



JAPAN COAST GUARD

Third Workshop on International Standardization of VDES

**Tokyo, JAPAN
1 – 5 December, 2014**

Executive Summary

The Third Workshop on International Standardization of VDES was held from 1st to 5th December 2014 in Tokyo, co-hosted by the Ocean Policy Research Foundation and the Japan Coast Guard. Seven international experts and 16 Japanese experts in the field of AIS and maritime radiocommunication participated in the meeting.

On the first day, the presentation and panel discussion was held at the TKP Garden-city Nagata-cho building in Tokyo and seven experts made presentations regarding VDES. At the Panel Discussion, the experts discussed various matters on VDES presided over by the moderator. There were about 100 attendees and they asked various questions after the panel discussion.

The meeting was also held at the same place on the second, third and last day. The agenda covered various technical and operational fields of VDES but mainly focused to draft a document that could become IMO performance standards for VDES in future. The participants made an active and eager discussion on the agenda and developed the working document toward draft IMO recommendation on performance standards for VDES with the conclusion which was attached at the end of this executive summary.

The technical tour to the Tsukuba Space Centre of the Japan Aerospace Exploration Agency (JAXA) was carried out on 4th December 2014. The experts observed the latest situation of the research and development project on satellite detection of AIS conducted by JAXA and exchanged views and opinions on the matter with the JAXA researcher.

CONCLUSION

THE THIRD WORKSHOP,

RECALLING that the First and Second Workshop on International Standardization of VDES were so successful with many outcomes regarding e-navigation, modernization of GMDSS and other maritime activities;

ALSO RECALLING that the VDES was recognized in IMO and expected to be utilized in e-navigation, modernized GMDSS and other maritime activities;

RECOGNIZING that ITU-R WP5B is now developing the draft ITU Recommendation, ITU-R M. [VDES] with the contribution from IALA in order to ensure the necessary channels for VDES;

ALSO RECOGNIZING that the 2015 World Radiocommunication Conference (WRC-15) will discuss and decide the regulatory matters including spectrum allocations for VDES under the Agenda item 1.16;

HAVING NOTICED that various testbeds and projects for the development of VDES were conducted or planned in the world;

HAVING ALSO NOTICED that the Telecommunication Working Group of IALA ENAV Committee is the leading international body on the development of VDES;

CONCLUDES THAT

- 1. The working document, draft IMO performance standards, developed by the Workshop could become a basis for the international standardization of VDES;*
- 2. Although the VDES is recognized in IMO to support e-navigation and as a possible candidate for the modernization of GMDSS, the promotion of VDES at IMO is necessary to further understand the benefits and needs of VDES;*
- 3. A review of channel management capability within the ITU Recommendation for AIS is necessary, at ITU, since the AIS-SART and similar AIS devices use only AIS 1 and 2 channels and thus the regional AIS channels are no longer recommended;*
- 4. Considering the possible allocation of additional channels for VDES at WRC-15, the review of the ITU Recommendation for AIS may be required;*
- 5. Considering the importance and the timing of VDES development, the initiative*

taken by the Ocean Policy Research Foundation (OPRF) to host the series of Workshop is greatly appreciated and admired;

ENCOURAGES

- 1. IALA and other interested parties to further develop the working document toward the draft IMO recommendation on performance standards for VDES in order to prepare the future discussion on the international standardization of VDES;*
- 2. IALA and the members to make effort to promote VDES in the world maritime community, especially in IMO and the national members to explore the possibility of the submission of the proposal to IMO on the development of IMO performance standards for VDES;*
- 3. IALA national members to also support the necessary changes to the ITU Recommendation for AIS. ;*
- 4. Authorities, organizations and manufactures to conduct more study, research, testbed or project on VDES and to share the results with international society;*

RECOMMENDS

- 1. The Japan Coast Guard to report the results of the Workshop to the planned intersessional meeting of the Telecommunication Working Group of the IALA ENAV Committee in February 2015 and IALA is invited to continue the development of VDES;*

AND INVITES

- 1. The Japan Coast Guard and the Ocean Policy Research Foundation to consider holding further international expert meetings for the development of VDES.*

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Report of 3rd Workshop on International Standardization of VDES

1. Background

Automatic Identification System (AIS) technology is very useful and effective and the usage of AIS is now expanding rapidly. However due to this rapid expansion, it has been identified that there will be a possibility that the AIS VHF Data Link (VDL) will be overloaded in future. At 2012 World Radiocommunication Conference (WRC-12) International Telecommunication Union (ITU) adopted Resolution 360 [COM6/21] (WRC-12): Consideration of regulatory provisions and spectrum allocations for enhanced Automatic Identification System technology applications and for enhanced maritime radiocommunication, and decided to consider this matter in WRC-15 as Agenda item 1.16: to consider regulatory provisions and spectrum allocations to enable possible new Automatic Identification System (AIS) technology applications and possible new applications to improve maritime radiocommunication in accordance with Resolution 360 [COM6/21] (WRC-12).

Responding the situation, the Ocean Policy Research Foundation (OPRF) and the Japan Coast Guard (JCG) considered the necessity of an international meeting for 'next generation AIS' development and held the two continuous Workshop on International Standardization of the 'next generation AIS' in Tokyo. The first Workshop developed the concept of VHF Data Exchange System (VDES) and identified many functional requirements for VDES. In the second Workshop, some technical issues on VDES including radio propagation, modulation, frequency sharing between its terrestrial and satellite components and data volume.

JCG reported the results of these Workshops to IALA and then ITU and the International Maritime Organization (IMO) through the International Association of Lighthouse Authorities (IALA). As the result, VDES concept was recognized in the maritime and radiocommunication community and many studies on VDES were started.

Taking the situation into account, the OPRF and JCG decided to hold a third Workshop on International Standardization of VDES and invited overseas and domestic AIS experts from national authorities, institutions and AIS related commercial companies. The third Workshop was held from 1st to 5th December 2014 at the TKP Garden City Nagatacho in Tokyo, JAPAN. The agenda is attached as Annex 1 and list of the participants is also attached as Annex 2.

2. Courtesy call to the JCG

6 foreign experts made a courtesy call to VADM Yoshio Ozeki, Director General, Maritime Traffic Department, JCG at the JCG Headquarters on the first morning.

VADM Ozeki welcomed the all experts by expressing his appreciation to the experts for accepting the invitation and coming to Japan. In response, the experts thanked the JCG and OPRF for hosting this valuable workshop.

3. Presentations and Panel Discussion

Afternoon of the first day, presentations and a panel discussion was held. The first part of this event was presentation from the 5 overseas experts and three Japanese expert. LCDR Ono, engineer of Japan Coast Guard, introduced each presenter as the MC. The summary of each presentation in as follows:

3.1. LCDR Kinji Takeuchi (Japan Coast Guard)

LCDR Takeuchi reported the results of the first and second Workshop that was held in 2012 and 2014. The series of Workshop were aimed to develop a possible draft for international standard on VHF Data Exchange System (VDES). He reported that there was a good progress at the last two sessions of the Workshop. The first Workshop resulted in the concept of the VDES and then the second Workshop showed that there were many testbeds on VDES conducted or still ongoing. The results were reported to IALA and IALA made many significant reports based on the results to ITU. He then introduced that the third Workshop would be aimed to develop a possible IMO Performance Standards for VDES. The copy of his presentation is attached as Annex 3

3.2. Mr. Bill Kautz (US Coast Guard)

Mr. Kautz firstly introduced the Agenda Item 1.16 of World Radioconference 2015 (WRC15) that would discuss possible new AIS applications and spectrum allocations. He then reported the results of the latest ITU-R WP5B meeting that the IALA proposed draft ITU-R Recommendation [VDES] was welcomed but still needed more developments, and there were new proposals for the channel plan of VDES that now became four options, channel plan A, B, C and D. He said that the IALA was expected to submit their opinion on the channel plan to ITU-R WP5B meeting again. The copy of the presentation is attached as Annex 4.

3.3. Mr. Stefan Bober (Germany Waterways and Shipping Authority)

Mr. Bober introduced the IALA concept of VDES and how the VDES could become one of the important elements of the maritime cloud. He then reported what the IALA had been developing the various issued on VDES and introduced the role of VDES in e-Navigation architecture and the IEC development of the integration into communication systems. Finally, he showed the VDES roadmap which indicated that the initial operation capability of terrestrial VDES could start from 2018 and the full operation capability would start 2020. The copy of the presentation is attached as Annex 5

3.4. Ms. Margaret Browning (exactEarth/ Canada)

The presentation of Ms. Browning was the challenges for VDES development. She said that while there were many technical challenges on VDES such as channel plan, ship installation and shore installation, there were also many political challenges both in IMO and ITU. She concluded that although there were a lot of challenges in the VDES development, there were also many reasons why such challenges were needed for instance, polar communications, health and maintenance monitoring of ships, true world-wide weather, world-wide VTS and GMDSS modernization. The copy of the presentation is attached as Annex 6.

3.5. Mr. Yasuhiro Nakagawa (Furuno/ Japan)

Mr. Nakagawa explained the complexity of VDES slot allocation compared with the AIS slot allocation. He mentioned that VDES is a mixture of AIS, ASM and VDE with satellite applications that caused signal masking by VDES for some ship data and virtual AIS AtoN as example. He emphasized the need of the VDES slot simulation which Furuno was now developing. The copy of the presentation is attached as Annex 7.

3.6. Mr. Yoshihiko Imada (JRC/Japan)

Mr. Imada introduced that VDES was the key technology of short range data exchange, though there was still a need of experiments on radio propagation for VHF data communication on the sea. He reported that the results of various sea trials that used a training ship of the University of Marine Science and Technology, a lighthouse tender of the Japan Coast Guard and a charter fishing boat in Izu peninsula. He concluded that those testbeds were conducted on only calm sea but he needed to carry out such test beds on more rough seas. A copy of the presentation was attached as Annex 8.

3.7. Ms. Jillian Carson-Jackson (Australia Maritime Safety Authority)

Ms. Carson-Jackson started her presentation by explaining how a today's mariner had to handle much information from various resources and thus e-Navigation was expected to solve such situation. She then demonstrated the complexity of the tidal movement in the Tress strait and VDES could be informed mariners of the real time situation of such tidal movement. She also introduced the concept of maritime cloud that would be able to fill a gap between aviation world and maritime world in the use of digital technology. The copy of the presentation is attached as Annex 9.

After the presentations, the event moved to the second part which was a questions and answer session from the audience with a panel discussion. The moderator was CDR Noguchi and he invited 6 speakers, Mr. Kautz, Mr. Bober, Ms. Browning, Mr. Nakagawa, Mr. Imada, and Ms. Carson-Jackson on the stage.

The moderator asked speakers when the development of VDES equipment would be finished. Mr. Nakagawa answered that it was difficult to predict the exact time of completion, however, the manufacturer is making their effort to finish the development as soon as possible. Mr. Imada commented that JRC is concentrating on solving each technical challenge and after that, JRC would try to develop VDES products. Mr. Johan Lindborg of the SAAB mentioned that their progresses on development of VDES were going ahead to the timeline of IALA. Mr. Johnny Schultz of L-3 pointed out that regulations might be a problem for development of VDES. Ms. Peggy Browning said that ESA was becoming sponsors for several researches for the development and it has a plan to launch VDES satellites by 2018. She also commented that the development of VDES is not from a scratch, the experience from the development of AIS could be used. Mr. Bober mentioned that IALA and ITU was trying the standardization of VDES, and the first version of the recommendation would be developed in 2015 and it would be useful for development of VDES when manufacturers are involved. Ms. Carson-Jackson commented that channel plan for VDES was required to encourage the development of VDES in manufacturers.

The moderator then asked how to harmonize operational usage of VDES with commercial usage of it. Ms. Browning said that it might be difficult to stop innovative commercial usage of it. Mr. Bober pointed out that additional capacity of VDES should cover commercial needs whereas AIS should be used only for navigational safety. Ms. Carson-Jackson added that innovative ideas could be realized by VDES with ensuring maritime safety.

The moderator also asked that whether IMO would allow using VDES as a distress device. Mr. Kautz answered that the United States was trying to make IMO allow using new devices including AIS and VDES as distress devices and asked other countries to support. Ms. Carson-Jackson commented that Australia was cautious to use AIS as a Search and Rescue device because global system would be needed to realize it. Ms. Browning commented that political challenge was the issue rather than technical one. Mr. Yoshida of the Research Institute of Marine Engineering (RIME) of Japan pointed out that IMO is very conservative about provision of maritime safety information and alerting system.

The next question from the moderator was that how many satellites would be required for GMDSS. Ms. Browning answered that it would depend on the orbit of the satellites. Mr. Fabritius of CLS added that the number of required satellites would be related to the network of terrestrial stations which would received data from satellites and tolerate time to wait.

The last question from the moderator was whether VDES shore stations had capability to control the usage of ship-borne VDES. Mr. Bober answered that the channel plan-A was able to filter only for VDES channel to protect AIS and VDES from VHF voice communication and after filtering, channel management would not be needed. Mr. Schultz commented that some control element would be needed for reserving usage of shore side.

The first question from an audience was what the definition of the term “digital”. Ms. Browning answered that main focus on the term in IALA was related to air components such as digital modulation.

The second question from an audience was whether VDES could solve the problem of poor man-machine interface like MKD for AIS. Ms. Browning pointed out that IALA should give an incentive with manufactures to solve the problem. Ms. Carson-Jackson commented that MKD for AIS had been kept because of the political reasons and the development of the interface for VDES should not trace the failure of MKD.

Finally, the moderator expressed his appreciation to the speakers for their presentations and for answering various questions and to the audience for participating in this event. The panel discussion was concluded and the session adjourned

4 Opening of the meeting

CDR Noguchi took the role of chairman and LCDR Ono of JCG took the role of the secretariat. LCDR Ono informed the participants of administrative matters during the workshop.

5 Approval of the agenda

The provisional agenda was approved.

6 Technical presentations

Four presentations were made in the session.

Mr. Lindborg made a presentation on the development of VDE radio in SAAB. According to his presentation, SAAB is conducting the development of a prototype of VDE radio as the phase 2 of its development following the phase 1 on the development of AIS and ASM prototype radio in 2013 Q4. He also noticed that the report of its development would be submitted for ITU WP5B in July 2015. He mentioned that SAAB has an intention for phase 3 and phase 4 as continue works for VDES standardization. His presentation is attached as ANNEX 10.

Mr. Fabritius made a presentation on the activities for the development of VDES in CLS

and ESA. Of the activities, he explained about 2 projects: ARTES-1 (Critical Trade-offs) and ARTES 5-1 (VDES downlink demonstration). He also mentioned about future activities of CLS and ESA and asked stakeholders to join the on-going activities. His presentation is attached as ANNEX 11.

Mr. Schultz made a presentation for the discussion on the usage of AIS as a distress device. He proposed following discussions on this matter:

- Distress alert using current AIS
- Regulatory changes required for AIS as a distress alert.

After his presentation and some comments from participants, the chair commented that the issue was going to discuss in the agenda "AIS as a distress device". His presentation is attached as ANNEX 12.

LCDR Takeuchi made a presentation on the location sharing method by using VDE. In his presentation, he reported that there was more than 50% of VDL load in Japan recently and some administrative actions for encouraging the installation of class-B AIS by Japanese Government might increase dramatically the VDL. To support detecting ships in high VDL load, he proposed to send supplementary information for AIS position report via VDES. He also mentioned that the estimated data volume for position information for 1000 ships would be less than 3kbps if the information was send every 30 seconds. After his presentation, Prof. Hayama Imazu pointed out that 30 seconds of interval was too long to detect real time information of small crafts. His presentation is attached as ANNEX 13.

7 Test bed Update

The chair asked participants to share their planed or ongoing test beds. LCDR.Takeuchi said that JCG have prepared to support field tests conducted by manufactures of Japan. Ms. Carson-Jackson introduced the plans of field test in Australia. The updated testbed list from that of ENAV 15-10.5 is attached as ANNEX 14. The chair commented that the updated testbed list would be submitted to IALA ENAV committee intersessional meeting held in February 2015.

8 AIS as a distress device

Mr. Yoshida explained the discussion at the 10th IMO-ITU Expert Meeting with regards to the use of AIS in GMDSS. He said that there was two issues on this matter, one was alerting and another was MSI, and the Expert Group was not negative to use AIS in alerting but it was slow movement since IMO had the resolution, Resolution A.1001 (25), on the criteria for the provision of GMDSS service and IMO needed to ensure if AIS met this criteria. He kindly provided the copy of the resolution as reference. He also said that the Expert Group considered the use of AIS in MSI especially for the modernization of

GMDSS but the problem would be the change of existing system. He added that there was also an issue of satellite, which some new service providers wanted to use their satellite in GMDSS.

Mr. Schultz explained that the main point of this agenda was not to replace the existing system but to enhance the present GMDSS by the use of AIS in distress. Mr. Kautz said that the US already raised this issue in ITU in 2012 and in spite of some resistances, ITU now developed ITU Report on this subject. He hoped that ITU would approve this report at the next ITU-R 5B meeting and believed that AIS had potential of handling distress signal. Dr. Fukuto said that there were two means of AIS in distress or GMDSS, one was to enhancing the capability of GMDSS and another was a scrap and built issue since seafarers did now want to handle additional information during distress situation so the scrap part should be considered when introducing new system.

9 Review of the Working Document toward Draft Recommendation ITU-R M. [VDES]

Mr. Bober explained the discussion at the last ITU-R WP5B meeting and said that the ITU well received the IALA developed draft document but also requested further information or definition of some issues such as channel management, modulation and satellite sharing with terrestrial system. China proposed a Channel plan D which is different from Channel plan A which the IALA draft document is based on . However, he added that, for the development of VDES, IALA might first focus on the ASM part and then develop the VDE part as well.

Mr. Nakagawa said that even though this draft was very technical, there was a need to hear the user's opinion for the review and it would be take a long time to make the final version. Ms. Browning said that although the user requirement was important, there was also a need to propose services using VDES to users, especially commercial service from the viewpoint of cost effectiveness. Mr. Lindborg mentioned that digital automatic reporting proposed by Ms. Carson-Jackson could draw interest of onboard users. Ms. Carson-Jackson cautioned that if the mariner did not understand the system correctly, it would be hard to obtain the correct user needs or requirement.

Mr. Kautz stressed that the IALA should complete technical work of the draft working document at the next ENAV meeting and also develop the criteria for evaluating the channel plan D that was newly proposed by China at the last ITU-R WP5B meeting. Mr. Bober invited manufacturers to provide technical solutions of ASM as well as VDE at the next ENAV meeting. Mr. Schultz commented that the criteria for channel plan A, B and C had been already developed and so it was needed to develop the criteria on channel plan D that did not have a guard band of 50 kHz between AIS/ASM channel and VDE

channel.

Ms. Browning briefly explained the contents of the draft document for those who were not familiar with the document. She hoped that at least, at the next ITU-R WP5B meeting, the draft document clarified the technical characteristics of ASM part so the manufactures could develop some part of VDES. She also added that, outside of this draft document, there was a need to amend the IMO performance standard for AIS to delete the capability of channel management and the participants agreed with her comment.

Ms. Browning commented that for the sharing study between satellite and terrestrial link, it was better to wait the results of the ESA satellite test but she hoped to use the whole 6 channel bands for the downlink of satellite VDES. Mr. Fabritius added that the ESA test satellite would be concentrated only the downlink issue due to the limitation of budget and so it was important to conduct the sharing study by CLS. Mr. Bober explained that the very last part of the draft documents regarding satellite transmission was explanatory part and so it could be extracted from the document. Mr. Schultz proposed to keep the contents of the part not as the ITU Recommendation but as the ITU Report. Mr. Yoshida raised the issue of e-Navigation regarding a seamless communication among not only VHF, HF and MF but also terrestrial and satellite. Mr. Lindborg pointed out that the issue also covered among different satellite service providers and Mr. Fabritius also pointed out that the issue was also related to the future GMDSS service. With regard to this issue, Mr. Bober introduced that the IEC was now developing the standard for the integrated communication system for GMDSS and the system could have a capability of automatic selection of an appropriate communication means. Mr. Lindborg stressed the importance of close coordination of the IALA work with the IEC work.

10 Development of a Working Document toward Preliminary Draft IMO Performance Standard for VDES

The discussion was started based on a draft working document made by the JCG. The chair mentioned that the document was drafted based on the IMO performance standards for AIS. He stressed that the document was only an early version of draft and any comment on the document would be welcomed.

At the first chapter “Scope”, VDES was defined to provide two major functional requirements, first was as a means of AIS and second was as a means of radiocommunication equipment. It was agreed that VDES should provide a capability of data exchange to ships and to shore users by terrestrial or satellite link. Although the original draft proposed to exchange information through the competent authority on

order to coordinate the communication, Prof. Imazu pointed out that the exchange of information between ships was conducted directly without the competent authority involvement. The participants agreed his point and word “through the competent authority” was deleted. Regarding the installation, Ms. Browning suggested that since AIS already had its performance standards, MSC.74 (69), VDES should comply with the VDES performance standards in addition to MSC.74 (69) and the participants agreed it. Regarding the functional mode, Mr. Schultz said that VDES inherently coordinate its functional mode with respect AIS, especially position reporting. Considering this remark. Mr. Lindborg suggested two modes for VDES, autonomous and controlled, and other modes such as polling could be done at application layer. The participants agreed with his suggestion.

For the components of VDES, Mr. Lindborg commented that it was better to draft this part as general as possible in order to allow any solution of VDES. A destination of output data from VDES became an argument point and temporary choose a word “devices” with square brackets. It was agreed that VDES should need a means of update but only when it was needed.

Regarding specific capabilities, Mr. Schultz pointed out that it was impossible to completely protect AIS from VDES but could give highest priority to AIS. Mr. Lindborg also mentioned that VDES should transmit a higher priority data automatically. Dr. Fukuto requested a capability of acknowledgement and transmitting addressed and broadcast data. The request was agreed.

For the user interface and identification, the participants agreed that the purpose of the user interface is to input and output as minimum requirement. LCDR Takeuchi explained that VDES could have additional identifier such as Media Access Control (MAC) other than MMSI. Mr. Kautz suggested that it is no need to mention an example of identifier and a word of appropriate unique identifier is enough to mention. The participants agreed his suggestion.

Regarding data provided by VDES, the chair explained that although applications of VDES were not decided at this point, the proposed draft enumerated all possible or thinkable data. Mr. Lindborg commented that if the performance standards enumerate the data then it should be needed to define the binary data structure in order to interpret the data. Mr. Yoshida suggested that it was better to distinguish data that should be contained in each data set from data set itself. Reflecting his suggestion, data such as time stamp, unique identifier and message identifier were separated from other data set. Mr. Lindborg commented that not every transmit message need time stamp but every message provided by VDES should need time stamp. Since what data would be

provided in e-navigation was unknown at this stage, it was agreed that e-navigation related data was retained with square brackets. Concerning priority, the proposed draft gave the highest priority to AIS data but Mr. Kautz proposed that GMDSS related data should have the highest priority and his proposal was agreed. It was agreed that at least five level of priority was decided. Regarding the security, Ms. Browning suggested that VDES should have a capability of notifying detection of disabling data to other ships or competent authority if possible and it was agreed. It was also agreed to add concealing data capability to VDES.

Regarding power supply, Mr. Yoshida pointed out that if VDES handled distress alert, an emergency power supply should be required. Mr. Nakagwa also pointed out that if VDES became GMDSS equipment, COMSAR/Circ.32 should be referred. The chair said that he would look for the document and review this section by the IALA ENAV WG3 intersessional meeting in February 2015.

The document was updated as ANNEX 15. The participants also discussed when and how to propose to IMO on the work for the development of performance standard on VDES. Mr. Yoshida explained about the information that should be contained in proposals to be assessed by IMO committees as unplanned outputs. His explanation was made based on ANNEX 16. Then the chair suggested two possible schedules for proposing the work for development of VDES shown in ANNEX 17 and asked participants which schedule would be preferable. Mr. Kautz mentioned that the proposal for the work for VDES development in IMO could justify the frequency allocation for VDES in WRC-15. Mr. Yoshida pointed out that it would be better to make informing and educating presentations on VDES at MSC or NCSR of IMO in order to promote discussion on VDES in IMO.

11 Operational Concept: Harmonization, Coordination and Control of VDES

Application

At the beginning of the discussion, the chair mentioned that some guideline would be required for VDES operation. On this matter, Ms. Carson-Jackson pointed out that the development of such a guideline had already been started within IALA working group. Then, Ms. Browning explained about the working document for the draft IALA guideline [VDES] as a guideline for operational concept for VDES. Mr. Yauchi commented that IALA had already developed a document relating to the agenda as San Francisco Output 02 “Plan for AIS and VHF Data Communication for e-Navigation”.

12. Technical tour

The technical tour to the Tsukuba Space Center of the Japan Aerospace Exploration Agency (JAXA), Tsukuba Ibaraki, was conducted on 4th December 2014. Following the

presentation mainly on the introduction of JAXA's Earth Observation Satellites including the Advanced Land Observing Satellite-2 (ALOS-2), the participants several facilities in the center, which included the operation room for the International Space Station (ISS). Participants were impressed the latest technologies used for space missions conducted by JAXA.

13. Closing of the meeting

The Chair expressed his appreciation to the participants for their contributions to the three continuous workshops including the third workshop. He added that during the three continuous workshops, very fruitful results were achieved by the contributions from the participants. The participants responded by saying that they were most grateful to the JCG and the OPRF for hosting the workshop, especially to the Chair and the secretariat of junior JCG officers for their hard work. The Chair wished everyone a safe journey home and then declared the meeting closed.

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Agenda for the 3rd Workshop on VDES

1. Adoption of agenda
2. Technical Presentations on the development of VDES
3. Testbed Update
4. AIS as a distress device
5. Review of the Working Document toward Draft Recommendation ITU-R M.[VDES]
6. Development of a Working Document toward Preliminary Draft IMO Performance Standard for VDES
7. Operational Concept: Harmonization, Coordination and Control of VDES Application

PARTICIPANTS

Australia	Ms. Jillian CARSON-JACKSON Australian Maritime Safety Authority
Canada	Ms. Margaret Jean BROWNING exactEarth
Finland	Mr. Antti KUKKONEN Furuno Finland OY
France	Mr. Gaëtan FABRITIUS CLS
Germany	Mr. Stefran Karl BOBER German Federal Waterway & Shipping Administration
Japan	Prof. Hayama IMAZU Dr. Junji FUKUTO National Maritime Research Institute Mr. Norimasa ITO Japan Aerospace Exploration Agency Mr. Koichi YOSHIDA Nippon Hakuyohin Kentei Kyokai Mr. Yoshihiko IMADA Japan Radio Co., Ltd Mr. Hiroyasu NAKAGAWA Furuno Electric Co., Ltd. Mr. Ichiya OGINO Furuno Electric Co., Ltd

Mr. Takuo KASHIWA
Furuno Electric Co., Ltd

Mr. Takamasa YAUCHI
Oki Consulting Solutions Co., Ltd

Mr. Koichi NISHIMURA
Tokyo Keiki Inc.

Mr. Hiroshi KUSAMA
Tokyo Keiki Inc.

Mr. Eita Sakai
Tokyo Keiki Inc.

Mr. Noboru MARUOKA
Zeni Light Buoy Co., Ltd

Mr. Shuzo KAWASHITA
Zeni Light Buoy Co., Ltd

Mr. Hidefumi YATOMI
Cubic-i Ltd

Capt. Toshio TAKAHASHI
Japan Coast Guard

Cdr. Hideki NOGUCHI (Chair)
Japan Coast Guard

Capt. Ko IGARASHI
Japan Coast Guard

Capt. Seiko FUKUSATO
Japan Coast Guard

Cdr. Kazuyuki TANAKA
Japan Coast Guard

Lcdr. Kinji TAKEUCHI
Japan Coast Guard

Lcdr. Masatora ONO
Japan Coast Guard

Sweden Mr. Johan LINDBORG
SAAB

United States Mr. William David KAUTZ
United States Coast Guard

Mr. Johnny SCHULTZ
United States Coast Guard

Result of the 1st and 2nd Workshops

Lcdr. Kinji Takeuchi
Japan Coast Guard

- Purpose of the workshop
- Progresses in the 1st and 2nd workshop
- The agenda of the 3rd workshop
- Today's Presentations from experts

- High VDL load (reported in May 2013)
 - Gulf of Mexico 64%
 - Japan 40%
 - Korea 40%
- Future needs for maritime data communication
 - e-Navigation
 - Modernization of GMDSS

- Purpose
 - To make a draft performance standard on the Next Generation AIS
- Plan
 - 1st Workshop: concept of the next generation AIS
 - 2nd Workshop: technical details
 - 3rd Workshop: performance standard

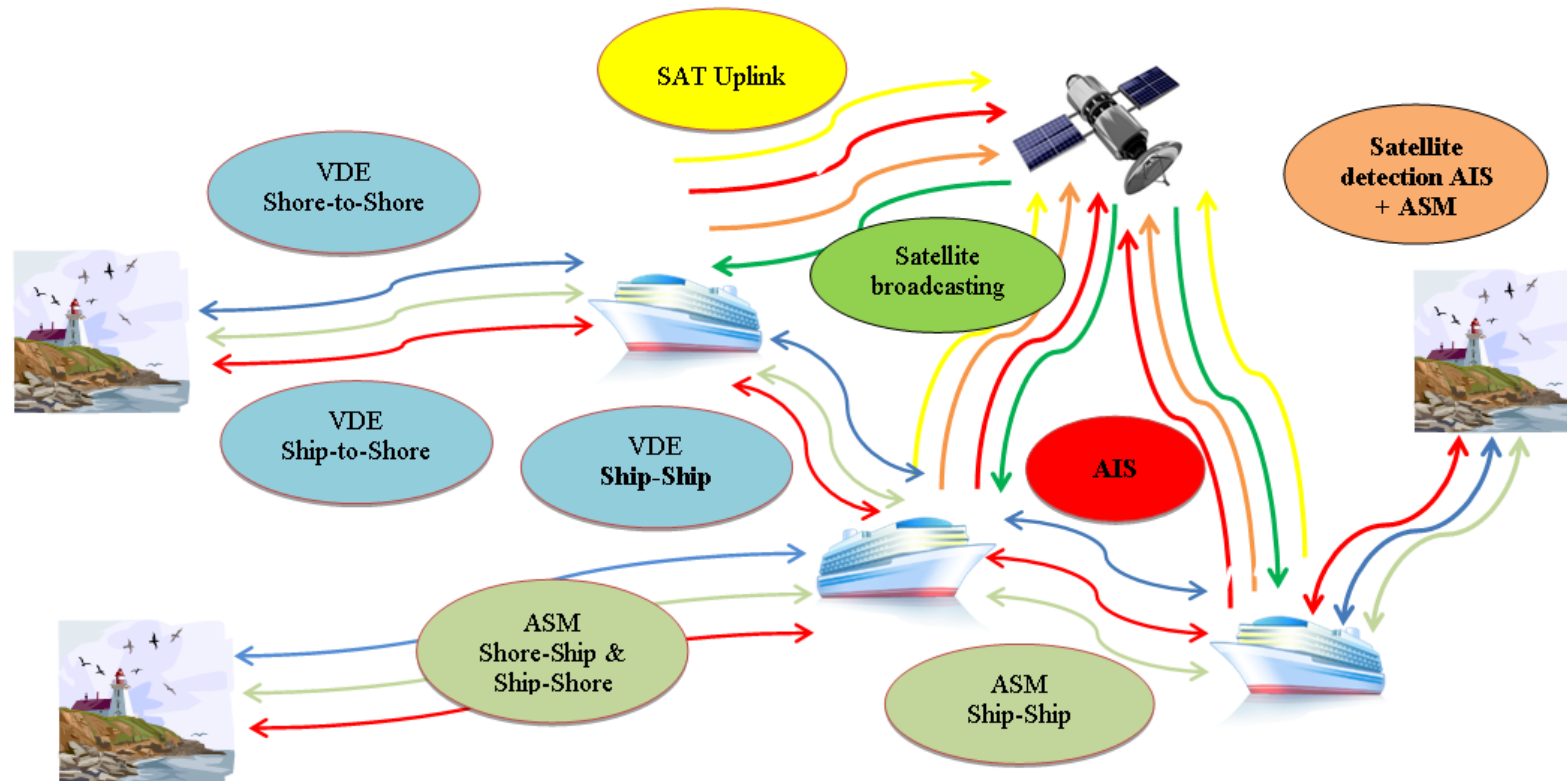
- Purpose of the workshop
- Progresses in the 1st and 2nd workshop
- The agenda of the 3rd workshop
- Today's Presentations from experts

- Name:
 - The 1st workshop on International Standardization on Next Generation AIS
- Date:
 - 3rd - 7th December, 2012
- Venue:
 - Nippon Zaidan Building
- Participants:
 - 26 experts from 6 countries



- 1st Workshop
 - developed the concept of VHF Data Exchange System (VDES) as the next generation AIS.
 - The name “VDES” has been used in ITU, IMO and IALA.
 - triggered development of prototype radio for VDES.

- VDES = AIS + Application Specific Messages (ASM) + VHF Data Exchange (VDE)
- VDES has terrestrial and satellite components



- Name:
 - The 2nd workshop on International Standardization on Next Generation AIS
- Date:
 - 20th - 24th January, 2014
- Venue:
 - Nippon Zaidan Building
- Participants:
 - 37 experts from 10 countries



- Agenda
 - Development of VDE Radio
 - Terrestrial VDES
 - Satellite VDES
 - Application and Data Volume
 - Authentication and Encryption
 - Test bed

- The 2nd workshop
 - has accelerated the studies, researches, and tests for developing international standard on VDES.
 - triggered to share the result of field tests in IALA
 - has made an agreement on the importance of user requirements and operational concept
- The results were reported to IALA



High Expectations for the 3rd workshop

- Purpose of the workshop
- Progresses in the 1st and 2nd workshop
- The agenda of the 3rd workshop
- Today's Presentations from experts

- Technical presentations
- Test bed
- AIS as a distress device
- Updating ITU-R M.[VDES]
- Performance Standard on VDES
- Operational concept

- Purpose of the workshop
- Progresses in the 1st and 2nd workshop
- The agenda of the 3rd workshop
- Today's Presentations from experts

- VHF Data Exchange System (VDES) ITU-R WRC-15 AGENDA ITEM 1.16 (Mr. William Kautz)
- The development of VHF Data Exchange System (Mr. Stefan Bober)
- Challenges for VDES (Ms. Margaret Jean Browning)
- Development of VDES slot simulator (Mr. Hiroyasu Nakagawa)
- VDES Channel Sounding Campaign in Japan (Mr. Yoshihiko Imada)
- Expectations for VDES (Ms. Jillian Carson-Jackson)

Result of the 1st and 2nd Workshops

Lcdr. Kinji Takeuchi
Japan Coast Guard



VHF DATA EXCHANGE SYSTEM (VDES)

ITU-R WRC-15 AGENDA ITEM 1.16



Bill Kautz – U.S. Coast Guard
Telecommunications Manager

Discussion



- WRC-15 Agenda Item 1.16
- ITU-R WP5B - VHF Data Exchange VDES
- ITU-R VDES Recommendation
- ITU-R VDES Reports
- ITU-R WP5B - Conference Preparatory Meeting (CPM) Situation
- WRC-18 Future Maritime Agenda Items

WRC-15 Agenda Item 1.16

- *1.16 to consider regulatory provisions and spectrum allocations to enable possible new Automatic Identification System (AIS) technology applications and possible new applications to improve maritime radiocommunication in accordance with Resolution **360 (WRC-12)**;*



WRC-12 Resolution 360 Resolves to invite WRC-15

- 1 to consider, based on the results of ITU-R studies, modifications to the Radio Regulations, including possible spectrum allocations, to enable new AIS terrestrial and satellite applications, while ensuring that these applications will not degrade the current AIS operations and other existing services;
- 2 to consider, based on the results of ITU-R studies, additional or new applications for maritime radiocommunication within existing maritime mobile and mobile-satellite service allocations, and if necessary to take appropriate regulatory measures



ITU-R Working Party 5B

VHF Data Exchange System (VDES)

- Significant support internationally at ITU to protect the AIS VDL and as a VHF Data solution
- Concept includes:
 - AIS 1 and 2 (Navigation – as originally intended)
 - AIS (channels 75 & 76) (Satellite – space detection of AIS)
 - ASM 1 and 2 (Application Specific Messages, MSI)
 - VHF Data Exchange (VDE) General Data, *Channels 24, 84, 25, 85, 26, 86*
 - Regional VDE Capability, *Channels 80, 21, 81, 22, 82, 23, 83*

*Regional VDE Capability desired in Regions 1 & 3

**Potential for future Distress capabilities

VDES Draft New Recommendation

- Preliminary Draft New Recommendation
ITU-R M.[VDES]
 - Under development (IALA/ITU 5B)
 - Expect approval by ITU-R July 2015
 - Necessary to support VDES at WRC-15

VDES REPORTS

- M.2287 Automatic Identification System VHF data link loading
- Working document towards a preliminary draft new Report ITU-R M.[CHANNEL SOUNDING] – VDES channel sounding campaign
- Preliminary draft new Report ITU-R M.[VDES SELECT] – Selection of the channel plan for a VHF data exchange system VDES) under WRC-15 agenda item 1.16
- Preliminary draft new Report ITU-R M. [AIS.PROTECTION] – Technical assessment of RR Appendix 18

VDES [SELECT] CHANNEL PLANS

- **Channel Plan A**

- VDE receives on upper leg frequencies, allows for protection from ship's voice communications
- Allows AIS and VDE to be co-located for shore applications using Co-Site Mitigation Systems
- Requires some level of integration with AIS system

- **Channel Plan B**

- VDE receives on lower leg frequencies, subject to interference from ship's voice communications
- Allows AIS and VDE to be co-located for shore applications using Co-Site Mitigation Systems
- Little integration with AIS system required

- **Channel Plan C**

- VDE receive on lower leg frequencies, subject to interference from ship's voice communications
- No Co-Site issues for AIS and VDE co-located for shore applications
- No integration with AIS system required

- **Channel Plan D**

- Does not allow for Co-Site Mitigation Systems for shore applications
- Required modification to ITU-R M.1842-1
- Proposes alternate regional channels

AGENDA ITEM 1.16 (CPM SITUATION)

- Because of the complexity, four issues have been identified to develop methods to satisfy the agenda item (Issues: A, B, C, D)
 - Issue A – ASM
 - Issue B – Terrestrial
 - Issue C – Satellite
 - Issue D – Regional
- For each of these issues one or two methods have been developed (e.g. Method A1, A2).
- The issues are complementary to each other.

Issue A: Application specific messages

- **Method A1** - identifies the channels 2027 and 2028 of RR Appendix 18 for the application specific message (ASM) not necessary for the safety of navigation and ensure protection of AIS1, AIS2, 2027 and 2028 by not allowing ships to transmit on channels 2078, 2019, 2079 and 2020.
- **Method A2** - identifies alternate channels 87 and 88 for the ASM channels and ensures the protection of AIS 1 and AIS 2 by power limitation on channels 2078, 2019, 2079 and 2020.

Issue B: New applications for the maritime radiocommunication (terrestrial component)

- **Method B1** - identifies the channels 24, 84, 25, 85 for the terrestrial component of the VDES.
- **Method B2** - identifies the possibility to use the channels 24, 84, 25, 85, 26, 86 for the terrestrial component of the VDES.

Issue C: New applications for the maritime radiocommunication (satellite component)

- **Method C1** - identifies a secondary allocation for the maritime mobile-satellite service (MMSS) (Earth-to-space) on the VDES channels 1024, 1084, 1025, 1085, 1026, 1086, 2027 and 2028. It also identifies a secondary allocation for the MMSS (space-to-Earth) on the VDES channels 2024, 2084, 2025, 2085, 2026, 2086.
- **Method C2** - identifies the frequency band 148 150 MHz (Earth-to-space) for the VDES satellite uplink, which is currently allocated to the mobile satellite service. It also identifies the frequency band 137-138 MHz (space-to-Earth) for the VDES satellite downlink, which is currently allocated to the mobile satellite service. No additional allocations or RR changes are required.

Issue D: VDES regional solution

- **Method D** - provides a regional VDES solution, utilizing channels 80, 21, 81, 22, 82, 23 and 83.

CPM SITUATION	Transmitting frequencies (MHz) for ship and coast stations		
	Ship stations (ship-to-shore) Ship stations (long range AIS) Ship stations (ship-to-satellite)	Coast stations Ship stations (ship-to-ship) (Satellite-to-ship)	
Channel number in RR Appendix 18			
AIS 1	161.975	161.975	 AP18 Approved for AIS
AIS 2	162.025	162.025	
75 (long range AIS)	156.775 (ships are Tx only)	N/A	
76 (long range AIS)	156.825 (ships are Tx only)	N/A	
2027 (ASM 1)	161.950 (2027)	161.950 (2027)	 CPM Method A1
2028 (ASM 2)	162.000 (2028)	162.000 (2028)	
Option 2			
87 (ASM 1)	157.375 (87)	157.375 (87)	 CPM Method A2
88 (ASM 2)	157.425 (88)	157.425 (88)	
24	157.200 (1024)	161.800 (2024)	 CPM-VDE B1 24,84,25,85 B2 24,84,25,85 ,26,86
84	157.225 (1084)	161.825 (2084)	
25	157.250 (1025)	161.850 (2025)	
85	157.275 (1085)	161.875 (2085)	
26	157.300 (1026)	161.900 (2026)	
86			

Regional VDE (Regions 1 and 3)

Ship transmit	1080 157.025	1021 157.050	1081 157.075	1022 157.100	1082 157.125	1023 157.150	1083 157.175
Ship receive	2080 161.625	2021 161.650	2081 161.675	2022 161.700	2082 161.725	2023 161.750	2083 161.775
	Can be used separately and/or as 50 kHz channel(s) or as one 100 kHz channel					Can be used separately or as one 50 kHz channel	
	NOTE – The VHF channels shown above are a contiguous set in RR Appendix 18. They comprise a contiguous frequency block, and thus are amenable to protection by a single selective filter in the receiver.						

Future Maritime Agenda Items for WRC-19

WRC-12 Resolution 359 - Consideration of regulatory provisions for modernization of the Global Maritime Distress and Safety System and studies related to e-navigation. *Resolves*

1. *to invite WRC-18 to consider possible regulatory actions, including spectrum allocations based on the ITU-R studies, to support GMDSS modernization;*
2. *to consider possible regulatory actions, including spectrum allocations based on the ITU-R studies, for maritime mobile service supporting e-navigation*

**Subject to change at WRC-15*

***IMO no longer supports these Agenda Items*

- Europe has introduced plans for a new agenda item to designate a maritime channel for innovative devices

Thank You!



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Challenges for VDES Development

Key Messages

- Technical Challenges –
 - Channel Plan challenges;
 - Ship side installation challenges;
 - Shore side installation challenges ;
- Political Challenges –
 - Within the IMO;
 - Within ITU;
- Why is it worth the fight?
 - Polar communications
 - Health Monitoring for ships;
 - Weather reporting from ships;
 - GMDSS Modernization;
 - World-wide VTS management;

Technical Challenges Ahead

CHANNEL PLAN MUST SUPPORT THE FOLLOWING:

- SAR Communications
- Broadcast of Marine Safety Information and Temporary/Preliminary Notice to Mariners
- Automated Reporting (IMO FAL forms)
- VTS Service Portfolio
- Download of updated digital publications
- Route Exchange Ship to Ship

While considering the following...

- CHANNEL PLAN MUST MINIMIZE INSTALLATION COSTS ON SHIP AND SHORE
- CHANNEL PLAN MUST ALLOW FOR SAT-UP AND SAT-DOWN WHILE MINIMIZING INTERFERENCE ON SHIP/SHORE AND WITH LAND MOBILE

Technical Challenges Ahead

- Ship Installation Challenges
 - Antenna placement – How many?
Where?
 - Antenna farms are already crowded – VDES must minimize impact;
 - Interference with existing analog communication equipment
 - On-board interfacing with existing displays and navigation equipment



Technical Challenges Ahead

- Shore Installation Challenges
 - Costs for Installation – Filters?
 - Interference with existing analog communication equipment
 - Interfacing with existing monitoring and control systems;



Political Challenges

- IMO Challenges
 - Must tie VDES requirements to e-Navigation needs;
 - No mandate anticipated;
 - e-Navigation must prove its commercial advantages;
 - e-Navigation success will hinge on ease of cost, installation and use of VDES equipment;

Political Challenges

- ITU Challenges
 - Alternate Channel Plans still under consideration;
 - World-wide availability of all channels – will regional channels be required?
 - ITU needs proof of need;
 - Trial Programs are a necessity;
 - Trial Programs involving VDES sat-down;
 - Proliferation of AIS devices for non-standard uses ;

Why is it worth the fight?

Polar Communications



Why is it worth the fight?

Health and Maintenance Monitoring



Why is it worth the fight?

True world-wide weather



Why is it worth the fight?

World-wide VTS



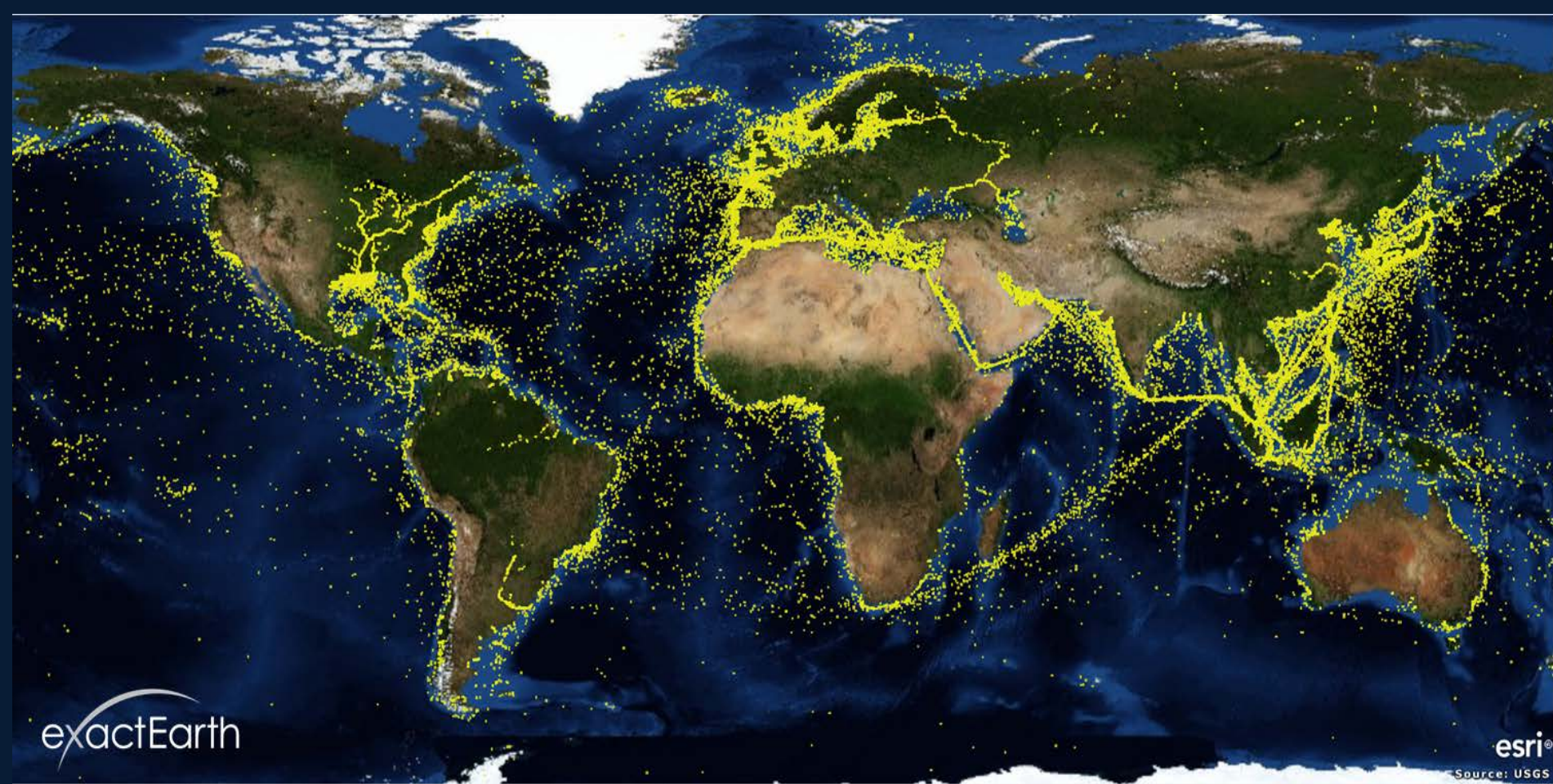
Why is it worth the fight?

GMDSS Modernization



Thank You!

Peggy Browning
email: peggy.browning@exactearth.com



www.exactearth.com

exactEarth®

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The 3rd

JCG

VDES TOKYO WORKSHOP

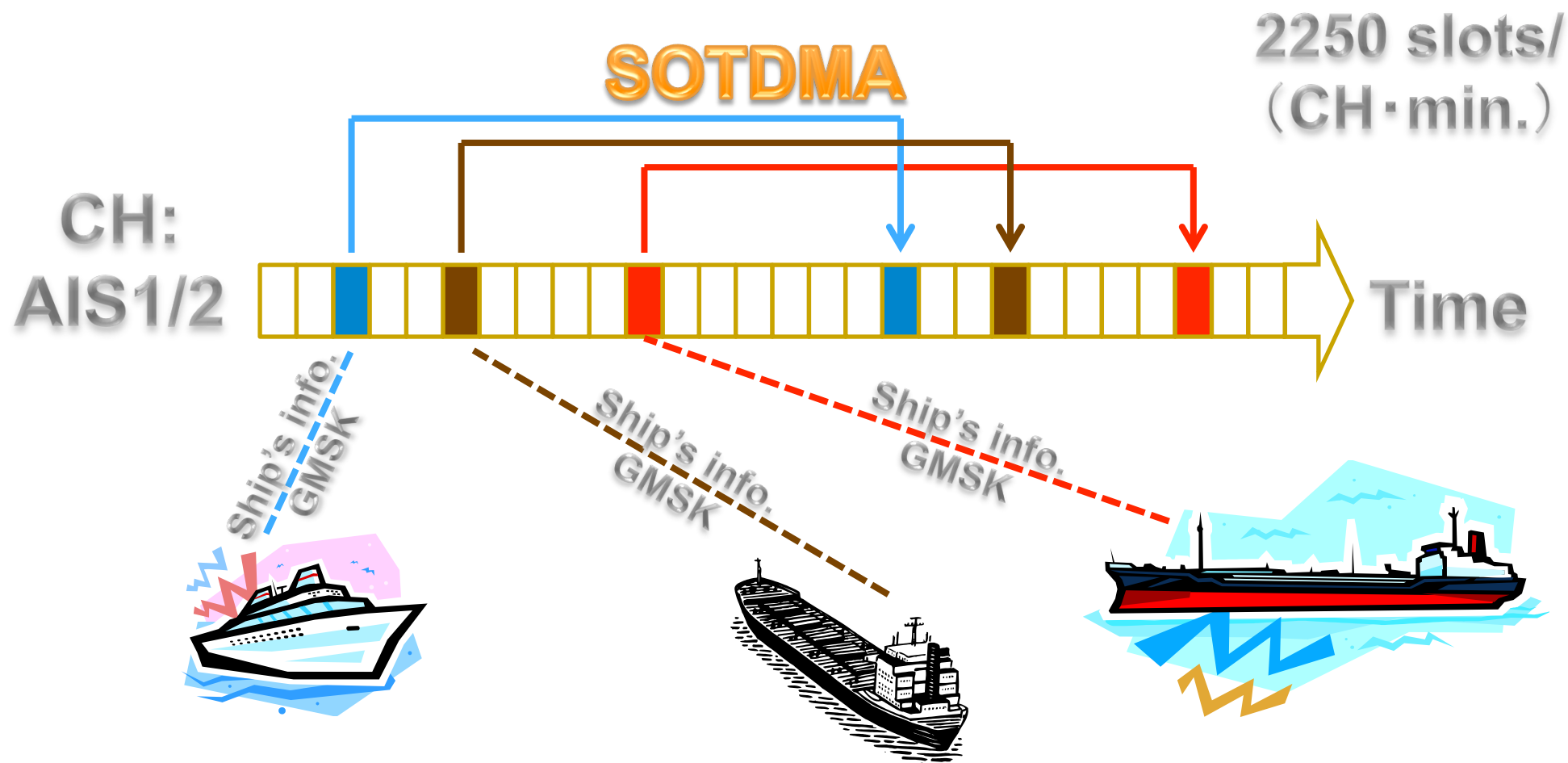
Development of VDES simulator

1 December 2014

1. Channels

Principle of AIS

➤ AIS (Class A)



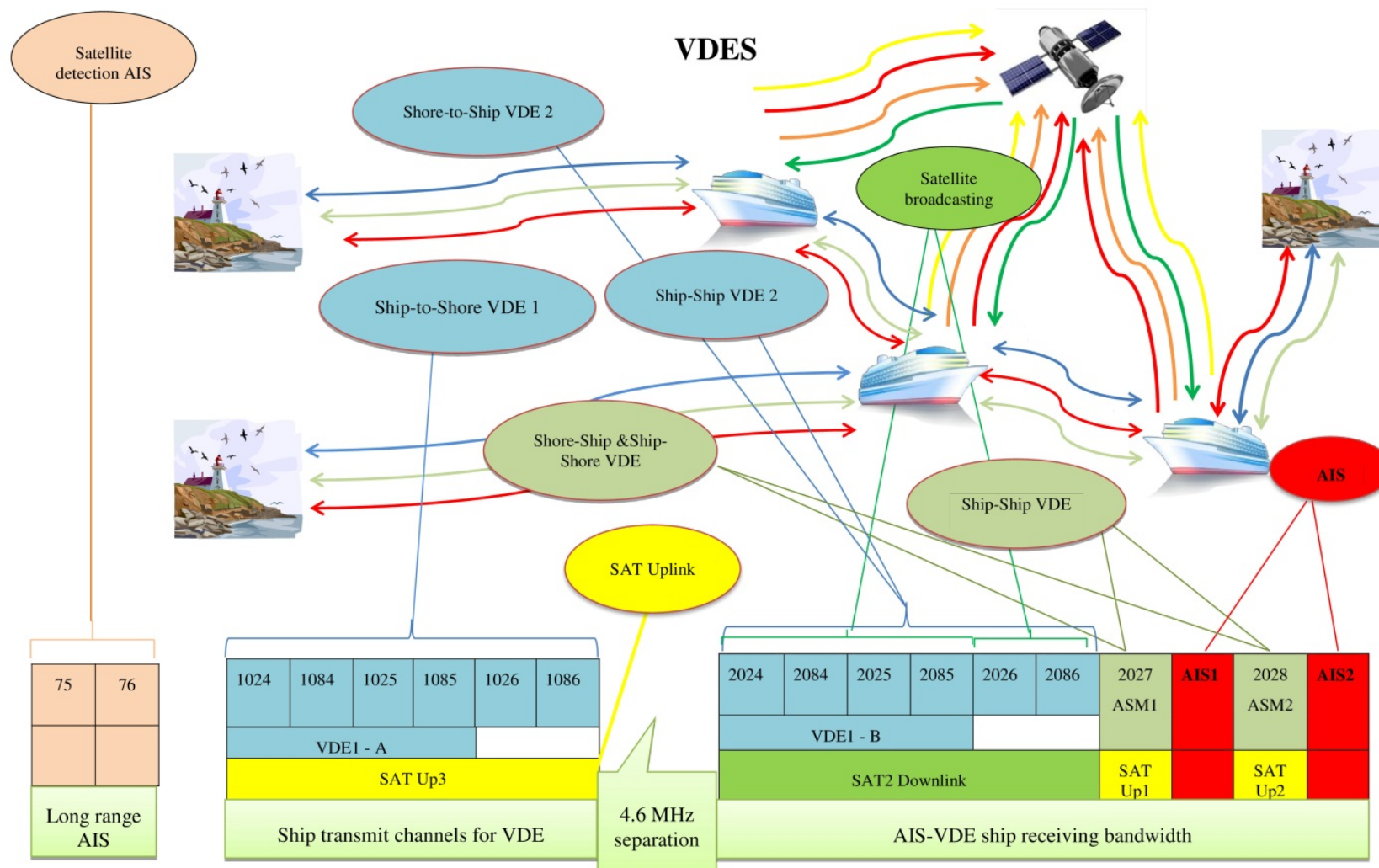
VDES

◆ VDES channel formula

$AIS1/2$ (Original AIS)
+ $ASM1/2$ (Application Specific Messages)
+ $VDEx/SATx$ (VHF Data Ex./SATellite link)

= $VDES$: VHF Data Exchange System

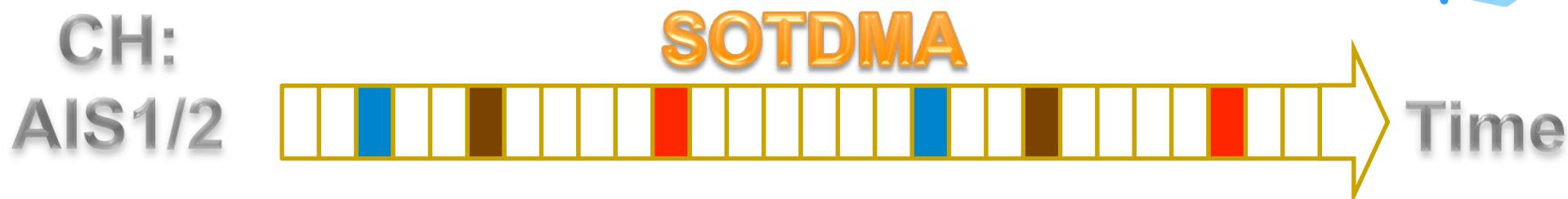
Figure of VDES (ITU-R Recommendation M.[VDES])



2. Slot map

Slot map of an AIS station

- Slot map for CH AIS1/2.



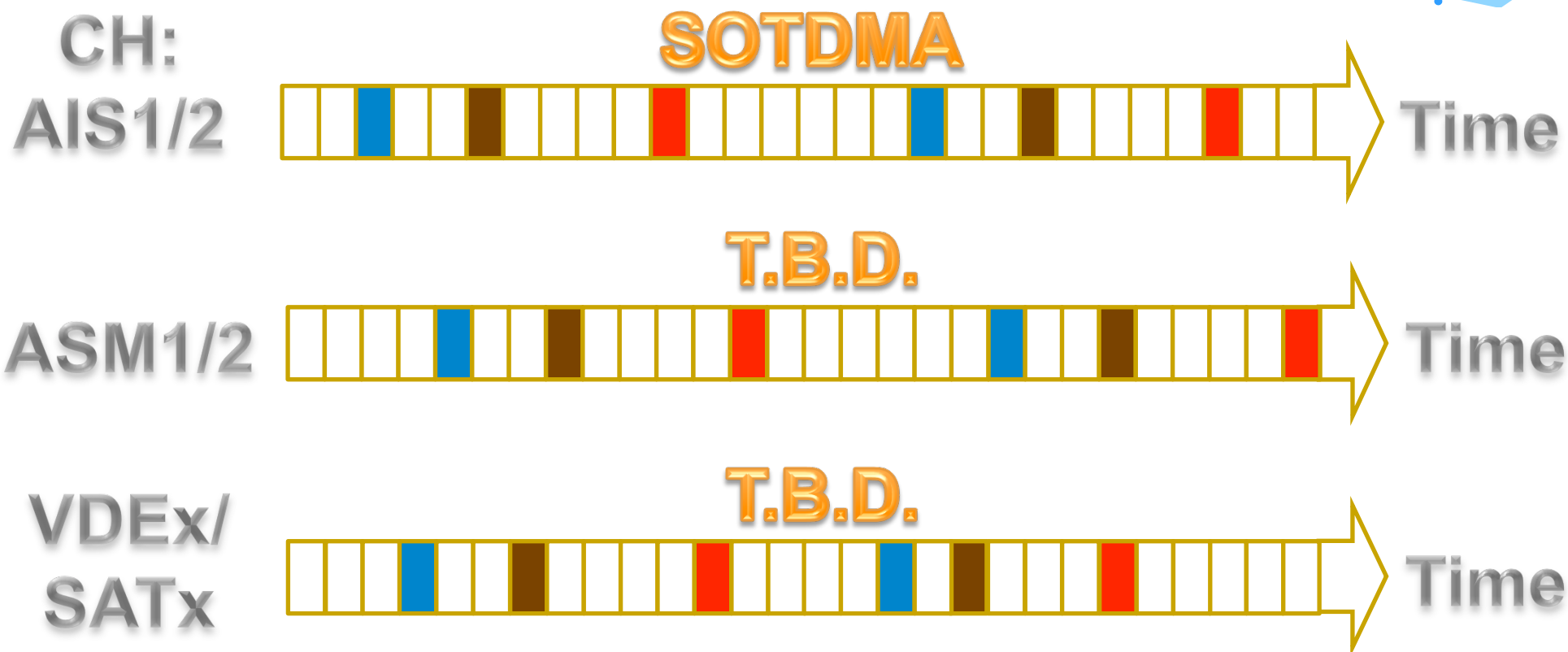
: Slots for own TX



: Slots for the other vessel's

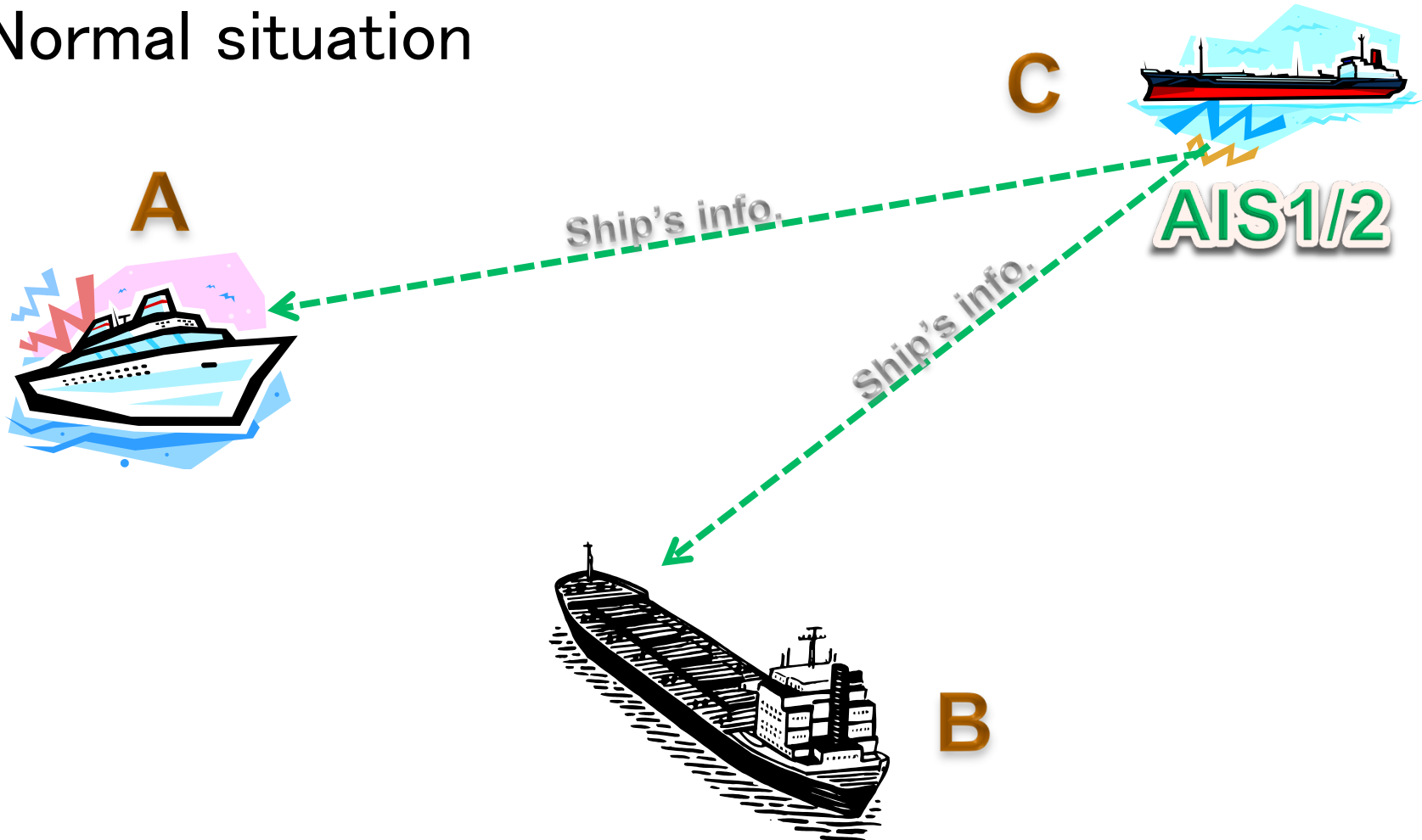
Slot maps for a VDES station

- Slot maps for each channel.



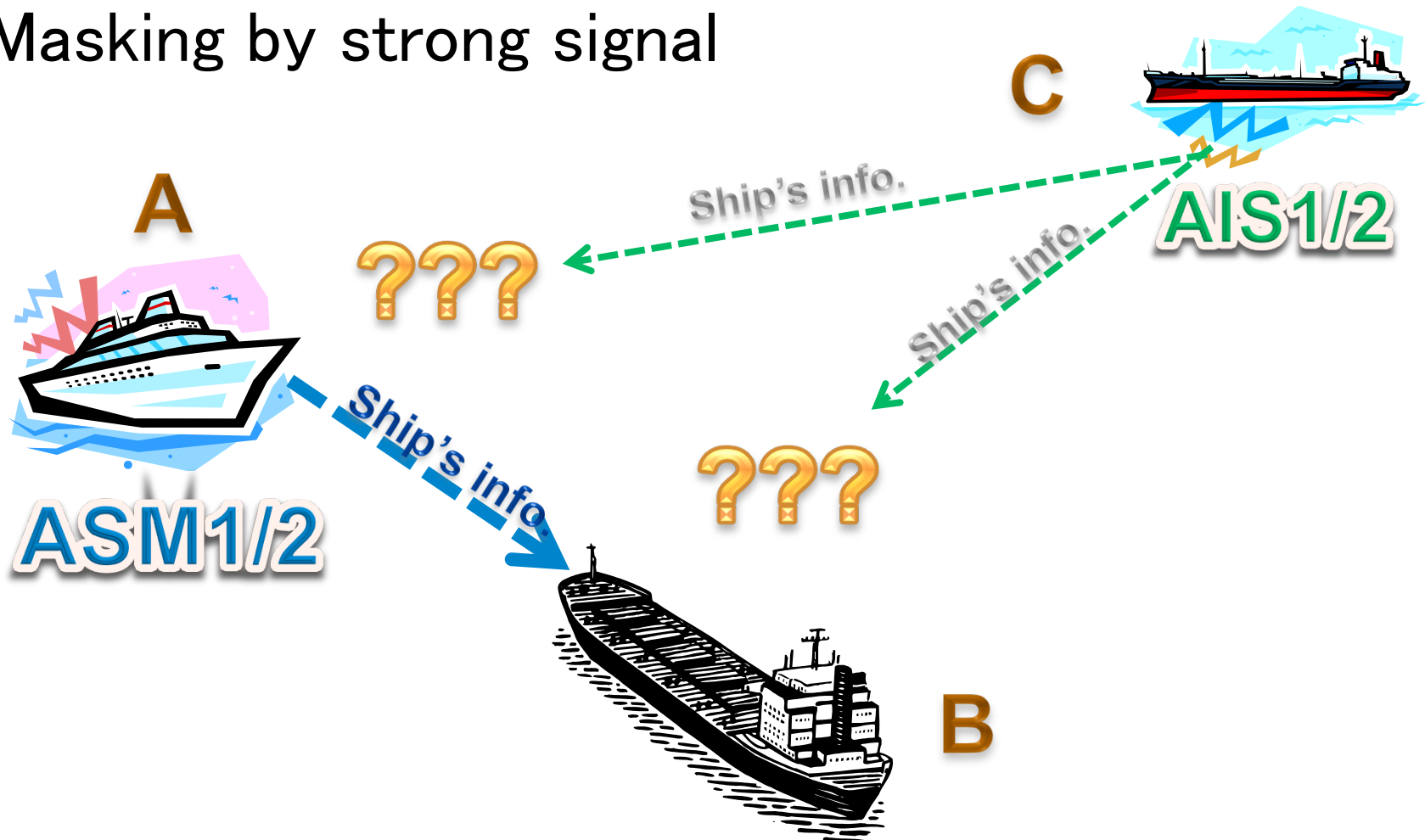
Signal masking

➤ Normal situation



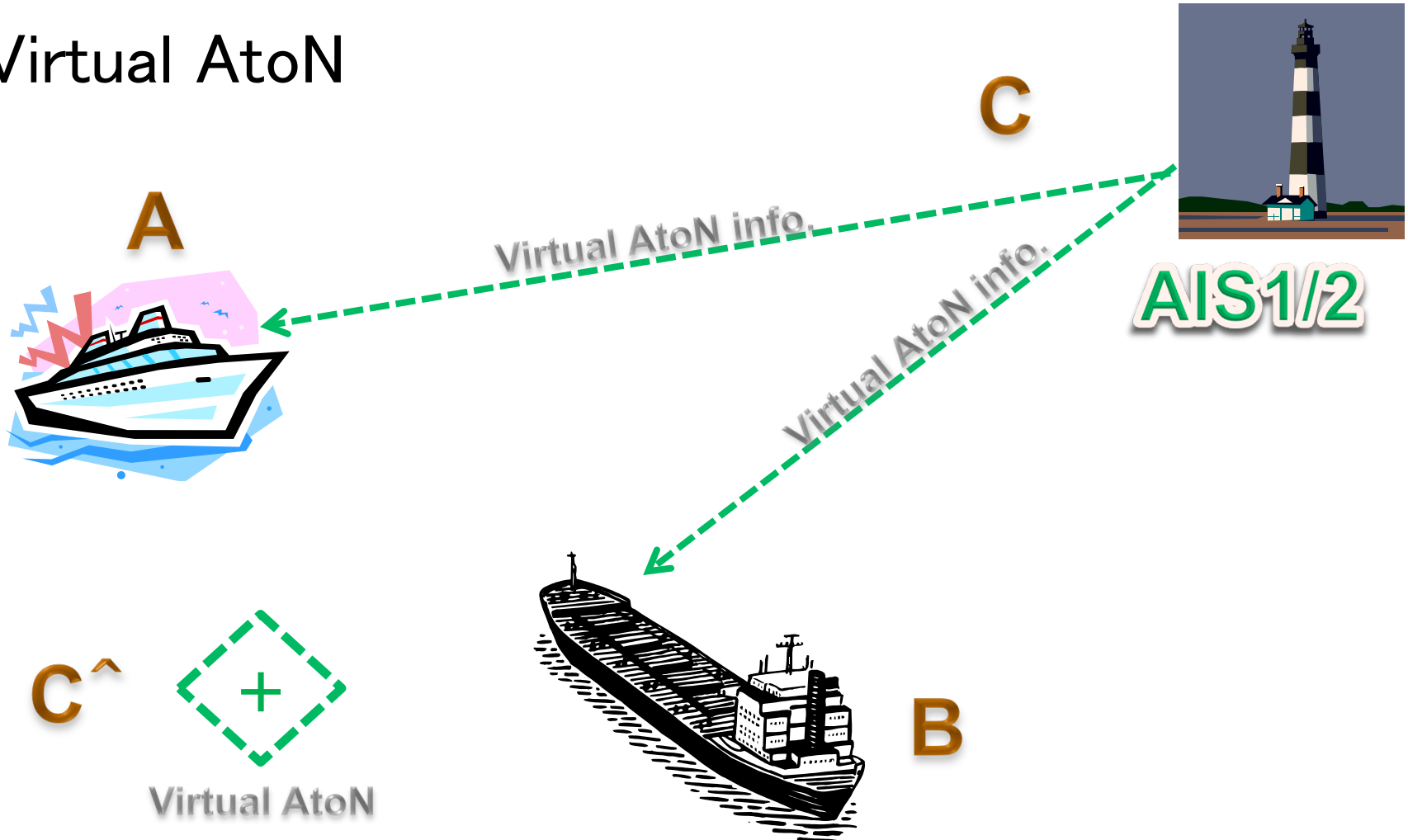
Signal masking

➤ Masking by strong signal



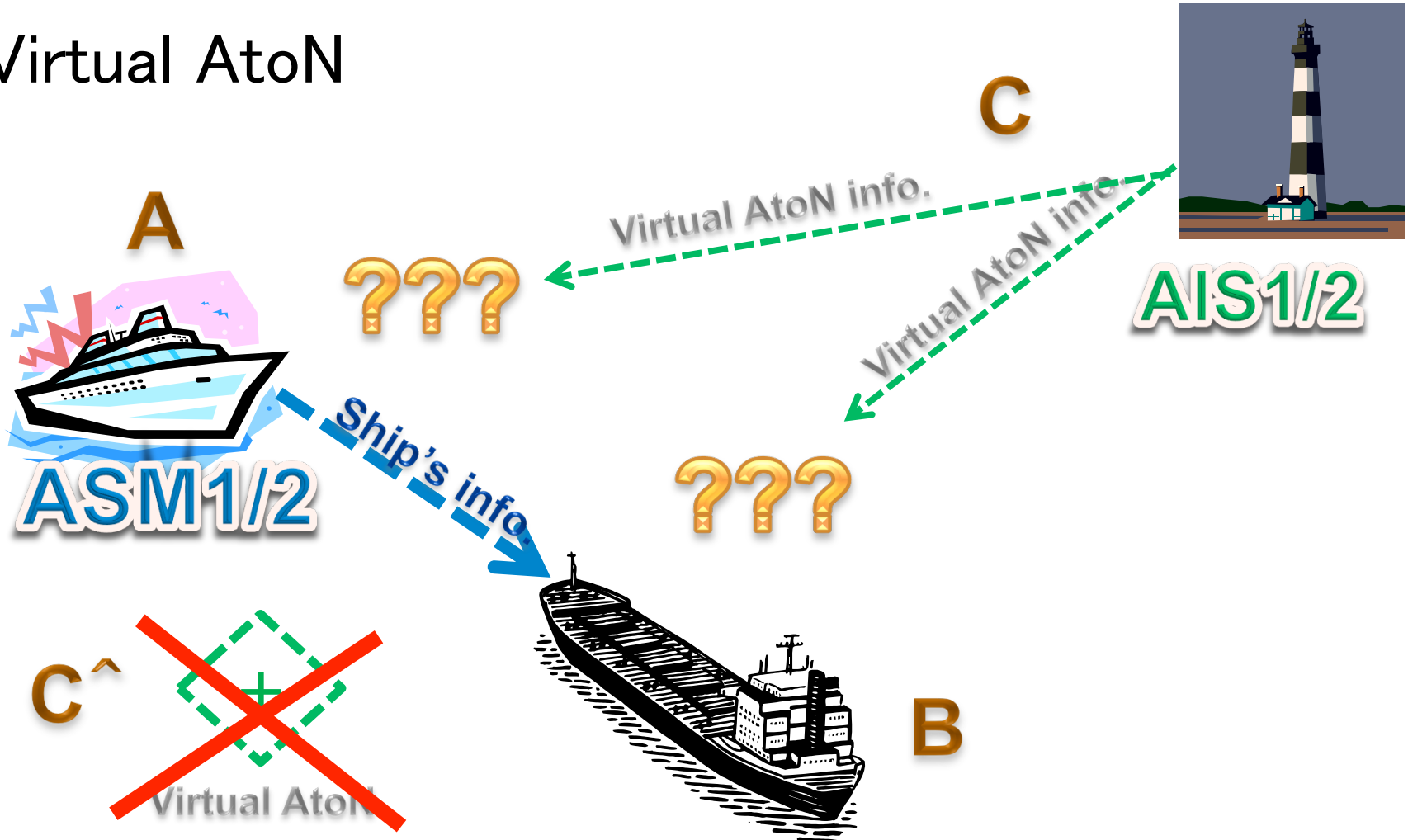
Signal masking

➤ Virtual AtoN



Signal masking

➤ Virtual AtoN



What is the best way of allocating VDES slot?

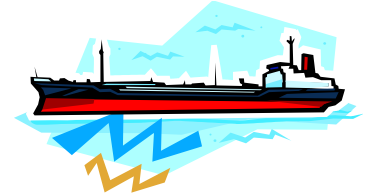
➤ How could we find the best way?



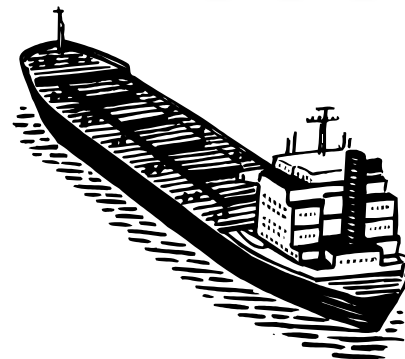
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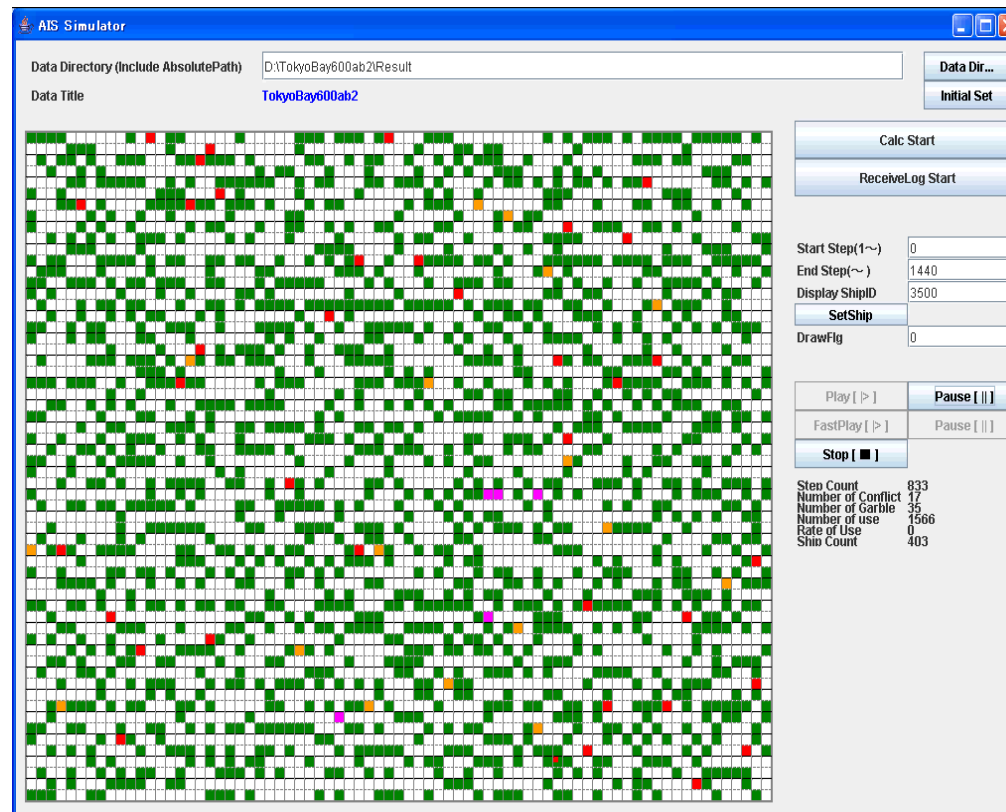


B

3. Development of a VDES simulator

VDES simulator development

◆ A snapshot of AIS simulator

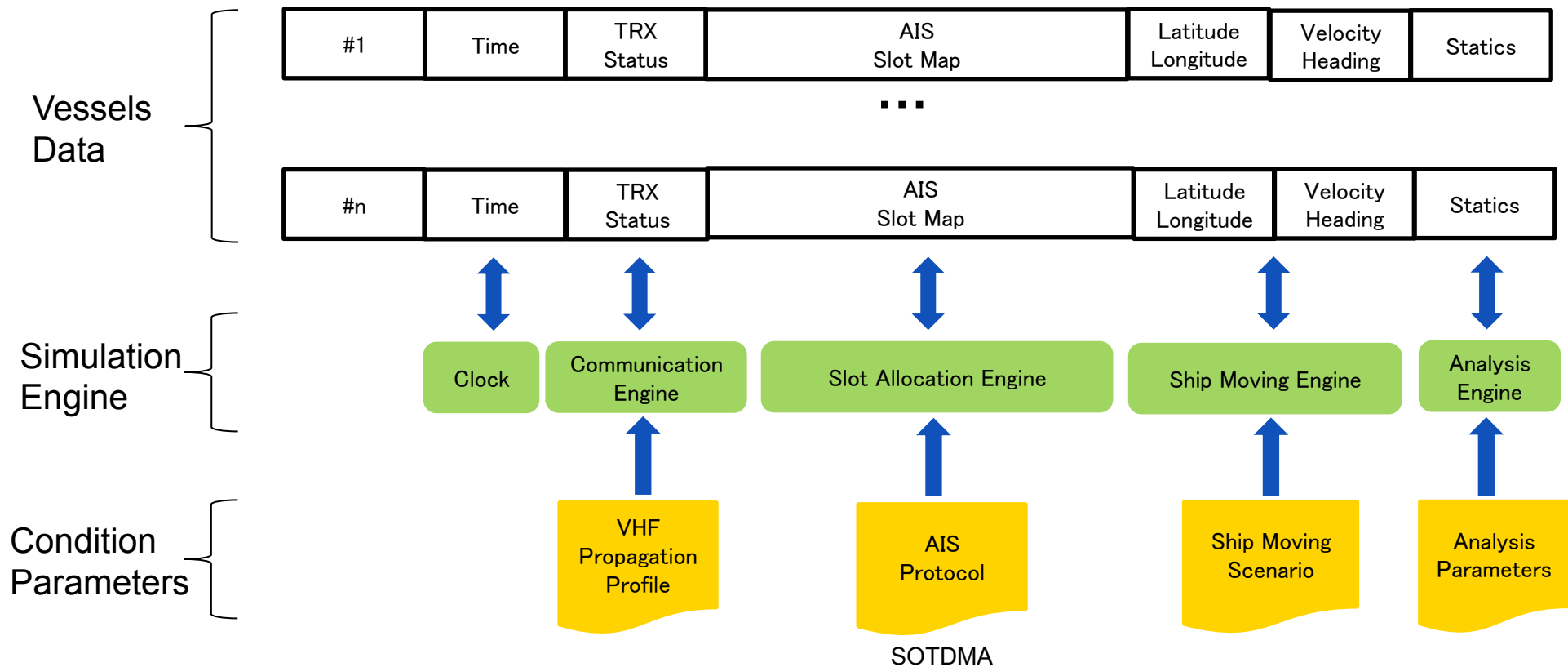


K.Hata, K.Hasegawa, K.Niwa, and H.Fukuda: AIS Simulator and ITS Applications, 48th International Symposium ELMAR-2006 focused on Multimedia Signal Processing and Communications pp.223~226, 2006

K. Hasegawa, K. Hata, K. Niwa, and J. Fukuto: Transmission Evaluation of Ship-borne Automatic Identification System (AIS) in Congested Waterways, The 8th International Conference on ITST, pp.18-23, Phuket, Thailand, Oct.22-24, 2008.

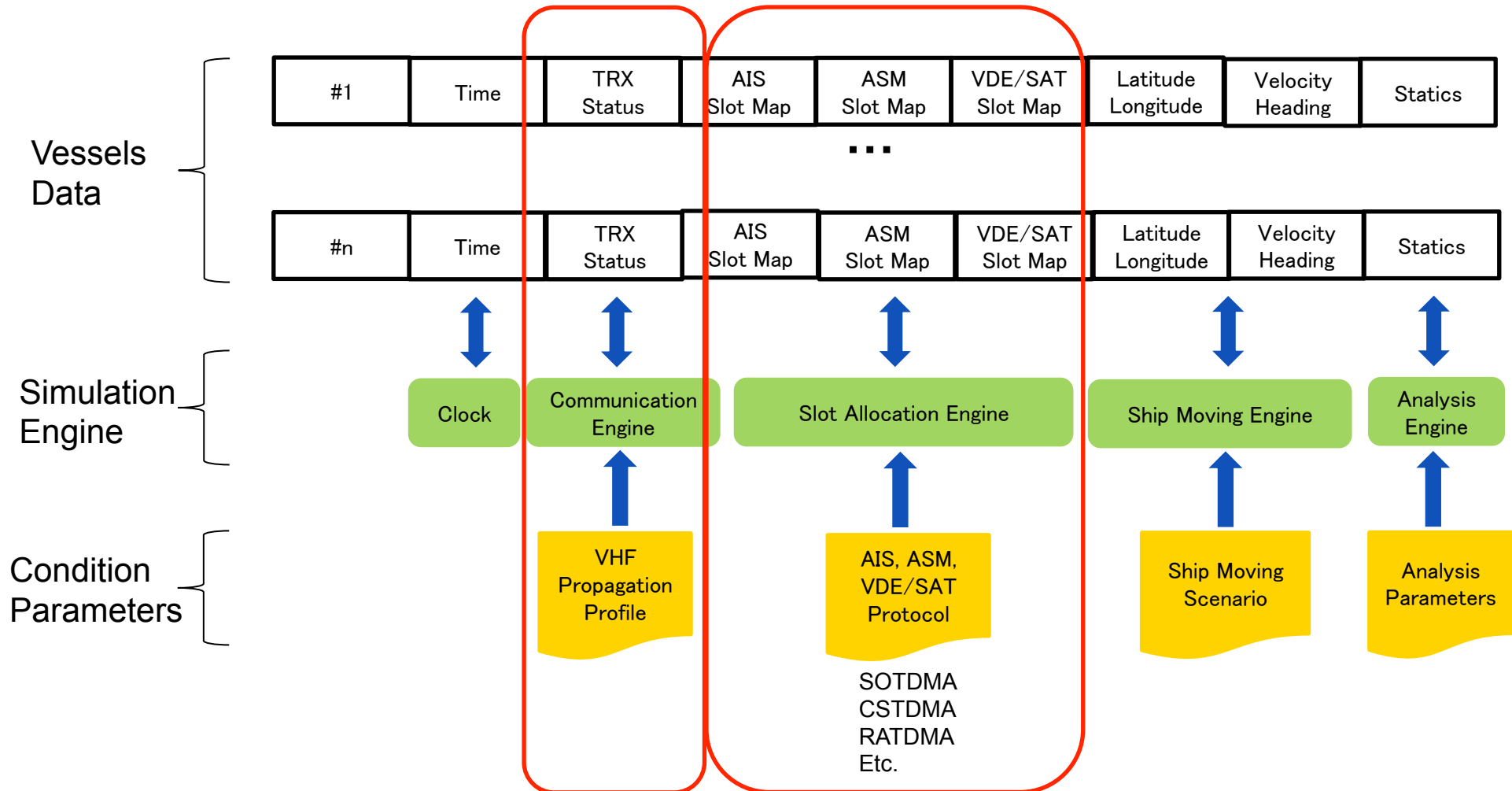
VDES simulator development

◆ AIS Simulator Architecture



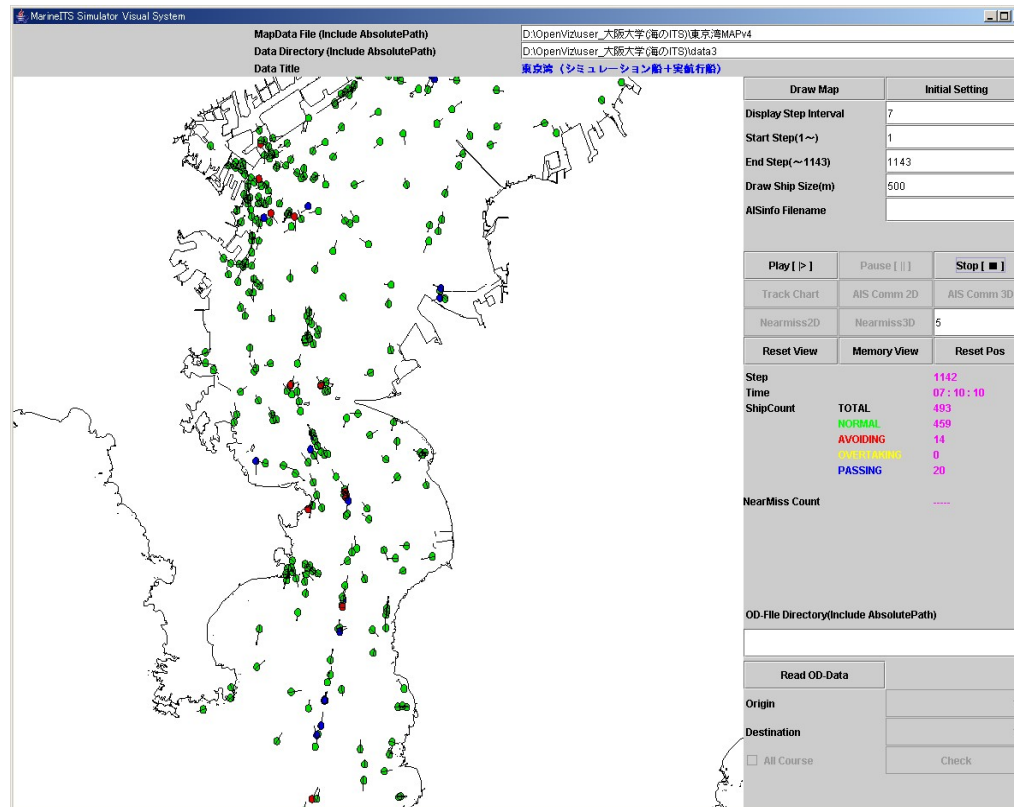
VDES simulator development

◆ VDES Simulator Architecture



VDES simulator development

◆ A snapshot of Marine Traffic Simulator

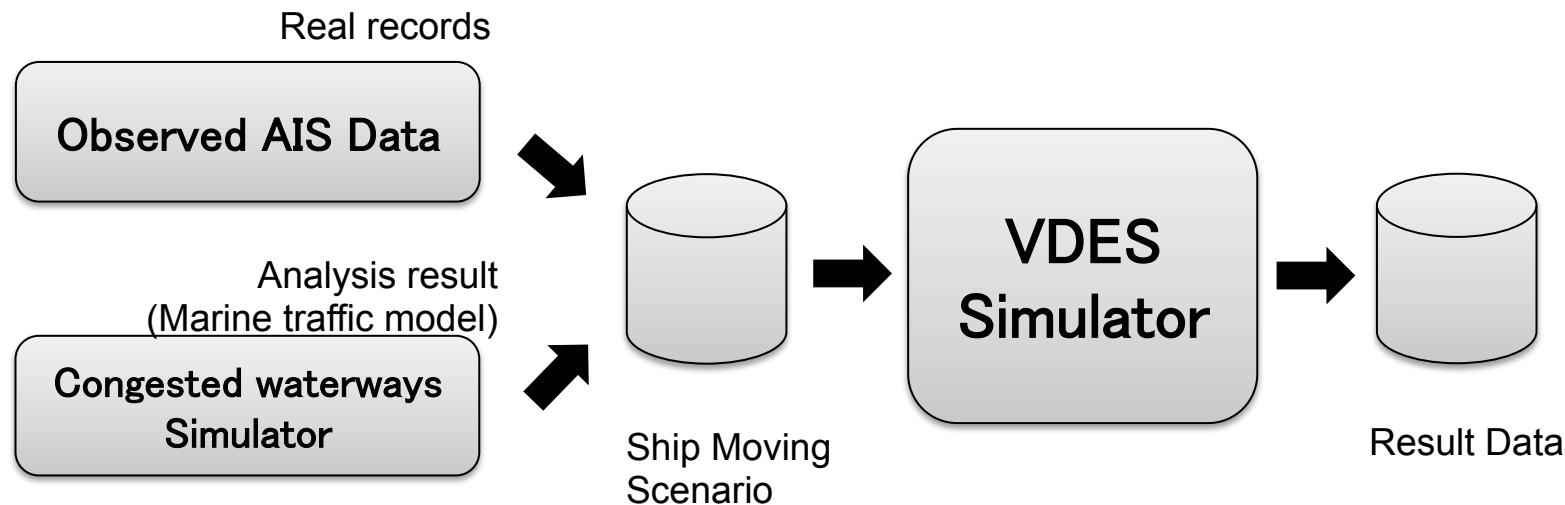


K.Hata, K.Hasegawa, K.Niwa, and H.Fukuda: AIS Simulator and ITS Applications, 48th International Symposium ELMAR-2006 focused on Multimedia Signal Processing and Communications pp.223~226, 2006

K. Hasegawa, K. Hata, K. Niwa, and J. Fukuto: Transmission Evaluation of Ship-borne Automatic Identification System (AIS) in Congested Waterways, The 8th International Conference on ITST, pp.18-23, Phuket, Thailand, Oct.22-24, 2008.

VDES simulator development

◆ Simulation of VDES performance



VDES simulator development

◆ Simulation of VDES performance

- To find the most effective slot allocation/access scheme.
- To minimize the influence on the other channels.

◆ Parametric analysis

- Slot allocation/access schemes (SOTDMA, RA/CSTDMA, etc)
- Modulation schemes (GMSK, QAM, PSK, etc)
- Radio wave propagation (multipath, sea reflection, etc.)
- Number of Ships
- Status of ships (Position, COG, SOG, etc···)

4. Summary

Summary

- The VDES detailed technical specification is under consideration.
- These VDES channels (ASM_x, VDE_x, SAT_x) are adjacent to existing AIS channels, and thus it is necessary to examine mutual interference matter carefully.
- Furuno starts developing a VDES simulator to resolve these problems. With various parametric analysis, Furuno intends to contribute to the development of VDES specifications.

The 3rd
JCG
VDES TOKYO WORKSHOP

Thank you!

20 January 2014

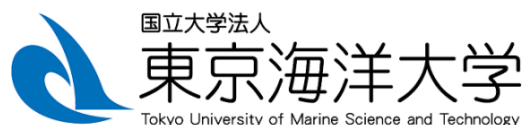
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Development of VHF Data Exchange System(VDES)

~ VDES Channel Sounding Campaign in Japan ~

Third Workshop on
International Standardization of VDES

1-5 Dec. 2014



Japan Radio Co., Ltd.

Contents

1. Introduction

2. The problem of mobile data communications

2-1. Typical problems

2-2. Influence over received signal (multipath fading)

3. Measurement environment

3-1. Measurement candidate site

3-2. Measurement places

3-3. Measurement environment

4. Result

4-1. Tokyo Bay (Urban)

4-2. Tokyo Bay (Urban: Coast industrial area)

4-3. Yokohama Bay (Urban)

4-4. Odoi Swimming Beach (Coast)

4-5. Heda Fishing Port (Cove)

5. Conclusion

6. Future plan

1. Introduction

VDES is the key technology of short-range data communication in maritime mobile service.

VDES will be achieved as global coverage service by VDES satellite system.

However, it is difficult to find the examination result of radio propagation for VHF data communication on the sea.

*Reference: Report ITU-R M.2317 (will be published)
- VHF data exchange system channel sounding campaign -*

2-1. Typical Characteristics

Problems affecting the performance are receiving signal variation due to the surrounding environment and own movement. Types of variation are as follows.

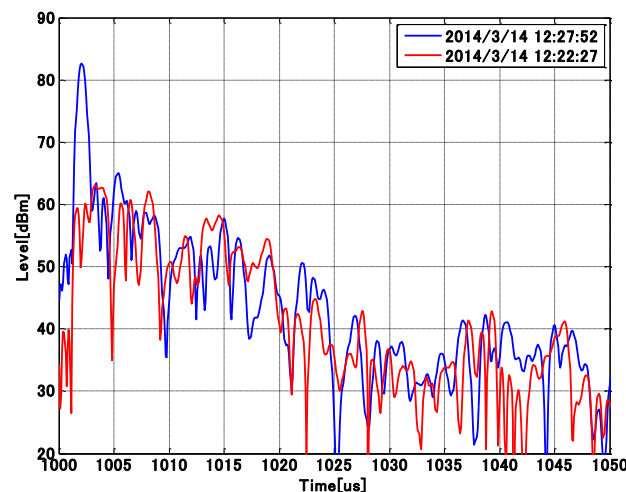
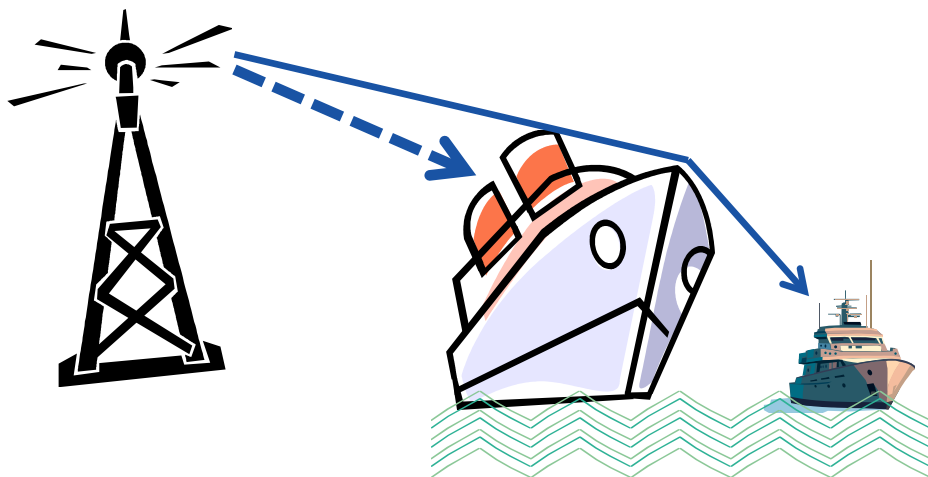
- 1) Distance decay
Propagation loss is increased and decreased according to the distance between TX and RX antenna.
- 2) Shadowing
Diffraction of radio waves by obstacles
- 3) Multipath fading
Synthesis of direct, reflected and diffracted waves

Items that have to consider in terms of mobile communication are 2) and 3).

2) Shadowing

By the direct wave is shielded, the received level is significantly reduced by diffraction .

This phenomenon relate to the motion of own ship or surrounding environment, and the received level is randomly varied over long periods.



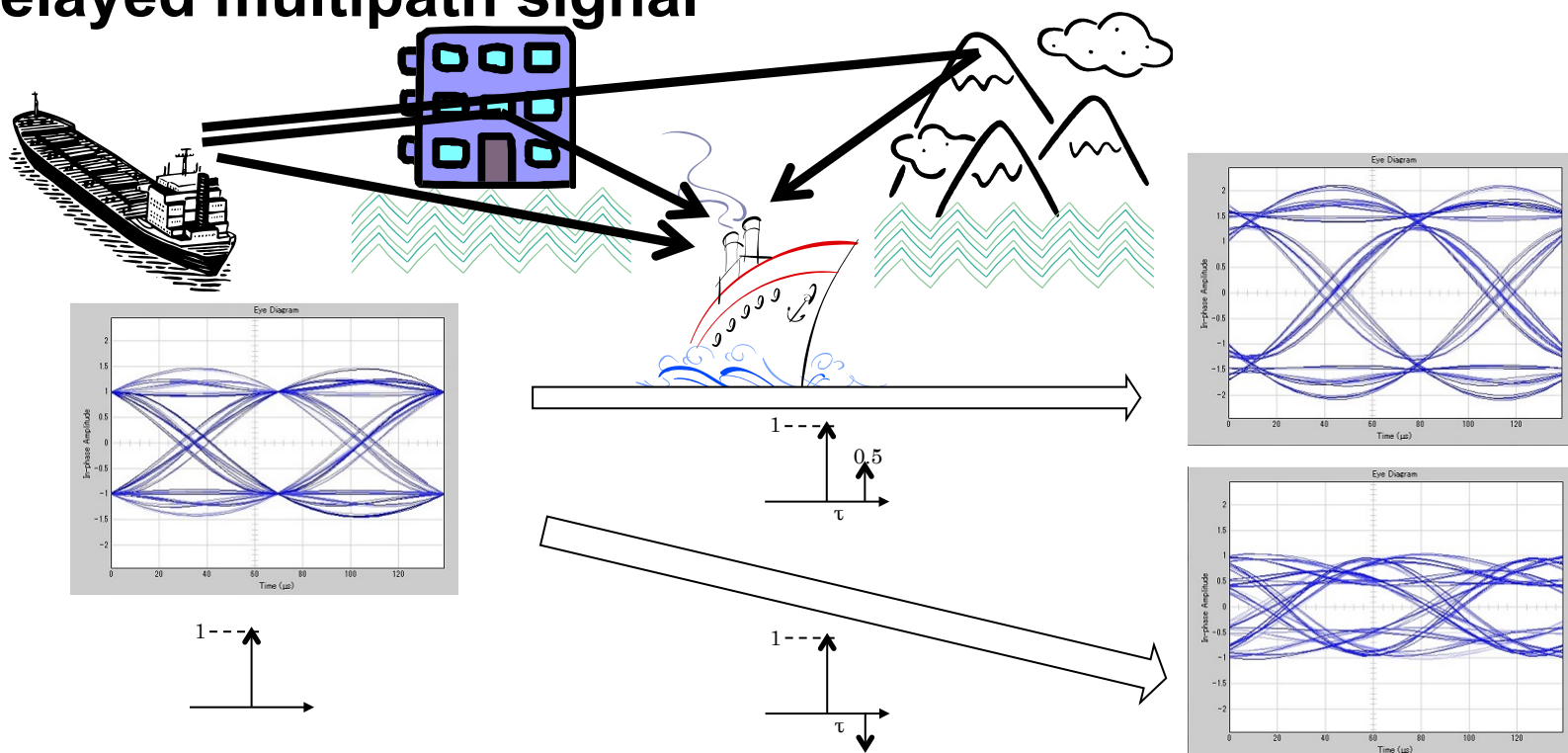
2. The Characteristics of Mobile Data Communication

ANNEX8

JRC

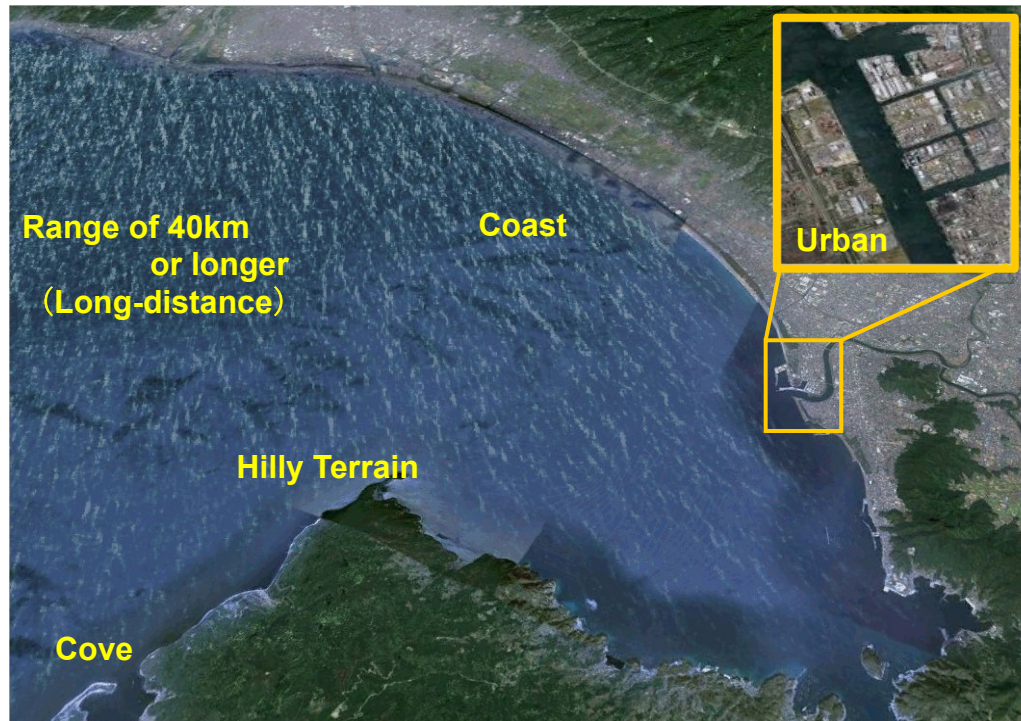
3) Multipath fading

The received waves which have different levels or phases are combined at the antenna, and the received level is randomly varied for very short periods. And delayed multipath signal



Measurement environment

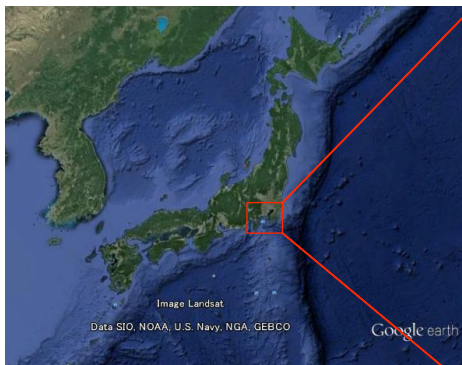
3-1. Measurement candidate sites



Landform	Note
Urban	Around the measurement place, there are artificial structures, such as high-rise buildings.
Coast	Area near lowland coast line or beach.
Hilly Terrain	There is a hill or a mountain.
Cove	A small area of the coast where the land curves round. It is used as a fishing port.
Long-distance	Distance that direct wave does not reach

Measurement environment

No.	Landform	Place
1	Urban	Tokyo Port and Keiyou industrial area
2		Yokohama port
3	Coast	Odoi swimming beach (Izu peninsula)
	Hilly Terrain	
4	Cove	Heda fishing port (Izu peninsula)



Measurement environments

	1. Tokyo bay	2. Yokohama bay	3. Odoi beach	4. Heda fishing port
Date	Jun 17, 18	May 27	Jun 11, 12	Mar 14
Type of test	Ship - Land	Ship - Land	Ship - Land	Ship - Land
TX points	Training ship "Shioji Maru"	Lighthouse tender "Souun"	Fishing boat "Koufuku Maru"	"Koufuku Maru"
TX power	25 [W]	25 [W]	25 [W]	25 [W]
Antenna type	Sleeve antenna	Sleeve antenna	Sleeve antenna	Sleeve antenna
TX antenna heights	10 [m]	5 [m]	2.5 [m]	2.5 [m]
RX antenna heights	5 [m]	18 [m]	5 [m]	5 [m]
Measured distance	1 - 8 [km]	1 - 10 [km]	1 - 3 [km]	0.1 - 1 [km]
Weather	Sunny	Cloudy	Rainy	Overcast
Mean wind speed	5.0 [m/s]	3.3 [m/s]	6.5 [m/s]	8.0 [m/s]
Wave heights	< 0.8 [m]	< 0.5 [m]	< 0.4 [m]	< 0.5 [m]



Shioji Maru
(Tokyo University of Marine
Science and Technology)

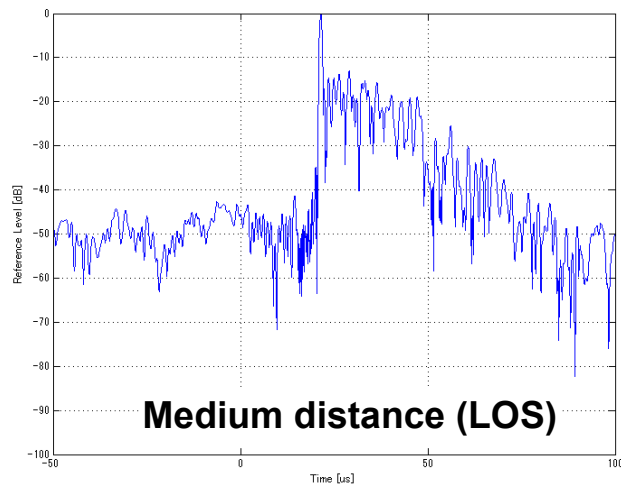
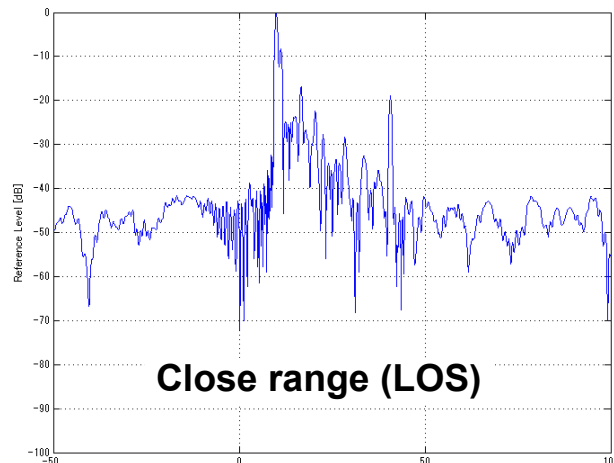


Souun
(Japan Coast Guard)

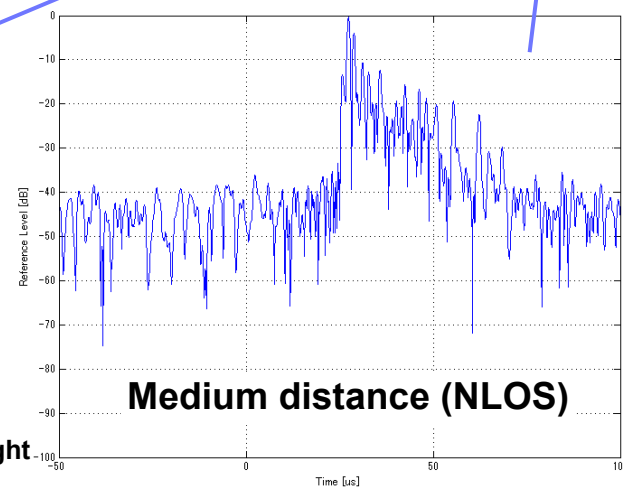


**Koufuku
Maru**

4-1. Tokyo port (Urban)

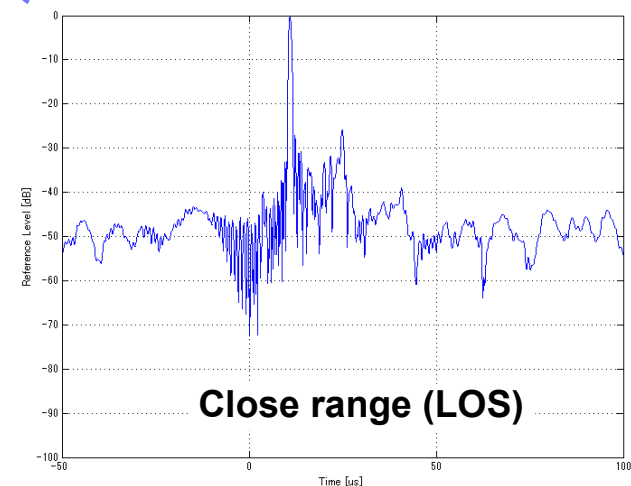
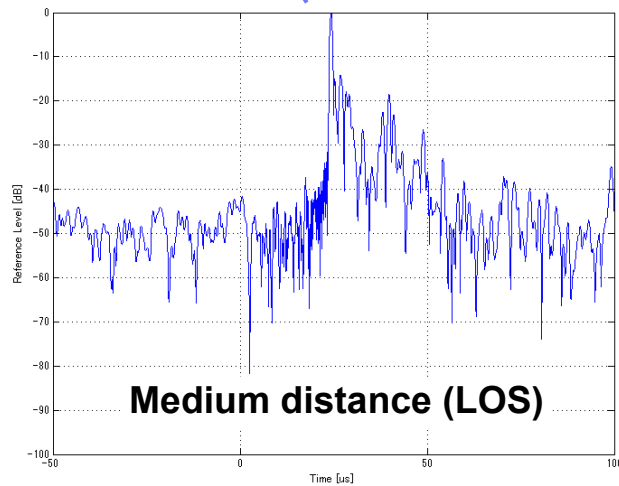
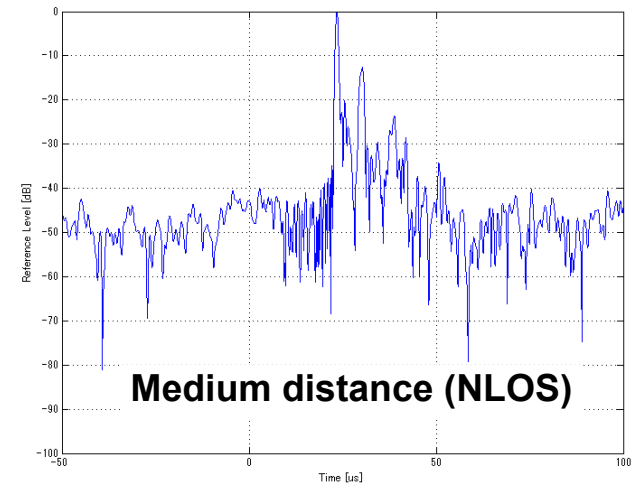


LOS : Line-Of-Sight
NLOS: Non-Line-Of-Sight



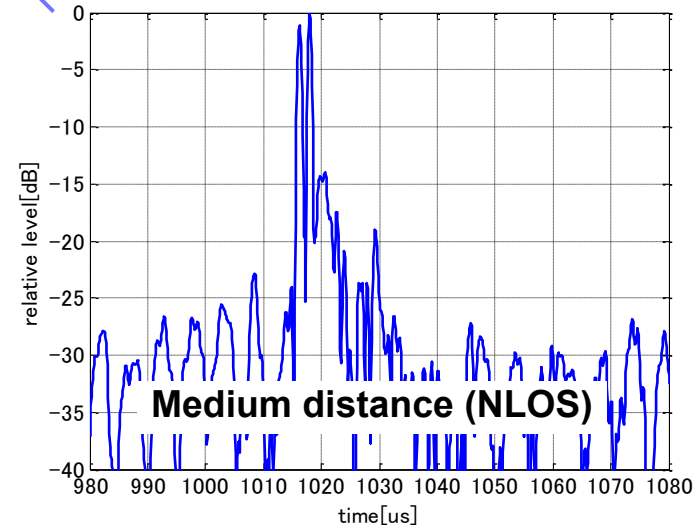
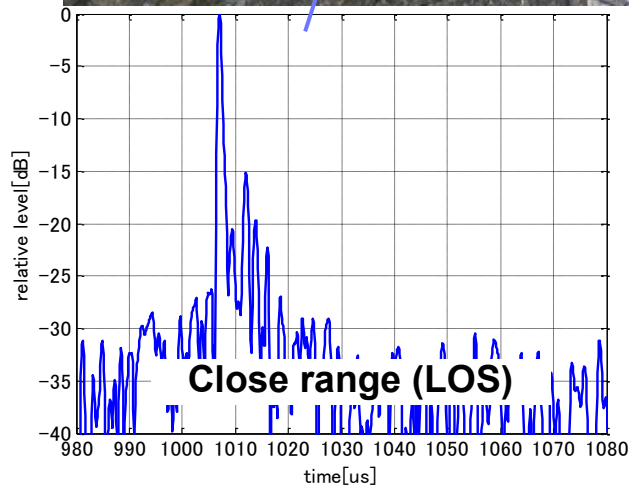
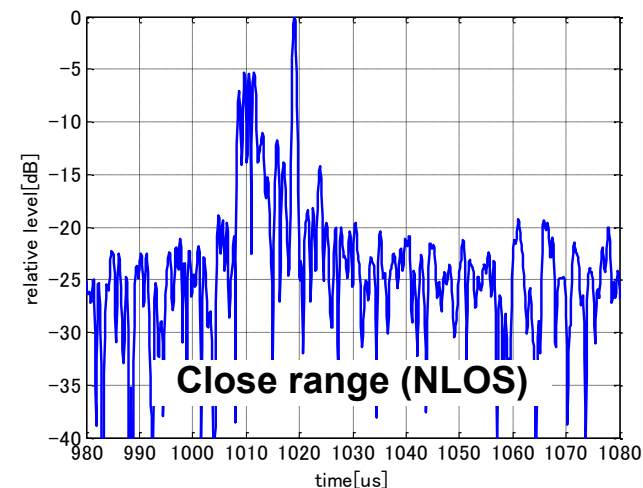
Result

4-2. Keiyou industrial area (Urban)



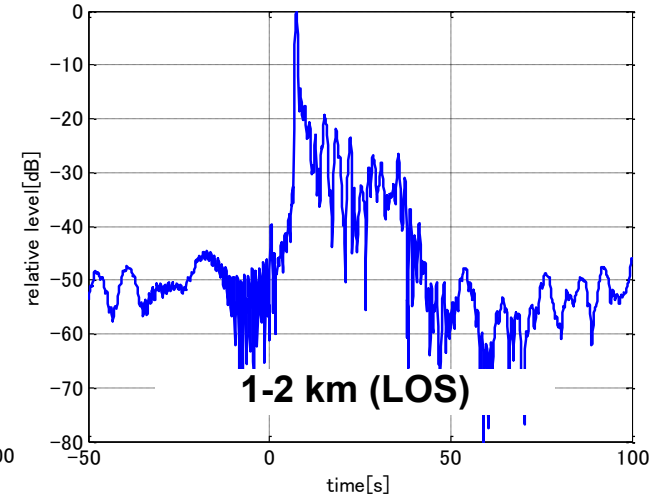
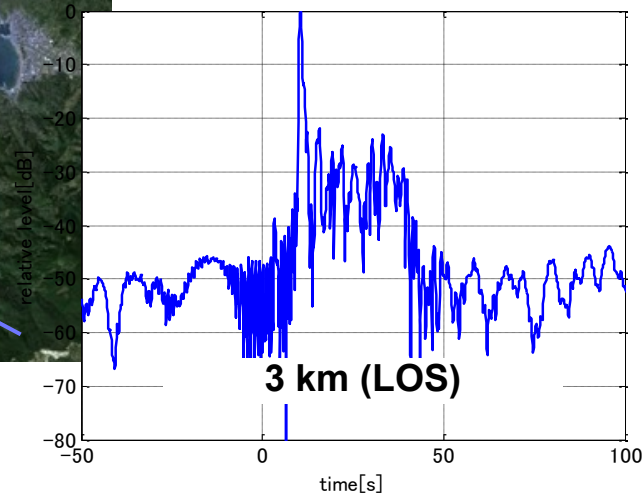
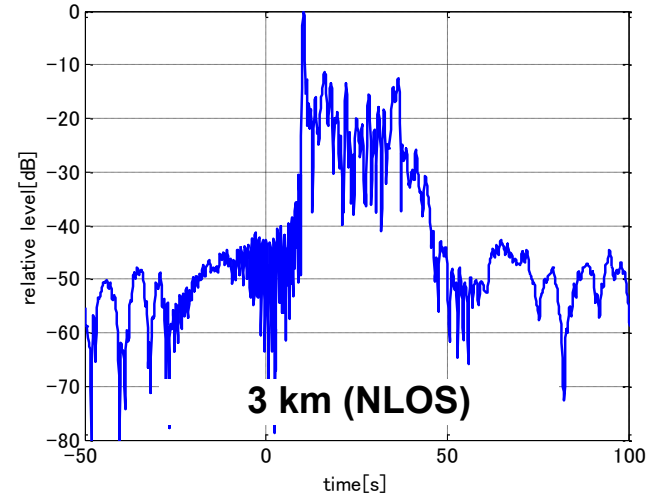
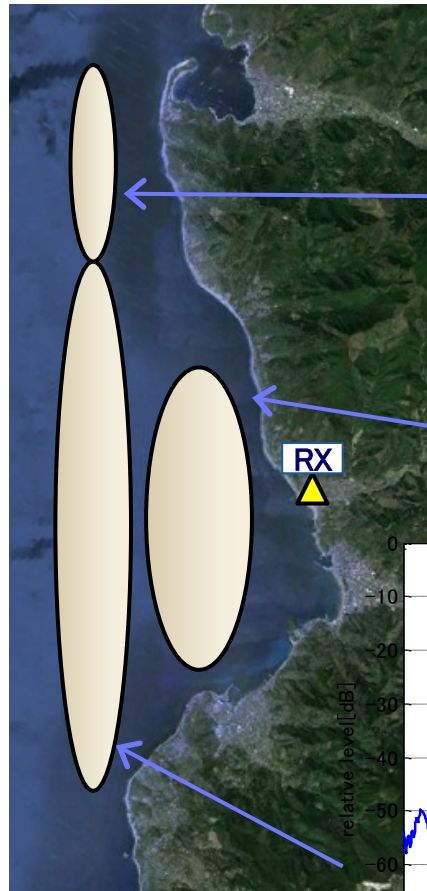
Result

4-3. Yokohama port (Urban)

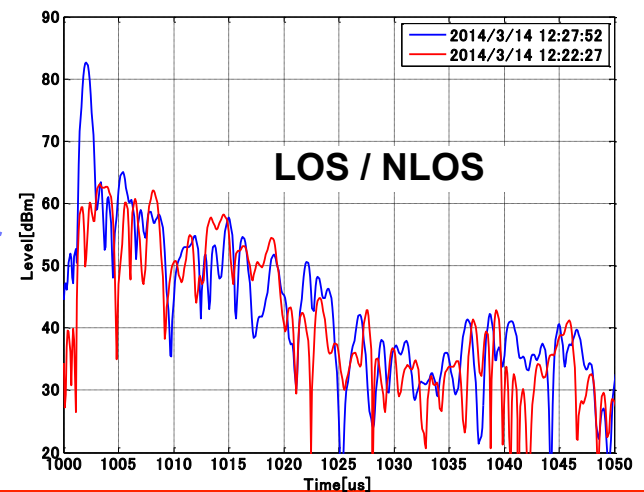
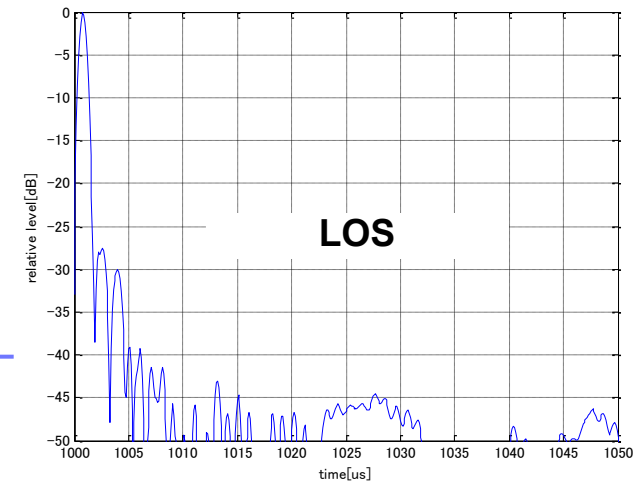
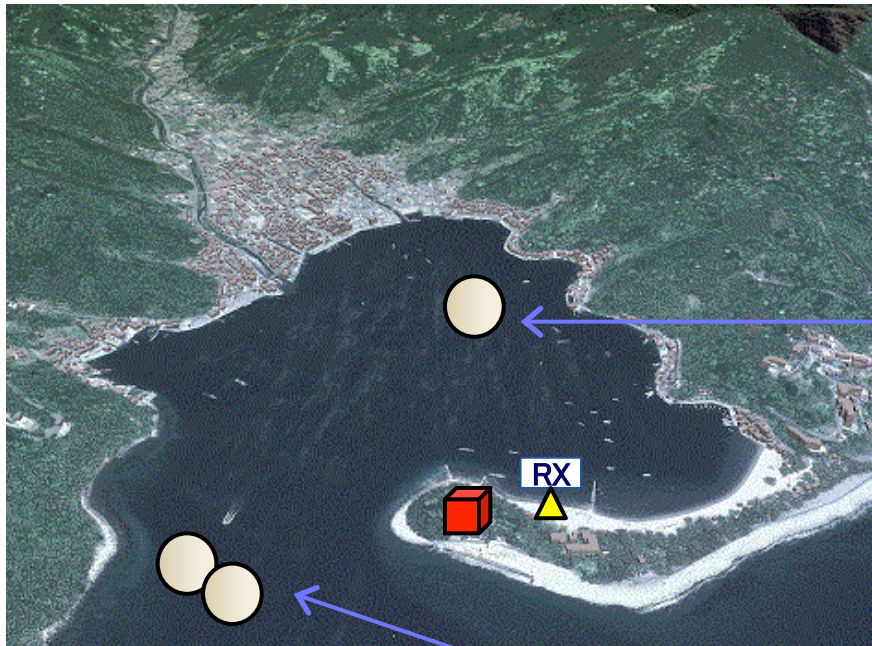


Result

4-4. Odoi swimming beach (Coast)



4-5. Heda fishing port (Cove)



Conclusion

Common characteristics of each investigation are as follows;

a) Short distance from obstacles

Delay waves overlap with preceding waves as we approach a obstacle. Affecting received performance due to multipath is less.

b) Medium distance from obstacles

Delayed wave input with a delay time of more than 10% of the symbol length was bigger level than we thought. Thus, Affecting received performance due to multipath is big.

The effect of multipath gradually emerge from more than 2km (relative distance).

Modulation	Standard (Rec. ITU-R M.1842-1)	Symbol length (μ S)	Required multipath delay (μ S)
$\pi/4$ DQPSK	Annex 1	69.4	Less than 7
16-QAM	Annex 3, 4	416.7	Less than 42

c) Non-Line-Of-Sight communications

Even at short range, direct waves is blocked by the obstacles and received level decrease. Received performance loss due to the delay waves becomes noticeable.

When occurring often state that interrupted the visibility, it often generate the level variation.

we have to consider not only the demodulation method but also multipath measures including the network layer.

Future Plan

All the measurements reported this time was the calm sea and good weather condition.

The next measurement, we are planning to investigate the impact on the received performance due to wave.

And, next study items are as follows;

- Comparison of the measurement results and the general propagation model,**
- Construction of the propagation model from the measurement results, and**
- The calculation of the reception characteristics by simulation.**

And then, consider communication protocol.

Thank you for your attention

Bon Voyage!

Special Thanks

- Japan Coast Guard
- Tokyo University of Marine Science and Technology
- Ocean Policy Research Foundation

1 Dec. 2014

Yoshio MIYADERA



Japan Radio Co., Ltd.

<http://www.jrc.co.jp/>

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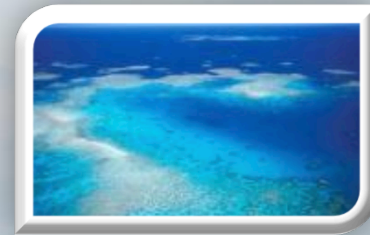
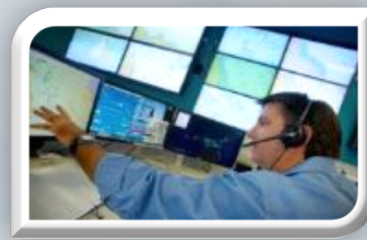
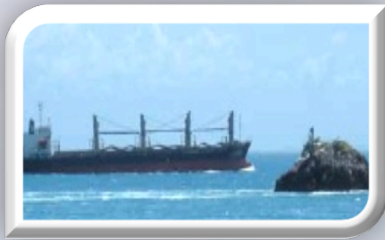


Australian Government

Australian Maritime Safety Authority

Expectations for VDES

Jillian Carson-Jackson, FNI, FRIN
Australian Maritime Safety Authority



e-Navigation

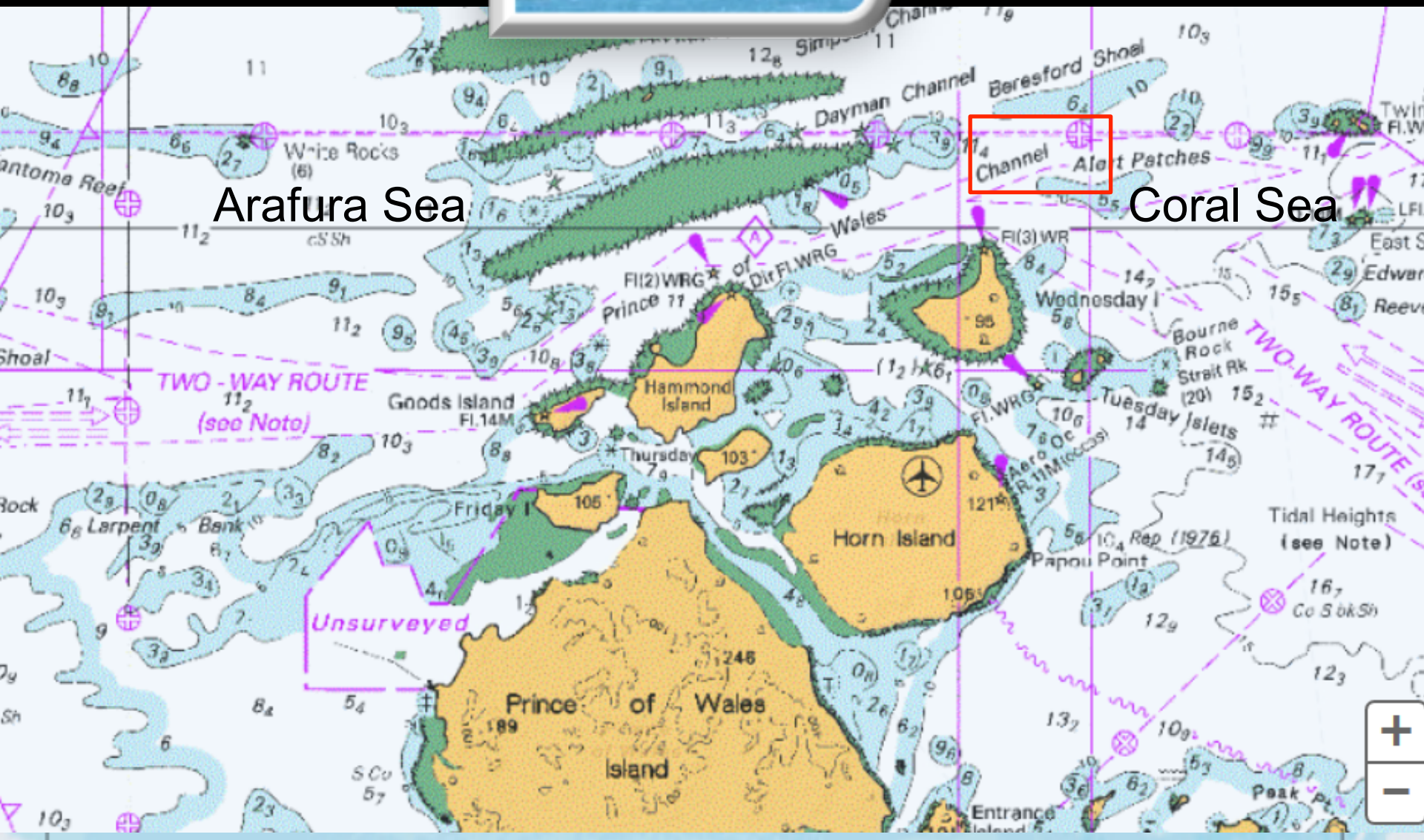
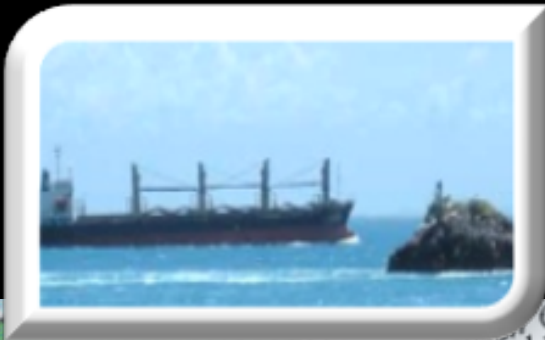
The harmonized collection, integration, exchange, presentation and analysis of

- marine information*
- onboard and ashore*
- by electronic means*

*to enhance berth to berth navigation
and related services for safety and
security at sea and protection of the
marine environment.*



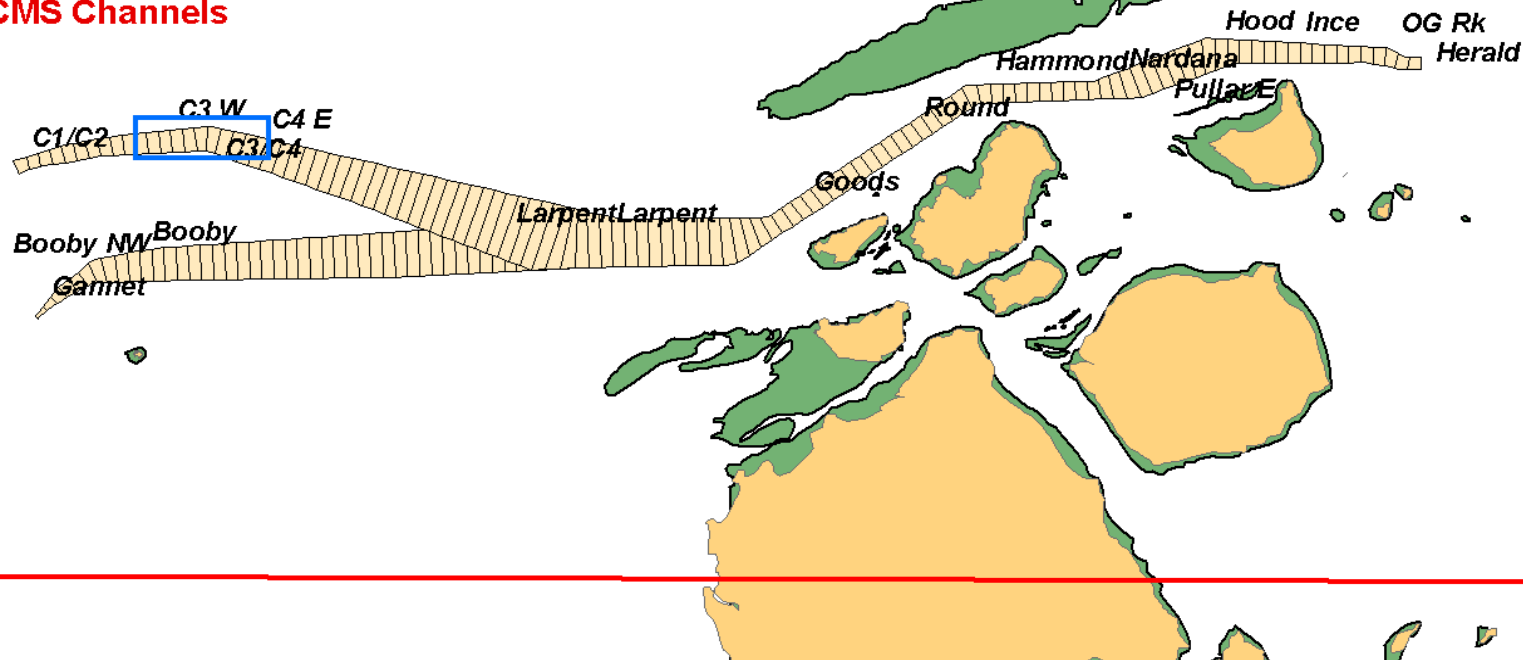




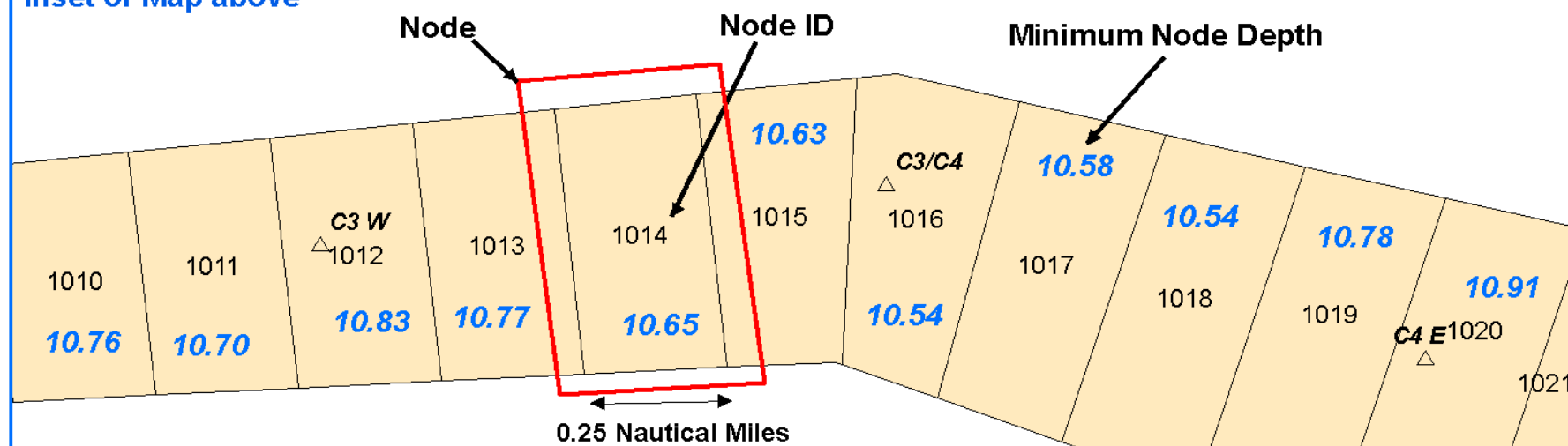


NOT FOR NAVIGATION

UKCMS Channels



Inset of Map above





Kota Lumayan

The Transit Plan was successfully calculated.

Calculated: 30Nov2014 1826

Available Windows: 01/0908 to 01/1207

Transit Commencement: 01Dec2014 1000



Set all speeds:

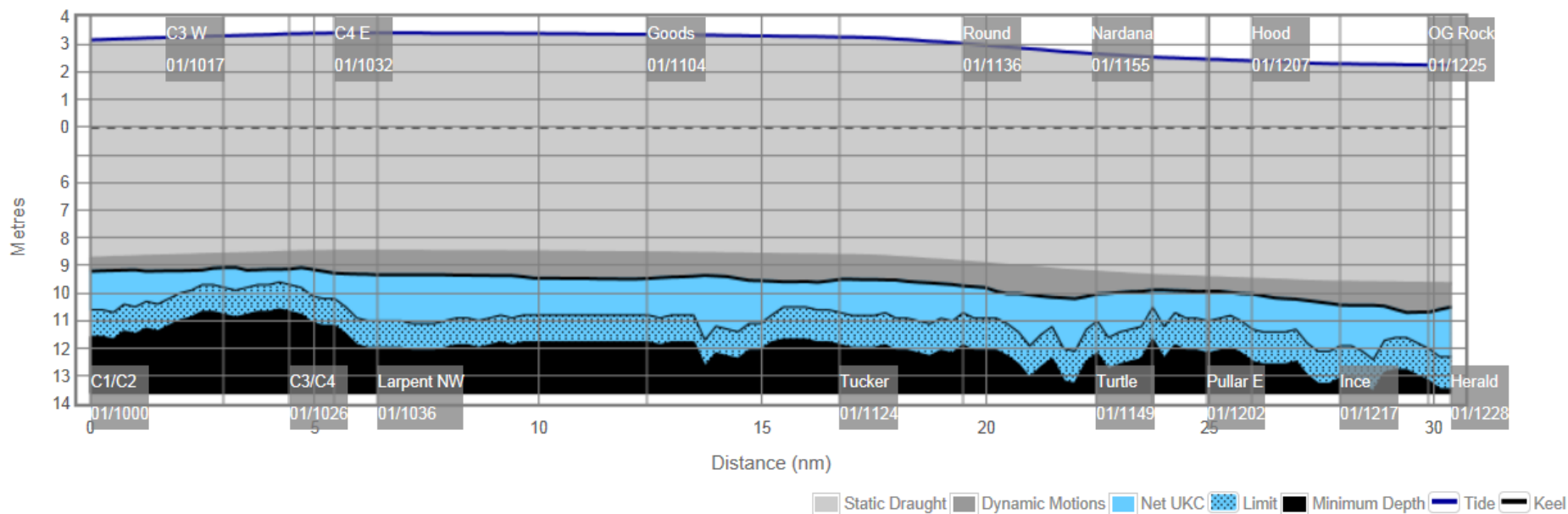


Set

Recalculate

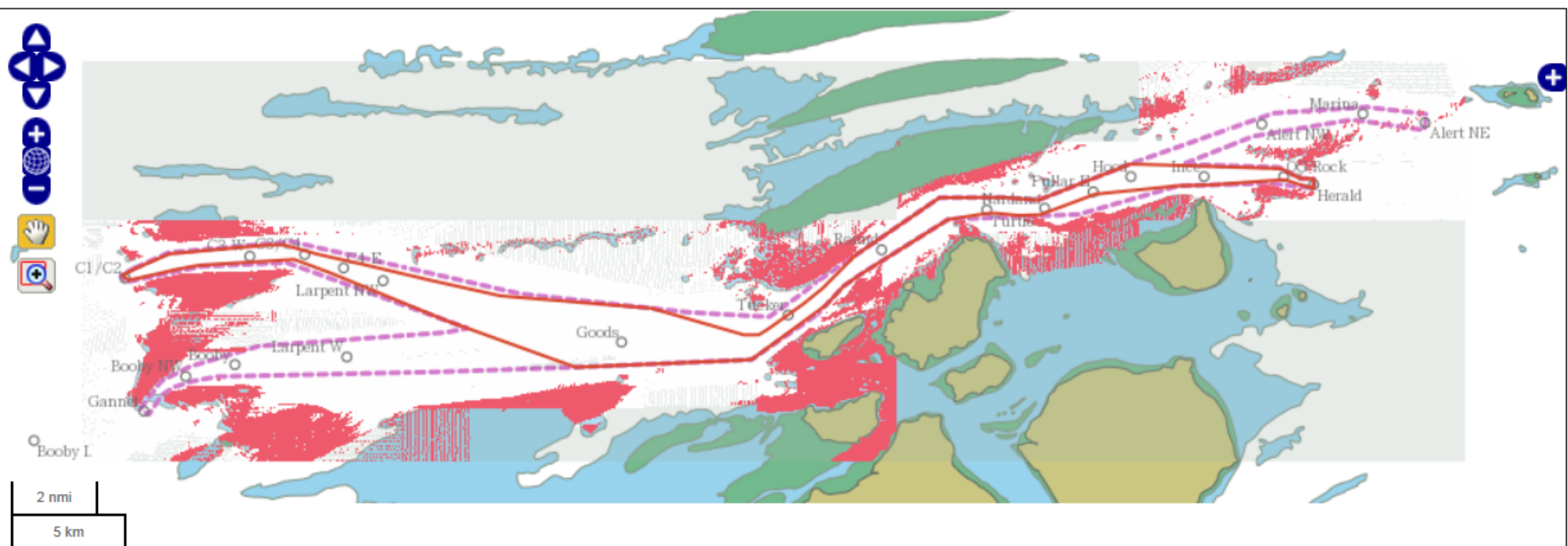
	C1/C2	C3 W	C3/C4	C4 E	Larpent NW	Goods	Tucker	Round	Turtle	Nardana	Pullar E	Hood	Ince	OG Rock	Herald
STW (kn)	10	10	10	12.5	13.2	13.2	13.2	13.2	13.2	10.2	10	10	13.2	13.2	13.2
Time (AEST)	01/1000	01/1017	01/1026	01/1032	01/1036	01/1104	01/1124	01/1136	01/1149	01/1155	01/1202	01/1207	01/1217	01/1225	01/1228
Squat (m)	0.47	0.49	0.50	0.79	0.85	0.86	0.86	0.87	0.79	0.49	0.48	0.47	0.82	0.85	0.84
Heel (m)	0.00	0.00	0.11	0.00	0.00	0.07	0.00	0.00	0.00	0.04	0.02	0.07	0.00	0.19	0.00
Tide (m)	3.16	3.31	3.38	3.41	3.41	3.36	3.26	3.03	2.66	2.54	2.46	2.40	2.29	2.25	2.24
Residual (m)	-0.11	-0.11	-0.11	-0.11	-0.12	-0.13	-0.14	-0.13	-0.10	-0.09	-0.07	-0.06	-0.03	-0.03	-0.03
UKC-L (m)	1.38	0.71	0.57	0.91	1.65	1.32	1.21	0.96	0.97	0.62	1.07	1.27	1.47	1.31	1.81

UKC



Show Speed and Dynamic UKC Charts

Generated: 30Nov2014 1827



141.82768, -10.43474



Australian Government

Australian Maritime Safety Authority

VDES / UKCM – some examples...

- Met Ocean measurement data broadcast (existing ASM)
- Met Ocean forecast data broadcast (adapt existing ASM)
- UKC ‘gate’ information (estimate data rate – 4 gates per transit transmitted every 5 mins ~ 12 kbyte/hour/ship)
- UKC calculation results (‘live’) (estimate 10 kbyte/result, transmitted every 5 minutes ~ 120 kbyte/hour/ship)
- UKC Chart overlay (‘live’) (estimate 20 kbyte / overlay, transmitted every 5 minutes ~ 240 kbyte/hour/ship)





Australian Government
Australian Maritime Safety Authority



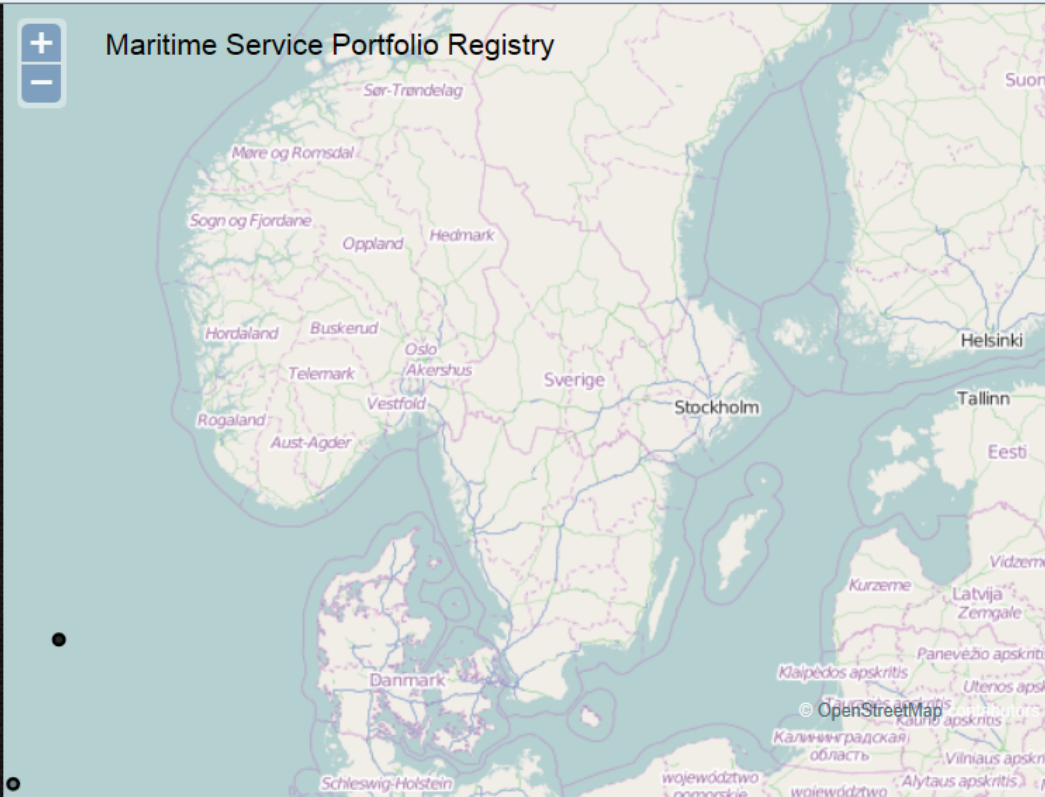
The Maritime Cloud

● All ● Own pos

No services available



Maritime Service Portfolio Registry

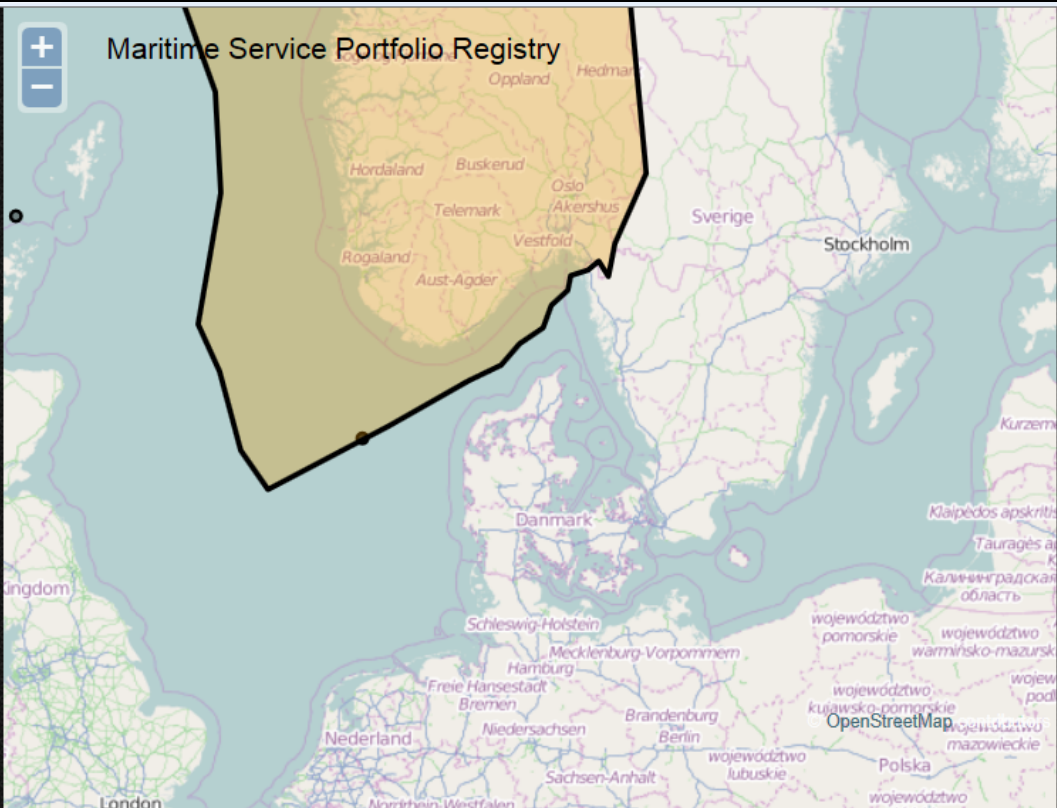


No service selected

- All
- Own pos

Vessel shore reporting

[Shiprep Norway \(web\)](#)



Service

Instance Name: [Shiprep Norway \(web\)](#)
Provider: Norwegian Coastal Administration
(NO-AUH-000001)
Url: [http://shiprep.no/...](http://shiprep.no/)

Hide details

● All ● Own pos

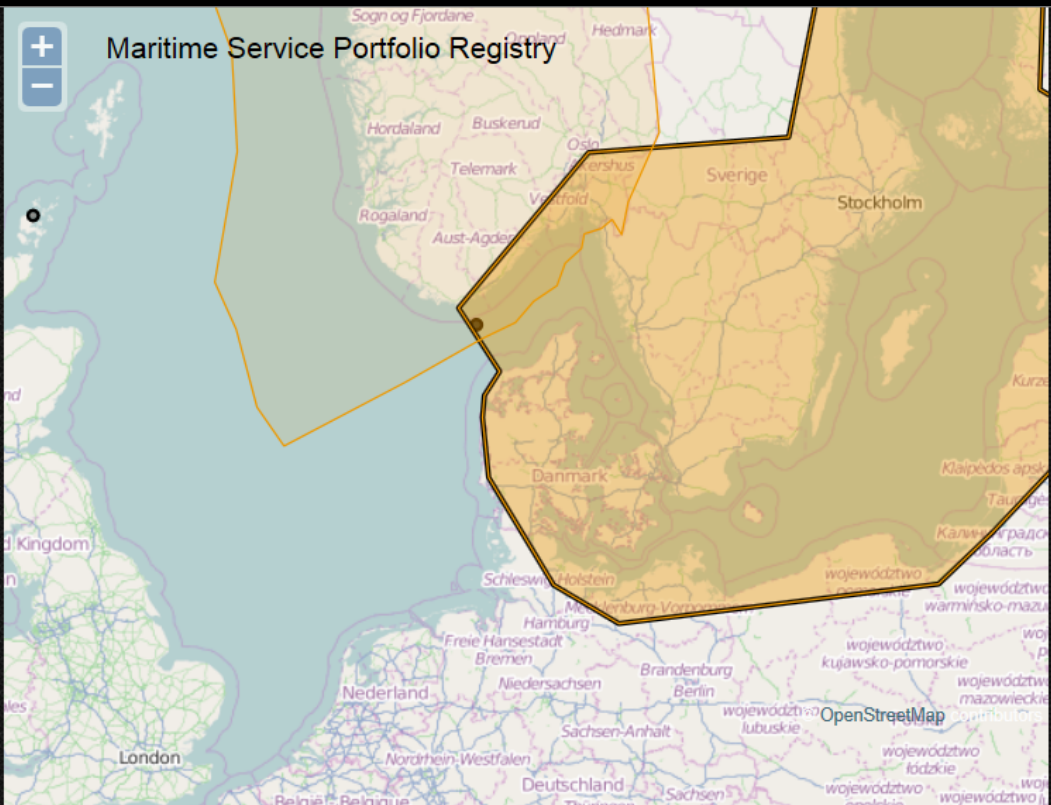
Maritime Safety Information

[MSI Baltico \(navtex\)](#)

[MSI Baltico \(web\)](#)

Vessel shore reporting

[Shiprep Norway \(web\)](#)



Service

Instance Name: MSI Baltico (navtex)

Provider: Swedish Maritime Administration (SE-AUH-000001)

[Hide details](#)

Operational Service: Maritime Safety Information

Endpoint:

Type: navtex

Url: navtex://grimeton

Type: navtex

Url: navtex://rogaland

Service specification:

Service ID: imo.msi

Name: MSI (navtex)

Version: 1.0

Variant: broadcast-low

Transport: navtex

● All ● Own pos

Traffic Organization Service

Great Belt VTS route suggestion (gm)
Great Belt VTS route suggestion (ais)

Maritime Safety Information

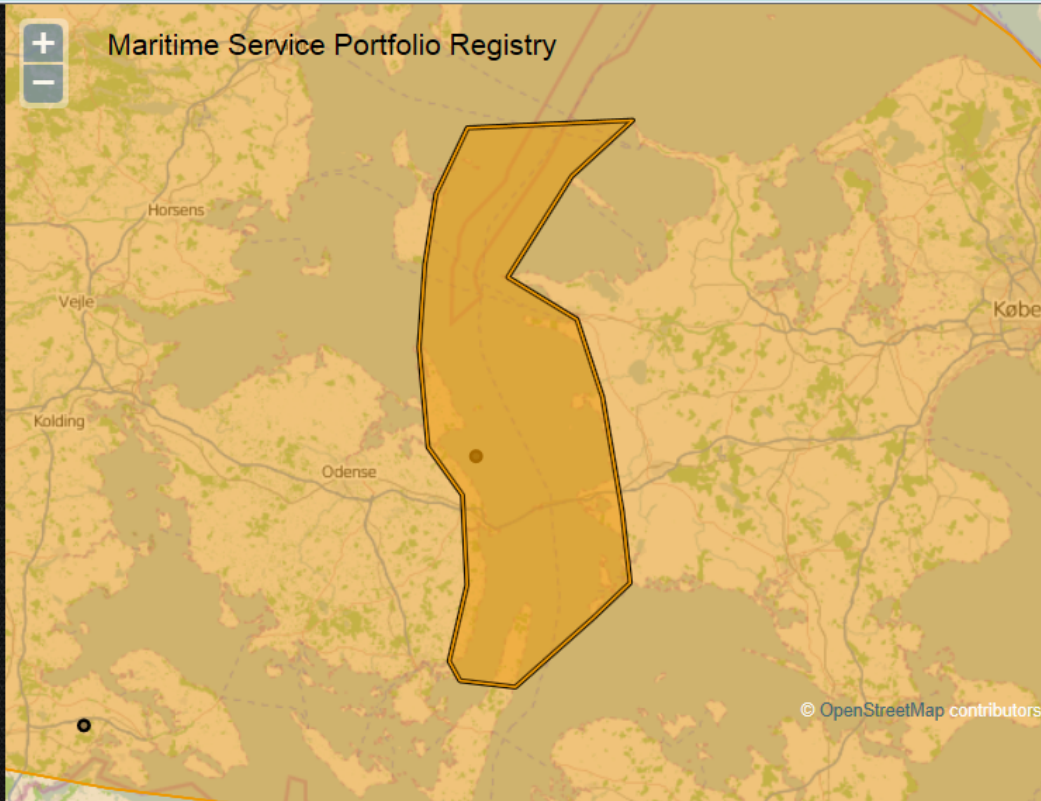
MSI Baltico (navtex)
MSI Baltico (web)
Danish local MSI (web)
Danish local MSI (vhf)
Danish local MSI (soap)

World Vessel Traffic Services Guide

[Great Belt WWTSG \(web\)](#)

Meteorological Information Services

DMI METOC on route



Service

Instance Name: Great Belt WWTSG (web)
Provider: Great Belt VTS (DK-VTS-000001)
Url: <http://www.worldvtsguide.org/D...>

[Hide details](#)

Operational Service: World Vessel Traffic
Services Guide

Endpoint:

Type: URL

Url: <http://www.worldvtsguide.org/D...>

Service specification:

Service ID: imo.worldvtsguide
Name: World VTS Guide (web)
Version: 1.0
Variant: web
Transport: web

<http://demo.maritimecloud.net/>





Australian Government

Australian Maritime Safety Authority

*He that lets the small things bind him,
leaves the great undone behind him!
- Piet Hein*

Expectations for VDES

Jillian Carson-Jackson, FNI, FRIN
Australian Maritime Safety Authority

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Saab TransponderTech

Development of VDES Radio - Phase 2



Johan Lindborg
2014-12

Swedish VDES research - background

- In 2012 Saab released its new SDR based R5 AIS platform
- Designed to work as a flexible radio communications system – radio largely defined in software
- The Swedish Maritime Administration and Saab began VDES research on the R5 platform in late 2013



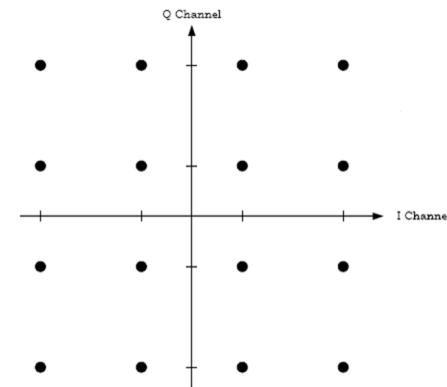
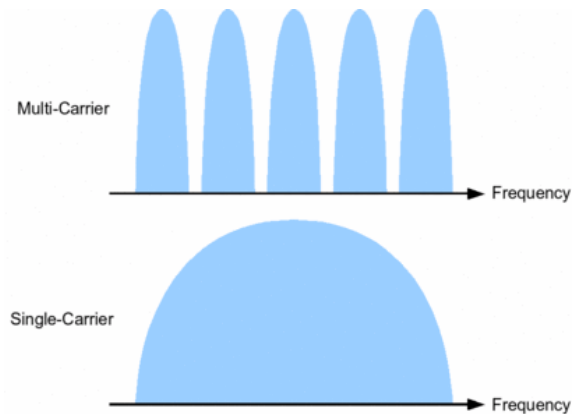
Phase 1 - ASM

- Existing R5 AIS SDR platform used
- Focused on research 25kHz channels (ASM1 and ASM2)
- Main achievement:
 - Implemented D8PSK allowing for 28,8 kbit/s communication
 - Done in existing R5 HW with only software/firmware update



Phase 2- VDE

- New collaboration between the Swedish Maritime Administration and Saab
- Spans October to December 2014
- Main focus will be VDE and related challenges
- Will produce a HW platform for VDE research
- Updated HW design
 - Designed for multi carrier and QAM challenges



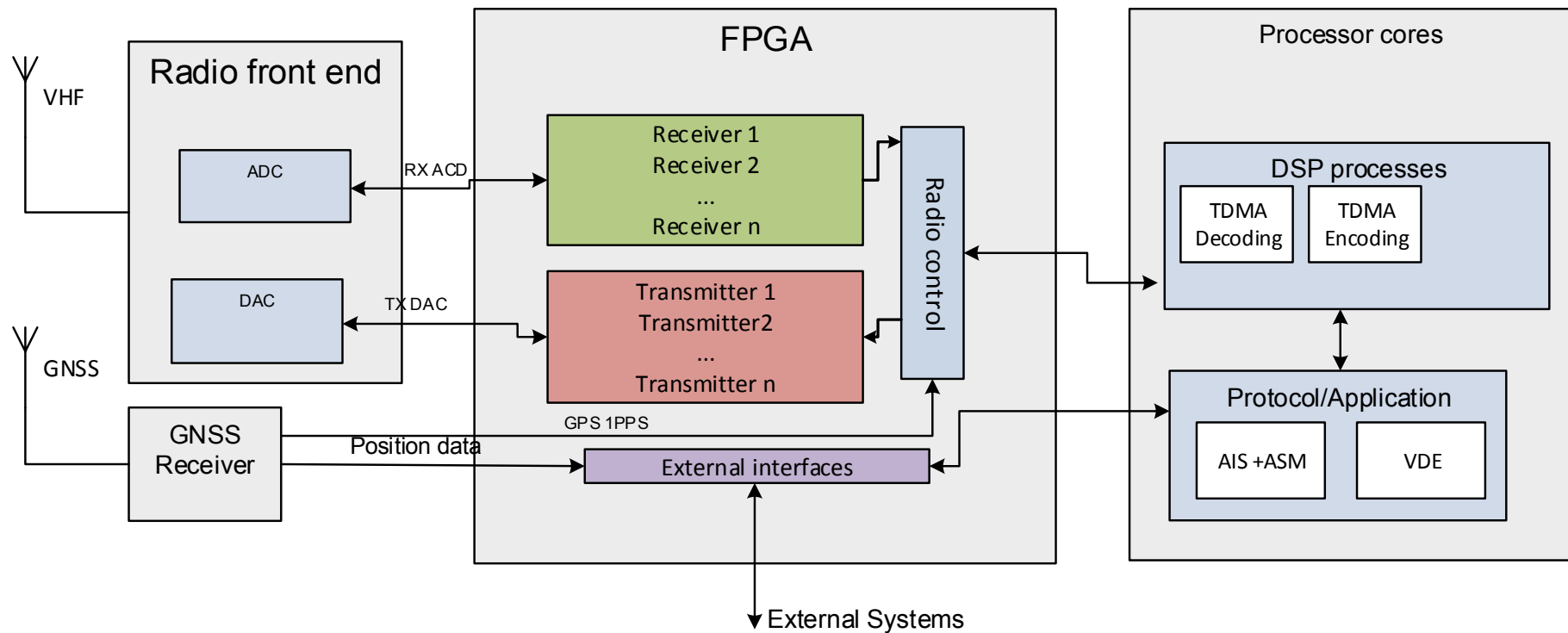
VDES Phase II - Project scope details

- Design of new transmitter HW and SW for multi-carrier waveforms
- Tailorizations of the R5 SDR receiver onto the new HW platform
- Power amplifier design
- Faster main processing HW
 - Must handle larger data streams
- Multi carrier signal research
- Investigation of suitable filters for RX and TX
 - Mitigate interference issues

VDES Platform

Block Schematic overview

- N number of communication channels realized in FPGA
- Waveforms defined in software



Phase 2 general research items

- VDE power requirements
 - AIS use 12.5W transmission over single carrier on 25 kHz channel
 - VDE may use 100 kHz channel with 32 sub-carriers
 - Each subcarrier may use 16 QAM modulation
 - 25W and 50W limits suggested for ship and shore
 - ITU-R M.1842-1 Annex 4
 - Peak-to-average power ratio may be very large
 - Suitable sub-carrier power levels will be researched
 - Based on performance and design cost trade-offs
- Linearization methods
 - Design heavily influenced by power requirement
- Filter techniques
 - Digital receive and transmit filters

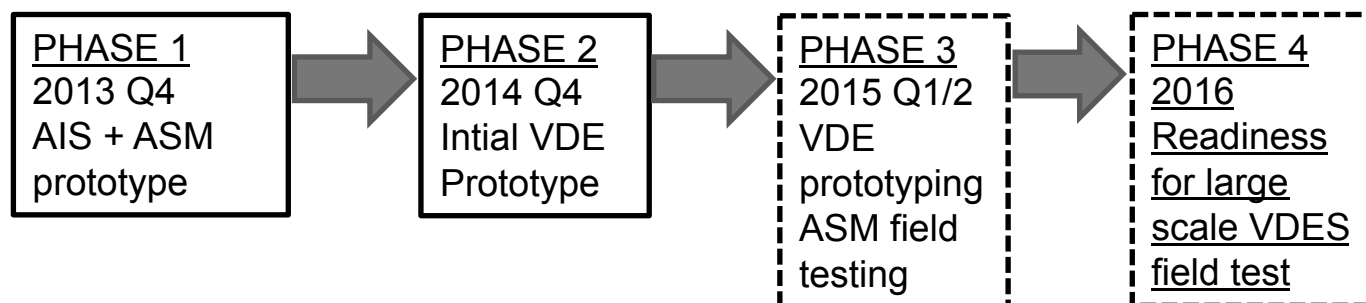


Where do we go from here?

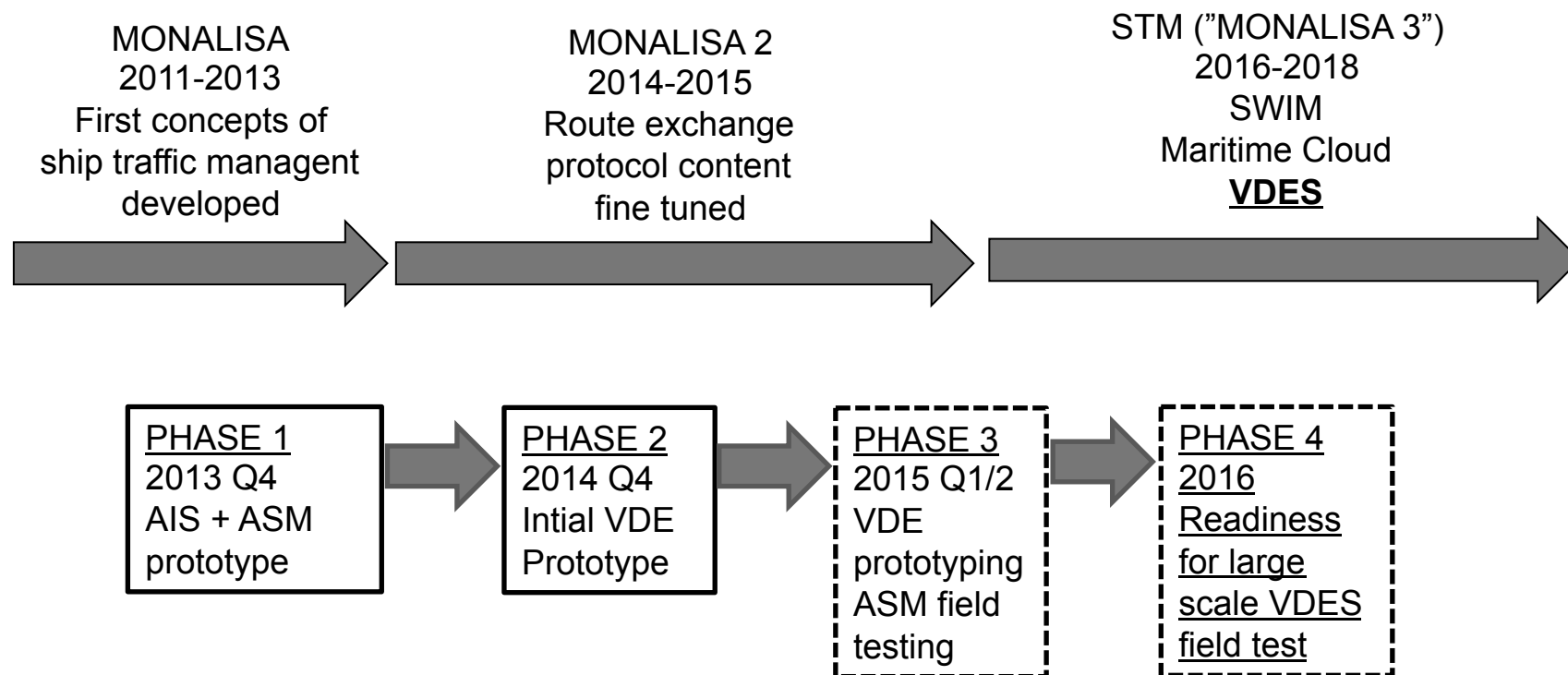
- Work should be synchronized through standardization bodies
- International VDES will only happen as a community effort
- Transparency of intentions helpful
- Input on priorities appreciated!



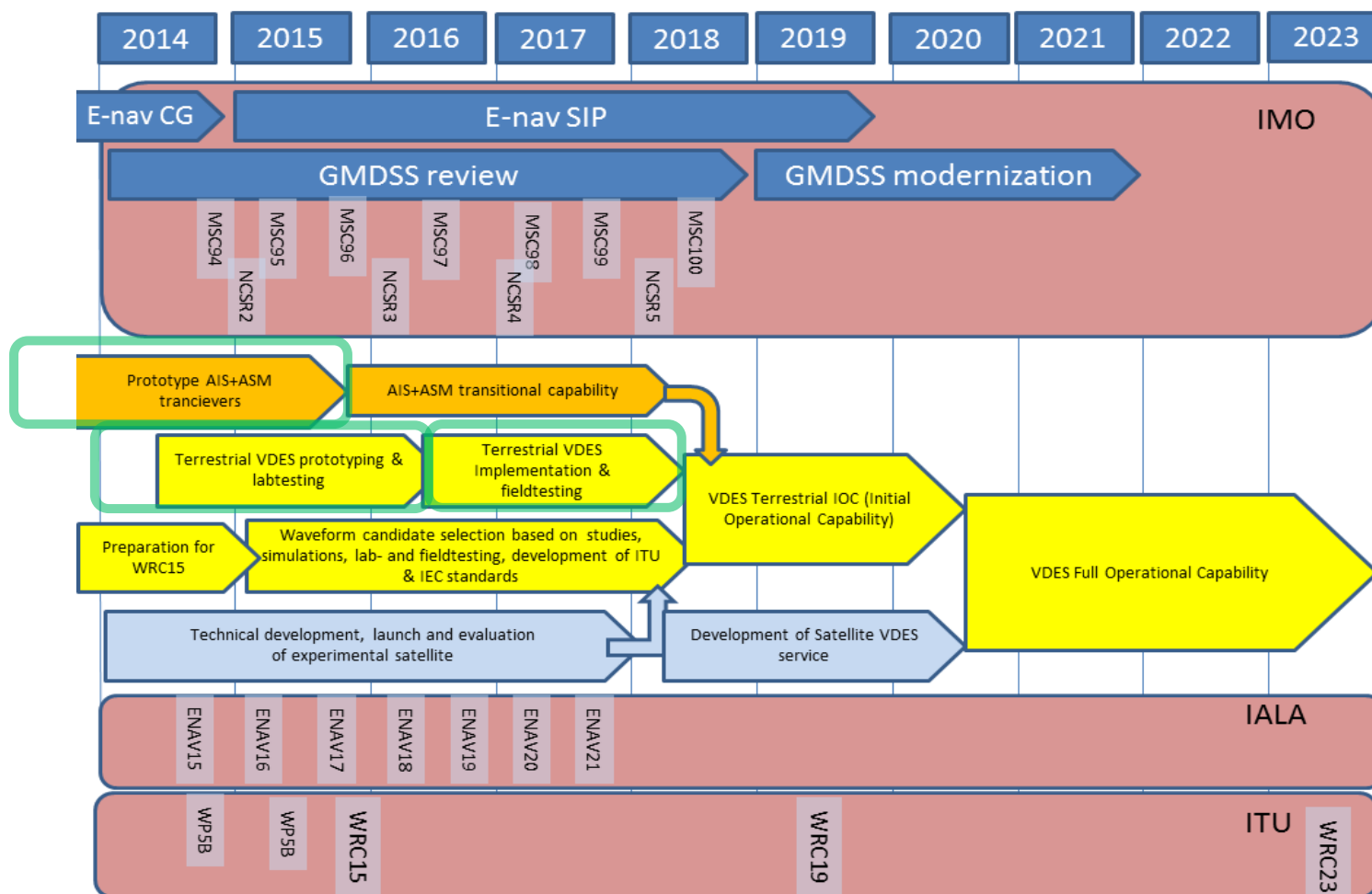
Our VDES development plan



Development aligned with MONALISA/STM project



Fit with IALA suggested roadmap



Research suitable for phase 3 (2015)

- Continue standardization work
- Apply lessons learned from first VDE prototype in new prototype run
 - Redesign where needed
 - Power amplifiers, filters and linearization methods may need further tailorization to reach desired performance
 - Allow for a multitude of waveforms and multicarrier scenarios
- Work out ASM details
 - Suggest missing detailed data for the IALA VDES draft
 - Use the R5 Platform to test and prove feasibility
 - Feedback to standardization process
 - Should be done with WRC-15 date in mind

Research suitable for phase 4 (2016)

- Continue standardization work
- Adjust for changes in requirements
- Prepare for larger scale production of VDES units
 - Provide STM (MonaLisa3) with test units
- Work with higher level layers
- Satellite adjustments?

Summary

- Saab and the Swedish maritime administration is continuing our VDES research
- Current focus is VDE prototyping
- We are currently well in line with the IALA suggested VDES timeplan
- We have intentions for a phase 3 and 4
- We are on track to be able to supply the STM project with VDES test units during 2016



SAAB

SAABGROUP.COM

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3rd International Workshop on VDES

Focus on Satellite VDES

Tokyo, 02/12/2014

Gaetan Fabritius
CLS, Head of Maritime Surveillance Team
www.cls.fr / www.sat-ais.fr



- Introducing CLS
- Towards a VDES satellite demo & future service
- On-going activities in Europe around satellite VDE
- Q1 2015 milestones
- Discussion



Created: 21 April 1986 – subsidiary of the French Space Agency (CNES)
⇒ Operating the Argos constellation (Advanced Doppler location)

Core activities:

- Commercial operation of **satellite systems for positioning, data collection, ocean observation and surveillance**
- Developing **added-value applications and services** based on satellite remote-sensing data;

Applications to:

- environmental surveillance
- sustainable management of marine resources
- maritime surveillance
- oil and gas

Supported by: Cubic-I (i3) – CLS office in Japan



About CLS involvement in VDES, SAT component



Page 4

Frameworks to move forward, so that our Group can test/play soon with the satellite component of the VDES ☺ :

- European Commission (DG MOVE, JRC, H2020 R&D framework program)
- European Space Agency (ESA)
- French Space Agency (CNES)
- CLS internal R&D



Title of Proposal:

EfficienSea 2 – Efficient, Safe and Sustainable Traffic at Sea

Call Topic:

MG4.2-2014: Safer and more efficient waterborne operation through new technologies and smarter traffic management

- During last workshop, preliminary presentation has been made of the outcomes of the 1st study conducted by CLS for ESA, highlighting the possible applications, use cases for a given satellite configuration.

⇒ *Following slides as reminder*

- New ESA initiatives and proposals are being evaluated these days:

- ARTES-1 (Critical Trade-offs) – 200K€ - 12 months
 - **Satellite Downlink, VDE Terrestrial, and Satellite AIS Interference Management**
 - **VDE Satellite Uplink, AIS, and VDE Ship-to-Shore Interference Management**
- ARTES 5-1 (VDES Downlink demonstration) – 700K€ budget – 18months

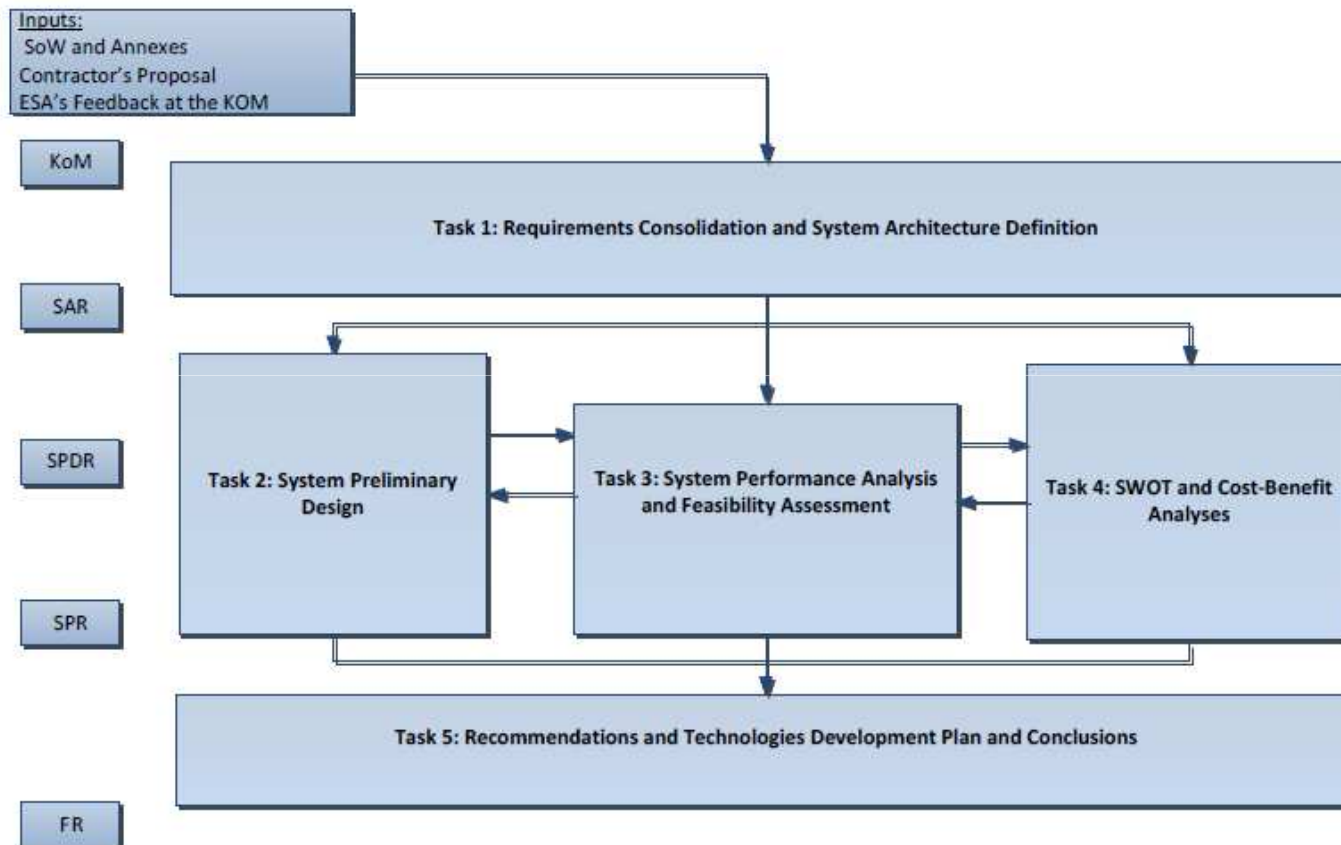


Figure 1: Work Logic

- Relying on on-going satellite constellations initiatives (« opportunities »)
- Trade-offs with user requirements vs. commercial viability (no IMO carriage requirement) (ie. purely commercial and defence)
- Workshop and invitations scheduled for Feb/March 2015

⇒ Who is ready to participate and travel to France ? 😊

⇒ Involvement of product/VTS manufacturers is also required as driving stakeholders

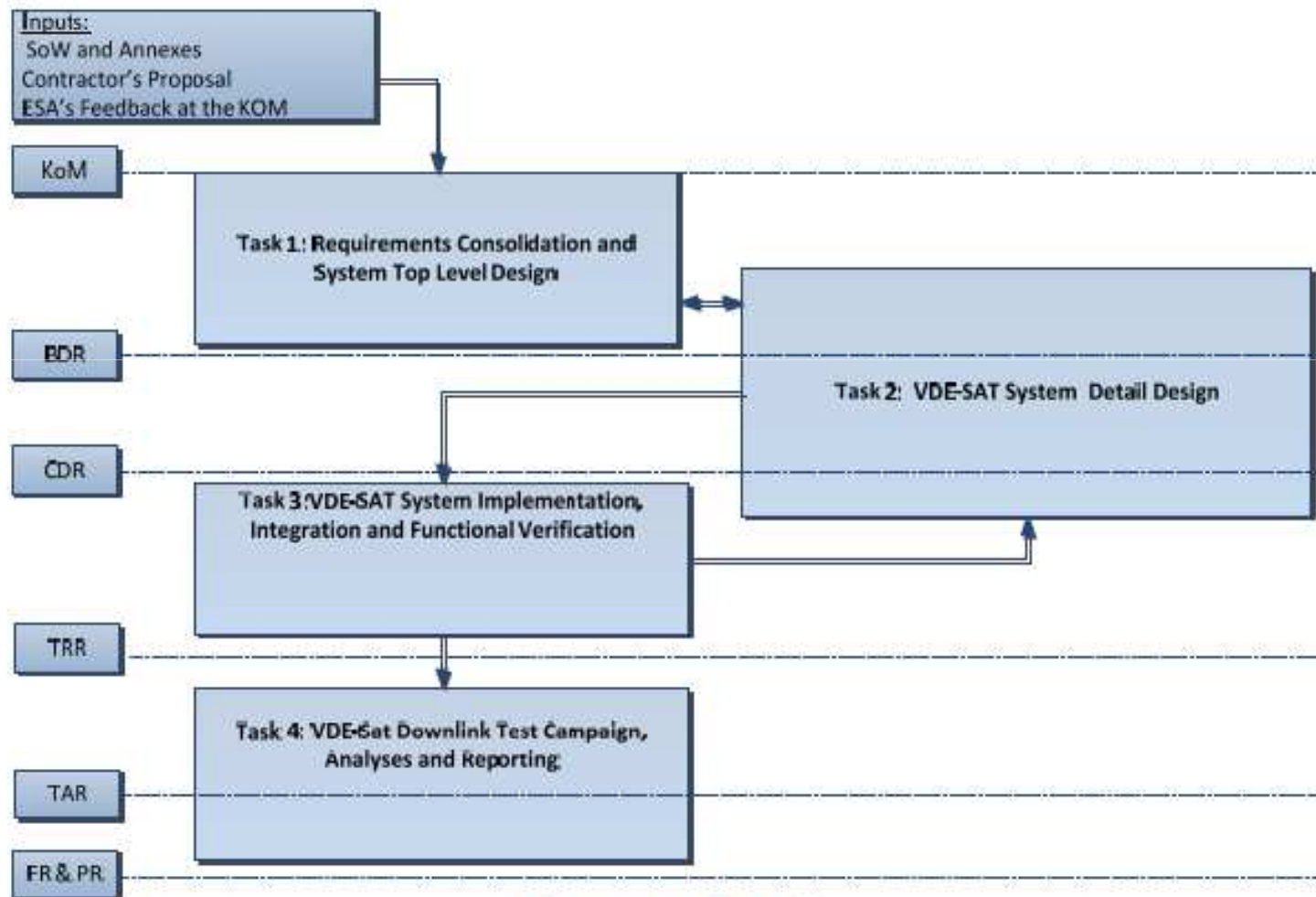
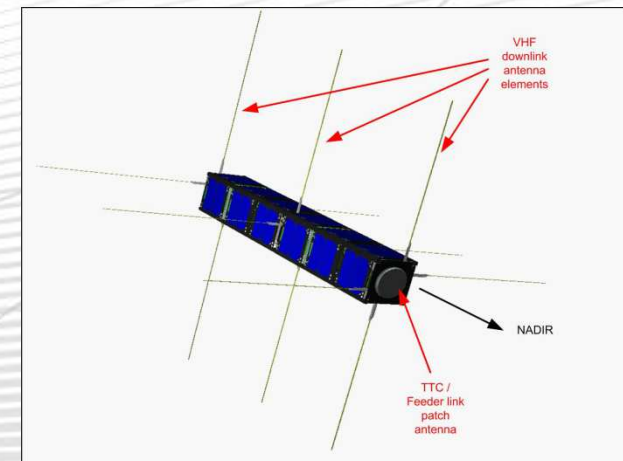


Figure 1: Study Logic

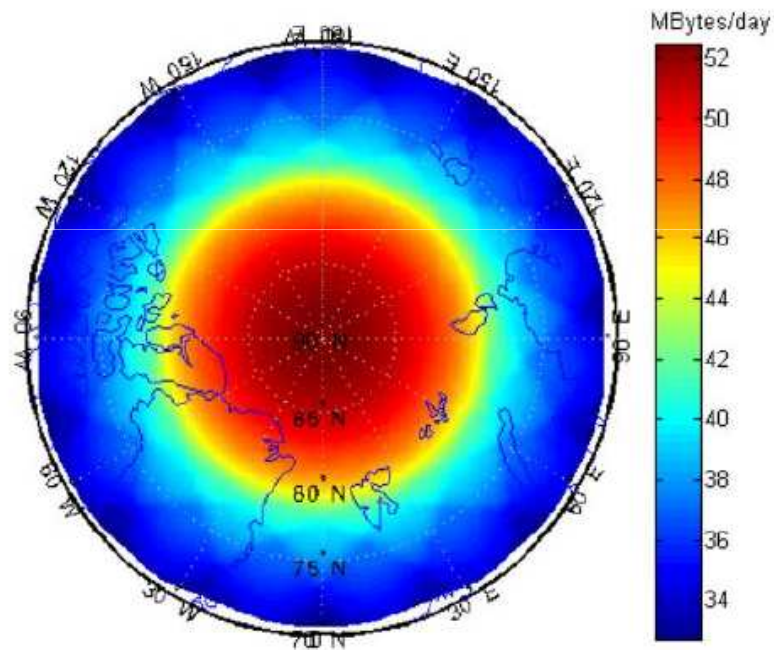
- Preliminary list of services has been made, focusing on the Arctic use case
- Simulations for corresponding space mission:
2 concepts meeting these specific requirements (latency, reliability, availability, geographical coverage, addressed vessel population, minimum bandwidth, encryption, ...):
 - 1 satellite (micro) at 850km (deorbiting)
 - 2 satellites (nano / 6kg each) on 2 different orbital plans below 600km (compliant with debris regulation)
 - Scenarios of interferences with terrestrial and satellite to satellite
 - ROM ~3M€/satellite incl. launch & operations (2Years)
- Review of possible operational concepts
- Roadmap



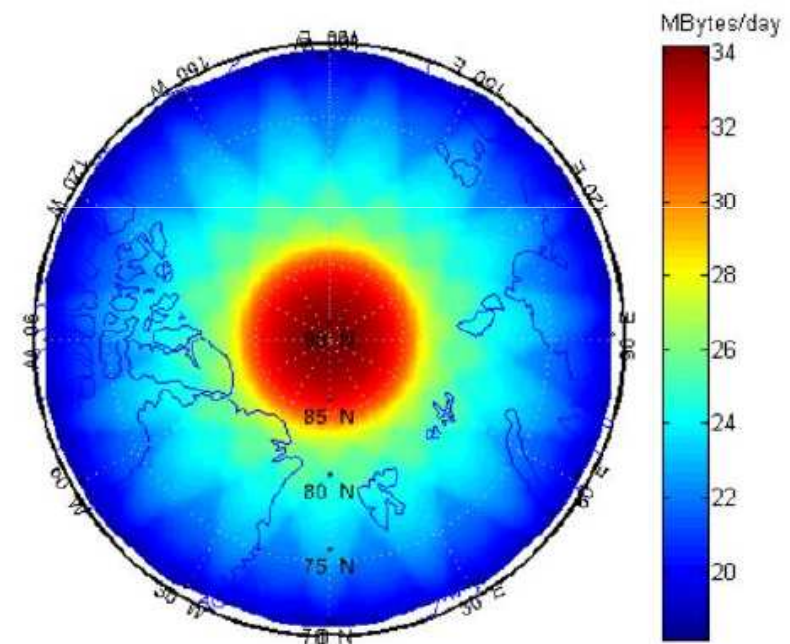
Example of expected performances: data volume delivered per day to the Arctic



Best Case



Worst Case



- Agree on final frequency plan allocation and consolidate sharing studies especially with land mobile systems
- Consolidate services and associated requirements
- Review possible operational concepts, in coordination with terrestrial VDE developments
- Financial viability (business case) and user feedbacks

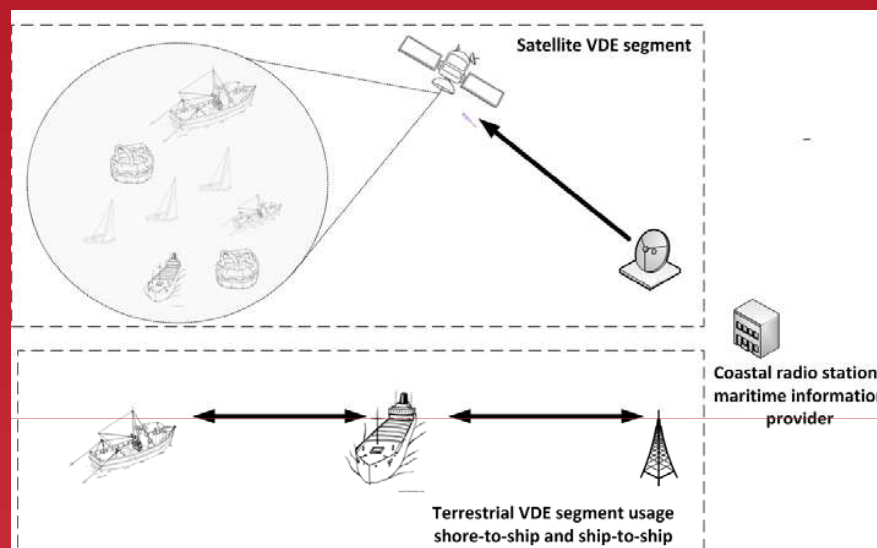
⇒ Phase II to start Q1 2014

⇒ **ESA & CLS are inviting main stakeholders to join the on-going study in preparation of following-up testbed**

⇒ Letter of interest have been circulated, as per recommendations of Annex 1 of e-NAV14-17.1.7.1 (guideline on testbeds) to involve users and stakeholders at every stage.

- ESA is also preparing a demo mission for satellite VDE (procurement Q4 2014 / launch 2016-2017). Other national initiatives are also expected (in Europe and worldwide)
- Planning is fully in line with:
 - e-NAV SIP (3 phases implementation 2014-2020)
 - IMO and ITU milestones
 - European Horizon 2020 R&D framework program

⇒ Towards a dedicated VDES (incl. satellite VDE) testbed in Europe



Thank you

gfabritius@cls.fr

Can AIS Identify Distress?

USING AIS TO IDENTIFY A SHIP IN DISTRESS

Distress Alert Using Current AIS

- ▶ Can The Current AIS Protocol Support Distress Alert?
 - ▶ Safety Text Messaging
- ▶ What Would We Modify To Support Distress Alert?
 - ▶ New Navigational Status
 - ▶ Binary Message
 - ▶ New VDL Message Type
- ▶ Dedicated Distress Button?
- ▶ Display Systems

What Regulatory Changes Required?

- ▶ IMO
 - ▶ IMO COMSAR.1 Circ .46 of February 2009
 - ▶ IMO Resolution A.694(17)
- ▶ ITU
- ▶ Other

Is This Technically Feasible?

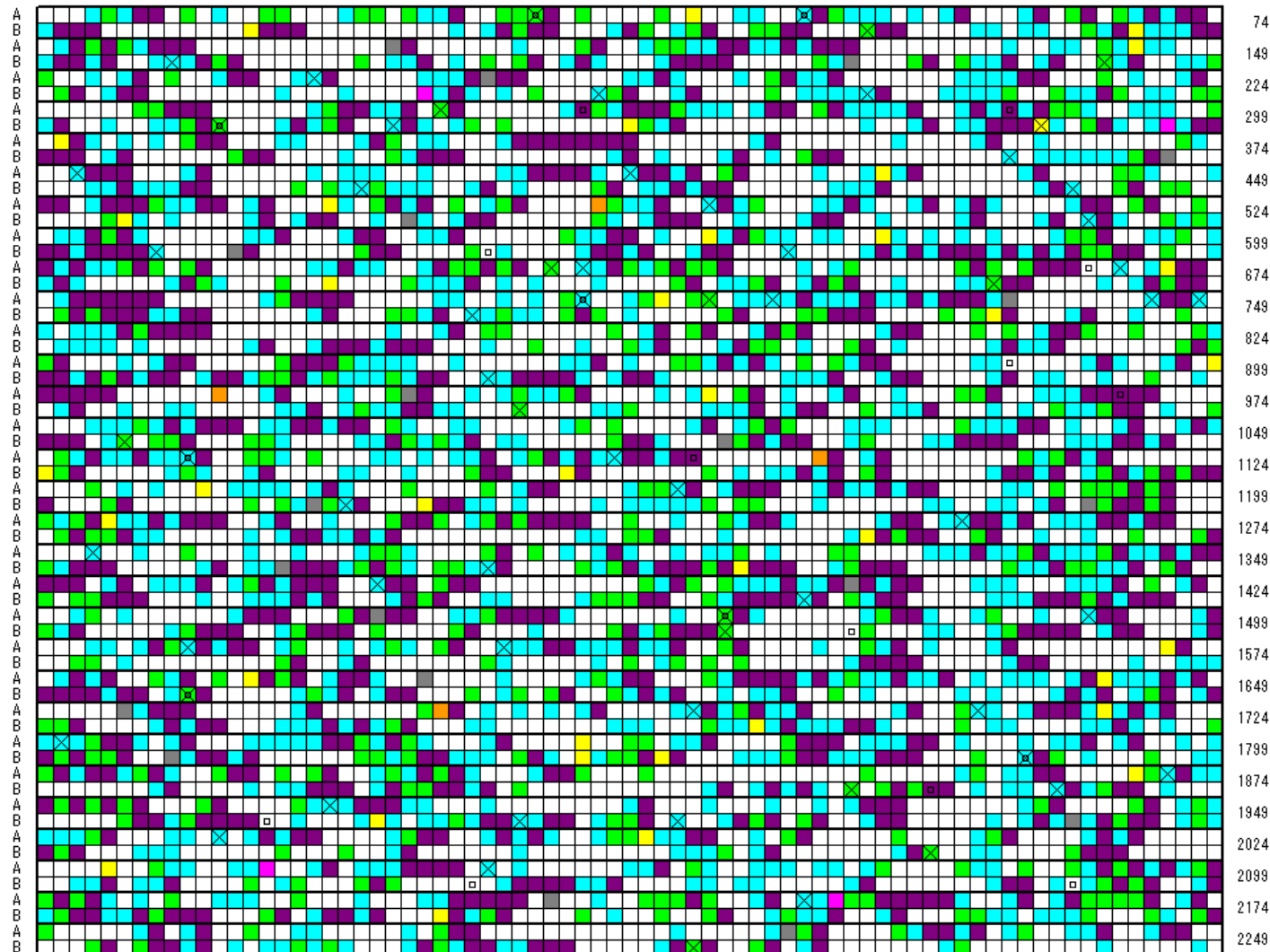
- ▶ What Studies Need To Be Done
- ▶ Can Field Trials Provide Additional Information
- ▶ What Are The Next Steps

VDE as a method for Location Sharing

LCDR Kinji Takeuchi
Japan Coast Guard

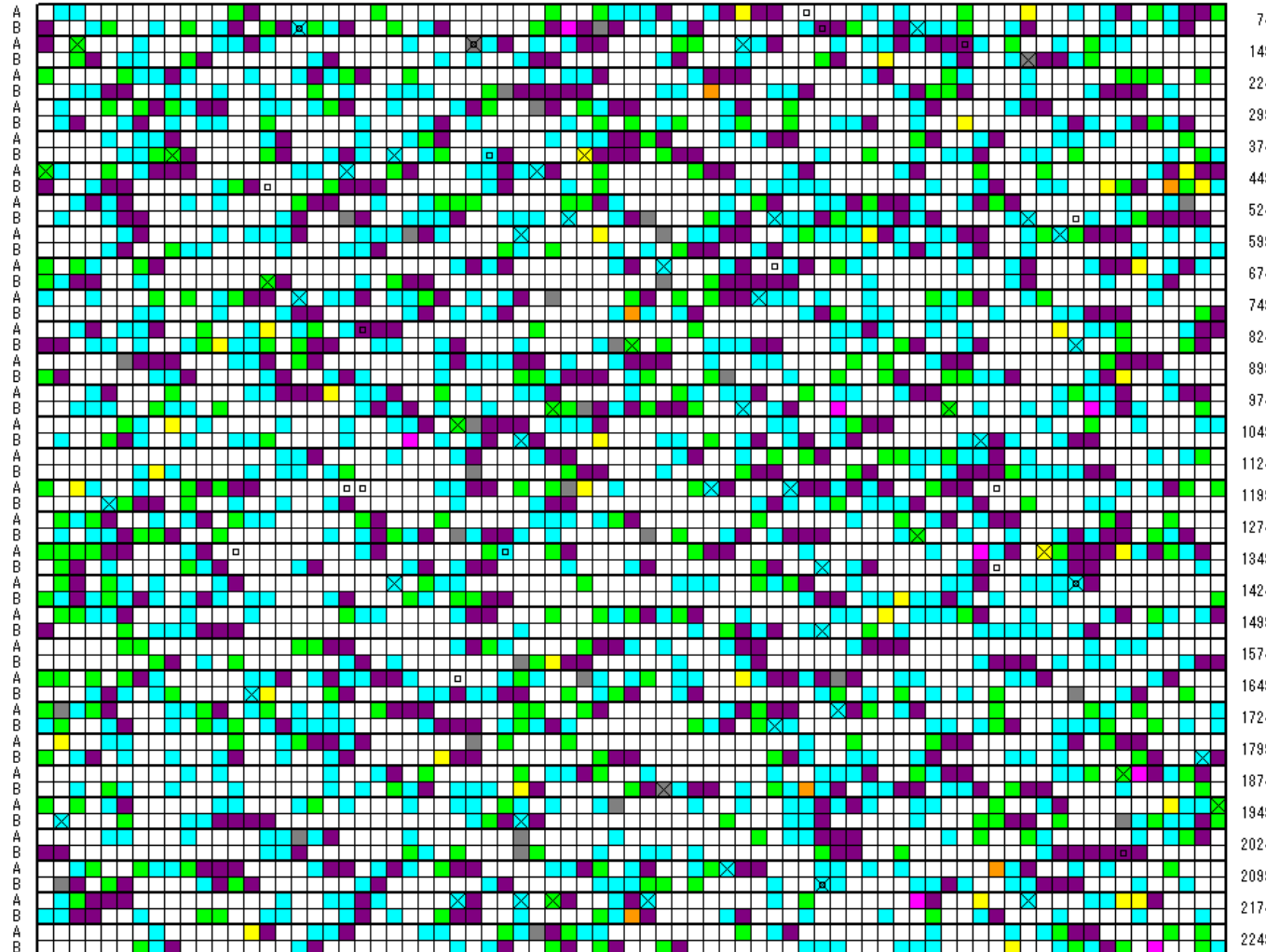
- Recent VDL load around Japan
- Details of AIS messages used currently
- Class-B AIS in Japan in the near future
- VDE used for location sharing
- Conclusion

- VDL load at Kannnon-zaki in Tokyo Bay



About 55% (in August 2014)

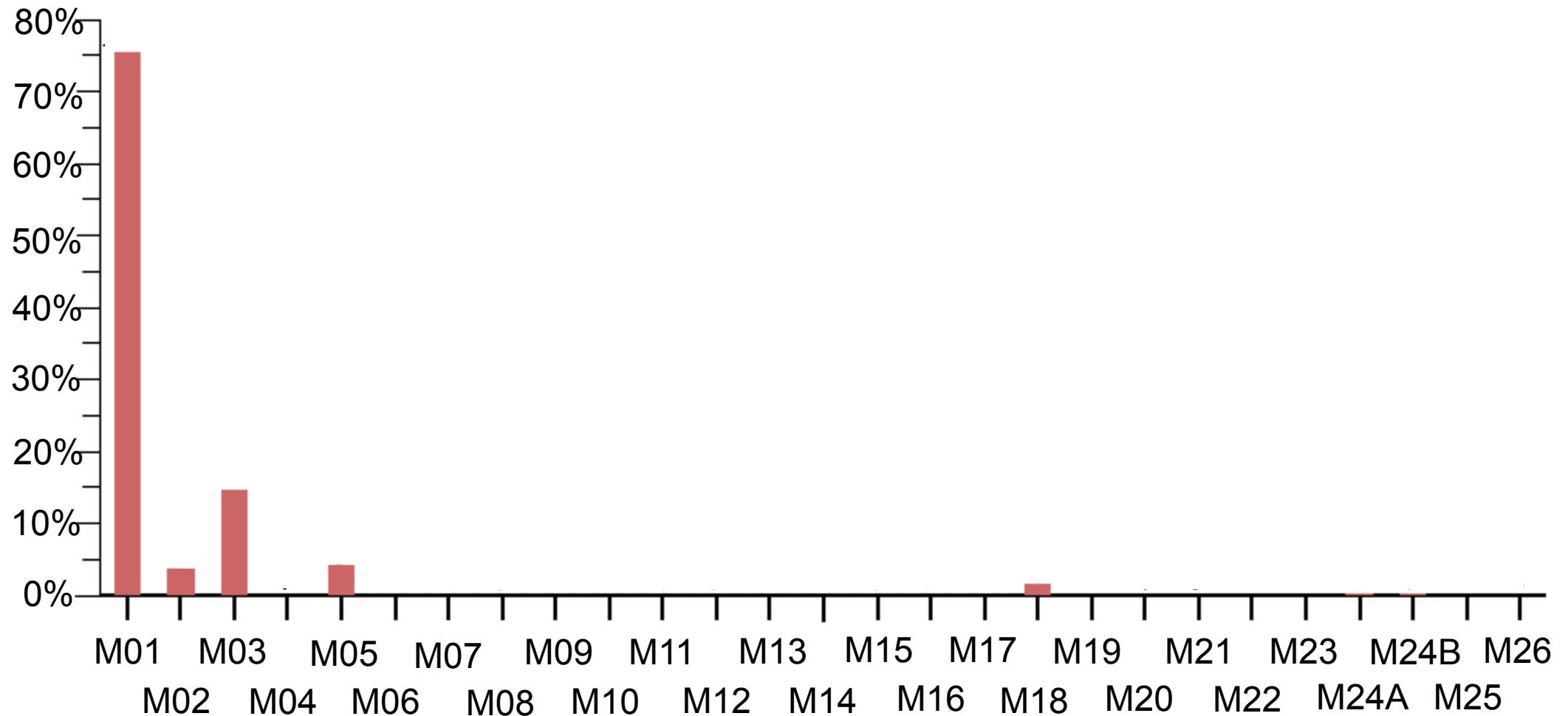
- About 42% (in August 2014)



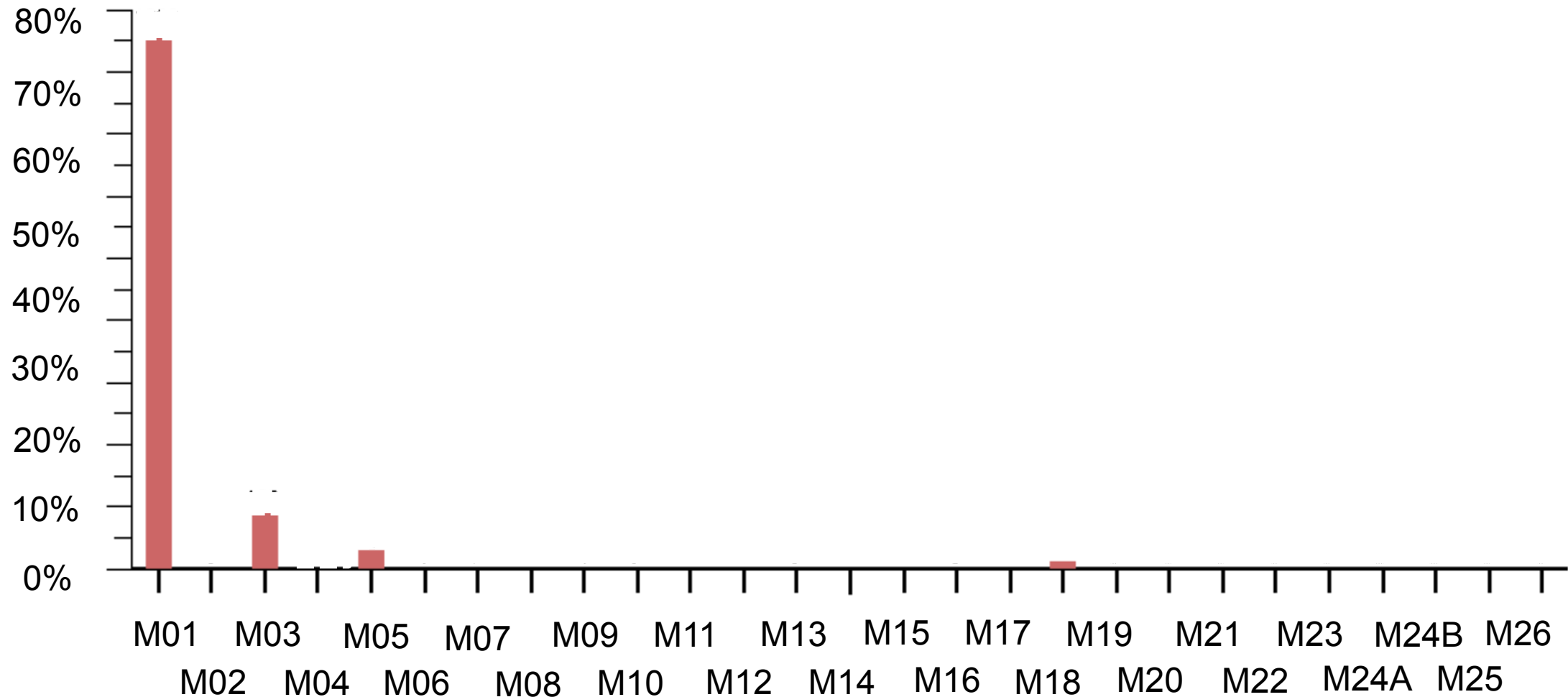
- VDL load in Other Countries
 - Gulf of Mexico: over 64%
 - Korea: 40 %
- What will happen in high VDL load ?
 - The range of reception of the AIS mobile station is reduced.
 - The AIS shore stations may miss a higher percentage of messages from AIS mobile stations.

- Recent VDL load around Japan
- Details of AIS messages used currently
- Class-B AIS in Japan in the near future
- VDE used for location sharing
- Conclusion

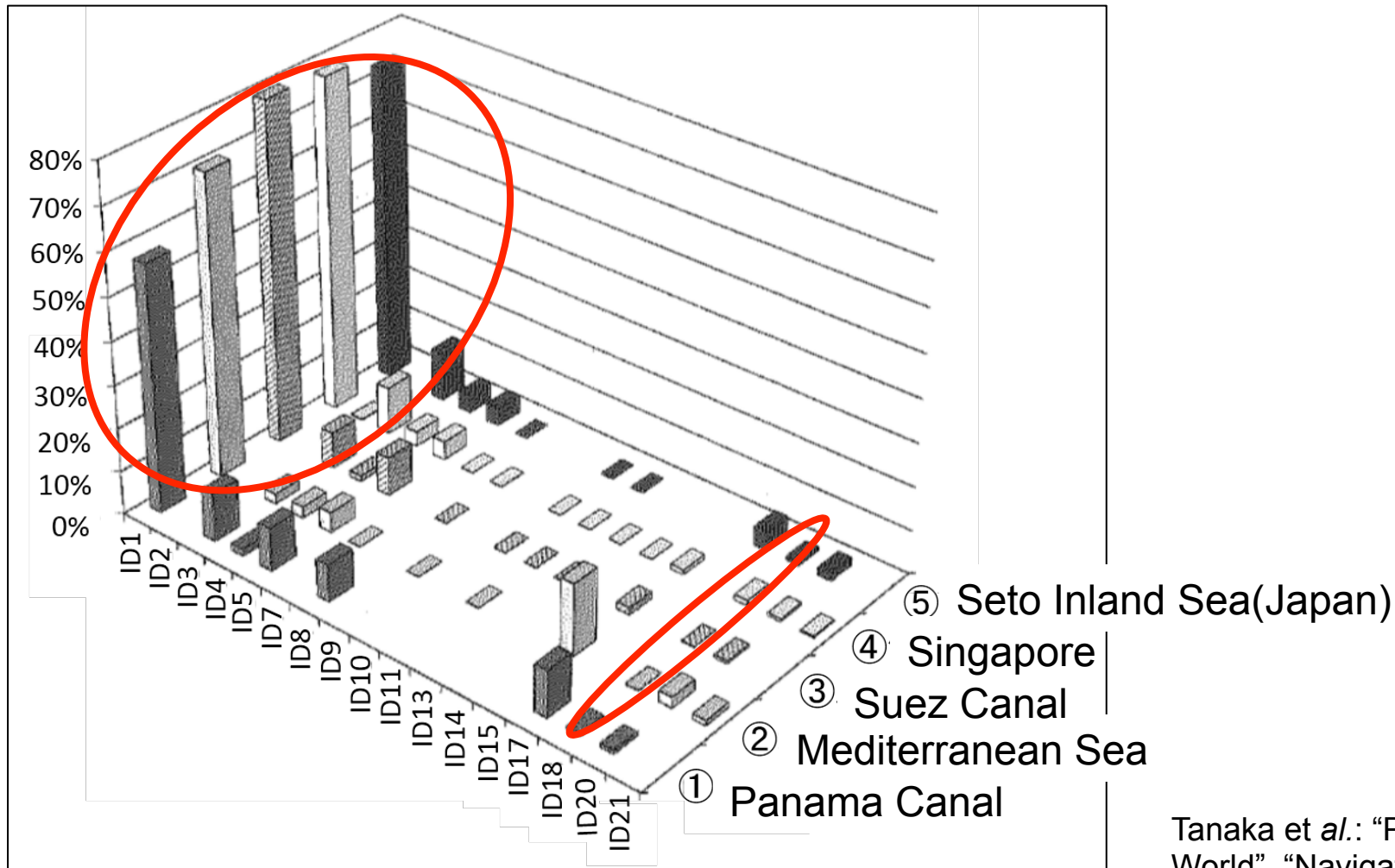
- Details of usages of messages in Tokyo Bay



- Details of Usage of messages in Ise Bay



- Details of usages of messages around the world
(in 2012)



Tanaka et al.: "Present Situation of AIS on Various Regions of the World", "Navigation" of Japan Institute of Navigation, vol. 188, pp87-91 March 2014.

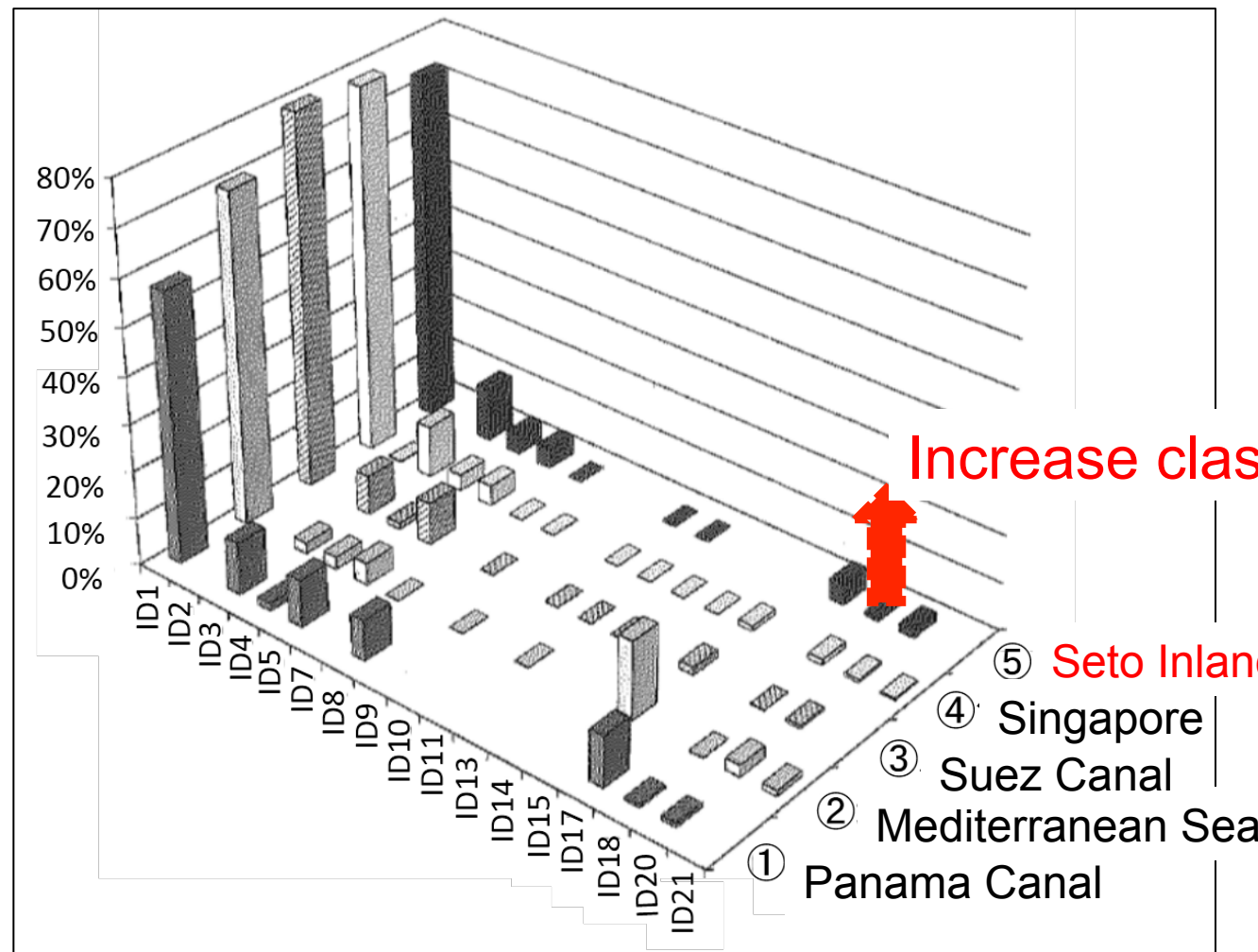
- Recent VDL load around Japan
- Details of AIS messages used currently
- Class-B AIS in Japan in the near future
- VDE used for location sharing
- Conclusion

- Encouragement of introduction of Class-B AIS by Japanese Government (acted in May, 2014)
 - Aid for fishing boat insurance for ships carrying Class-B AIS
 - An interest-free loan in case of setting up Class-B AIS
 - Exemption of periodic inspection and simplification of license procedure



The number of AIS may increase dramatically in the near future

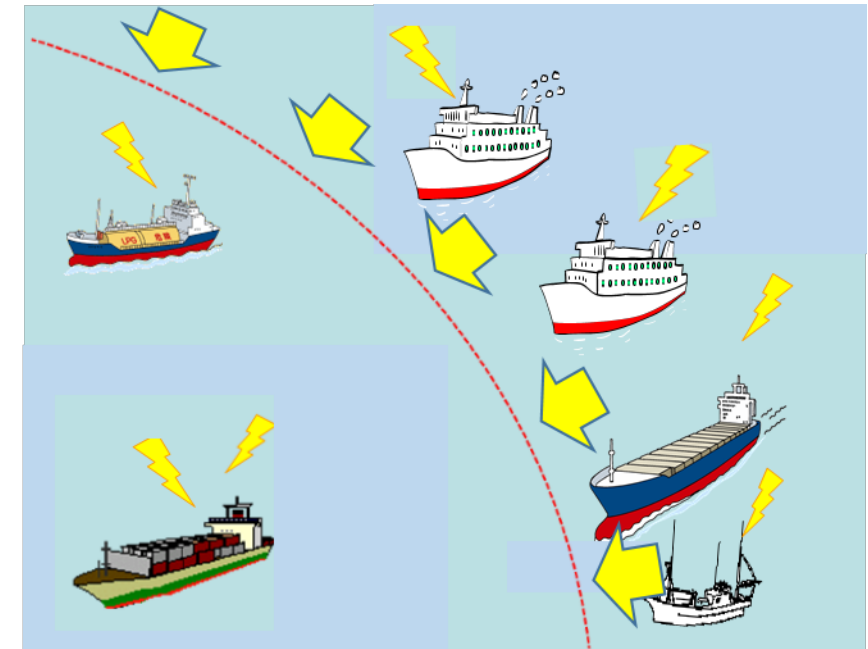
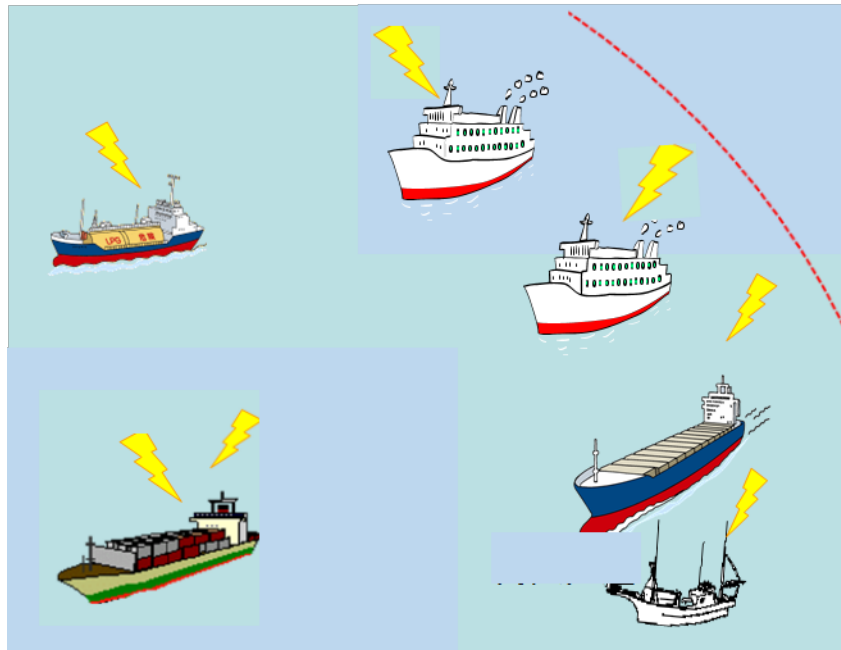
- Possible ratio of messages around the world in the near future



Increase class-B position report ?

- ① Panama Canal
- ② Mediterranean Sea
- ③ Suez Canal
- ④ Singapore
- ⑤ Seto Inland Sea(Japan)

- What may happen on ships around Japan's Coast in the near future?
 - The range of reception of the AIS mobile station may be reduced.



- What may happen on shore stations around at Japan's Coast in the near future?
 - The AIS shore stations may miss a higher percentage of messages from AIS mobile stations.



- Competent authorities have many (possible) sensors for detection or identification of ships:
 - AIS
 - Radar
 - Video Camera
 - Position report from Smartphones (possible)



Competent authorities can provide supplemental information for AIS position report. But how to send this information?

- Recent VDL load around Japan
- Details of AIS messages used currently
- Class-B AIS in Japan in the near future
- VDE used for location sharing
- Conclusion

- High speed data communication at 307.2kbps
- However, not enough for sending real time videos from camera.

An Example of estimation on data flow under the conditions as follows:

Standard resolution: 720×480

Standard frame rate: 30fps or 29.97fps

Brightness: 8bit, Color 8bit

Amount of data per picture is: $16\text{bit} \times 720 \times 480 = 5529600\text{bps}$ (5.53Mbps)

There're 30 pictures per second, so total amount of data is: $5.53 \times 30 = \text{about } 166\text{Mbps}$

Data can be compressed under 1/40 in H.264: $166 \times 1/40 = 4.15\text{Mbps}$ (per camera)

- High speed data communication at 307.2kbps
- However, not enough for sending real time videos from camera.

An Example of estimation on data flow under the conditions as follows:

Resolution: 720×480

Frame rate: 30fps

Brightness: 8bit, Color 8bit

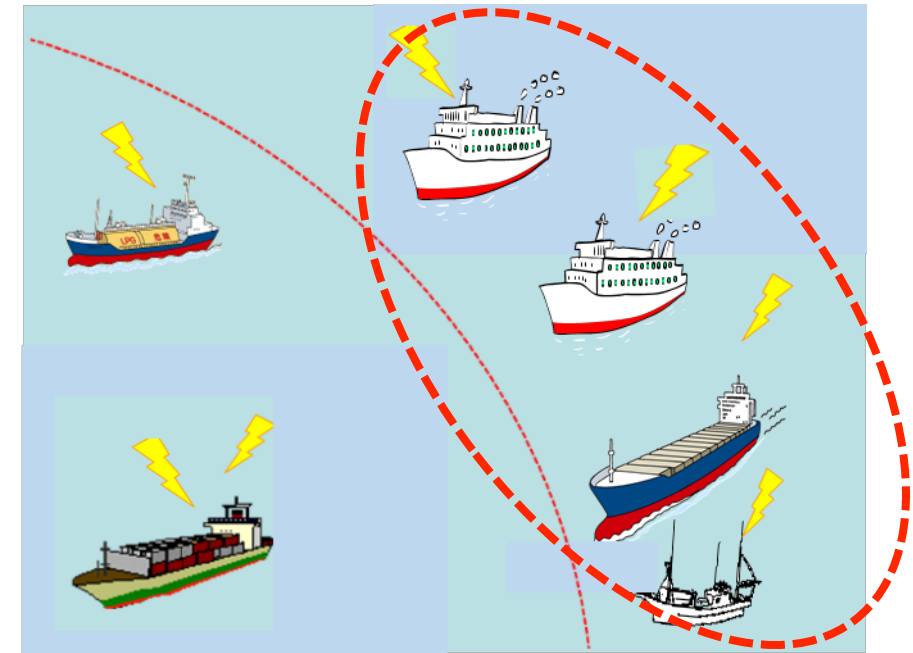
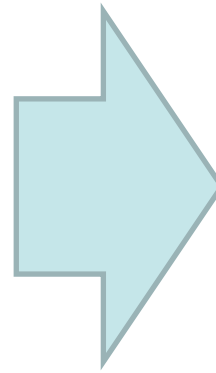
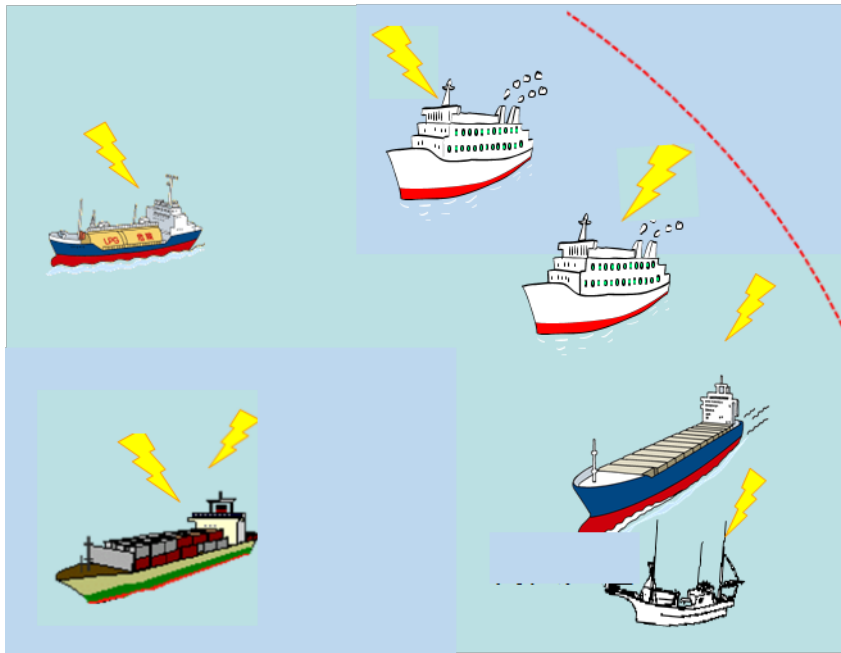
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Data can be compressed under 1/40 in H.264: $166 \times 1/40 = 4.15\text{Mbps}$ (per camera)

- Provision of ship positions by Competent Authorities via VDE

position sharing information from competent authorities



- An example of estimation on data volume for sharing locations

Information for position sharing:

Identifier (such as MMSI number) 30 bit

Longitude 28 bit

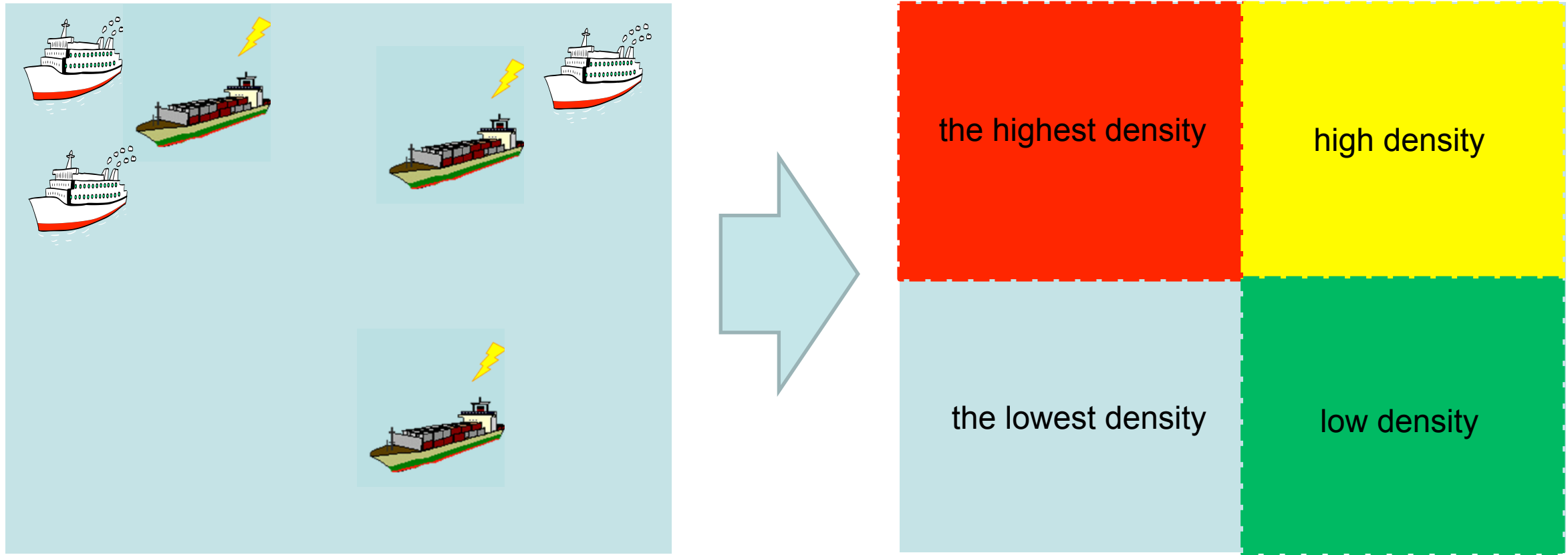
Latitude 27 bit

85 bit (per ship)

Data volume for positions of 1000 ships provided every 30 seconds:

$$85(\text{bit}) \times 1000 / 30 = \underline{2.8 \text{ kbps}}$$

- Another example of estimation on data volume for sharing locations (expressed by meshed area and traffic volume of ships)



- Another example of estimation on data volume for sharing locations

An estimation in Tokyo Bay under the condition as follows:

Mesh size: $0.4\text{km} \times 0.4\text{km} = 0.16\text{km}^2$

The area of Tokyo Bay: 1320km^2

Required meshes: 8520

Quantifying steps for traffic volume: 10

Required data volume: 4bit (per mesh)

Required data volume per provision: $8520 \times 4 = 34080\text{bit}$

Providing interval: 30seconds

Required data volume is $34080(\text{bit}) / 30 = 1136\text{bps}$ (1.2kbps)

- Recent VDL load around Japan
- Details of AIS messages used currently
- Class-B AIS in Japan in the near future
- VDE used for location sharing
- Conclusion

- High VDL load around the world
- Possible increase usage of Class-B AIS in Japan and expected result
- Examples of location sharing as a usage of VDE
 - Less than 3kbps is required for location sharing for 1000 ships in Tokyo Bay

VDES as a method for Location Sharing

LCDR Kinji Takeuchi
Japan Coast Guard

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Planned or on-going testbeds for VDES development

Name	Location	Time and duration	Status	Contact person(s)	Testbed website	Organisation(s) involved	Funding programme and budget
	Korea	in 2014	planned			Korea Research Institute of Ships & Ocean Engineering	
Sesame		3 years	on-going	Mr. Haugen		Kongsberg, The Norwegian Coastal Administration, The Maritime and Port Authority of Singapore	
	Japan	in 2014	planned	Lcdr. Takeuchi		Japan Coast Guard, manufacturers in Japan	
MONALISA			on-going	Mr. Zetterberg	http://www.sjofartsverket.se/en/MonaLisa/	CHALMERS, Danish Maritime Authority, SSPA, Liikennevirasto, Swedish Maritime Administration, GateHouse, SAAB	
	United States		planned	Mr. Kautz Mr. Tetteault		United States Coast Guard, other US government agencies	
	Australia United Kingdom		on-going	Mr. Safar		General Lighthouse Authorities, University of South Australia	
	France or EU	start mid/end 2014	planned	Mr. Fabritius		TBC, incl. Space Agency, Satellite industry	
Swedish testbeds, Phase 1,2,(3),(4)	Sweden	2013Q4,2014Q4,(2015Q1/2),(2016)	on-going, (planned)	Mr. Lindborg		Swedish Maritime administration, Saab	

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**WORKING DOCUMENT TOWARD
DRAFT RECOMMENDATION ON PERFORMANCE STANDARDS FOR
SHIPBORNE VHF DATA EXCHANGE SYSTEM (VDES)**

1 Scope

1.1 These performance standards specify technical and operational requirements for the shipborne VDES.

1.2 The VDES should improve the safety of life at sea, the safety and efficiency of navigation, and the protection of marine environment and enhance maritime safety and security, through efficient and effective maritime radiocommunications, by the following functional requirements:

- .1 as a means of AIS;
- .2 as a means of radiocommunication equipment through exchange of digital data between ship and ship, ship and shore including satellite via AIS, Application Specific Messages (ASM) and VHF Data Exchange (VDE).

1.3 The VDES should provide a capability of data exchange to ships and to shore users by terrestrial or satellite link, information from the ship, automatically and manually with the required accuracy and assigned VHF channel(s). Transmission and reception of the data should be with the minimum involvement of ship's personnel with a high level of availability.

1.4 The installation, in addition to meeting the requirements of the Radio Regulations, applicable ITU-R Recommendations and the general requirement as set out in resolution A.694(17), should comply with this performance standards in addition to the resolution MSC.74(69).

2 Functionality

2.1 The VDES should be capable of coordinating with respect AIS in the following modes:

- .1 an "autonomous" mode for operation in all areas. This mode should be capable of being switched to/from alternate modes by a competent authority;
- .2 a "controlled" mode for operation in a period of time when or an area where, a competent authority responsible for radiocommunication or

maritime affairs requires, such that the data transmission may be set or controlled by the authority.

3 Capability

3.1 The VDES should comprise:

- .1 antenna(s), capable of transmitting and receiving data through terrestrial and satellite link;
- .2 an AIS part complying with the performance standards for AIS as set out in resolution MSC.74(69) ANNEX3;
- .3 a multi-function data communication process for coordinating AIS, ASM and VDE;
- .4 a multi-function transmitter, capable of operating over a range of maritime frequencies for AIS, ASM and VDE
- .5 multi-function receivers, capable of operating over a range of maritime frequencies, simultaneously for AIS, ASM and VDE;
- .6 a means to automatically input data from other sources;
- .7 a means to automatically output data to other [devices];
- .8 a means of ensuring the integrity of the data;
- .9 a means to automatically or manually update the device as needed;
- .10 built in test equipment (BITE).

3.2 The VDES should:

- .1 not harm VHF voice communication by ships from communication method of VDES;
- .2 give a higher priority to AIS;
- .3 automatically schedule the transmission of data by its priority;
- .4 automatically select the operation mode described in 2.1 by a reception of a message from a competent authority;
- .5 send an acknowledgement as required;
- .6 send addressed or broadcast data.

4 User interface

To input and output data, the VDES should be provided with an interface conforming an appropriate international marine interface standards.

5 Identification

For the purpose of ship and message identification, an appropriate unique identifier should be used.

6 Data

6.1 The data provided by the VDES should include :

- .1 time stamp;
- .2 unique identifier;
- .3 message identifier.

6.2 As a minimum, the VDES should support the following:

- .1 AIS data;
- .2 distress and urgency communication related data;
- .3 search and rescue co-ordinating communications related data;
- .4 on-scene communications related data;
- .5 position related data;
- .6 maritime safety information (MSI) related data;
- .7 security and safety information related data;
- .8 VTS related data:
- .8 [e-navigation related data]
- .9 general radiocommunications related data;
- .10 bridge-to-bridge communications related data;

6.3 Priority

The data provided by the VDES should be prioritized as follows:

- .1 Global Maritime Distress and Safety System (GMDSS) related data (distress, urgency, emergency, MSI);
- .2 AIS data;
- .3 security and safety related data;
- .4 e-navigation related data;
- .5 others.

6.3 Security

A security mechanism should be provided:

- .1 to detect disabling data;
- .2 to prevent unauthorized alternation of input or transmitted data;

- .3 to conceal necessary data such as security related data; and
- .4 when possible, to notify.

7 Permissible initialization period

The installation should be operational within [2] min of switching on.

8 Power supply

The VDES and associated sensors and/or equipment should be powered from the ship's main source of electrical energy. In addition, it should be possible to operate the VDES and associated sensors and/or equipment from an alternative source of electrical energy.

9 Technical characteristics

The technical characteristics of the VDES such as variable transmitter output power, operating frequencies, modulation, and antenna system should comply with the appropriate ITU-R Recommendations.

PROPOSALS FOR UNPLANNED OUTPUTS**Method of work of MSC and MEPC; MSC-MEPC.1/Circ.4/rev3 Nov. 2014****ANNEX 1**

To enable the Committees to carry out a proper assessment of proposals for inclusion of unplanned outputs, submissions containing such proposals should contain, as a minimum, the following information, including demonstration and documentation:

1 IMO objectives Provide evidence as to whether and how the proposal	.1 is within the scope of IMO's objectives;
	.2 is strictly related to the scope of the Strategic Plan and contributes to the implementation of the high-level actions established in the Plan.
2 Compelling need Demonstrate and document	.1 the need for a proposed measure;
	.2 the compelling need addressed by a proposal for a new convention or an amendment to an existing convention.
3 Analysis of the issue	Provide an analysis of the proposed measure, including a plausible demonstration of its practicability, feasibility and proportionality

PROPOSALS FOR UNPLANNED OUTPUTS**Method of work of MSC and MEPC; MSC-MEPC.1/Circ.4/rev3 Nov. 2014****ANNEX 1**

4 Analysis of implications	Provide an analysis of the implications of the proposal, addressing the cost to the maritime industry as well as the relevant legislative and administrative burdens
5 Benefits	Provide evidence that the benefits in terms of enhanced maritime safety, maritime security or protection of the marine environment expected to be derived from the inclusion of the new item justify the proposed action.
8 Industry standards	Provide information on whether adequate industry standards exist or are being developed.
7 Output	Specify the intended output in SMART terms (specific, measurable, achievable, realistic, time-bound). If a final output cannot be specified, an interim output to be produced before the end of the current biennium should be specified in SMART terms.

PROPOSALS FOR UNPLANNED OUTPUTS**Method of work of MSC and MEPC; MSC-MEPC.1/Circ.4/rev3 Nov. 2014****ANNEX 1**

8 Human element	Provide the completed Checklist for considering human element issues by IMO bodies (MSC-MEPC.7/ Circ.1) to demonstrate that the human element has been sufficiently addressed
9 Priority/urgency Provide, with reference to the current Strategic Plan and High-level Action Plan	.1 evidence for the urgency of the proposed unplanned output
	.2 the date by which the proposed unplanned output should be completed
	.3 the timescale needed for the respective IMO organ to complete the work
10 Action required	Specify the action required of the IMO organ

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How to proceed the international standardization in IMO

