Meeting: 15th Mediterranean AIS Expert Working Group

Place and date: Italy, Venice, 27 November 2018

Agenda item: AIS data buffering

Document number: MAREΣ 15/9/1

Submitted by EMSA

Summary	This document presents the issues related to the AIS data buffering..
Action to be taken	As per paragraph 3.
Related documents	1. Technical Manual of the MAREΣ regional AIS server V.1.0 (05.04.2018). 2. SSN Interface and Functionalities Control Document (V.1.2)

1. Introduction

The aim of this paper is to illustrate the importance of AIS data buffering in the event of a technical or communications mulfunction. Information is based on the document SSN/LRIT 4.5.4 „AIS data quality report“, presented by EMSA at the SSN/LRIT workshop 4.

2. Status

Data buffering is an important functionality which allows storing the data during the time of malfunction and retransmitting the AIS data as soon as the connection resumes. However AIS buffering can only succeed if applied by all components participating in the information flow from the Member States national servers to central SSN. These components are presented in the schema below:

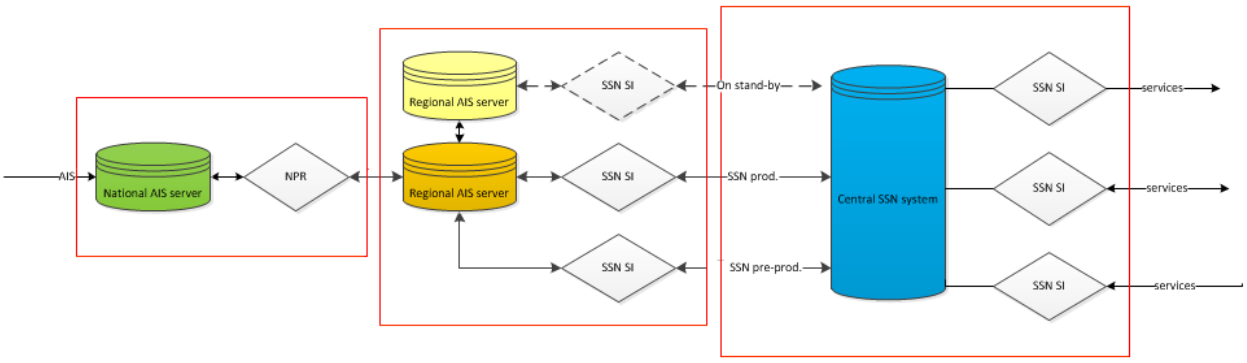


Figure 1: AIS information flow

The technical solutions implemented by EMSA and regional AIS servers ensure the data buffering at the following levels:

- SSN streaming interface (SSN SI) installed at the regional server site shall be capable of storing AIS data for up to 12 hours;

- In the event of a failure of SSN SI the regional AIS server shall buffer the received AIS messages (up to 12 hours) and then retransmit them once the connection to SSN SI has resumed. The regional AIS server shall be capable of storing the received messages for up to 2 weeks and then transmit them to the central SSN system when communications and/or systems have recovered;

- The national proxy (NPR), installed at the Member State site, begins storing the AIS information in a local data base (or the RS disk cache) when the connection with the regional AIS server is down, and begins sending the real time and the stored information when the connection is restored. The storage capacity depends on the technical solution applied. On 18 October 2018, Italy informed that the NPRs buffering capabilities were increased (i.e. to 12 hours) to the MAREΣ participating Member states.

The functionalities for buffering and retransmitting the stored information also shall be ensured by the national AIS systems. EMSA in cooperation with Norway and Italy carried out an analysis on the data buffering functionalities (e.g. when the AIS data flow was discontinued due to maintenance). In addition to that, EMSA carried out an analysis of the AIS data provision incidents spotted during June – August 2018. The methodology applied and the preliminary conclusions are presented in Annex 1.

EMSA considers it necessary to conduct systematic tests to verify if the data buffering and retransmission is performed properly by all components in the data exchange information chain (i.e. national AIS servers, NPRs, regional AIS servers and SSN SI). The tests scenarios are presented in Annex 2.

The AIS data buffering issue was presented to the SSN/LRIT workshop 4 (23 October 2018). The SSN Group agreed to conduct systematic tests to verify whether data buffering and re-transmission is being carried out properly at all stages, and to draft and included in the Common Operational Procedures document (COP) the procedure for the AIS data buffering and re-transmission by Member States.

3. Action required

Participants are invited to note the provided information.

ANNEX 1

AIS data buffering analysis

1. Introduction

The AIS data buffering is directly linked to the data quality. Considering the importance of the data buffering and retransmission, EMSA has analysed the AIS data provision incidents spotted during June–August 2018. The analysis showed that many MSs already apply buffering/retransmission at national level however the situation is not conclusive for all cases; therefore further analysis and testing would be necessary.

2. Methodology

The data retransmission capabilities were analysed using the QLIK monitoring tool, by comparing the values “Create_DT” (presents the number of messages recorded in SSN by their reception time stamp) and “Contact_DT” (presents the number of messages recorded in SSN by their creation time stamp).

During normal conditions, both sensors should show a positive value (i.e. the incoming messages are recorded by their reception time stamp and creation time stamp). In the event of a failure, the “Create_DT” value is “0”, confirming that messages are not received by the central SSN system (i.e. the message reception time stamp is not recorded). In case the data is retransmitted following the incident, the “Contact_DT” shows a possitive value for the incident period, confirming that messages were received (i.e. the message creation time stamp was recorded).

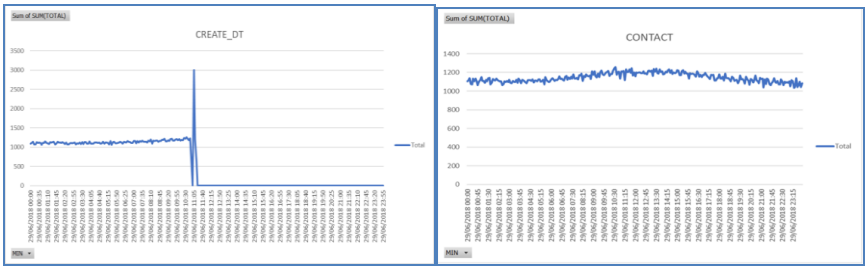


Fig. 1: Data retransmission

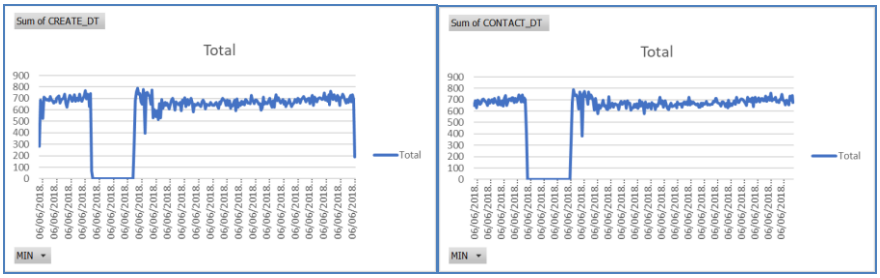


Fig 2: Data retransmission failure

The SEG application was also used to filter ships movements since the analysis of the AIS tracks visualizes if data is retransmitted, i.e. if the vessel track is complete or not.

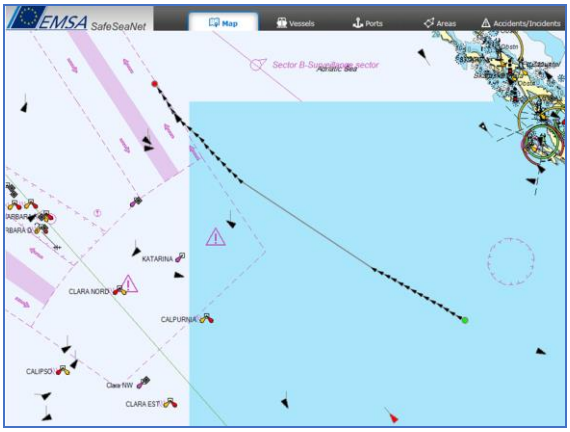


Fig 3: SEG application

3. Findings

A summary of findings per MAREΣ region is presented below:

Member State	Date	Retransmission	Comments
Croatia	23-24.06.2018	Y	The recovery period was too long. The issue shall be further monitored by both the regional server and EMSA.
Italy	27.07.2018	Y	A specific condition causing the incident was reported. An additional test should be conducted.
Malta	07-08.07.2018 11-12.07.2018 15-16.07.2018	N N N	
Portugal	03.08.2018	N	A specific condition causing the incident was reported.
Slovenia	29.01.2018 09.03.2018	Y	EMSA/RS/Slovenia exercises.

Table 1: Summary of findings

4. Preliminary conclusions

The results of analysis allowed us to conclude that:

- In 43% of cases the monitored systems were retransmitting the buffered data following the incident.
- The “random case” evaluation does not allow consideration of the individual conditions of each incident (e.g. lost connection with NPR, malfunctioning of the national server, communication problems etc.). Therefore, standardized tests shall be conducted to achieve more complete results.
- A specific procedure for the buffered/stored data resending should be agreed and specified in the Common operational procedures (COP) document.

ANNEX 2

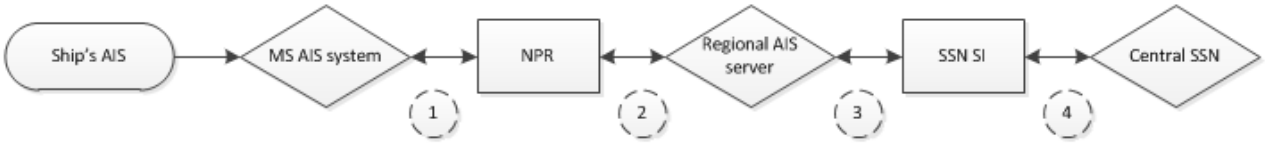
Tests proposed by EMSA

1. Objective

The objective of the proposed tests is to verify if the data buffering and retransmission is performed properly by all elements of the data exchange system (i.e. national AIS server, NPRs, RS and SSN SI).

2. Test scenarios

The main components of the AIS data information flow are presented in the schema below. The elements to be tested are marked as links No 1, 2, 3 and 4.



Test scenario 1: Data buffering by SSN SI

- The link **No 4** will be disconnected (or disabled) by the SSN admin., allowing the SSN SI to buffer the received data for a specified period.
- Following the re-connection, the participants will compare the amount of data delivered/received before and after the disconnection.
- In case of the buffering/retransmission failure, the RS administrator will provide the dataset of the testing period (through FTP).
- Participants: EMSA and RSs.
- Number of tests: 1-2 per RS.

Test scenario 2: Data buffering by the regional AIS server

- The link **No 3** will be disconnected (or disabled) by the RS admin., allowing the RS system to buffer the received data for a specified period.
- Following the re-connection, the participants will compare the amount of data delivered/received before and after the disconnection.
- In case of the buffering/retransmission failure, the RS administrator will provide the dataset of the testing period (through FTP).
- Participants: EMSA and RSs.
- Number of tests: 1-2 per the RS connection to SSN SI.

Test scenario 3: Data buffering by NPR

- The link **No 2** will be disconnected (or disabled) by the RS admin., allowing the NPR to buffer the received data for a specified period.
- Following the re-connection, the participants will compare the amount of data delivered/received before and after the disconnection.
- In case of the buffering/retransmission failure, the MS administrator will provide to the (?) RS the dataset of the testing period.
- Participants: EMSA, RS and MS.
- Number of tests: 1-2 per the NPR connection to RS.

Test scenario 4: Data buffering by national AIS server

- The link **No 1** will be disconnected (or disabled) by the MS admin., allowing the national server to buffer the received data for a specified period.

- Following the re-connection, the participants will compare the amount of data delivered/received before and after the disconnection.
- In case of the buffering/retransmission failure, the MS administrator will provide to the (?) RS/SSN the dataset of the testing period (through FTP).
- The MS technical capabilities to perform the test will be assessed prior the testing.
- Participants: EMSA, RS and MS.
- Number of tests: 1-2 per national AIS system.

3. Execution

The tests will be conducted by involving each individual Member States and regional AIS servers and will impact only the data stream connected to SSN pre-production.
The detailed test scenarios and the schedule will be provided at a later stage. The results will be presented at the next meetings.