

# **2<sup>nd</sup> IMDatE Meeting**

## **IMDatE Functional Prototype**

**19/10/2012**

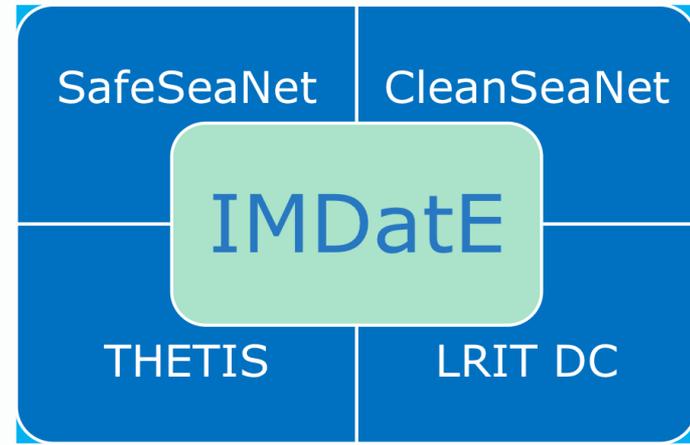
**Justino de Sousa**

**European Maritime Safety Agency  
C.3.1 Integrated Maritime Data**

## Integrated Maritime Data Environment (IMDatE)

Refresh on:

IMDatE project drivers



1. To integrate existing maritime services (LRIT, SSN, CSN, THETIS) to fully exploit their cross-platform capabilities.
2. To develop value added services – on top of the integrated framework.
3. To have a more flexible means to support future services.

# Refresh: IMDatE Project Drivers

## 1. Technical Framework for :

- Improved internal and external data exchange
- Increased flexibility - easy to add and modify maritime business logic and delivery of new services/features.
- Moving towards a Service Oriented Architecture
- Configurable data processing engine -> data fusion, correlation, enrichment, monitoring engine, alerting.

## 2. EMSA wide architecture - Data Rationalisation (Definition of application & enterprise level data, reduction of duplications and inconsistencies, standardised/canonical internal formats, storage approach, etc.)

## 3. Development and deployment of a **Satellite AIS Data Processing Centre**

## 4. Deployment of new **Value Added Services** – Automated Monitoring, Integrated Ship Profile, Area Centric Service etc...

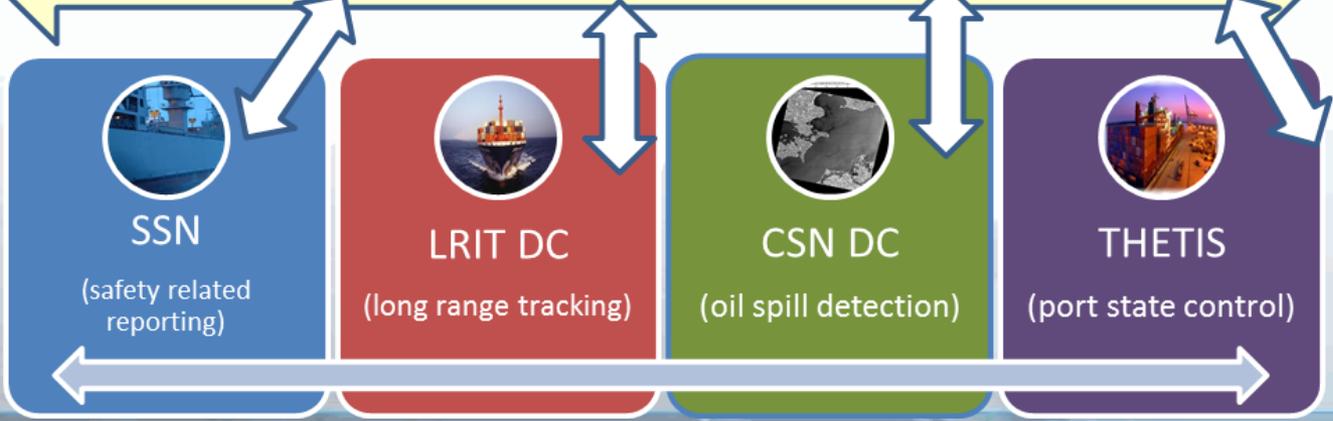
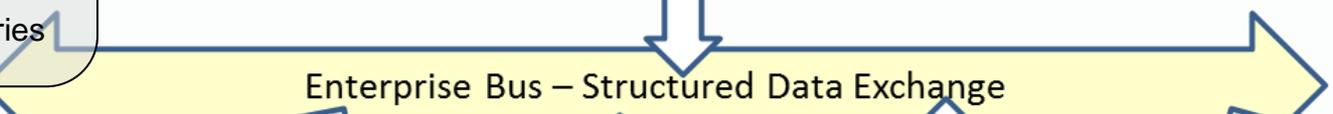
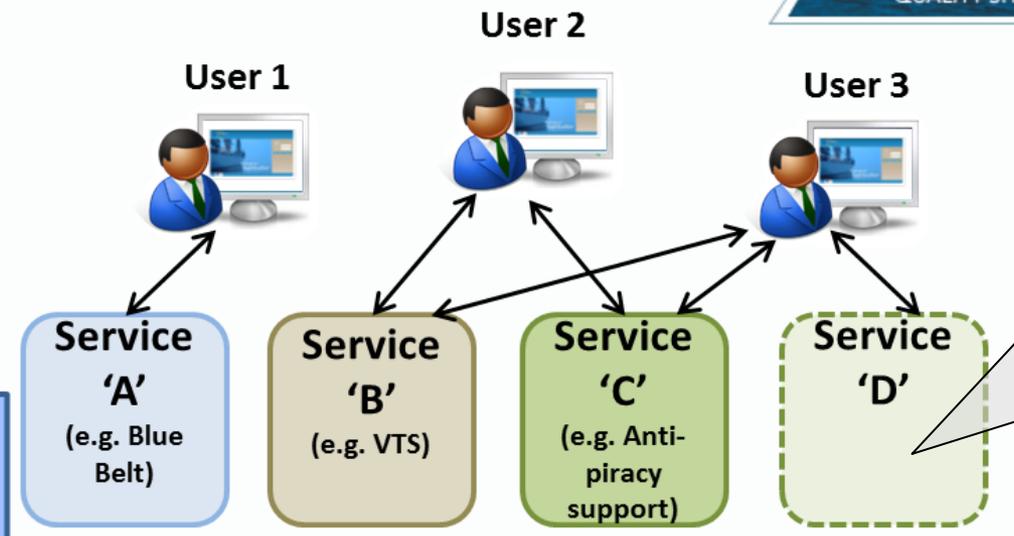
## Customisation – What does it bring?

- Faster: to deliver new (pilot) services. Key processes can now be set-up by configuration
  - Order of time from *months to weeks*.
- Cheaper: less dependence on external contractors. Improved rationalisation among multiple applications. Improved platform extensibility.
- Improved: new integrated services. New services deployed easily.

- 1. Capabilities:**
- Data fusion
  - Dissemination (S2S)
  - Automated monitoring
  - Addition of custom data
  - New analysis tools – for combined data
  - Satellite AIS

- 2. Rationalisation among applications:**
- Single Sign-On
  - Common user management
  - Common registries

- 3. Service Configuration:**
- Data feeds (AIS, LRIT..)
  - User/community-specific data
  - Custom visualisation
  - Automated Monitoring Framework
  - Alerting means
  - Dissemination format



## Customisation process - User Data and Display

1. **Selection of the core data/services** available at EMSA and seen by the user.
  - Position reports : AIS, S-AIS, LRIT etc.
  - Voyage and cargo information
  - PSC information
  - Satellite products (images, VDS, and oil spill)
2. **Addition of user specific data**
  - E.g. Additional AIS **position report** feeds, VMS or coastal radar.
  - Specific **ship particulars** not available through EMSA ship database (RVR) but necessary for specific monitoring.
  - Geo-referenced events e.g. vessel sightings, pollution detection, known infringements.
3. **Configure display symbols and panel content.**

*\*User specific data is only seen by the users who are granted access to it.*

## IMDatE - out-of-the-box features (1 of 2)

### ***Data Processing:***

- **Live picture of last known vessel positions**
  - From multi-source data (AIS, LRIT, S-AIS etc)
  - Multi-criteria vessel search
- **Ship track creation**
  - Track association
  - Track interpolation and prediction
  - History of vessel voyage
- **Position reporting correctness checks** - Kalman filter processing
- **Easy addition of new data** – e.g. surrounding AIS positions received by patrol vessels, on-scene incident reports etc
- **Validation** - against complete EMSA vessel registry -operational databases
- **Correlation:**
  - Automated correlation of VDS from SAR images with position reports.
  - Enrichment of position reports with data from multiple databases
- **Display of satellite images** (SAR and optical) and overlay of ship tracks.
- **Handling of 'incident' information** – inspections/sightings/events.
- **Handling of reported voyage information** – next port of call, last port etc.

## IMDatE - out-of-the-box features (2 of 2)

### ***Automated behaviour monitoring and alerts:***

- **Monitoring engine**
- **Comprehensive and expandable set of automated monitoring functions.**
  - E.g vessel entered/exited a defined area
  - Detection of at-sea-encounter between two vessels.
  - Vessel deviated from expected and reported route.
  - Vessel not reporting or under-reporting.
- **Choose between receiving emails, PDF reports, XML messages.**

### ***Supporting Tools:***

- **Aggregation - Single request to have ALL available information on a vessel from different EMSA applications**
- **Area Centric Query**
  - All available information in a given area – ship tracks, incidents, satellite images, non-correlated VDS....
- **Graphical interface with tailored symbols, filtering of data, user specific data.**
- **Overlay of community specific data using WMS/WFS web services**

### ***System-to-System interfaces:***

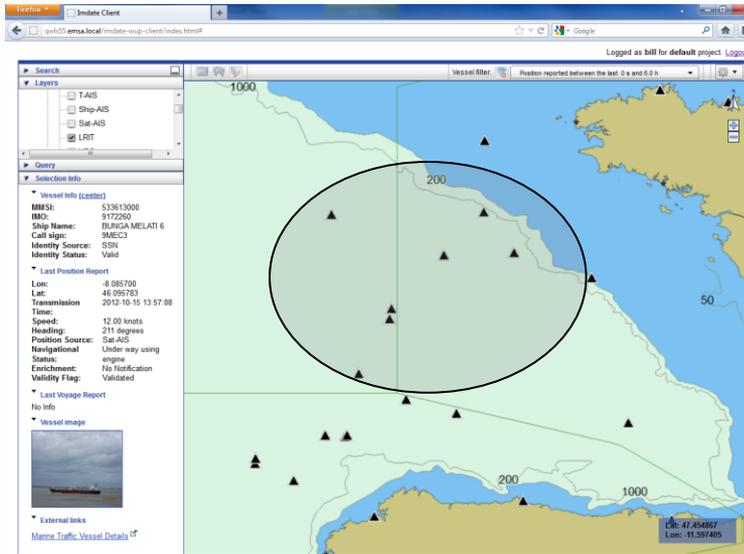
- **Position dissemination facility**
- **New XML interfaces**

## Additional Integration Activities

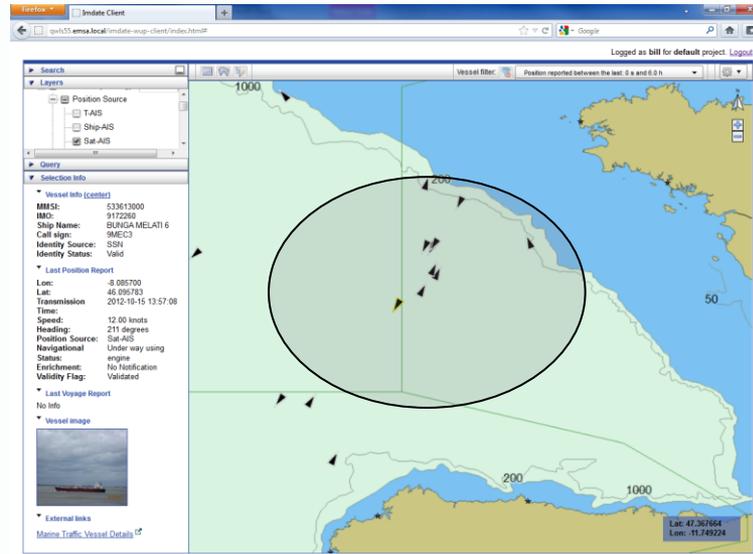
1. Adoption of the **Single Sign-On (SSO)** solution and central user registry for all maritime applications
2. Promotion of **common geo-registries**
  - Single repository. RVR is an example of one. Locode registry is another.
3. New **supporting ICT tools** at EMSA e.g. Enterprise Service Bus
  - Make applications more robust to change
  - Promote cost reduction
4. **New integrated services** that may be used by the other applications or directly by the Member States. e.g. vessel track query, on-demand automated monitoring.

- ❑ **A single platform**, all on **one graphical interface**
- ❑ **Last known vessel position** view with **multiple data sources**:
  - AIS + LRIT + S-AIS + VMS + coastal radar + satellite radar
- ❑ Now position reports can be **systematically subjected to validation/data checks**:
  - Validation of between reports from the same source (e.g AIS).
  - Validation of reports **between different sensor sources** (e.g AIS and LRIT).
- ❑ Real-time **generation of ship tracks**:
  - based on single source of position reports
  - based on multiple types of position reports.
- ❑ **Correlation** of satellite radar and coastal radar detected vessels with other position report sources to establish identified/non-identified vessels.

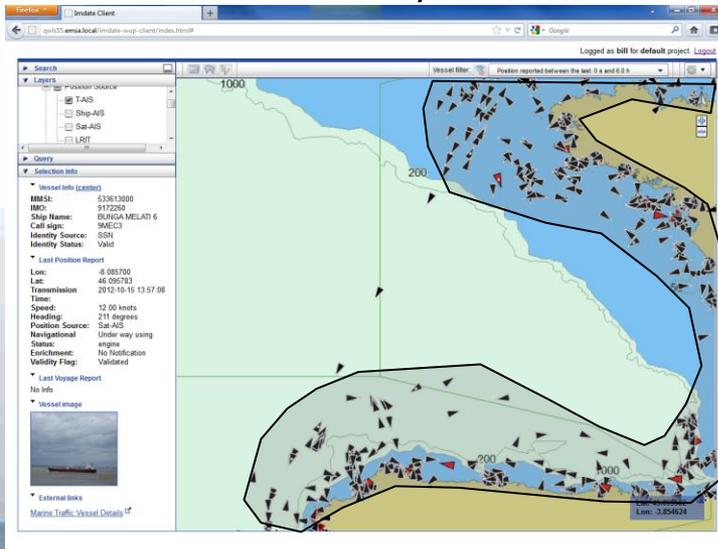
LRIT only



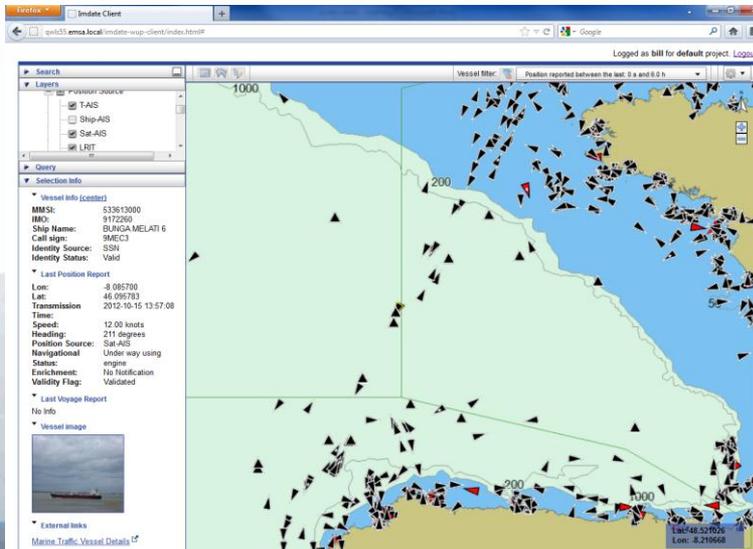
S-AIS only



AIS only



AIS+S-AIS+LRIT



# Data fusion: Kalman filter - Use of Ship type

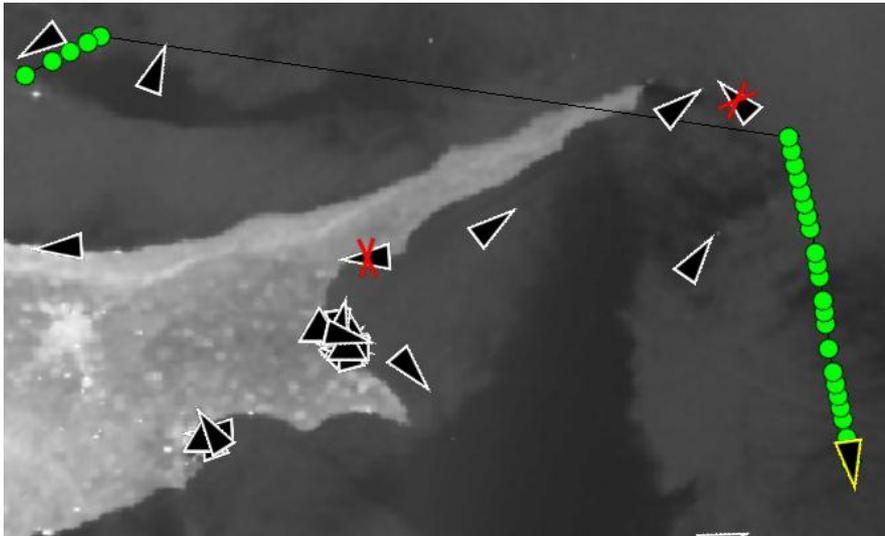


Tanker parameters



Highspeed craft parameters

## Data Fusion: in case of data gaps



# AIS and S-AIS reports with track interpolation

Get vessel track

Vessel: MMSI 352879000

Begin Date: 2012-02-12T00:00:00Z

End Date: 2012-02-15T11:00:00Z

Advanced options:

Sources: ALL

Kalman Filtering:

Fuse and smooth

Extrapolate

Extrapolation duration (min): 30

Step (s): 60

Submit

---

Selection info

Flag: PANAMA

Call sign: 3EAG4

Ship type: Other Type, all ships of this type (90)

Length: 199 m

Identity Source: AIS TYPE 5

Identity Status: Valid

Last Position Report

Lon: 016°29'08"E

Lat: 35°10'08"N

Transmission Time: 2012-02-15T10:17:55Z

Speed: 15.90 knots

Heading: 106°

Position Source: Sat-AIS

Destination: N/A

Navigation Status: N/A

Validity Flag: Validated

Enrichment: No Notification



Marine Traffic Vessel Details

**Interpolation considers:**

- Previous position reports
- Heading and speed
- Correctness thresholds



Lat: 34°47'31"N  
Lon: 002°42'58"E

Vessel Tracks

Number of tracks: 1 Total track points: 5068

MMSI: 352879000

MMSI	IMO	IR	SH
352879000	9284776	N/A	GP

Number of positions: 5068

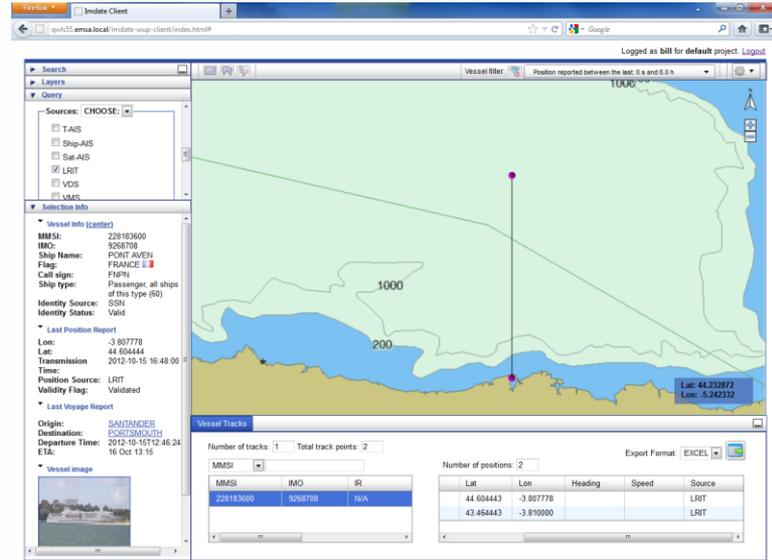
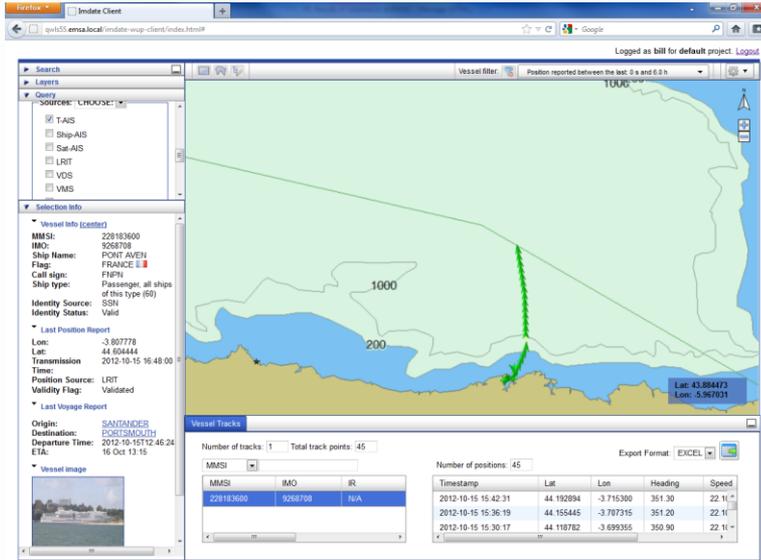
Timestamp	Lat	Lon	Heading	Speed
2012-02-13T04:05:03Z	36.52	-0.73	80.44	7.41
2012-02-13T04:04:03Z	36.52	-0.74	80.25	7.60
2012-02-13T04:03:03Z	36.52	-0.74	80.02	8.15
2012-02-13T04:02:03Z	36.52	-0.75	79.77	9.08

Export Format: EXCEL

<< first < prev 29 30 31 32 33 34 35 36 37 38 next > last >>

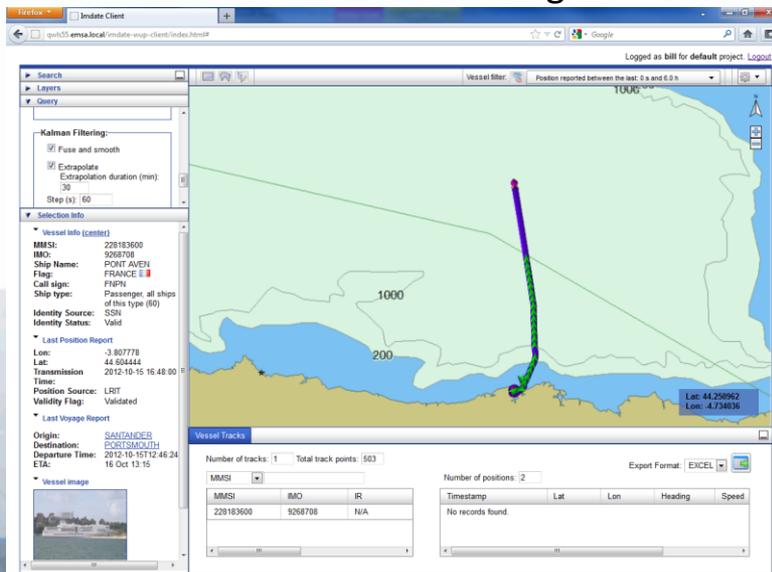
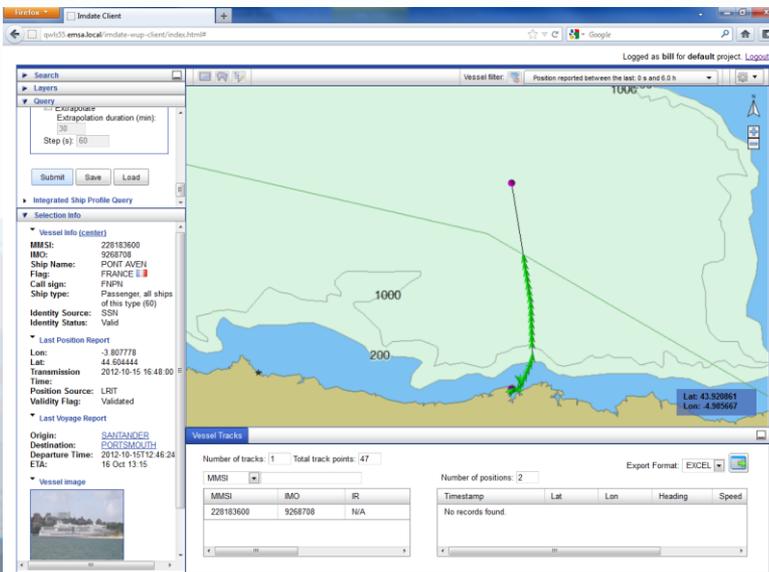
AIS only

LRIT only



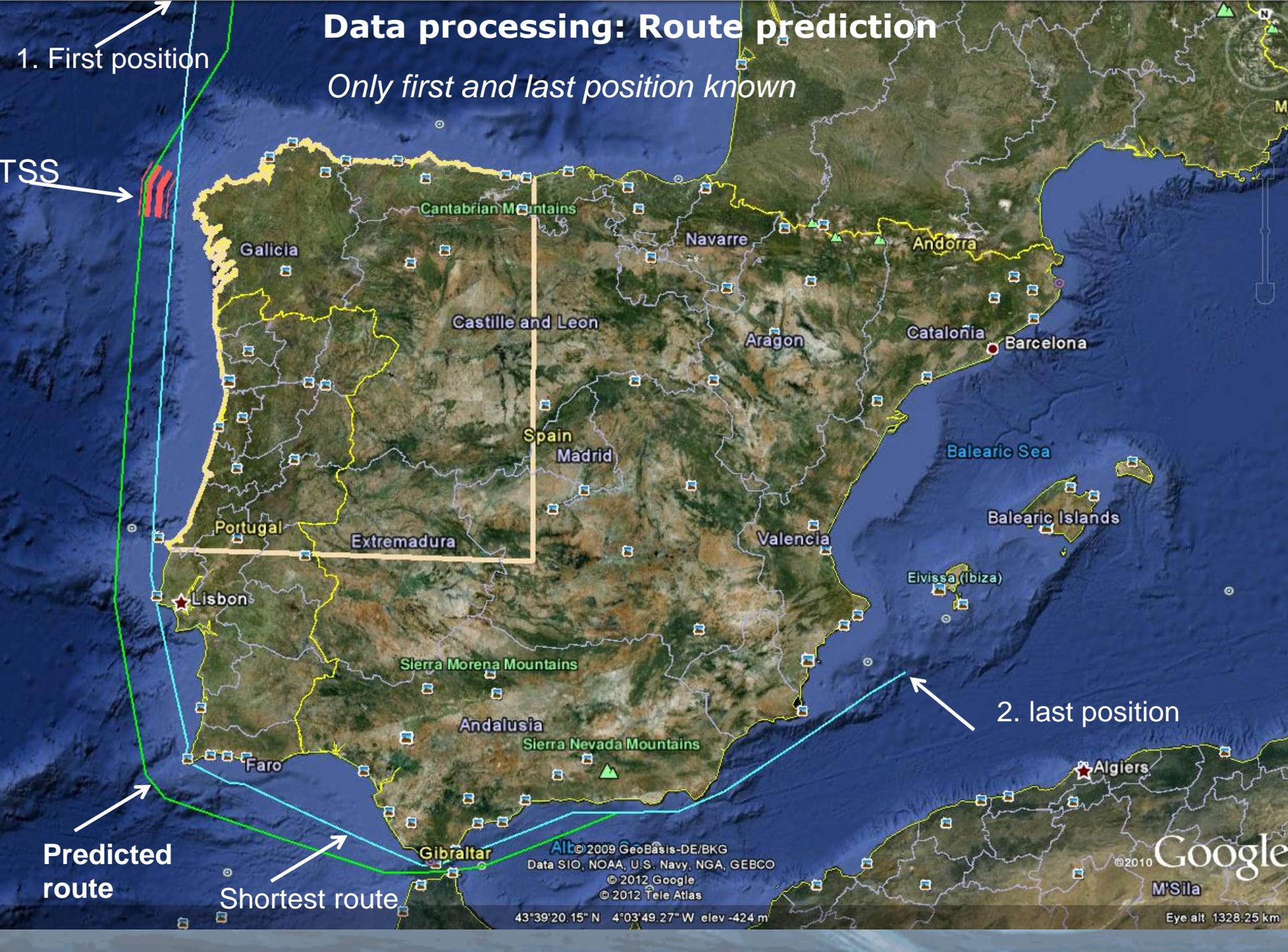
AIS+LRIT

AIS+LRIT+Smoothing



# Data processing: Route prediction

*Only first and last position known*



1. First position

TSS

2. last position

Predicted route

Shortest route

© 2009 GeoBasis-DE/BKG  
Data SIO, NOAA, U.S. Navy, NGA, GEBCO  
© 2012 Google  
© 2012 Tele Atlas

Google  
M'Sila

43°39'20.15" N 4°03'49.27" W elev -424 m

Eye alt 1328.25 km

# Route prediction: ship density by ship type and grid weighting

Predicted route

Ship density lines

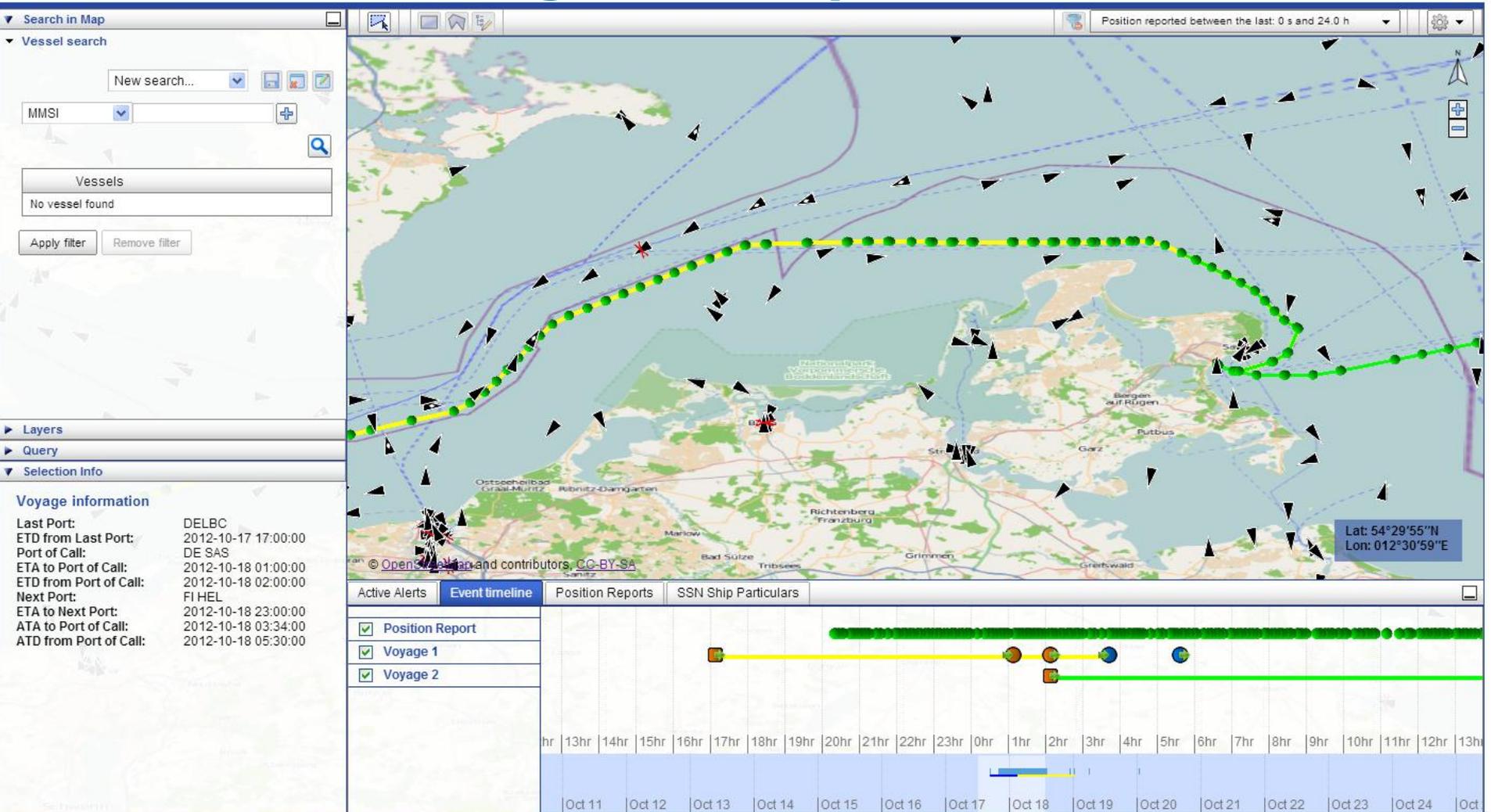


## Combining maritime data – second level

- *Integrated Ship Profile*
  - A single operation to aggregate information on a vessel from all EMSA applications.
    - SSN notifications, THETIS - SRP, Priority of inspection etc.
  - A 'Timeline' tool to provide better awareness of temporal events and information.
- *Area Centric*
  - Any position related information and ship tracks
  - Overlay of satellite images
  - Correlation for satellite detected vessels (VDS)
    - Checking detected vessel position against position reports.
  - External information layers (oceanographic and meteorological information, ad-hoc external information sources)

# Integrated Ship Profile

Logged as bill for default project. Logout



In addition to the map view, a 'Timeline' tool provides better awareness of time related events/information. Clicking on an element in the timeline refocusses on the relevant part of the map.

**Search in Map**

**Vessel search**

New search...

MMSI

Vessels

No vessel found

Apply filter Remove filter

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**Layers**

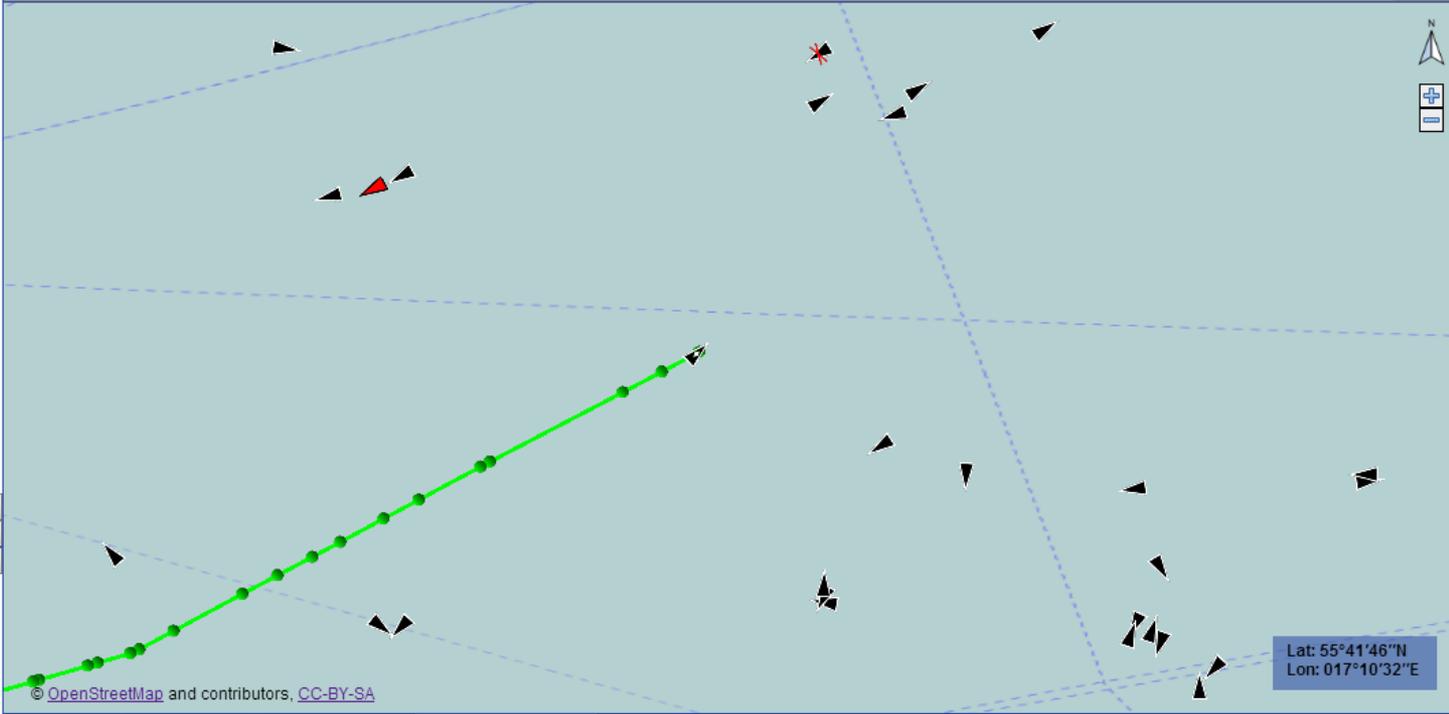
**Query**

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**Selection Info**

No item selected

Position reported between the last: 0 s and 24.0 h



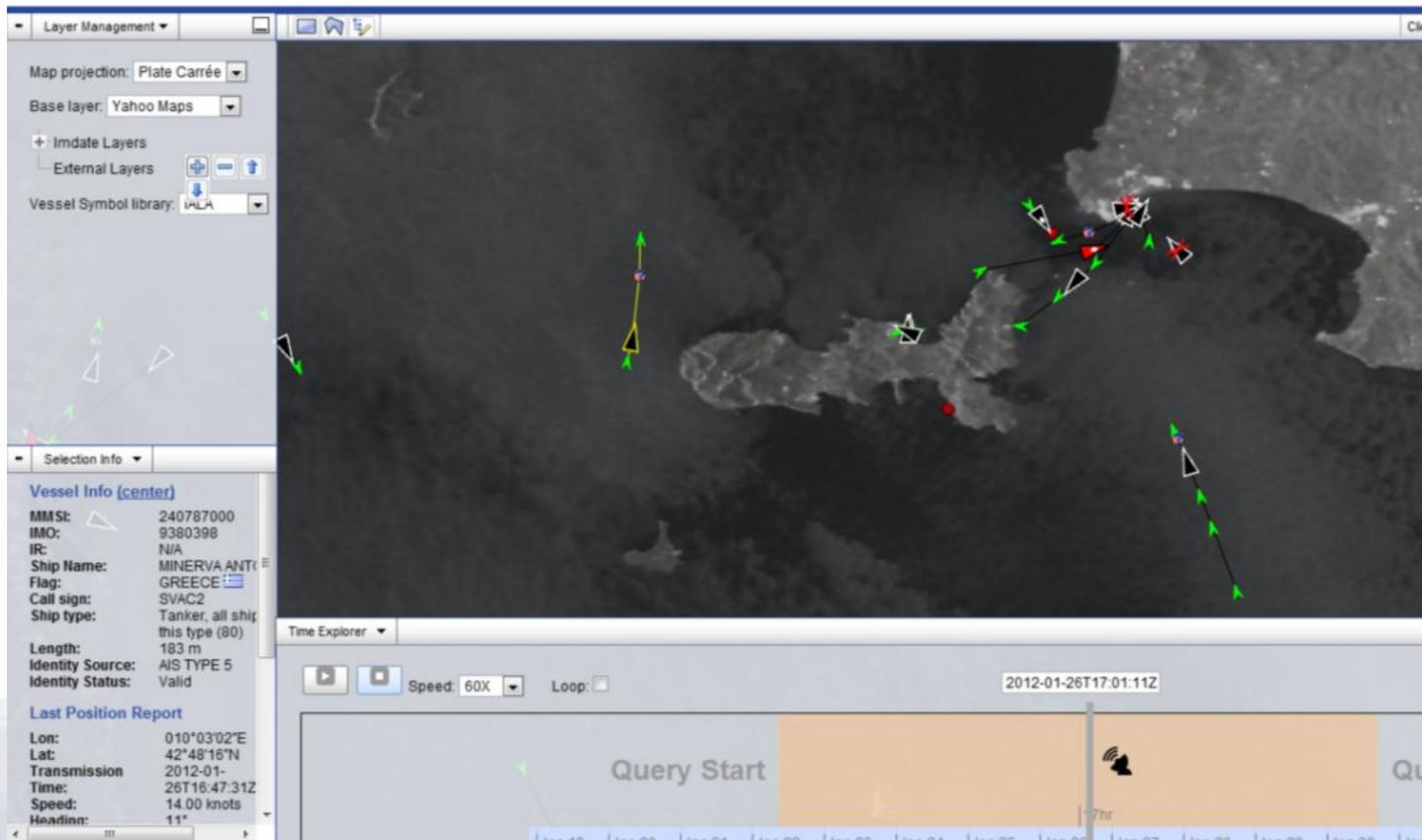
Lat: 55°41'46"N  
Lon: 017°10'32"E

Active Alerts | Event timeline | Position Reports | SSN Ship Particulars

Vessel Identification		Vessel Information		Current Vessel Status	
IMO:	9010163	Gross Tonnage:	32534 t	Inspection Priority:	0
MMSI:	266262000	Dead weight:	11558 t	Banned:	0
Ship Name:	FINNPARTNER	Length:	183 m	Detained:	0
Call Sign:	SKIH	Ship type (AIS):	69	Eligible for Banning:	0
Flag:	SE	Ship type (LMIU):	1	Eligible for Esp Inp:	0
		Ship type (PSC):	1	Single Hull:	0
				Risk Profile:	0
				Service Indicator:	0

THETIS co-display

## Correlation between satellite detected vessels and ship position reports



A graphical interface may provide “time slider” visualization for correlation inspection

## Monitoring Framework

- A *plug-in* framework for new automated monitoring algorithms
- Authorised users may create automated monitoring instances based on templates, using a wizard, and by defining the rules and specific conditions.
- Data driven– triggered based on specific criteria of:
  - Area of Interest (AoI)
  - Vessels of Interest (VoI)
  - Event of Interest (EoI)

# Initial Monitoring Algorithms

- Vessel Entering or Leaving Area
- At sea encounter - 2 vessels
- Drastic change in ETA
- Vessel - Off track considering reported voyage
- Under/over reporting
- Sudden change of speed
- Sudden change of heading
- Sudden change of port of destination
- Check if vessel is anchored.

Search:

Template	Status	Description	AOI	V	T
Detect suspicious vessels	running	Detect and analyse suspicious vessels in Strait	Strait	Z	1
Detect suspicious vessels	stopped	Analyse suspicious vessels close Brest coasts	Brest	Z	2

<< Prev 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 Next >>

...

Template:

Surveillance parameters
 

Form is built on the fly according the selected surveillance template

Alert notification
 

Notification:  E-mail  SMS  Fax

Recipients:

Template report:



Imdate Client

127.0.0.1/imdate\_head/imdate-wup-client/index.html#

Logged as **bill** for **default** project. [Logout](#)

Position reported between the last: 0 s and 24.0 h

**Search in Map**

**Vessel search**

New search...

MMSI

Vessels

No vessel found

Apply filter Remove filter

**Layers**

**Query**

**Selection Info**

No item selected

**Route Check Alert ALR\_04**

Type: Route Check  
Timestamp: 2012-10-17 03:00:00  
Lon: 003°10'48"W  
Lat: 50°17'24"N  
Description: Alert description

**Rendezvous Alert ALR\_01**

Type: Rendezvous  
Timestamp: 2012-10-18 06:47:00  
Lon: 000°40'48"W  
Lat: 49°43'16"N  
Description: Rendezvous between two vessels  
Involved Vessels: [F/V PERE DANIEL](#)  
[F/V L EUROPE](#)

**Reserved Zone Entry Alert ALR\_02**

Type: Reserved Zone Entry  
Timestamp: 2012-10-16 22:00:00  
Lon: 001°43'48"W  
Lat: 49°10'12"N  
Description: Vessel entered in reserved zone

Lat: 50°43'08"N  
Lon: 002°45'55"W

**Active Alerts**

Total records: 3

ID	Type	Lat	Lon	Timestamp
ALR_01	Rendezvous	49.721	-0.68	2012-10-18 06:47:00
ALR_02	Reserved Zone Entry	49.17	-1.73	2012-10-16 22:00:00
ALR_04	Route Check	50.29	-3.18	2012-10-17 03:00:00

By clicking on the ship name, the display will automatically center the map on the current position of the ship to which it refers to.

Imdate Client | 127.0.0.1/imdate\_head/imdate-wup-client/index.html# | Logged as bill for default project. [Logout](#)

Position reported between the last: 0 s and 24.0 h

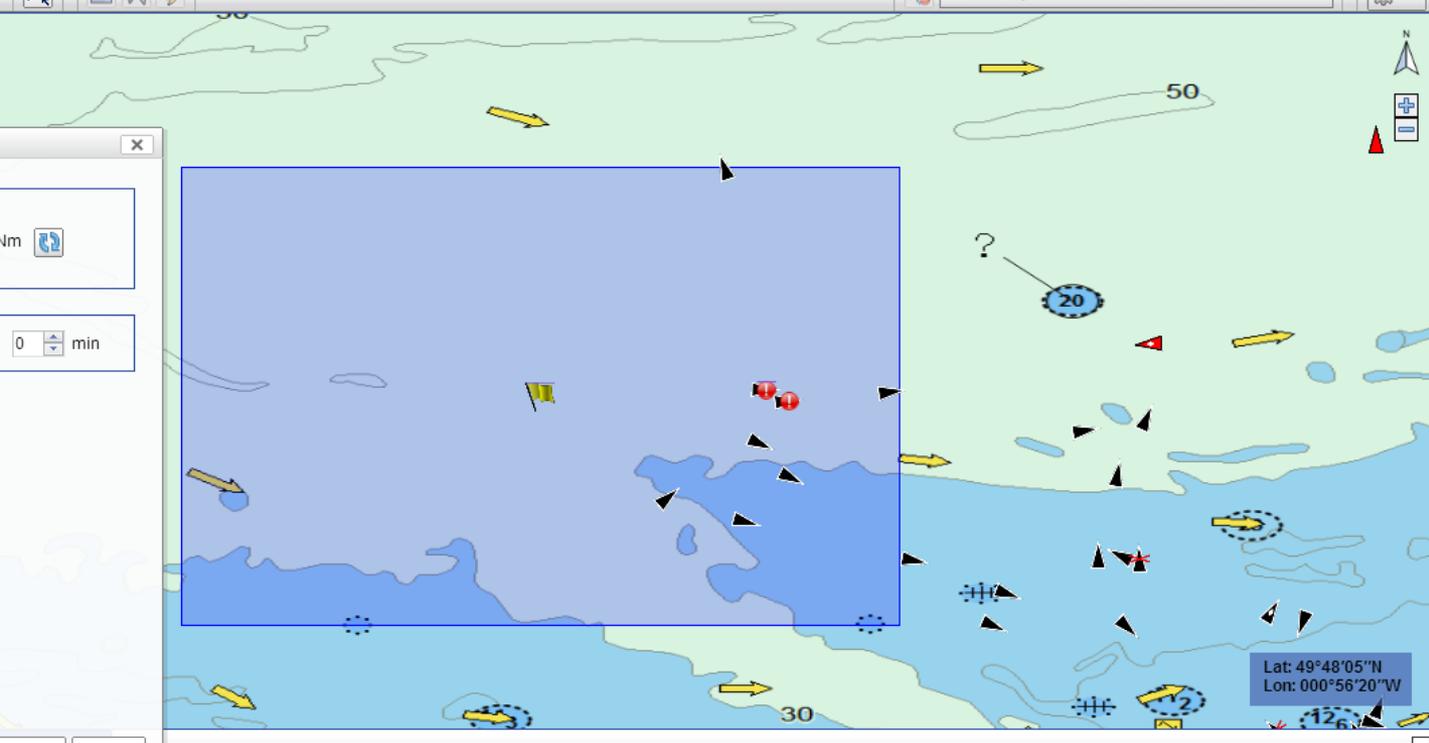
**Area Centric Query**

Area:  
 Lat: 49° 43' 16" N  
 Lon: 0° 40' 48" W +/- 10 Nm

Time:  
 2012-10-18 06:47:00 +/- 2 h 0 min

Service options:  
 Vessel Tracks  
 Position sources: ALL  
 Uncorrelated Positions  
 Incidents  
 Category: All  
 Type: All  
 CSN-DC Oil spills  
 CSN-DC EO Products

Submit Set as default Load default Cancel



Total records: 3

ID	Type	Lat	Lon	Timestamp
ALR_01	Rendezvous	49.721	-0.68	2012-10-18 06:47:00
ALR_02	Reserved Zone Entry	49.17	-1.73	2012-10-16 22:00:00
ALR_04	Route Check	50.29	-3.18	2012-10-17 03:00:00

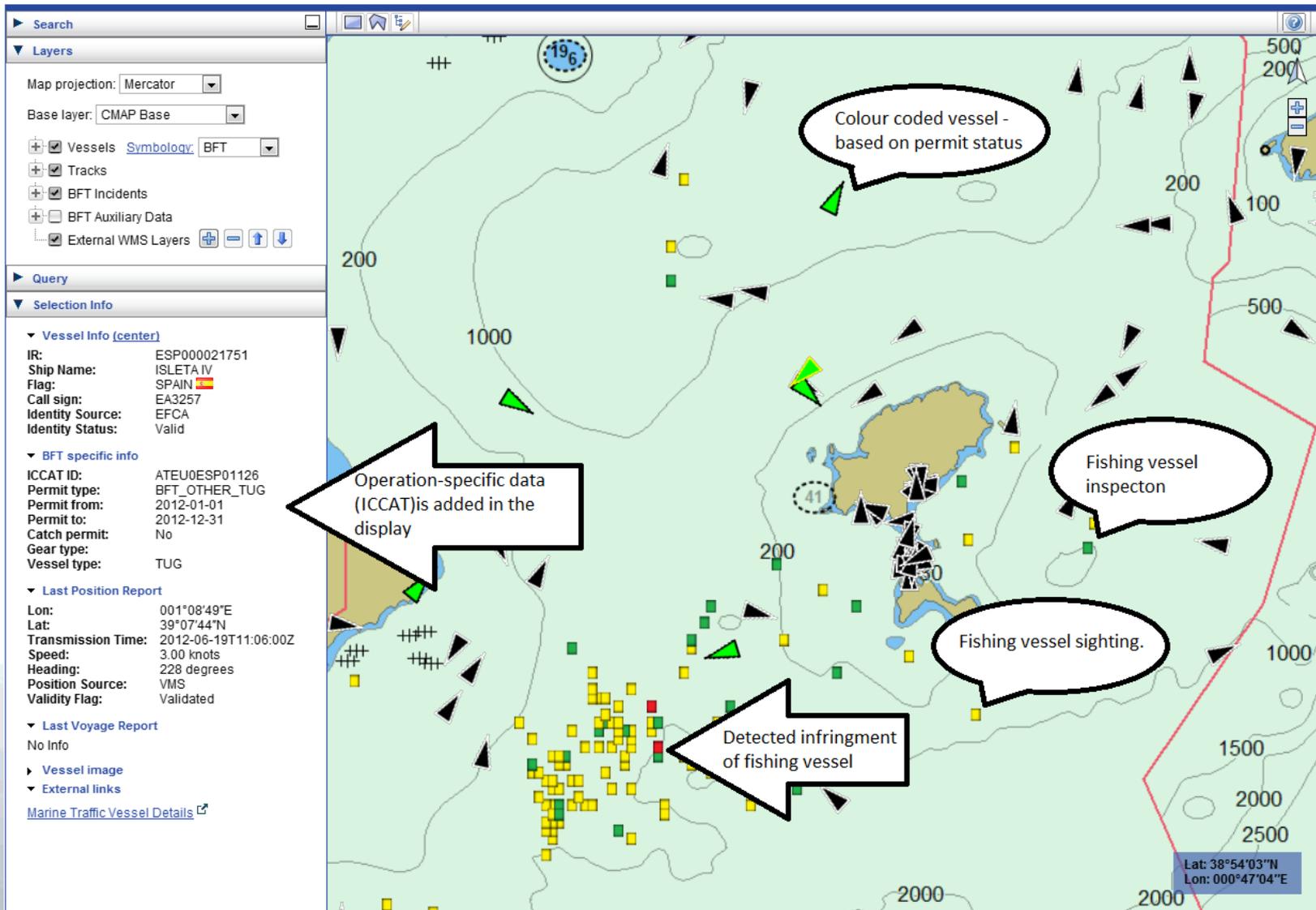
Easily and quickly query all data in an area centred around the position of the alert.

## System-to-System Interfaces

- **Position reports – dissemination facility**
  - Subscription to data by:
    - Source (AIS, LRIT, S-AIS etc)
    - Geographic area
    - Time window
  - Different formats and protocols supported.
    - NPR proxy – IEC format
    - IVEF (Inter-VTS Exchange Format)
    - EMSA standard format (CDF)
  - Use of plug-in to extend to new interfaces.
- **Data aggregation interfaces**

XML interface for the Integrated Ship Profile.
- **Alerting:**
  - Email and PDF
  - XML messaging (CAP – Common Alert Protocol)

# Example of Graphical Interface customisation



**Search**

**Layers**

Map projection: Mercator

Base layer: CMAP Base

Vessels **Symbology:** BFT

Tracks

BFT Incidents

BFT Auxiliary Data

External WMS Layers

**Query**

**Selection Info**

**Vessel Info (center)**

IR: ESP000021751  
 Ship Name: ISLETA IV  
 Flag: SPAIN   
 Call sign: EA3257  
 Identity Source: EFCA  
 Identity Status: Valid

**BFT specific info**

ICCAT ID: ATEU0ESP01126  
 Permit type: BFT\_OTHER\_TUG  
 Permit from: 2012-01-01  
 Permit to: 2012-12-31  
 Catch permit: No  
 Gear type:  
 Vessel type: TUG

**Last Position Report**

Lon: 001°08'49"E  
 Lat: 39°07'44"N  
 Transmission Time: 2012-06-19T11:06:00Z  
 Speed: 3.00 knots  
 Heading: 228 degrees  
 Position Source: VMS  
 Validity Flag: Validated

**Last Voyage Report**

No Info

**Vessel image**

**External links**

[Marine Traffic Vessel Details](#)

**Callouts:**

- Colour coded vessel - based on permit status
- Fishing vessel inspector
- Fishing vessel sighting.
- Detected infringement of fishing vessel
- Operation-specific data (ICCAT) is added in the display

**Map Data:** Lat: 38°54'03"N, Lon: 000°47'04"E



**Thank you very much**  
[justino.de-sousa@emsa.europa.eu](mailto:justino.de-sousa@emsa.europa.eu)

