Fish-X

D4.1: Insight Platform Functional Definition and Use Cases WP4

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Abstract	The deliverable “Insight platform functional definition and use cases” contains functional descriptions for all functions and use interfaces that will be provided in the Insight platform. The Insight platform represents one potential data user connected to the Fish-X data space and accessing to vessels data which have been sourced from data providers under the control of the data space, implementing Gaia-X guidelines. Main data sets used are the Vessel Monitoring Systems (VMS) positions and the Electronic Reporting Systems (ERS) fishing activities. The requirements are expressed with an Insight version number. When a V2 is indicated, it means that the requirement will be implemented into the version 2 of the application. This document is used for guidance of the CLS developers' team and seeking support of potential future users (represented by the consortium partners involved in the demonstrations) as providing a clear understanding of functions and user experience offered by Insight. The Use cases have been collected through interviews and working groups meetings during the WP2 and during the preparation of the site demonstrations in WP5.

Document history

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Acronyms and abbreviations

Abbreviation	Meaning
ACK	Acknowledgement
AI	Artificial Intelligence
AIS	Automatic Identification System
API	Application Programming Interface
CFR	EU Common Fleet Register
DG Mare	Directorate-General Maritime Affairs and Fisheries
EEZ	Exclusive Economic Zone
EM	Electronic Monitoring (see REM)
EMFF	European Maritime and Fisheries Fund (now EMFAF with aquaculture)
EMODnet	European Marine Observation and Data Network
ERS	Electronic Reporting System
EU	European Union
FAO	Food and Agriculture Organization
FLUX	Fisheries Language for Universal Exchange (also UN/FLUX)
FMC	Fisheries Monitoring Center
FRA	Fisheries Restricted Area
GDPR	General Data Protection Regulation (EU) 2016/679
GFCM	General Fisheries Commission for the Mediterranean and Black Sea
GNSS	Global Navigation Satellite System (e.g. Galileo)
GPRS	General Packet Radio Service
GUI	Graphical User Interface
ICES	International Council for the Exploration of the Sea
OSM	Open Street Map
MPA	Marine Protected Area
NAF	North Atlantic Format
REM	Remote Electronic Monitoring (cameras onboard the vessels)
SSF	Small-Scale Fisheries
UTC	Coordinated Universal Time
UX	User Experience
VMS	Vessel Monitoring System

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WGS 84	World Geodetic System 1984 (used by GNSS to determine a position)

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Executive Summary

This deliverable D4.1 contains a functional description of the Insight platform which is developed in a prototype version during the Fish-X project. Resulting of the Task 4.3, the first version constitutes the deliverable D4.2 and will be available by Summer 2024. A second version will be developed through the Tasks 4.4 and 4.5 in the end of 2024 with AI functions, to constitute the deliverable D4.3.

The Insight web-based application aims at giving access for a wide audience to fisheries monitoring data sets collected through the course of project during use cases with voluntary small-scale fishers.

Insight is connected to the Fish-X data space, a Gaia-X compliant data management system which allows access controlling, protection of data owners' rights, and interoperability.

The Insight prototype platform represents the first sectoral use of Gaia-X for fisheries monitoring applications, to illustrate how fisheries data can be shared among various user platforms.

Insight allows any visitor to have a quick view on real fisheries data sets over marine charts. The data (vessel positions and electronic reports if available) are collected over the duration of the project. To ensure data privacy, through a process of pseudonymisation (in the data space) and aggregation, individual vessel tracks are not displayed. Instead, they are converted into times of presence and aggregated into density maps. In the second version of Insight, the fishing effort will be estimated using state-of-the-art AI methods and displayed as fishing effort density maps and dashboards. As the concept of fishing effort varies with the type of fishing gear (e.g. gillnet, pots, trawl, longline etc), the Insight V2 fishing effort algorithms will be adapted to the specific types of vessels involved in the demonstrations.

Insight is developed by CLS, a company with expertise in vessel monitoring for institutional uses such as control of fisheries. The development of Insight is made by CLS in parallel with the development of a new generation of Fisheries Monitoring Center (FMC) and unified Electronic Reporting Systems (ERS) applications. The specifications enclosed in this document remain at a high level to be understood by a non-specialist audience, not only for developers. This document is then derived into individual and more technical service specifications and shared with the CLS software developers. Using an Agile methodology, it

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is expected that some functions will be amended or replaced by others if considered more critical during the next few months.

The data types managed by the Insight platform are detailed into the documents D3.1 Cross-sector Data Sets and Data Types (public), and D3.2 Technical Specifications for Data Formats and Data Storage (sensitive, available under MoU). The specific interfaces between Insight and the Fish-X data space are described in the D3.2 document.

1. Background Information

The Fish-X project is co-funded by the European Commission Horizon Europe program (agreement no.: 101060879). The Fish-X project includes the development and operation of the Insight platform and the Data Space environment to support the digital transition of the Small-Scale Fisheries.

The Insight platform is a general public web-based interface that can be used to display several fishing indicators (fishing effort, density maps, smart KPIs, etc.) for small-scale fisheries.

Insight will provide a global overview for everyone while following EU guidelines in term of sovereignty and protection of data.

Indeed, the Insight platform will be connected to the Fish-X data space, which is Gaia-X compliant (it must implement all needed recommendations of the Gaia-X paradigm). The Insight platform represents the first use of Gaia-X for fisheries monitoring applications, to illustrate how Gaia-X could support the development of a range of applications. Insight offers standardized data interfaces, and data management through the Fish-X data space. Depending on the data sets which will be imported into the Insight platform, it could cover applications such as fisheries monitoring, control, scientific assessment, traceability, and market supporting applications.

This platform will also host data from several use cases and will provide to corresponding fishers simple and efficient tools that will help them prove their fishing grounds in case of conflicting uses of the maritime domain.

There will be two versions of the Insight platform. The first one will be available without machine learning algorithms and will show density maps based on vessels presence (without distinction if they are fishing or not). This first version is collecting data from use cases

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implemented during the WP 5 (Croatia, Portugal, possibly Ireland, Baltic, and reanalysis of STARFISH 4.0 Greek data sets).

In the version 2 of the Insight platform, these data will be used to feed artificial intelligence algorithms, to be integrated to produce additional indicators such as fishing effort per statistical area.

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2. Definition of Terms

AIS: Automatic Identification Systems, a position reporting system which collects vessel positions at variable intervals (depending on their speed). AIS is installed on all types of merchant vessels (tankers, passengers, container carriers etc). Access to AIS data is provided by commercial suppliers which operate satellite constellations listening to AIS terminals onboard vessels, or through coastal receivers. A major difference of AIS with VMS is that vessels are allowed to switch off their AIS, should they consider it may represent a threat (e.g., navigating in piracy areas), so that AIS cannot be used alone for enforcement of fisheries regulations.

ERS: Electronic Reporting Systems allow fishers to report their activities manually, without using paper logbooks, in compliance with EU regulations. The reports are necessary for measurement of fishing impact on fish stocks, with sufficient level of precision (per area and per species). The reports contain a unique identifier of the fishing trip and details of fishing trips from port departure to return to port, with list of catches and quantities, specific events such as entry or exit of zone. The new EU control regulation will require SSF to report by electronic means (e.g., smartphone app) after each fishing trip before landing their captures, interactions with vulnerable species, and lost fishing gears.

Fishing Effort: According to the FAO: "Fishing effort is generally defined in terms of the time spent searching for fish (search duration) and/or the amount of fishing gear of a specific type used on the fishing grounds over a given unit of time e.g. a fishing operation, fishing activity, day or fishing trip. The measure of effort (unit of fishing effort) depends on the fishery and type of gear used." The fishing effort represents the resources involved in the catching of fish, generally proportional to a duration of activity and a function of the fishing gear efficiency (number of hooks in a longline, or traps or lines for other techniques). In the context of the Insight platform, the fishing effort will be the result of a calculation based on the vessel trajectory and additional data.

Gaia-X: Gaia-X is an EU-initiative focused on crafting a software framework for regulating and governing cloud and edge technology stacks. It establishes a shared set of policies and regulations to promote transparency, controllability, portability and interoperability across data and services. Gaia-X's architectural foundation is rooted in the decentralization principle, resulting in a cooperative ecosystem of individual platforms that adhere to a common standard. The Gaia-X standard is dedicated to developing a data infrastructure founded on

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the principles of openness, transparency, and trust. So, what emerges is not a cloud, but a networked system that links many cloud services providers together, who keeps control of its own data.

Through Gaia-X, the formation and enhancement of data spaces are facilitated by trusted platforms that uphold consistent rules. This framework fosters mutual trust between users and providers on an objective technological basis, allowing them to exchange data securely and freely across multiple entities. The Fish-X data space builds on this initiative and hence offers its users the accompanying benefits.

Marine Chart: in this present context, marine charts are digital charts used as background of vessels locations, to help understanding the fishing activities with regards to the bathymetry and other features (buoys, protected areas etc). They are not used for navigation.

UI: User Interface screens with series of menus, selection buttons, etc available through an app on a smartphone, or through a web browser.

VMS: Vessel Monitoring System is a position reporting system which collects vessel positions at regular intervals (e.g., every two hours in the EU) imposed by most fisheries regulations in the world, applicable to all fishing vessels in the EU above 12 meters in length fishing for more than 24 hours, and this regulation will be progressively extended to vessels below 12 meters until 2030. The vessel masters are obliged to maintain an active VMS onboard, and interruption of VMS reports may be considered as infringements if not justified (e.g., vessel to port).

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3. Architecture Overview

The Insight platform is composed of several components and is fully integrated in the CLS system. This platform can integrate VMS and ERS data, either sent automatically by participating vessels (via corresponding service providers) or sent by an external entity (FMC platforms for example).

These data will be anonymized, processed, aggregated, and stored at backend level. Final users can consult these data using an interface (UI).

3.1 Summarized Functional Overview

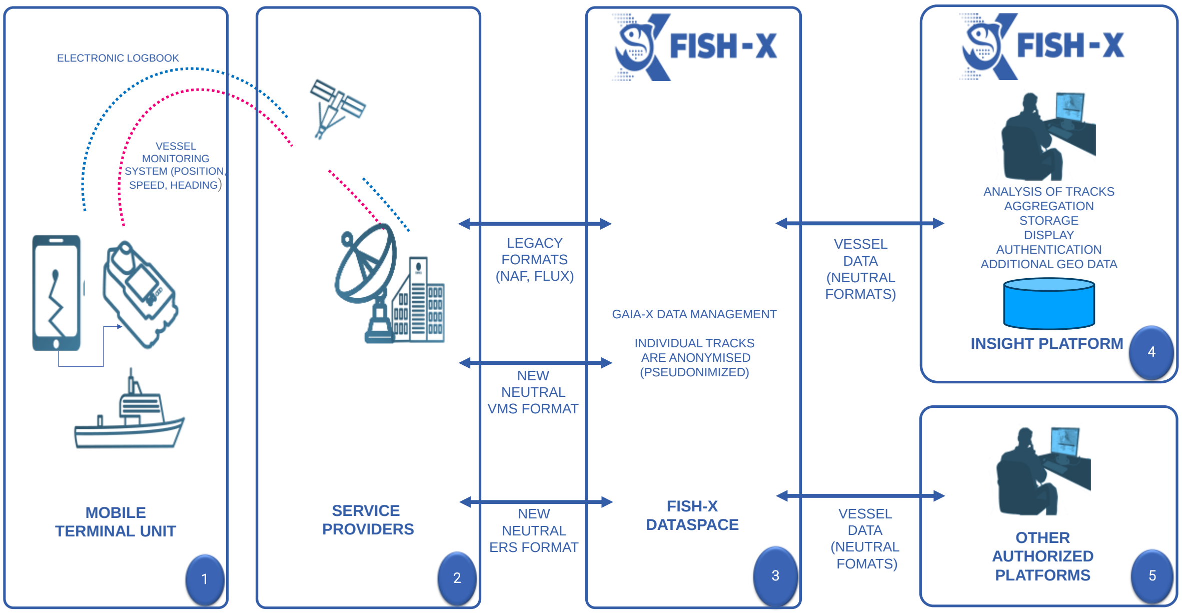

Figure 1 - Data flows relevant for Insight

1 – The data of interest (positions, electronic logbooks) are generated onboard the vessels and relayed to the shore by communication networks and specialized service providers.

2 – These service providers are responsible for the performance of the VMS units, the decoding and analysis of the reported messages, and the conversion of these messages in internationally recognised messages. The service providers are in relation with the fishers on one side (managing the unique correspondence between the vessel and the terminal ID), and with end user applications on the other side. There could be several service providers in cascade, not represented on the figure, before the data arrive to the data space. For instance,

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a service provider could serve a national end user (e.g., fisheries department) which then would push the data to the data space.

3 – The service providers make the converted data available to the data space through the recognised formats and protocols, in particular the NAF (North Atlantic Format), a legacy format for encoding fishing activities, and the FLUX format supported by the EU. In addition, CLS is proposing neutral formats for VMS and ERS data which are described in the D3.2 deliverable, to be accessible to service providers not supporting NAF or FLUX. The data space processes the incoming data according to pre-agreed rules (refer to D3.2) in coherence with the authorizations given by the data owners represented by the data providers. One of the processes is the anonymisation of the data sets, replacing every individual data (vessel name, vessel registration number, etc) into a pseudonym. The data space does not record the data sets which have been processed through it.

4 – After anonymisation, these data will be processed, aggregated, and stored at backend level by any authorized application. Insight is one of these applications, and other authorized platforms could also connect and make use of the same data sets. Final users can consult these data using an interface (UI).

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3.2 Detailed Overview

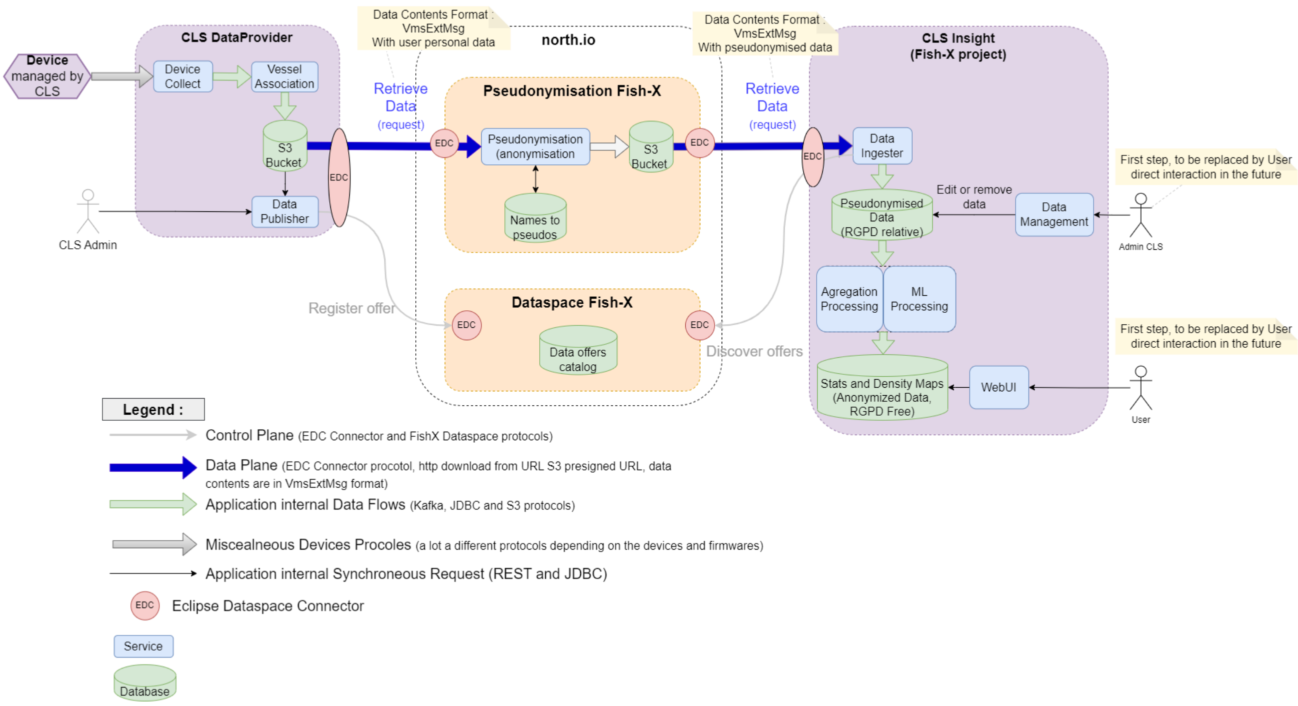

Figure 2 - Detailed overview with all processes and connectors

This schema focuses on the main dataflow during the first step of the project and shows its three applications / actors:

- **Data Space Fish-X**
  - The data space is only responsible to make entities (data producers and consumers) to meet. It is an entity directory that references data offers and who offers, so the consumers may contact the producers directly. It offers service to conclude contracts between entities about data provision for the consumer (and conditions).
  - The data space allows producers to register their data offers and to consumers to discovers the data offers. Then create contracts to access the data and for both parties to conclude the contract.
  - The unit of data made available is called an Asset (by example if data made available is in directories and the root folder is the Asset, then only all the data of the root folder can be made available or not. If the sub-folders are Assets,

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then contracts can be about some data in a selection of sub-folders (Assets) and there the possibility is not limited to the root folder and sub-contents (access or not access but to all).

- **CLS as Data Provider and how it will provide data**
    - Any other Data Provider can provide data too by connecting with an EDC Connector like CLS does. The Communication is detailed in Fish-X document "Technical Specification for data Transfer and Storage Format" (WP 3.2).
    - The Application collects data from various devices on fishing vessels (through GPRS or satellite), decodes the miscellaneous binary formats and sends it as a unified contents format VmsExtMsg and LogbookExtMsg (will be defined for the V2).
- **Pseudonymization Application**
    - Its role is to Pseudonymize (replace personal data values with pseudo values) and ensure output data cannot be directly linked to a user. Pseudonymization output data it still GDPR regulated.
    - It is a data consumer from "CLS as Data Provider" and a data producer to "CLS Insight Application".
- **Insight Application**
    - The Insight platform receives vessel data after the data space control process. No other vessel data can be read by Insight if they were not controlled through the data space in term of data access rights. Insight is fully dependent of the data space availability.
    - Insight consumes data from Pseudonymization Application, then compute statistics and density map (aggregated data is then anonymized and not regulated by GDPR).
    - Statistics and density maps are available for viewing to users through a Web UI.

3.3 Data Communication

The data communication is described in the document: "Fish-X - Technical Specification for data Transfer and Storage Format" (WP 3.2)

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The communications between the application are processed through a Control Plane and a Data Plane and are about Assets (refer to the document D3.2 Technical Specifications for Data Transfer and Storage, for these definitions).

Both Control Plane and Data Plane layers are made through EDC Connectors (EDC for Eclipse Data Space Connectors) which are both a protocol and an implementation of the Data Space Connector standard. It is an application that will run on each infrastructure and that is customizable to fit the storage specificities on each side.

3.3.1 Control Plane

The Control Plane communicates with the data space to register Assets (data offers) and allow Assets discovery. It allows the data consumers to negotiate contracts for access to assets. The Control Plane communication is done through the EDC Connector protocol and Fish-X Data Space sub-specific protocols.

In the schema above, communications are:

- Data Offers Registering:
  - CLS Data Provider to Data Space
    - Produce: Not pseudonymized fishers' data
  - Pseudonymization Application
    - Produce: Pseudonymized fishers' data
- Data Offers Discovery:
  - Pseudonymization Application
    - Want to consume: Not pseudonymized fishers' data
  - Insight Application
    - Want to consume: Pseudonymized fishers' data
- Contract/Negotiation between Producers and Consumers of required data

3.3.2 Data Plane

The Data Plane is the road where the data is sent. It does not imply the Data Space. Partners exchange data directly once the contract/negotiation about the assets has been settled (Control Plane).

The two Data Plane communications (CLS Data Provider to Pseudonymization Application, and Pseudonymization Application to Insight) have identical structures:

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- Producers offer data through an Asset given through the EDC Connector and a pull method (caller will receive data in response to its call)
- The data given by the EDC Connector is a http link to download the data (technically it is the files of the bucket that are made available by an S3 pre-signed url (http) valid for 12h)
- The data downloaded through this link has **VmsExtMsg** contents or **LogbookExtMsg** depending on file's folder name ("VMS" or "Logbook").

3.4 Data Storage

There are several Data Storages in the schema above due to the decentralized concept of the data space.

3.4.1 Context of Data

The data handled is the message coming from the devices onboard of vessels. The emission of the message is not continuous (VMS devices transmit at programmed intervals or the device may be interrupted or masked for some reasons and will transmit again later. To ensure all data are received by Insight (and even before by the Data Provider) a delay has to be taken into account before processing the whole and complete data of the day.

Additionally, data is put in a storage location to be available by consumers. We have to define a time interval when the data is updated (copy) and shall not be accessed (during copy) as there is no transactional atomicity for this copy (to avoid retrieving only a part of the files because all have not been copied, or look at data of previous days that has begun to be deleted).

3.4.2 Vessel's Data Provided by CLS

As described in WP 3.2 document (with more details) there is a 4-day window of data made available from day-6 to day-2.

- The 4-day window is necessary because the Pseudonymization application or the Insight platform may be unavailable, so to prevent losing data if not retrieved on the same day it is made available.
- The 2-day offset is there because data taken time to be retrieved from vessels (in case of a vessel not returning to port the same day). This delay is set to ensure that all data have been retrieved for one given day.

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3.4.3 Pseudonymization Application and Pseudonymized Data

Like for CLS as Data Provider, the Pseudonymization Application has to forward data the same way (after having anonymized it) (Full details are also in WP 3.2 document).
The application may also have a database to match the not-yet pseudonymized values to their pseudonymized values, because the process has to be constant for same values and unicity has to be conserved.[1]

3.4.4 GDPR Application

All data in entry are pseudonymized before they enter in the Insight platform. The Insight platform does not have the real identifiers of participating vessels (nor information about the captains/shipowners).
The pseudonymized data is still regulated by GDPR, so if users ask, the Insight application has to be able to delete it or to give it back to user.
To handle the GDPR on these data:

- A procedure to delete and export the data of users will be made. A contact will be provided to ask for these actions.
- A 5-year data conservation policy will be applied on these data by default.

The application will also store statistics and density maps. As data have already been aggregated, it is no longer personal data and is not regulated by GDPR.

3.5 Processing

The processing is relative to statistical computing (with traditional algorithms), aggregation of data into density maps and Machine Learning processing to deduce fishing activities from trajectories.

They must be listed to users, as they have to agree to each processing when giving authorization to process their data.
Processing will occur once a day, after the daily data has been retrieved. And results will be made available in web UI soon after.

[1] Each unique value field shall have a unique pseudonym, and so each unique pseudonym shall match only one unique value field.

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4. Functional Specification

4.1 Data Acquisition

4.1.1 Accepted Dataflows

(1) **VMS**

Concept

VMS (Vessel Monitoring System) is a technology used in the fishing industry and maritime enforcement to monitor the location and activities of fishing vessels and other marine vessels.

The primary purpose of a VMS is to improve fisheries management, enhance maritime security, and promote sustainable fishing practices. VMS is often mandated by governments to regulate fishing activities and prevent illegal, unreported, and unregulated (IUU) fishing.

A VMS is composed of an active equipment installed onboard the fishing vessel, which 1) acquires positions of the vessel with a GNSS receiver (Galileo, GPS) at regular intervals, and 2) sends this data through a communication transmitter to a service provider.

Typical VMS data sets are described in Deliverable D3.1 and composed of:

- Source identifier
- Date and time UTC
- Position (latitude and longitude)
- Speed derived from GNSS
- Course derived from GNSS
- Technical messages

After these VMS data sets reach the service provider which acts as distributor of the data, the VMS data can be coded in several (proprietary or not) formats.

Sources of VMS data

In the context of the Fish-X project, several sources of VMS data will be integrated: NAF, FLUX VMS and VmsExtMsg (for NEMO devices).

Each of these sources has its own format (cf. D3.1 Cross Sector Datasets document).

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If authorized, this data will be processed, decoded and anonymized by the Fish-X data space dedicated decoders before to be encoded in a unified VMS format and distributed to the Insight platform.

The VMSExtMsg is an open format proposed by CLS to adapt other sources of positioning data, should other VMS providers wish to join the Insight platform. The specification and format of the Unified VMS format (VmsExtMsg) is defined in the Appendix A.

Following fields of VMS data will be anonymized:

- Name of the vessel.
- Reference of the satellite terminal (TID of the NEMO for instance).
- Identifiers of the vessel.
    - Depending on the source of VMS data, identifiers may be different.
    - Most used identifiers:
        - CFR: Common Fleet Register.
        - IRCS: International Radio Call Sign.
        - XR: External Marking.
- Flag of the vessel.

Other information of the VMS data will be kept as it is (like GNSS location, date/time, speed and course) to be able to give accurate information while displaying data on a map or to use it for Machine Learning.

The Anonymization service (Gaia-X) provided before data entry into the Insight platform will generate an anonymized vessel that will be associated to the real vessel.

All VMS data sent by the real vessel will then be associated with its anonymized vessel.

(2) **ERS**

Context

ERS (Electronic Reporting System) is a technology used in the fishing industry to collect and manage data related to fishing activities, catch reporting, and compliance with fishing regulations. ERS plays a vital role in promoting sustainable fisheries management by improving data accuracy, transparency, and timely reporting. ERS is now mandatory for European Union vessels above 12 meters with fishing trips longer than 24 hours in distance beyond 6 nautical miles. This regulation will be extended to vessels of all sizes in the future.

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ERS allows fishers to electronically report their catch data, including species, quantity, size, and location. This data is crucial for assessing the distribution of fish populations, impact of fisheries, adapt stock management measures per area and species (e.g. quota), and making informed decisions to prevent overfishing. Electronic reporting is also used to report lost fishing gears and vulnerable species interactions (accidental catches and releases).

Source of ERS

In the context of the Fish-X project, several sources of ERS data will be integrated (NAF and FLUX ERS).

Each one of these sources have its own format (cf. D3.1 Cross Sector Datasets document).

If authorized at data space level, this data will be processed, decoded, and anonymized by the Fish-X data space dedicated decoders before to be encoded in a LogbookExtMsg and distributed to the Insight platform.

The LogbookExtMsg is under design and will be made available in the next version.

Following fields of ERS data will be anonymized:

- Name of the vessel.
- Identifiers of the vessel.
    - Depending on the source of ERS data, identifiers may be different.
    - Most used identifiers:
        - CFR: Common Fleet Register.
        - IRCS: International Radio Call Sign.
        - XR: External Marking.
        - IMO: International Maritime Organisation unique vessel number.
- Flag of the vessel.
- Information of the Master.
- Information of the crew.

Other information of the ERS data will be kept as it is (like GNSS location, activity date/time, fishing area, list of catches and quantities, observations) to be able to give accurate information when displaying data on a map or to use it for Machine Learning.

The anonymization service (Gaia-X) will generate an anonymized vessel that will be associated to the real vessel.

This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101060879.

All ERS data sent by the real vessel will then be associated to its anonymized vessel.

4.1.2 Data Integration

(1) **Data Anonymisation**

The data sent by the Gaia-X anonymization service are already anonymized and will be sent to the Acquisition module of the Insight platform.

The Insight platform will process this data like if it is real data (since the anonymization is applied at data space level, the Insight platform does not know that some data is anonymized or not).

Indeed, corresponding vessels and personal information of the master and crew are anonymized.

Anonymized vessels will be integrated in the Vessel Registry database, to insure the correct association of data to the right vessel and satellite terminal.

(2) **Data Aggregation**

Received VMS data will be aggregated, by period and by geographical area (by square and by zone EEZ, FAO or FRA).

Received ERS data will be aggregated, by period and by geographical area (by square and by zone EEZ, FAO or FRA).

ERS data aggregation can also be done by data/time, geographical area and specie caught (out of the scope of the V1 of the Insight platform).

The 0.025° is the highest resolution and will be associated to the maximum zoom level on the Map.

Each time a user selects a lower zoom level, the resolution of the square will be updated accordingly (from zoom level N to zoom level N-1, the resolution R of the square will be updated to R*2).

To protect the identity of the fishing vessels, data from at least 3 different vessels must be available by geographical area to start the aggregation operation.

If not, corresponding data will not be used and shall not be displayed (neither on the map nor on any indicator or KPI).

This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101060879.

4.1.1 Data Volumetry

The Insight platform must gather hundreds of thousands of vessels (up to 100,000 for the V1 and 500,000 for the V2).

For each vessel, it must be possible to integrate VMS and ERS data. The average frequency for VMS data is 1 location each 3 min and for ERS one declaration per day.

By default, users will display data of the last month (calendar).

4.1.1 Expected Performance

The Insight platform must be ergonomic and simple to use.

Data must be displayed smoothly without sluggishness.

Following metrics must be respected while using the solution:

- Display the whole world density Map in less than: 10 s.
- Display a density Map using an EEZ or an FAO area as a filter in less than: 2 s.
- Display a density Map using a FRA or a sub-FAO area as a filter in less than: 1 s.

4.2 General User Interface Requirements

4.2.1 Supporting Browsers

The latest versions of the following web browsers are supported:

- Chrome,
- Edge,
- Firefox,
- Safari.

4.2.2 User Interface

Users should be able to use the Insight platform without any previous training, and get access to most functions immediately, without long series of clicks.

The screens should display a minimum number of buttons and multiple choices. Buttons should contain self-understandable icons and info bubbles should be available.

The entry of numerical values should be replaced by pre-defined values.

This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101060879.

Menus can be used with drag movement on screens, like for panning the map, and zooming in and out.

4.2.3 Home Page with EU Credentials

The home page must display clearly:

- The name of the platform Insight,
- The name and logo of the project Fish-X,
- A short welcome text explaining the objectives of the project (to be provided),
- A banner displaying the logos of the project's partners,
- The EU flag and the text "Co-funded by the European Union" must be displayed in the bottom right section of the screen,

The rules applicable to the use of the EU emblem and logos are mandatory and described in the commission document:

https://commission.europa.eu/system/files/2021-05/eu-emblem-rules_en.pdf

The European Union emblem must not be modified or merged with any other graphic element or text. If other logos are displayed, the EU emblem must be at least the same size as the biggest of the other logos. The minimum flag size is 1 cm. A protection area in monochrome colour is around the flag with a width half the height of the flag.

The EU flag in Reflex Blue colour, and the text "**Co-funded by the European Union**" placed next to the flag in Arial (bold) or Calibri.

On a white background, the text is Reflex blue or black.

On a black background, the text is white and the flag has a white contour.

The exact colours composing the flag are:

- EU corporate blue C: 100 | M: 80 | Y: 0 | K: 0 | R: 0 | G: 51 | B: 153 #003399
- Yellow 100% C: 0 | M: 0 | Y: 100 | K: 0 |R: 255 | G: 204 | B: 0 #FFCC00

The European flag can be downloaded here:

https://european-union.europa.eu/principles-countries-history/symbols/european-flag_en

This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101060879.

Example of flag displayed with the consortium logos on Fish-X banners:

Figure 3 - Example of home page banner with consortium partners and EU emblem

4.3 Connection to the Platform

The Insight platform offers several authentication methods to access the interface.

Note: the following mockups are made to illustrate the functions and are not representative of the final display.

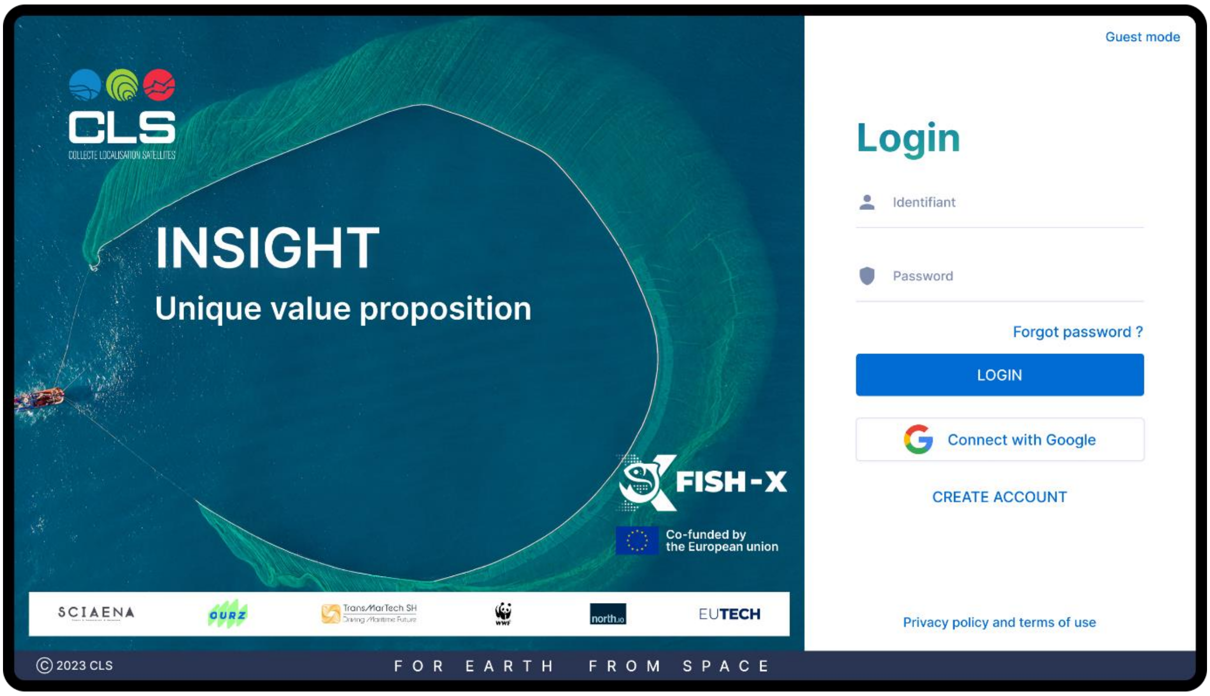

Figure 4 - Mockup Login

4.3.1 Insight Credentials

The Insight platform must have its own user's management system.

The Insight platform administrator must be able to create, update and remove user accounts.

When a user account is created, corresponding user will receive an email and must be able to set by his own password.

This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101060879.

If a user has already its own account, he can connect to the Insight platform using its credentials.

Users can also reinitiate their passwords (if forgotten for example).

4.3.2 Google Credentials

A user with a valid Google account must be able to connect to the Insight platform.

4.3.3 Guest Connection

It must be possible to connect to the Insight platform as a guest, without setting any credentials.

In that case, corresponding user will access, in read only, to the Insight platform.

Figure 5 - Mockup Guest Mode

No user preferences will be stored for such users.

4.3.4 User Preferences (V2)

Following user preferences must be stored:

- Last applied search criteria,
- Last applied filters (on the map and on the dashboard),
- Favourite indicators and KPIs.
- Last zoom level on the map (for density grids).
- Last used map layer.

4.4 Map Module

4.4.1 Map Layers

The system must provide a global cartographic layer to display georeferenced data compatible with the WGS84 datum used by GNSS receivers.

There is no need to provide a marine chart for the Insight platform needs.

For example, a layer like “OPEN STREET MAP” or “OPEN SEA MAP” can be used as the standard cartographic layer.

This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101060879.

The system must also provide an open-source bathymetric layer, that can be used instead of the standard cartographic layer if needed.

4.4.2 Bathymetry

Although obtaining a high-resolution bathymetry may be challenging, the present EMODnet European service maintained by the DG Mare gives access (with WFS) to two samples of bathymetry of interest:

- The EMODnet bathymetry World base Layer (EBWB), with 100-meter resolution around Europe and 500-meter elsewhere.

Service catalogue description:

https://emodnet.ec.europa.eu/geonetwork/srv/eng/catalog.search#/metadata/386fe2aa-84c4-4cea-9e22-fcba4d5f2e75

Service URL:

https://tiles.emodnet-bathymetry.eu/wmts/1.0.0/WMTSCapabilities.xml

- The EMODnet bathymetric contours version 2022. The following contour values are included in the set: 50|100|200|500|1000|2000|5000|7000 meters depth.

Service catalogue description:

https://emodnet.ec.europa.eu/geonetwork/srv/eng/catalog.search#/metadata/4f7ab468-f4b9-4c2c-8d3b-49a375cf9964

Service URL:

https://ows.emodnet-bathymetry.eu/wfs

This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101060879.

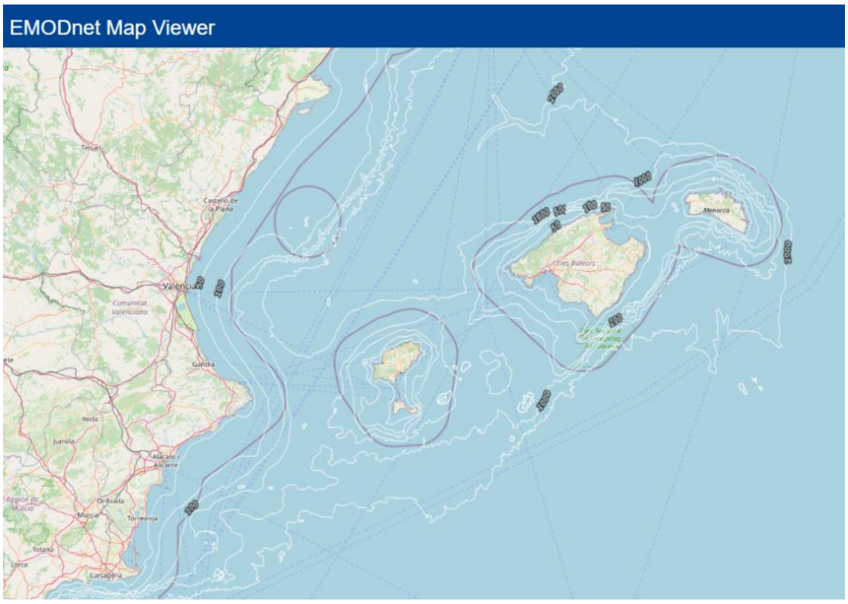

Figure 6 - Extract of EMODnet bathymetry contours over Open Street Map

4.4.3 Density Map Layer Display

The data used for the Insight platform is aggregated.

It must not be possible to display a track of one single vessel or to access declarative information about one single vessel or a single fishing activity.

To display data, the system must provide grided density maps that will gather aggregated data and display it over a cartographic layer.

(1) **VMS Presence Density Layer**

A VMS presence density map will display the number of vessels that have sent VMS positions per square.

This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101060879.

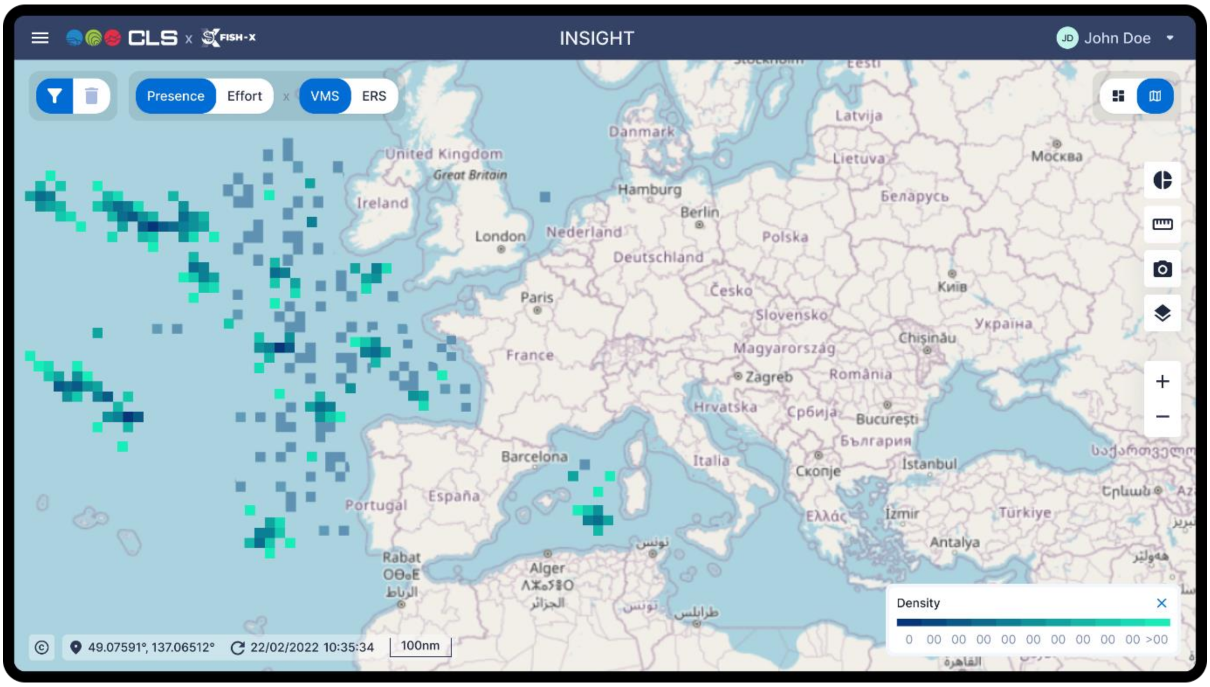

Figure 7 - Mockup VMS Presence

A vessel shall be used once for this calculation per square (even if several VMS positions were sent by that vessel).

For each defined period, the calculation of VMS data concentration per square must be performed at backend level, per level of zoom and for each geographical zone (EEZ, FAO and FRA) to avoid any impact on the fluidity of the display of data on the map.

(2) **ERS Presence Density Layer**

The ERS presence density layer will display the number of vessels that have sent ERS declarations (logbooks) per square.

This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101060879.

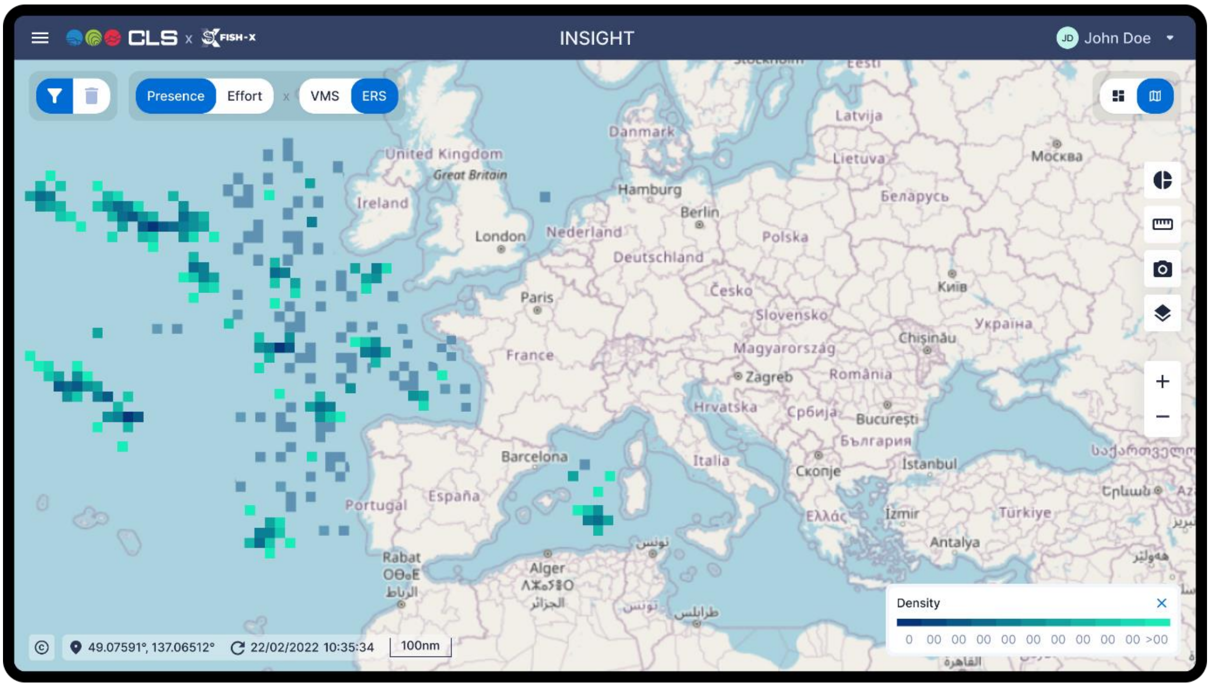

Figure 8 - Mockup ERS Presence

A vessel shall be used once for this calculation per square (even if several ERS declarations were sent by that vessel).

Only georeferenced ERS data must be used to display this density grid (for example, usually departure from port and arrival declarations don't have any GPS location. In that case, they must not be used for the calculation).

For each defined period, the calculation of ERS data concentration per square must be done at backend level, per level of zoom and for each geographical zone (EEZ, FAO and FRA), to avoid any impact on the fluidity of the display of data on the map.

(3) **Overlaid VMS & ERS Density Layer (V2)**

It must be possible to select both VMS and ERS density layers and display the concentration of vessels that have sent VMS and/or ERS data.

This layer will give quality indicators regarding the behaviour of vessels in term of declarations, especially in some regulated areas.

The square with VMS presence and ERS presence will be displayed in two different colours.

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For squares that contain the two types of data VMS and ERS, a mixture of the two colours will be used to easily identify this scenario (transparency will be added to ease the display in that case).

The calculation of both layers will be the same as above, but vessels that have declared VMS and ERS data in the same square must be identified only once.

(4) **Fishing Effort Density Layer**

By default, users must be able to select one of the following options:

- Total hours density layer,
- Fishing effort density layer.

If the first option is selected (total hours density layer), the corresponding layer will display the total number of hours spent by vessels per square.

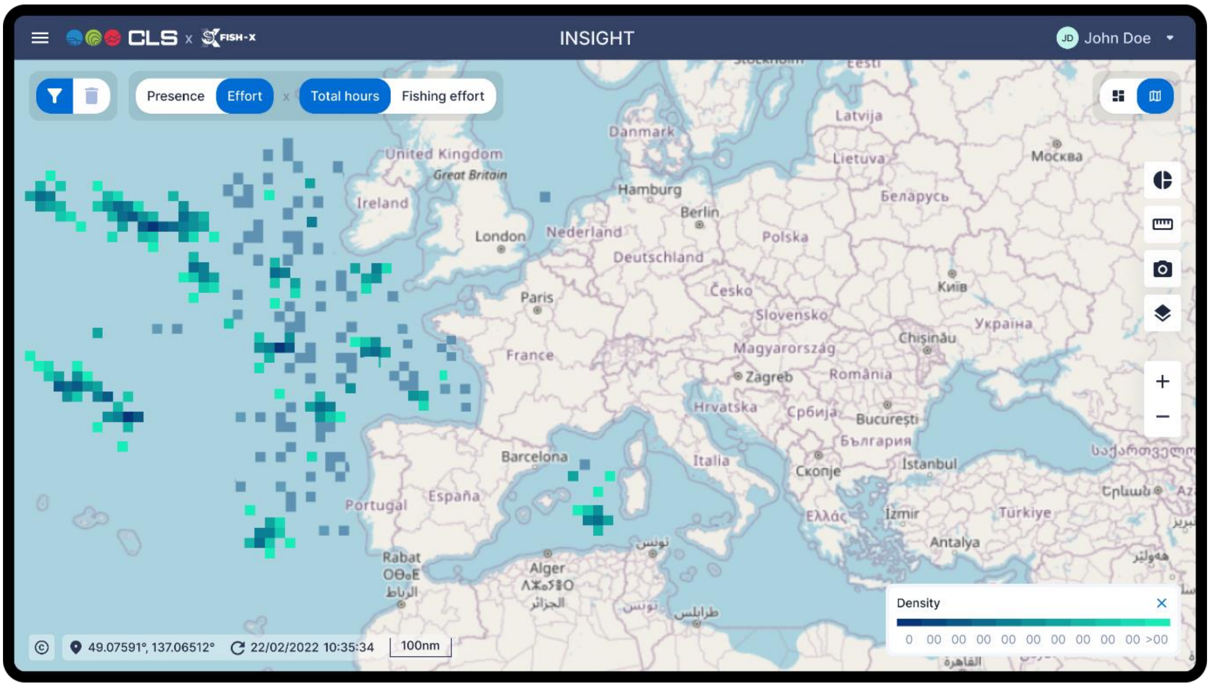

Figure 9 - Mockup Total Hours per square

If the second option is selected (fishing effort density layer), the corresponding layer will display the fishing effort by vessels per square, calculated using AI algorithms that will be available with the version 2 of the platform.

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According to the FAO: “Fishing effort is generally defined in terms of the time spent searching for fish (search duration) and/or the amount of fishing gear of a specific type used on the fishing grounds over a given unit of time e.g. a fishing operation, fishing activity, day or fishing trip. The measure of effort (unit of fishing effort) depends on the fishery and type of gear used”.[2] The units of fishing effort may vary with the fishing gear used.

The AI algorithms will be tuned to produce a fishing effort for some types of the fishing gears, among the most frequently used by the selected SSF fishers taking part in the demonstrations.

For this reason, the user must select a fishing type after selecting the Fishing Effort option.

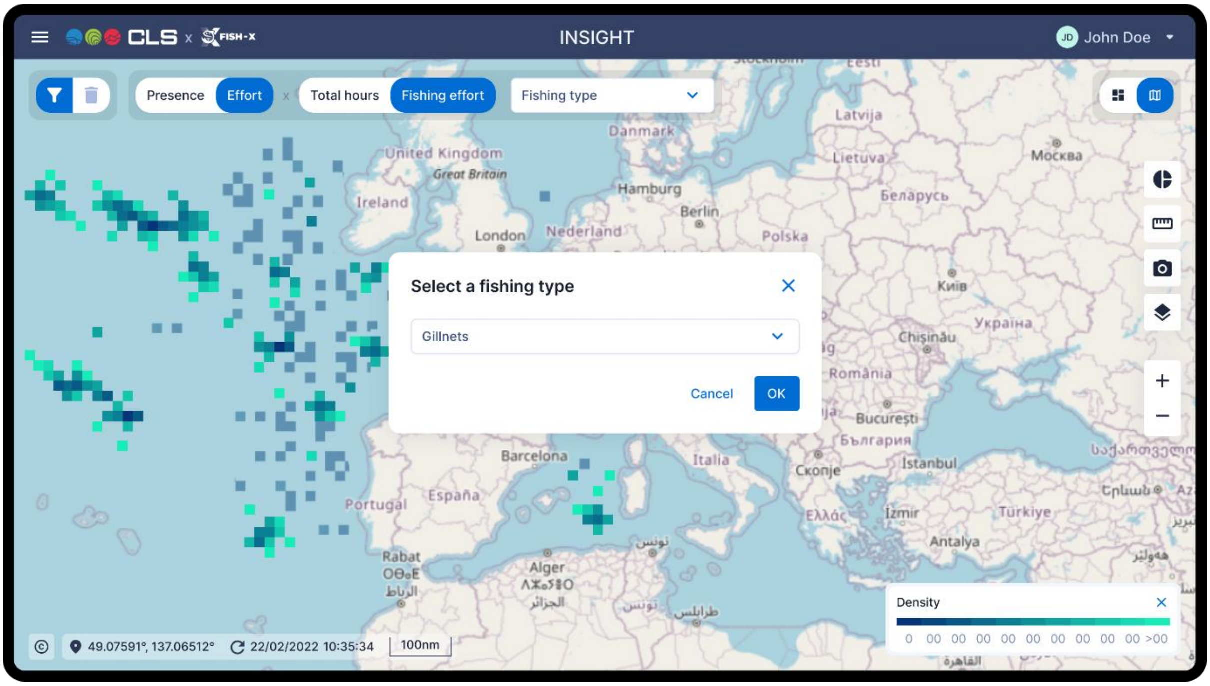

Figure 10 - Mockup Fishing Effort per fishing type (V2)

To calculate the total number of hours spent by grid cell, a dedicated algorithm will be applied:

---

[2] See complete definition by the FAO Coordinating Working Party on Fishery Statistics (CWP): https://www.fao.org/cwp-on-fishery-statistics/handbook/capture-fisheries-statistics/fishing-effort/en/
with the table of standard measures of effort per fishing gear category.

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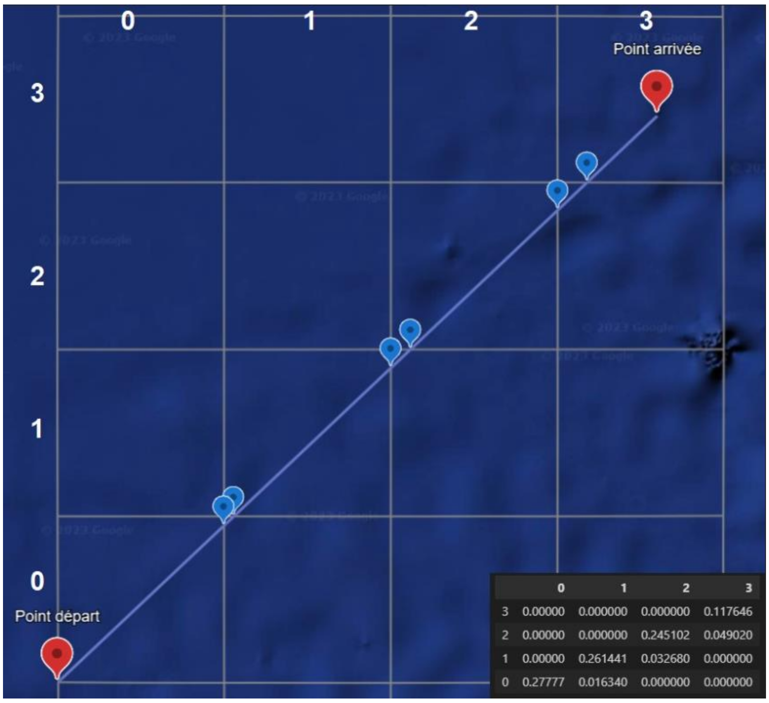
- It cumulates the times between consecutive VMS or ERS positions located inside the statistical square.
- For two consecutive VMS or ERS positions crossing the statistical square limit, it calculates the portion of the time interval in each square. If several squares are crossed between the two consecutive positions, a portion of time is calculated for each square, using a linear interpolation assuming that the vessel speed is fixed between two VMS positions. This latter case is illustrated with two consecutive positions (red dots) in different statistic squares, the algorithm processes the times intervals in each square (transit time from blue dot to blue dot):



	0	1	2	3
3	0.00000	0.000000	0.000000	0.117646
2	0.00000	0.000000	0.245102	0.049020
1	0.00000	0.261441	0.032680	0.000000
0	0.27777	0.016340	0.000000	0.000000

Figure 11 - Calculation of entry/exit times for each square for time spent in zone

(5) **Density Layer Configuration**

The Insight platform must provide following predefined periods:

- Per year (calendar),
- Per month (calendar),
- Per day (using a delay parameter).

The display of real time data is not requested for the time being.

This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101060879.

The system shall provide a “delay” parameter that must be set at configuration level. By default, this delay must be set to “2 days”. In that case, for each day, the system shall calculate a density layer for the **CURRENT DAY – 2 days**.

It shall also be possible to use a “time range” (searching between two dates) and display a density layer over corresponding days (***available for the V2 of the platform***).

4.4.4 Search Criteria and Filters

The following search criteria must be available when using the Cartographic map module:

- Period:
    - Day,
    - Month (calendar),
    - Year.
- Fishing type (longline, purse seine, etc.),
- Geographical area.

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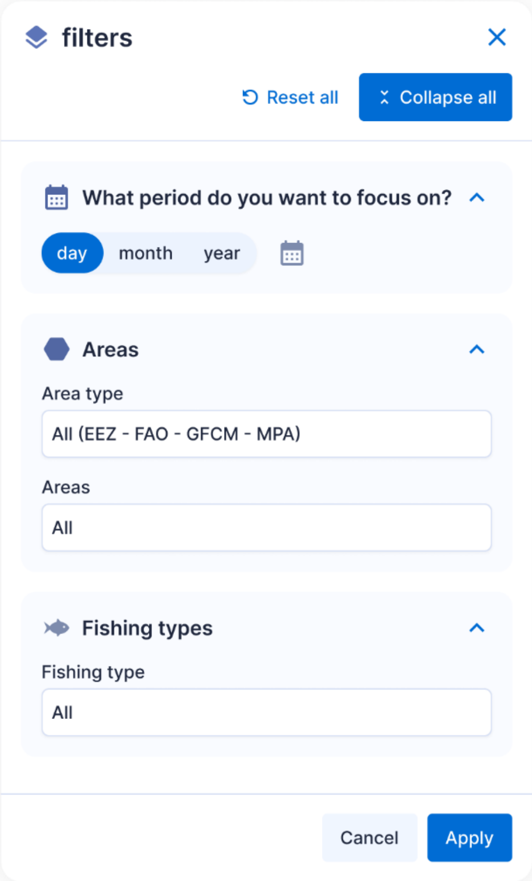

Figure 12 - Mockup Map Filters

4.4.5 Time Slider Functionality (V2)

The system shall propose a Time Slider that will serve a time range definition tool.

On hover, user shall be informed of value under mouse cursor (aggregated data information, no information about a single vessel). A legend shall remind the user of the plotted data.

The axis shall be properly named and graduated indicating value ranges.

A text-based input (or a date picker) solution shall also be provided.

4.4.6 Data Summary

The system shall provide a data summary panel which details data nested inside a complex data element (square from a density layer) on the map.

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A Data summary always relates to a Data Ensemble, all indicators below relate to associated data contained in the Data Ensemble over a selected time range.

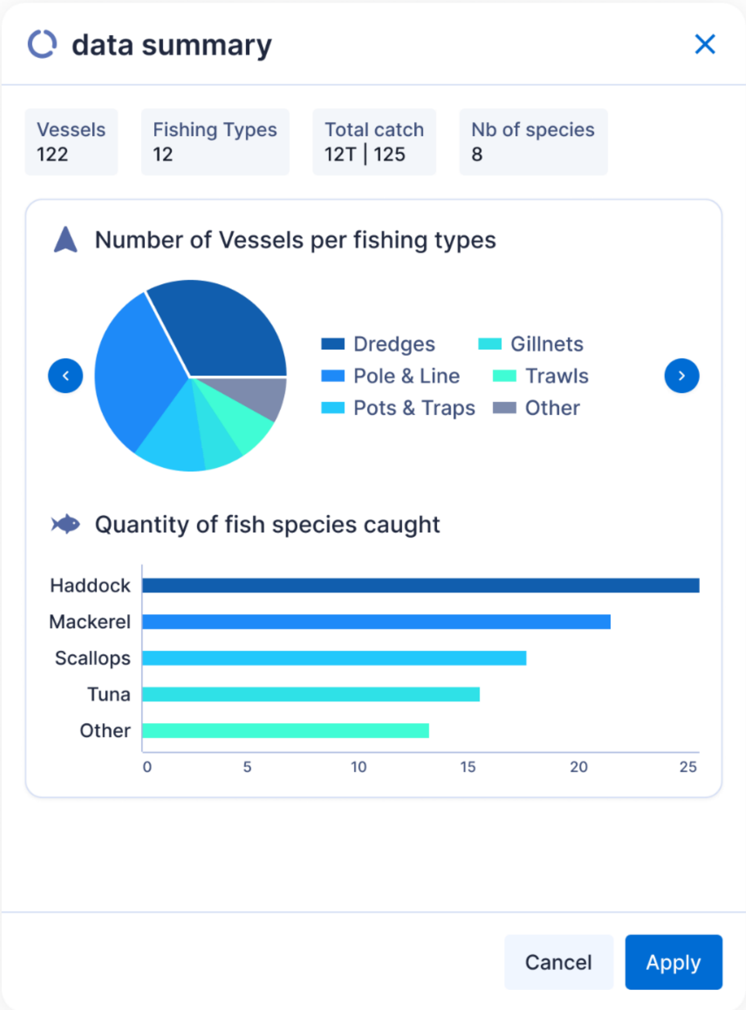

Figure 13 - Mockup Data Summary

(1) Quantitative Indicators

By default, Data Summary panel shall include a number of elements per categories:

- Number of vessels,
- Number of fishing types,
- The total weight (and number of, if applicable) of fish caught.

This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101060879.

- Number of species.

(2) **Graphical Chart Indicators**

By default, Data Summary panel shall include following charts:

- Number of Vessels per Vessel type as a donut chart,
- Quantity of fish species caught (and its FAO code) as horizontal bars (top 10 and an additional bar for other species).

4.4.7 Map Tools

(1) **Zoom in and out**

Map interfaces shall allow users to navigate by zooming either using mouse wheel or with on-screen controls.

(2) **Screenshots**

On any Map View, the System shall allow to capture a screenshot of the current view.

The screenshot shall only contain relevant information and not System-related information or controls.

Output formats shall be PNG or JPG. Screenshots shall embed the capture date and time.

(3) **Distance Measurement**

The system must provide a tool capable of measuring a distance between two points on the map.

The distance must be calculated automatically in nautical miles and must be displayed on the line joining both points.

After plotting a line, user must be able to remove this selection or plot another line.

4.4.8 Management of Geographical Areas

The system must provide several geographical areas layers.

These layers cannot be modified using the interface.

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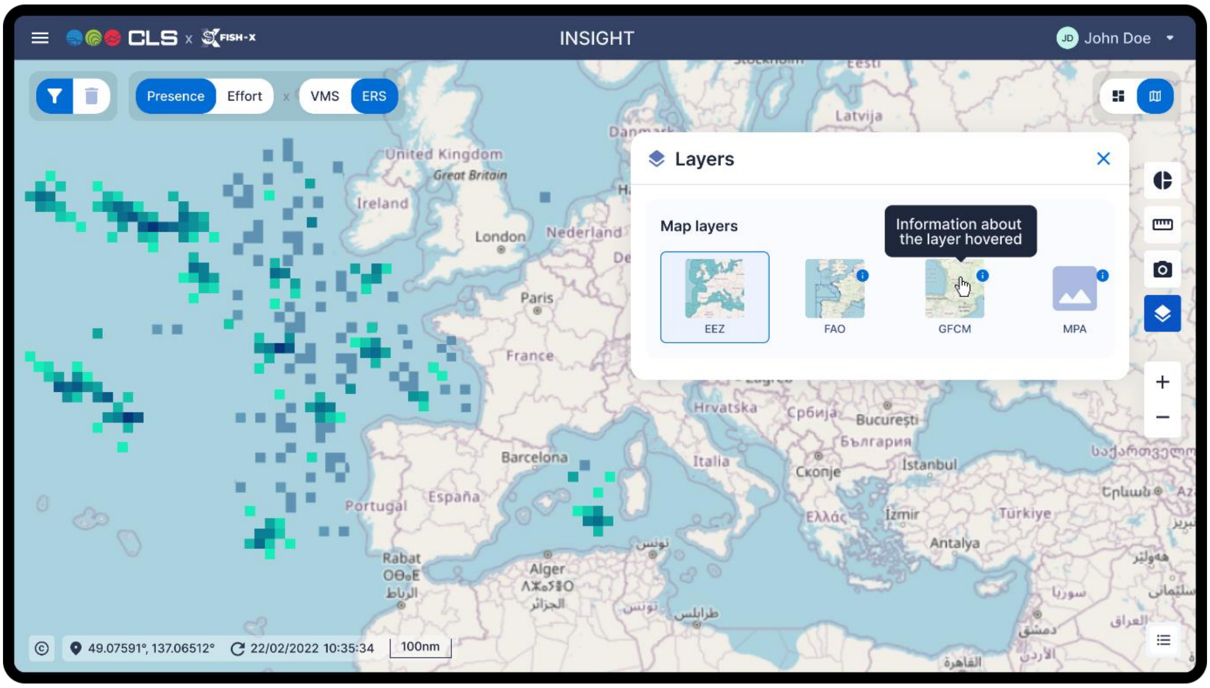

Figure 14 - Mockup Geographical Layers

(1) **EEZ Layer**

An EEZ (Exclusive Economic Zone) is an area beyond and adjacent to the territorial sea, extending seaward to a distance of no more than 200 Nautical miles.

The EEZ layer must display all EEZ boundary data.

This layer must be interactive. User can select one EEZ area and use it as a filter to only display data over that area (multiple selection of areas must be possible).

(2) **FAO Zone Layer**

The FAO layer is composed of several area levels that help to organize and categorize fisheries data.

It must be possible to display the right area level:

- FAO (18, 27, 37, etc.),
- Sub-FAO (37.1, 37.2, etc.).

This layer must be interactive. User can select one FAO or sub-FAO area and use it as a filter to only display data over that area (multiple selection of areas must be possible).

This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101060879.

(3) **GFCM Zone Layer (V2)**

The GFCM area corresponds to the FAO area 37. The Fisheries Restricted Areas (FRA) defined by the GFCM will be represented (polygons in the Mediterranean in which specific management of fisheries apply). See FRA description here:

https://www.fao.org/gfcm/data/maps/fras/en/

See the exact denomination and geographical coordinates of the GFCM sub-areas in the annex 1 of COM(2021) 434 final – ANNEXES, the EU regulation on provisions for fishing in the GFCM Agreement area.[3]

Some FRAs are simple rectangles. Another FRA limits the whole portion of the Mediterranean and Black Sea with a water depth beyond 1000 meters where trawling is prohibited.

This layer must be interactive. User can select one FRA area and use it as a filter to only display data over that area (multiple selection of areas must be possible).

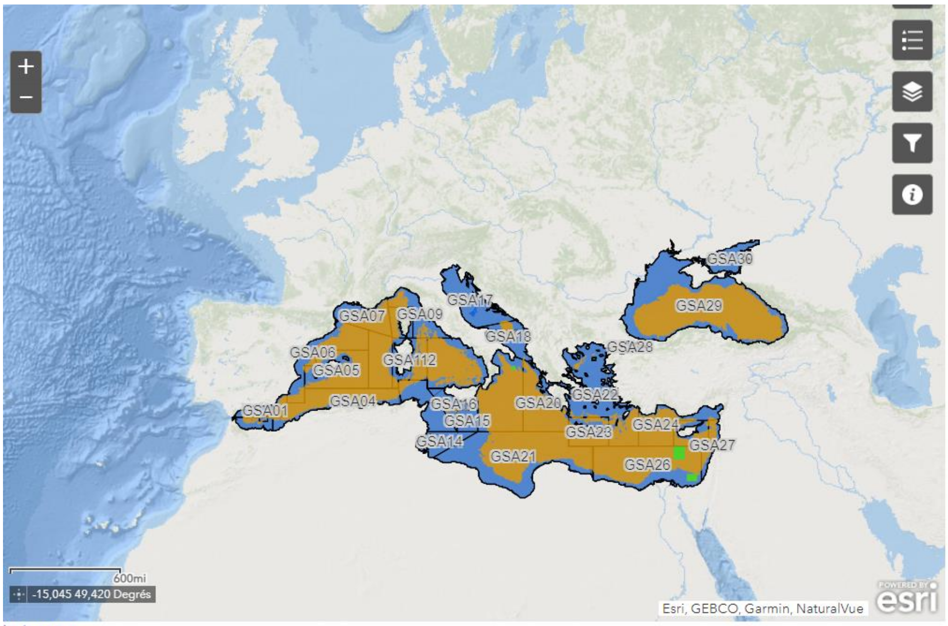

Figure 15 - GFCM Sub-Areas (black contours) and FRA (orange and green), view from GFCM portal

[3] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CONSIL:ST_11136_2021_ADD_1

This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101060879.

(4) **MPA Layers (V2)**

An MPA (Marine Protected Area) is a designated region where fishing activities are regulated or restricted to some degree.

Each country will have its own MPA layer.

For the Insight platform, we will need at least the following MPA layers:

- MPA layer for Portugal,
- MPA layer for Croatia,
- MPA layer for Greece,
- MPA layer for the Mediterranean Sea.

A reference layer can be downloaded from the EMODnet portal.

See EMODnet product catalogue:

https://emodnet.ec.europa.eu/geonetwork/srv/eng/catalog.search#/metadata/8ee2d464-c628-4e4c-8308-be48a2da121e

The data set includes the Marine Protected Areas implemented by the EU Member States and the Countries of the Mediterranean Sea.

This layer must be interactive. User can select one FRA area and use it as a filter to only display data over that area (multiple selection of areas must be possible).

4.5 Dashboard Module

The dashboard module is a set of widgets that provides a high-level overview.

Widgets may contain graphics, charts, indicators or any other element that will highlight one given information in a synthetic way.

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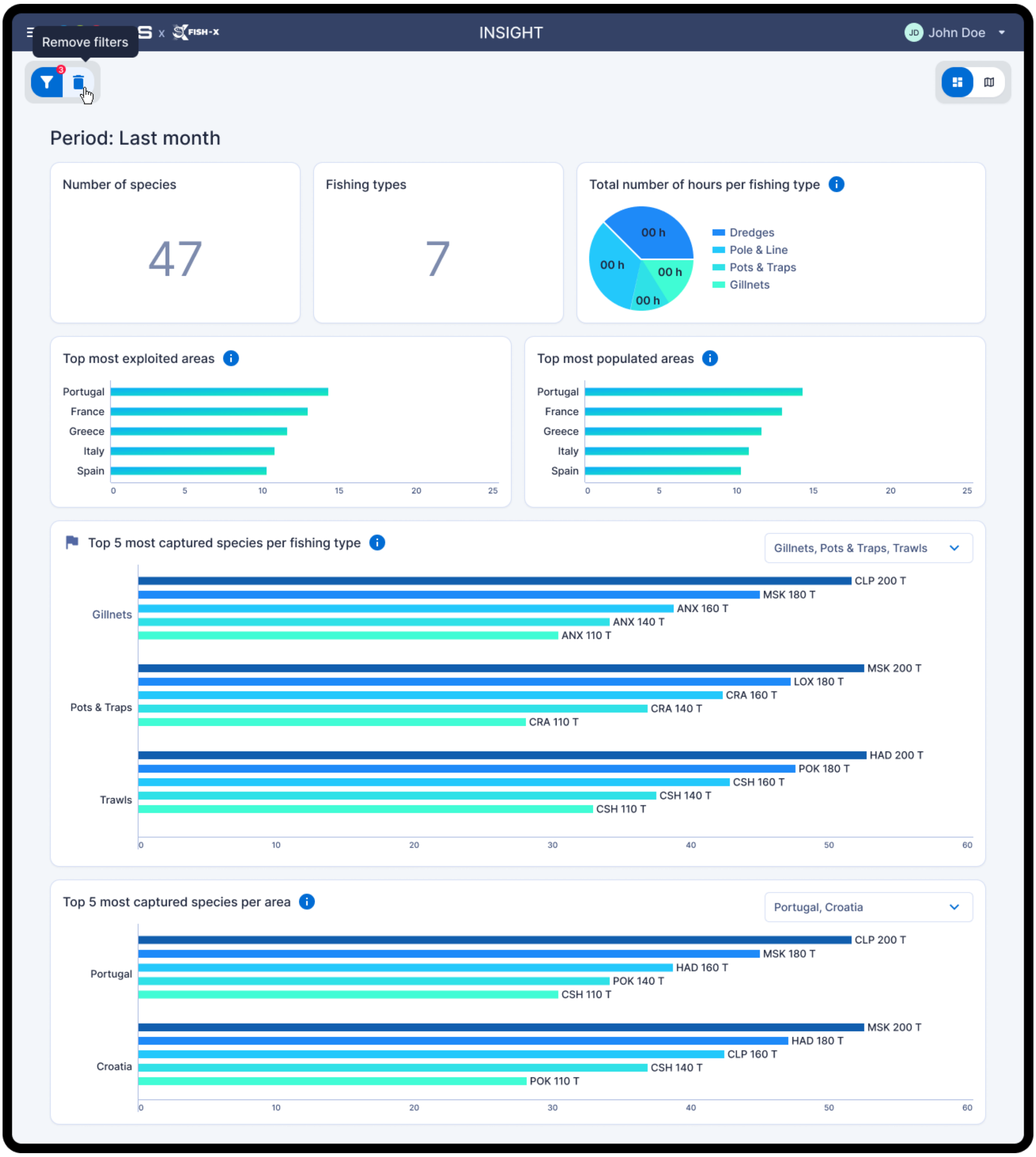

Figure 16 - Mockup Dashboard

Each registered user can customize its dashboard as follows:

- Enable/Disable widgets,
- Customize widgets (each widget can be customized differently),

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- Apply a filter on all widgets.

4.5.1 Dashboard Filters

The system shall provide following filters:

- **Period**: User must be able to apply a temporal filter (range of dates or a period). Only data from the selected period must be used.
- **Type of fishing**: user must be able to select one or several types of fishing (longline, purse seine, trolling, etc.). In that case, only data from corresponding vessels will then be used.
- **Geographical area**: user must be able to select one or several areas. Following types of areas must be used:
  - EEZ.
  - FAO.
  - GFCM (FRA).
  - MPA.

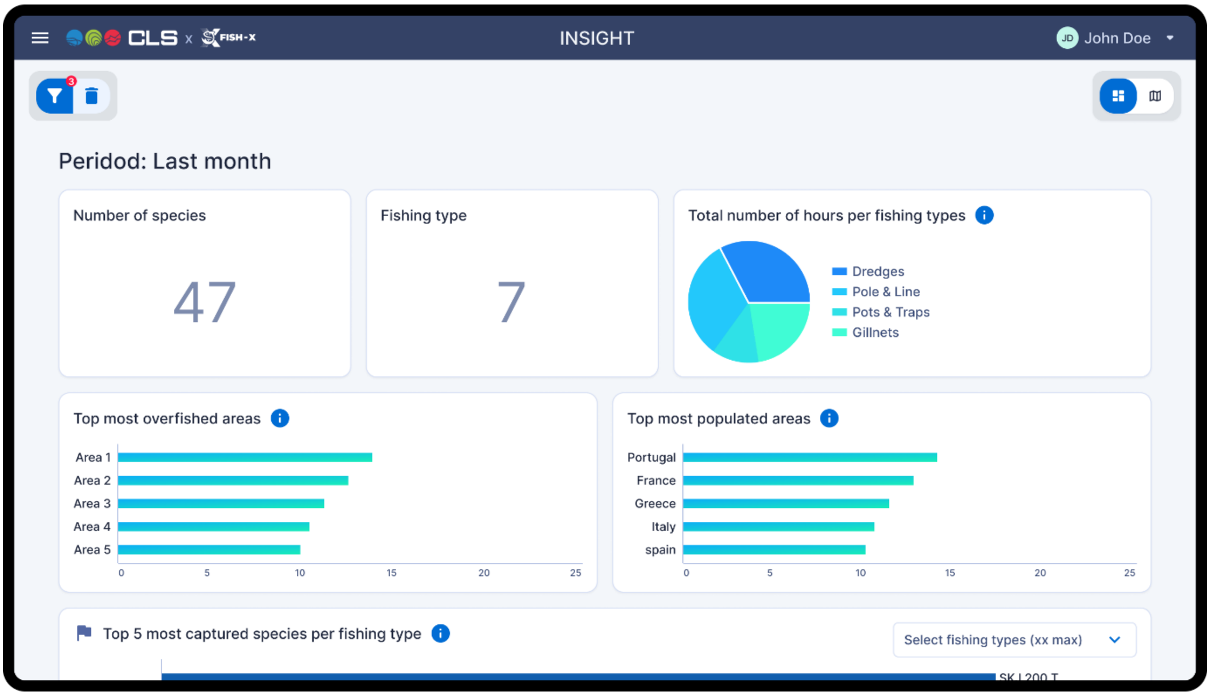

Figure 17 - Mockup Dashboard Filters

It shall not be possible to combine several types of areas. However, it must be possible to select several areas of one given type.

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It must be possible to combine these filters to obtain more accurate results.

4.5.2 Dashboard Widgets

(1) **Total Number of Hours per Fishing Type**

This widget must display the total number of hours per fishing type. We define in this document the fishing hours as the result of the analysis made by the AI algorithm implemented by CLS (see section 4.6) to extract from the fishing vessel trajectory the apparent portion of the track in fishing activity, and calculate the time spent to cover this portion.

If the fishing type filter is applied at Dashboard level, only selected fishing types must be used to populate this widget.

To display this information, a "Pie Chart" representation may be used.

(2) **Fishing Effort per Fishing Type (V2)**

This widget must display the fishing effort per fishing type.

Indeed, the fishing effort is calculated differently following its fishing type.

Dedicated machine Learning Algorithms (see section 4.6) will calculate the corresponding effort for all vessels that are actually fishing (all conditions are met to declare them as fishing vessels).

If the fishing type filter is applied at Dashboard level, only selected fishing types must be used to populate this widget.

To display this information, a "Pie Chart" representation is recommended.

(3) **Top 5 Most Populated Areas**

This widget must list the 5 most populated areas regarding one given dataflow.

This widget needs a geographical layer to work properly (EEZ by default, FAO, FRA of MPA). If a geographical area filter is already defined at Dashboard level, this choice is then made automatically.

A dataflow indicator (VMS, ERS) must be implemented to customize this widget.

If the geographical area filter is applied at Dashboard level, only selected areas must be used to populate this widget.

This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101060879.

To display this information, a “histogram” representation may be used.

On each bar, corresponding concentration of data (number of vessels) must be displayed.

(4) **Top 5 Most exploited Areas (V2)**

This widget will use results of machine learning algorithms (see section 4.6) calculating the fishing effort per area.

This widget needs a geographical layer to work properly (EEZ, FAO, FRA of MPA). If a geographical area filter is already defined at Dashboard level, this choice is then made automatically.

If the geographical area filter is applied at Dashboard level, only selected areas must be used to populate this widget.

To display this information, a “histogram” representation may be used.

On each bar, the corresponding fishing time must be displayed.

(5) **Top 5 Most Captured Species Per Area (V2)**

This widget will only work if ERS data are available.

This widget needs a geographical layer to work properly (EEZ, FAO, FRA of MPA). If a geographical area filter is already defined at Dashboard level, this choice is then made automatically.

If the geographical area filter is applied at Dashboard level, only selected areas must be used to populate this widget.

This widget must display the 5 most captured species per geographical area.

For each captured species, the corresponding quantity of catch (in tons) must be displayed.

(6) **Top 5 Most captured Species Per Fishing Type**

This widget will only work if ERS data are available.

If the fishing type filter is applied at Dashboard level, only selected fishing types must be used to populate this widget.

This widget must display the 5 most captured species per fishing type.

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For each captured species, the corresponding quantity of catch (in kilograms) must be displayed.

4.6 Machine Learning Algorithms (V2)

In version 2, we will enhance the platform by integrating artificial intelligence methods. These models will enrich our proposed density maps.

Two Machine Learning models will be employed for the automated analysis of trajectories, with the first model dedicated to **identifying the type of fishing gear in use**, followed by the second model tasked with **detecting fishing activities**. These models will finally be integrated into a pipeline whose steps are summarized in the diagram below.

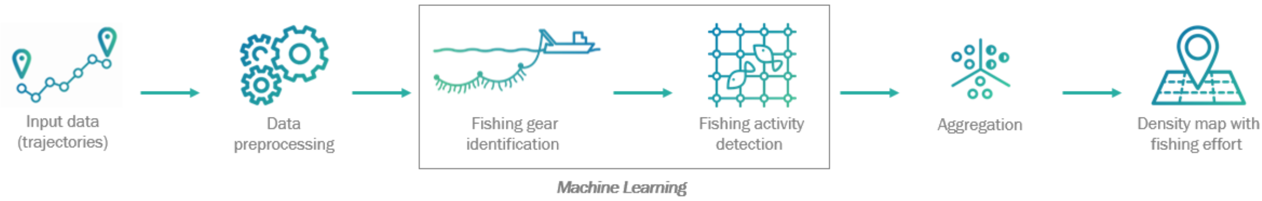

Figure 18 - Workflow for automatic detection of fishing gear and fishing activity

As with any project dealing with data, the first step is to realise the **data preprocessing**. In the context of this project, this means correcting outliers or adding features that best represent the specificities of the trajectory.

Then, the first model will **identify the fishing gear used** by the vessel from its trajectory.

Subsequent models will be used to **detect fishing activities**. It will be a point-by-point binary classification, meaning that the machine learning model will classify each position as being linked to a fishing activity or a transit, providing an associated confidence index. This information will then be used to **estimate the fishing effort**, depending on fishing type.

It should be made clear that each activity detection model is specific to a single type of fishing, which means that we need a distinct machine-learning model for each fishing method. Thus, it is necessary to determine the fishing gear used to select the appropriate model, either from the results of the gear identification model or based on reported information.

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Lastly, the application aggregates the data to produce density maps. This step involves determining the fishing effort in each cell of the density grid. The final step is to display the density maps.

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5. Use Case Definition and Implementation

5.1 Use Case: Fishers in Algarve, Portugal

In this use case, the Insight users will monitor the activities of fishers from different ports in Algarve (Alvor, Albufeira, Armação de Pêra and Ferragudo). Their NEMO VMS devices will report their vessels movement with an interval of approximately 3 minutes when leaving the port.

Most vessels are less than 9 meters in length. The typical fishing trips vary from port to port but are generally less than 8 hours long.

These fishers have multiple fishing licences and use various types of fishing techniques depending on the season. They are already used to report their activities through paper logbooks.

The algorithm for machine learning will be adapted to detect the fishing technique and compute the fishing time observed from the vessels' trajectory. Considering the large number of techniques, it is not yet guaranteed that the AI involved will be able to detect and discriminate all of them.

The various techniques are gillnet, trammel net, longline, handline, pots and traps.

The targeted species over the seasons are cuttlefish or squid (with handline), octopus (with pots and traps), sole and common pandora or seabream (with trammel net), red mullet (with gillnet), white seabream, two banded seabream and conger (with longline).

It is expected to be able to train the automatic fishing gear detection algorithm, with the support of declarations by fishers, and then let the tool detects by itself on a different dataset.

5.2 Use Case: Adriatic Sea, Croatia

In the Adriatic Use case, the Insight users will monitor the activities of different groups of fishers with a special focus on those using traps for scampi fishing - operating in the Velebit Channel, a 141-km long channel along the Croatian coastline which is specific by its unique position and rough weather conditions and, most important, ban of trawling in this FRA Area.

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The fishers participating in the use case are spread along the entire length of the channel, targeting the Norwegian lobster or nephrops using baited traps. The nephrops are found over muddy and clay sediments. Other target species are hake, scorpionfish, sea bream, john dory and red mullet.

The vessels are usually less than 7 meters in length. The fishers are already using the m-catch paper report for daily reports. By the beginning of 2024 they will all have to use electronic reporting.

In addition to the fishers in the Velebit Channel who have already been highlighted, additional fishers along the Adriatic coast are also contacted and included in the NEMO test. Other fishers are employing fishing gear other than traps, such as trammel nets, gillnets, and longlines.

It is expected that the system will be able to learn an algorithm for automatic detection of fishing gear, supported by fishers declarations, in order to determine the fishing activity they carry out.

5.3 Use Case: Greece (STARFISH)

In this Use case, we are processing data which were collected during the STARFISH 4.0 project funded by the EMFF in 2021-2022. There were about 70 SSF vessels tracked with NEMO devices as a technological demonstrator made to improve the performance of VMS devices for the specific purpose of small-scale fishing monitoring.

The STARFISH data sets will be anonymised through the process in the data space then aggregated estimating the cumulated presence (fishing or not fishing). In the version 2 the machine learning process will apply for the detection of fishing times before aggregation.

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6. User Scenarios

6.1 Scenario 1 (Mapping the Fishing Effort)

- A user connects to the Insight web interface as a GUEST.
- The Map module is displayed and shows the last month of data worldwide (OSM layer is used by default).
  - By default, only VMS data is available.
  - VMS data is displayed on a presence density Map layer.
- User starts exploring the MAP (using available map tools).
- User adds the EEZ cartographic layer to display data over all EEZ areas.
- User wants to display only data over Portugal, he selects the PRT EEZ and uses it as a filter.
  - The MAP is focused on the PRT area.
  - Only data present on PRT is displayed.
- User selects the fishing effort Map layer to have a more precise overview of the state of fishing effort in Portugal (for SSF vessels).
    - User must select one fishing type to retrieve the exact fishing effort displayed as a density grid.
- User generates a screenshot of its interface.
- User modifies the temporal search period to compare the actual fishing effort and the one from last year for the same period (month).
- User modifies the fleet selection: either the entire fleet or specifically by fishing gear;
- User selects an MPA and analyses which fleets operate in this area;
- User logged out. His preferences are not saved as he is only a guest (no Insight credentials).
    - If he connects again, the MAP will display the default values (no filters will be applied).

6.2 Scenario 2 (ERS and VMS display)

- A user connects to the Insight web interface using its credentials.
- User applies selects the ERS presence density layer on the Mediterranean Sea (using as a geographical filter the FOA zone 37).
- User disconnects and reconnects.

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- He must retrieve the same context as in his last connection (displaying the ERS presence density layer on the Mediterranean Sea).

- User wants to display VMS data as well. He added the VMS presence density layer.
- Both VMS and ERS presence density layers are displayed.
- User can see the concentration of data regarding these two dataflows.
- User adds the sub-FAO filter on the FAO geographical layer to distinguish data concentrations by sub-FAO area.
- User identifies 3 sub-FAO areas that contains some singularities (too much VMS data, no ERS data at all).
- He uses these sub-FAO areas as filters.
- The MAP focuses on these areas using the right zoom level.
- User opens the Dashboard module.
- User selects a widget to list the top 5 most concentrated "sub-FAO" areas (in term of VMS presence).
    - He finds out that the three sub-FAO that he was working on are on top of this ranking.
- User selects another widget and displays the most captured species in these 3 areas.
- User generates a screenshot of its interface.

6.3 Scenario 3 (MPA surveillance)

Background information: a new marine protected area has been created in the Algarve in an area used by most of the fishers who are part of the Portuguese use case. Part of this area will be closed to all fishing activities, and a larger part will be open to fisheries but under particular rules.

- A user, who is part of the marine protected area's management committee, connects to the Insight web interface using its credentials.
- User wants to check VMS activity in and around the MPA to ensure proper compliance of rules.
- User focuses in the area of the marine protected area, in the Algarve.
- User checks if any presence (density map) shows lack of compliance. If so, the user will contact authorities to enforce control activities and colleagues of the management committee to decide on next steps.

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6.4 Scenario 4 (Fishers Association)

- A user, who is part of a local fishing association in the Algarve, connects to the Insight web interface with its credentials. There is a new public consultation to create an offshore aquaculture (or windfarm) facility in an area the user feels it will create conflict with fishing activities.
- The Map module is displayed and shows the last month of data worldwide (OSM layer is used by default).
  - By default, only VMS data is available.
  - VMS data is displayed on a presence density Map layer.
- User starts exploring the MAP (using available map tools).
- User adds the EEZ cartographic layer to display data over all EEZ areas.
- User wants to display only data over Portugal, he selects the PRT EEZ and uses it as a filter.
  - The MAP is focused on the PRT area.
  - Only data present on PRT is displayed.
- User selects the fishing effort Map layer to have a more precise overview of the state of fishing effort in Portugal (for SSF vessels).
  - User “zooms in” in the area he is more interested in. His goal is to show and collect information of where the associates/fishers have their fishing grounds to be able to give proof, based on data, of the importance of that area to the local fishers.

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7. Appendix A – Unified VMS format (VmsExtMsg)


```
 openapi: 3.0.3
info:
  title: VmsExtMsg
  description : Definition of the data format for VMS Positions of
vessels
  version: 1.1.0

paths: {}

components:
  schemas:
    vmsExtMsg:
      type: object
      properties:
        metadata:
          type: object
          required:
            - extMsgRef
            - extMsgSendingTimestamp
            - supplier
          properties:
            extMsgRef:
              type: string
              format: "uuid"
              description: Unique ID of the message. It could be used
to help technical support, to send an acknowledgement ...
              example: 504bfabd-bfe4-46c8-bb38-32ba71820f2e
            extMsgSendingTimestamp:
              type: string
              format : date-time
              description: processing datetime of the message by the
sender.
              example: "2022-10-31T14:10:00.01Z"
            supplier:
              description : Identifying who is sending the message
              type: object
              required:
                - id
              properties:
                id:
                  type: string
                  description: this ID identify each supplier
```


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```
                  example: CLS
        emitter:
          description : The message must contain identifiication about
the transmitting device and/or of the     vessel associated with the
position.
          type: object
          properties:
            device:
              type: object
              required:
                - deviceRef
                - providerName
                - providerType
              properties:
                deviceRef:
                  type: string
                  description : Device identifier, unique for a given
providerName + providerType
                  example: 765432
                providerName:
                  type: string
                  description : Identify the company transmitting the
message from the device (examples CLS,     Vodafone, Inmarsat ...)
                  example: CLS
                providerType:
                  type: string
                  description : Identify the technology of transmission
(examples Argos, Iridium, GPRS ...)
                  example : ARGOS
                model:
                  type: string
                  description : device model
                  example : 'Marge V2'
                imei:
                  type: string
                  maxLength : 15
                  description : device's modem identifier
                  example: 123456789123456
            vessel:
              type: object
              properties:
                identifiers:
                  type: object
                  description : Identifying a vessel. At least one of
the properties must be transmetted.
                  properties:
```


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```
                    cfr:
                      type: string
                      description : ISO3 code of Flag State and 9
alphanumeric characters
                      example: FRA123456789
                    extMark:
                      type: string
                      maxLength : 14
                      example: 12345678912345
                    callSign:
                      type: string
                      maxLength : 7
                      example: PF1234
                    mmsi:
                      type: string
                      minLength : 9
                      maxLength : 9
                      description : Maritime Mobile Service Identity
                      example: 123456789
                    imo:
                      type: string
                      minLength : 7
                      maxLength : 7
                      description : International Maritime Organisation
number
                      example: 1234567
                    name:
                      type: string
                      description : vessel name
                      example: 'My Vessel'
                properties:
                  type: object
                  description : additional informations on the vessels
                  properties:
                    registrationFlag:
                      type: string
                      description : ISO Code of the flag state of the
vessel
                      maxLength : 3
                      example: FRA
        measures:
          type: array
          items:
            type: object
            required:
              - timestamp
```


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```
            properties:
              timestamp:
                type: string
                format: date-time
                example: "2022-10-31T14:10:00.001Z"
              location:
                type: object
                required:
                  - lat
                  - lon
                properties:
                  originEvent:
                    type: string
                    default : REGULAR
                    enum:
                      - REGULAR
                      - POLL
                      - ZONE_ENTRY
                      - ZONE_EXIT
                      - MANUAL
                  lat:
                    type: number
                    format: double
                    minimum : -90
                    maximum : 90
                    description: beware exception to SI rule here we
use degrees for lat/lon
                    example: 43.5
                  lon:
                    type: number
                    format: double
                    minimum: -180
                    maximum: 180
                    description: beware exception to SI rule here we
use degrees for lat/lon
                    example: 1.4
                  speed:
                    type: number
                    format: double
                    minimum: 0
                    description: in meter per second
                    example: 1
                  courseOverGround:
                    type: number
                    format: double
```


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```
                     description: in degrees, Azimuthal, angle ref =
north
                     example: 10
```


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