Universidad Carlos III de Madrid
12:00	**PROMARES Project** Dr. Cozzi Alberto, Port of Trieste, Project Manager
12:30	**PASSPORT Project - Demo**
13.30 Light lunch	

PASSPORT
European Maritime Days

Autorità di Sistema Portuale
del Mar Tirreno Centro Settentrionale

PORTI DI ROMA E DEL LAZIO · CIVITAVECCHIA · FIUMICINO · GAETA

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European Union | European Regional Development Fund

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IN THE MEDITERRANEAN

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Digital Europe

Thank you for your attention

Mr. Luca Lupi

lupi@portidiroma.it

Autorità di Sistema Portuale Mar Tirreno Centro Settentrionale

PASSport project. Stakeholders interview

Agenda

- The need for safety and security in port areas
- Stakeholders’ interview

Usage of drones in port areas: the context
PASSport: Operational *P*latform managing a fleet of semi-autonomous drones exploiting GNSS high *A*ccuracy and Authentication to improve *S*ecurity & *S*afety in *port* areas

The purpose of the PASSport is to engineer and qualify a solution extending the **situational awareness** based on **aerial fixed/ rotary wing and underwater drones to improve safety and security in port areas**.

The need stems from the directive 2005/65/CE asking to complement surveillance systems for the whole port area, in order to significantly improve security and safety for daily operations implanted in port area. Around one thousand European ports fall within the scope of the directive.

The proposed solution is intended to **complement already operational platforms** by extending the surveillance perimeter using a fleet of drones to provide innovation and operational support to the recognition, management and analysis of safety and security aspects of daily operations with particular attention to:

- ✓ Pollution monitoring (safety)
- ✓ Support to e-navigation (safety)
- ✓ Critical buildings/ Infrastructures protection (security)
- ✓ Protection against non-cooperative small craft approaching the port areas (security)
- ✓ Underwater threats monitoring (security)

The project novelty is represented by **the usage of a fleet of semi-automated drones integrating Galileo services** (and other sensors) for a safe and efficient guidance, navigation and control (GNC) even in a challenging environment in presence of obstacles - including buildings and other ground assets - and potentially unfavorable weather conditions.

Stakeholders' interview

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- ✓ Port of Ravenna, Italy
- ✓ Port of Hamburg, Germany
- ✓ Port of Valencia, Spain
- ✓ Port of Le Havre, France
- ✓ Dunkirk-Port, France
- ✓ Grand Port Maritime La Rochelle, France
- ✓ Port of Kołobrzeg, Poland

Three main mission types:

1. Monitoring and inspection (MI)
2. Environmental (ENV)
3. Operation and Logistics (OL)

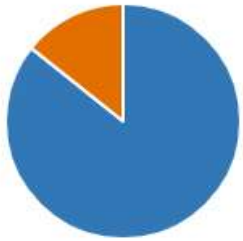
Five use cases

1. Pollution monitoring (ENV)
2. Support to e-navigation (OL)
3. Critical buildings and infrastructures protection (MI)
4. Protection against non-cooperative small craft approaching the port areas (MI)
5. Underwater threats monitoring (MI)

Usage of drones in port areas: current view

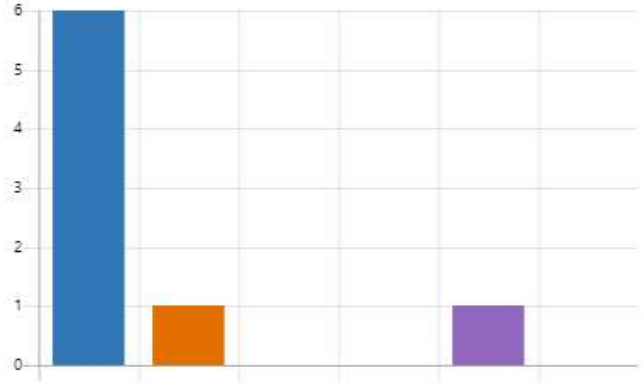
2. Do you use any drones in your port?

Yes	6
No	1



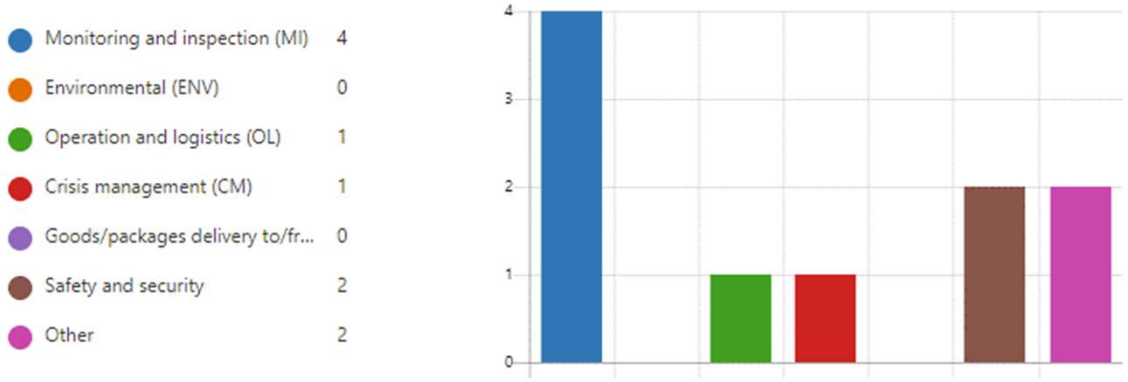
3. What kind of drones are you using in your port?

Aerial	6
Water	1
Underwater	0
Autonomous	0
Remotely operated	1
Other	0



Usage of drones in port areas: current view

5. What kind of tasks/missions are drones used for?



Other: Aéral view, marketing / communication

Usage of drones in port areas: future view

7. Do you plan to further increase number and/or types of drones in your port?

Yes	4
No	2

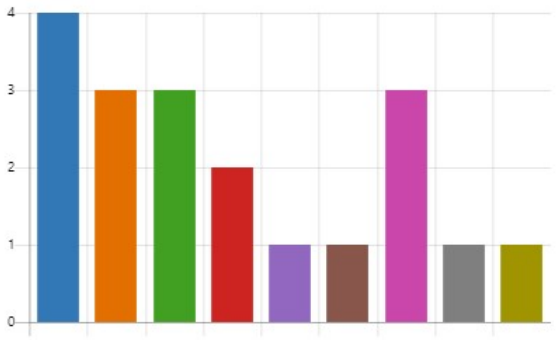
9. What kind of task/mission do you plan to use drones for?

Monitoring and inspection (MI)	1
Environmental (ENV)	1
Operation and logistics (OL)	1
Crisis management (CM)	1
Goods/packages delivery to/fr...	0
Other	0

Usage of drones in port areas: risk assessment perception

10. What drawbacks/risks do you anticipate when using drones in your port?

Costs	4
Need for a dedicated operator	3
Safety	3
Security (cybersecurity)	2
Additional infrastructure	1
Data privacy	1
Regulatory issues	3
Collaboration issues	1
Other	1



Other: network signal/coverage problems

12. What is the main obstacle in introducing drones technology in ports?

Legislation	3
Workload	2
Lack of operators	1
Safety	1
Other	1

Other: It is the PFSO who is on charge of the terminal's security

Usage of drones in port areas: benefit perception

11. What benefits would you consider when using drones in your port?

Task automatization	1
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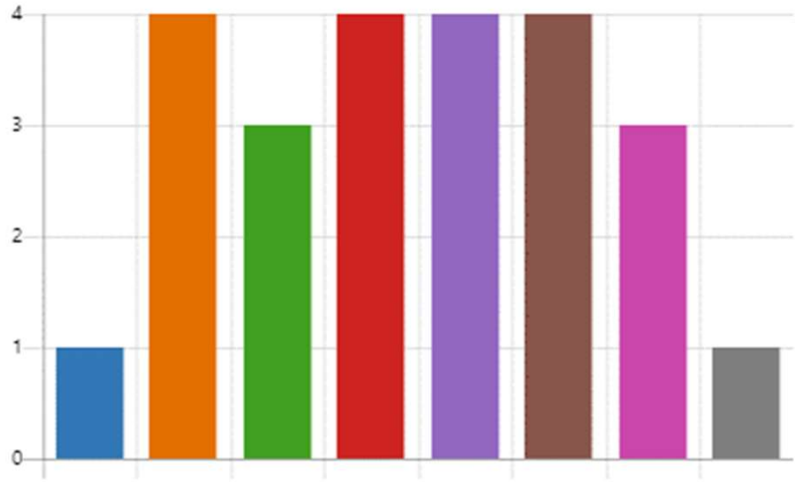
Support accident and incident...	3
Other	1



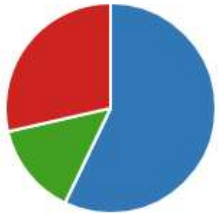
Other: help with crisis management

Usage of drones in port areas: current view

13. What level of integration with existing port systems would you prefer?

More Details

Full integration with all system...	4
One integrated system, coordi...	0
Multiple systems in port, but c...	1
It should be an independent s...	2
Other	0



14. What level of automation of this technology would you prefer?

More Details

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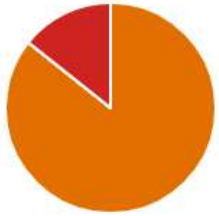
Semi-automatic/autonomous	6
Operated manualy	0
Other	1



Other: automatic or manual on demand

Usage of drones in port areas: integration and automation

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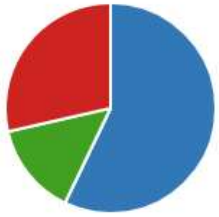

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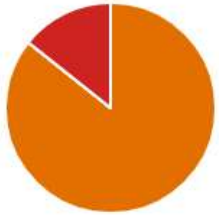

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GNSS and EO as key enabling technolgies for safety and security in port areas. PASSport project

Agenda

- The need for safety and security in port areas
- Stakeholders' interview
- PASSport project
- The consortium
- The architecture
- EGNSS, EO and MR as enabling technologies
- Project implementation
- Validation campaigns
- Next steps

PASSport

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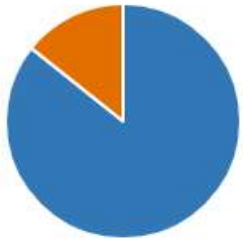

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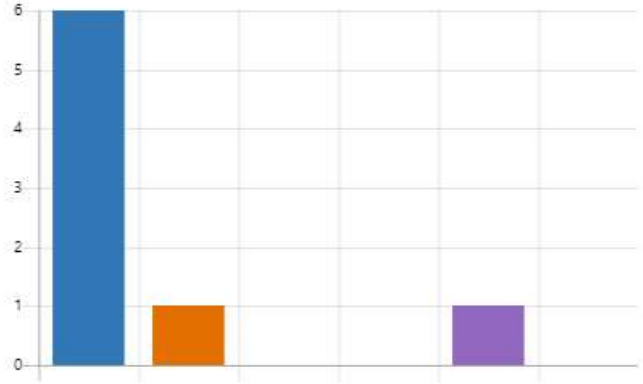

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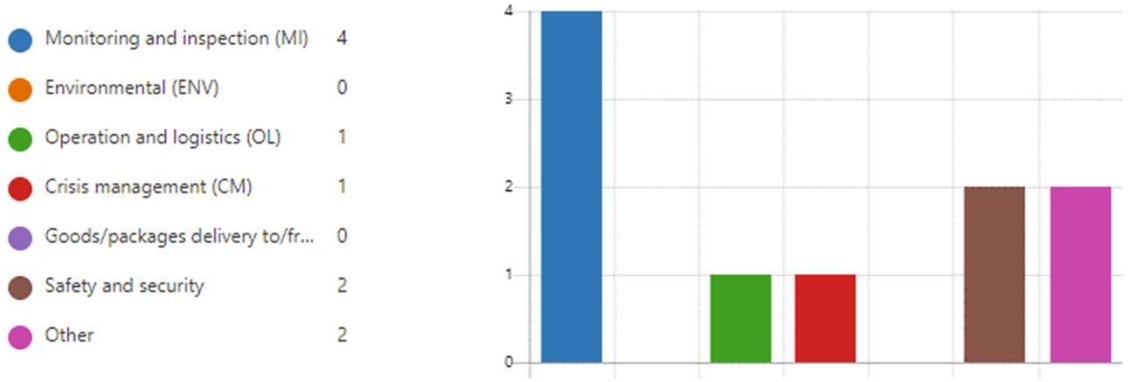

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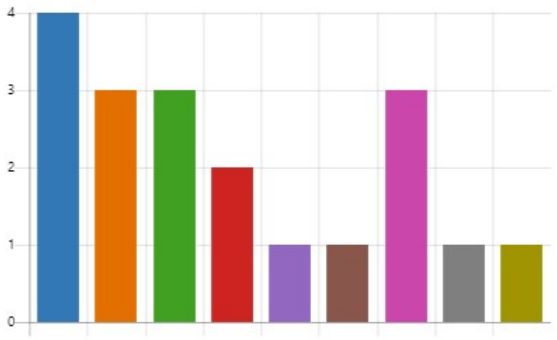

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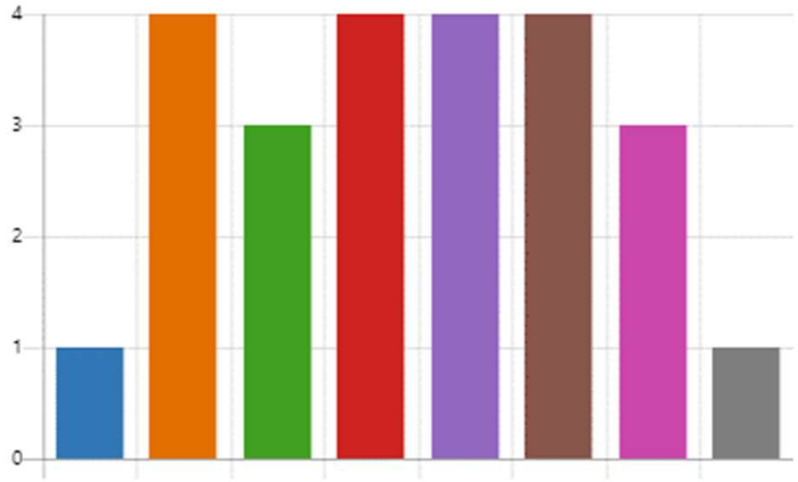

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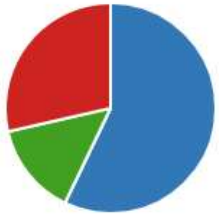

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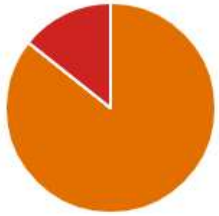


Other: automatic or manual on demand

Galileo HAS and OS-NMA

Performance of Galileo Services

Galileo High Accuracy Service

- Aims at providing accurate positioning information to the users
- Accuracy of positioning information <20 cm
- Available globally
- Free of charge
- Fully operational as of 2024

Galileo Open Service Navigation Message Authentication

- Authenticates the GNSS signal, providing protection against jamming and spoofing
- Authenticates the signal within one or a few minutes
- Free of charge
- Operational as of 2023

Questions for ports

About the potential usefulness of Galileo High Accuracy Service

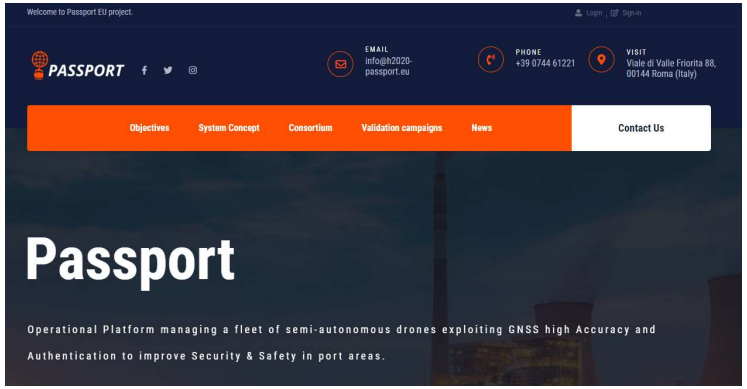
- Looking at Galileo HAS and its characteristics, do you see use for it in port applications?
- How important is 20cm accuracy of positioning information in a port?
- For which applications would you see the added value of this service?
- Are there any future applications in the port environment for which you would imagine such a service to become useful?

Questions for ports

About the potential usefulness of Galileo Open Service Navigation Message Authentication

- Looking at Galileo OS-NMA and its characteristics, do you see use for it in port applications?
- How important is the authentication of GNSS signal in a port?
- Are spoofing and jamming accidents frequent in port activities? If so, in which applications?
- For which applications would you see the added value of this service?
- Are there any future applications in the port environment for which you would imagine such a service to become useful?

PASSport team and identity



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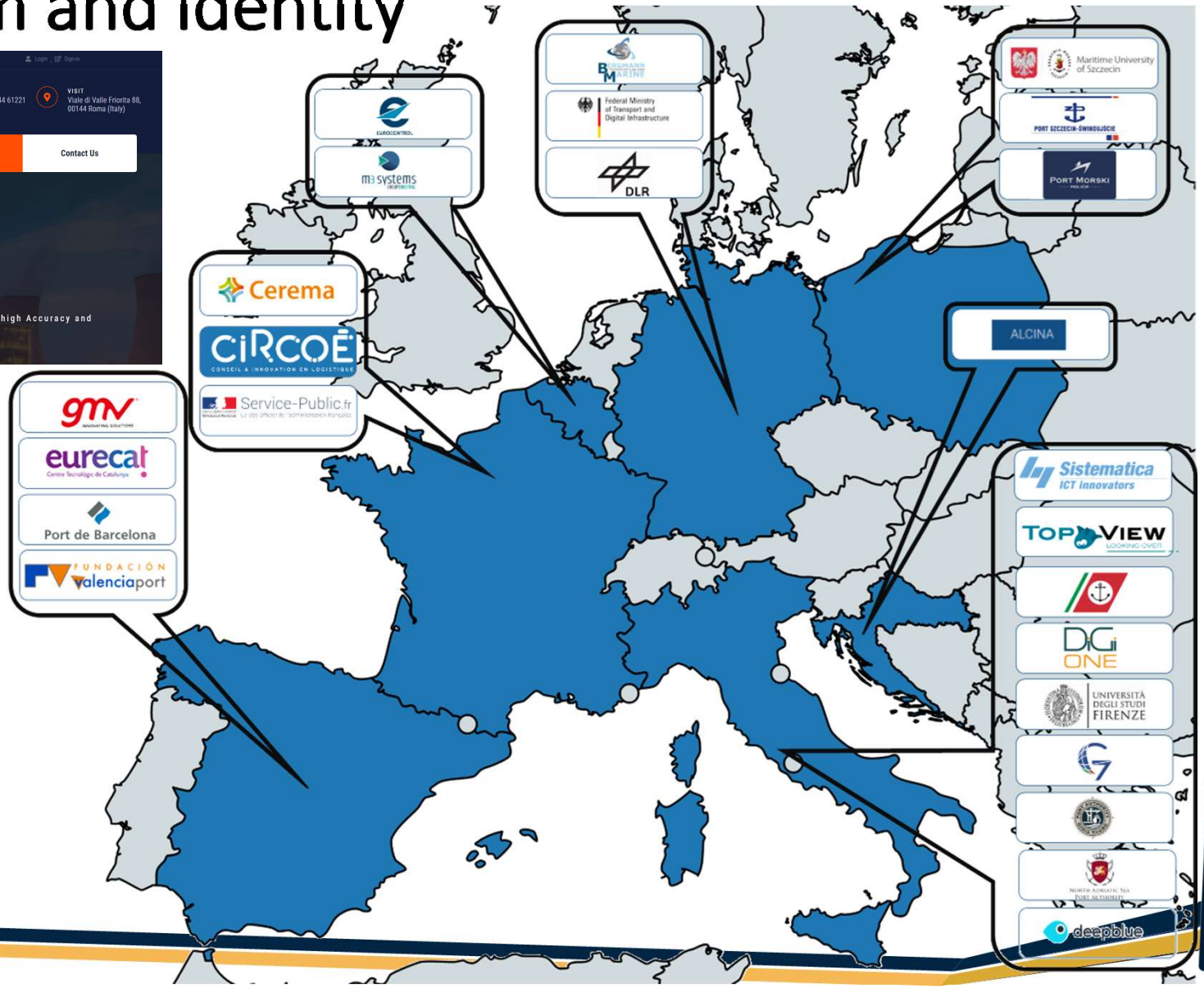

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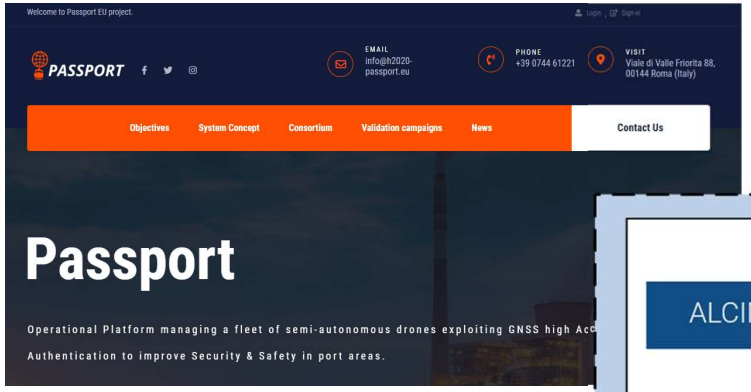

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m3 systems GROUPEMISTRAL
UNIVERSITÀ DEGLI STUDI FIRENZE
Maritime University of Szczecin
FUNDACIÓN valenciaport
Cerema
Autorità di Sistema Portale del Mare Adriatico centro settentrionale
Port de Barcelona
PORT AUTHORITY GIOIA TAURO
NORTH ADRIATIC SEA PORT AUTHORITY
PORTS OF VENICE AND CHIOGGIA
Federal Ministry of Transport and Digital Infrastructure
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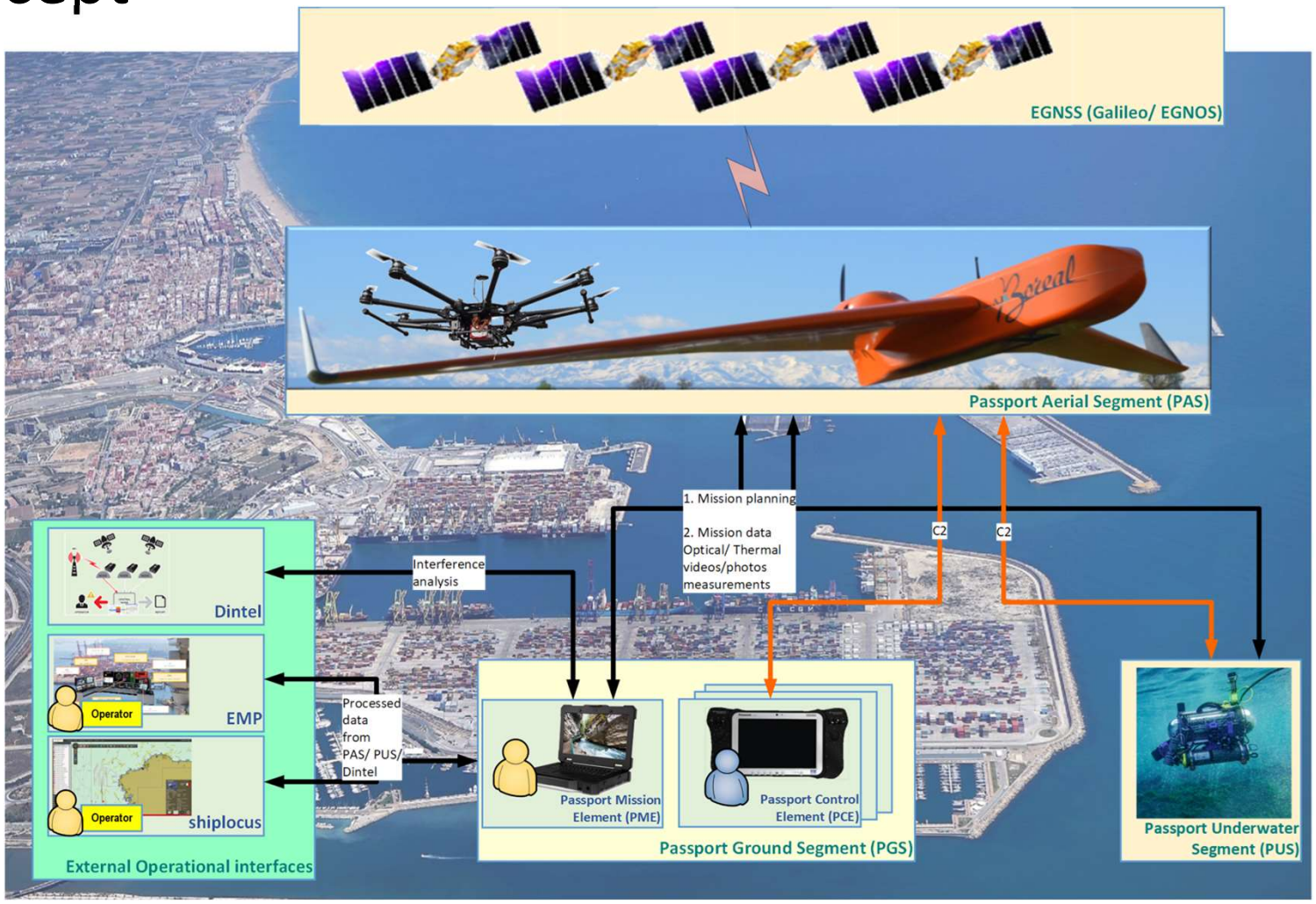
PORT SZCZECIN-ŚWINOUJŚCIE
MARITIME OFFICE IN SZCZECIN
RÉPUBLIQUE FRANÇAISE Service-Public.fr
CIRCOE CONSEIL & INNOVATION EN LOGISTIQUE
Sous-direction des ports et du transport fluvial

System concept



GNSS usage as enabling technology

One of PASSport features is to use E-GNSS capabilities to contribute to **safety** (automated RPAS flying in a challenging environment) and **security** (image geo-referencing for surveillance analysis or the need of a robust and protected GNSS signal as input for GNC of the RPA) for operations in ports.

E-GNSS can provide:

- **High accuracy:** E-GNSS can provide RPAS position very accurately, even in the level of centimetres depending on the technology used.
- **Integrity and reliability** of the solution is required not only for the safety of the operations but also as means of measuring the confidence in the correctness of the positioning information provided by the navigation system. The reliability on the RPAS position provided by the GNSS user terminal will be also very useful to increase the reliability of the images taken from the RPA.
- **Robustness against interferences or spoofing attacks.** The concern on GNSS interferences, mainly the intentional ones, recommends the use of GNSS solutions that are robust against interferences.

User requirement	GNSS contribution
Safe trajectory for automated RPAS	High accuracy (e.g. Galileo HAS, PPP) Integrity (e.g. SBAS, HA with integrity)
Geo-localisation of detected target	
System resilience	Signal authentication (e.g. Galileo OS-NMA) Interference detection (e.g. DINTEL)

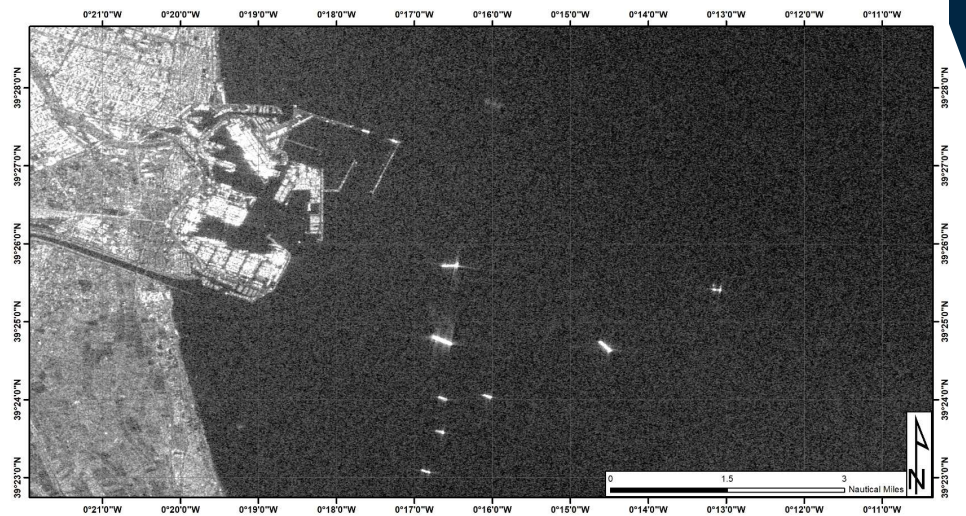
HOW?

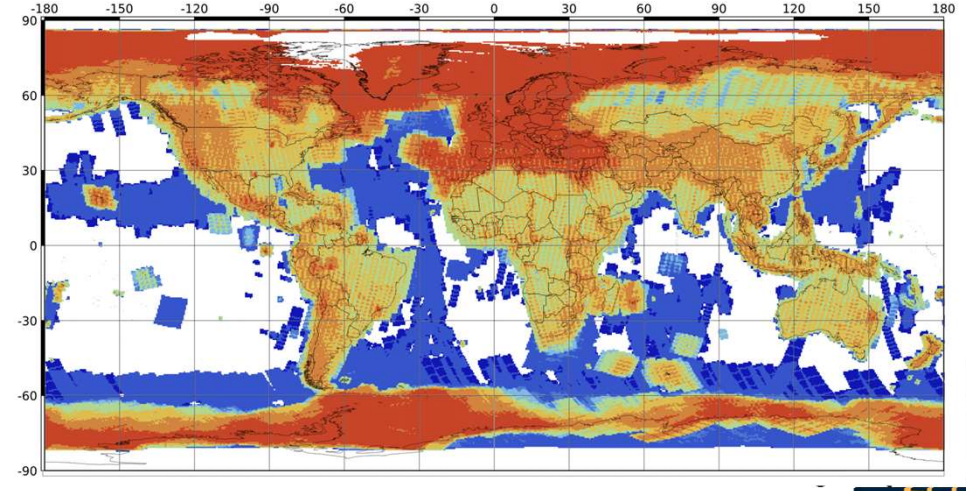
GNSS user terminal (e.g. magicUT)

Interference monitoring system (DINTEL)

Earth Observation (EO) usage to support port operation monitoring

- **The Copernicus Program**: existing Earth observation-based services for maritime, land and atmospheric applications, The Sentinel Constellation, European Ground Motion Service
- **Dedicated algorithm based on Copernicus data:** wind detection and measurement, ship detection, air pollution estimation, port facility stability assessment
- **Activities within the Passport project, maritime, terrestrial and atmospheric scenarios:** Areas of interest - Le Havre, Valencia, Kołobrzeg, Hamburg, Ravenna.
- **Methodology:** maritime analysis based on Sentinel-1 imagery for the ship detection and for the wind estimation, terrestrial analysis relying on EGMS data for the assessment of the port facilities stability, Sentinel-5p data for the monitoring of air quality in port areas.
- **Maritime applications:** results with Sentinel-1 data for the detection of ships within Le Havre and Valencia port areas.
- **Maritime applications:** results with Sentinel-1 data for the assessment of the major winds within Ravenna and Le Havre port areas.
- **Terrestrial applications:** analysis of EGMS interferometric data for the assessment of the stability of Hamburg port facilities and infrastructures.
- **Atmosphere applications:** results with Sentinel-5p data for the Kołobrzeg air quality assessment.





Mixed Reality device for drones performed mission

- Increasing number or AR devices
- Increasing number of AR applications
- Low number of quality research in safety-critical environment

GOAL: to increase situational awareness and improve decision making time by providing the user with real-time data from drones that are part of the system.

Stand-by mode for active monitoring.

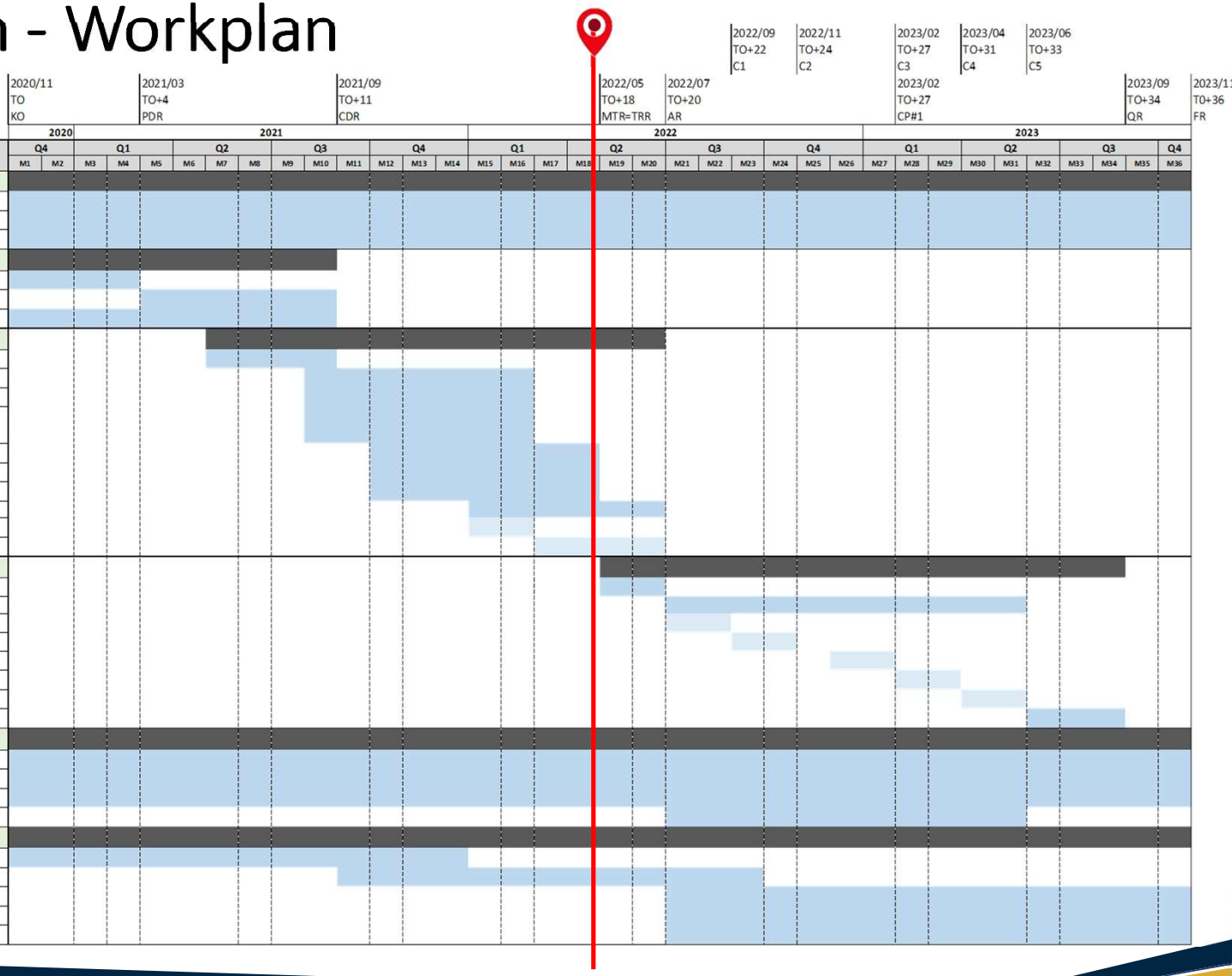
Use-cases:

- Pollution detection where drone monitors discharged ballast waters or ships' emissions and measures level of SO2. An immediate alert will be visible through the glasses with the identification of a polluter if a pollution is detected.
- Safety and security monitoring where immediate alert and video feed will be shown to the operator when a predefined criterium is met, e. g. movement detection (unauthorized entry to port facilities) or elevated building temperature (fire indication).

Innovation potential

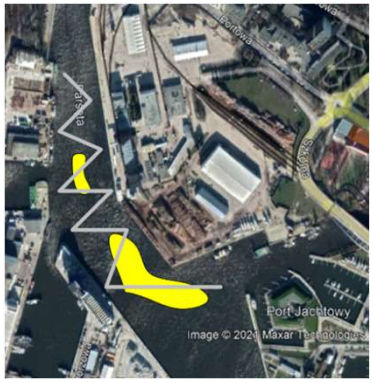
Innovation brought by PASSport providing Extended surveillance service with an automated RPAS	
Coverage	RPAS allows to cover large area in reduced time
Cost saving	No need for static infrastructure to be deployed
Operational Time efficiency	The implementation of AI & DL algorithm allows to have additional information (image and video metadata) for an improved situational awareness in real time
Service reliability	GNSS (high accuracy, integrity, authentication) and other sensors allow the solution to be more reliable and resilient
Usability	Operator does not require specific expertise as operations (take off, mission management, area scanning and landing) are driven by an automated process once waypoints are configured (although a qualified remote pilot will still be present when required by the regulation)
Interoperability	interface with some already deployed and daily used operational platforms (developed by partners of the consortium)

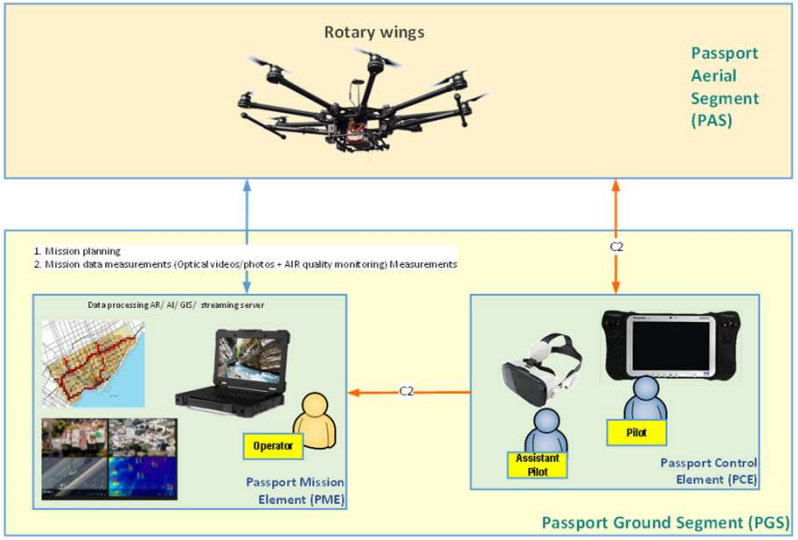
Implementation - Workplan



WP ID	WP Title	Start	End
1	**Management and Technical coordination**	T0	T0+36
1.1	Project & Contractual Management	T0	T0+36
1.2	Technical Coordination	T0	T0+36
1.3	IPR management	T0	T0+36
2	**User Requirements, ConOps and Regulation**	T0	T0+10
2.1	User Requirements	T0	T0+4
2.2	Use cases identification	T0+4	T0+10
2.3	Regulation for RPA usage in port areas	T0	T0+10
3	**PASSport solution design and MAIT**	T0+6	T0+20
3.1	System specification	T0+6	T0+10
3.2	Ground operational platform (GOP) manufacturing	T0+9	T0+16
3.3	GNSS module for rotary RPAs manufactuing	T0+9	T0+16
3.4	AI & DL for GNC and payload for rotary RPAs manufaturing	T0+9	T0+16
3.5	Autonomous Aerial Rotary wings RPAs	T0+10	T0+18
3.6	Aerial Fixed wings RPAs	T0+10	T0+18
3.7	Underwater RPAs	T0+10	T0+18
3.8	System Integration and verification activities	T0+14	T0+20
	Planning	T0+14	T0+16
	execution and report	T0+16	T0+20
4	**Validation Campaigns**	T0+18	T0+34
4.1	Validation campaign planning	T0+18	T0+20
4.2	Validation campaigns execution	T0+20	T0+31
	Poland (Szczecin)		
	Spain (Valencia)		
	Germany (Hamburg)		
	France (Le Havre)		
	Italy (Crotone)		
4.3	Operational validation Report	T0+31	T0+34
5	**Dissemination for awareness and exploitation**	T0	T0+36
5.1	Innovation Management and Advisory Boards management	T0	T0+36
5.2	Stakeholders engagement	T0	T0+36
5.3	Communication activities	T0	T0+36
5.4	Professional User Training	T0+20	T0+31
6	**Economic viability and Solution roadmap**	T0	T0+36
6.1	Market Analysis and Business Model	T0	T0+14
6.2	Cost Benefit Analysis	T0+10	T0+23
6.3	Business plan	T0+20	T0+36
6.4	Solution Roadmap	T0+20	T0+36
6.5	Sales channel activation	T0+20	T0+36

Kolozberg campaign (2022/09)
Pollution monitoring (safety)

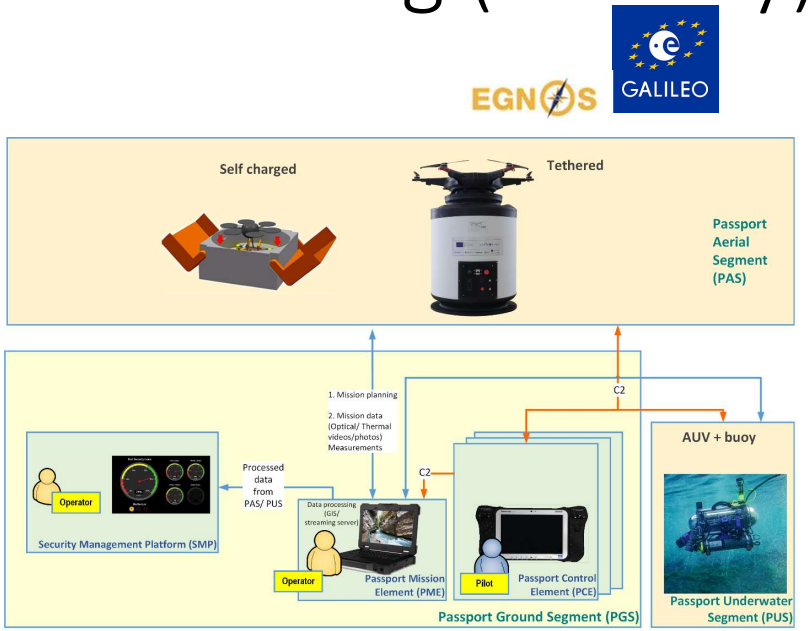




Air/water quality monitoring

- ✓ In situ (drone fleet) + Copernicus Sentinel 5P quality parameters ingested on a GIS
- ✓ MR for real time mission control
- ✓ Video for context awareness

Ravenna campaign (2023/04)
Underwater threats monitoring (security)

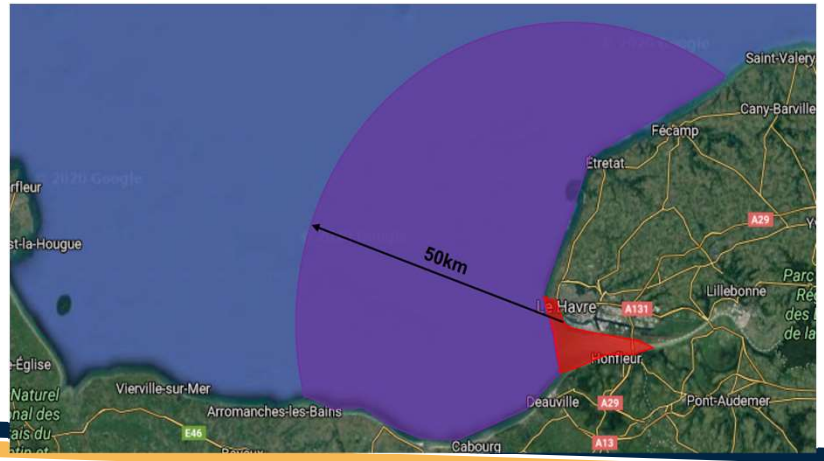


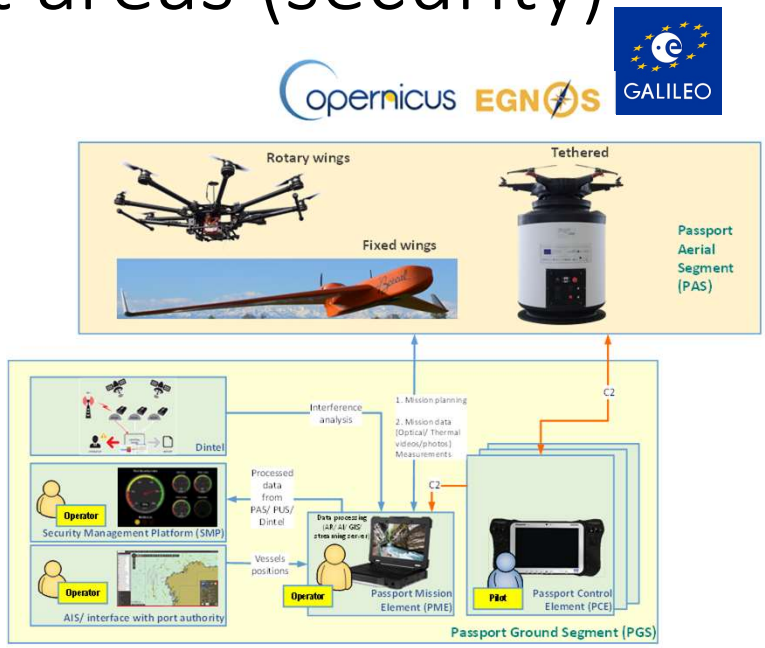
Underwater inspection and monitoring

- ✓ Bathymetry integrated with underwater inspection (ship/vessel and pier yard): comparison between surface vehicle and underwater also for 3D of submerged infrastructure
- ✓ Video for context awareness (fully or semi-autonomous flight). Drone integrated with already existing CCTV
- ✓ Drone segment: self-charged drone + tethered (surveillance + communication relay)

Le Havre campaign (2023/04)

Protection against non-cooperative small craft approaching the port areas (security)



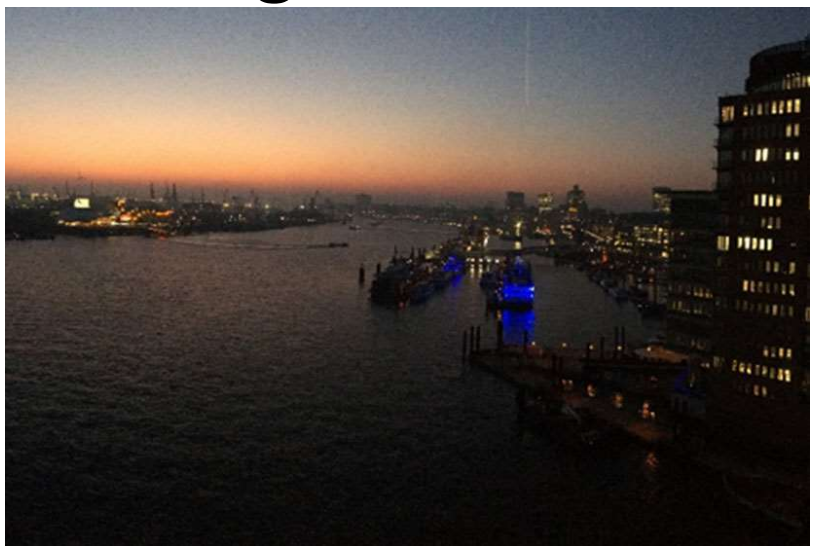


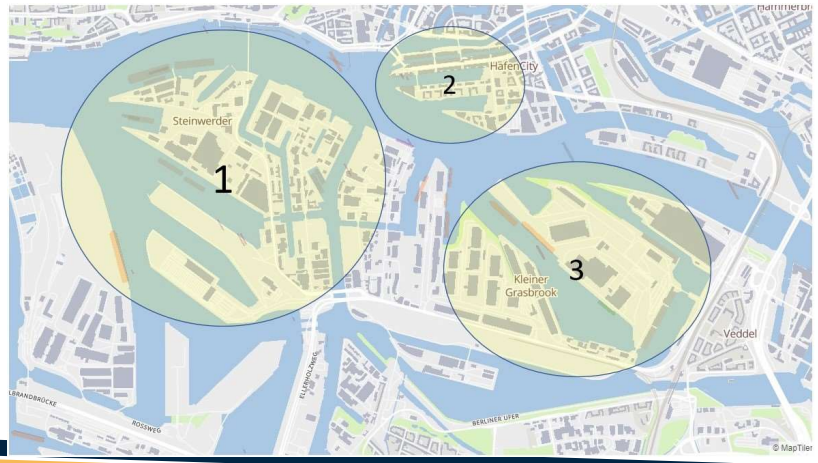
Protection against non-cooperative small craft

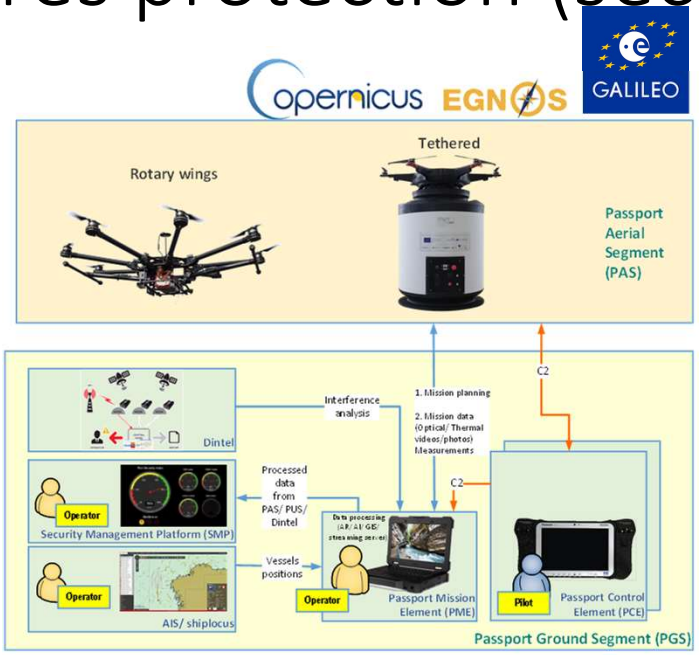
- ✓ to assess operational contribution of RPAs in support to protection against non-cooperatives small crafts approaching the port areas. Migrant or activist semi-rigid inflatable boats, leisure boats with deliberate or undeliberate illicit behavior, should be consider as non-cooperative crafts.

Hamburg campaign (2023/07)

Critical buildings/ Infrastructures protection (security)





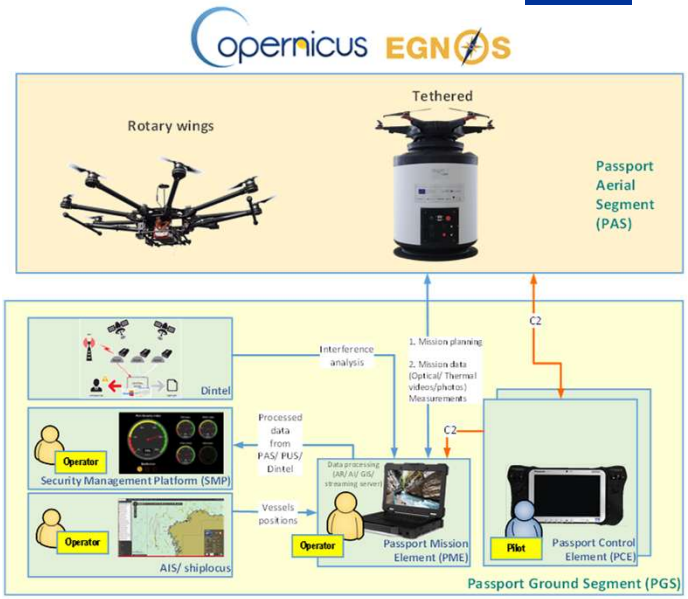


Critical buildings/ Infrastructures protection

- ✓ Sea side (vessel traffic monitoring) and ground side surveillance
- ✓ Non cooperative ships detection and location based on AI algos
- ✓ Ground side asset/ people detection and location based on AI algos
- ✓ GNSS interference detection
- ✓ Video for context awareness

Valencia campaign (2023/09)

Support to e-navigation (safety)



E-Navigation support

- ✓ Contribute to continuous real-time monitoring for ship arrival/departure to/from port.
- ✓ Detection of vessels with AIS disabled.
- ✓ Provide real-time information/data to support "Pilots" VTS.
- ✓ Ships monitoring in anchorage areas

H2020-PASSport
158 followers
6h •

Vancouver, May 17th 2022
Inernation Association of Ports and Harbours (IAPH) conference sor sustainability awards. ...see more

BM Bergmann-Marine
228 followers
7h •

The H2020-PASSport Project has been presented the International Association of Ports and Harbors (IAPH) Sustainability Award in the category Digitalization. BM Bergmann-Marine is one of the partner in the project and as associated member of IAPH we could comvince our partners for BM to submit it to the award. Now, as we are successfull, we congratulate our partners ALCINA, GMV, Sistematica S.p.A., G7 International Srl, DiGi ONE Srl, TopView srl, DEEP BLUE SRL, German Aerospace Center (DLR), Eurecat - Technology Centre of Catalonia, M3 Systems, Università degli Studi di Firenze, Akademia Morska w Szczecinie, Fundación Valenciaport, Cerema, AUTORITA ... PORTO DI RAVENNA, as well as our associated partners, especially the ports supporting our validation campaigns Hamburg, Ravenna, Kolobrzeg, Valencia and Le Havre. As our owner Michael Bergmann MBA FRIN AFNI wasn't able to join, we are very thankful to Dr. Phanthian Zuesongdham from Hamburg Port Authority (HPA) Anstalt öffentlichen Rechts to speak on behalf of the project consortium and together with the partners at the event to accept the award.

Thank you International Association of Ports and Harbors (IAPH), thank you expert joury and thank you public voters selecting our project. It is a great honor!

https://lnkd.in/eATqKh-E

#technology #marine #sustainability #iaph

H2020-PASSport
158 followers
5mo •

https://lnkd.in/enKZr5pr

Présentation du projet PASSport à la 11e édition des assises port du futur 2021. Notamment, en présence des principaux ports français et du Ministre de la Mer, a été présentée la campagne C4 qui se déroulera au port du Havre en mai 2023.

Presentation of the PASSport project at the 11th edition of the assise du port du futur 2021. In particular, in the presence of the main French ports and the Minister of the Sea, the C4 campaign was introduced which will be carried out at the port of Le Havre in May 2023

EUSPA - EU Agency for the Space Programme
#Galileo #Copernicus #drones #EGNSS

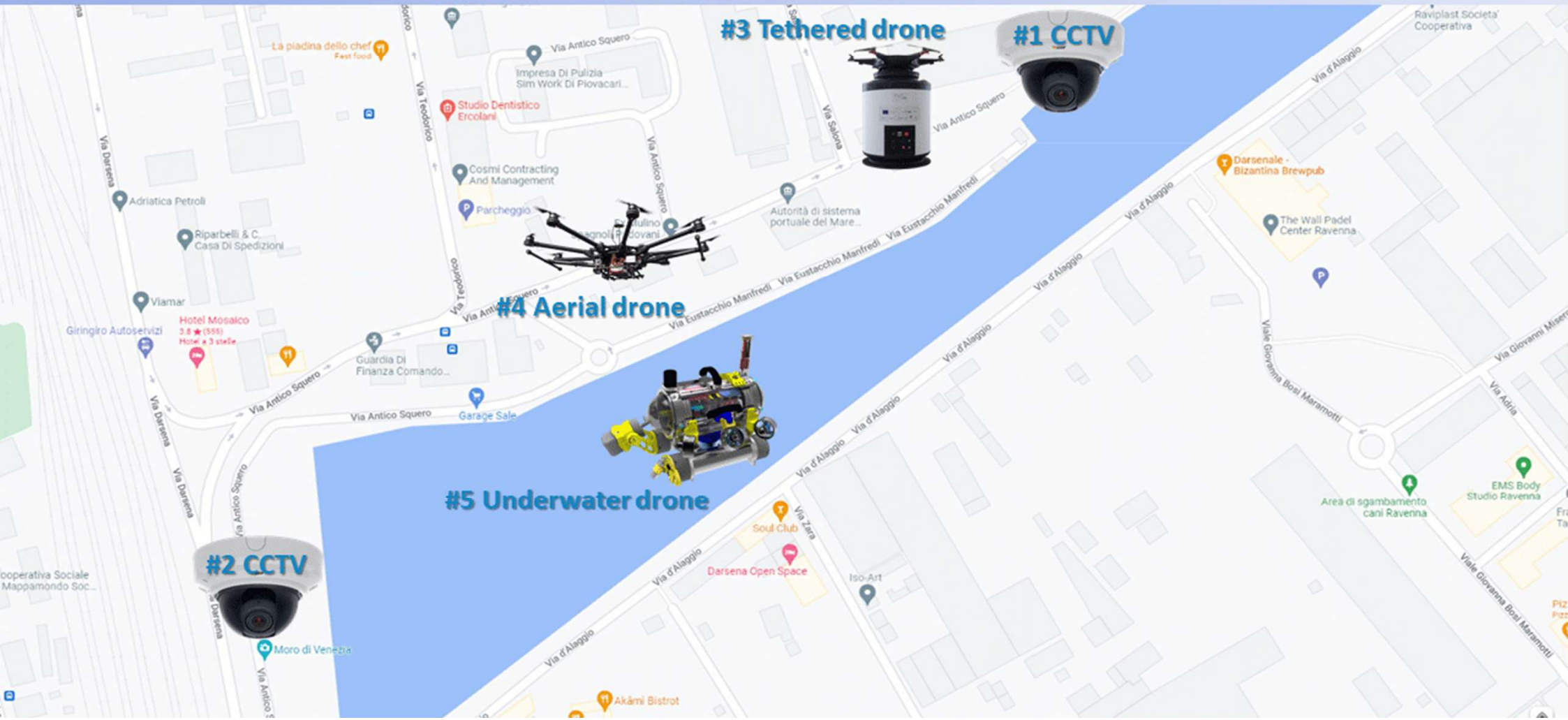
See translation

PASSPORT. 11me Assises port du futur. Novembre 2021
youtube.com

27–30 June 2022
Kuala Lumpur, Malaysia

GLOBAL PORT MARINE OPERATIONS

Ravenna, May 20th 2022. European Maritime Days.
PASSport Project Demonstration



PASSport project. C1 [MUS]

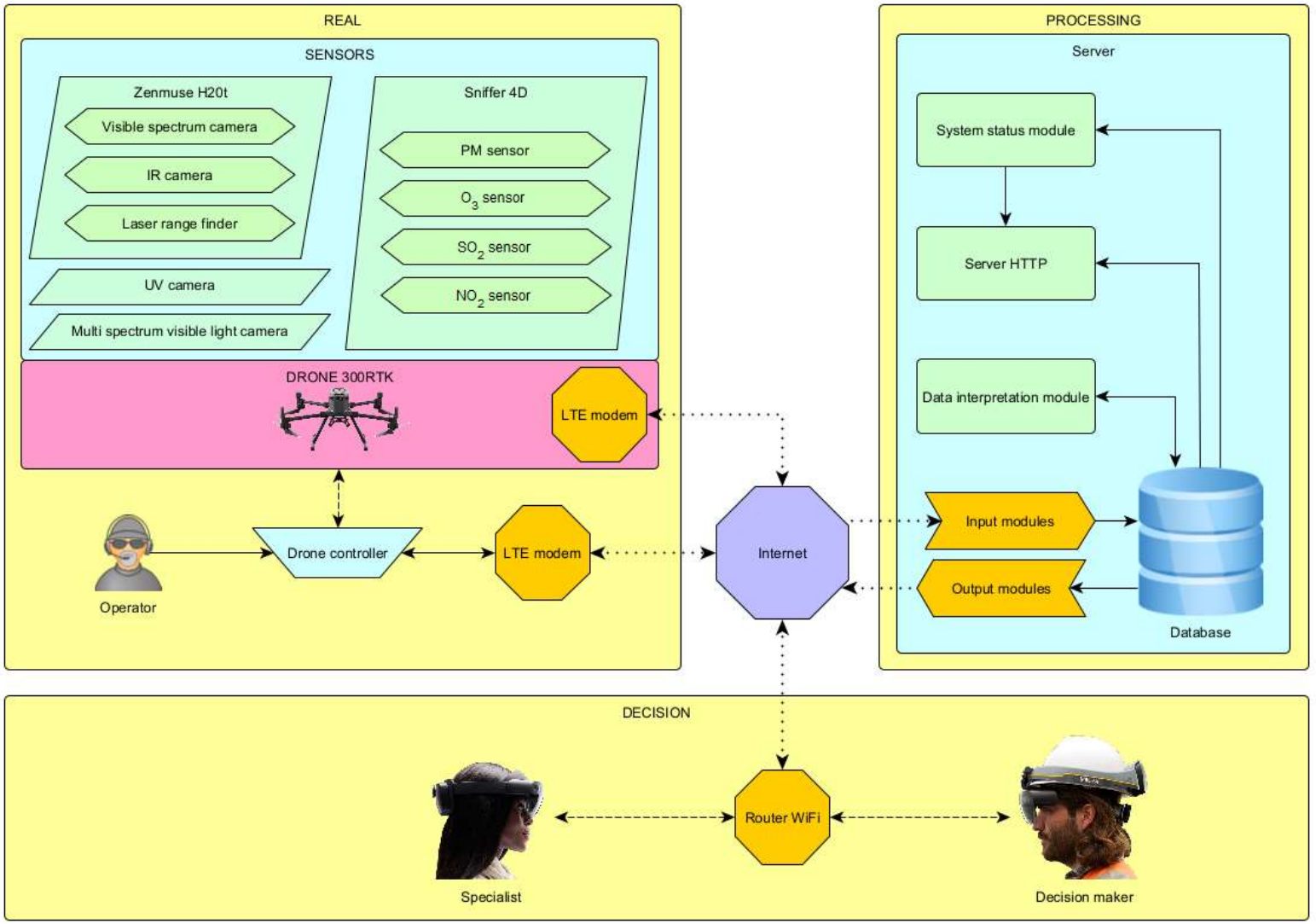
C1

- **C1 Validation Campaign: Kołobrzeg**
- **LOCATION: Port of Kołobrzeg, Poland**
- **Time: Autumn 2022**
- **SCOPE: Air and water pollution monitoring, safety**

Port of Kołobrzeg

- merchant ship loading/discharging
- fishing
- passenger
- 2 yacht marinas
- ships with a length of up to 100 meters, width of up to 15 meters and a draft of up to 5.0 meters are operated
- Cost Guard and SAR
- complete infrastructure
- no port restrictions for drones

System architecture



Sensors for DJU Matrice 300RTK for air and water pollution

- Air quality (Sniffer 4D mobile air quality station):
  - PM (0,3 – 10 um)
  - O3 sensor (0-10 ppm)
  - SO2 sensor (0- 10 ppm)
  - NO2 sensor (0-10 ppm)
- Other environmental remote sensors (oil spill/water pollution):
  - UV camera (PCO-UV 14 bit CCD camera - 1392x1040, 190nm – 1100nm)
  - Visible spectrum camera (Zenmuse H20t, 1/1.7" CMOS, 20 MP, 20x zoom)
  - Multi spectrum visible light camera (Mica sense RedEdge MX dual camera with spectrum: coastal blue 444nm, blue 475nm, green 531nm, green 560nm, red 650nm, red 668nm, red edge 705nm, red edge 717nm, red edge 740nm, NIR 842nm, 1280 x 960 – 1.2 MP per band))
  - IR (thermal) camera (640×512 @ 30 Hz)
  - Laser range finder (1200m +/-0,2m)

Plan

- 2 separate missions:
  - Air pollution
  - Water pollution

in cooperation with Port Authority and SAR

26-29/09/2022

VR / AR interface

- Microsoft Hololens, 2nd generation – one of the most advanced AR system available, that allows for a full 3d, spectroscopic holographic projection to the user without blocking the view of the surrounding.

AR – Decision support

AR – Decision support

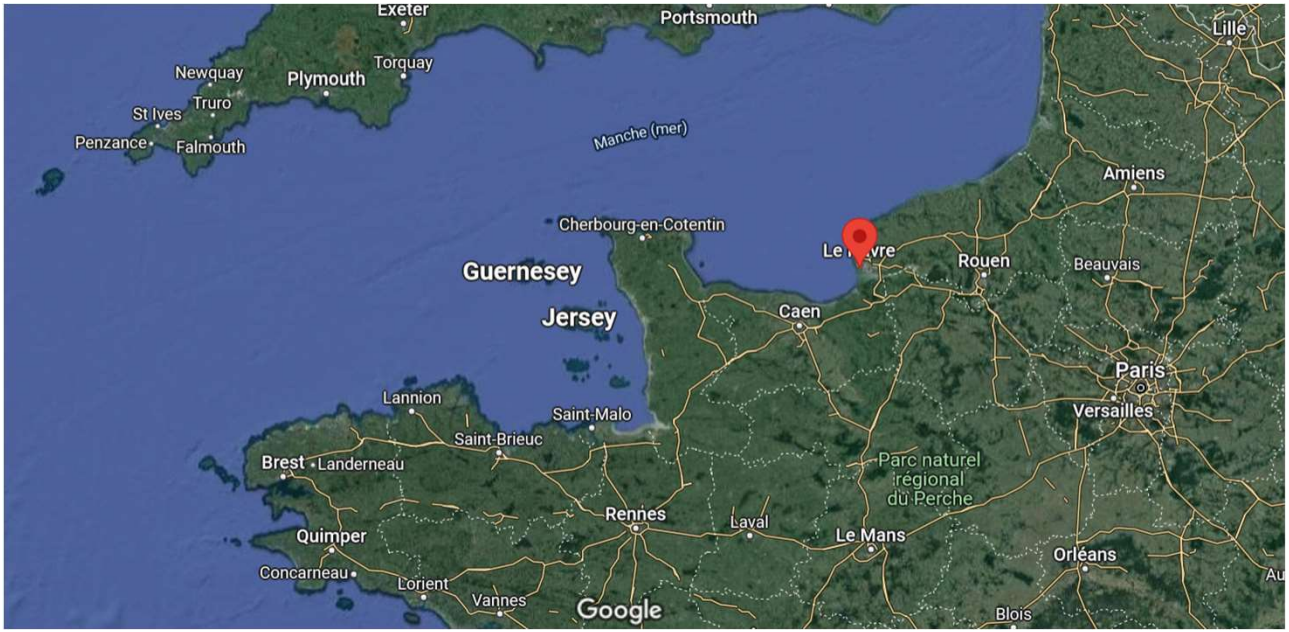
PASSport Campaign C4

Le Havre (France)

Emilie Miquel – M3S
Loïc Gourmelen - Cerema

Agenda

- Campaign Objectives and scenarios
- Campaign Solution



Campaign Objectives

The aim of port security is to detect threats of unlawful actions against ports and port facilities (terminals) in their role as an interface with ships engaged in international transport, and to take appropriate measures to **prevent these threats and limit their impacts**.

The scope of this campaign is to assess operational contribution of RPAs in support to **protection against non cooperatives small crafts** approaching the port areas. Migrant or activist semi-rigid inflatable boats, leisure boats with deliberate or undeliberate illicit behaviour, should be consider as non-cooperative crafts.

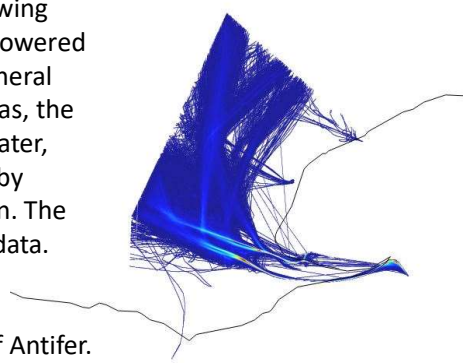
Campaign to be hold by 2023 / 06

- ✓ Campaign preparation: starting from 2022 Q3
- ✓ Campaign dissemination: starting from 2022- Q4
- ✓ Campaign execution: 2023 Q2 (June 2023)
- ✓ Campaign event organisation 2023-Q2
- ✓ Campaign report: 2023 Q3

Campaign Scenarios

Scenario 1 : patrolling and general surveillance

For general safety and security purposes, fixed-wing drone patrols around the harbor and the wire-powered drone is deployed from the port to carry out general surveillance of the water. Thanks to their cameras, the two drones are able to detect mobiles on the water, recognise the type of vessel, and identify them by reading their name, registration or radio call sign. The identification can be cross-referenced with AIS data.



Case study:
- Vessel in fishing action in the restricted area of Antifer.
- Vessel showing abnormal

Scenario 2 : Surveillance of a specific target

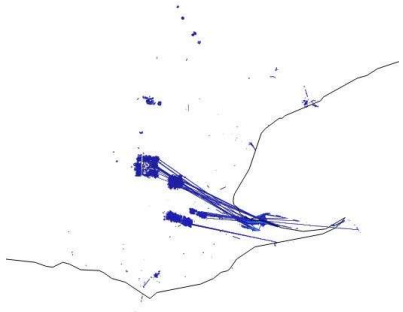
When there are several indications that a vessel is potentially suspicious to the port authorities, the fixed-wing drone will proceed to the vessel to identify and observe it.

Example of a concrete case:
- Vessel not responding to VHF
- Cutting off of AIS transmission
- Vessel with erratic course

Scenario 3 : Securing the boarding of pilot

The fixed-wing drone follows the pilot's ship and observes in detail the ship on which the pilot is to embark.

The drone must be able to detect damage or anomalies in the behaviour of the vessel or on the bridge.



Scenario 4 : securing entrance and exit of the port

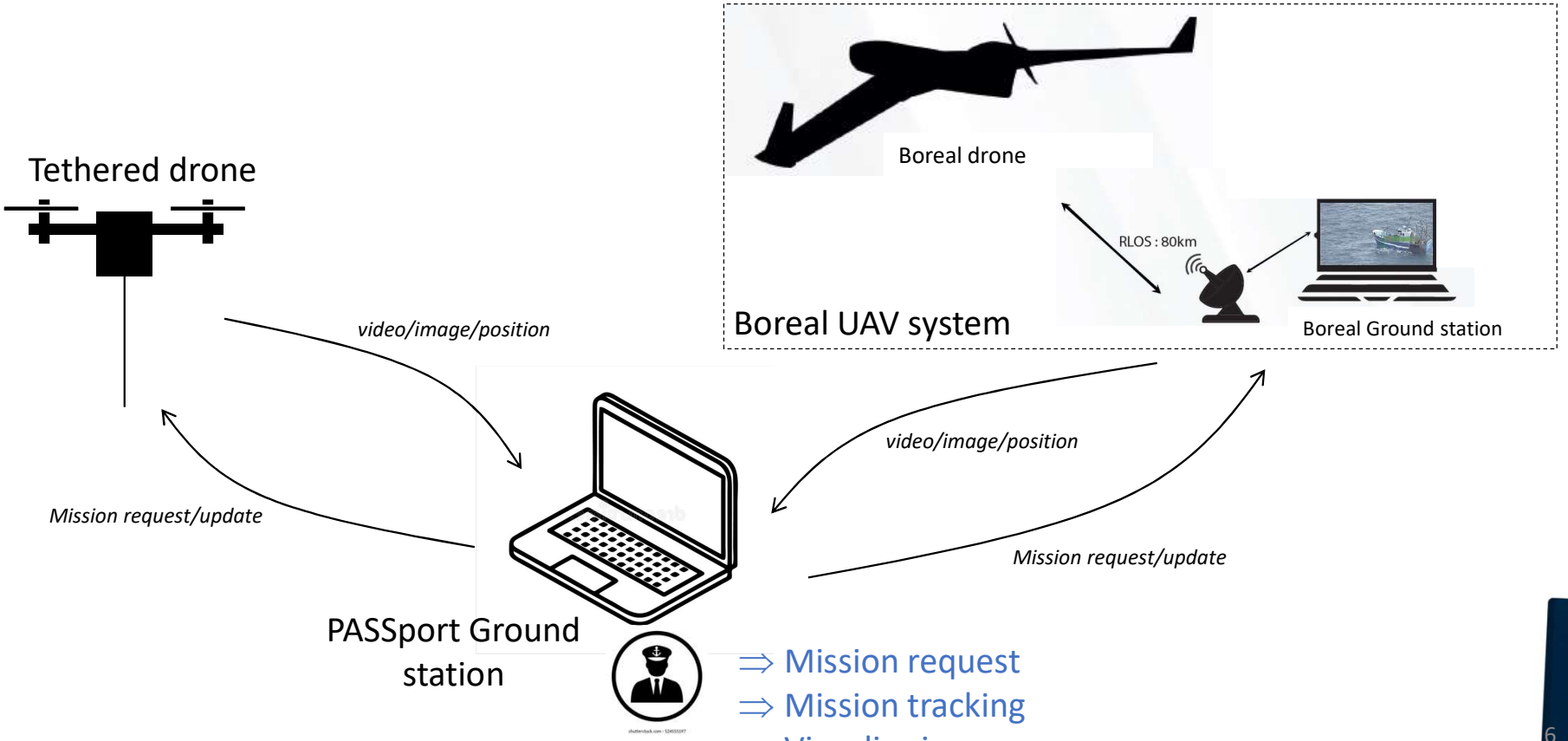
The wire-powered drone allows detailed observation of all vessels manoeuvring in the vicinity as they enter or leave the port. The fixed-wing drone takes over a few hundred metres out to sea.

Case study:
- Monitoring that small pleasure craft do not sail in forbidden areas or interfered commercial trafic.
- Complete direct observation during escort procedures (high-risk level vessel).

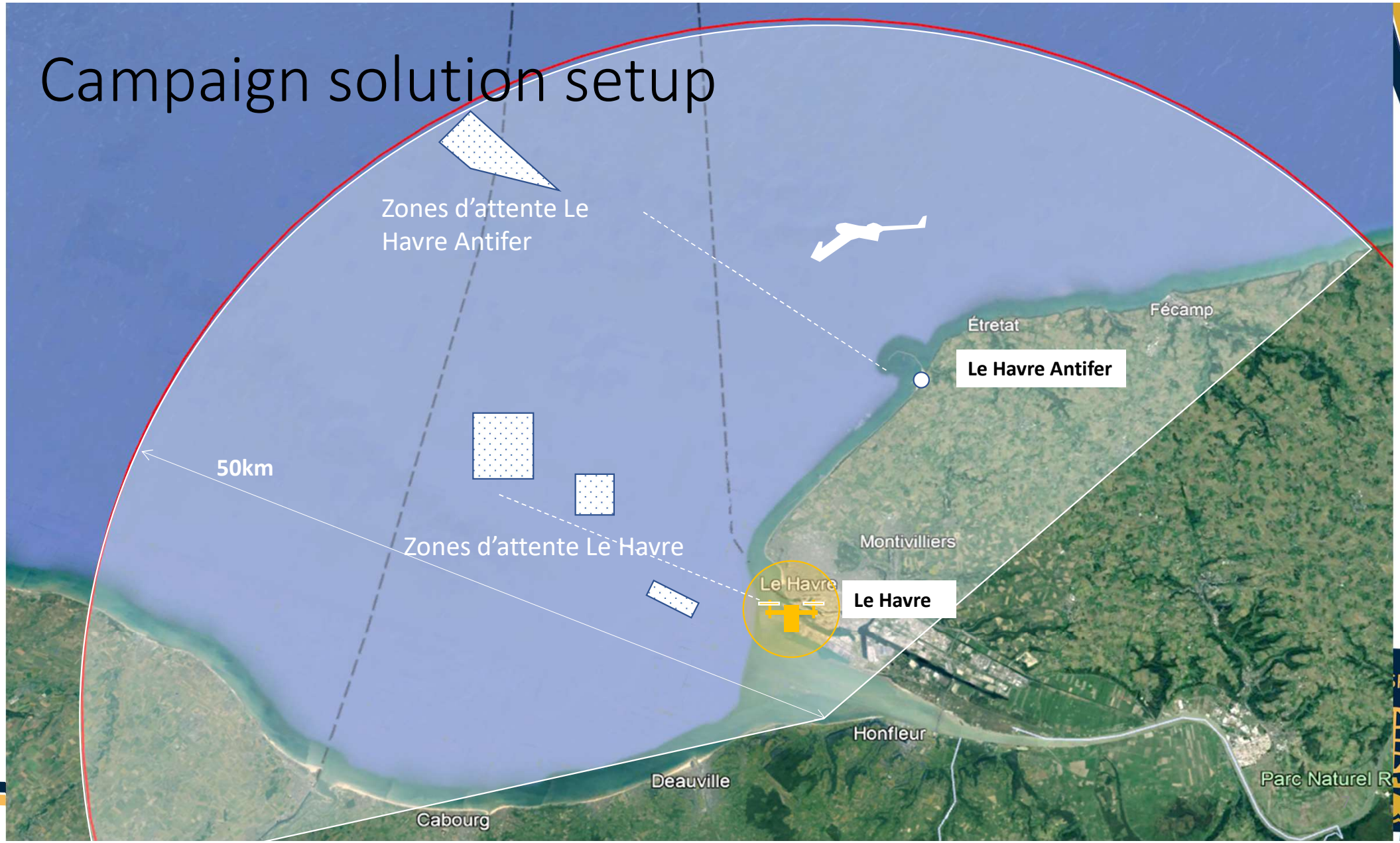
Video and Real Time surveillance

- Operational need: RT Video and geo positioning in the port area and up to 50 km from the port
  - Long range UAV to cover coastal waters
  - Tethered drone to provide eagle's eye view on strategic areas of the port
  - All information managed and delivered to the Port Authority in a single platform

An integrated solution for the port Authorities



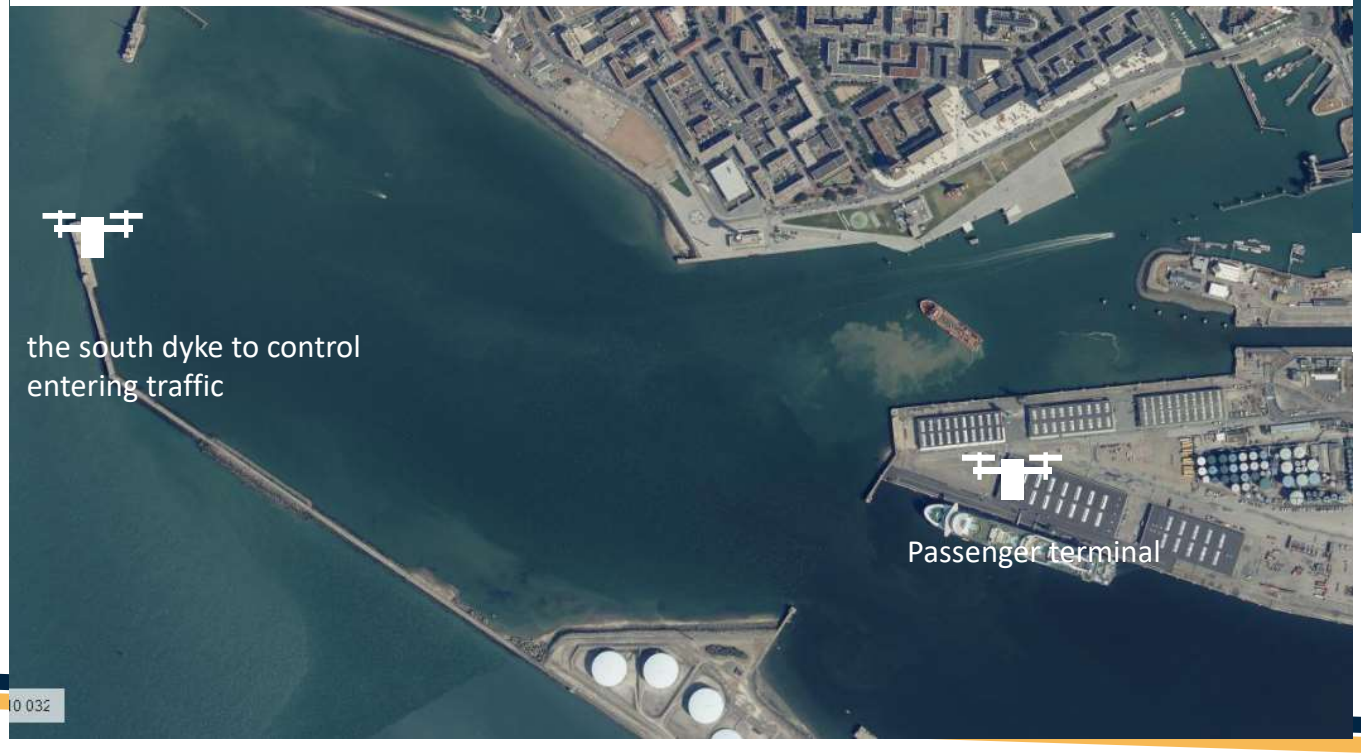
Campaign solution setup



Campaign Setup - Details

Le Havre Antifer – Boreal fixed wing drone
TKOF/LDG terrain

Le Havre Historical Port vicinity – tethered Drone



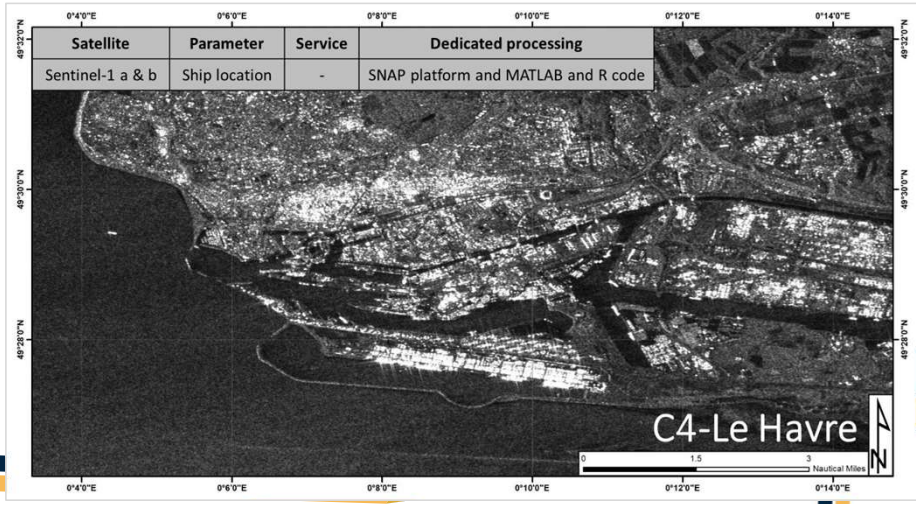
GNSS and Copernicus

- C4 campaign will support a series of GNSS initiatives:

New Galileo services HAS and OS NMA added value will be assessed and quantified via lab testing

- C4 campaign will benefit from Copernicus Satellite imaging to support possible post operation analysis and reporting

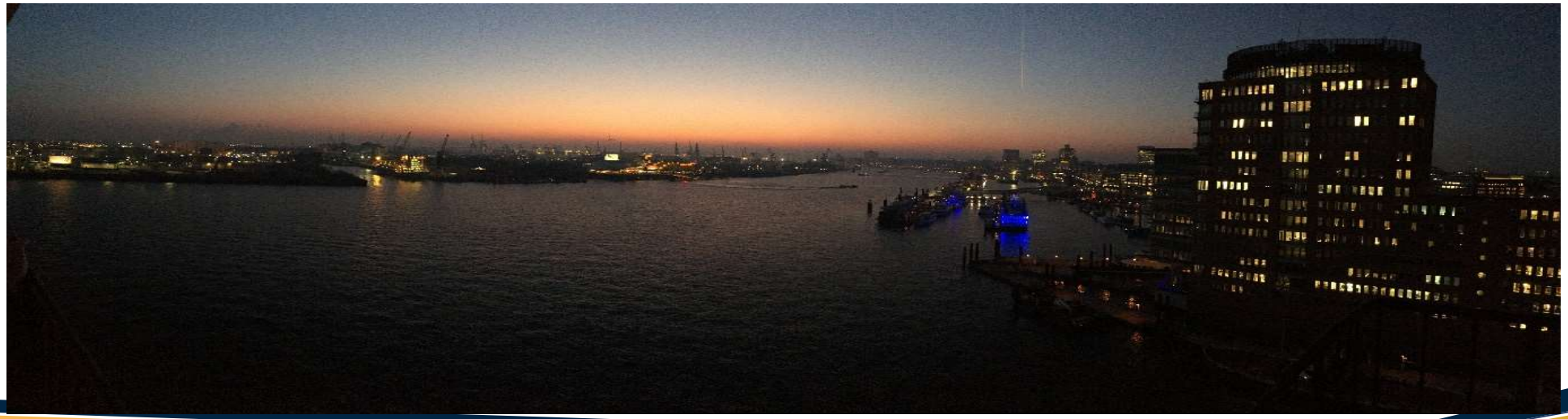
GNSS interference detection using GMV antenna:



PASSport project. Hamburg campaign

Hamburg port

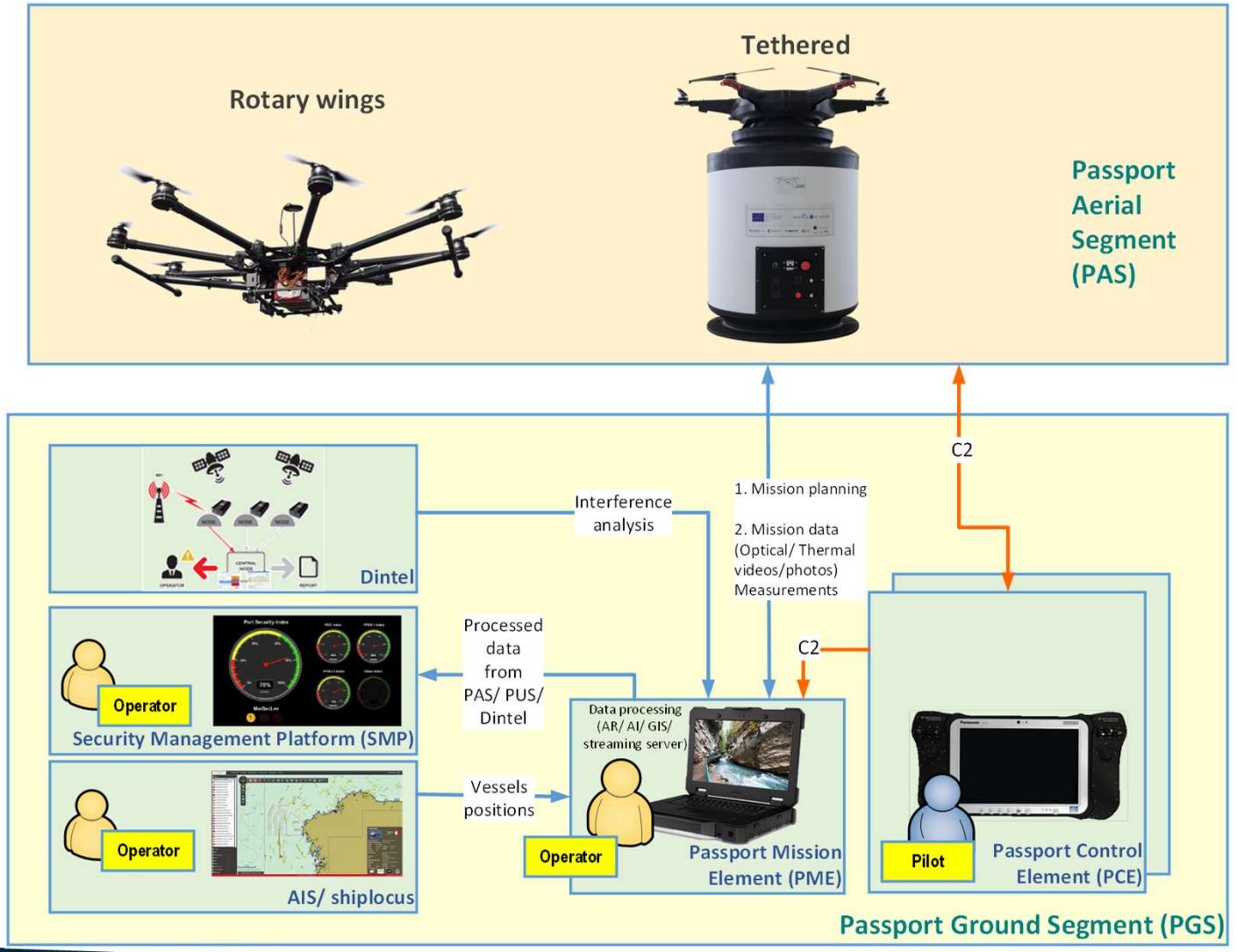
- Around 8,000 ship calls per year, almost 300 berths and a total of 43 kilometers of quay for seagoing vessels, more than 2,300 freight trains per week, four state-of-the-art container terminals, three cruise terminals and around 50 facilities specialized in handling roro and breakbulk and all kinds of bulk cargoes, along with about 7,300 logistics companies within the city limits – these are just a few of the factors making the Port of Hamburg to one of the world's most flexible, high-performance universal ports.
- 136.6 million tons of cargo crossed the quay walls of Germany's largest seaport in 2019. That included around 9.3 million standard containers (TEU). Hamburg is accordingly the third largest container port in Europe and in the 17th place on the list of the world's largest container.
- The port is one of the backbones of the German economy and seen as a critical infrastructure of the country. But it also has further reach as the hinterland connectivity as well as feeder vessels are connecting Hamburg with other countries within Europe.



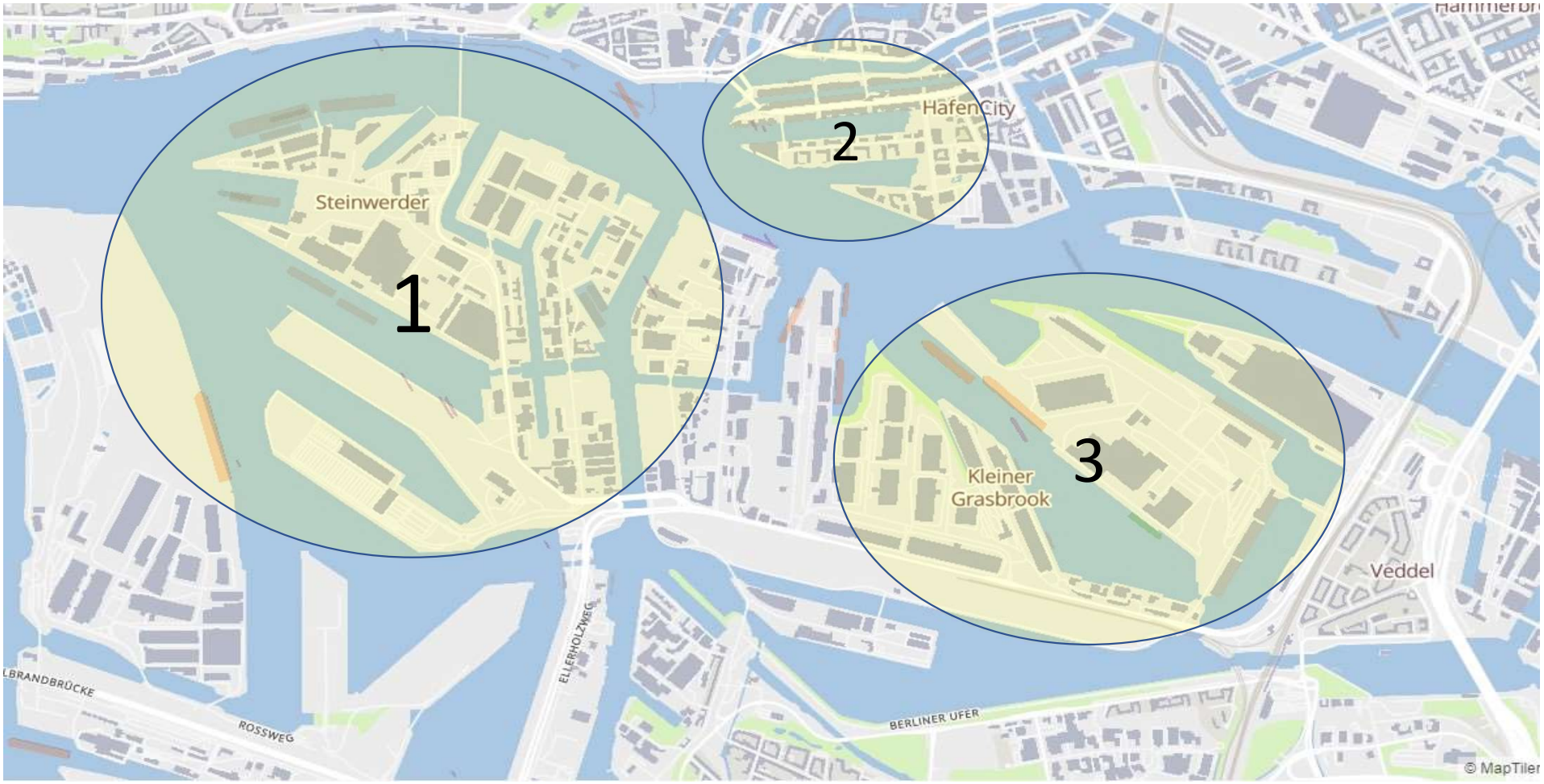
Critical buildings/ Infrastructures protection (Hamburg)

- Port areas are characterized by a large number of infrastructures which makes that unintentional interferences can occur more than desired. Moreover, maritime community is increasingly be concerned about intentional attacks such as jamming and spoofing which could potentially provoke accidents, vessel misrouting or theft.
- For this reason, the campaign performed in Hamburg will be devoted to **operate a fleet of drones for surveillance purposes** being integrated as interface to DINTEL interference detector in the port to detect interference events that could compromise the security and the safety of port operations.
- The scope of the demonstration campaign will be to test the following benefits:
  - Continuous aerial surveillance monitoring
  - Uninterrupted, automatic operation for continuous monitoring of interferences in GNSS bands.
  - Dual-band simultaneous monitoring (e.g. GPSL1/Galileo E1 and GPSL5/GalileoE5a).
  - Identification and characterization of interference sources
- Also **vessels traffic monitoring (non cooperative vessels on sea side**) is planned to be included as a potential case of interest

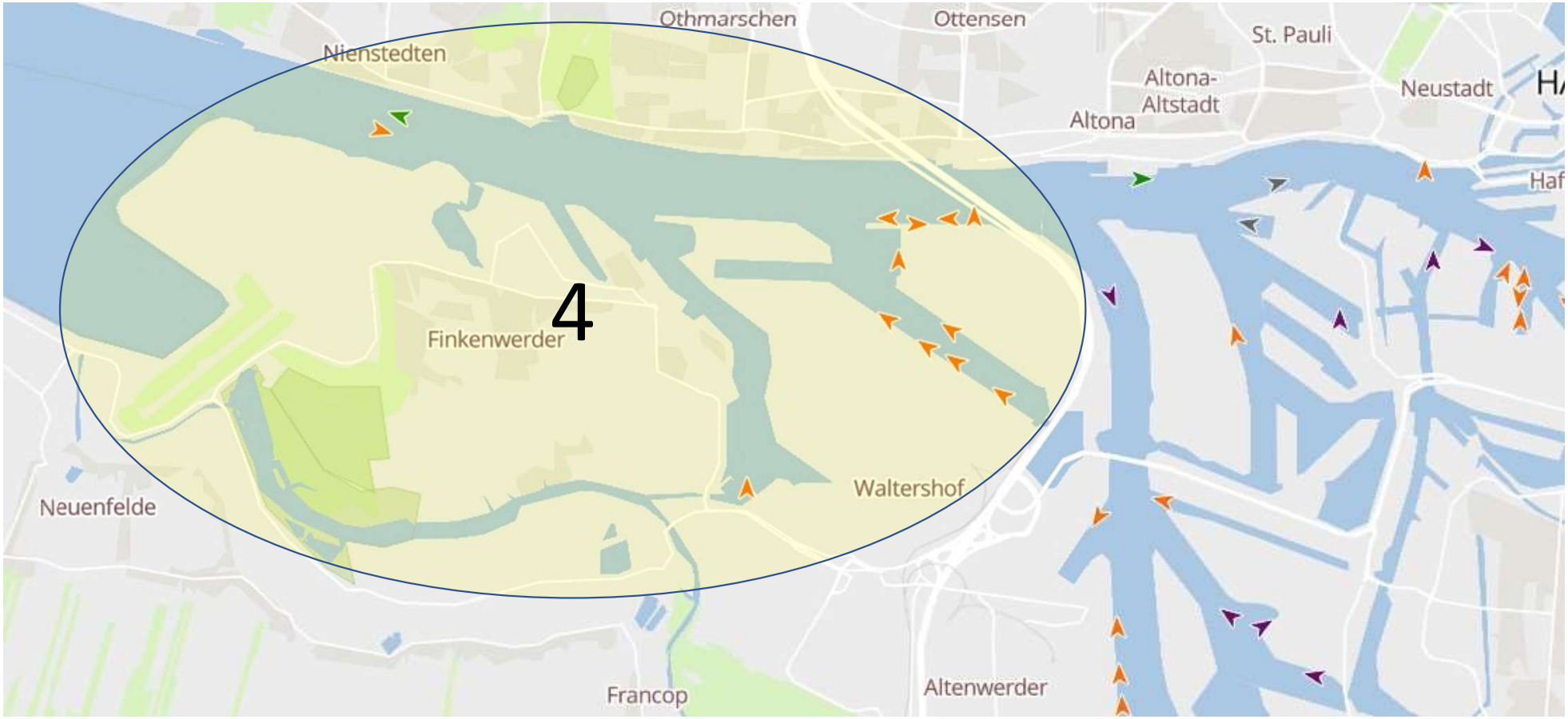
Critical buildings/ Infrastructures protection (Hamburg)



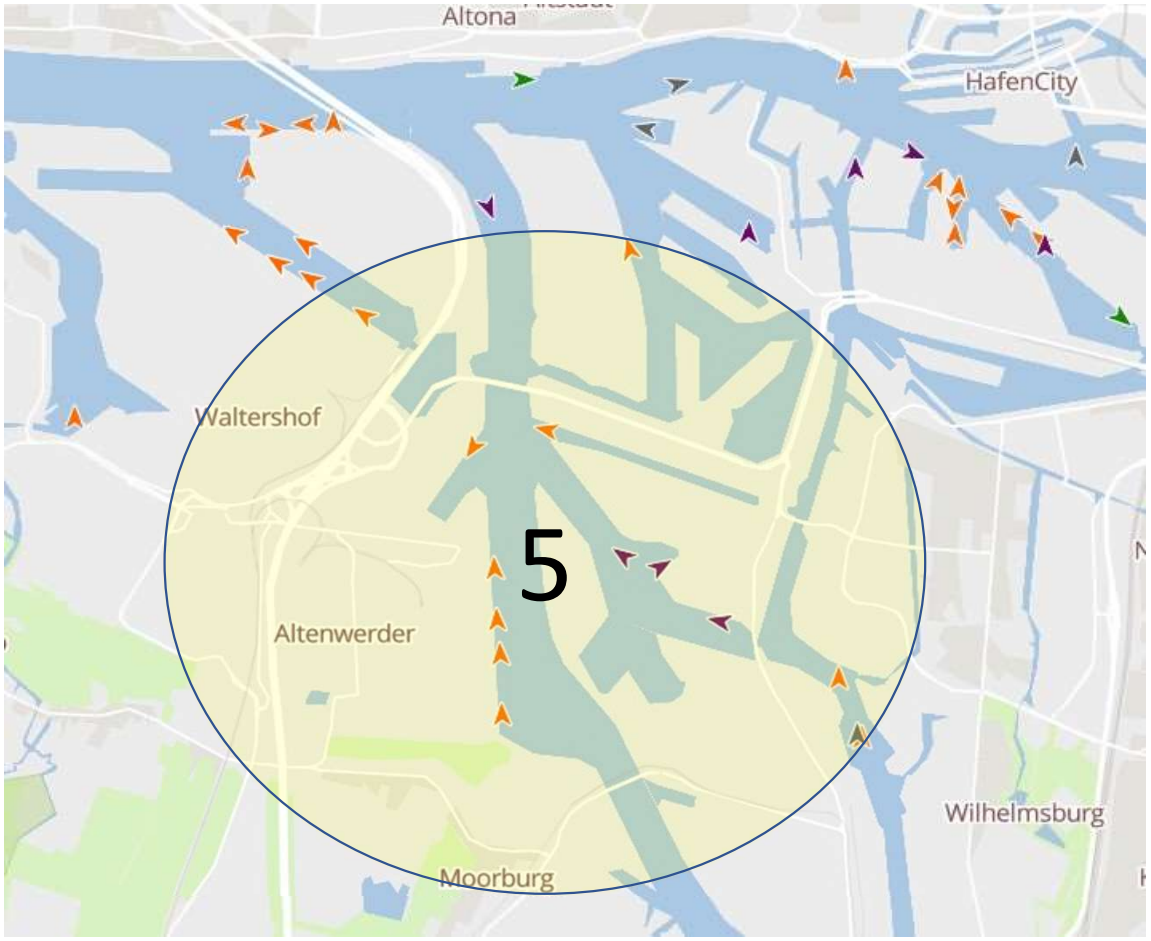
Hamburg Focus Areas



Hamburg Focus Areas



Hamburg Focus Areas



Potential Campaign Area

Container Terminals in Altenwerder

Thank you very much

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CONSULTANTS & ADVISORS
MARINE