European Maritime Safety Agency

Appendix 1 – Use cases

Use cases (business perspective)

1. **User selects a vessel and wants to get a labelling for the inconsistency between the destination declared and detected (or predicted); potentially based on a prediction of the vessel movement/route/ETA, based on all available data sources;**
2. **User selects a vessel and a time criterion and wants to obtain a list and tracks of vessels that were following similar (trading/routing) patterns;**
3. **User selects a vessel and wants to get an information if the ships conducts unsustainable/ not viable economic activity or not;**
4. **User selects and area and wants to obtain an aggregated list of vessels with detected anomalous or specific situations focusing on potential incidents (e.g. fires on board of ships), close-quarter situations, and addressing also discrepancies ETA/Destination detected vs. declared; analysis of the draught; filtering per destination or last port of call.**

The text further below describes typical, potential, human actions that may be executed over various interfaces and databases in order to complete one of the below scenarios. Further below, each of the use cases, a potential support of the technology and the interaction with the business or expert users is described.

The manual process executed by an operator is usually lengthy and requires a good level of understanding of the data sources, their limitations as well as the maritime surveillance or monitoring technologies. A user needs to access multiple interfaces and try to structure the data or find links between the data. User may also need to interpret certain data or information as some specific values (e.g. a ‘destination’ entered manually by the ship’s crew) are error prone or not harmonized.

There are common practices in the maritime domain that only maritime experts can identify and understand. They range from the vessels’ behaviors in certain conditions (that are not described or not detectable in the EMSA´s data sets). For instance, collision avoidance maneuvers will not be visible in the EMSA´s interfaces (SEG or IMS App) due to the low frequency of the position reports available. Meanwhile, a navigator onboard of the ship or a VTS operator ashore, in his area of responsibility has a real-time situational picture, with multiple additional sensors, like weather conditions, or radar echoes and tracks.

On the other hand, a maritime surveillance operator using EMSA applications/interfaces, only sees the result of the anti-collision maneuver or may detect anomalous movement after some time, when looking on the vessel’s historical track. There are services automatizing certain interactions, like in the case of Automated Behavior Monitoring (ABM). They may support maritime surveillance in an early, automatic detection and alerting, but they rely on the near real-time data sets. Added value that EMSA may present is the global coverage and the availability of sensors. EMSA has also rich, historical data sets, and experience in integration and tailor-making of the interfaces for various communities. Additionally, there are data sets and products that may support early detection of specific situations outside SRR or EEZ of the MS.

What is expected from a technology, considering specific use cases? This is explained further below, following each use case.

1. User selects a vessel or a group of vessels belonging to specific type/ flag/ owner and wants to get labelling for the inconsistency between the destination declared and detected (or predicted); potentially based on a prediction of the vessel movement/route/ETA, and all available data sources.

Situation as it is now - What would the user need to do to get the result/ execute the scenario?

User would identify a vessel of interest and locate it in SEG (via search). User would know if the vessel is in the immediate vicinity of the port or in port, what speed it does and what is the course. From the background, nautical map user could figure-out if the vessel if following already a route to the port (there are specific channels, marked by buoys leading to ports), or Traffic Separation Schemes (fictitious lines to be followed via congested traffic areas). User could check, what the ETA and Destination information the vessel is transmitting via AIS onboard transponder. User could also check what is the SafeSeaNet (SSN) current notification information, including the expected port call.

User could also check what was the route of the selected ship over last 2 months and verify if the current movement is corresponding to a regular route, with certain sequence of the calls.

Additionally, a new service for the detected port calls could be also used to obtain the history of the port calls. They could be used to identify regular patters of the calls, or passages between specific ports. By analyzing the results, the users could check if the vessel is only trading withing one country, or a region. Consequently, it would be highly probable that the vessel will visit the same ports as during previous voyages, especially if she is employed on a regular route. External sources of information, like the companies' websites also provide information on, so called 'liner services' with regular calls at certain ports.

Approx. time spent:

- 30 min. – 1 hour, per ship

Complexity:

- Medium

Legal context:

- Dir. 2002/59/EC, as amended.

Objective(s):

- Improving quality of the SSN mandatory reporting (contribution to response to accidents);
- Verification of the obligation of the ship as regards the reporting of the destination/arrival/port call.
- Helping in monitoring of the IMO AIS performance standards requirements

Data sets used:

- Vessel positions (T-AIS, Sat-AIS)
- Vessel attributes from the ship reference databases (e.g. CSD)
- SSN Products

- Historical ABMs

How could technology help?

- Shortening the analysis,
- Saving the manual workload of the operator, who needs to execute many actions,
- Getting the right information regarding the ships from multiple databases or sources,
- Linking various data sets/ information for the selected ship(s),
- Predicting next port calls,
- Calculating certain data.

What could be the role of the expert/human?

- Pointing to the correct data sources,
- Evaluating results,
- Flagging common practices or behaviors of ships,
- Confirming what is normal or not,
- Serving as a source of expertise in the maritime domain.

2. User selects a vessel and a time criterion and wants to obtain a list and tracks of vessels that were following similar trading/routing/ behavioral patterns.

Situation as it is now - What would the user need to do to get the result/ execute the scenario?

A user could select a vessel of interest, e.g. a containership (ULCC) trading between Asia and Europe. This would be a reference ship. The user could then run a Vessel Track Query (VTQ) to visualize on the map the trading route of the ship, e.g. over a year period. Additional information could be found using the detected port calls Historical Automated Behavior Monitoring (ABM), where detected port calls can be queried. From the ship's metadata, user can find a type of vessel, flag, size, etc.

In the external sources, user might confirm the shipowner and verify the fleet belonging to the same company/ manager. Another approach would be to locate and filter all vessels with the same type, similar size or at the same ports/ bound for the same ports using filtering or searching functionalities. All those vessels present similar characteristics, and subsequently can be later queried separately, for their historical tracks or information on the port calls.

User could then compare visually the trading routes and see if there are similarities, e.g. similar route, ports visited, time spent in ports etc.

User could also use the existing graphical interfaces to analyze these similarities or export the results to external files (e.g. Excel, CSV) or databases and perform analysis, filtering, grouping of data and identify similarities looking on the lists of visited ports, duration of stay in ports etc.

Approx. time spent:

- 1-2 hours, per ship

Complexity:

- Medium

Legal context:

- Dir. 2002/59/EC, as amended.

Objective(s):

- Verification of the reporting of incidents and accidents at sea
- Identification of ships posing a potential hazard to shipping
- Monitoring of the compliance of ships with vessel traffic services
- Verification of the obligation of the ship as regards the reporting of the destination/arrival/port call.
- Management of the ship traffic (free berths allocations)

Data sets used:

- Vessel positions (T-AIS, Sat-AIS)
- Vessel attributes from the ship reference databases (e.g. CSD)
- Near Real-Time (NRT) ABMs

- Historical ABMs

How could technology help?

- Automatizing the analysis, querying,
- Saving the workload of the operator, who needs to execute multiple actions in various interfaces,
- Getting the right information regarding the ships from multiple databases or sources,
- Linking various data sets/ information for the selected ship(s),
- Calculating or aggregating certain data e.g. time spent in ports, travel times between ports.

What could be the role of the expert/human?

- Pointing to the correct data sources or, potential new sources of data (e.g. new port websites with arrival/departures schedules),
- Evaluating results,
- Flagging similarities,
- Serving as a source of expertise in the maritime domain.

3. User selects a vessel and wants to get an information if the ships conducts unsustainable/ not viable economic activity or not.

Situation as it is now - What would the user need to do to get the result/ execute the scenario?

User would define own criteria for the 'unsustainable activity'. For a specific ship type e.g. container feeder vessels, this would be a prolonged time spent in a single port.

User could also select a specific EU country or a port and analyze the available SSN data or detected port calls services to establish duration of stay for specific types of vessels. An expert user could exclude ports, where shipyards are located and where particular vessels could be undergoing repairs. Also, specific vessels could be excluded, or being flagged as those conducting inner port activities only.

An alternative way for establishing such activity, could be a comparison with the vessels that are conducting regular activities and, for instance, trying to establish a common 'sustainable' activity model. This could be based on a sample of 10 vessels to establish a percentage of time spent in ports and outside ports, as well as average speed and distance travelled. Once the reference/ model behavior is defined, user could check selected vessel against this, to verify if similar characteristics of the movements/ trade are followed by other ships. If not, then the vessel's activity could be considered as 'unsustainable'.

Approx. time spent:

- 1-2 hours, per ship

Complexity:

- Medium- High

Legal context:

- Dir. 2002/59/EC, as amended + EMSA Founding Regulation and TWA

Objective:

- Identification of ships posing a potential risk
- Support to CG functions
- Support to Risk Assessment
- Verification of the obligation of the ship as regards the reporting of the destination/arrival/port call.
- Management of the ship traffic (free berths allocations)

Data sets used:

- Vessel positions (T-AIS, Sat-AIS)
- Vessel attributes from the ship reference databases (e.g. CSD)
- SSN Products

- Near Real-Time (NRT) ABMs
- Historical ABMs

How could technology help?

- By providing an interface for the definition of the unsustainable activity model – e.g. per type of a ship;
- Automatizing a comparison of the selected ship against the model.

What could be the role of the expert/human?

- Defining the unsustainable or sustainable activity;
- Identifying the correct data sources;
- Validating results and updating the definition of the unsustainable or sustainable activities.

4. User selects and area and wants to obtain an aggregated list of vessels with detected anomalous or specific situations focusing on potential incidents (e.g. fires on board of ships), close-quarter situations, and addressing also discrepancies ETA/Destination detected vs. declared; analysis of the draught; filtering per destination or last port of call.

Situation as it is now - What would the user need to do to get the result/ execute the scenario?

A user would need to perform multiple area centric queries, looking on the historical tracks of the vessels (for the close-quarter situations); historical ABMs, or near-real time ABMs recorded; analyze all the reported data, during specific period of time (message 5 destination, SSN enrichment). Following that the user would need to export and clean the data, organizing it per ship type or per flag and perform analysis, groping results and indicating number of events per vessel e.g. number of events drifting; number of close-quarter situations; number of discrepancies ETA reported and SSN ETA.

An alternative solution would be to analyze position and enrichment data for the vessels involved in the accidents/incidents in the past. User could configure regular monitoring of specific areas using NRT-ABMs. These ABMs would be configured outside ports, for the movements/ behaviors similar to the accident ships (e.g. sudden change of speed or heading, drifting etc.).

Approx. time spent:

- 1 day for an area of interest

Complexity:

- High

Legal context:

- Dir. 2002/59/EC, as amended.

Objective:

- Identification of ships posing a potential hazard to shipping
- Verification of the obligation of the ship as regards the reporting of the incidents and accidents
- Verification of the obligation of the ship as regards the reporting of the destination/arrival/port call.
- Helping in monitoring of the IMO AIS/ LRIT performance standards requirements
- Monitoring of the compliance of ships with vessel traffic services

Data sets used:

- Vessel positions (T-AIS, Sat-AIS)
- Vessel attributes from the ship reference databases (e.g. CSD)
- SSN Products
- Near Real-Time (NRT) ABMs

- Historical ABMs

How could technology help?

- Automatizing the analysis, querying, data aggregation, storing;
- Finding patterns that the user was unaware off, e.g. identifying areas where ship-to-ship operations are occurring outside ports;
- Presentation of the results in a human-readable or attractive form.

What could be the role of the expert/human?

- Validating results and updating the references for the standard (normal) behaviours e.g. excluding some areas where specific patterns are normal e.g. close quarter situations in ports (due to pilot transfer or tug operations);
- Identifying the correct data sources.