SSN-VMS synergies pilot project

Evaluation report

17 September 2012

Table of contents

Executive summary

The objective of this pilot project was to investigate the synergies between SSN and VMS. The concept stemmed from the carriage requirement introduced by Directive 2009/17/EC (amendment of the Directive 2002/59/EC), which requires fishing vessels over 15 metres to be fitted with AIS. In addition, Council Regulation 1224/2009, establishing a Community control system based on the common fisheries policy, requires Member States to use the AIS data for cross-checking purposes.

Against this background, EMSA contacted Member States with the aim of developing a pilot project to investigate the interactions between the two systems, and as a result, Italy, Latvia, Malta and Spain played an active role in the operational phase (April – October 2012).

The project and the associated technical tools were effectively implemented with no additional costs or technical impact on either of the sectors in participating Member States. The project demonstrates that synergies between SSN and VMS can support the monitoring tasks carried out by FMCs in a cost effective way (i.e. more information, higher update rate and free of charge).

An important issue noted during the pilot project, was the lack of standardisation in the areas of methods of exchange, message content, type of coding, etc., making it difficult for FMCs to exchange messages and effectively communicate. In response, a tailor-made interface was developed and implemented at the central SSN level which covered all identified issues and enabled the exchange of messages despite differences in message formats and contents used by FMCs.

The overall conclusion is that the SSN/VMS pilot project was successful in meeting its objectives and the participants' expectations. The technical tools tested and implemented during the pilot project showed satisfactory performances.

The objective of this document is to summarise the main issues and results of the project. It should be reviewed and completed after the closure of the operational phase (planned on 10th October 2012) to constitute a final report.

1. Background information

1.1   INTRODUCTION

The objective of this pilot project was to investigate the synergies between SSN and VMS. The idea arose in response to the requirement introduced in Directive 2009/17/EC (amending Directive 2002/59/EC - the so-called VTMIS Directive) for fishing vessels over 15 metres to be fitted with AIS. Because of the VTMIS Directive, EU fishing vessels are monitored by both the Community's SafeSeaNet (SSN) system, for safety purposes, and the Vessel Monitoring System (VMS) for fisheries monitoring purposes.

The SSN-VMS synergies pilot project is the first attempt to bring together the fisheries and the VTMIS communities. EMSA contacted Member States with the aim of developing a pilot project to investigate the interactions between the two systems, and as a result, Italy, Latvia, Malta and Spain played an active role in the operational phase (April – October 2012). The EFCA also expressed an interest in being involved.

This document aims at providing an overall picture of the outcomes of the pilot project that have been identified so far.

1.2   LEGAL BACKGROUND

According to the EU fishing regulations[1], all EU fishing vessels above 12 metres in length must be fitted with Vessel Monitoring System (VMS) equipment (the so-called "blue box"). The VMS is a satellite-based positional tracking system which monitors the location of vessels that carry the required equipment. Fisheries Monitoring Centres (FMCs) use VMS to monitor and assess the position of fishing vessels in accordance with the relevant legal provision. FMCs track the activity of fishing vessels to fight illegal fishing activity (such as incursions into protected waters) and to assess trends in fishing activity in general.

The legislation requires that the identification, position, time, date and speed are included in data transmissions from vessels to coastal MSs, and that the frequency of the automatic VMS data transmissions is at least once every two hours, although FMCs may require the information at shorter time intervals.

European FMCs are expected to monitor:

- fishing vessels flying their own flag, regardless of jurisdiction or location;

- other EC flagged fishing vessels when they are operating in waters within the national jurisdiction of an MS, and;

- third country fishing vessels during the time that they are in the waters of an MS.

The Automatic Identification System (AIS), is a ship-to-ship based open broadcast system. The system operates in the marine VHF band under a globally recognised standard. AIS messages include ship information such as identity, position, course, speed, ship particulars

---

[1] Council Regulation (EC) 1224/2009 and Commission Implementing Regulation (EU) 404/2011.

and other voyage information. The information can be received by ships, as well as by shore-based stations managed by coastal states.

Article 9 of Directive 2002/59 EC (as amended) established coverage of the EU coastline from AIS base stations ashore. Currently, the EU has more than 700 AIS base stations, and their positions and a draft calculation of their area of coverage are shown in Figure 1.
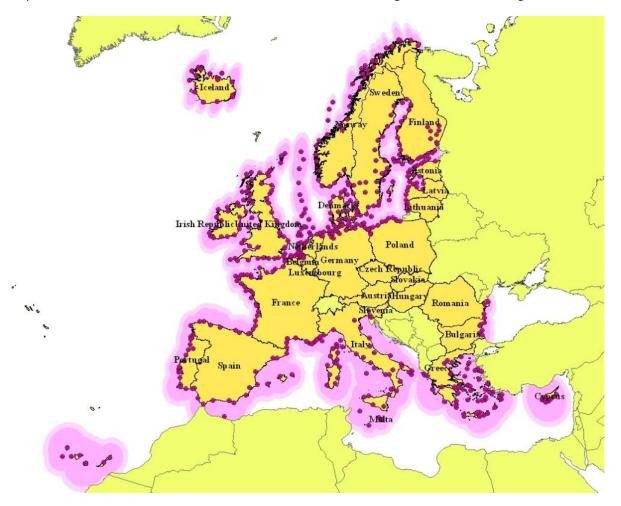
Figure 1: AIS coverage in EU waters

Article 6a of Directive 2002/59 EC (as amended) contains the obligations for fishing vessels. All fishing vessels over 15 metres in overall length should be fitted with AIS Class "A" equipment, as should other vessels within the scope of the Directive, in accordance with the following timetable[2]:

- Fishing vessels of overall length 24 metres and upwards, but less than 45 metres, not later than 31 May 2012.

- Fishing vessels of overall length 18 metres and upwards, but less than 24 metres, not later than 31 May 2013.

- Fishing vessels of overall length exceeding 15 metres, but less than 18 metres, not later than 31 May 2014.

---

[2] In addition, new built fishing vessels of overall length exceeding 15 metres are subject to the mentioned carrying requirement as from 30 November 2010.

In addition, Article 10 of Council Regulation No. 1224/2009, establishing a Community control system for ensuring compliance with the rules of the common fisheries policy, states that "Member States may use the automatic identification system data, when such data are available, for the purpose of cross-checking with other available data... For that purpose, Member States shall ensure that data from the automatic identification system for fishing vessels flying their flag are available to their national fisheries control authorities." As a direct consequence of the above legal provisions, EU fishing vessels will be monitored both by the Community's SSN system, and by the FMCs in the Member States concerned.

1.3   OPERATIONAL CONCEPT

The "SSN/VMS pilot project" aims at exploring the potential synergies which could result from the exchange of VMS and AIS data via SSN. The operational concept of the pilot project is described below:

a. VMS data from the participating FMCs is provided to the central SSN system using the NAF[3] format. Specific software has been developed to present VMS data as a separate layer of information, while using the existing GIS tools and chart display (SSN GI).

b. The AIS positions of fishing vessels are presented on the same layer, with the objective of developing an integrated traffic image (consisting of VMS and AIS data). The VMS information provided to EMSA by FMCs is only for the specific fishing vessels participating in the pilot project.

c. VMS messages are provided to FMCs every two hours, whereas AIS information would be available every 6 minutes. Therefore, FMCs would have more up-to-date information on the location of fishing vessels within AIS range. Also, SSN AIS information is provided to FMCs via SSN without additional communication costs.

d. FMCs receive AIS information from SSN for fishing vessels which carry their flag and operate within their area of responsibility. SSN converts the AIS data into a NAF format, which is similar to VMS messages, and therefore has no impact on FMC applications at Member State level. The same information is also made available to FMCs via the EMSA web interface.

The technical specifications within the pilot project are summarised below:

i. Data from VMS to SSN

To avoid changes in the existing systems installed in FMCs, the data transmitted from FMCs to SSN are provided in NAF-based position messages. Consequently, in terms of VMS system business logic, SSN is regarded as an FMC.

ii. Data from SSN to VMS

The outgoing AIS data are transformed into NAF format and provided to FMCs. To support this, the SSN application has been modified to replicate the business logic of VMS applications.

---

[3] NAF is the format used for fisheries related electronic data transmission.. The main features of the format is the fact that it can be readable both by humans and by computers, and that "vessel to shore" transmission can be done using a reduced number of "bytes" making the transmission affordable.

The data stream includes information related to the vessels participating in the pilot project, for which incoming VMS reports had been previously received by SSN. Any other AIS information relating to vessels not participating in the pilot is filtered out.

The outgoing AIS data is provided to the FMCs at the maximum refresh rate available (e.g. 6 min), in accordance with the down-sampling rate for AIS data coming from the regional or national proxy providing the AIS raw information to SSN.

iii. SSN web-based graphical interface

A web-based graphical interface is implemented in SSN to allow for the visualisation on the composite traffic image of vessels selected by participating FMCs for the pilot project.

To ensure proper access rights management (in line with the agreements of the participants in the pilot project and the applicable legal documents), new distinct roles have been created for FMCs in SSN. The main tools available in the web-based graphical interface have been made available to the FMCs.

Figure 2 outlines the operational concept of the pilot project:
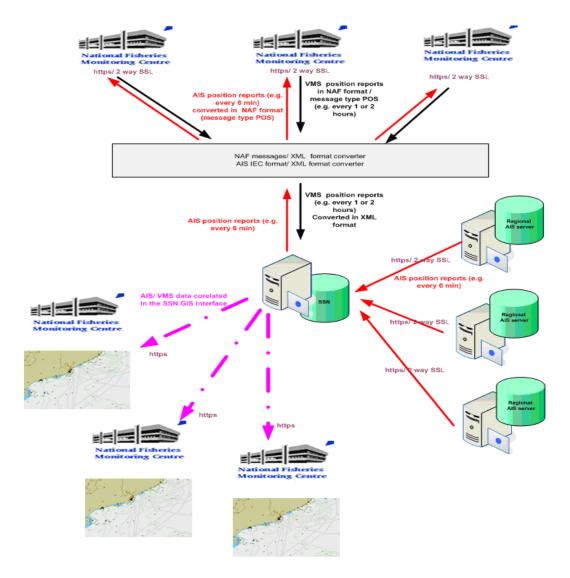

Figure 2: Operational concept

The FMCs identified a limited number of participating fishing vessels, each of which were fitted with both AIS and VMS devices and operating within the coverage of AIS coastal stations. The vessel details were uploaded into the SSN central system.

Table 1 shows the numbers of participating fishing vessels:

COUNTRY	PARTICIPATING VESSELS
Spain	4
Italy	24 (including 6 fitted with class "B" AIS)
Latvia	11
Malta	2
TOTAL	**41** (including 6 fitted with class "B" AIS)

Table 1: Participating fishing vessels

1.4   VOLUME OF EXCHANGED DATA

The graph in Figure 4 shows the quantity of data exchanged between the participating FMCs and SSN during the operational phase (until 31 August 2012):
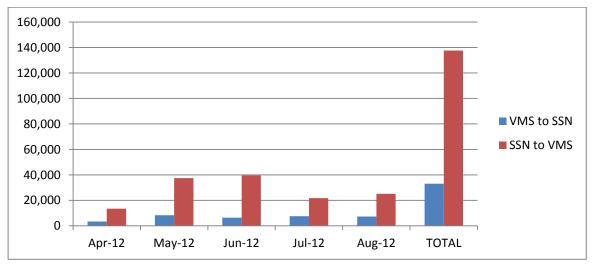

Figure 3: Quantity of data exchanged

In accordance with the operational concept of the pilot project, data are provided in two directions[4], which are: FMC to SSN for VMS position messages (in NAF format) and; SSN to FMC for AIS position messages. AIS messages are parsed at a higher rate than VMS messages (every 6 minutes in SSN against every 2 hours). By using AIS messages as an additional data source, FMCs benefit from having access to 4 to 10 times more data than is available when only using VMS.

The performance of the application will improve when it is operating in the production environment (instead of the test environment as it is now).

---

[4] In addition to the real data, the SSN-GI was made available to FMCs national systems participating in the pilot project.

1.5   PROJECT PHASES AND ACTIVITIES

This section aims at describing the project management phases. Details about the meetings and activities carried out within the pilot project are included in Annex I.

1.5.1 Preparatory phase

The activities in the first phase of the pilot project began with the participation of EMSA, three Member States (France, Italy and Spain) and EFCA experts, with the objective of agreeing the operational concept of the project. Once the operational concept and the technical specifications had been defined, Italy, Spain, Malta and Latvia agreed to participate in the operational phase and the monitoring and evaluation process.

The preparatory phase began in June 2009, and was completed in May 2010.

1.5.2 Technical implementation

The second stage included the technical implementation and testing of the IT services. The contract was signed in November 2010, and included the development of software to be installed in the SSN central application. The contract also included the development of the so-called "VMS proxy," which is centrally developed software for delivery to FMCs for deployment in their systems.

The "VMS proxy" allows for communication between the SSN central application and FMCs without them having to undertake any developments. An important part of the technical specification was the development of the web interface, which allows FMCs to access the combined AIS/VMS image via the web graphical interface.
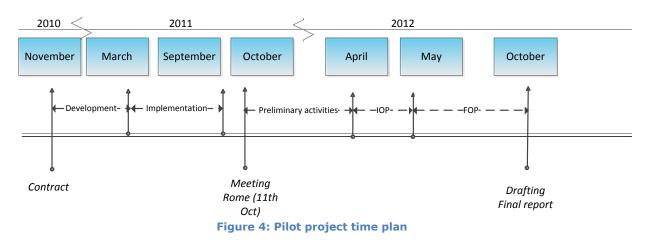
The main principle behind the technical specification was that technical developments would be required at SSN central level, but that they would have no technical impact at Member State level (either on FMCs or on national SSN applications). EMSA completed the central SSN developments in September 2011, and subsequently embarked on resolving issues at MS level, together with the participating FMCs.

1.5.3 Operational phase

This phase concerned the operational activities and data exchange between EMSA and the participating FMCs. It began on 10th April 2012, and incorporated 2 sub-phases:

   a. **Initial Operational Phase (IOP)**: Access credentials and a tutorial on the use of the SSN GI were provided to the participant FMCs, and the EMSA-FMC data exchange began. During the IOP, the FMCs completed the preliminary activities necessary to run the pilot project, as agreed during the operational phase kick-off meeting in Rome on 11 October 2011).

   b. **Full Operational Phase (FOP)**: This phase began on 7 May, and is planned to end on 10th October 2012. The project assessment process was launched together with the FOP in accordance with the methodology agreed.

The time plan is shown below:

Figure 4: Pilot project time plan

1.6   PILOT PROJECT MANAGEMENT AND COSTS

The SSN/VMS pilot project was implemented for FMCs and SSN NCAs without the necessity to make any major technical changes to, and without any negative impact on the operation of, their national applications. Consequently, there were no direct cost implications.

The project required technical developments in the SSN central application of some €200,000. The hosting environment of EMSA was also used for supporting the pilot application.

EMSA was responsible for: the overall management; preparing the technical specifications; managing the preparatory and technical meetings with the participating MSs, and; providing 24/7 MSS support. These costs were supported by EMSA.

All SSN AIS and graphical interface information was provided to FMCs free of charge.

2 Project monitoring

2.1   PARTIES INVOLVED

The methodology adopted for the monitoring and evaluation of the 6 month operational phase was agreed at the meeting held in Rome on 11 October 2011. The stakeholders involved in the pilot project were:

a. EMSA for project management, technical issues and helpdesk. The EMSA MSS also provided a 24/7 service to assist FMCs in the implementation of the pilot project.

b. FMCs in participating MSs for technical and operational issues. The FMCs and EMSA analysed the information obtained, and also identified potential improvements.

c. SSN NCAs as AIS data providers, although their personal involvement was minimal.

The participants' were supportive of the pilot project and performed well in making the necessary contributions.

2.2   MONITORING METHODOLOGY

The methodology was designed bearing in mind the requirement to retrieve meaningful information on the overall project, while keeping the impact on the day-by-day activities of FMCs to a minimum. The following items were defined:

a.   The indicators used to measure the success of the project

The indicators have been grouped within the following two broad categories. The **technical indicators** relate to how the AIS messages are delivered to FMCS, their accuracy and relevance. This category also concerns the execution of the preliminary activities, and in particular, compliance with the ICT security requirements and the accessibility of the SSN-GI.

The **operational indicators** relate to how the FMCs used the information made available within the pilot project to perform their tasks, and to what extent the synergies between AIS and VMS may impact the fisheries business. Both the indicators measure the realisation of the project goals. In parallel, EMSA continuously collected technical information, both through the MSS and through the application tests.

b.   Methods of data collection

Data were collected from the FMCs via questionnaires. FMCs have been requested to provide their feedback in 3 rounds by completing 2 specific questionnaires:

• the first questionnaire focused on the execution of the preliminary activities (for return by 31st May 2012).

• the second questionnaire aimed at obtaining technical and operational feedback to cover the mid and final rounds (for return by 31st July and 8th October 2012).

2.3   EVALUATION METHODOLOGY

The project evaluation is based on the results of project monitoring, system functionalities testing, feedback received from participants and related analysis. This includes:

- evaluation of how the major project objectives were achieved, by comparing the contributions with the benefits observed (or expected to be achieved);

- assessment of the extent to which the combined AIS/VMS information has been timely, reliable and useful for the participating FMCs;

- evaluation of the overall impression of the pilot project, and of whether the outcomes met the expectations of stakeholders;

- analysis of comments/proposals received and impacts reported;

- analysis of the outcomes collected by the EMSA technical team, and;

- analysis of the added value obtained and possible further steps.

3 Constraints

The main constraints noted during the pilot project execution were:

3.1   COMMERCIAL SENSITIVITIES OF VMS POSITIONS

VMS positions are parsed and distributed in accordance with the confidentiality criteria described in Art. 113 of Council Regulation 1224/2009, while AIS radio transmissions are inherently open and non-confidential.

Disclosure related concerns were expressed during the different phases of pilot project by some FMCs, and this sometimes caused them to hesitate at participating in the SSN/VMS pilot project.

Some administrations could have wrongly seen the pilot project as an attempt to establish a data sharing platform between participating countries. Consequently, it is possible that this type of misunderstanding also resulted in the reluctance of some FMCs to join the project.

It must be recalled that all EU fishing vessels over 15m length will be fitted with AIS, and therefore their movements will be monitored in line with Directive 2002/59/EC (as amended).

3.2   AIS COVERAGE LIMITATIONS

AIS coverage is dependent upon VHF transmissions, which provide an assured range of only 30/35 nautical miles from any AIS base station. Consequently, the fishing zones outside these limits would only be covered by VMS, which is satellite-based and therefore not limited by distances from surface-based stations.

Despite of these concerns, it is well appreciated that there is very good AIS coverage covering wide sea areas, and that high proportions of fishing vessels operate within these areas. Moreover, the use of the Satellite AIS is a promising technology which offers global coverage, and is already in use by SSN in limited areas.

3.3   COORDINATION BETWEEN THE VTMIS COMMUNITY AND THE FISHERIES SECTOR

In most Member States, the transport and fisheries sectors are managed by different organisations. Some coordination issues were detected during the pilot project between authorities, probably because of their different priorities and working procedures.

On the other hand, fruitful technical cooperation between FMCs and relevant SSN NCAs was sometimes noted and appreciated.

3.4   AIS COMPLEMENTARY TO VMS DATA

The two systems are fundamentally different (both technically and functionally serving different purposes), but can be considered as complementary. Although the AIS message is much more complete than that of VMS, three elements are missing (i.e. the address of the party receiving the message, represented by the Country code; the unique ID composed of the flag state code, followed by the vessel number and; the type of message). Another important characteristic (not required in AIS standard) is the fact that VMS equipment is designed to be tamper-proof (making hardware manipulation difficult).

Therefore, the project should be seen as an opportunity for FMCs to benefit from the existing SSN infrastructure and AIS data in order to support their monitoring business.

3.5 LACK OF STANDARDISATION IN THE VMS DATA TRANSMISSION

Lack of standardisation was a critical issue affecting the design of the application at central SSN level. Issues relating to lack of standardisation were noted in the following areas:

- Encoded/Decoded Transmission: The issue was addressed and resolved during the pilot project. However, should the pilot project be expanded to other MSs, a further assessment should be carried out to determine whether it is possible for all FMCs to switch easily from an encoded to a decoded mode.
- Data quality and rejection of NAF messages: Although this issue was also addressed, it would be necessary to have a clear understanding of the correct data format, especially if the number of participating countries increases. Additional clarification on this point will be necessary.
- Https transmission method (GET/POST): EMSA amended the "VMS proxy" in order that the system could parse both the "GET" and "POST" methods at the SSN core level. As a future step, FMCs could assess the possibility of changing their applications to use the "POST" method (as recommended by international standards, increasing amounts of data would require a change to the "POST" method).

3.6 A NEW FISHERIES REGULATION (REG. 404/2011/EU)

The fisheries regulation has been amended, introducing changes to the structure of the NAF message. If the pilot project is continued, an amendment to the "VMS proxy" should be made and aligned with the new legislation.

3.7 CLASS "A" AND "B" AIS DEVICES

In line with the VTMIS Directive, the current SSN version should parse only Class "A" AIS messages. However, EMSA took note of the existing situation, and amended the pilot project system to also manage Class "B" AIS.

3.8 IT SECURITY AND DIGITAL CERTIFICATE ISSUES

Some FMCs experienced technical difficulties when installing the EMSA certificate on their servers. EMSA provided technical support and solved the problems by applying workaround solutions.

These findings can be seen in greater detail in Annex II, while Annex III analyses Member States' replies to the assessment questionnaires.

3.9 ACCESS RIGHTS AND DATA CONFIDENTIALITY

To ensure the effective management of access rights, a new distinct role was created in SSN for FMCs, taking into account the applicable legal documents and agreements between the pilot project participants. Within the VMS system business logic, SSN was regarded as another FMC. The transmission of data to FMCs using the SSN proxy solution was carried

out automatically in accordance with the established access rights. Also, changes were made to the SSN access management in order to allow for access to VMS data.

To ensure a high level of information security and data confidentiality, the system-to-system communication links were based on 2-way SSL protocols, and the associated digital certificates were issued by EMSA following the procedure applicable in SSN. Some of the feedback from the MSs and EMSA contained proposals for amendments to the method for the installation of digital certificates.

4 Results

On the basis of the feedback received, the results of the pilot project are summarised as follows:

4.1   INCREASED MONITORING CAPABILITIES

Correlation of VMS and AIS data can increase operational capabilities, and in particular, the ability to monitor fishing activities and/or violation of restricted fishing areas. By using the correlated VMS/AIS data, more specific information can be obtained.

The higher update rate of AIS through SSN (every 6 min.) gave a more precise vision of fishing vessel movements (under AIS coverage) in comparison to that given by VMS messages (every 2 hrs, or another selected time frame should a vessel be "polled" by the authorities). Therefore, high frequency AIS messages from SSN provide significant additional information between predefined VMS reporting intervals. As a result, monitoring can be done in a more precise and continuous manner, and a more accurate voyage history is made available.

For example, a slow speed (less than 3 knots) may be an indicator of fishing operations in progress, and the way a vessel is moving (the sequence of movements) can indicate the type of fishing (e.g. long lining or trawling). Long lining operations may be indicated by multiple positions (at a relatively higher speed) in one direction, as the vessel sets its lines, followed by movements in the opposite direction for retrieving the nets with the catch. Vessels which are trawling will manoeuvre within a relatively small area, with tracks intersecting themselves.

By using AIS data to analyse the position, the actual vessel patch can be monitored in a more precise way (e.g. the fishing vessel crossed a restricted area between 2 VMS reports, as shown in Figure 5).
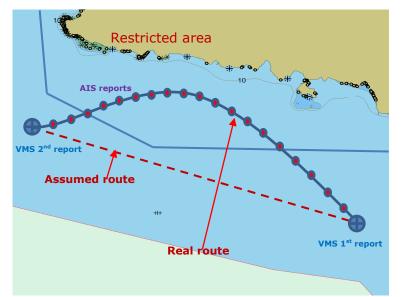

Figure 5: Comparison between real route and VMS reports

Figure 6 shows the outcome of real tests carried out with participating vessels, and shows how the combined AIS/VMS image can provide additional information to assess the history of a vessel (VMS positions are circled in red). It is worth noting that, within the selected timeframe (27 June 2012 from 00.05 UTC to 14.03 UTC), 104 positions were provided by AIS, while VMS provided only 7 positions.
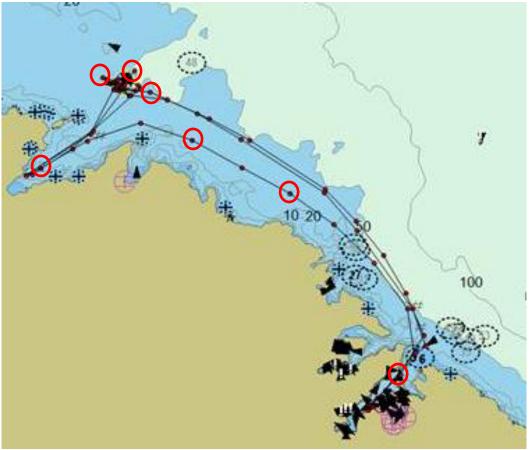

Figure 6: Combined AIS/VMS picture (27 June 2012)

4.2   CROSS-CHECKING PURPOSE

The pilot application supported the FMCs in implementing Art.10 of Regulation 1224/2009/EU, which refers to the use of AIS data for cross-checking with VMS reports.

This capability has been made possible by the provision of AIS data (converted into NAF format) from SSN to FMC systems, and by the SSN web-based graphical interface, which was adjusted to visualise either combined AIS/VMS, or just VMS.

4.3   REDUCING THE NEED FOR "POLLING COMMANDS"

According to the VMS rules, a fishing vessel can be "polled" by an FMC to determine its exact position at any given time. The option to poll the unit allows the FMC to request information on demand, including: an updated report on its position; the status of its

equipment or; a change to the reporting interval. Every polling command incurs extra polling costs, and these are usually paid by the requesting FMC.

The SSN/VMS pilot project gave the possibility of having "near-real-time" access to the positions of all fishing vessels within selected areas without having to send or pay for polling commands. By using SSN, instead of sending polling requests to ship-borne "blue boxes," all of the AIS information for selected vessels can be obtained automatically and continuously (with positions updated every 6 minutes). This capability can make the job of FMCs easier, and more cost-efficient, by supplying the AIS positioning information free of charge.

4.4   MONITORING BACK-UP SOLUTION FOR FMCS

The pilot project provided the capability to access the combined VMS/AIS traffic image created in SSN via the SSN web based graphical interface. In addition to providing much more detailed information on fishing vessel operations, this approach also ensures the provision of a monitoring back-up solution in the case of technical malfunctions of VMS systems (at least for retrieving AIS positions).

During the pilot project operational phase, several tests were carried out which demonstrated the ability of the back-up system to support business continuity, although it was noted that this only applies to AIS data within base station coverage.

4.5   PILOT PROJECT DEDICATED INTERFACE

The SSN web-based graphical interface also provides an improved interface, in that it displays the composite traffic image for the vessels selected by the participating FMCs for the pilot project. As a result, users are able to query the SSN database in order to receive the complete range of information available in SSN for fishing vessels displayed on the web-interface (SSN GI). In addition, they can access a number of different SSN functionalities, such as: the provision of the image using a high quality free of charge electronic nautical chart; the search function; the ability to zoom-in and zoom-out; plotting of past positions, passage lines and areas; reports and statistics generation, etc.).

4.6   SUPPORTING SEARCH AND RESCUE

The combination of AIS and VMS data in a single platform not only enables more effective monitoring of fishing vessel operational activities, but also provides an important support tool for search and rescue (SAR). This applies mainly within areas covered by AIS, where positions are provided every 6 minutes, but also outside, where VMS positions are typically provided every 2 hours.

To this end, a visual warning function was incorporated in the SSN pilot project web application, so that operators are alerted whenever there is a case of non-reception of either an AIS or a VMS report from a participating vessel. Should there be an incident involving a fishing vessel, the system could provide national authorities with important additional safety information for emergency management and SAR operations.

4.7   WORKING DEMO APPLICATION AND PROCEDURE FOR OPERATIONS

The project provided a specific application (i.e. the "VMS proxy") for parsing and distributing data between EMSA and the participating FMCs. In addition, a dedicated web-based graphical interface has been developed, as well as several operational procedures (e.g. the EMSA provided helpdesk service; the issuing of digital certificates and; the reporting of failures at SSN level. etc.).

Based on this, the system is now fully tested and operational and, if required, is available to be used by the FMCs which participated in the project, and any other FMCs/MSs that may wish to join in the future.

5 Conclusions

The main conclusion of the pilot project was that AIS can be very effective in supporting the monitoring of fishing vessels when combined with the VMS.

The SSN/VMS pilot project demonstrated the synergies between the maritime transport and fisheries sectors.

The synergies are clear to the fishing sector and the participating FMCs, and they can benefit without requiring any further legal or technical arrangements.

Both technically, and in terms of cost, Member State FMCs can benefit from improved monitoring by having immediate access to fishing vessel AIS data, which is not only collected by their own AIS base stations, but also by infrastructure in other Member States.

Maritime safety administrations also expressed their interest in using VMS information for search and rescue purposes, and highlighted the importance of making VMS data available to the SSN community. The project participants noted that such use of VMS data is not yet legally supported, and agreed that this issue should be considered as one of the suggestions to be included in the final report.

A specific application and a web-based graphical interface have been implemented and deployed at no additional cost to FMCs. In addition, EMSA established the required procedures for the 24/7 monitoring and helpdesk service.

The experience gained, together with the technical methods and tools developed and tested during the pilot project, can be taken, if so required, as a basis for further implementation.

ANNEX I:
List of previous activities and meetings

The pilot project activities and meetings are described below:

a. 1st Technical Working Group (Paris, 29 June 2009)

The preparatory phase began with the participation of EMSA and three Member States (France, Italy and Spain), at which time the participating FMCs presented information on the status of their national systems and defined the objective of the pilot project and its operational concept.

b. EMSA/CFCA meeting (Lisbon, 6 October 2009)

Experts from EMSA and the EFCA agreed the operational concept of the pilot project. The EFCA informed EMSA of a new fisheries Council regulation that created an obligation for MSs to check/verify fishing vessel VMS information against AIS. This gave further legal grounds for work with Member States on the exploitation of AIS for fisheries monitoring purposes.

c. 2nd Technical Working Group (Vigo, 4 December 2009)

The operational concept of the pilot project was further reviewed and agreed by the participating MSs and Agencies (EMSA and CFCA), with slight modifications. The experts from Italy, Spain and the CFCA agreed to move forward with the pilot project, but France could not confirm. EMSA and the CFCA agreed to coordinate matters of a technical nature and draft the technical specifications.

d. 3rd Technical Working Group (Madrid, 31 May 2010)

The concept paper and the technical specifications were validated by the participating MSs.

e. EMSA/MS Maritime Directors (IT, ES, FR) meeting (Lisbon, 10 March 2010)

The SSN/VMS pilot project principles and implementation phases were discussed and agreed between EMSA and the participating MS maritime directors.

f. 5th Meeting of the SSN HLSG (Brussels, 14 April 2011)

EMSA presented the background, operational concept and benefits of the pilot project and the progress made, and the Commission invited MSs to express their interest in participating in the pilot project. Italy and Spain confirmed their participation in the next phase, Malta and Latvia expressed their interest in joining and France withdrew.

g. Operational phase kick-off meeting (Rome, 11 October 2011)

Italy, Spain, Malta and Latvia agreed to begin both the operational phase and the monitoring and evaluation process. The data distribution process was further defined. The participants agreed the application to support data exchange with both AIS Class A and B.

h. Presentation of the pilot project to CFCA Admin Board (Vigo, 18 October 2011)

EMSA gave a presentation on the status of the project to the CFCA Administrative Board, as a result of which there was very positive feedback on the project.

i. Evaluation meeting on the operational phase (to be held in Lisbon on 27th October 2012)

ANNEX II:
Findings related to the development/deployment of the application

This section deals with the EMSA findings related to the development of the application and its deployment:

1. Lack of standardisation in the exchange of messages

Lack of standardisation has a critical impact on the design of the application at central SSN level, especially with a significant number of participating FMCs. Issues relating to lack of standardisation were noted in the following areas:

a. Encoded/Decoded Transmission

During the first connectivity tests, some FMCs were sending decoded NAF messages to EMSA, while others were sent encoded. The application was rejecting the encoded messages, so to overcome the problem, EMSA asked FMCs to send the messages in the original decoded format (which did not have an impact on their systems).

Should the pilot project be expanded to other MSs, a further assessment should be carried out to determine whether it is possible for all FMCs to switch easily from an encoded to a decoded mode.

b. Data quality and rejection of North Atlantic Format (NAF) messages

Taking into account the requirement in Regulation 404/2011/EC, the "VMS Proxy" rejected messages which were not compliant with the defined NAF standards in order to ensure data quality. The following two issues arose during the tests:

- VMS messages sent by FMCs without the mandatory fields "AD" (=Address of the coastal State) and "FR" (=From) were rejected.

- According to the NAF standard, the value provided in the mandatory field "CO" (=course) should be between 1 and 360. Some NAF messages provided the value "0" when a vessel's course was north, and this message was therefore rejected by the application. It also emerged that "CO"=0 is normally used to indicate a moored fishing vessel.

It is necessary to have a clear understanding of the correct data format, in particular if the number of participating countries increases. Additional clarification on this point will be necessary should the project be continued.

c. Https transmission method (GET/POST)

Within the FMC environment, data can be exchanged via HTTPS either by using an HTTP Post or an HTTP GET method of request. The difference is that, when using "GET", data is encoded into a URL, while with "POST", the data appears within the message body.

HTTP GET is suitable for "safe interaction[5]", such as simple queries, while POST is more appropriate for sharing large amounts of data (all of the data can be sent in one package).

The first release of the "VMS proxy" supported only the "POST" method, although many FMCs use the "GET" method. Changing to the "POST" method would require amendments to the FMCs' software, so to overcome the problem, EMSA amended the "VMS proxy" in order that the system could parse both the "GET" and "POST" methods at the SSN core level. A further investigation of the issue (carried out with the support of EFCA) found that no standardised method is envisaged within the fisheries legislation.

As a future step, FMCs could assess the possibility of changing their applications to use the "POST" method, while also bearing in mind that the exchange of increasing amounts of data would require a change to the "POST" method at some stage anyway.

2. Impact of Regulation 404/2011/EC repealing Regulation 2244/2003/EC

The VMS technical specifications were established in 2010 in accordance with Commission Regulation 2244/2003/EC, which lays down detailed provisions concerning satellite-based VMS. This Regulation was repealed by Implementing Regulation 404/2011/EC, which introduced changes in the structure of the NAF message as follows:

a. New definition of the field "IR" (=EU Fleet Registration Number)

The "IR" field (mandatory for EU vessels) plays a central role in the data validation process for NAF messages because it provides the unique EU Fleet Register number. In compliance with the repealed Reg. 2244/2003/EC, the "IR" field in the current application is defined as "ISO alpha 3 code + 9 numeric characters" (e.g. ITA 999999999). On the other hand, Regulation 404/2011/EC introduced a new validation rule for this field: "ISO alpha 3 code + 9 alphanumeric characters" (e.g. ITA 9999BNMHY).

The application rejected NAF messages which did not comply with the old validation rule.

b. Additional "FS" (=Flag State) mandatory field

The purpose of this field is to identify the originator whenever a NAF message is sent from a European body (e.g. the Commission) to a Regional Fisheries Management Organisation (e.g. ICCAT[6]). This issue does not impact the pilot project, because any rejection is registered by the EMSA application.

Should the project be continued, the flexibility of the message format should be retained in order to be fully aligned with the legislation as it evolves.

3. Use of Class "A" & Class "B" AIS

ITU-R Recommendation M.1371-4 describes the technical capabilities of both Class "A" and Class "B" AIS devices. Class "A" ship-borne equipment is intended for use on vessels which

---

[5] A safe interaction means that the user does not guarantee the result of the interaction (e.g. users do not commit themselves to anything by querying a resource or following a link).
[6] International Commission for the Conservation of Atlantic Tunas

must fully comply with the IMO AIS carriage requirement, while Class "B" equipment does not necessarily operate in full compliance. The differences between Class B and Class A are as follows:

- The Class B reporting rate is less than for Class A (e.g. every 30 sec. when under 14 knots, as opposed to every 10 sec. for Class A).

- Class B equipment does not transmit the vessel's IMO number, destination or ETA.

- Class B equipment does not transmit information on navigational status (e.g. under way using engine, etc.), rate of turn or maximum present static draught.

In line with the VTMIS Directive, the current SSN version should parse only Class "A" AIS messages. However, EMSA took note of the fishing vessel situation, and amended the pilot project system to also manage Class "B".

4. Use of digital certificates

The security of VMS data is important to both fishing vessel operators and fisheries management authorities, primarily because the position of fishing vessels is sensitive commercial information.

Some FMCs questioned the necessity of exchanging digital certificates with EMSA, as they had already implemented a set of IT security procedures within the fisheries community. EMSA clarified the importance of meeting the SSN-specific IT security standards when connected to this system.

Some FMCs experienced technical difficulties when installing the EMSA certificate on their servers in addition to those already installed. In some cases, the co-existence of two different types of digital certificates generated conflicts on the server.

EMSA provided technical support and solved the problems by applying workaround solutions. However, the issue should be re-addressed should the project be developed further.

5. FMC participation in the pilot project

The fishing sector deals with sensitive information which relates to the activity of fishing vessels and has a potentially high commercial impact. The pilot project is fully compliant with the business logic applied to the fisheries sector, and the data are provided to the relevant FMCs while strictly observing the logic associated with the current legislation.

However, some administrations could have considered the pilot project as an attempt to establish a data sharing platform between participating countries. Consequently, it is possible that this kind of misunderstanding has resulted in the reluctance of some FMCs to join the project.

6. ICT cooperation

Depending on their organisational structures, FMCs have different ICT support resources available. Nevertheless, these resources made a remarkable contribution to the completion

of the preliminary activities, and EMSA provided effective technical support helpdesk services to the FMCs.

The pilot project also promoted cooperation between FMCs and relevant SSN NCAs (especially in the case of Latvia and Italy).

7. Visualisation techniques

The pilot project contributed to improving the ability of FMCs to monitor fishing vessels. The navigation characteristics of the fishing vessels are very different from those of most other commercial vessels. The provision of SSN AIS to FMCS with a higher update rate resulted in the monitoring of fishing vessel movements by FMCs being much more accurate.
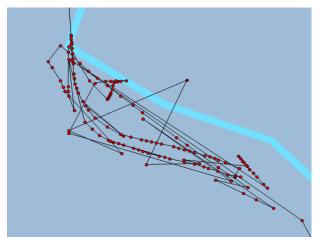

Figure 8: Typical track of a vessel engaged in fishing operations

Further visualisation techniques could be implemented to support the FMCs in performing their tasks.

ANNEX III:
Feedback from the FMCs

The participating FMCs provided feedback by completing two questionnaires dealing with technical and operational issues. The aim of this section is to present the findings:

OUTCOME OF THE 1ST QUESTIONNAIRE

The first questionnaire consists of 3 items and 9 questions, and addressed the preliminary activities carried out by the FMCs in accordance with the "work plan" agreed at the meeting in Rome on 11 October 2011, as well as some technical indicators.

ITEM 1: VMS proxy (FMC2SSN & SSN2FMC)

a) Were the preliminary activities (as defined in the paper "work plan") easy to perform?

The FMCs evaluated the implementation of the "work plan" as being a relatively easy task, although there were some difficulties related to the digital certificates (EMSA-FMC).

b) Were the AIS data provided at the refresh rate of 6 minutes?

The FMCs confirmed that AIS data were received on a regular basis with an update rate of 6 minutes.

c) Were any difficulties reported in installing the digital certificates issued by EMSA?

The installation of digital certificates had a serious impact on the operational phase. In one case, there was a difficulty in managing two different digital certificates in a national system, and this reduced its ability to provide data to SSN. This probably happened because of the server configuration, and EMSA ICT technicians are analysing this issue in order to propose a workaround.

ITEM 2: Web-based graphical interface

a) Was the explanatory material on the web-based graphical interface (SSN GI) functions useful and clear?

Participating FMCs recognised that the tutorial provided by EMSA enabled them to work with the basic functionalities of the SSN-GI. Only in one case was additional clarification requested (relating to the correlated AIS & VMS track).

b) Have you noted any difficulty in accessing the SSN GI?

Three of the four participating FMCs did not report any difficulties in accessing the SSN-GI. In one case, some issues were noted concerning the use of Internet Explorer as a browser, so the relevant users were given access to the GI using Google Chrome.

c) Could you confirm that the SSN GI caused no negative impacts to the existing systems?

FMCs did not report any negative impacts. Existing systems worked without any problems.

d) Could you confirm that the SSN GI web functionalities such as search, zoom-in/out, filter selection, pan, measure distance, ship identification and plotting past position were made available and worked properly?

All of the functionalities worked properly, although in one case, there were problems relating to creating filters and delays in operating tools. Each of the problems was solved.

e) Do you consider the SSN GI as a user-friendly interface?

The SSN GI was considered by FMCs as user-friendly interface. Additional functionalities and ergonomics were proposed by FMCs, such as the possibilities of: visually discriminating between AIS and VMS tracks and positions, and; retrieving additional information on targets, both when they are navigating and in port (e.g. automatic provision of the port name in the "history" tab in addition to the coordinates).

ITEM 3: Access rights and security

a) Was the VMS information provided according to the defined access rights and only to the specific fishing vessels participating in the pilot project?

FMCs agreed that the defined access rights were respected.

VMS information is sensitive, so this question is very important to the overall assessment of the pilot project.

OUTCOME OF THE 2ND QUESTIONNAIRE

The aims of this questionnaire (6 items and 18 questions) were: to allow FMCs to provide feedback on the operational use of the application and; to assess the extent to which benefits could be obtained by exploiting the synergies between AIS and VMS. FMCs provided their answers to the questionnaire by 31st July (mid-term) and by 8th October (end of the project). This section deals with the mid-round feedback:

ITEM 1: VMS proxy (FMC2SSN & SSN2FMC)

a) Do you consider the AIS data refresh rate of 6 minutes to be satisfactory?
In general, FMCs considered the AIS data refresh rate of 6 minutes to be satisfactory, although one suggested that an even higher refresh rate would be desirable in order to improve the monitoring capabilities further.

ITEM 2: Web-based graphical interface

a) Do you consider the SSN GI to be a reliable backup solution for the VMS proxy?
In general, FMCs expressed gave positive feedback and, in particular, felt that the provision of both AIS and VMS data via the SSN-GI was a significant step forward. In addition, the SSN GI gives FMCs the possibility to check whether there are any errors in the VMS. Also, should national FMS systems fail at any time, the AIS is considered to be a reliable backup solution.

ITEM 3: Incidents

a) Did any incident occur during the data streaming from/to SSN (e.g. breakdown of communication, lack of integrity of AIS data?
No incident related to the data process from/to SSN was reported.

b) If some incidents occurred during the data streaming, how long did it take to restore the normal operations? What actions have been taken?

No comment was provided to this question (no incidents).

c) What was the impact of a temporary loss of connection between the inter-connected systems, if any?

No comment was provided to this question (no incidents).

ITEM 4: Access rights and security

a) Were any security problems reported with reference to the VMS proxy and SSN GI?

No issues relating to IT security were reported, although in one case, a conflict between digital certificates was mentioned, as well issues related to the password to access the SSN-GI.

b) Has the high rate AIS stream (SSN2FMC) caused any negative impact on your national system?

There were no issues reported on this point, although in one case, it was noted that the AIS2NAF stream had not been fully integrated in a national VMS system for cross-checking purposes.

ITEM 5: Operational indicators

a) Has the interoperability between the different systems (AIS & VMS) been properly achieved?

In general, there was proper interoperability between the two systems.

b) Do you think the correlation between AIS and VMS positions improved the ability to monitor fishing vessels?

FMCs provided generally positive feedback. In one case, it was noted that the correlation between systems allows the plotting of fishing vessel positions every 6 minutes, instead of the normal 2 hours, without polling the ship-borne device. This means that a significantly improved monitoring capability is available at no extra cost. Another significant comment was that the combined use of both systems (when the vessel operates under the coverage of AIS base stations) effectively provides the "real-time" position. As a practical consequence, the coordination of inspectors and patrol assets could be carried out in a more effective way without using different applications. Another FMC noted that the monitoring capabilities would improve as the number of participating vessels increases.

c) Do you think the "SSN/VMS synergies" pilot project outcomes assist in improving the capability to monitor the fishing vessels?

All FMCs provided positive feedback, and one in particular provided this important comment: "*VMS message from vessel (A) has given a message that it is 3.5 nautical miles off the coast. In the two-hour period before the next VMS transmission the vessel can travel to local port and then, 20 minutes before the next VMS signal is due, travel to its base port. Without AIS streams you would not know what is happening in those two hours.*" As an additional remark, one FMC noted that AIS data can be used as a reliable tool for opening administrative proceedings against fishing vessels which do not comply with the relevant rules.

d) Does the high rate AIS stream provide additional useful information?

Once again, all FMCs provided positive feedback. In one case, the importance of "real time" data was stressed, as it improves the coordination between inspectors and the effectiveness of controls. For example, it would be possible to let an inspector know when a targeted fishing vessel enters port. Another FMC pointed out the benefits of retrieving more frequent positioning data, especially with respect to fishing vessels operating close to the coast.

e) Do you think the SSN-GI is a valid back-up solution in case of failure of your national system?

Some FMCs made proposals on the basis of the current implementation. Firstly, in the event of a failure in a national VMS system, SSN would not be fed with the relevant VMS data. As a consequence, only AIS data would be available via the SSN GI within the coverage of coastal stations. Secondly, ship-borne AIS devices are not yet installed as widely on fishing vessels as the "blue box." This is because Directive 2002/59/EC (as amended) has introduced a gradual installation timetable which relates to the length and age of vessels. Lastly, the SSN GI could only be considered as a valid back-up solution if additional details are provided in the geographic layers (e.g. marine protected areas or restricted fishing zones).

f) Do you think the synergies between SSN and VMS systems are useful to accomplish the provisions of the fisheries legislation (e.g. art. 10.3 Regulation 1224/2009)?

All FMCs provided positive feedback, and one provided this important comment: *"under the legal basis provided by Art. 25 of the Regulation 404/2011 and Art. 10 of Regulation 1224/2009, in the event of technical failure of the ship-borne "blue-box" where the master cannot be contacted, the competent FMC has the opportunity to manage the AIS data."*

g) As an overall assessment, do you think that the outcomes of the pilot project are positive?

All FMCs provided positive feedback, with one pointing out that the pilot project demonstrated how the combined use of both AIS and VMS is effective for effectively monitoring fishing vessels at no extra cost. Another FMC suggested that the maritime surveillance projects associated with the fisheries business (i.e. MARSUNO, Bluemassmed, SSN-VMS synergies, etc.) would be more effective if they were within a single coordinated initiative.

h) In case of future developments of the pilot project, which additional functionalities at SSN central level could be desirable?

FMCs provided valuable proposals for further assessment. These proposals mainly aimed at enhancing the capabilities of the SSN-GI in order for it to: possess kinematics capabilities (such as CPA or TCPA); distinguish AIS and VMS tracks and positions and; display static and dynamic data on vessels (e.g. name, speed, direction, position) by passing the pointer on the target. In addition, the potential benefit of having access to the server containing the AIS dataset for at least the last year at the highest frequency rate was noted.

i) Do you think SafeSeaNet can provide any added value to the VMS sector?

All FMCs gave positive answers. In particular, the added value for search and rescue purposes was noted, as FMCs would be able to provide the SAR competent authorities with

the exact position of a target. Additional benefits were also noted for plotting tugs and processing vessels within the Blue Fin Tuna campaign.

j) Which are the possible gaps between the current implementation of the pilot project and the desired service level, if any?

FMCs recalled the benefits arising from a single system which automatically incorporates VMS and AIS data. They suggested that even more effective support could be provided to the fisheries sector if the system was enriched with additional, customised functionalities (to be defined).

ITEM 6: Financial indicator

a) Could you calculate the possible cost reductions associated to the data transmission via AIS instead of satellite in case the fishing vessels operate within the coverage of coastal stations?

This question aimed at providing a raw assessment of the potential financial benefits relating to cases where fishing vessels provide position information via AIS instead of via the "blue-box" when operating within the coverage of AIS stations.

In one case, the average cost reduction was estimated at €460 per fishing vessel per year. This FMC assessed that 1,500 own-flagged fishing vessels operated within AIS station coverage, which means that the expected saving was estimated to be €690,000. In another case, the estimated savings from polling operations were €30,000. Another authority stated that, in principle, AIS transmissions could take over from VMS data for vessels operating within the coastal coverage area. However, concerns relating to confidentiality were raised, as AIS data (as transmitted from the ships) is in the public domain.