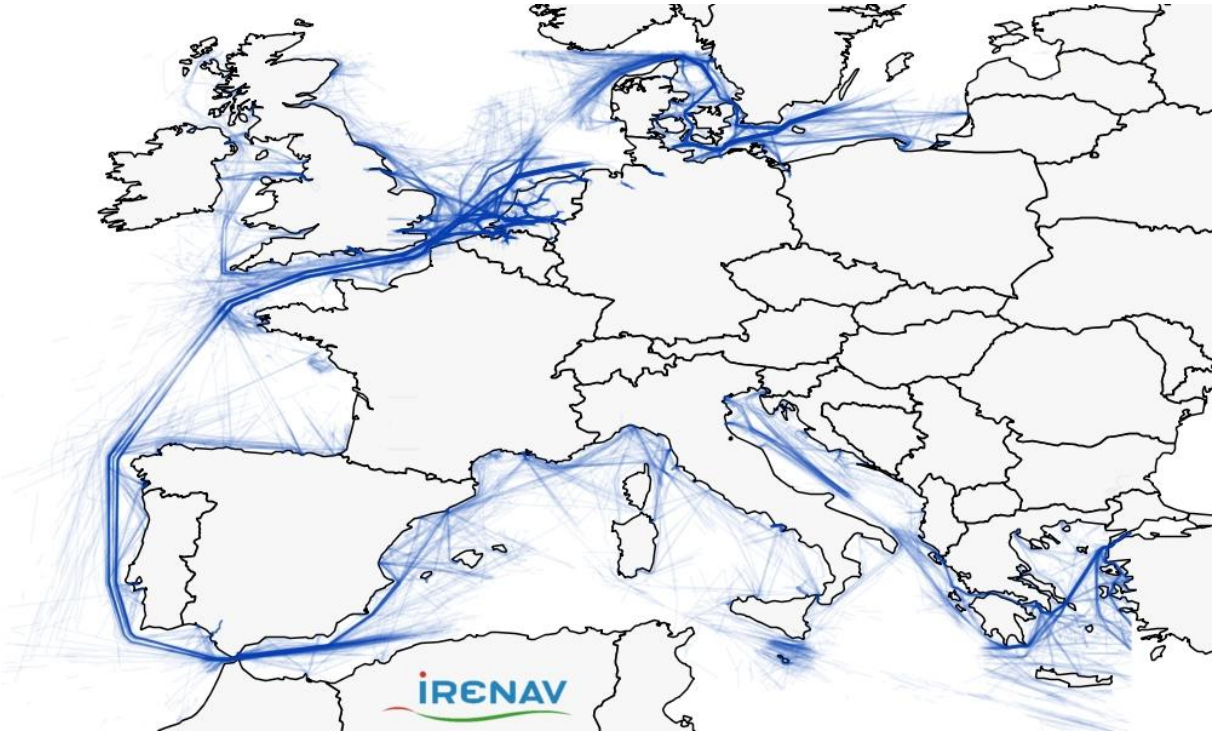
**Data challenge**

The workshop will encourage multi-disciplinary discussions and concrete outputs that demonstrate successful solutions regarding the analysis and visualisation of moving objects at sea.

Researchers without data and interested by applying existing algorithms and techniques to maritime traffic can freely use the dataset available at ChoroChronos Web site. A session will be dedicated to the analysis and visualisation of this specific dataset, other experiments oriented to marine life or any specific subject oriented to moving objects at sea are also welcome.




**About the AIS**

Automatic Identification System (AIS) has been recently implemented and made a mandatory standard on commercial and passenger ships. This system, whose objective is to identify and locate vessels at distance, automatically broadcasts location-based information through self-organised wireless communications (VHF). AIS usually integrates a transceiver system, a GPS receiver, and other navigational sensors on board, such as a gyrocompass and a rate of turn indicator. An AIS transponder runs in an autonomous and continuous mode, and regularly broadcasts a position report according to the ship's behaviour. There are two different classes of AIS that can be found on ships, search and rescue aircrafts and base stations on ground: Mandatory AIS (class A) for large vessels and low-cost AIS (class B) which has been introduced for smaller vessels. Devices from these two classes broadcast information at different time intervals (from 2 seconds to 3min), and at different ranges (typically 20-40 miles for class A and generally 5-10 miles for class B).

Transmitted AIS data comes from twenty-seven different messages each providing specific information either related to the behaviour of the AIS system or to ship's locations and characteristics. Positioning data defines point-based trajectories describing two-dimensional routes on the sea surface. That is, an ordered series of locations expressed in WGS84 format (latitude **L**, longitude **P**, time t) of a given mobile object with t indicating the timestamp of the location (**L,P**).

Among all the received data, meaningful information that can be considered in a purpose of movement discovery and understanding can be classified in the three following categories:

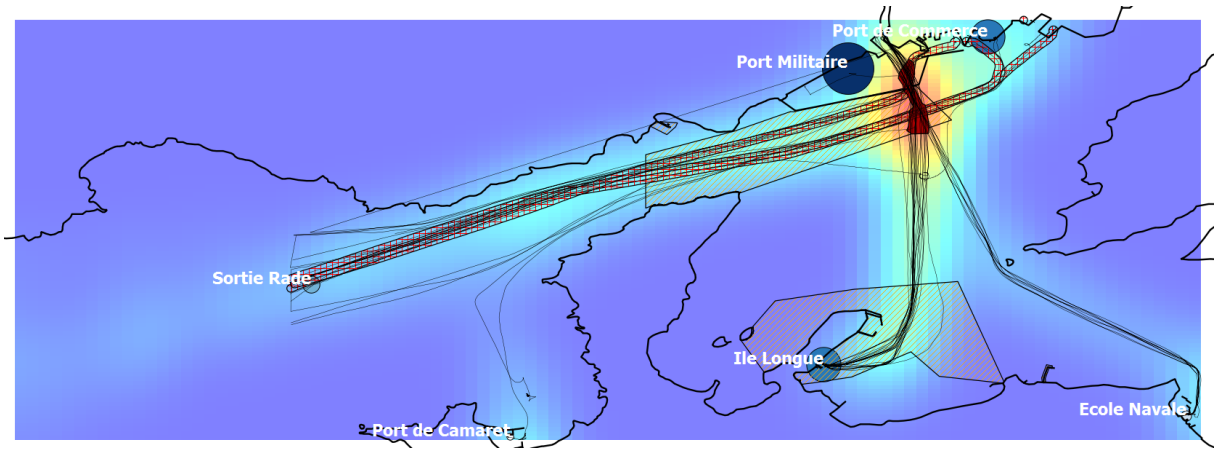
- Static: MMSI number (Maritime Mobile Service Identity: a unique ID), Name, Type, International Maritime Organization Code, Call sign, Dimension;
- Dynamic: Position (Longitude, Latitude), Time, Speed, Heading, Course over ground (COG), Rate of turn (ROT), Navigational status;
- Route-based: Destination, Estimated time of arrival (ETA), Draught, Dangerousness.

**About the available dataset**

The dataset contains 1,048,576 positions reports during all the year 2009 in Brest area. Data from January and September are not available. This set is a csv file which contains the following fields:

- MMSI_Number (the unique ID)
- Time (reception time of the AIS frame)
- Longitude and Latitude (WGS84)
- Heading (-1 or 511 means undefined)
- Speed (-1 means undefined)
- Course over Ground (COG, 511 means undefined)
- Rate of Turn (ROT, -128 means undefined)
- shipCode (report to AIS specification or to the following Java code to compute exact type from shipcode)

The dataset belongs to a protected bay with a main port area (Brest) which comprises military, commercial and pleasance zones. In the south there's a strong restricted area (submarine base; Ile longue) and naval academy. A small port (Camaret) is in front of the Atlantic ocean and main exit/entrance path to the bay.




OSM shapefile (especially coastline) of Brittany is available here.

**Some questions to consider as the data challenge but not limited to**

- Extracting the main traffic flows (overall traffic vs. type-based)
- Clusters of different behaviours
- O/D matrices
- Dangerous time and areas
- Abnormal behaviours (eg. find typical routes vs. outliers, high speed, sharp changes in ship's direction, drifting ships …)
- Waiting areas

- Temporal distribution of the traffic (year, month, day vs. night…)
- Prediction of future movements and destination
- Find whether (and how many times) a ship goes through specified areas (eg. restricted)
- Average and minimum distances from shore or between two ships
- Detect specific human activities/events (fishing, military operation, sailing, tug operations …)