A proposal to amend AIS performance standards and guidelines for navigation safety

Team : rAISe

Photo 1: DNV Maritime

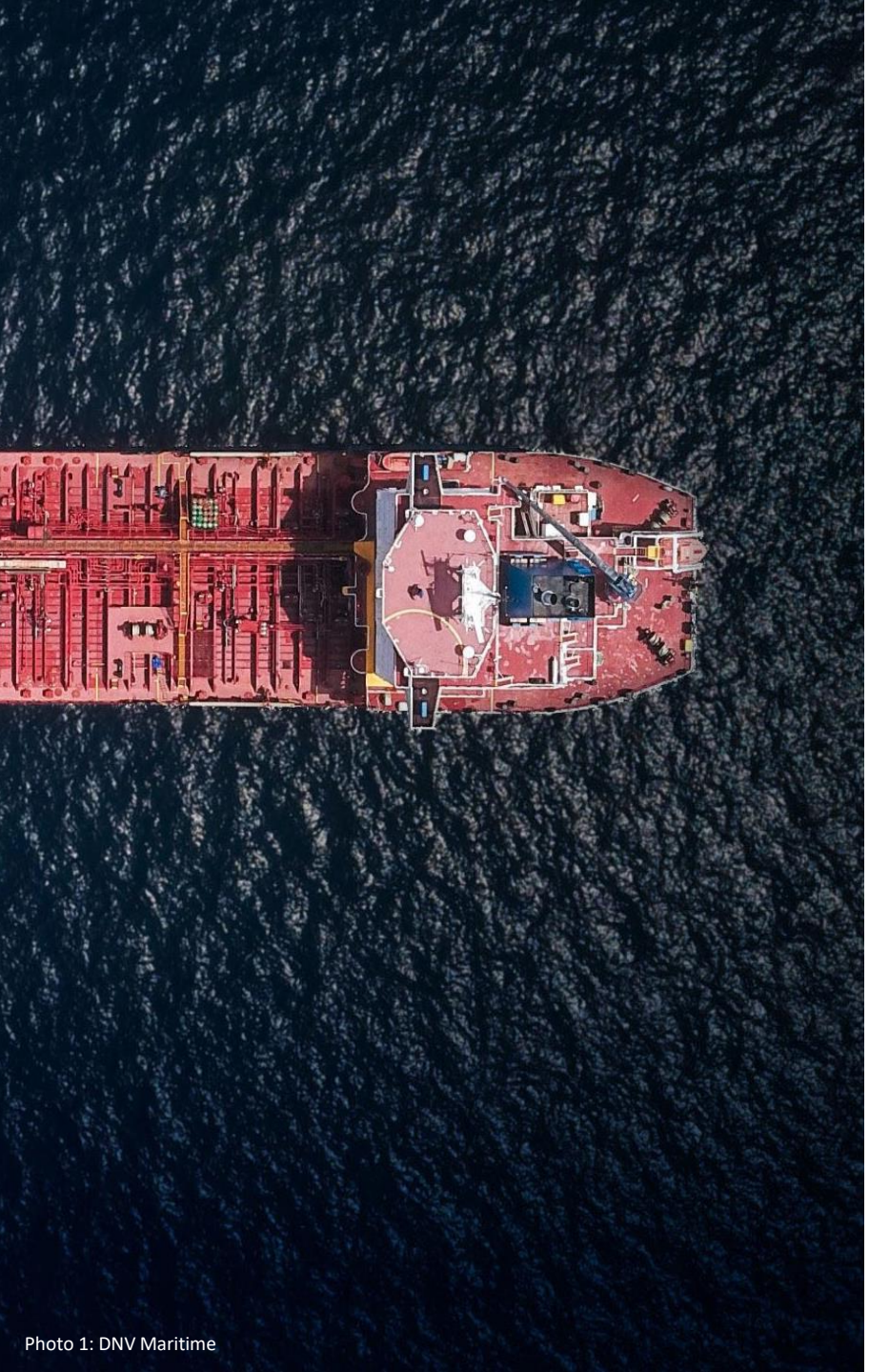


Photo 1: DNV Maritime

INDEX

PART 1

Why AIS?

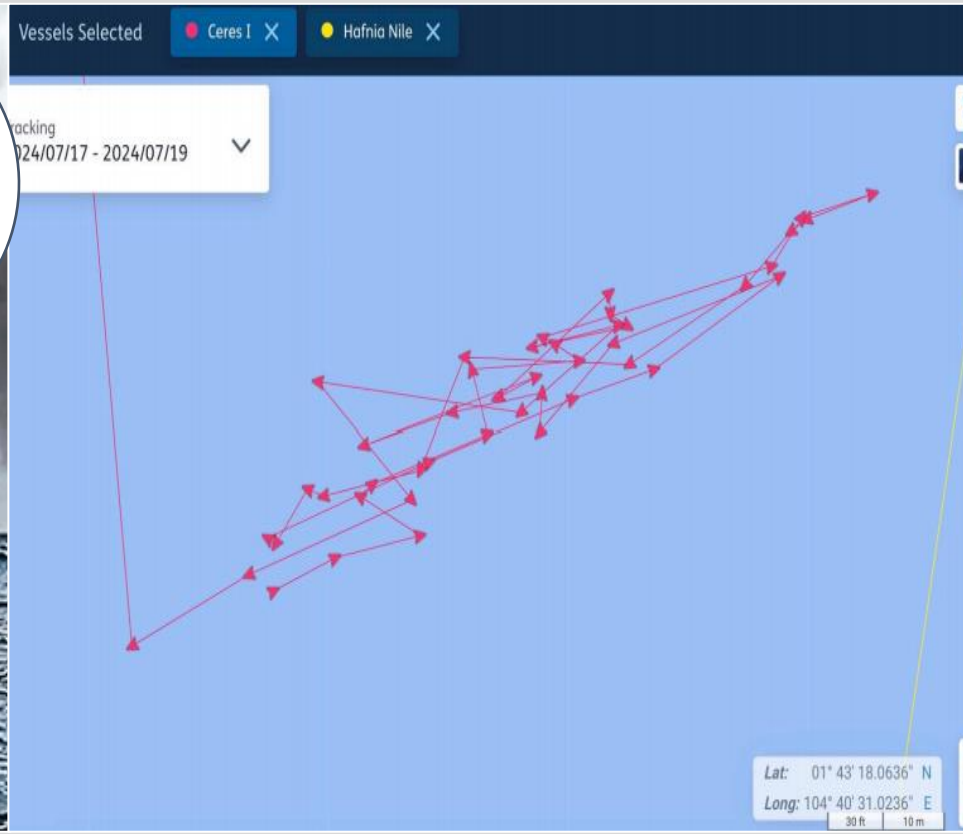
Video: shipping, port/ pixabay

PART 1

Why AIS?

Background

Collision between Ceres and Hafnia Nile



AIS Spoofing in Ceres Ⅰ

Reference: IMO KOREA, 2024 July, IMO trend magazine
Photo 1, 2: Lloyd's list / https://www.lloydslist.com/LL1149957/Investigators-start-to-examine-collision-that-sparked-fires-on-Hafnia-tanker-and-sanctions-busting-VLCC

PART 1

Why AIS?

AIS Spoofing accident

AIS Spoofing accident current trends

- Currently, while there is a downward trend, spoofing incidents remain 200% higher than in early 2022, underscoring the ongoing challenge of enforcing maritime sanctions against increasingly sophisticated evasion tactics.

3-months rolling average trend of AIS spoofing events - Kpler

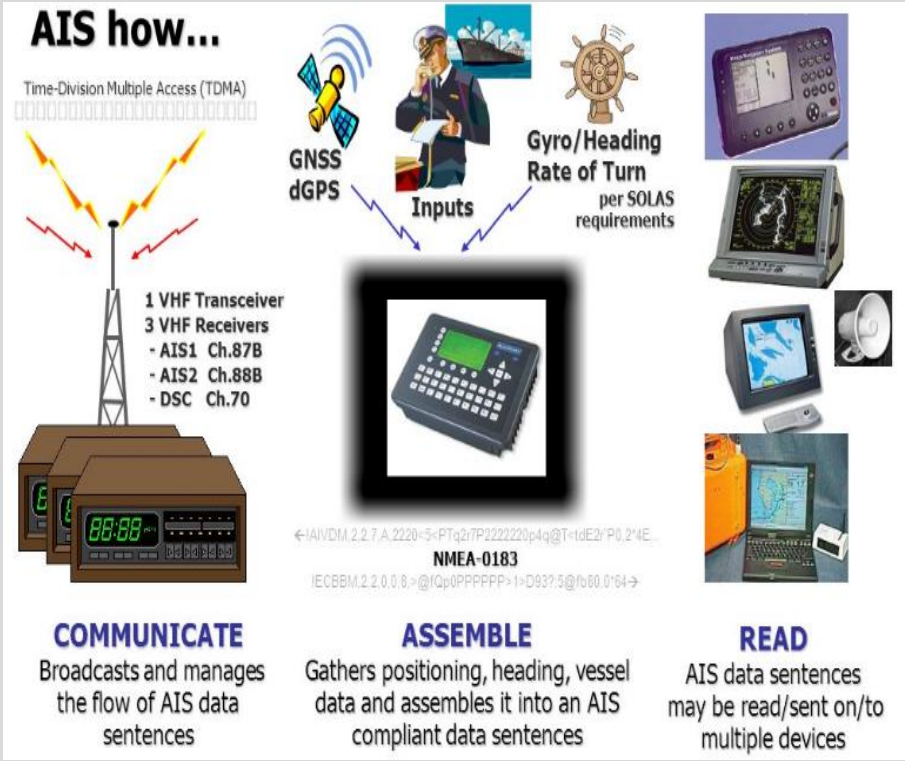
Reference: https://www.kpler.com/
Photo 1:https://www.kpler.com/

PART 1
Why AIS?

What is AIS?

Automatic Identification System

- Under SOLAS Convention V/19, IMO has an important role in ensuring safety and compliance.
- AIS must be applied to all ships regardless of size, including cargo ships of 300 gross tons or more participating in international voyages, and cargo ships of 500 gross tons or more not participating in international voyages.
- AIS is reading the information and assembling it. So, communicate with the port and the other vessel.



Reference: SOLAS chapter V regulation 19
Photo 1: AIS, United States Coast Office of Navigation Systems

Importance of AIS

- Obtain basic vessel information necessary for navigation (position, speed, and orientation of the vessel)
- Collision avoidance
- Rescue in distress
- Assisting in the efficient navigation of ships
- Operation of Vessel Traffic Services (VTS)

Reference: SOLAS, chapter V , regulation 19

IMO discussions

Discussion status

LEG 107th Session	The LEG Committee is discussing DARK FLEET, which artificially turns off AIS transponders.
MSC 107th & 109th Session	The MSC Committee included “Identification of measures to improve the security and integrity aspects of AIS” as a future task.
NCSR 11th Session	The NCSR Committee is making the guidelines for AIS equipment.

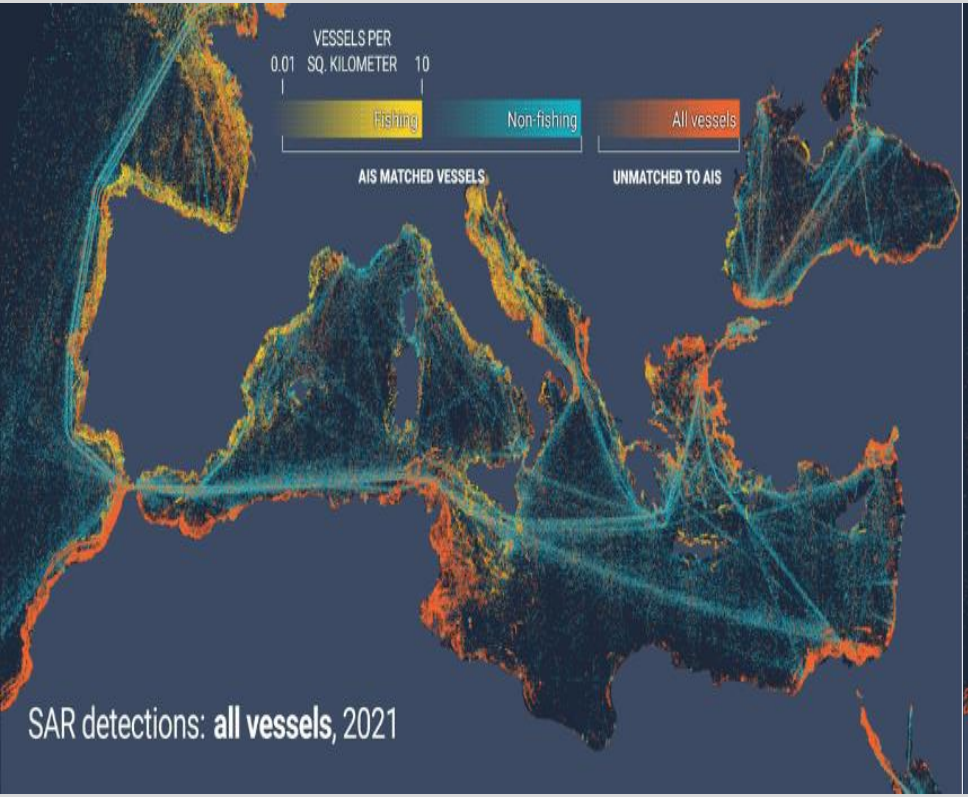
Reference: IMO docs/ https://docs.imo.org/

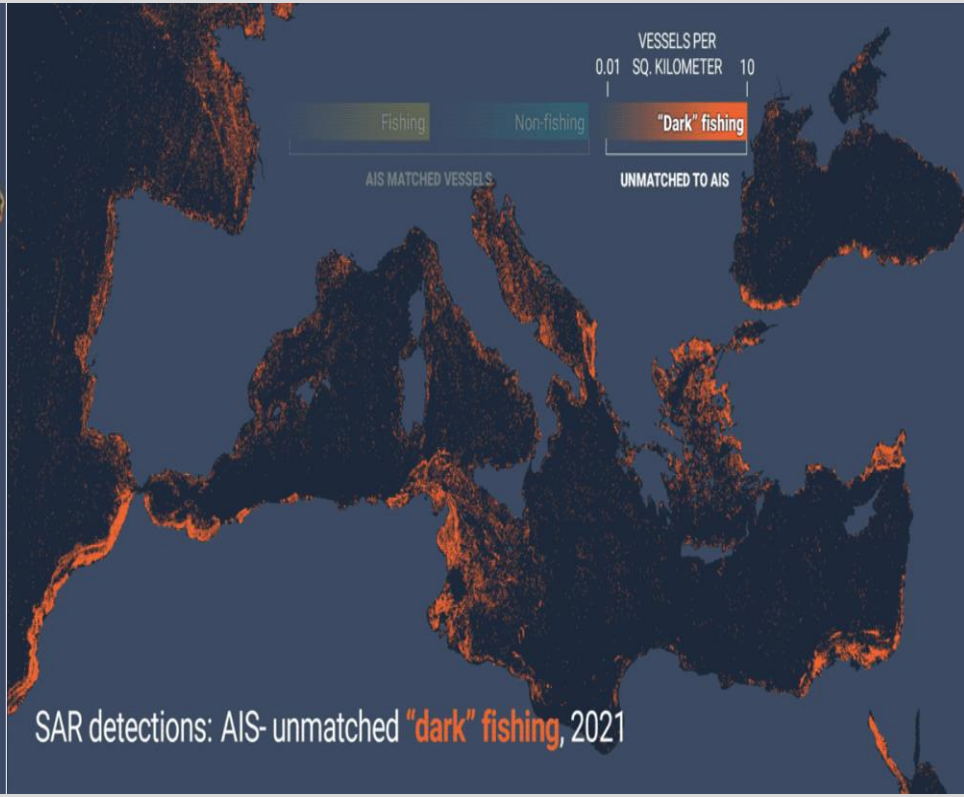
PART 1

Why AIS?

LEG 107th Session

DARK FLEET, which artificially turns off AIS transponders.



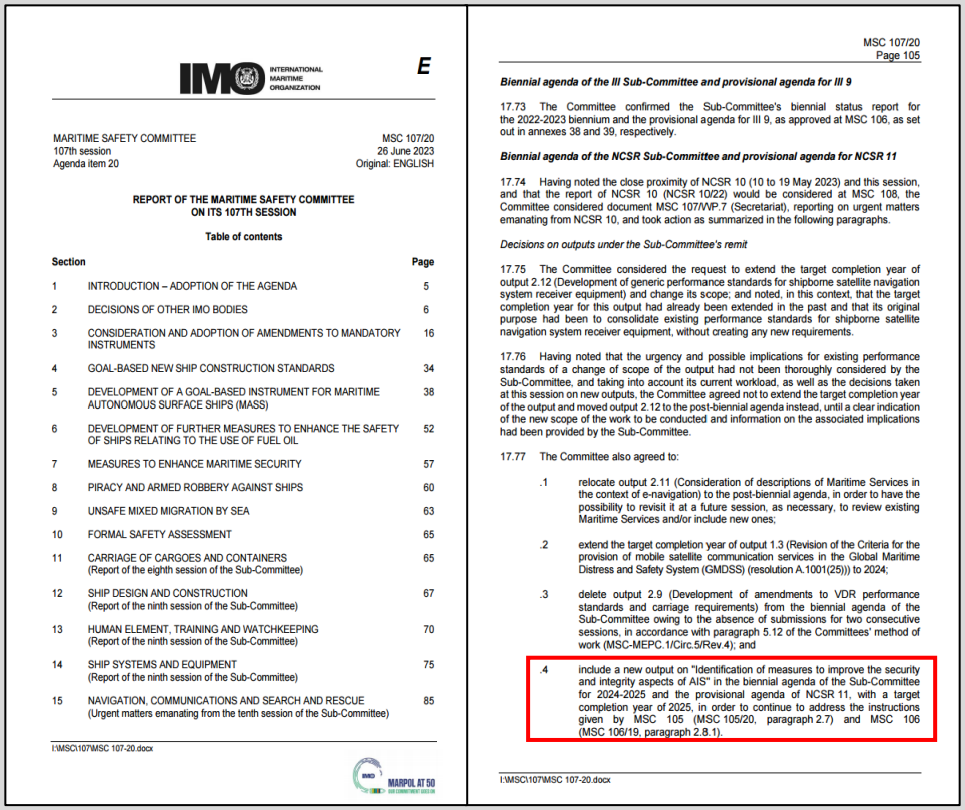


Reference: https://maritime-professionals.com/the-dark-fleet-explained/
Photo 1: Dark fleet / https://piersight.space/blog/illegal-iuu-fishing-what-is-it-and-how-to-detect-it

PART 1

Why AIS?

MSC 107th Session



IMO INTERNATIONAL MARITIME ORGANIZATION

E

MARITIME SAFETY COMMITTEE
107th session
Agenda item 20

MSC 107/20
26 June 2023
Original: ENGLISH

REPORT OF THE MARITIME SAFETY COMMITTEE ON ITS 107TH SESSION

Table of contents

MARPOL AT 50

Biennial agenda of the III Sub-Committee and provisional agenda for III 9

17.73 The Committee confirmed the Sub-Committee's biennial status report for the 2022-2023 biennium and the provisional agenda for III 9, as approved at MSC 106, as set out in annexes 38 and 39, respectively.

Biennial agenda of the NCSR Sub-Committee and provisional agenda for NCSR 11

17.74 Having noted the close proximity of NCSR 10 (10 to 19 May 2023) and this session, and that the report of NCSR 10 (NCSR 10/22) would be considered at MSC 108, the Committee considered document MSC 107/WP.7 (Secretariat), reporting on urgent matters emanating from NCSR 10, and took action as summarized in the following paragraphs.

Decisions on outputs under the Sub-Committee's remit

17.75 The Committee considered the request to extend the target completion year of output 2.12 (Development of generic performance standards for shipborne satellite navigation system receiver equipment) and change its scope; and noted, in this context, that the target completion year for this output had already been extended in the past and that its original purpose had been to consolidate existing performance standards for shipborne satellite navigation system receiver equipment, without creating any new requirements.

17.76 Having noted that the urgency and possible implications for existing performance standards of a change of scope of the output had not been thoroughly considered by the Sub-Committee, and taking into account its current workload, as well as the decisions taken at this session on new outputs, the Committee agreed not to extend the target completion year of the output and moved output 2.12 to the post-biennial agenda instead, until a clear indication of the new scope of the work to be conducted and information on the associated implications had been provided by the Sub-Committee.

17.77 The Committee also agreed to:

.1 relocate output 2.11 (Consideration of descriptions of Maritime Services in the context of e-navigation) to the post-biennial agenda, in order to have the possibility to revisit it at a future session, as necessary, to review existing Maritime Services and/or include new ones;

.2 extend the target completion year of output 1.3 (Revision of the Criteria for the provision of mobile satellite communication services in the Global Maritime Distress and Safety System (GMDSS) (resolution A.1001(25))) to 2024;

.3 delete output 2.9 (Development of amendments to VDR performance standards and carriage requirements) from the biennial agenda of the Sub-Committee owing to the absence of submissions for two consecutive sessions, in accordance with paragraph 5.12 of the Committees' method of work (MSC-MEPC.1/Circ.5/Rev.4); and

.4 include a new output on "Identification of measures to improve the security and integrity aspects of AIS" in the biennial agenda of the Sub-Committee for 2024-2025 and the provisional agenda of NCSR 11, with a target completion year of 2025, in order to continue to address the instructions given by MSC 105 (MSC 105/20, paragraph 2.7) and MSC 106 (MSC 106/19, paragraph 2.8.1).

The Committee also agreed to:

Include a new output on "Identification of measures to improve the security and integrity aspects of AIS" in the biennial agenda of the Sub-Committee for 2024-2025 and the provisional agenda of NCSR 11, with a target completion year of 2025, to continue to address the instructions given by MSC 105 (MSC 105/20, paragraph 2.7) and MSC 106 (MSC 106/109, paragraph 2.8.1)

Photo1, Reference: MSC 107th Session, MO docs/ https://docs.imo.org/

MSC 109th Session

- MSC committee requests approval of performance standards to clarify the vessels subject to mandatory IMO number entry to AIS.
- The international community is also urging the solutions to cyber security.

Photo 1, Reference: IMO 109th Session / https://ichca.com/event-imo-maritime-safety-committee-msc-109-02-06-december

PART 2

Issue raising

Video: shipping, port/ pixabay

Issue raising

AIS Data Quality

AIS Abuse

Update Interval of AIS Data

PART 2

Issue Raising

AIS Data Quality

- Poor quality AIS data threatens safe navigational.
- AIS hacks can lead to the following misconceptions.

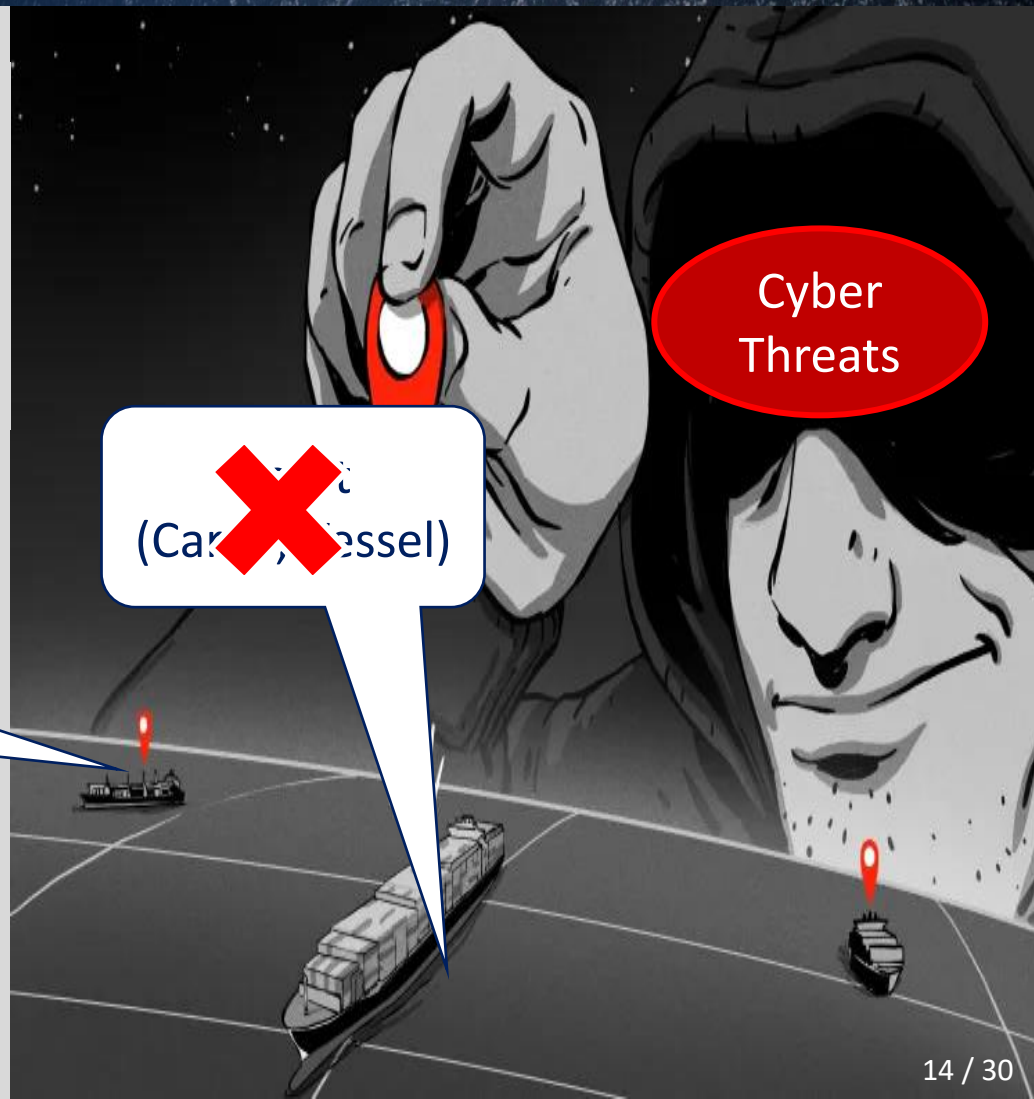


Photo 1: AI image
Photo 2 : Lloyd's List Intelligence
Reference. : Seized UK tanker likely 'spoofed' by Iran, Michelle Wiese Bockmann, Lloyd's list, 2019 https://www.lloydslist.com/LL1128820/Seized-UK-tanker-likely-spoofed-by-Iran

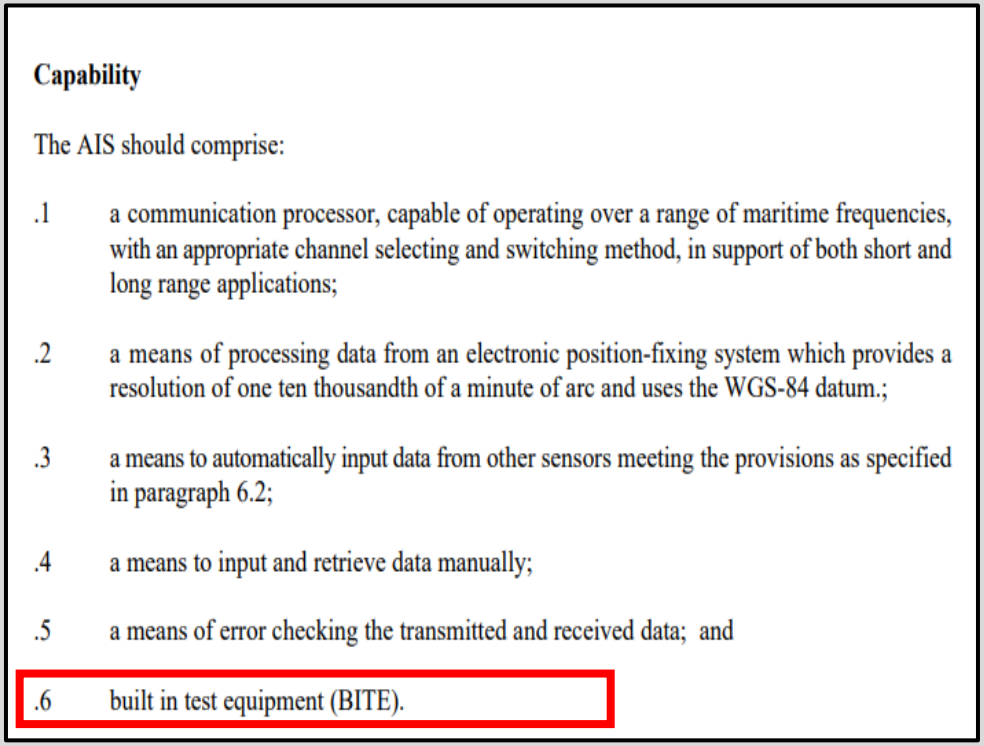
PART 2

Issue Raising

AIS Data Quality

- Furthermore, a small misunderstanding of warship can escalate tension between countries.

- AIS has no system to verify that you sent the correct information.



Capability

The AIS should comprise:

.1 a communication processor, capable of operating over a range of maritime frequencies, with an appropriate channel selecting and switching method, in support of both short and long range applications;

.2 a means of processing data from an electronic position-fixing system which provides a resolution of one ten thousandth of a minute of arc and uses the WGS-84 datum.;

.3 a means to automatically input data from other sensors meeting the provisions as specified in paragraph 6.2;

.4 a means to input and retrieve data manually;

.5 a means of error checking the transmitted and received data; and

.6 built in test equipment (BITE).

Photo 1: IMO Resolution MSC.74(69). ADOPTION OF NEW AND AMENDED PERFORMANCE STANDARDS

Reference:

- IMO Resolution MSC.74(69) ANNEX 3. RECOMMENDATION OF PERFORMANCE STANDARDS FOR A UNIVERSAL SHIPBORNE AUTOMATIC IDENTIFICATION SYSTEM(AIS)
- S. Khandker, H. Turtiainen, A. Costin and T. Hamalainen. (2020). Cybersecurity Attacks on Software Logic and Error Handling Within AIS Implementations: A Systematic Testing of Resilience IEEE Access, vol. 10, pp. 29493-29505.

PART 2

Issue Raising

AIS Abuse

- AIS abuse has caused problems with VTS control and communication between mariners for safe navigation.
- If the status quo is maintained, AIS abusing will come

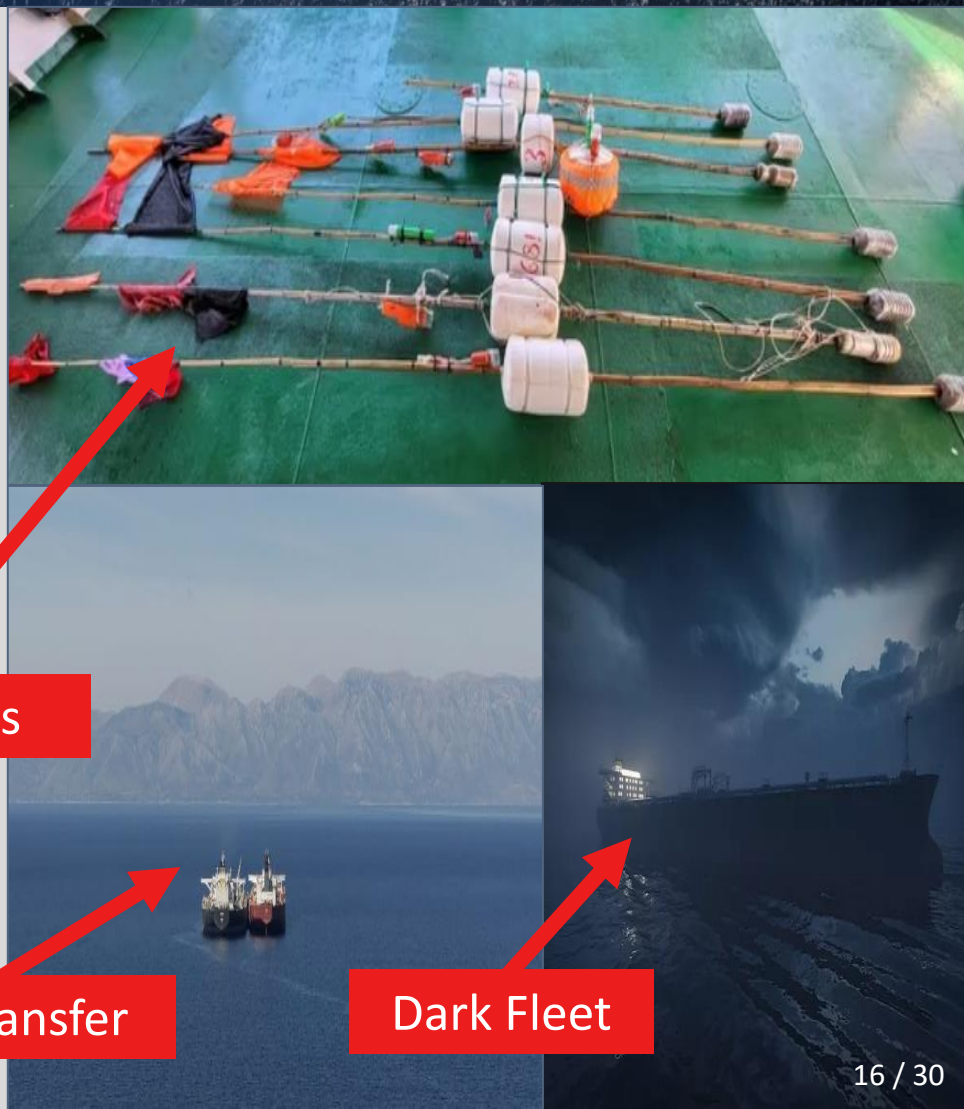


Photo 1 : jeju news1, https://jeju.news1.kr/news/articleView.html?
Photo 2 : AI image
Photo 3 : Bloomberg / https://www.bloomberg.com/news/articles/2023-09-27/russian-oil-exports-two-tankers-caught-spoofing-tracking-systems

PART 2

Issue Raising

Update Interval of AIS Data

- Currently dynamic data reporting interval is based on vessel speed and course changing.
- An increase in vessel speed does not necessarily mean an increase in crash risk.

Type of ship	Reporting interval
Ship at anchor	3 min
Ship 0-14 knots	12 sec
Ship 0-14 knots and changing course	4 sec
Ship 14-23 knots	6 sec
Ship 14-23 knots and changing course	2 sec
Ship > 23 knots	3 sec
Ship > 23 knots and changing course	2 sec

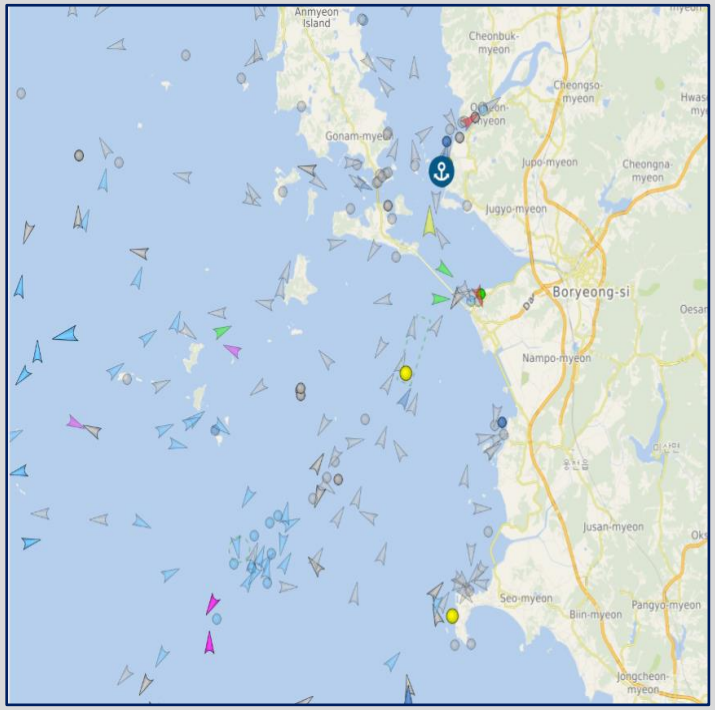
Reference:
IMO Resolution MSC.74(69) ANNEX 3. RECOMMENDATION OF PERFORMANCE STANDARDS FOR A UNIVERSAL SHIPBORNE AUTOMATIC IDENTIFICATION SYSTEM(AIS)

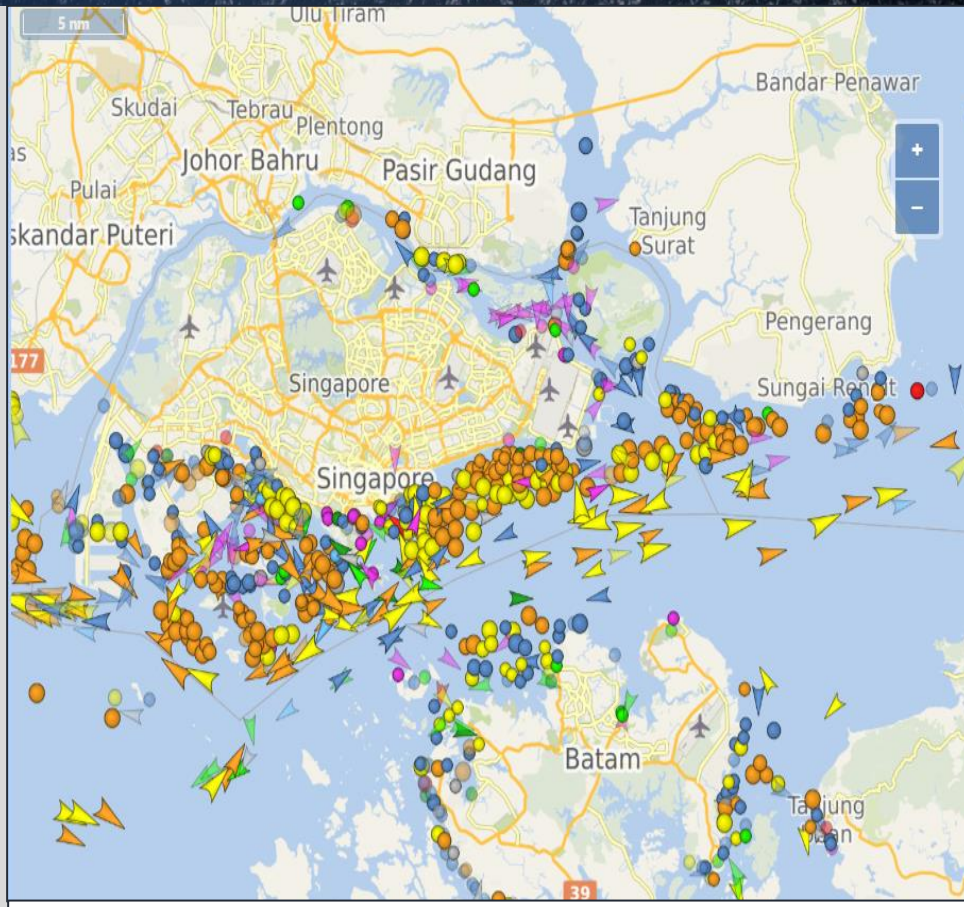
PART 2

Issue Raising

Update Interval of AIS Data

- In heavy Ship traffic Areas such as strait and coastal zone.





(Singapore strait)

Speed Limit : **14kts**

Reporting interval : **12sec**

Photo 1 : VesselFinder.com
Photo 2 : MarineVesselTraffic.com

PART 3

Solution

Video: shipping, port/ pixabay

PART 3

Solution

Adding security measures

AIS data quality

Photo : https://files.oaiusercontent.com/

PART 3

Solution

Adding security measures

AIS data quality

REVISED RECOMMENDATION ON PERFORMANCE STANDARDS FOR AN UNIVERSAL SHIPBORNE AIS

Capability

The AIS should comprise :

1. a communication processor, capable of operating over a range of maritime frequencies, with an appropriate channel selecting and switching method, in support of both short and long-range applications.

2. a means of processing data from an electronic position-fixing system that provides a resolution of one ten-thousandth of a minute of arc and uses the WGS-84 datum.

3. a means to automatically input data from other sensors meeting the provisions as specified in paragraph 6.2

4. A means to input and retrieve data manually

5. A means of error-checking the transmitted and received data

6. Built-in test equipment (BITE)

7. means to verify that data has been sent/received to an authenticated user.

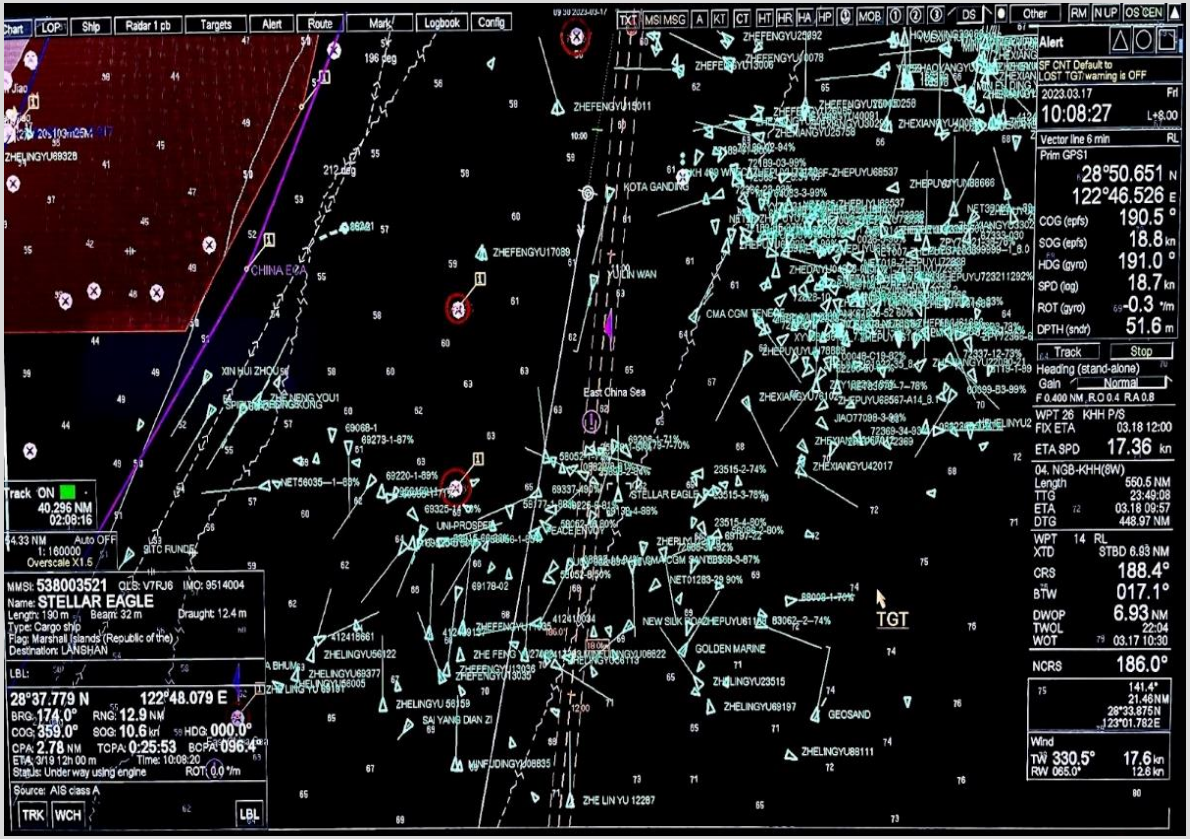
Photo : https://files.oaiusercontent.com/

IMO Resolution MSC.74(69). ADOPTION OF NEW AND AMENDED PERFORMANCE STANDARDS

PART 3

Solution

Consider additional categories



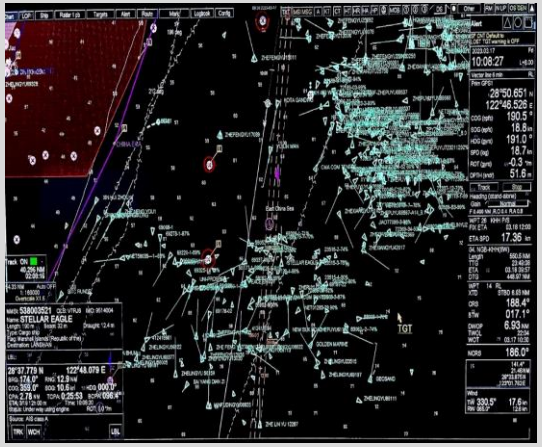
AIS Abuse

Photo : Team rAISe

PART 3

Solution

Consider additional categories



AIS Abuse

REVISED GUIDELINES FOR THE ONBOARD OPERATIONAL USE OF SHIPBORNE AUTOMATIC IDENTIFICATION SYSTEMS (AIS)

Class A shipborne equipment
complies with relevant IMO AIS carriage requirements.

Class B shipborne equipmentprovides functionalities not in full accordance with IMO AIS carriage requirements.

Class B devices maybe carried on ships which are not subject to the SOLAS carriage requirements.

Class C shipborne equipment
AIS attached to off-ship floats

AIS, which is being abused within the boundaries of the law, must be brought into the law and stipulated.

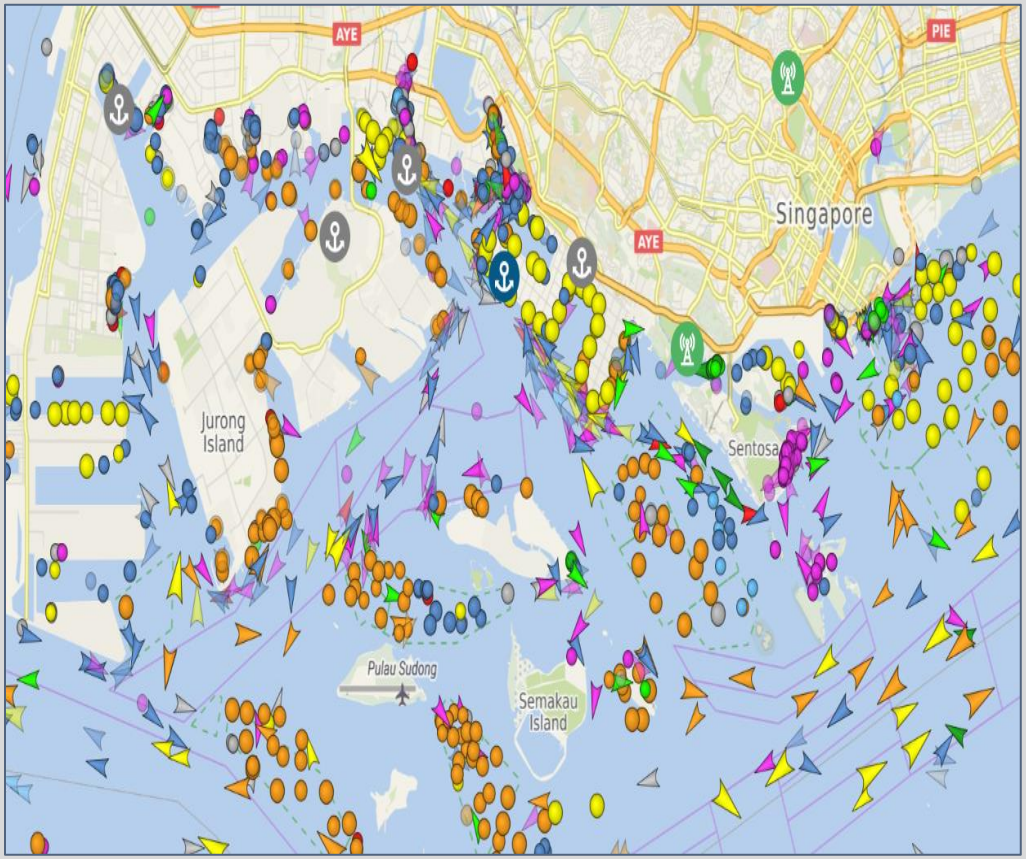
Photo : Team rAISe

Reference: Resolution A.1106(29) REVISED GUIDELINES FOR THE ONBOARD OPERATIONAL USE OF SHIPBORNE AUTOMATIC IDENTIFICATION SYSTEMS (AIS)

PART 3

Solution

Set the AIS reporting interval for the heavy ship traffic area



Heavy ship traffic areas

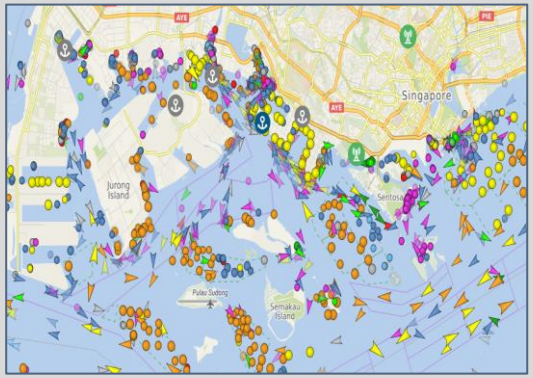
- Low speed
- High risk
- Long reporting interval

Photo : Vessel finder

PART 3

Solution

Set the AIS reporting interval for the heavy ship traffic area



Heavy ship traffic areas

- Low speed
- High risk
- Long reporting interval

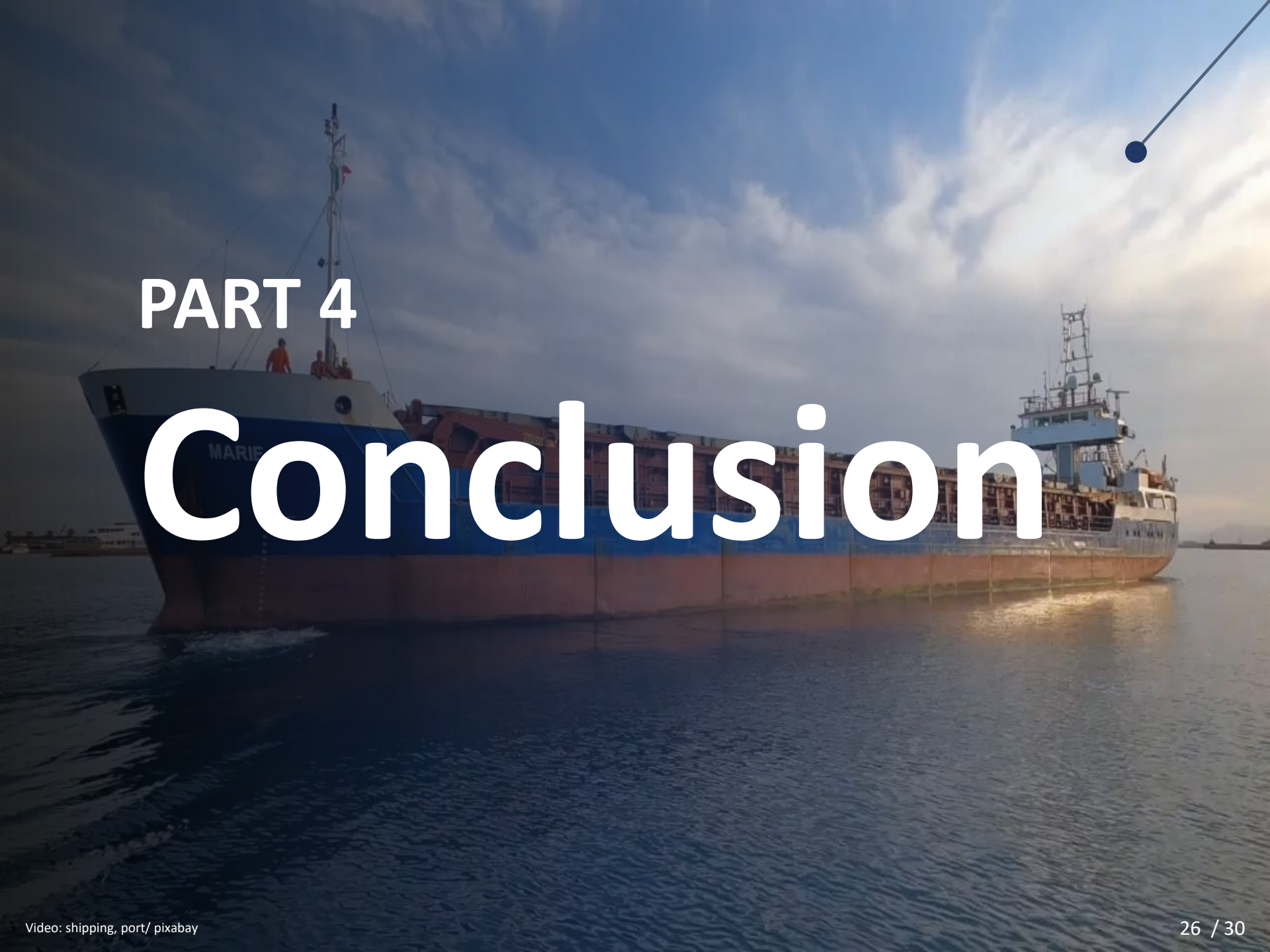
REVISED RECOMMENDATION ON PERFORMANCE STANDARDS FOR A UNIVERSAL SHIPBORNE AIS

Type of ship	General reporting interval
Ship at anchor or moored and not moving faster than 3 knots	3 min
Ship at anchor or moored and moving faster than 3 knots	10 sec
Ship 0-14 knots	12 sec
Ship 0-14 knots and changing course	4 sec
Ship 14-23 knots	6 sec
Ship 14-23 knots and changing course	2 sec
Ship > 23 knots	3 sec
Ship > 23 knots and changing course	2 sec
Heavy ship traffic areas	**2 sec**

Set the AIS reporting interval more frequently for the congestion area - Ex. Singapore Strait, pilot station

Photo : Vessel finder

Reference: IMO Resolution MSC.74(69). ADOPTION OF NEW AND AMENDED PERFORMANCE STANDARDS



PART 4

Conclusion

Video: shipping, port/ pixabay

PART 4

Conclusion

We need…

IMO

MSC

NCSR

A review of AIS rules, responding to new-generation technologies and problems

IMO Strategic Directions

SD 7 : Ensure regulatory effectiveness of international shipping

SD 7.50 : Identification of measures to improve the security and integrity aspects of AIS

Reference: Resolution A.1173(33). STRATEGIC PLAN FOR THE ORGANIZATION FOR THE SIX YEARS 2024 TO 2029

PART 4

Conclusion

Contribution

- Contribute to the security of ships and ports by preparing for cyber threats in the next AIS operation.
- Helps operators operate safely and efficiently by reducing AIS abuse.
- In situations where real-time information is needed, the dynamic information of the ship should be quickly identified to help traffic control.

Photo : https://files.oaiusercontent.com/

Photo 1: DNV Maritime

Thank you for listening !

Team: rAISe

Photo 1: DNV Maritime