



# EMSA & Maritime Surveillance

## Portugal Shipping Week 2018

Fionn Molloy / Deputy Head of Unit

Lisbon / 19 September 2018



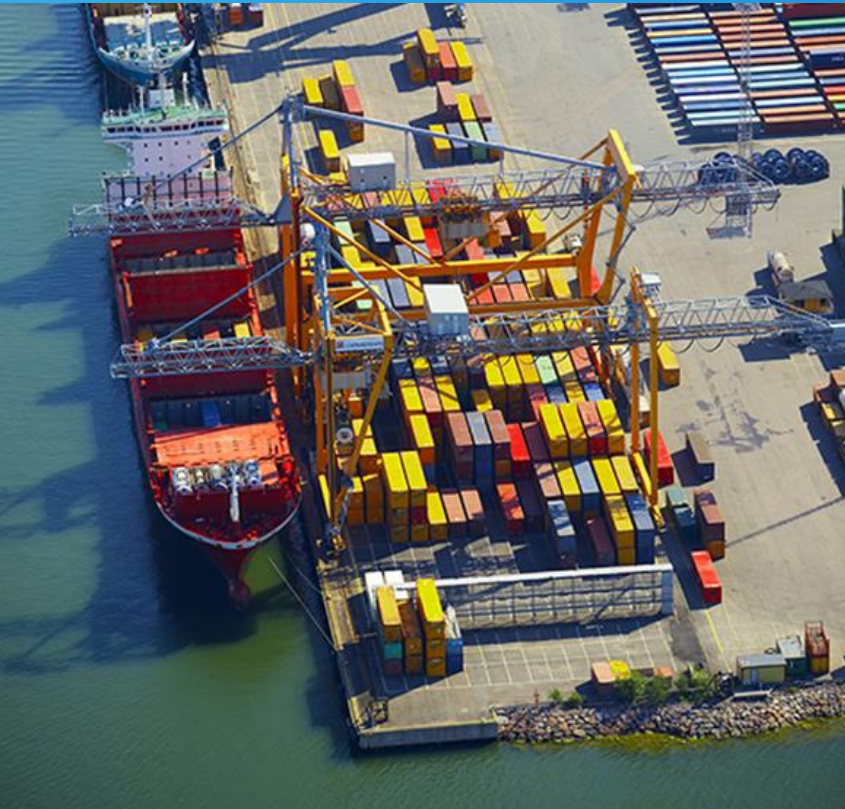
## Presentation on:

- EMSA's activities in the domain of maritime surveillance and
- How these are channelled to Member States and EU bodies to support the implementation of their tasks





# Maritime Challenges



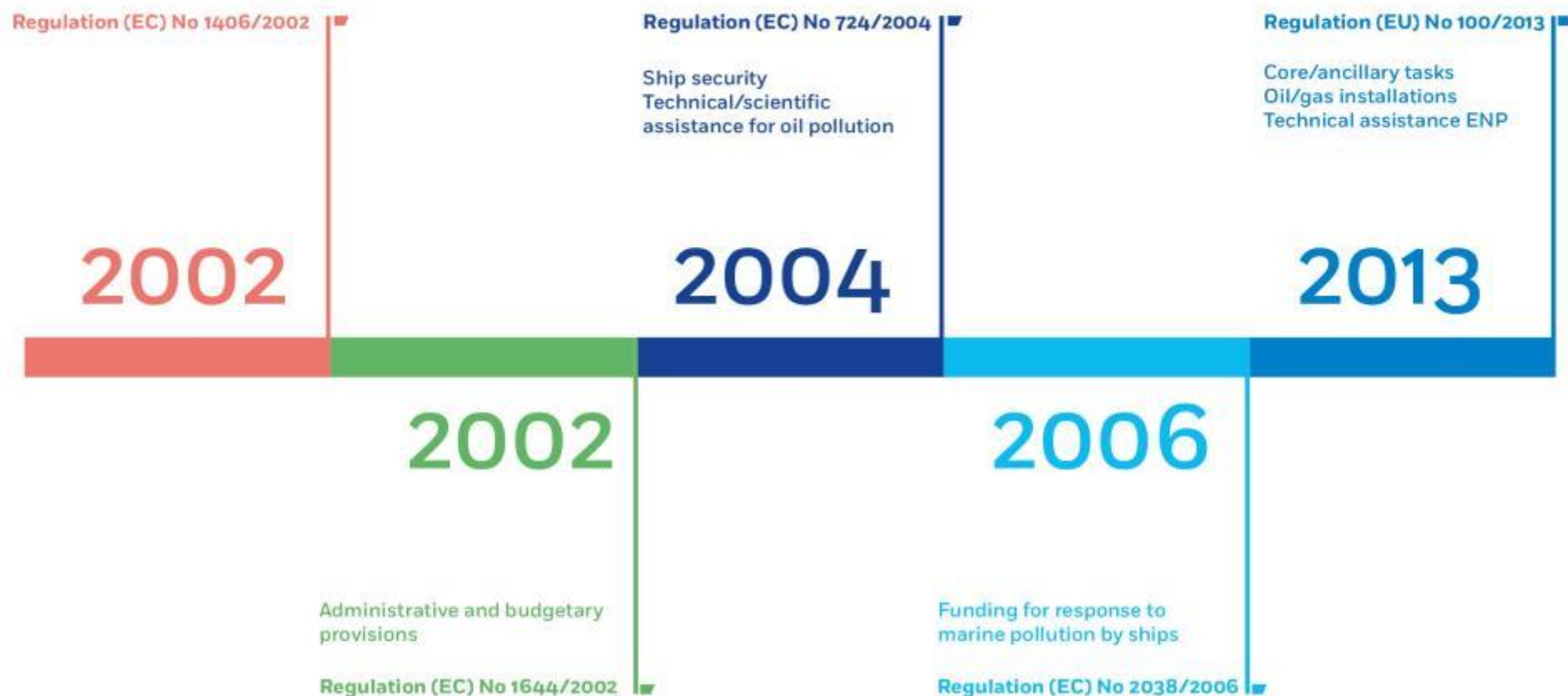


# Legal basis

- Erika sinks off Brittany, France 12/12/1999
- Decision taken to reinforce EU maritime legislation
- Erika I & II Safety Package
- EMSA established Regulation (EC) No 1406/2002



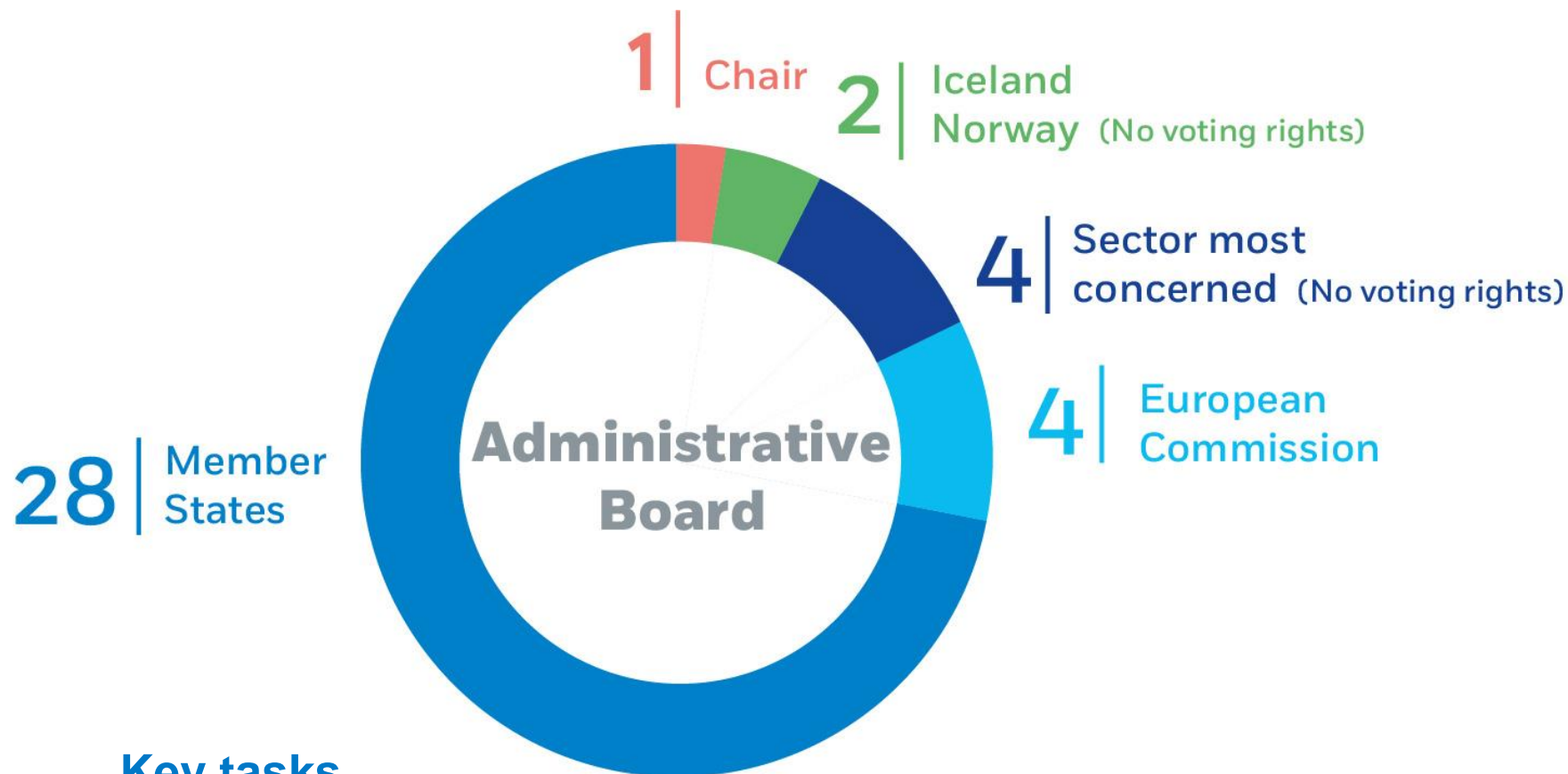
## Amendments to the founding regulation



## Regulatory Agency of the European Union

- Own legal identity  
(Regulation (EC) No 1406/2002)
- Maritime safety, security, prevention and response to marine pollution by ships, oil and gas installations
- Technical and operational support to 28 EU Member States and Commission
- Staff ~ 250 people ~ 24 nationalities
- Annual Budget: ~65 million EUR
- HQ Lisbon, Portugal





## Key tasks

- Appoints the Executive Director
- Adopts the final budget as well as Annual Work Programme etc.



## 6 CORE TASKS

Since the recent change to its founding regulation, EMSA will support authorities carrying out coast guard functions at national, European and international level. It will achieve this by continuing to carry out a host of its core, mainstay activities as well as by setting up new and enhanced services in the field of maritime surveillance and capacity building.



SHIP CASUALTY & MARITIME ASSISTANCE SERVICE



MARITIME, SHIP & PORT SECURITY



MARITIME MONITORING & SURVEILLANCE



MARITIME SAFETY & VESSEL TRAFFIC MANAGEMENT



MARITIME ENVIRONMENTAL PROTECTION & RESPONSE



MARITIME ACCIDENT & DISASTER RESPONSE

## 5 SUPPORT ROLES



MARITIME SEARCH & RESCUE



MARITIME BORDER CONTROL



MARITIME CUSTOMS ACTIVITIES



FISHERIES INSPECTION & CONTROL



PREVENTION & SUPPRESSION OF TRAFFICKING & SMUGGLING & RELATED MARITIME LAW ENFORCEMENT



Member States



EFCA



EU Navfor



Frontex



European Commission



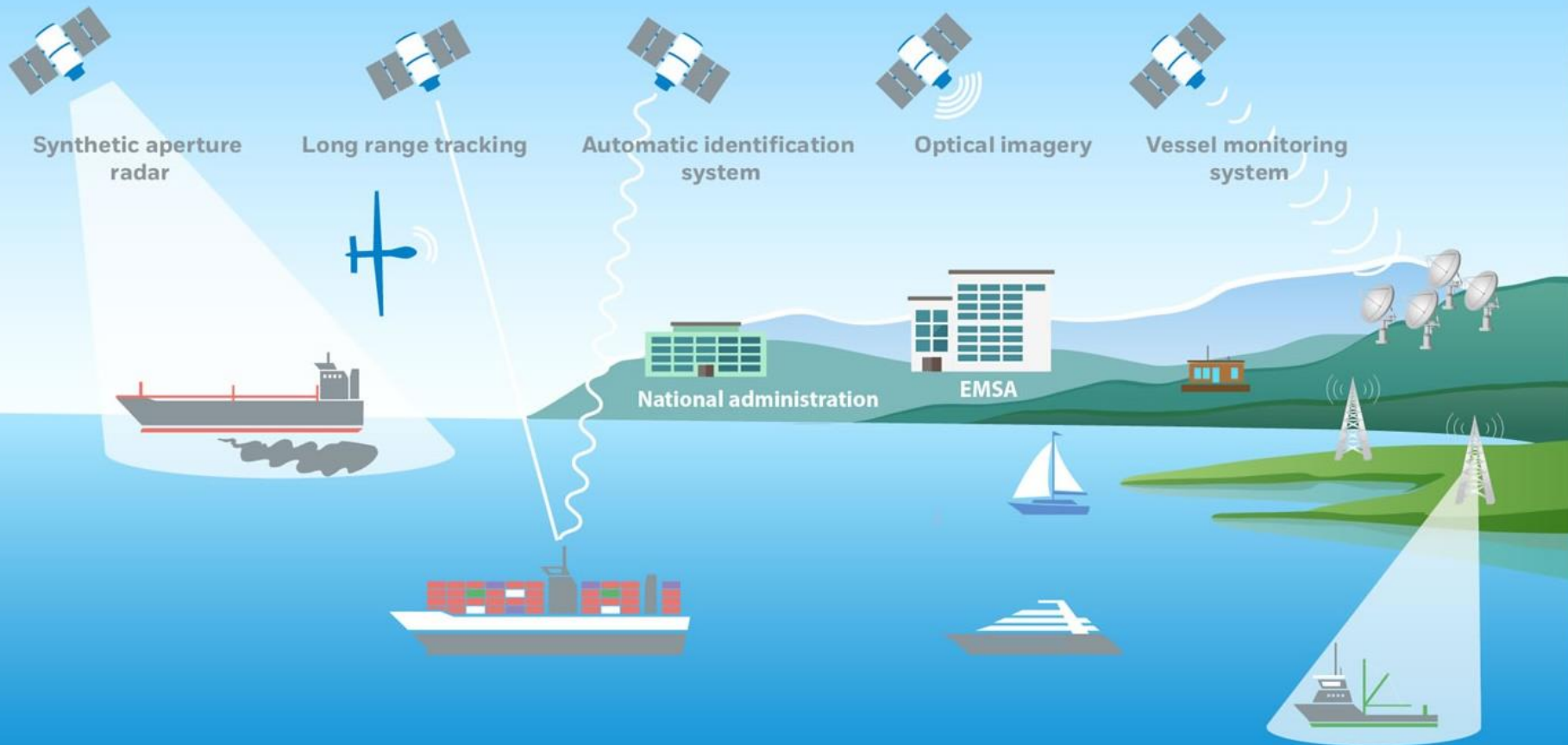
MAOC-N



OLAF

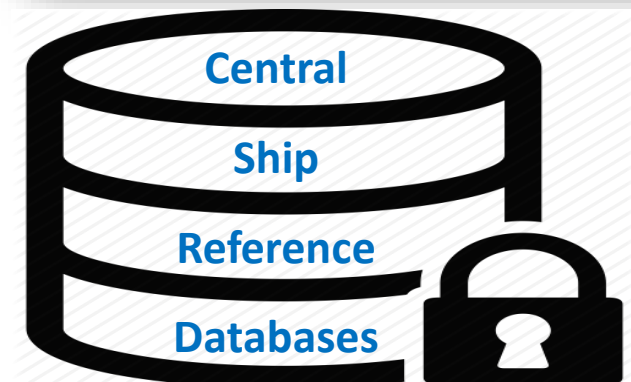


# Maritime Data Sources



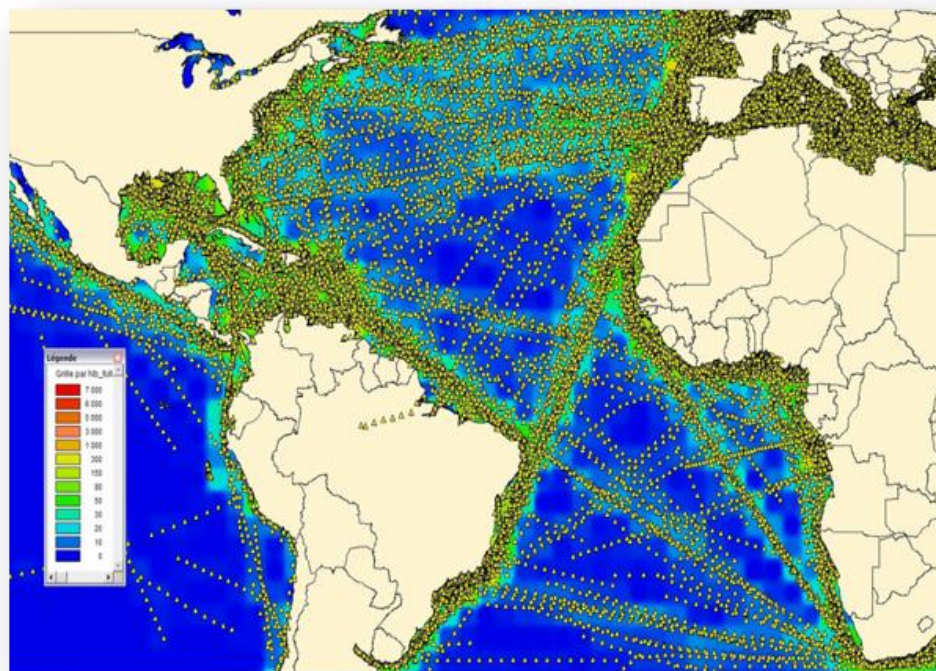
# Initial Maritime Picture: 3 sources

## SafeSeaNet (SSN)

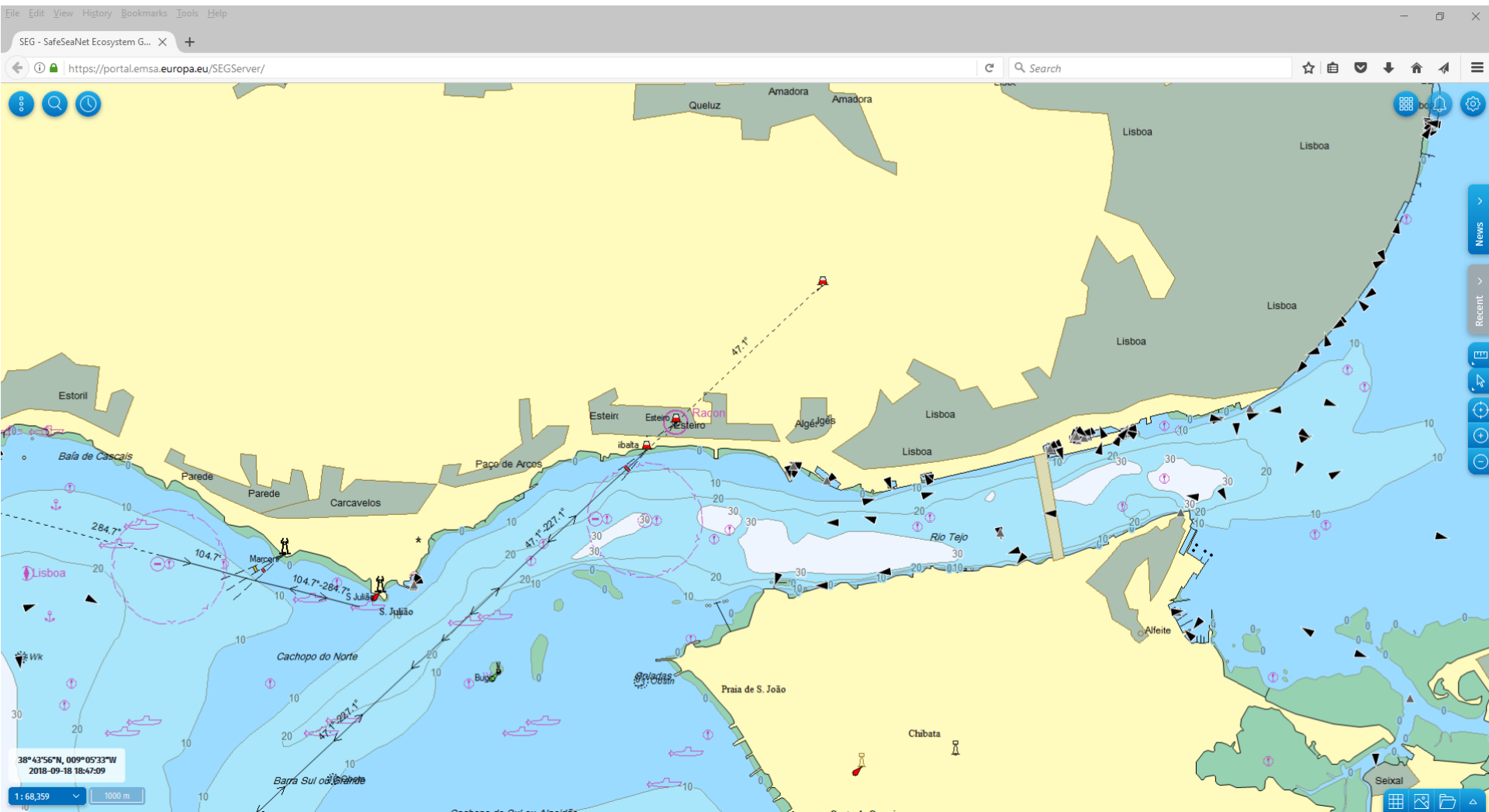


## Satellite- AIS (S-AIS)

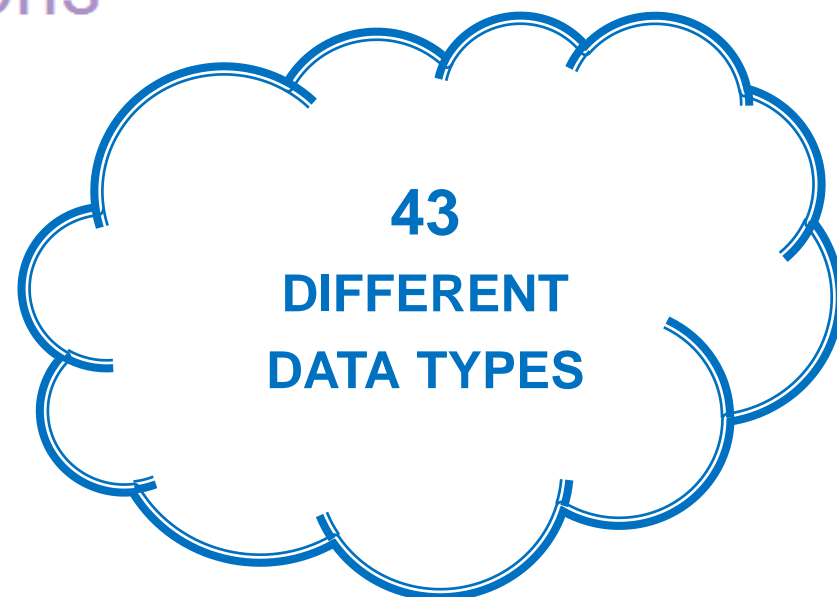
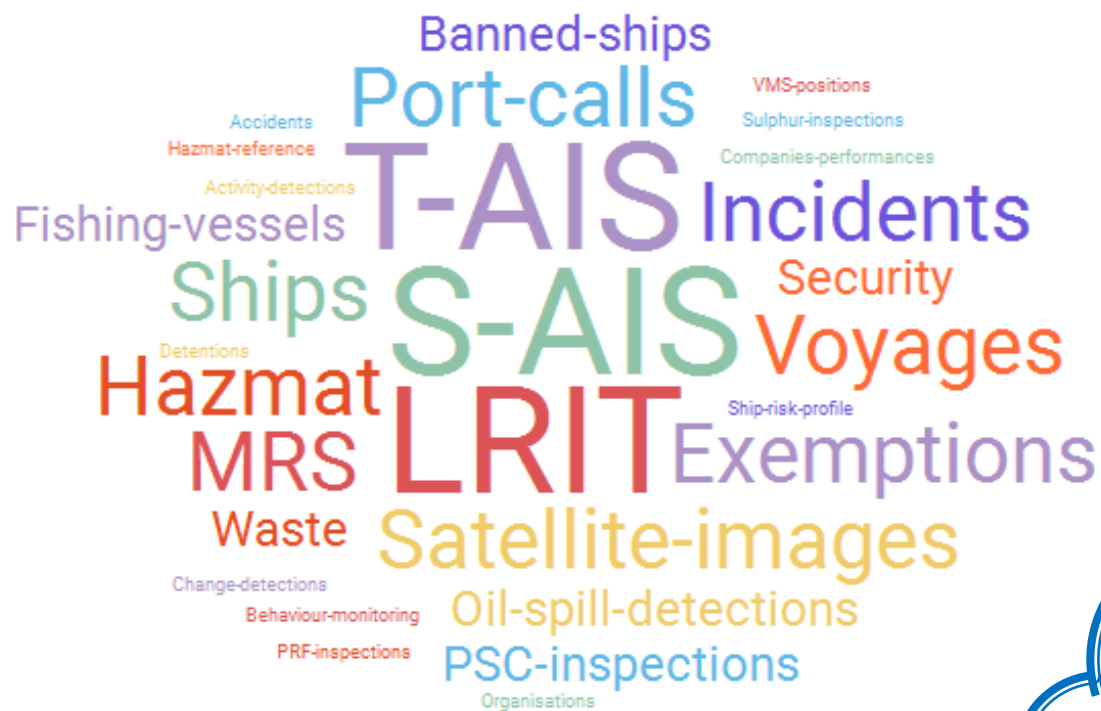
## Long Range Identification and Tracking (LRIT)



# Initial Maritime Picture: 3 sources







## 2017

DATA PROCESSED BY EMSA  
INFORMATION SERVICES



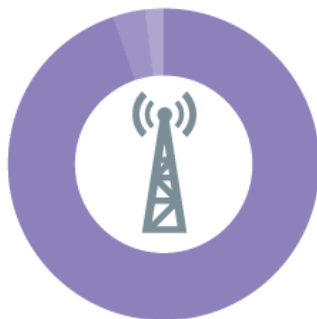
ACTIVITIES COVERING:



## 21 million

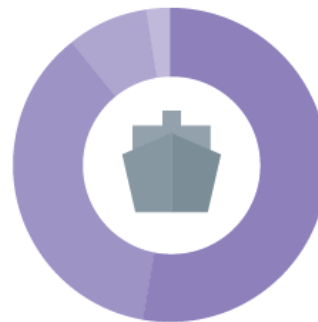
TOTAL MESSAGES RECEIVED BY EMSA  
ON 05/09/2017

AIS	21 417 877
(terrestrial & satellite)	
VMS	78 368
LRIT	40 421



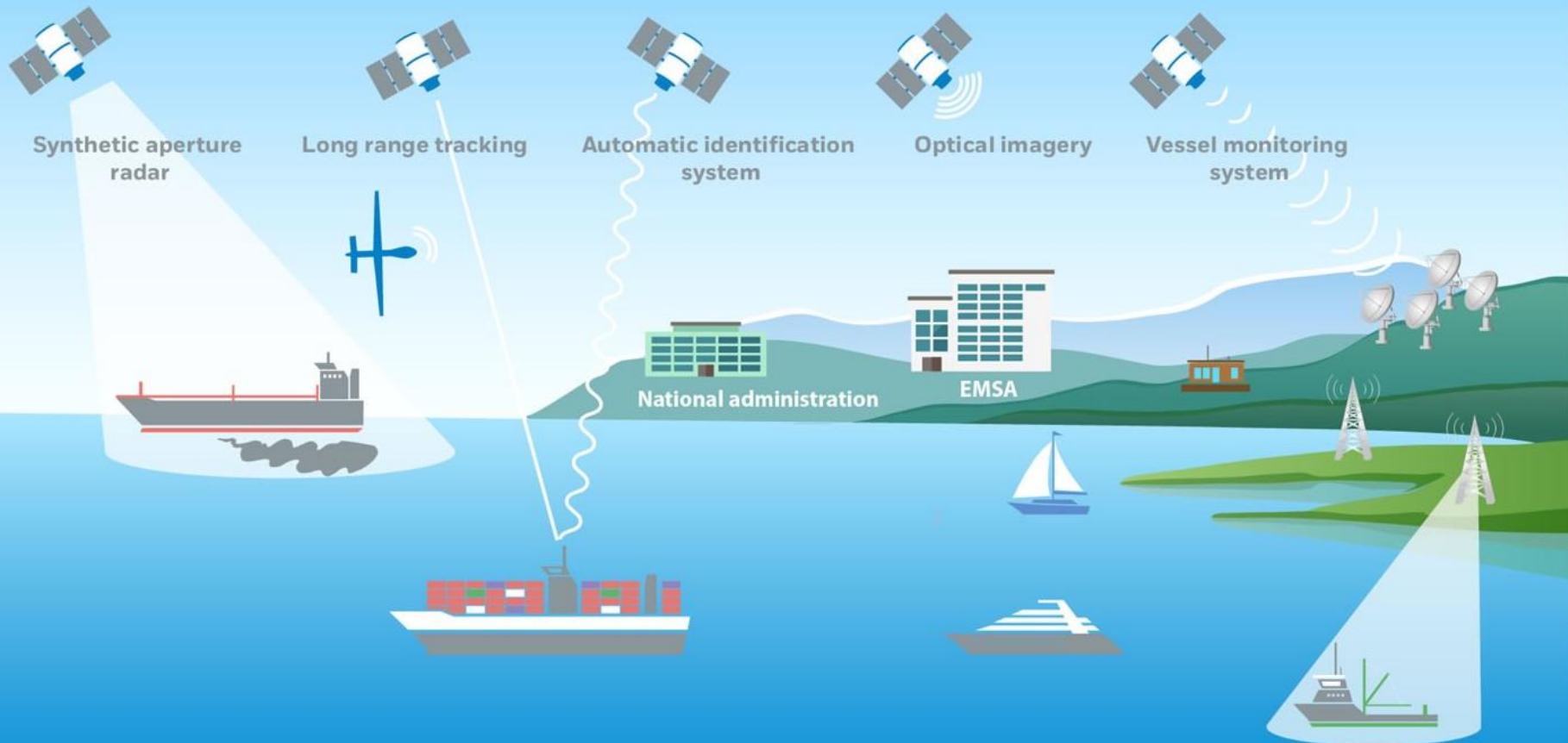
## 95719

NUMBER OF DISTINCT VESSELS DETECTED  
PER SOURCE ON 05/09/2017



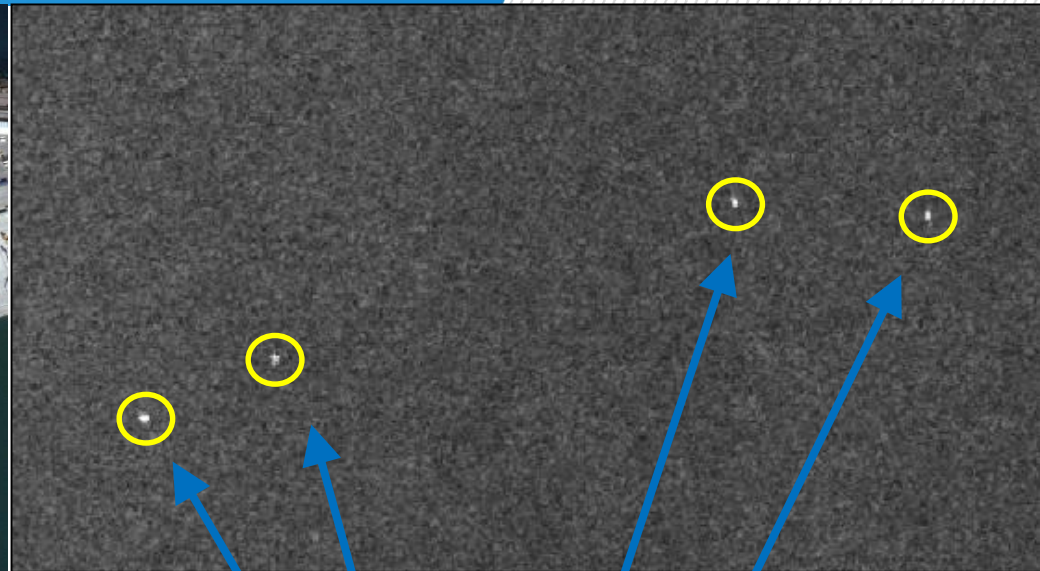
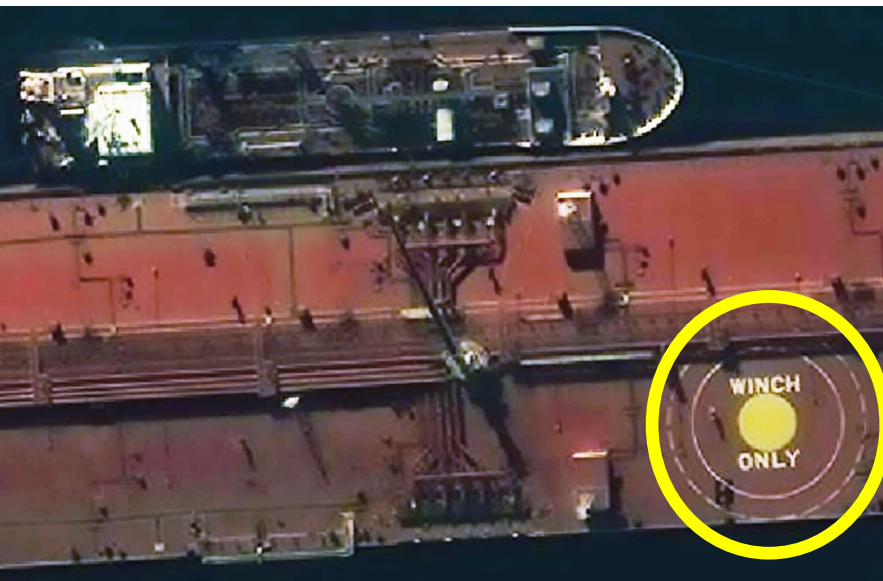
S-AIS	63,5%
T-AIS	44,6%
LRIT	10,6%
VMS	3,8%

# Maritime Data Sources





# Satellite Data: Optical and Synthetic Aperture Radar (SAR) Sensors



**Ships?**

## Synthetic Aperture Radar

- Quasi-real time in Europe (value added products delivered to users within 30 min)
- Near real time outside Europe (using on-board recorders and in the near future EDRS)



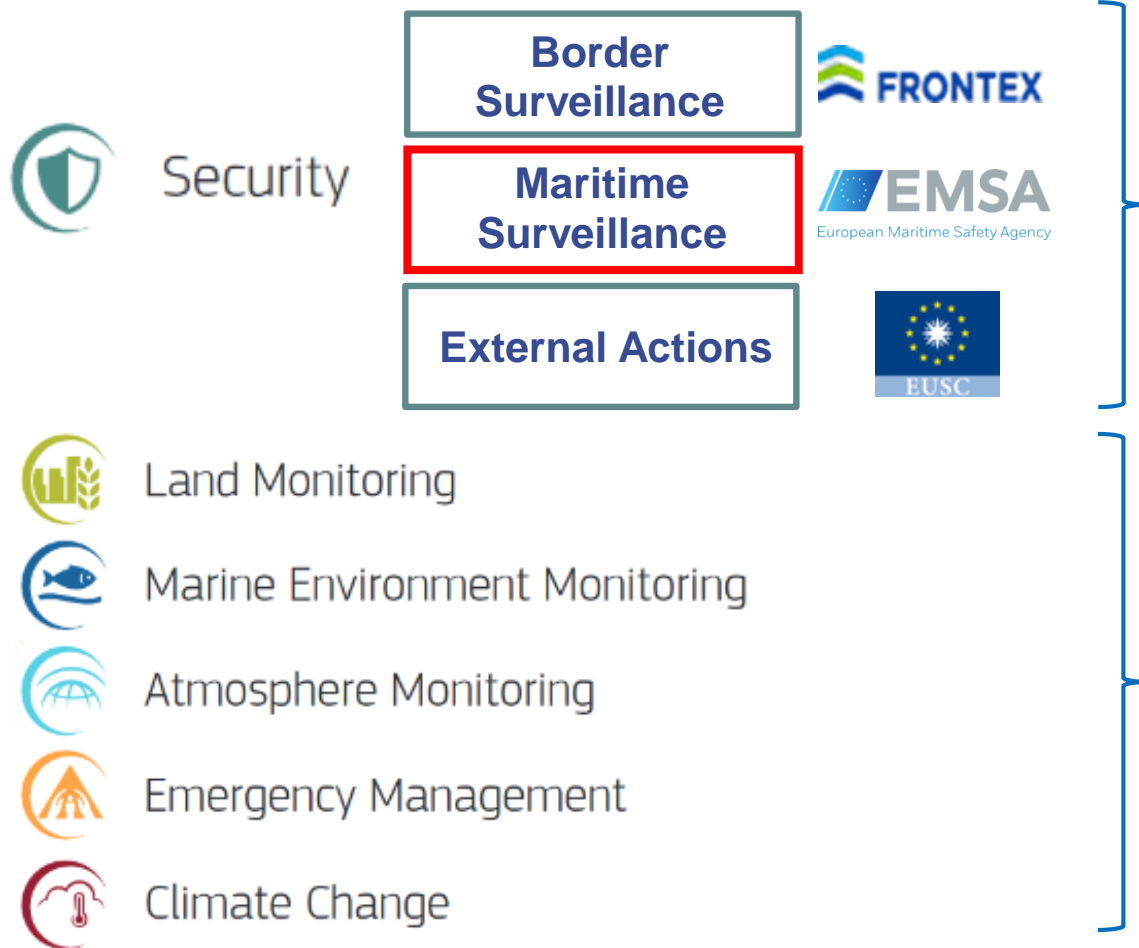
\*Times refer to the fastest delivery times for the relevant products



## Optical

- Delivery 45 min after satellite overpass (basic products)
- Delivery 60 min after satellite overpass for value adding products (vessel detection and activity detection)

## Copernicus Service Component



**Restricted access;**  
specific conditions; delivered  
directly and securely to user

**Full and open access;**  
data accessible to all;  
mostly available online



## Background

- EMSA is the “Entrusted Entity” for CMS implementation
- Delegation Agreement signed Dec. 2015
- Services delivered from Sept. 2016
- Budget 2016-2020: 40 M EUR
- Budget 2018: 8.2 M EUR

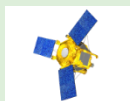


**3 December 2015**

***Miss Lowri Evans (Director General – DG-GROW) and Mr. Markku Mylly (Executive Director – EMSA) sign the Delegation Agreement***

# Satellite Data Portfolio

## OPTICAL MISSIONS



SPOT 6/7



Pleiades 1A/1B



WorldView-1



WorldView-2



WorldView-3



WorldView-4



DEIMOS-2



GeoEye-1

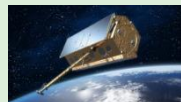
## SAR MISSIONS



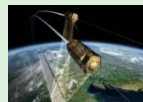
Sentinel-1 A/B



Radarsat-2

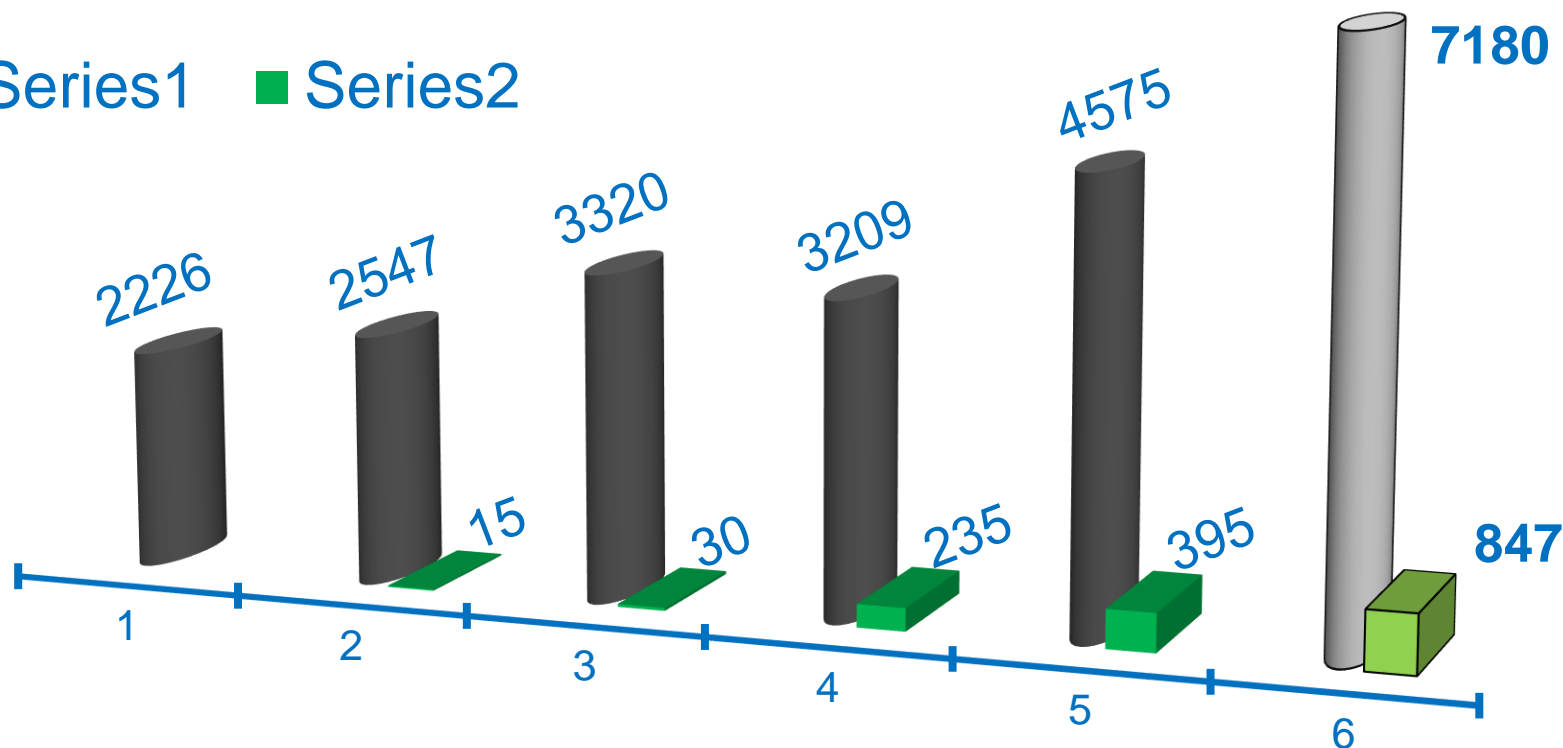


TERRASAR-X

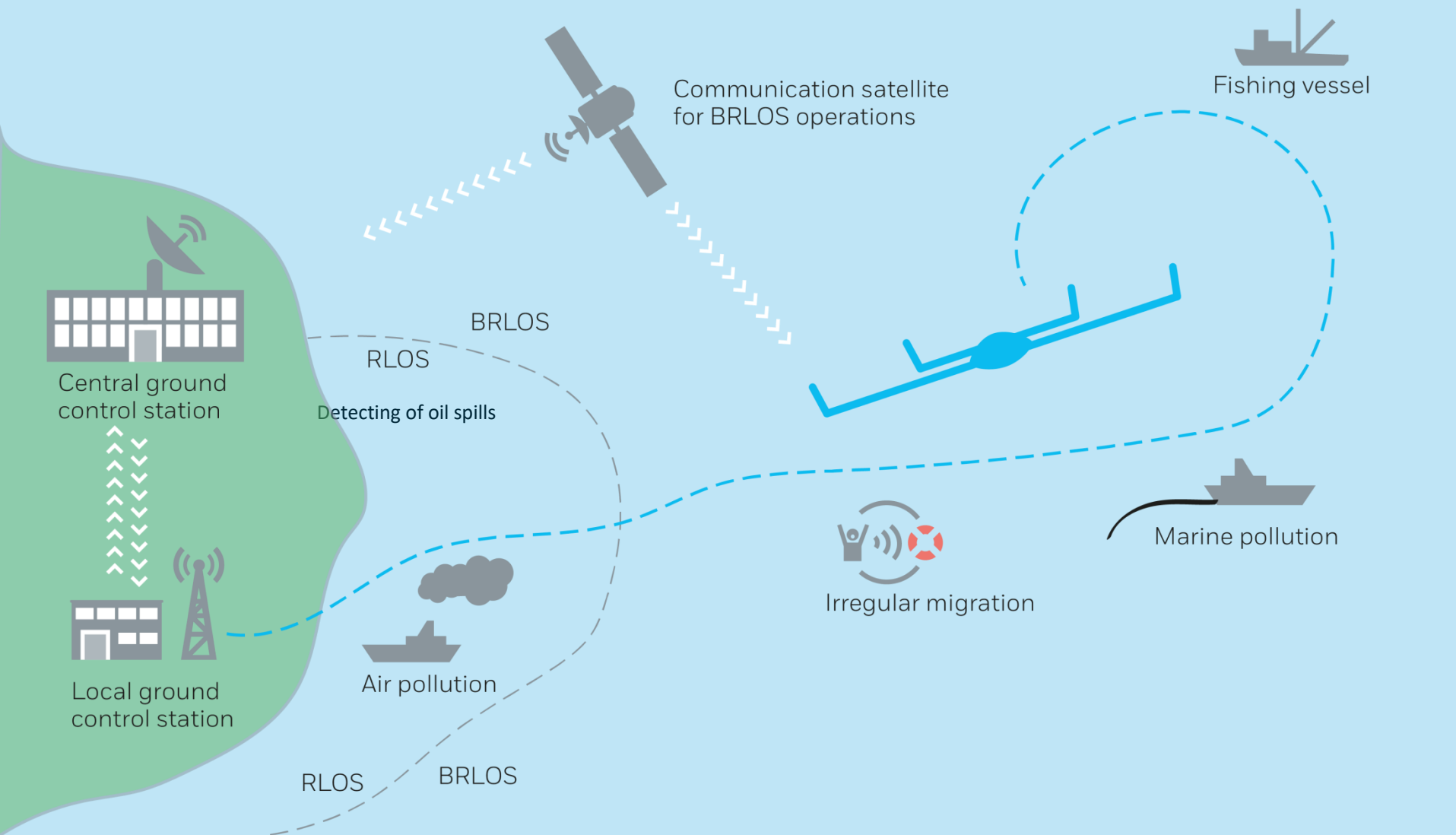


TanDEM-X

■ Series1 ■ Series2



# New Information Source: RPAS: Multi-Mission Capability



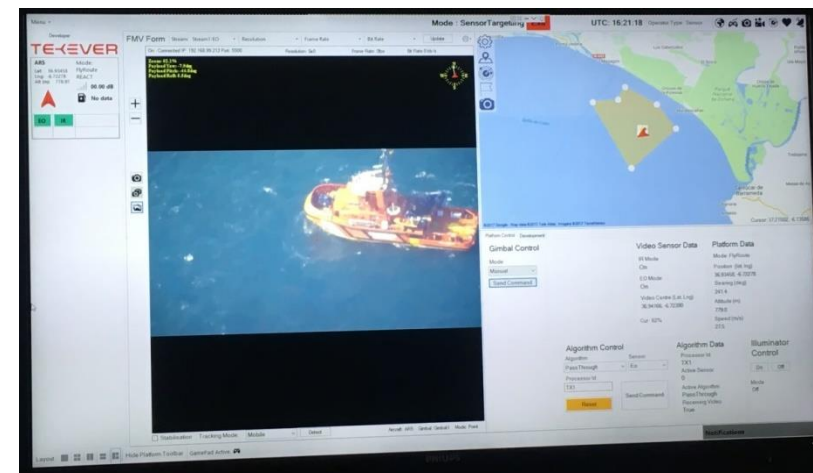
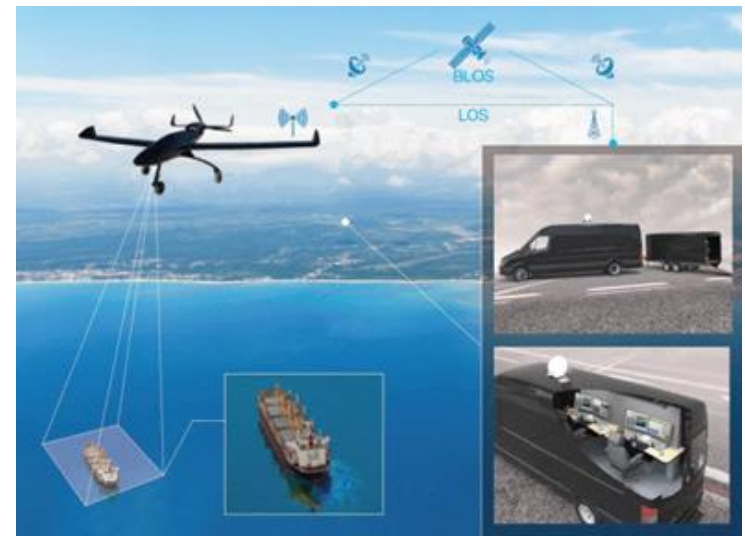


## Marine Environment

- Marine Pollution Detection and Monitoring
- Ship Emission Monitoring

## Supporting Coast Guard Functions

- EU Border Package:  
EUR 67 million over 4 years
- Multi-purpose operations
- Supporting Member States in cooperation with FRONTEX & EFCA

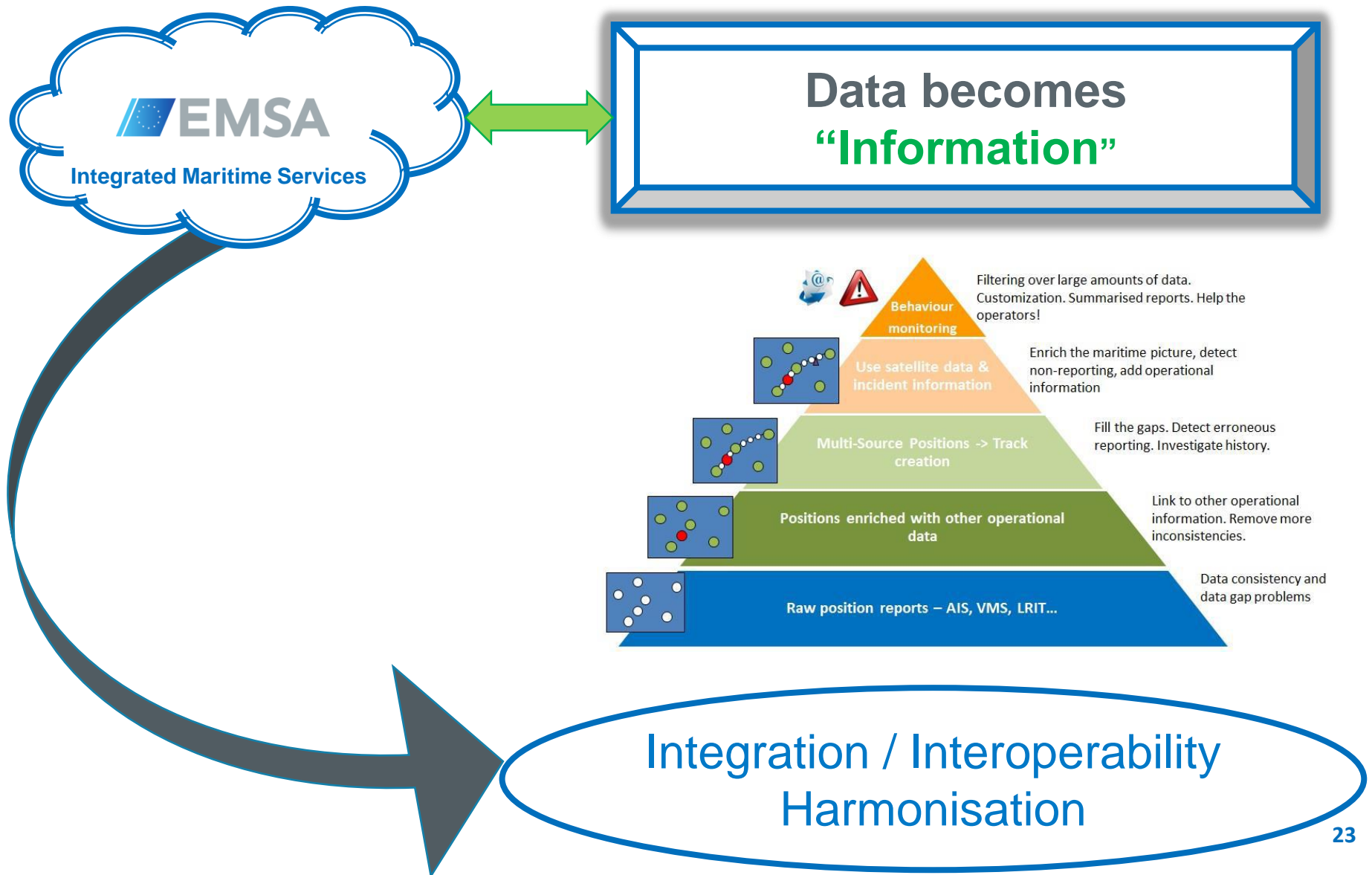


# New Information Sources: RPAS



## PAYLOAD

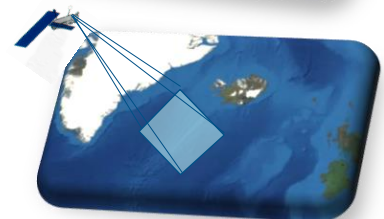
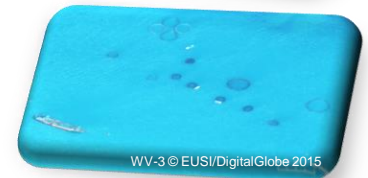
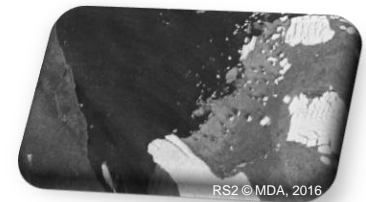
- SATCOM
- MARITIME RADAR
- SAR FOR OIL SPILL  
DETECTION
- ELECTRO-OPTICAL CAMERAS
- THERMAL IR
- SOx (AND NOx) SNIFFERS
- DISTRESS SIGNAL RECEIVER
- AIS





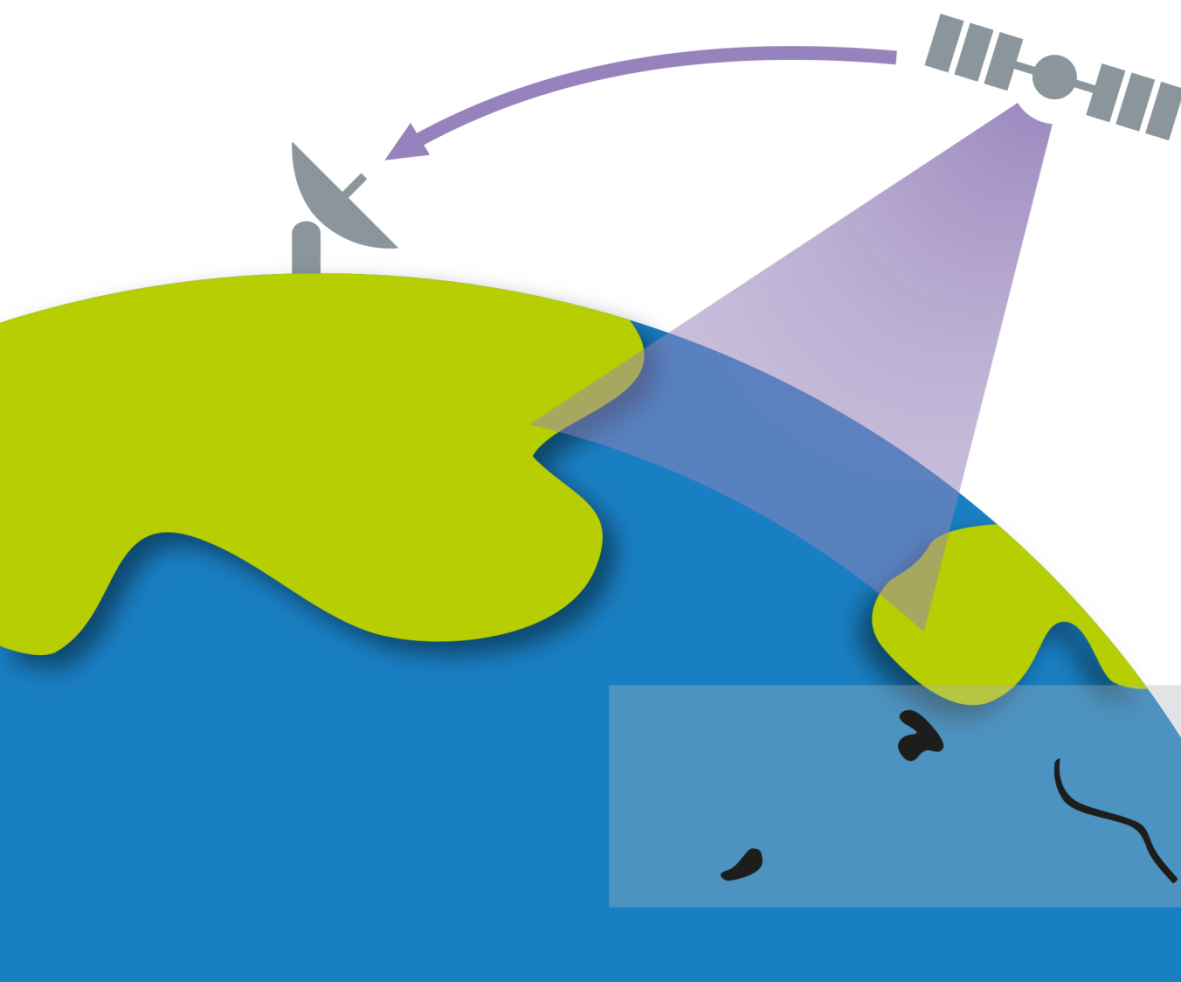
## CleanSeaNet

- **European Service** for Satellite Oil Pollution monitoring
- Launched in **2007**
- Provides **oil spill detection** and **potential polluters**
- Provides **vessel detection** (radar echoes)
- Mainly uses **SAR** (Synthetic Aperture Radar) images
- Linked into **national/regional** response chain
- Free at point of use: Funded by EU budget



## CLEANSEANET

Taking measures to detect and deter marine pollution



**30 minutes**

**NEAR REAL TIME SERVICE**

between satellite image acquisition and reporting of detection results to the affected coastal state

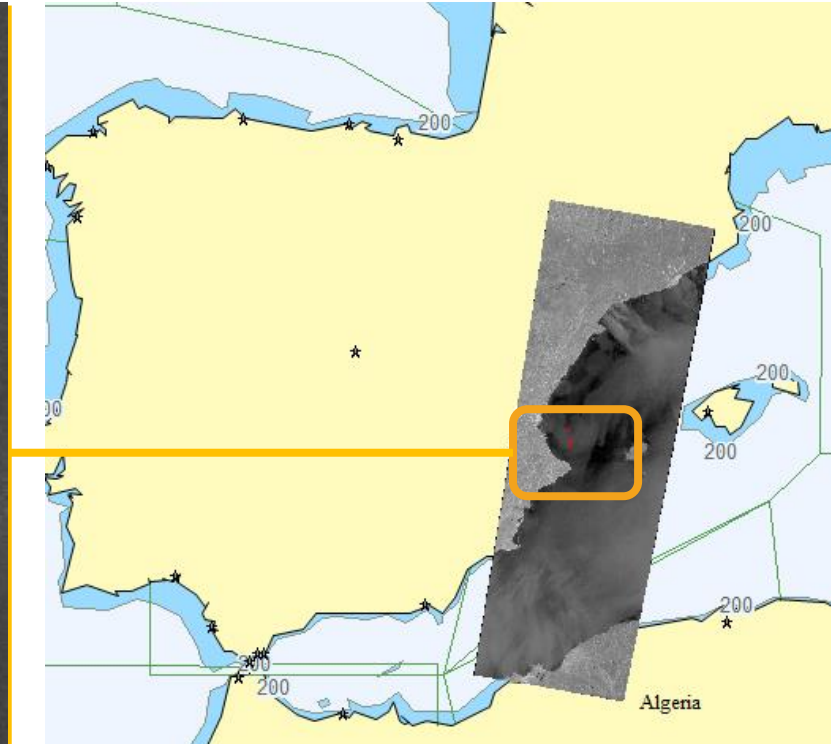
**500x500**

**KM PER IMAGE**

making every single image potentially relevant for several coastal states

**SAR images**

HR2 and MR1 with single polarization (VV preferable)





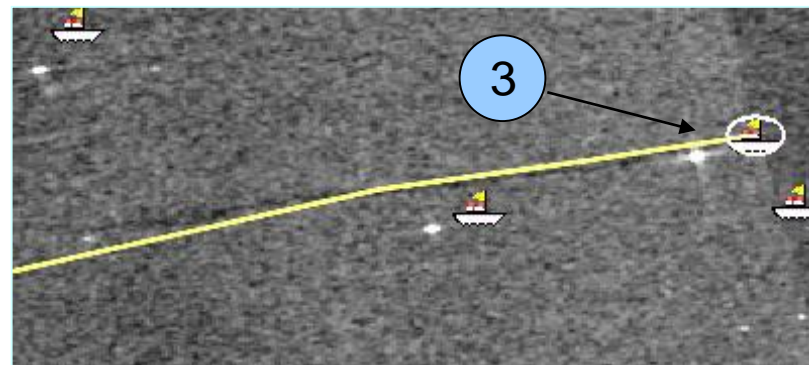
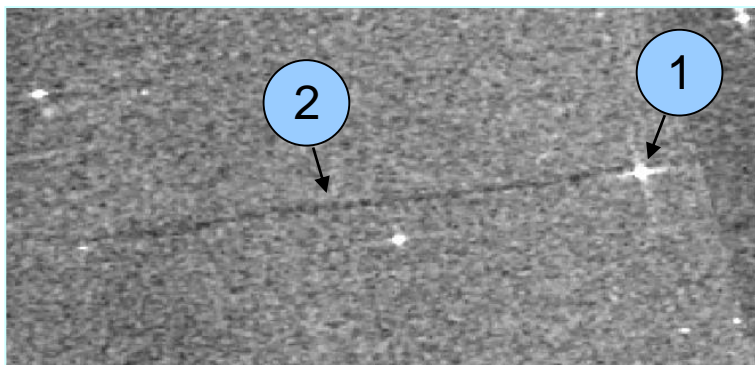


- Ship detected on SAR image (Bright Spot)
- Possible spill matches the track of the vessel
- Vessel identified using AIS information

1

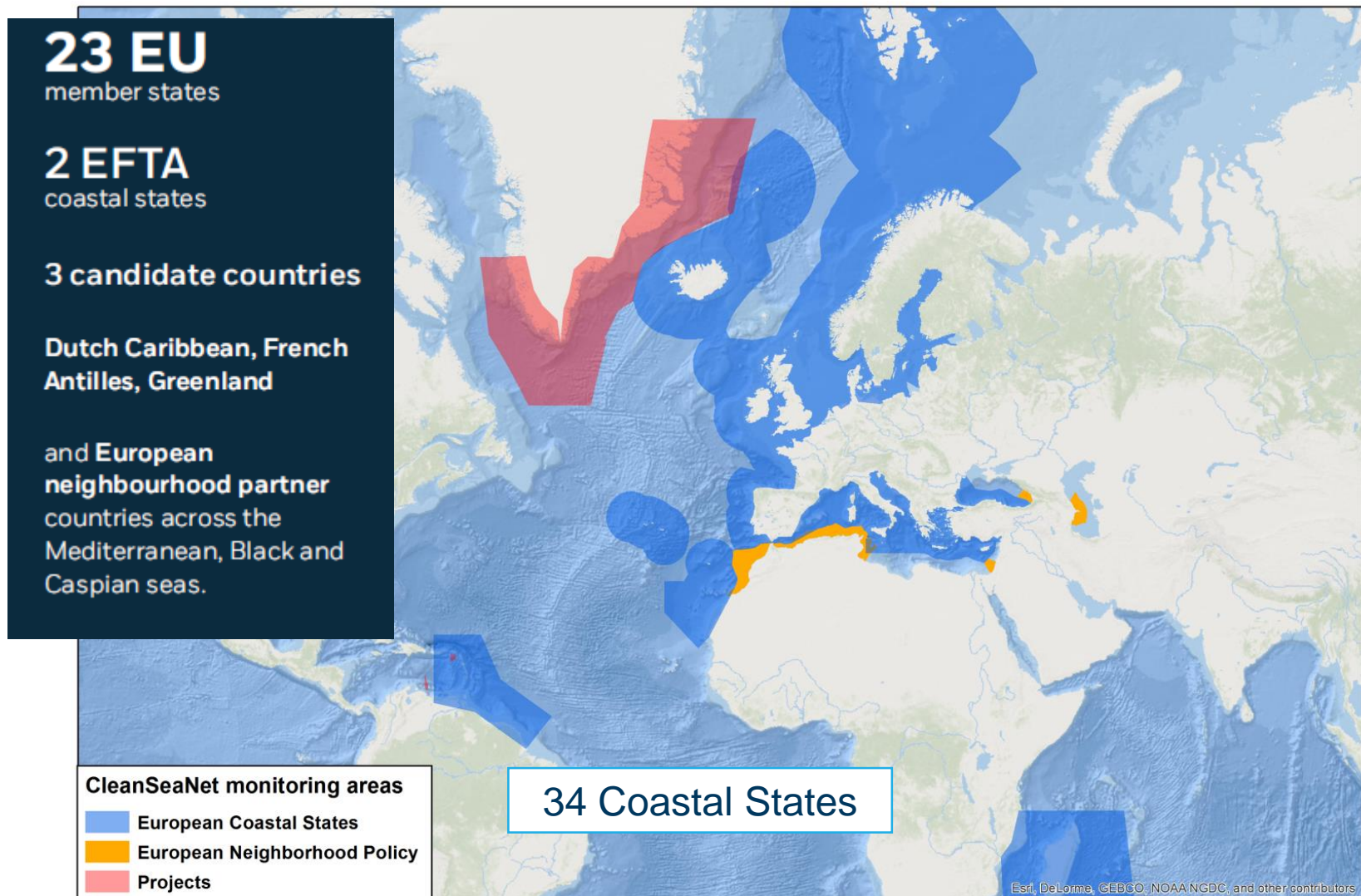
2

3



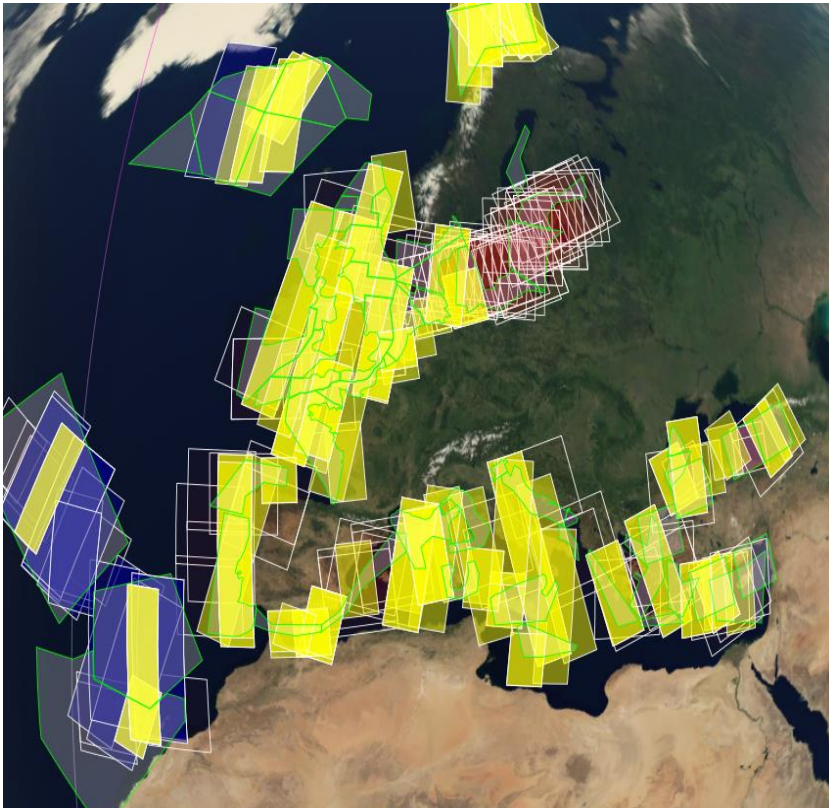
Remark: Similar vessels in vicinity at similar course and speed => not a wake

## Areas monitored regularly by CSN in 2017





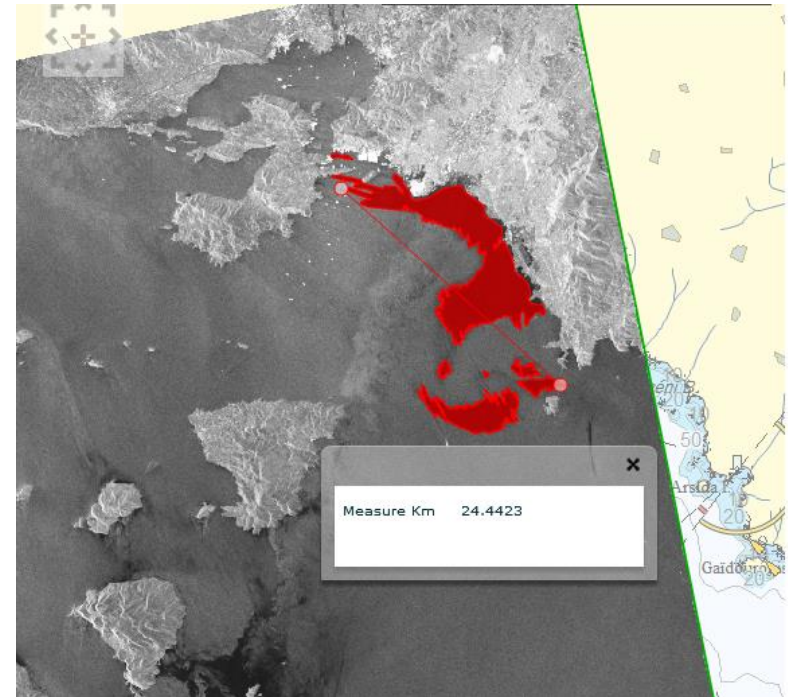
## Routine Monitoring



Example - **May 2018**

453 services were ordered:  
338 Sentinel, 89 Radarsat-2, 26 TSX

## Support to emergencies



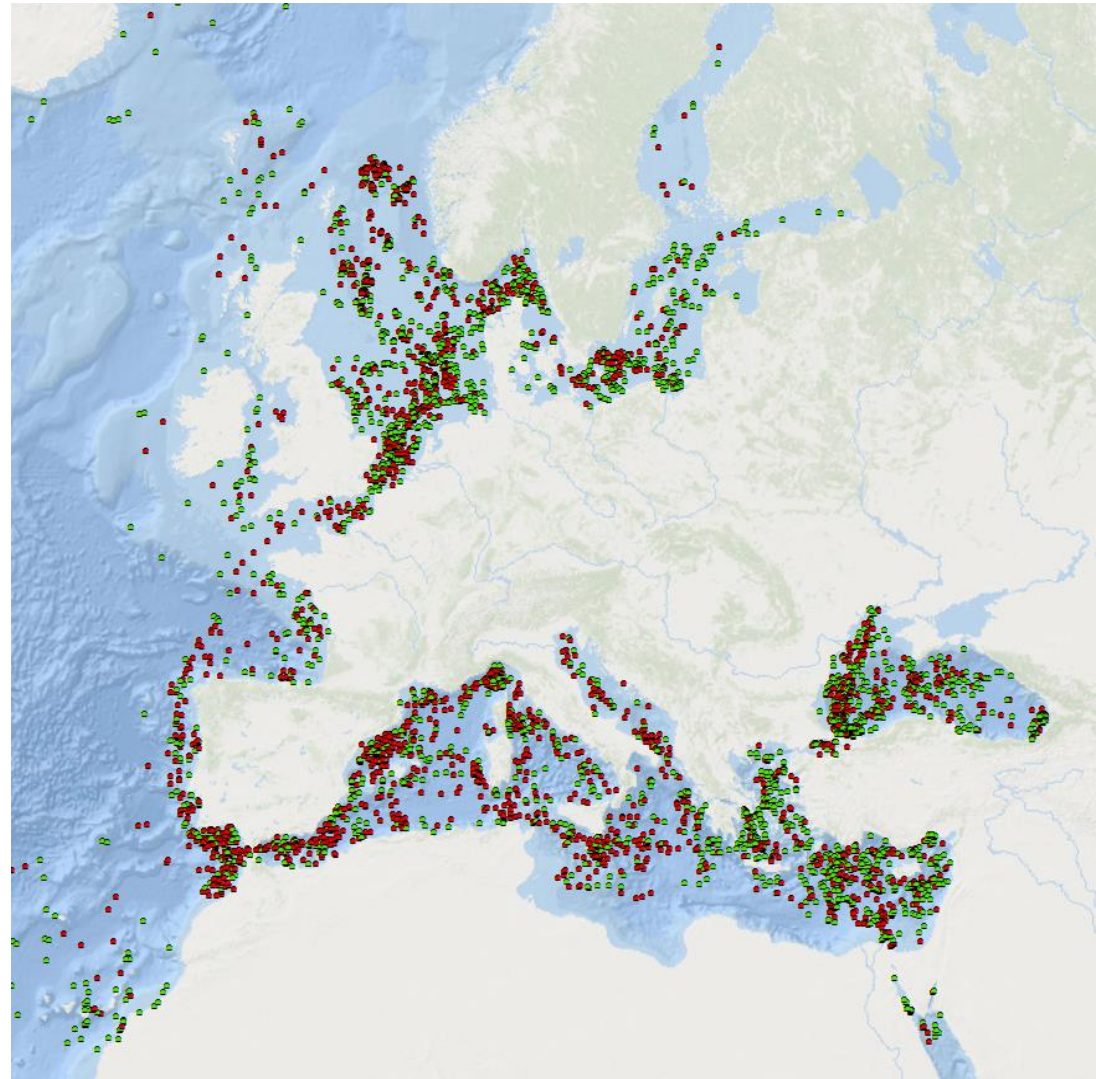
Support to oil spill emergency © EMSA, 2017. RADARSAT-2 Data and Products © MacDONALD, DETTWILER AND ASSOCIATES LTD [2015] – All Rights Reserved” and “RADARSAT is an official mark of the Canadian Space Agency

31 large accidental spills and oil related emergencies so far

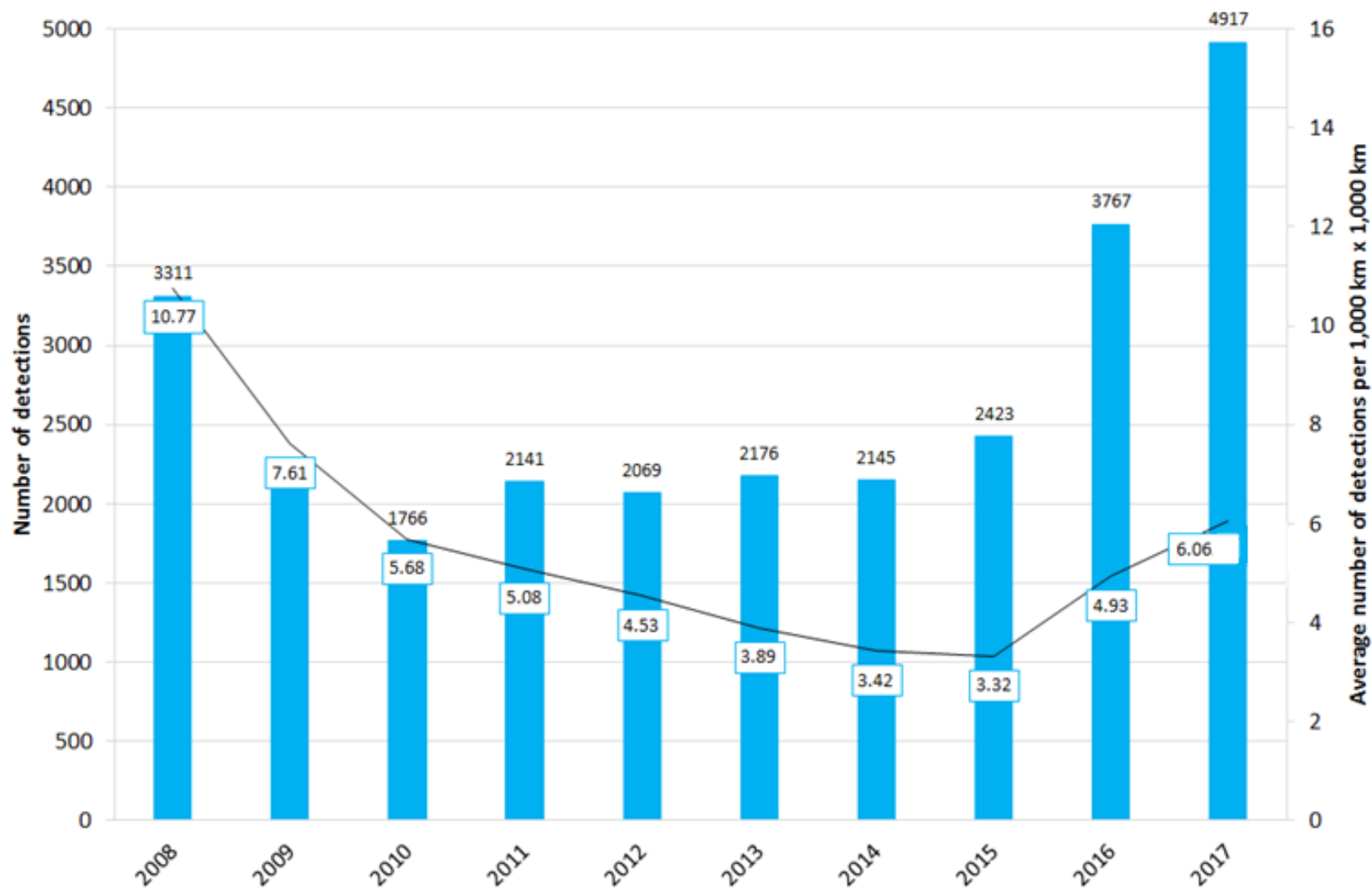
## Map of possible spills detected worldwide in 2017.

- Class A: spills which have a higher detection confidence level (2451)
- Class B: spills which have a lower detection confidence level (2465)

Total = 4917

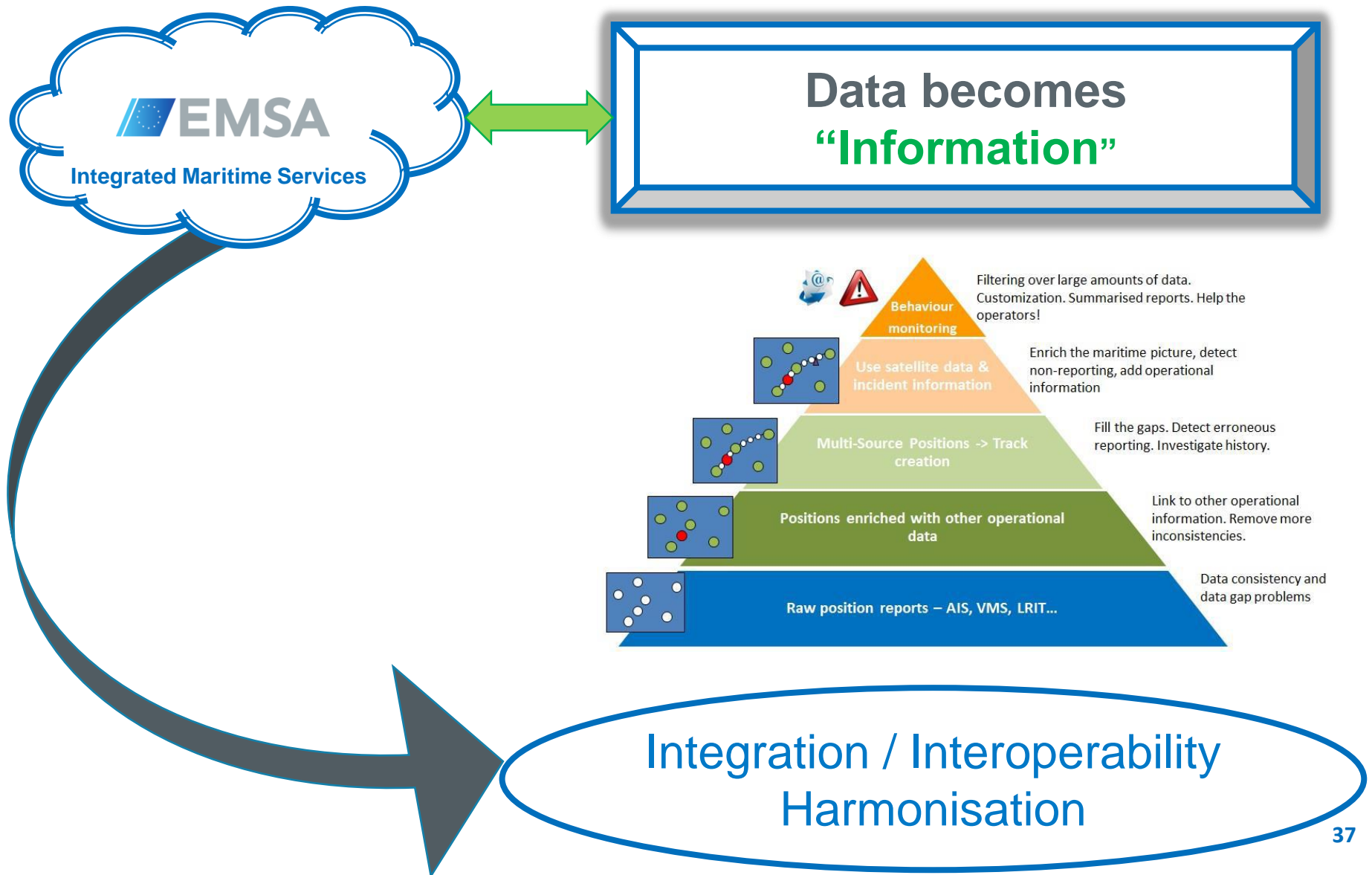


## Long term deterrent effect: 2008 -2017



- Trend over most of past decade was an yearly reduction in the number of possible spills per million km<sup>2</sup>
- In 2016 this trend seemed to reverse. This could be explained by:
  - intensive use of Sentinel-1 =>improved detection capabilities:
  - to a lesser extent, an increase in shipping volume; the EU SafeSeaNet system registered a 5% increase in the number of ships calls from 2015 to 2016.





## Step 1:

Satellite (SAR) monitoring of Area of Interest

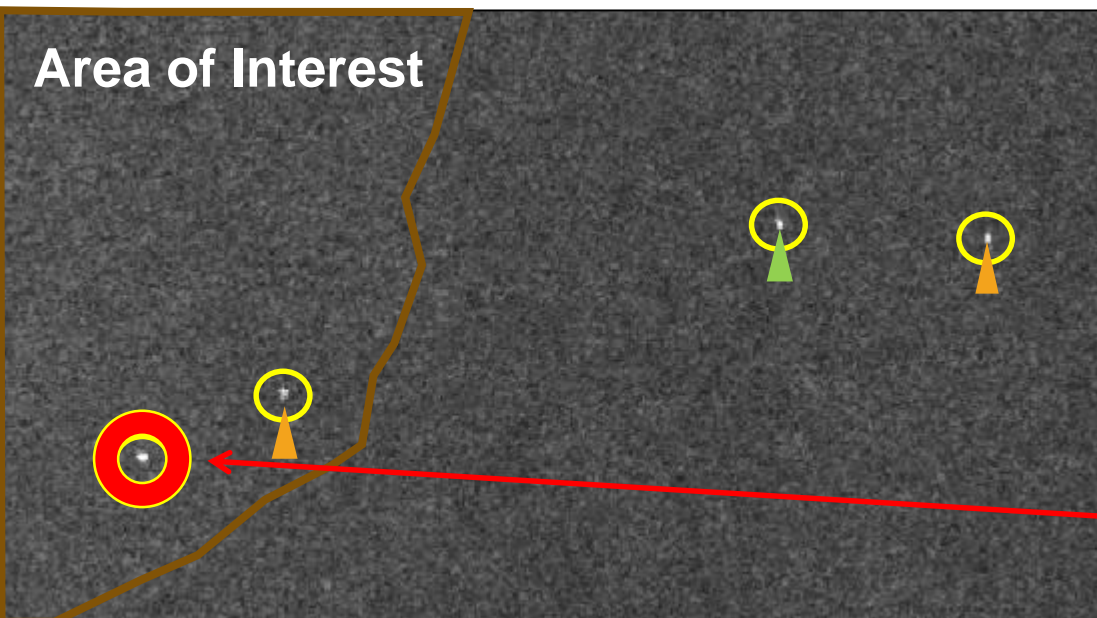
→ Detection of vessels (Automated)

## Step 2:

Cross-referencing maritime position data (Automated)

→ Vessel identification

Step 3: Unidentified Vessel = **Target of Interest**



○ Satellite detected vessels

▲ Target cross-referenced  
- Cargo Vessel (AIS)

▲ Target cross-referenced  
- Fishing vessel (VMS)

Vessel **NOT** identified  
**Target of Interest** for further  
analysis



Integrated Maritime Services

A graphic of a puzzle. A central white puzzle piece is placed on a red background. The word "ALGORITHM" is written in bold, black, capital letters on the white piece. The puzzle piece is surrounded by other grey puzzle pieces, some of which are visible at the edges of the frame.

ALGORITHM

ABMs

Automated Behaviour Monitoring

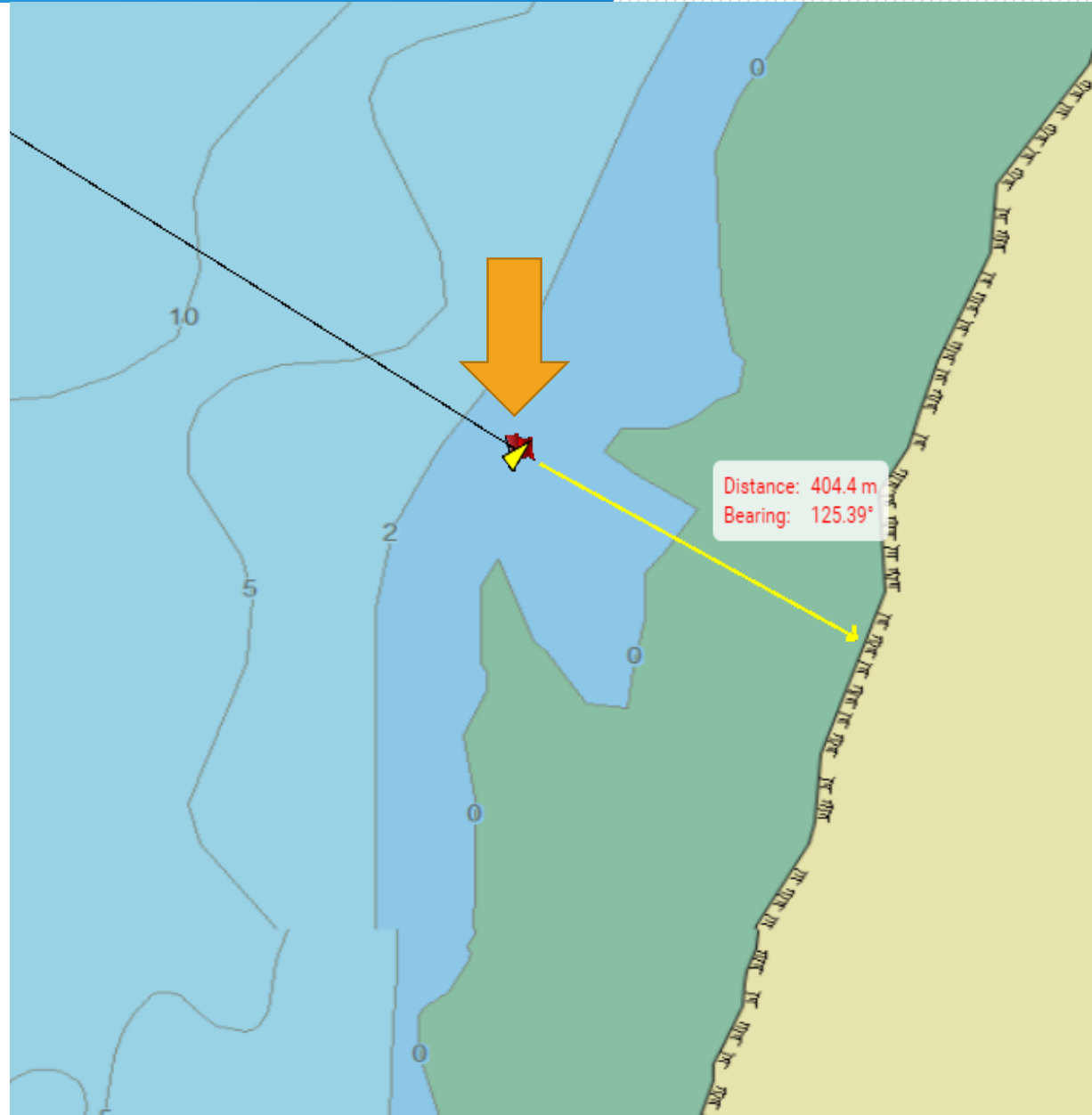
+

Alerts to User

## Safety community

Distance to

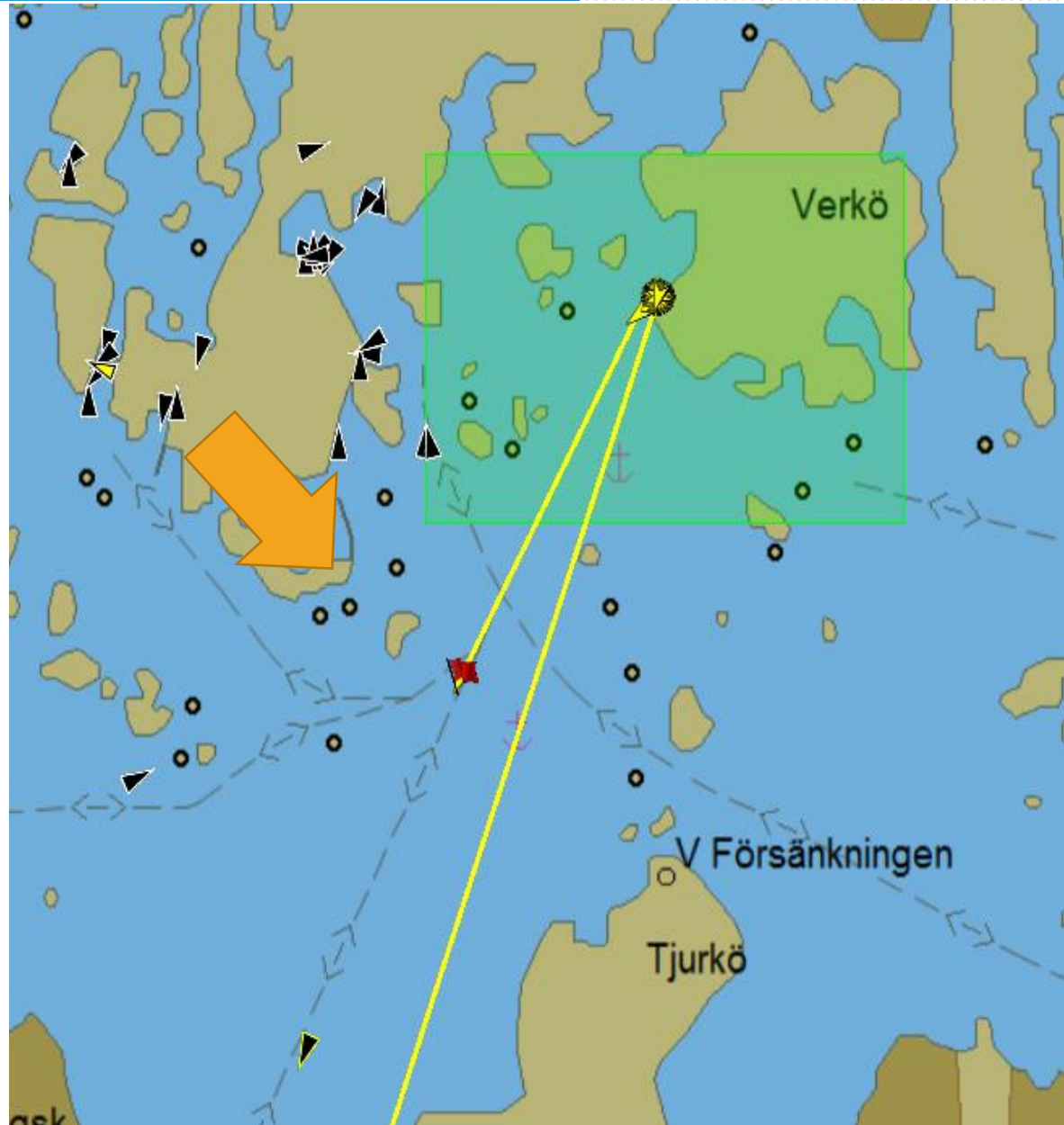
Shore less than a  
defined threshold

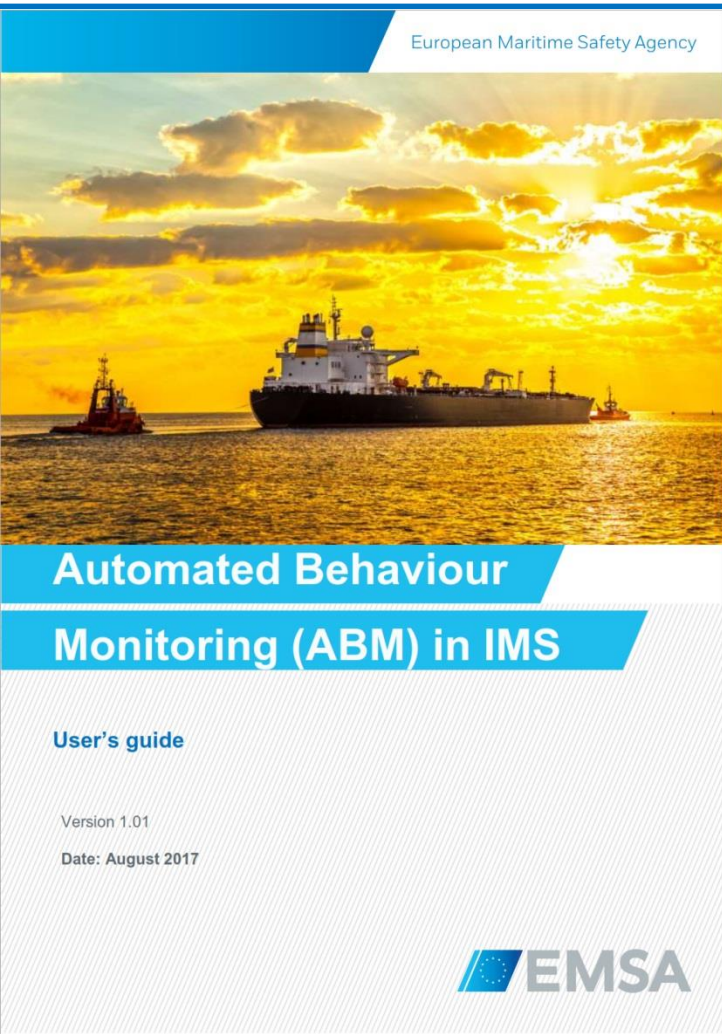




## Safety community

Vessel leaving area of interest





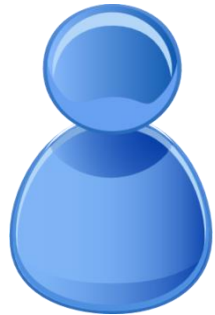
- ✓ Vessel enters Area X
- ✓ Vessels approaching each other closer than a defined distance at a speed below defined threshold
- ✓ Vessel switches off transponder
- ✓ Vessel leaves Area X
- ✓ Vessel sails close to the shore
- ✓ Frequency of vessels' position reports higher than expected
- ✓ Change of speed above or below a limit set
- ✓ Vessel leaves Area X and enters Area Y
- ✓ Passage of a vessel close to Area X
- ✓ Anchored vessels detected
- ✓ Vessels entering a closed area at a specific time
- ✓ Change of heading higher than a threshold
- ✓ Sudden change of speed
- ✓ Vessels entering or leaving ports
- ✓ Port of Departure is X
- ✓ Port of Arrival is X
- ✓ Vessel is drifting
- ✓ Vessel departs from coastline
- ✓ Vessel heads towards coastline
- ✓ Spoofing - change of position/ out of range
- ✓ Change of speed above or below a limit set outside port
- ✓ Anchored vessels outside port
- ✓ Frequency of vessel position reports lower than expected
- ✓ Sudden Change Of Speed Outside Port



## Data governed by Access Rights & User Profiles

- Access Rights from legislation
- User Profiles by Competent Authorities

**“You  
only see  
what you are  
entitled  
to see”**



Maritime  
Application User





Given the range of data available **SELECTING** and **PRESENTING** relevant data in an easy-to-use way is critical



- The right information
- At the right time
- In the right way

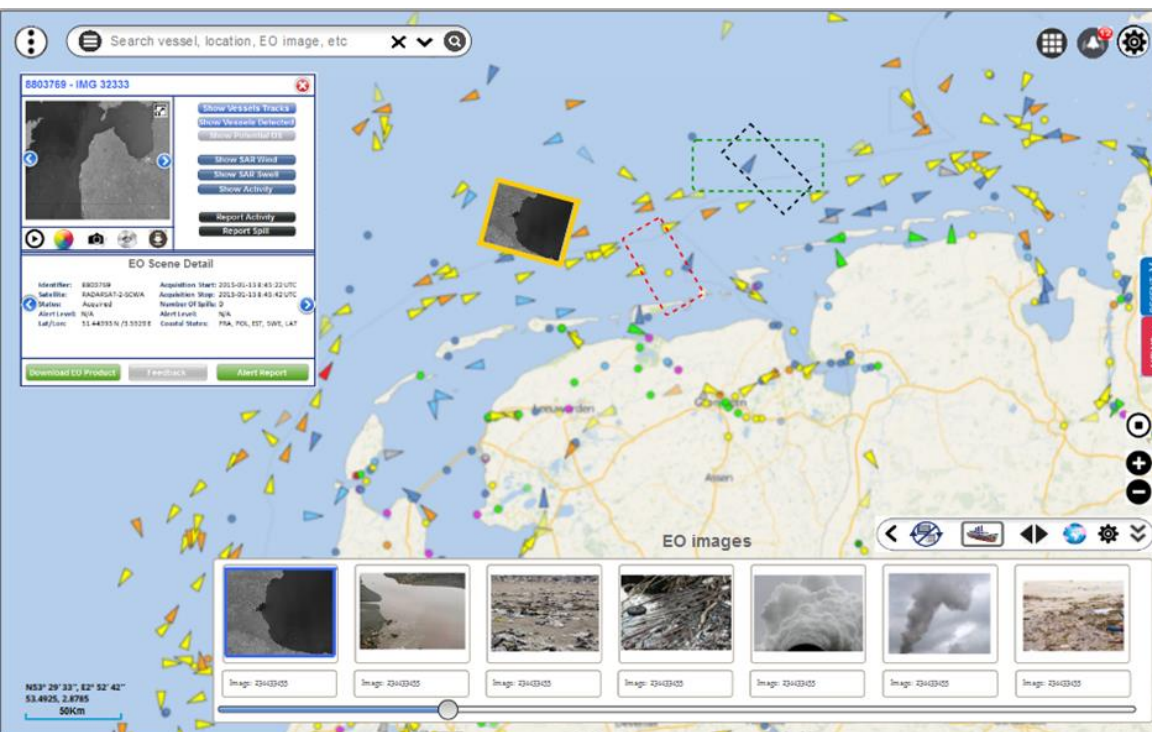


# Access to Integrated Maritime Services



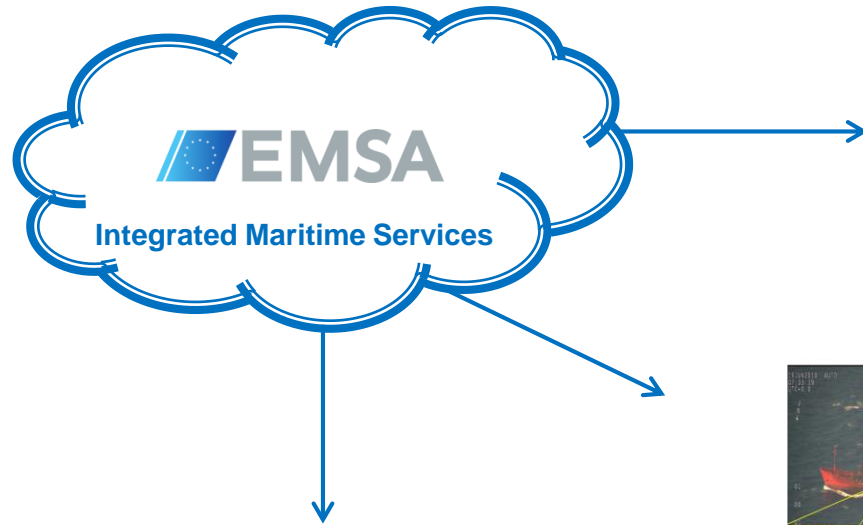
**“SEG”**

## SafeSeaNet Ecosystem Graphical User Interface



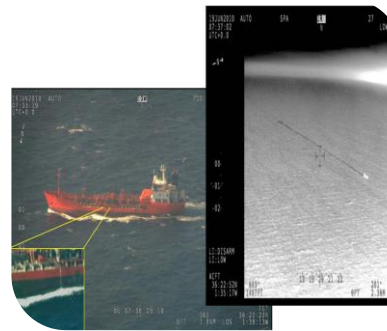
## IMS Mobile App





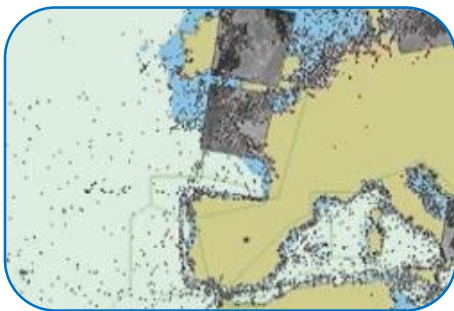
## SEARCH AND RESCUE

National Authorities



## OIL POLLUTION MONITORING & DETECTION

National Authorities



## VESSEL MONITORING

National Authorities



**ANTI-PIRACY**  
**EUNAVFOR**  
-Atalanta



**FISHERIES**  
**MONITORING**  
**EFCA**



**MARITIME**  
**BORDER**  
**CONTROL**  
**EUNAVFOR**  
-Sophia  
Frontex



**NARCOTICS**  
**MAOC-N**



... other  
projects

Safemed Project  
and BC Seas



## VESSELS MONITORING AND TRACKING

- Last vessel positions reported
- Filter options for individual data sources (LRIT, AIS, etc.)
- Historical track for individual vessels

## VESSEL DETECTION SERVICE

- Satellite radar detection of vessels over sea areas of interest
- Correlation with vessels tracks
- Highlighting small unidentified boats

## ANOMALY DETECTION SERVICE

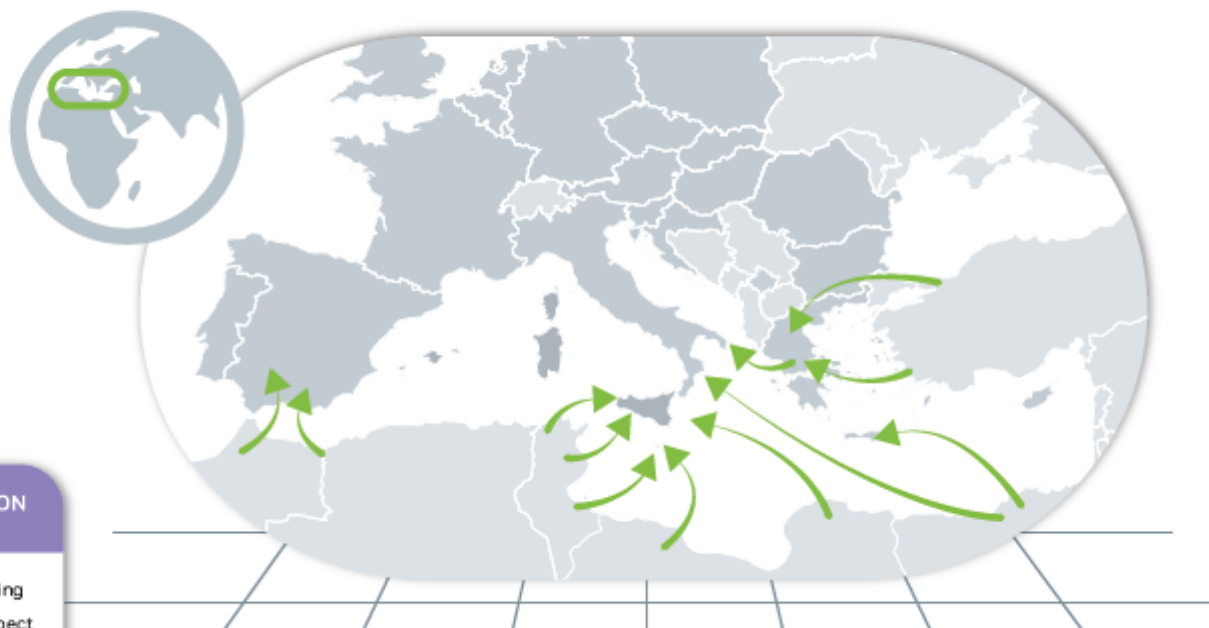
- Vessel behaviour monitoring
- Alert notifications for suspect behaviour
- Advanced anomaly detection algorithms

## ACTIVITY DETECTION SERVICE

- Optical high resolution monitoring
- Activity detection over shore, ports or sea areas

## VESSEL REPORTING SERVICE

- Regular reporting on vessels of interest
- Intelligence driven approach for monitoring potentially suspicious behaviour



**5** EMSA SERVICES TO FRONTEX UNDER THE INTERAGENCY SERVICE LEVEL AGREEMENT



## BIG VESSEL CASE SCENARIO

300 GT vessels and above  
Ships reporting position data via LRIT, AIS, etc.

- ✓ MONITORING SERVICES FOR CROSS-BORDER CRIME (SMUGGLING MIGRANTS, WEAPONS, TOBACCO, DRUGS)
- ✓ TRACKING OF PARTICULAR VESSELS OF INTEREST
- ✓ IDENTIFYING BEHAVIOURAL PATTERNS OF UNLAWFUL ACTS AT SEA

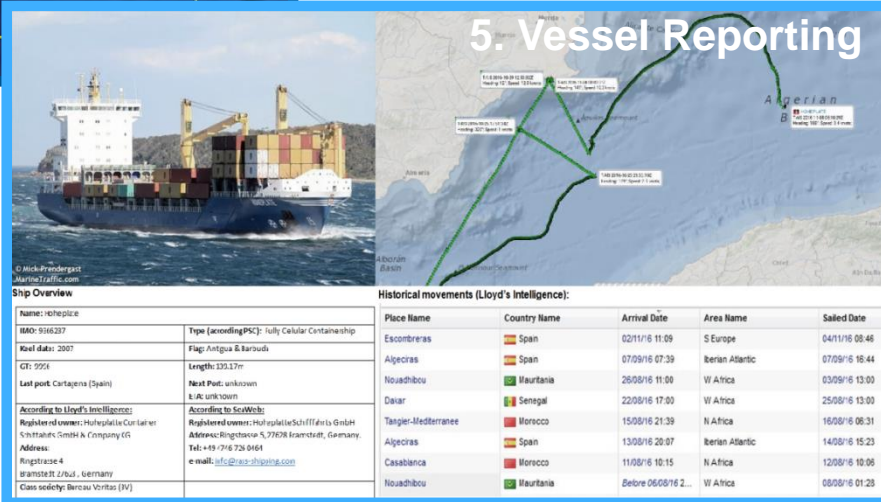
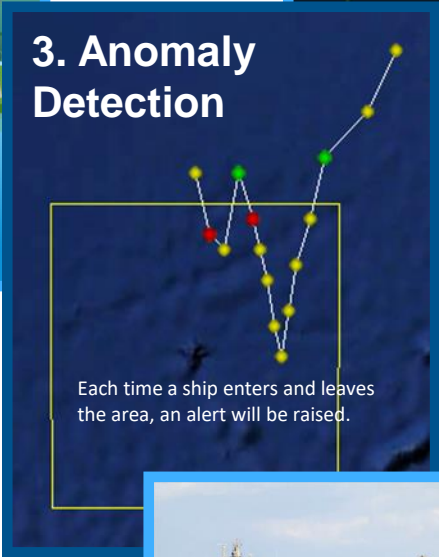
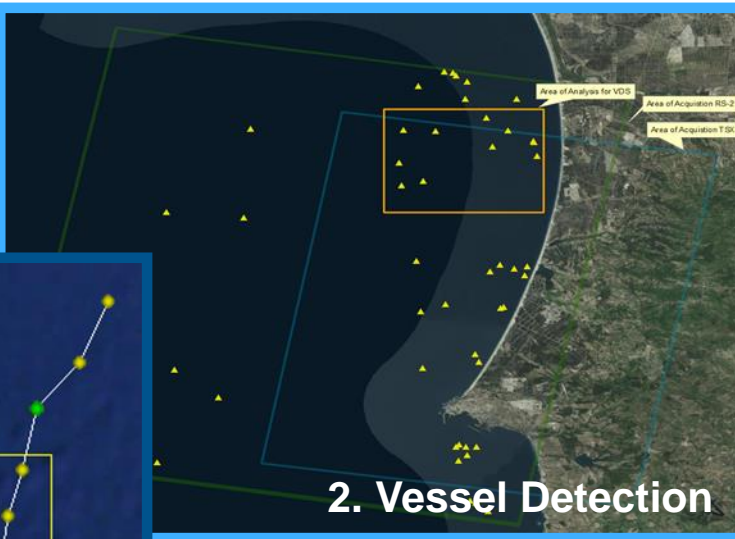
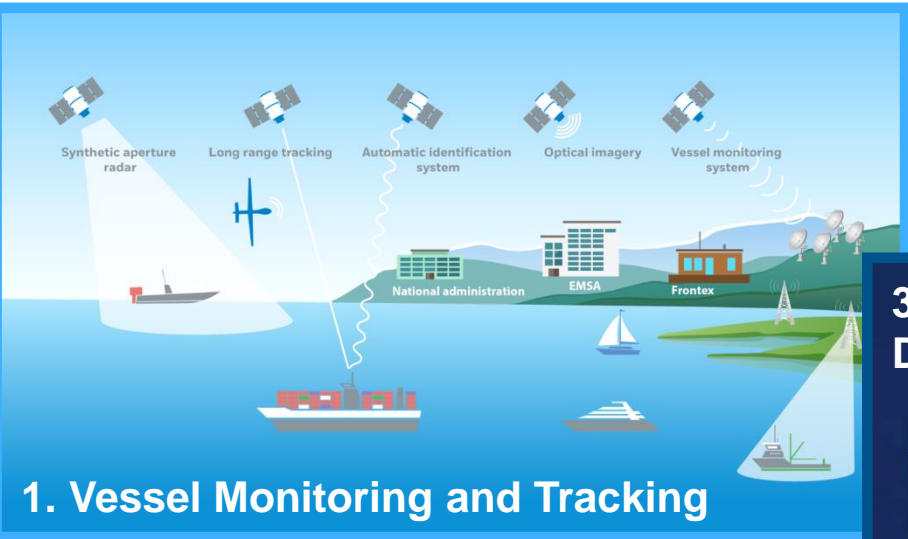


## SMALL VESSEL CASE SCENARIO

15 metres in length and below  
Boats not reporting position data

- ✓ EARLY WARNING DETECTION SERVICE BY SATELLITE RADAR FOR SMALL UNIDENTIFIED BOATS AT SEA
- ✓ FOLLOW-UP BY MEMBER STATES/FRONTEX ASSETS FOR IDENTIFICATION AND POSSIBLE SEARCH AND RESCUE OPERATIONS
- ✓ TRANSFER OF INFORMATION IN NEAR REAL TIME TO ALL OPERATIONAL AUTHORITIES INVOLVED

# 5 EMSA services to Frontex under SLA



## Maritime Analysis & Operation Centre – Narcotics Support for identification of vessel of interest (March 2017)



- Action: Verify if the vessel is at the reported AIS position
- Suspicions of AIS spoofing (falsifying reported location)
- Very high resolution optical image to identify vessel



© Marine Traffic, 2017

**Image displays a vessel similar to the vessel of interest- Match between AIS and EO image**



## Anti-Piracy Measures off coast of Somalia



EU Naval Force warships / aircraft patrol to:

- Deter piracy.
- Provide protection to World Food Programme vessels carrying food aid to displaced people in Somalia.

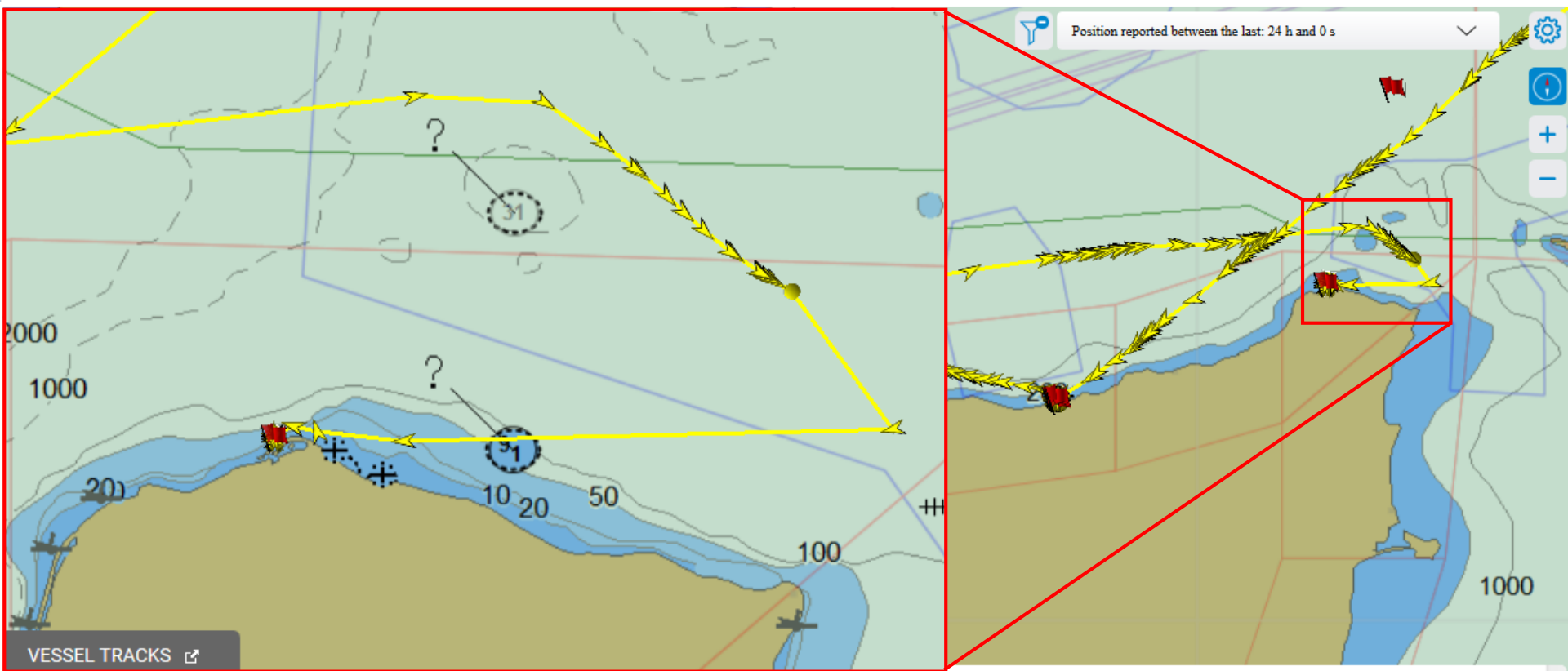
Service Usage:

- Constant/Daily use to track and detect unusual movements

### Case study: “ARIS 13” on March 2017

- Movements before and after ARIS 13 was pirated.
- The point at which she was taken can be clearly identified by a sudden change in course.
- Tanker released 4 days later





Number of Vessels: 1    Total positions: 1041    ☐ Time selection:

MMSI

MMSI	IMO	IR	Ship Name	Call Sign
620094000	9012501	N/A	ARIS 13	D6A2094

Number of positions: 1041

Timestamp	Lat	Lon	Heading	Speed	Source
2017-03-14 06:44:58Z	11°59'00"N	050°45'42"E	191	0	Sat-AIS
2017-03-14 06:41:40Z	11°59'04"N	050°45'48"E	194	0	Sat-AIS
2017-03-14 06:38:58Z	11°59'00"N	050°45'42"E	347	0	Sat-AIS

- Multiple maritime challenges to be addressed by governments
- Multiple national authorities in each country
- Multiple data sources...
- Multiple user preferences...

✓ Need “**Tool Box**” solution

✓ Data fusion, analysis and availability becomes “**Information**”

- Common good...common purpose

✓ **Integrated Maritime Services**

# Questions?





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 [facebook.com/emsa.lisbon](https://facebook.com/emsa.lisbon)

