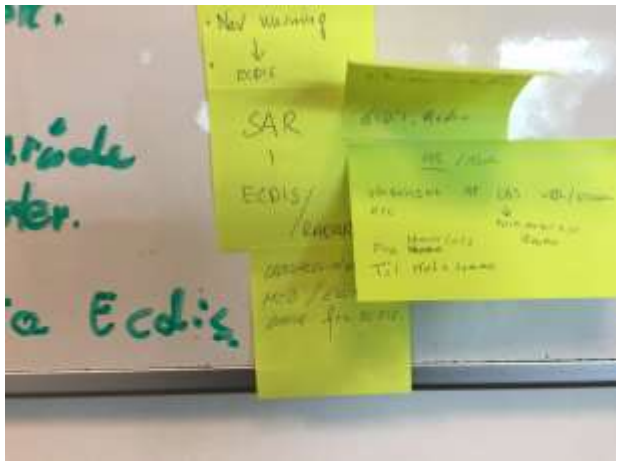
# High Level User Group


# Combined report
# Deliverable 1.7

## Final report 12th of October 2017

MARITIME DEVELOPMENT CENTER

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# Content

# 1. The High Level User Groups - an introduction

Today, information exchange between ships and shore is unstable, costly and marked by old technology and non-standardized solutions. This increases the risk of accidents, inefficiency and administrative burdens. The need for creating and implementing innovative and smart solutions for efficient, safe and sustainable traffic at sea through improved connectivity for ships is significant. The EfficienSea2 project was created in order to look at possible solutions.

To support the work of the EfficienSea2 project and maximize impact, four High Level User Groups (HLUG) was appointed. The task of the HLUG was to give advice on user needs and expert input on the possibilities and barriers for the development of new Information and Communication Technology (ICT) solutions.

The HLUG commented on four different subjects; the Maritime Cloud (now named Maritime Connectivity Platform), Automated Reporting, the BalticWeb and Communication Channels

Participants were invited from the EffiencienSea2 partner consortium consisting of a wide range of the leading part of the maritime industry and academic institutions, European authorities and international standard-setting interest organizations in an effort to unite technical and human factor experts.

The HLUG input was given both as individual input from each participant as well as through joint discussions and the resulting reports were uploaded to http://efficiensea2.org. Also, at the end of the project a Closing Conference will be held in order to present the results of the project and especially the results of the HLUGs to the maritime industry.

# 2. Possibilities and barriers for developing the Maritime Connectivity Platform - HLUG1

## Introduction

New ICT solutions are rapidly improving the possibilities for increasing safety at sea and enhancing the efficiency of the maritime industry. The overall objective of the EfficienSea2 project is to co-create and deploy innovative solutions for safer and more efficient waterborne operations. The project consists of a consortium, encompassing excellent technical and human factor competences, equipment, system and service providers as well as authorities and international organizations, with expert domain and regulatory knowledge and influence.

One of the core elements in the EfficienSea2 project is to develop and test the Maritime Cloud, which is a ground-breaking communication framework that will improve information sharing in and around the maritime sector for smarter traffic management, facilitating a comprehensive e-maritime and e-navigation environment, enabling the maritime internet of things.

In order to support the work of the EfficienSea2 project and maximize impact a High Level User Group (HLUG) has been appointed. The HLUGs task is to give advice on user needs and expert input on the possibilities and barriers for the development of new Information and Communication Technology (ICT) solutions.

***This report summarizes the results from the first HLUG meeting of the EfficienSea2 project, which was held in Copenhagen 8th October 2015. The objective of the meeting was to identify possibilities and barriers for the development of the Maritime Cloud. The focus was on governance models, legal aspects as well as business models that are relevant for the successful development and operation of the Maritime Cloud (MC).***

The HLUG input was given both as individual input from each participant as well as through joint discussions. The meeting was divided into 4 sessions. During the first session each participant gave input to the MC based on a SWOT analysis that was prepared beforehand. During the second session the possibilities and barriers regarding the governance of the MC were discussed. The third session addressed the business models for the MC while the fourth session addressed the legal issues related to the development and operation of the MC.

## Participants:

**Members of the High Level User Group**

| Company | Name | Title |
|---|---|---|
| BIMCO | Jeppe Skovbakke Juhl | Senior Marine Technical Officer |
| CESMA | Capt. Fredrik J. van Wijnen | General Secretary |
| Danish Maritime Authority | Erik Tvedt | Special Adviser |
| DNV-GL Maritime | Sascha Müller | Regional Business Development Manager |
| Ericsson | Dogulas Watson | Director - Business Unit – Shipping |
| GS1 Denmark | Douglas Hill | Chief Operating Officer |
| IALA | Michael Card | Deputy Secretary-General |
| ICS | Matthew Williams | Senior Marine Adviser |
| Lloyd's Register, Copenhagen | Kim Wiese | Marine Business Development Manager for DK |
| Maersk Maritime Technology | Kim Henriksen | Lead Naval Architect |
| Nautical Institute | Captain Harry Gale | Technical Manager |
| SMHI Weather Solutions | Lennart Cederberg | Global Product Manager at GAC |
| Swedish Maritime Authority | Ulf Siwe | MONALISA 2.0 Communication Officer |

**Representatives from the EfficienSea2 project:**

| | | |
|---|---|---|
| DMA | Bjørn Borbye Pedersen | Business Developer and Special Advisor |
| DMA | Jens Kristian Jensen | Innovation Engineer |
| DMA | Katja Øder | Innovation and Communication Manager |
| MDCE | Jan Boyesen | Business Development Manager |
| MDCE | Louise Boesen Karlsen | Project Manager |

## Meeting agenda

The agenda for the HLUG meeting was the following

1. Welcome and introduction to the day by Jan Boyesen, MDCE
2. Introduction to the EfficienSea2 project by Bjørn Borbye Pedersen, DMA
3. Table Round – short initial prepared input to the Maritime Cloud (MC) from each HLUG participant based on a SWOT analysis
4. Presentation of the Maritime Cloud by Jens Kristian Jensen, DMA
5. Discussion of the possibilities and barriers related to governing the Maritime Cloud
    - Governance aspects
    - Business models
    - Legal aspects

## SWOT

Overview of the SWOT on the Governance of the Maritime Cloud.

| Strengths | Weaknesses |
|---|---|
| • Narrow focus on the shipping industry<br>• Substantial budget and support by the EU<br>• Good timing<br>• Scalability - due to open source<br>• Harmonized solutions<br>• Technical neutrality | • The project is very broad and too ambitious<br>• There is a week collaboration with other projects<br>• Lack of port cooperation<br>• No clear commercial need or commercial demonstration of MC<br>• No modern gear on board many ships<br>• Too many data formats and different systems to be included<br>• Lack of branding the project<br>• Not the core business of a maritime authority |
| **Opportunities** | **Threats** |
| • Maritime Cloud has overall momentum<br>• Can create a platform for business development<br>• Enabler to improve safety at sea<br>• Automated updating, ensuring updated data without human involving<br>• Working closely together with other projects and related initiatives<br>• Implement global standards and involve major commercial players such as IBM, Ericsson and GS1 and draw on their experiences<br>• To be technology neutral – so the concept can be deployed despite technological developments<br>• Use existing technologies<br>• Huge opportunities for hinterland transport and Supply Chain connectivity<br>• China, Korea and Japan are potential takers of the project | • Cyber security, liability and insurance are major threats<br>• General trend towards reversing openness<br>• Many stakeholders, conflicting interests and small kingdoms as well as competing projects<br>• Lack of progress of Single Window and too many previous projects with no effect<br>• Very complex technical task. Many formats and different systems<br>• Shipping is a “conservative” industry<br>• DMA is experiencing organizational changes<br>• No clear management structure of MC or business models<br>• The user perspective is lacking<br>• Certification of equipment is very slow<br>• Focus towards results to be delivered and documented to EU rather than actual implementations and impact |

## Strengths

The strengths of the SWOT are the beneficial factors that are internal to the project. The strengths of the Maritime Cloud can be divided in to four overall categories. A strong focus on the maritime industry, substantial resources to develop the MC, a good overall timing as well as a strong focus on harmonized solutions and scalability of the concept.

There are many cloud systems being developed. However, the specific focus on the shipping industry and reducing the administrative burden are strengths for the work carried out in the project.

The project has a substantial budget of over 10 million EUR which gives a vast amount of human resources for the development activities. At the same time the support from the European Union gives the project an official stamp. Both represent strengths for the development and acceptance for the MC.

The overall timing is good since the Maritime Cloud is “happening” anyway. The maritime sector is generally lacking behind other sectors in terms of ICT implementation, e.g. compared to the aviation industry. There are many outdated administrative procedures that require manual routines and a lot of the IT equipment is obsolete. The fast technological developments create new opportunities at a low cost since it is possible to learn from other sectors and build on existing solutions.

The project builds on open source and technically neutral solutions. Even though this will create resistance from some of the commercial players it also makes it easier to scale the solutions and help gain the acceptance from the broader maritime community.

## Weaknesses

The weaknesses describe the negative factors that are internal to the project. The weaknesses of the Maritime Cloud can be divided in to four overall categories. These are: a too broad scope of the project, no clear commercial need or business case, ancient equipment on board ships and too many data formats and standards.

The EfficienSea2 project is too broad and ambitious. There are many different components being developed and tested and many partners involved in this work. Even though the project has a substantial budget the broad scope is a weakness in order to develop specific solutions that actually will have an impact.

There is no clear commercial need for the Maritime Cloud and it is furthermore difficult to sell the concept to the industry since there is no operational demo version of the concept at the present. Even though the Danish Maritime Authority has a lot of competence within the ICT area, it is not the core business of an authority to develop business oriented systems. At the same time there is no regulative incentive to promote the concept since the approach is to promote the business opportunities and efficiency rather than safety. The business case for MC is therefore rather unclear. This constitutes a large weakness towards securing industry uptake.

Not all ships operate with sophisticated and integrated ICT infrastructure. Furthermore, there are many different systems and data formats that are used in the industry. This makes it difficult to create a solution that will work across the industry and be adopted globally.

There is a weak collaboration with other projects in the area and synergies as well as co-creation are rather limited. At the same time there is a limited branding of the maritime both in the EfficienSea2 project, but also in collaboration with other projects. This represents a major barrier for the development and adoption of the MC.

### Opportunities

The opportunities of the SWOT are the beneficial factors that are external to the project. The opportunities can be divided in to three overall categories: technological opportunities, collaboration with existing stakeholders and initiatives, as well as a strong focus on the business opportunities.

The Maritime Cloud can create a common platform for business development that service providers, producers of maritime IT equipment and related firms can use to reach a broader market. This platform can have a larger number of users than similar clouds developed by individual firms. However, it is important that the Maritime Cloud build on existing technologies and standards since there is no need to develop new and costly technologies that have already been developed and adopted in other sectors. Furthermore, it is important to be technology neutral so that the concept can be deployed at a global scale despite new technological developments and regional interests.

The MC has already gained momentum. However there is a possibility for boosting the development further by collaborating closer with other stakeholders. This includes collaborating with major commercial players such as e.g. IBM, Ericson and GS1, learning from their experiences. It also includes collaboration with existing initiatives and projects. One of the large potential takers of the projects results are China, Korea and Japan.

It is important to focus on the benefits that the system will bring in order to create possibilities for the development of the MC. Some of the interesting areas are: Reducing the administrative burden by automated updating, ensuring reliable data without human involvement and integration with hinterland transport and Supply Chain connectivity. Furthermore, to focus on increased safety could be an opportunity since e.g. 85% of all accidents are related to the human element and safety at sea could prove to become a key enabler.

It was recommended to the project that a strategic roadmap should be drafted, to indicate what needs to be achieved first, what could be achieved by other or future projects, and to isolate items not to be progressed by the EfficienSea2 project, in order to sharpen the focus of the project.

### Threats

The threats are negative factors that are external to the project. The threats can be divided in to four overall categories: Cyber security, resistance from other stakeholders, lack of results from previous projects and organizational changes at the DMA.

Most participants at the workshop mentioned that the greatest threat of all to the adoption of the MC is cyber security issues. In recent years increasing attention has been given to commercial threats as well as terrorism and pirate attacks. This includes issues such as liability and insurance by using the system and ownership of data. Even though the shipping market is highly competitive and transparent there is a general trend across industries towards decreasing openness due to cyber risks.

There are many actors such as ship-owners, ports, ship agents, international organizations, authorities, projects and related initiatives that have to be involved in the development of the maritime cloud. Even though these actors can help create synergies they also represent a threat that can block the development and adoption. Many stakeholders have contradicting interests and there are many "small kingdoms" who are unwilling to give away power or business opportunities voluntarily. At the same time the system has to work together with many other IT systems, data formats etc. which together with a lack of a clear business and governance model represents major threats.

Furthermore the lack of results of previous projects and initiatives such as the single window will create skepticism. Even if major stakeholders should be willing to go ahead with the MC the slow procedure of certification in the maritime community will represent a threat for hindering the development.

Finally the DMA is experiencing organizational changes since the headquarters will be relocated from Copenhagen to Korsør by the end of 2017. Many employees will most likely leave the DMA during the next 18 months. There is a risk that the development of the MC in the EfficienSea2 project will lose momentum due to a "brain drain" at the DMA.

## Governance models

**Is there a need for governance?**

Some members of the HLUG expressed the view, that there might be no need for a governance body for the MC. However, most participants agreed that it is very important to make sure that the information coming from the MC is trust worthy since security is important for the deployment of the system. At the same time the MC will require hardware and software components, and it will therefore be necessary to provide funding to cover such costs. The most likely setup for the MC will be a mixture of private and public data and services on the same system, which the governance model needs to accommodate. Someone will need to be responsible for granting access to the various users and services, and create interfaces and rules based on standards.

**Need for a global approach**

Since the maritime industry is highly globalized with ships operating all around the world it is imperative that the MC builds on a global governance structure. There was consensus among HLUG representatives that the MC should not be governed by national or regional bodies such as the European Union. Many suggested that the MC should be independent, while most agreed that it should be governed by IMO if an authority should be the governing body; although this might not be without its own challenges.

**Business as a driver**

The best way to proceed with the development of the MC is to develop a service registry and let the commercial players provide independent services to the maritime industry. The independent approach could be strengthened by letting the classification societies play a role in certifying developers, equipment and services based on international standards. Classification societies often have a greater competence within approval of equipment than national or international authorities and might therefore be the right choice for certification of the MC components.

**A federated governance model**

Several find that a structure of federated services on the MC could be the best way forward. The MC could act as a registry or "the yellow pages" with physical servers being placed in different locations.

This could help solving issues regarding where to place servers, since some countries will be reluctant to accept having physical databases in other countries.

On the other hand LRIT is based on a lot of data centers which are operated at excessive costs. It is therefore important to find a balance between political acceptance, the amount of data centers servers in the system, and costs.

One possibility is to have different governance bodies for different parts of the registry. This way the system could be flexible and accommodate both private and public content as well as national and regional authorities and their interests.

**Need for continuity**

Even though the EfficienSea2 project has substantial funding, it is important to find a governance body that can undertake the work on a permanent basis. One of the problems that often occur with projects is that they finish and die. It is not possible to build the MC within the framework of the project and then expect someone to use it. It is important to find a stakeholder that can maintain the MC after the project finishes.

## Business models

There are two major issues to be resolved when it comes to the creating a sustainable business model for the MC. One is how to finance the development and operation of the MC itself. The other one is to secure the income of the companies which are providing services on the MC. Both issues are closely interlinked.

**How to start the MC?**

Ship-owners are often perceived as being conservative when it comes to adopting new technologies. It is therefore important to have a good business case and show value before trying to sell the concept to the users. Otherwise it will not "take-off". One way to start is to create a specification and a living reference model of the MC and continue extending the system as users increase. It should be considered a commercial business, be service oriented and have no safety-critical issues as this will slow down the work. The MC could start as a business platform with few features and define links and standards to other systems later on.

**Business models for the Maritime Cloud?**

It is doubtful if users will pay for being part of the cloud framework itself. This is perceived as basic infrastructure which does not create value. One way to finance the MC could therefore be to collect a small transaction fee from the users when they use the MC. This could be done by letting service provides pay the fee to the system administrator. Another model for financing the MC could be to have a subscription model where you subscribe to the platform and get all the services. A third model could be to let the ports and other service providers pay for providing services to their users. It is essential for creating a sustainable business model for the MC to identify the services that are going to part of the system.

Several members of HLUG find that there will be a great interest in paying for the messaging service in the MC. Furthermore, the team behind the US conference e-Navigation Underway are interested in having a global standard for navigational warnings. This could be an enabler for the MC. Reducing the administrative burden by automated reporting could be another one.

It is important to make it possible for users to choose various suppliers of similar services that are based on the same standards in order to secure vendor independency. At the end of the day the ones who pay for the services will be the ones who control the datacenters, and it is therefore important to think the business models through when developing the framework and governance model for the MC.

**The aviation industry as inspiration?**

One of the cases that are often discussed as inspiration for the maritime industry is the aviation industry. Overall, however, shipping is doing well in terms of safety and there is no need for implementing a heavy control and information system similar to aviation in the maritime domain. The aviation industry should not act as a raw model for MC. We need to create a structure that is appropriate for the shipping industry.

## Legal aspects

There are two possible drivers for adopting the MC. One is to create business value and voluntary market uptake. The other one is by regulative requirements and mandatory measures such as demanding that ships use the MC to increase safety. The overall recommendation of HLUG is that business value is more suited as a driver than regulation.

**Safety and regulation as drivers**

The legal aspects are far more important if the system and services are related to safety and compliance with requirements from authorities. In this case you will need trusted ID and be sure that the data is reliable. However, when you put safety critical issues into the system, you bring heavy legal aspects and regulations into play. This makes it very slow to get the systems approved and might block the development of the MC.

When it comes to regulative measures, the requirement for Single windows and Safe Sea Net could be a driver to implement the MC. One possibility could be for the ship-owners to see an opportunity to integrate various systems that they use already into one. However, a problem might be that companies will be concerned that internal and commercially sensitive information is shared, thus we need standards and independent suppliers.

# 3. Possibilities and barriers for developing a new common database concept and structure - HLUG2

## Introduction

***This report summarizes the results from the second High Level User Group (HLUG) of the EfficienSea2 project, which was held in Copenhagen on 1st June 2016 at the offices of the Danish Maritime Authority. The input was given through joint discussions between the members of the HLUG. The objective of the meeting was to identify possibilities and barriers for implementing e-maritime and increasing the automated flow of information related to port calls among maritime stakeholders. The discussions were based on the five scenarios for automated data exchange that BIMCO has developed as part of the EfficienSea2 project.***

New ICT solutions are rapidly improving the possibilities for increasing the efficiency of the shipping industry. The overall objective of the EffcienSea2 project is to co-create and deploy innovative solutions for more efficient and safer waterborne operations. The project consists of a carefully selected consortium, encompassing excellent technical and human factor competences, equipment, system and service providers as well as authorities and international organizations, with expert domain and regulatory knowledge and influence. For more information on the EfficienSea2 project please see http://efficiensea2.org

One of the elements in the EfficienSea2 project is to focus on improving the exchange of information between maritime stakeholders by facilitating the automatic flow of information within and between ships, ports and their surroundings. This aim is to standardize templates and reporting forms together with techniques for single reporting in order to streamline the information flow to ensure efficient exchange of data. This will reduce the time spent preparing and executing the data exchange and thereby reduce the administrative burden on the shipping industry.

In order to help reducing the administrative burden related to port calls, BIMCO has developed five possible scenarios on how to automate the exchange of information between the maritime stakeholders as part of the EfficienSea2 project.

The five scenarios are:

Scenario 1: Exchange of information between ship and port
Scenario 2: Port information for fine-tuning the voyage plan
Scenario 3: Seafarers' licenses and STCW documents
Scenario 4: Coordinating the port call
Scenario 5: Emissions information shared with authorities, ports and potential third parties

You can find the five scenarios described in the EfficienSea2 report – Deliverable 5.2. – “Development of a new port database concept and structure”.

In order to support the work in the EfficienSea2 project and maximize impact a High Level User Group (HLUG) has been appointed. The HLUG consists of stakeholders from the maritime industry such as ship-owners, business associations, ports, service providers, authorities, maritime organizations and

developers of maritime equipment, who give advice on user needs and expert input on the possibilities and barriers for developing new ICT solutions for the maritime industry.

In order to help the project proceeding with the work on reducing the administrative burden related to port calls by automated exchange of information between maritime stakeholders a High Level User Group meeting was arranged. The aim of the meeting was to help developing a roadmap and identify key barriers and possibilities for the future work.

## Participants at the High Level User Group meeting

| Company | Name | Title |
|---|---|---|
| BIMCO | Aron Frank Sørensen | Chief Marine Technical Officer |
| DNV-GL Maritime | Flemming Mose Christensen | Area Manager, Denmark, Faroe Islands, Iceland & Greenland |
| Envecon | Rajesh Nair | CEO |
| Ericsson | Dogulas Watson | Director - Business Unit – Shipping |
| GS1 Denmark | Sacha Mendes da Silva | Head of Market Relations |
| IALA | Marie-Helene Grillet | Technical Operations Manager |
| IBM | Boy Steiner | Sales Director |
| ICS/Danish Ship-owners' Association | Per Winther Christensen | Deputy Technical Director |
| Lloyd's Register, Copenhagen | Kim Wiese | Marine Business Development Manager for DK |
| Maersk Maritime Technology | Niels Bjørn L. Mortensen | Director, Regulatroy Affaris |
| Swedish Maritime Authority | Ulf Siwe | STM Validation Communications Officer |
| Weilbach | Torben Frerks | CEO |
| **Project Partners** | | |
| BIMCO | Jeppe Skovbakke Juhl | Senior Marine Technical Officer |
| DMA | Bjørn Borbye Pedersen | Business Developer and Special Advisor |
| DMA | Tomas Groth Christensen | Softwaredeveloper |
| MDCE | Jan Boyesen | Head of Development |

## Meeting agenda

The agenda for the HLUG meeting was the following

1. Welcome and short round table, by Jan Boyesen
2. Introduction to the EfficienSea2 project and the Maritime Cloud, by Bjørn Borbye Pedersen
3. Presentation of the 5 scenarios, by Jeppe Skovbakke Juhl
4. SWOT results on the 5 scenarios, by Jan Boyesen
5. Joint discussion and input on the SWOT
6. Presentation of the selected scenario, by Jeppe Skovbakke Juhl
7. Joint discussion:

*How do we create a sustainable business model?*

1. *What are the expected costs and benefits and who will gain and pay these?*
2. *Who should pay, own, operate and control the system?*

3. *Who are the central partners to be involved when developing a system related to the selected scenarios 4, 1 and 2?*

8. Wrap up and future steps, by Bjørn, Jeppe and Jan

## First HLUG session – SWOT of the 5 scenarios

During the first session of the HLUG meeting each of the five scenarios were presented and the strengths, weaknesses, opportunities and threats were discussed. The strengths and weaknesses of the SWOT are the beneficial and negative factors that are internal to the project. The opportunities and threats of the SWOT are the beneficial and negative factors that are external to the project.

Some of the overall comments on all the 5 scenarios are that even though they are different, they are also interrelated and often require the same standards and solutions. If you solve some of the central issues (such as digital signatures) these can be used in all scenarios. Furthermore, the solutions should build on the EPCglocal, ISO, S100 or other industry standards in order to maximize impact. At the same time, it is very important to design a system that has a high level of cyber security since the data exchange often concerns sensitive information.

## Scenario 1: Exchange of information between ship and port

Scenario 1 focuses on reducing the administrative tasks related to preparing pre-arrival and port call documents. The scenario was perceived as very important by the HLUG. Among the strengths are that it is closely related to the core work carried out by BIMCO in the EfficienSea2 project. Furthermore, the vast extent of the administrative burden is well documented. Weaknesses include, that the scenario assumes that electronic and electronically signed documents will be acceptable by the authorities outside of the port such as customs. Furthermore, it is a weakness that the scenario does not address the fundamental challenge of implementing e.g. National Singe Windows which are policy related rather than technical. Among the opportunities are that the scenario has the potential to change the information exchange in the future and lower the administrative burden on ships as well as ports. The threats are that unless the system is strictly managed the many stakeholders and users will be a challenge. Furthermore, the solution may be too advanced for many ships and ports to test.

<u>Input from the discussion</u>

In order to make this scenario possible there will probably need to be a long transition period where authorities use an electronic document format before a fully automated system will be in place. The idea of standardizing reporting and letting the authorities build their own template based on such a standard, as well as letting authorities pull the information was well received by the HLUG. However, it might be a challenge that authorities have to pull the information actively rather than receiving it from the ships (ship-owners or agents). A way to motivate authorities (and ship agents) to adopt the system could be to focus on saving human resources through less routine tasks. However, there is a risk that the burden is shifted to other stakeholders rather than being removed. If the information is standardized, there is a better chance that the authorities will create a template based on the standard since there will be less work related to updating reporting templates in the future.

## Scenario 2: Port information for fine-tuning the voyage plan

Scenario 2 addresses the potential for automated gathering of information collected by the ship prior to arrival at port as part of the voyage planning. Among the strengths of this scenario are that it provides a

way of confirming that the preliminaries for arrival are complete. Weaknesses include that this might be seen as an extra administrative burden from the ship's side, that the scope is very limited, that the information must come from a trusted source in order to be used for navigational purposes and that there is risk that the scenario will address the same work which has already been done in the AVANTI project. The scenario gives the opportunity to improve safety of navigation as it reduces workload on the bridge while some of the weaknesses are that there is a risk of over engineering a trivial matter and that the responsibility "issue" may hinder voluntary participation of a realistic testing.

Input from the discussion

Scenario 2 is closely related to the AVANTI, Pronto and STM Validation projects at it is important to seek collaboration between EfficienSea2 and these projects so work is not duplicated. It is also important to take into account that many stakeholders are involved in updating the information and keeping the data valid. It will be a comprehensive and complex task to incorporate all these data sources into the solution.

## Scenario 3: Seafarers' licenses and STCW documents

The third scenario addresses the potential for digitalizing the seafarer documents in order to reduce the administrative burden on ship operators when keeping track of the personal certificates and seafarer documents. The strength of this scenario is that it supports electronic documents and certificates. However, only few of the STCW certificates are standardized and the international interest might be very small. Event thought it might create an opportunity to enhance the availability of information on seafarer qualifications; it is a threat, that it might create new administrative burdens. Furthermore, the system needs to be recognized by an international body and this might be a barrier.

Input from the discussion

The IMO/ILO has previously worked on e-certificates for seafarers, however with little success. Furthermore, the Estonian Maritime Administration is working on a project on electronic seafarer certificates, and it is worth looking more into this project before initiating own project activities. Even though the suggested system would include a lot of sensitive data such as medical information, it was assessed that this can be handled. The project should look at other industries such as the health sector in order to get inspiration on how to handle sensitive data.

## Scenario 4: Coordinating the port call

Scenario 4 concerns the information that has to be checked by charters in their preparation before they commit themselves by signing a contract. Among the strengths of this scenario are that it covers many different stakeholders and builds on knowledge from previous EU projects. However, the scope is limited to charter information and there is a risk that the scenario will duplicate work done in other projects such as the AVANTI project. Among the possibilities are that the solution has the potential to make the industry more efficient while the risks includes that the scenario assumes that a standard template will be universally accepted which might be problematic since it is dependent on third party participation and acceptance.

Input from the discussion

Scenario 4 is similar to scenario no. 2 but has more commercial information where the shipping agent collects and distributes information to the port etc. The scenario has the potential to disrupt the current market and become a challenge for the agents. However, the first movers in this arena might be able to gain a competitive edge and new business opportunities. At the same time some agents will be happy to

get rid of some of the administrative tasks. The concept is closely related to the Port Collaborative Decision Making activity in the Sea Traffic Management Validation Project as well as the Pronto project. Close collaboration with these activities is therefore needed.

## Scenario 5: Emissions information shared with authorities, ports and potential third parties

Scenario 5 focuses on using automated reporting in order to enforce the regulation on sulfur in the fuel of ships and air emissions. Several of the High Level User Group members pointed out that scenario number five is of great importance to the industry. The reason for this is that reductions of sulfur emission in order to comply with requirements under annex VI in the MARPOL convention in the designated Emission Control Areas comes with high costs for the ship-owners. The economic incitement for not complying with the regulation is therefore high and there is a risk that some ship-owners will deliberately disobey the rules in order to reduce costs. The incitement for non-compliance will even increase when the global cap on sulfur of marine fuel is implemented since the amount of ships and the areas included will be greatly increased. In order to help the ship-owners to document compliance with the sulfur regulation the scenario suggests a voluntary system of information exchange.

Input from the discussion

This work is very important for the shipping industry and it has therefore been decided that further work on ECA compliance monitoring is needed. This will be done in another work package of the EfficienSea2 project since the solution apart from data exchange also will focus on measuring emissions and how to create the data. The HLUG is positive towards a paradigm shift where ships-owners actively send emissions data to prove that they are in compliance. The port state control often does not have the resources to monitor emissions and it is therefore a good idea to use a setup as in other industries (e.g. the road freight industry where data is recorded continuously from trucks). However, there are still many challenges in order to implement the scenario as e.g. the equipment for emissions monitoring is still expensive and unreliable.

## Second HLUG session – selection and discussion of preferred scenarios

The second session of the HLUG meeting was focused on selecting the preferred scenarios, and to identify important possibilities and barriers to be taken into consideration when creating a roadmap for the future work of the scenarios. During the beginning of the second session it was decided that the focus should be on scenarios 1, 2 and 4. Scenario number 5 is very important and will be worked on in another work package of the EfficienSea2 project, while scenario number 3 is very different from the others and there is already a project which is addressing this area.

### Partners and collaboration with other initiatives

One of the central questions is how to involve external stakeholders into the development work and how to build cross industry collaboration. The shipping industry is very fragmented and it is important to include central players in order to maximize impact. The central players to include in the work are ship-owners, agents and the large ports as well as their representing organizations. ICT firms and service providers should be involved as advisors in order to secure that standards and systems developed work well together with other existing systems. The authorities should also be involved as external stakeholders since it is most likely those who will be pulling the data from the system and in many cases they are the end-users. However, the authorities should not be leading the work. Focus should rather be on creating an industry standard.

Furthermore, it is very important to have a close collaboration with other existing initiatives such as the STM Validation, Pronto and Avanti projects in order to create synergies and involve more users rather than creating a situation of competition.

IMO was not perceived as the right forum for developing the system since it includes commercial information. The system should build on existing standards such as ISO or EPCglobal. Another possibility is to create a sub-standard of the S100. In any case the project needs to prepare at good concept if such an international organ should adopt it. Furthermore, it shall be noted that the development and adoption of such standards often takes many years. If business interests are the drivers of the development the time for implementing the standard will probably be shortened.

It was mentioned that the IHMA - International Harbour Masters Association – has written a paper with definitions that have been passed to the IMO and which will be adopted by the IMO within two years. The paper was passed quickly since it only includes definitions and not regulation. If a similar team of players makes a suggestion for a data definition format it might however get through the IMO quickly and this could be a way forward.

## Creating a roadmap

One approach could be to start by implementing the system in some of the major and advanced ports and ship-owners and letting the system create a ripple effect to other ports and regions.

Event thought it was decided during the HLUG meeting to combine scenarios 1, 2 and 4 into the future work, the HLUG agreed that as the task becomes bigger and more complex it will also be more difficult to get results from the work. The project should therefore consider making the task smaller and create a template that can be expanded with more information later on in order to gain speed. The preferred and most critical information should be selected and included. In general the HLUG perceived Scenario 1 as the most relevant scenario for the future work.

At the same time it was suggested to look at if some of the information could be provided from the land side instead of the ship side in order to reduce the captain's workload. A lot of the information comes from the ship-owners office originally and it does therefore not make sense that the ship has to provide this information to the stakeholder on-shore.

A lot of the data does not change between port calls and it was also suggested to design the system in such a way that only new data is uploaded into the system in order to eliminate duplication of work.

Inside Europe there are many different reporting templates. Event thought the scope of the system is to have a global system; the National Single Windows could provide a good platform to develop the concept. This could be used as a building block for a global solution later on.

Another important issue to solve is how to digitalize stamps and signatures as a way of reducing the administrative burden. There are systems such as DNV Navigator which supports port clearance and compliance documentation. However, even though such systems prepare the documents, they still need to be printed and signed and handed over in several copies to the authorities.

### Business models

There are two clear paths for the development of automated data exchange which build on two different possible business models. One is to define a standard for the data to be exchanged and let the companies and authorities integrate the standard into their existing templates, services etc. if they find that these standards can help reduce the administrative burden. Another approach is to set up an actual service with a database and try to commercialize this. The second option is much harder to implement since it will require allocating many more resources into the development activities.

Some of the HLUG participants find that the role of the commercial players is not entirely clear. If commercial players should be part of this solution it is necessary that their customers are interested in the solution. Otherwise the service provides will most likely not be interested in spending resources on the development activities.

Furthermore, it is important to clarify the connection between the automated data exchange system and the Maritime Cloud being developed as part of the EfficienSea2 project. From a commercial point of view there needs to be some more information on how the Maritime Cloud works. In this context it is important to define the business model for the Maritime Cloud itself and the relationship to the selected scenario.

One of the new business possibilities emerging from automated data exchange that the project could look into is the possibility of selling the data collected by the ships. The more data you have for producing e.g. navigational charts the higher the value for the industry.

## Conclusions and recommendations for future work

The High Level User Group found that the two most relevant scenarios to proceed with are:

Scenario 1 - Exchange of information between ship and port,
Scenario 5 - Emissions information shared with authorities, ports and potential third parties.

As there is work being carried out on Scenario 5 elsewhere in the EfficienSea2 project (Work Package 5, task 3), it was decided that Scenario 1 and an attempt to increase automated reporting to authorities was the most relevant task for future work.

There are two clear paths for the development of automated data exchange which build on two different possible business models. One is to define a standard for the data to be exchanged and let the companies and authorities integrate the standard into their existing templates, services etc. Another approach is to set up an actual service with a database and try to commercialize this. The second option is much harder to implement since it will require allocating many more resources into the development activities.

One approach could be to start by implementing the system as a pilot in some of the major and advanced ports and letting the system create a ripple effect to other ports and regions. It is important to start such a pilot with a consortium consisting of central players, including ship-owners, agents and the large ports as well as their representing organizations. ICT firms, service providers and authorities should be involved as advisors but not leading the work. It is furthermore very important to have a close collaboration with other existing initiatives such as the STM Validation, Pronto and AVANTI projects in order to create synergies instead of completion.

The project should consider making the task relatively narrow and create a template that can be expanded with more information later on in order to gain speed. The preferred and most critical information should be selected and included. Even though the scope of the system is to have a global system, the National Single Windows could provide a good platform for developing the concept. This could be used as a building block for a global solution later on. Furthermore, the best way forward would be to build on existing industry standards such as EPCglocal or ISO in order to maximize impact and secure fast development.

Some of the HLUG participants find that the role of the commercial players is not entirely clear. If commercial players should be part of this solution it is necessary that their customers are interested in the solution. It is furthermore important to clarify the connection between the automated data exchange system and the Maritime Cloud being developed as part of the EfficienSea2 project. The participants would like to get more information on how the Maritime Cloud works and how the business model for the Maritime Cloud will be.

It was suggested to look at if some of the information could be provided from the land side instead of the ship side and to build the system in such a way that only new data is uploaded into the system and the rest is reused.

Another important issue to solve is how to digitalize stamps and signatures as a way of reducing the administrative burden.

**Appendix 1 – SWOT table on the 5 scenarios**

| *Strengths* | *Weaknesses* |
|---|---|
| Scenario 1<br>• Focused on reducing the administrative burden and its consequences for safety<br>• Is the core of the work BIMCO is caring out in E2<br>• A lot of expertise in the E2 project coercing the S1<br>Scenario 2<br>• Provides a way of confirming, that the preliminaries for arrival/departure are complete<br>Scenario 3<br>• Supports the use and acceptance of electronic documents and certificates<br>• DMA has expertise on STCW certificates<br>Scenario 4<br>• Enhancing the efficiency of a port call through better situational awareness<br>• Covers data transfer between many stakeholders<br>• Builds on knowledge attained in other EU projects<br>Scenario 5<br>• There is keen interest in measuring from more external stakeholders in the industry<br>• (The scenario has not been correctly defined) | Scenario 1<br>• Assumes that electronic and electronically signed documents will be acceptable to authorities outside the port, eg: customs<br>• Unless this is strictly managed the many stakeholders may be a problem<br>• Does not address fundamental challenges of implementations of NSW which are policy rather than technical issues<br>Scenario 2<br>• Form the ships side this may be seen as an extra administrative burden<br>• The scope is very limited and this may be a hindrance for this scenario<br>• Navigational information/services must come from an official source for it to be used for navigation<br>• Additional complexity and the possibility for conflicts in information correctness and validity<br>• May re-invent work already done on systems such as AVANTI which works very well outside a cloud solution<br>Scenario 3<br>• Attempts to solve a problem which does not exist<br>• Only a few of the STCW certificates are standardized and the SC may therefore be of limited interest seen from an international perspective<br>Scenario 4<br>• Scope limited to charterer related information. The proposed solution does not focus on port call coordination but on information for contract fixing<br>• May re-invent work already done on systems such as AVANTI which works very well outside a cloud solution<br>• The commercial interests in this will have to be taken into consideration to avoid unbalanced commercial impact<br>Scenario 5<br>• Not correctly defined. Demonstration of compliance is not through measurement and reporting of emissions. Compliance is demonstrated through use of compliant fuel (bunker delivery note) |

| | |
|---|---|
| | • Does not address relevant information exchanges:<br>  ○ Fuel oil non-availability reporting; and<br>  ○ Reporting instances of the provision of non-compliant fuel.<br><br>Could be seen as pointing fingers - Big brother is watching you |
| *Opportunities*<br><br>Scenario 1<br>• Potential to change information exchange in the future!<br>• It will lower the administrative burden to ships and ports<br>Scenario 2<br>• May improve the safety of navigation<br>Scenario 3<br>• Potential opportunity to enhance the availability of information on seafarer qualifications<br>• Electronic certificates will be beneficial to shipping, and the use of them has been very limited until now<br>Scenario 4<br>• Enhancing the efficiency of a port call through better situational awareness<br>• Improvement of port calls through coordination may have a large potential to make the industry more efficient<br>Scenario 5<br>• If scenario correctly defined, this could make the process for Fuel oil non-availability and the provision of non-compliant fuel reporting more efficient<br>• Emission information may help to create a level playing field by ensuring compliance to MARPOL emission regulation | *Threats*<br><br>Scenario 1<br>• Policy decisions and implementation of NSW, not technical solutions, are the source of Administrative burdens<br>• The solution may be too advanced for many ships to test. Some of this information is sensitive and may be threatened by hackers etc.<br>Scenario 2<br>• Potentially an over-engineered solution to a trivial matter<br>• The responsibility question may hinder voluntary participation of a realistic testing<br>Scenario 3<br>• Opening up seafarer records to service providers – reducing one administrative burden but increasing their exposure to “SPAM” from related service providers<br>• IMO’s FAL committee is still discussing electronic certificates and this could potentially change the format. All this information is sensitive and may be threatened by hackers etc.<br>• Would need to be supported by an internationally recognized application<br>Scenario 4<br>• Digital collaboration on information sharing does not equate to collaboration in the provision of physical services<br>• Assumes that the standardized template will be universally accepted<br>• Is dependent on third party participation, which may be problematic if it is seen as a threat to future business<br>Scenario 5<br>• Incorrectly defined scenario for reporting which does not reflect the actual and/or anticipated requirements for emissions reporting |

# 4. A roadmap for the Baltic web - HLUG3

## Introduction

***This report summarizes the results from the third High Level User Group (HLUG) of the EfficienSea2 project. The HLUG meeting was held in Copenhagen on 9th November 2016 at Copenhagen Business School back to back with the mid-term conference of the EfficienSea2 project. The objective of the meeting was to identify expected costs and benefits, central partners as well as how to create a sustainable governance and business model for the deployment of the BalticWeb. In other words the scope of the meeting was to help developing a roadmap or the deployment of the BalticWeb.***

***At the beginning of the meeting the DMA presented a demo version of the BalticWeb, which is a web-based platform for promulgation of maritime information which is made available as part of the EfficienSea2 project. Hereafter the input from the HLUG was given as a roundtable discussion between the members of the group.***

New ICT solutions are rapidly improving the possibilities for increasing the efficiency of the shipping industry. The overall objective of the EffcienSea2 project is to co-create and deploy innovative solutions for more efficient and safer waterborne operations. The project consists of a carefully selected consortium, encompassing excellent technical and human factor competences, equipment, system- and service providers as well as authorities and international organizations, with expert domain and regulatory knowledge and influence. For more information on the EfficienSea2 project please see http://efficiensea2.org

EfficienSea2 is making services available to the end-users by developing web-based platforms for the Arctic and Baltic areas. Services are being prototyped and tested in commercial onboard and shore equipment for the long-term roll-out. A major goal of EfficienSea2 is to establish a number of operational services on web-based platforms. The focus is on two different areas – Arctic waters and the Baltic Sea. Based on the operational platform ArcticWeb, developed by the Danish Maritime Authority, EfficienSea2 develops the corresponding BalticWeb covering the Baltic Sea. BalticWeb will display and demonstrate most of the end-user services developed in EfficienSea2, including the services developed specifically for Arctic waters. The web-based solutions are independent from onboard equipment, and all that is needed to access the services available is a computer and an internet connection.

You can find a current test version of the BalticWeb here: **https://balticweb.e-navigation.net/**

In order to support the work in the EfficienSea2 project and maximize IMPACT a High Level User Group (HLUG) has been appointed. The HLUG consists of stakeholders from the maritime industry such as ship-owners, business associations, ports, service providers, authorities, maritime organizations and developers of maritime equipment, who give advice on user needs and expert input on the possibilities and barriers for developing new ICT solutions for the maritime industry.

In order to help the project in proceeding with the work on the BalticWeb a High Level User Group meeting was arranged. The aim of the meeting was to help developing a roadmap and identify key barriers and possibilities for the future work.

## Participants at the High Level User Group meeting

| Company/Organisation | Name | Title |
|---|---|---|
| BIMCO | Jeppe Skovbakke Juhl | Senior Marine Technical Officer |
| CIRM | Frances Baskerville | Secretary-General |
| Danish Maritime Authority | Per Sønderstrup | Head of Centre |
| DanPilot | Søren Westerskov | Chief Pilot |
| DanPilot | Brian Schmidt Nielsen | Deputy Chief Pilot |
| DFDS A/S | Jakob Elleby Steffensen | Senior Manager Technical Organisation |
| FURUNO | Timo Kostiainen | Manager, Research and Development |
| Danish Geodata Agency | Jens Peter Harman | Senior Advisor at Danish Geodata Agency |
| IALA | Omar Frits Eriksson | Dean of the IALA World-Wide Academy |
| Maersk Line | Søren Thuen | Nautical and Marine Specialist Manager |
| Port of Rotterdam | Capt. Ben van Scherpenzeel | Director Nautical Developments, Policy and Plans |
| SIMAC | Jan Askholm | Vice President |
| Swedish Maritime Authority | Ulf Siwe | Communication Officer |
| Transas | Anders Rydlinger | Product Director Navigation |

## Meeting agenda

The agenda for the HLUG meeting was the following

1. Welcome and short round table
2. Introduction to the EfficienSea2 project and the BalticWeb, by Mads Bentzen Billesø
3. Joint discussion and input to the BalticWeb moderated by Omar Frits Eriksson

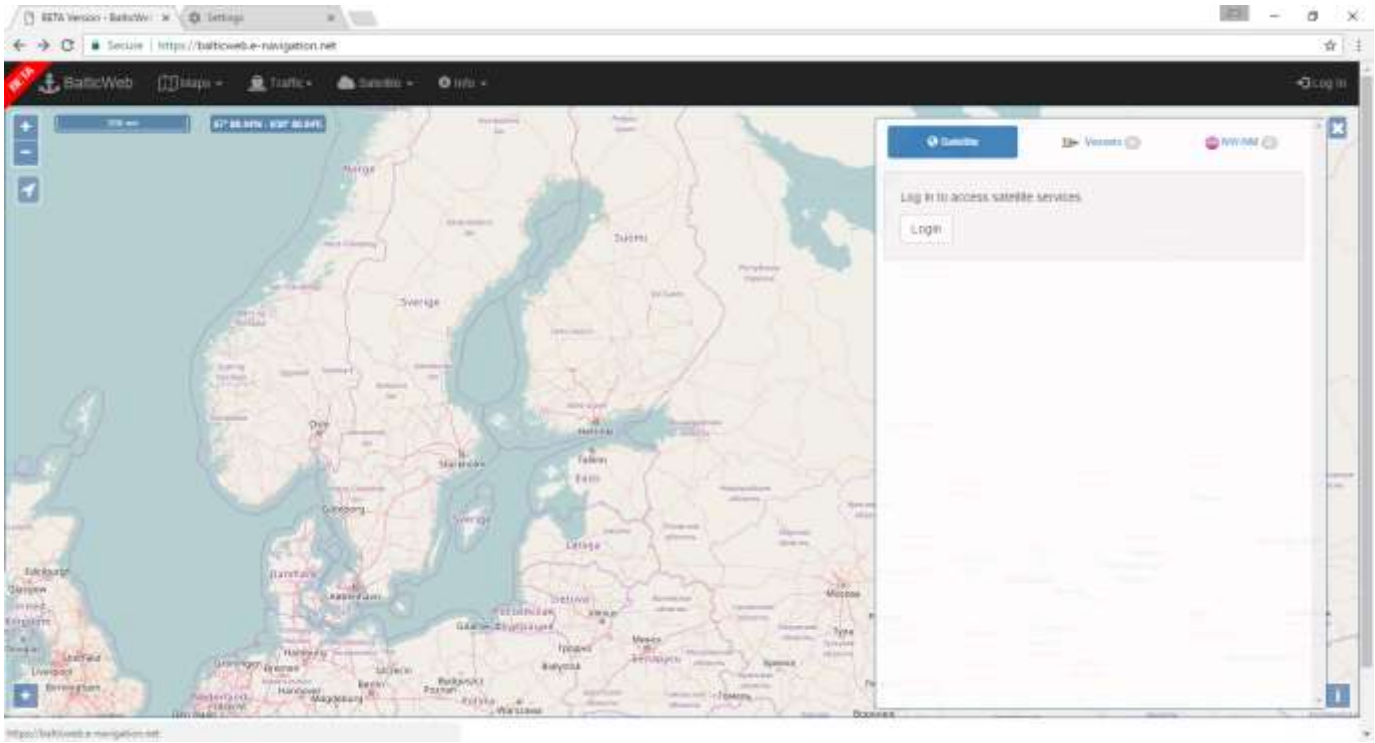
## Questions discussed during the High Level User Group Meeting

The questions discussed during the HLUG meeting were the following:

a) What does the HLUG see as the main benefits of the BalticWeb? And for whom?
b) What are the main disadvantages and pitfalls, and where should we be cautious?
c) How can we get the users and Service Providers on board to use the BalticWeb?
d) How should the BalticWeb be governed? And who should be the Owner?
e) Who should pay for the development and running costs and what are the commercial possibilities as you see it?
f) Are there limits to the kind of services that can be handled by BalticWeb? E.g. due to cyber security issues?
g) How should a roadmap till the end of the project look like (the next 1.5 years)? And how should it look like for the next 5 to 10 years? And beyond?

## HLUG discussion on the BalticWeb

After the presentation of the test version of the BalticWeb the HLUG meeting focused on discussing the possible business models, governance models, as well as how to develop a roadmap for the BalticWeb. In the following the advice from the High Level User Group is presented.




## Possible business models

It is most likely that the driver for financing the BalticWeb and the services that are provided will be based on a strictly commercial basis, as there seems to be no interest in setting mandatory regulative requirements for using the BalticWeb. When setting up the business model for the BalticWeb it is therefore necessary to both secure the income of the company or organization that will be operating the system after the EfficienSea2 project funding ends, as well as to secure the income of the companies that will provide the services on the BaticWeb.

Even though some HLUG members only saw potential in BalticWeb as a component in research projects, the discussion also showed that many of the HLUG members find that there are several potential revenue streams for the BalticWeb. One possible source of income could come from providing existing services and systems through the BalticWeb. This way the BalticWeb could become a platform for delivering the data and services directly to the end-users. However, it will probably be difficult to get the end-users to pay for the BalticWeb itself as this is only a communication platform or infrastructure. The real value of the BalticWeb will be the services that are provided through the BalticWeb. A strategy should therefore probably build on a concept where end-user pay for the services, e.g. on a flat rate basis or for each time they use a services, and where a small fee is collected in order to finance the BalticWeb itself. The amount of users and end-user cost was stated as one of the key issues for the success of the BalticWeb.

One suggestion was to both deliver services on a commercial basis, as well as to give access to the BalticWeb and some services for free. Another suggestion was to create revenues by showing ads e.g. regarding services and products that are available in a specific area. As an example MarineTraffic is funded 30% by ads and a few “Gold” services, which are commercial services that pay for development and operation costs.

A third option suggested is to have a collaboration with the companies that provide satellite communication for the ships since they might be interested in financing some of the costs of the BalticWeb, if they can increase the data volumes and thereby their own revenues.

In any case it is important to define how the commercial players should be involved in the development of the BalticWeb as they will be the ones providing the data and services on the BalticWeb. If their business model is not clear it will be very difficult to motivate them to support the BalticWeb.

## Governance models

A central question is how the governance model for the BalticWeb should look like. This will very much depend on the services provided on the BalticWeb and how the business model is built. The governance model will be very different if the system runs on a purely commercial basis or the focus is on public services provided by authorities. A realistic scenario is that there will be a mixture of both private and public data and services, which the governance model needs to accommodate. Someone will need to be responsible for granting access to the various users and services, and create interfaces and rules based on standards. At the same time collecting and distributing revenues will be a central task.

One possibility is to have different governance bodies for different services. This way the system could be flexible and accommodate both private and public content as well as national and regional authorities and their interests. One suggestion was to use the LRIT model with regional centers. However, the many data centers are operating with excessive costs and it would therefore be important to find a balance between political acceptance, the amount of data center servers in the system, and costs.

The general view was that the BalticWeb should be governed internationally and builds on voluntary users rather than mandatory measures. It could be an existing organization, e.g. Helcom that governed the BalticWeb.

Since the maritime industry is highly globalized with ships operating all around the world it would be an advantage if the BalticWeb builds on a global governance structure. The possibility of a BalticWeb or a GlobalWeb as a Capacity building system for presentation and promulgation of data in less developed parts of the world was discussed. Several participants saw potential in this. However, some participants were worried that BalticWeb was yet another system on a long list of other systems. At the same time several participants saw a risk that the system would only cover a smaller regional area and not globally. It was therefore seen as important for the project to aim globally and seek international standardization and adaption of the system.

## Some technical issues

It was pointed out that the poor or lost connection on board ships will be a challenge for the system, and that connectivity issues need to be handled. Several participants were concerned about the necessary connection to internet and that this would limit the number of users.

Several participants stated that the main advantage of the BalticWeb was the collection of data in one place and the integration with Maritime Cloud which is being developed as part of the EfficienSea2 project.

It is important to make it possible for users to choose various suppliers of similar services that are based on the same standards in order to secure vendor independency. At the end of the day the ones who pay

for the services will be the ones who control the datacenters, and it is therefore important to think the business models through when developing the framework and governance model for the BalticWeb.

## Creating a roadmap for the BalticWeb

There are three main challenges that need to be addressed when creating a roadmap for the BalticWeb. These are 1) how to create sustainable funding, 2) a clear strategy on which data and services that are to be provided, and 3) a widely accepted model for who will manage the BalticWeb.

Even though the EfficienSea2 project has substantial funding, it is important to find a governance body that can undertake the work on a permanent basis. One of the problems that often occur with projects is that they finish and die. It is not possible to build the BalticWeb within the framework of the project and then expect someone to use it and maintain it. It is therefore important to find a stakeholder that can maintain the BalticWeb and take ownership.

Ship-owners are often perceived as being conservative when it comes to adopting new technologies. It is therefore important to have a good business case and show value before trying to sell the concept to the users. Otherwise it will not "take-off". One way is to start with some core services and continue to extend the system as users increase. It should be considered a commercial business that is service oriented and have no safety-critical issues as this will slow down the work. The BalticWeb could start as a business platform with few features and define links and standards to other systems later on.

One way to proceed with the development of the BalticWeb is to use it as a development platform for the development of the Maritime Cloud. For this purpose it is important to clarify the connection between the BalticWeb and Maritime Cloud, which is being developed as part of the EfficienSea2 project. One approach could be to start by implementing the system in some of the major and advanced ports and ship-owners and letting the system create a ripple effect to other ports and regions.

A central question is how to involve external stakeholders into the development work and how to build cross industry collaboration. The shipping industry is very fragmented and it is important to include central players in order to maximize impact. The central players to include in the work are ship-owners, agents and the large ports as well as their representing organizations. ICT firms and service providers should be involved as advisors in order to secure that the standards and systems developed work well together with other existing systems. The authorities should also be involved as external stakeholders since it is often those who will be pulling the data from the system and in many cases they are the end-users. However, the authorities should not be leading the work. Focus should rather be on creating an industry standard.

# 5. Expert input to Communication Technologies - HLUG4

## Introduction

This report summarizes the results from the fourth High Level User Group (HLUG) of the EfficienSea2 project, which was held in Kongens Lyngby, Denmark, on 21st of June 2017 at the offices of Cobham SATCOM.

***The objective of the meeting was to gather expert input on the communication technologies and solutions developed as part of the EfficienSea2 project supporting the Maritime Cloud.***
***The Maritime Cloud gives access to validated services, an identity register and a messaging service. Thus, it is a secure way to get access to endorsed services and information.***

The input and ideas was given through joint discussions between the members of the HLUG and members of the project team. The discussions focused on the overall communication solution, VDES, Roaming and onboard network.

The EfficienSea2 project addresses the challenges of weak connectivity and high-cost communication on ships by developing concepts for cost-effective and seamless switching (roaming) between communication channels, effective and secure onboard networks and VDES (VHF Data Exchange System). This is part of the EfficienSea2 project Work Package 2.

The HLUG was appointed in order to consist of end-users familiar with shipboard communication and the technologies behind, in order to give relevant feedback on the theme: Communication Channels.

To support the objective of the project: to make an onboard structure that allows for utilization of the Maritime Cloud, including intelligent roaming for external communication and safe and efficient distribution of information onboard.

## Participants at the High Level User Group meeting

| Company | Name | Title |
|---|---|---|
| D/S Norden | Christian Laursen | Chief Officer |
| Viking Supply Ships | Jan Pedersen | Chief Officer |
| Ultraship | Claus Bo Christensen | Marine Application Manager |
| Danpilot | Birger Bruun Bager | Licensed Pilot |
| MAN Diesel & Turbo | Hans O. Mortensen | Senior Manager, Engineering Process Management |
| | | |
| **Projects Partners/representatives:** | | |
| Danelec Marine | Hans Bech Helnæs | Product Manager, Communication Solutions |
| Danish Maritime Authority | Mads Friis Sørensen | Managing Director |
| Cobham SATCOM | Peter Andersen | Manager, Business Development |
| Cobham SATCOM | Niels Peter Agdal | Director |
| Cobham SATCOM | Claus Hornbech | Business Manager |
| MDC | Mikkel Hansen | CEO |

| | | |
|---|---|---|
| MDC | Jannie J. Davidsen | Project Assistant |

## Meeting agenda

The agenda for the HLUG meeting was the following

1. Welcome & short round table, Mikkel Hansen
2. Introduction to the EfficienSea2 project and the communication solutions , Peter Andersen
3. Feedback Sessions:
    - *Overall Communication Solutions*, Peter Andersen
    - *VDES*, Peter Andersen
    - *Roaming*, Peter Andersen
    - *Onboard network*, Hans Bech Helnæs
4. Prioritization of feedback
5. Advice and input to the project
6. Wrap-up and next step, Peter Andersen & Mikkel Hansen

## Introduction - Communication Channels

The Efficiensea2 project focuses on finding communication channels which will improve navigational safety and efficiency. The foundation for ship-to-shore communication must be effective, safe, and reliable. In the development of real-life implementation of e-Navigation and data exchange at sea, the Efficiensea2 Project involves end-users in order to find and enhance solutions.

The available channels all have strengths and weaknesses related to the actual communication intended to and from a specific vessel. The user-perspective addresses the challenges and helps identify the most effective communication channels for particular services used in the maritime industry.

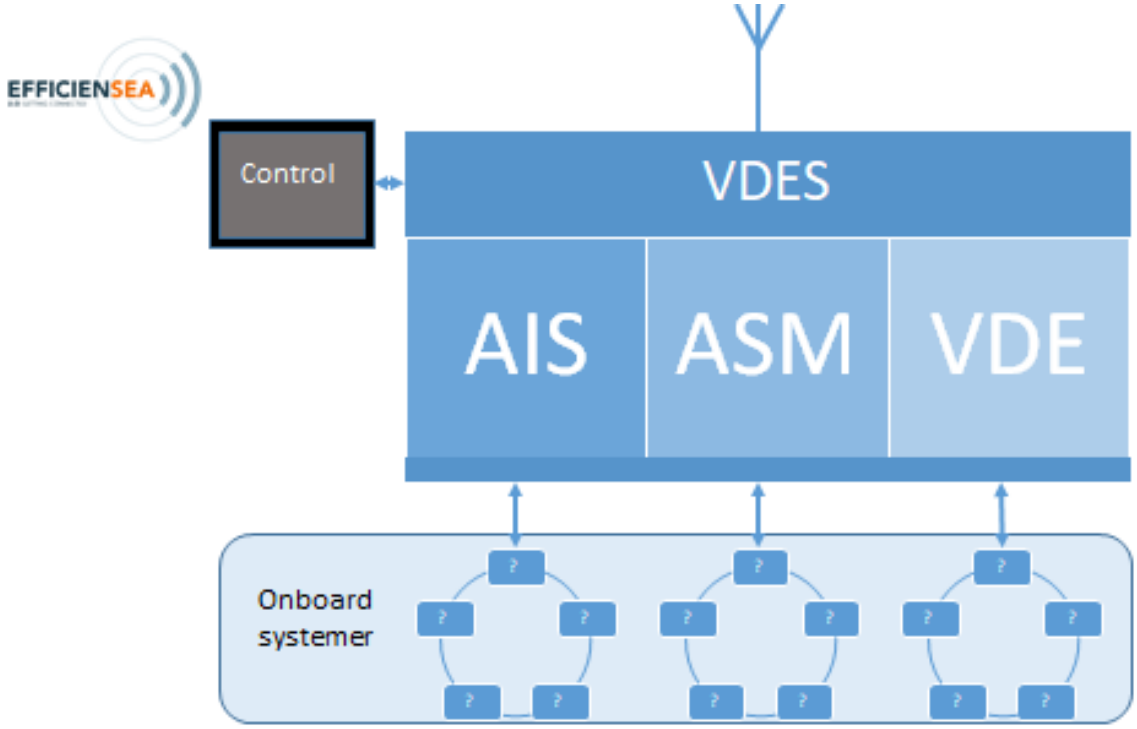
## VDES (VHF Data Exchanger System)

Introduction to VDES technology (VHF Data Exchange System):

- VDES is a new data transceiver working on the VHF band.
- It works terrestrial and over satellite with data speed up to 302.7 kilo bit per second
- VDES can be seen as a further development of the AIS, or AIS 2.0. It makes the following functions available:
    - AIS as known today
    - ASM (Application Specific Messaging, messages being broadcasted could be wave height and water depth. Uses same methods and protocols as AIS),
    - VDE terrestrial, for high speed data exchange
    - VDE satellite, for data exchange on a low cost system.
- Works from point to point (from ship to ship, from ship to land)
- Works as multicast (from one to a defined group)
- Works as broadcast
- Communication channels do not support IP (requires a processer to convert from IP to the communication channel protocols)

- Specification is under development

Communication Channels:



## User cases and feedback

The discussion of ASM, VDE terrestrial and VDS Satellite was focusing on the opportunities and application:

- What are the potential use cases for the technologies and what benefits will this enable?
- How should they be presented and processed?

**Idea outline:**

**1)** Possibilities for ASM in terms of:
- Local weather map and forecast
- Local Nav warnings
- Pilot data and other ships with pilot and their data plans
- Presentation on ECDIS (Electronic Chart Display and Information System)

Based on the route information or the current position, it should be possible to filter information so that no irrelevant topics appear. The HLUG emphasized it as most important that you can easily assess, evaluate and sort information. It would be beneficial to geographically (or by route) limit the data outside the route and relevance. This is possible to do on ECDIS, if you set up specific filters for the relevant area to be shown.

**2)** Safety warnings/Nav warnings to be shown on ECDIS/radar

**3)** Search patterns, coordination and communication

**4)** Precise traffic

During SAR (search and rescue operations) ASM can be used to manage the operation. Transponders can be visible for an ASM, the coordinating vessel can transmit details and information about the SAR area and patterns using VDES. Other ships entering or passing through the area are thus also kept informed. Using traditional VHF communication of positions and identification of vessels is very difficult.
The HLUG prefer that information about accurate content e.g. about position, which has to be memorized for a longer time span, is communicated via data message.
This gives a flow where you have the positioning, who's involved and search patterns digitally, instead of via VHF voice.
When irrelevant information comes up, it should be possible to quickly remove it. The HLUG see ECDIS as the primary visual platform, and prefer not to add more to the radar.

**5)** Exchange of MOB (Man Over Board) and Event data from ECDIS

MOB button (ECDIS): In case of accidents, it would be beneficial to have the possibility of exchanging data (simple data, e.g. position data) with the surrounding ships. This will make the process more efficient, since you do not have to read the position (via radio) and risk misunderstandings.

**6)** ASM: Experience from other industries, e.g. similar to trains and signal systems and stop before entering no-go areas

**7)** ASM: Automatic Collision Avoidance

Reference and experience from other industries can be included for inspiration to the discussed technologies. If an autonomous ships (or ordinary ship comes to close to a limit/no-go zone) it should be possible to transmit a signal to stop propulsion of a ship.

E.g. in case of:

- Underwater cable work and no-go zones
- Bridges
- Offshore installations

The HLUG suggested looking at automatic collision avoidance (e.g. airplanes) where a set of rules define the required collision parameters. This requires that the counterparts have similar systems of avoidance or that it is indicated who do not have the systems/network (proximity warning system). This can clarify command structures, but still requires you taking into consideration canal, depth, speed, wind conditions etc.

**8)** Direct VHF call via AIS target

This is already possible with the DSC call.

**9)** ASM/AIS: Ships' intention on the way to anchoring (expected spot), on the way to port

**10)** Port information (ECDIS)

**11)** ASM: Route planning (VTS to ship): Suggested route through VTS area (ECDIS)

It should be possible to send a request to the ports when anchoring, this will ease e.g. appointing of anchor spaces, so the same ships do not aim for the same spot, which is appointed via VTS.
Prerequisite: The other ships' routes are known.

**12)** Exchange of Nav data between ships and rig (rig move)
Exchange of video from ROV or similar (dedicated system)

Use the data connection in a dedicated system (stand-alone screen/PC connected).

13) VDE/ASM: Exchange of information (weather, electricity)
14) Sharing sailing conditions in the arctic (weather, ice, icebergs, safe passage)

The HLUG experience requests historic weather conditions in an area, this can be difficult via radio contact.
A reverse system where all relevant weather information (noted in the log) is sent to DMI was mentioned as potential opportunity. The HLUG also mentioned experience, where local data from the ships are shared, making it possible for others to benefit from it, for example by VDI systems and mini satellites.

15) Ships engaged in tows can send out Nav warning as broadcast related to the route

When rigs are towed the position is often announced once every hour to notify nearby ships etc. It would be more efficient to send out the information digitally, which eliminates questions about distance etc.

16) Operation and status information from ship systems: AIS, Cargo System, Navigation system, Communication and ITC
17) Route exchange: Anti-collision, optimization, Auto VTS reporting, ECDIS, Radar
18) Cargo monitoring: Condition, temperature, position (customer, shipping office, cargo system)
19) Information about future sailing/navigation
20) Responsible information operator: Ports, authorities, ship to ship
21) Booking of local assistance (pilot, tugboat, tow boat & personnel and garbage disposal
22) Real time data: Depth, tide, waves, electricity, wind (ECDIS)
23) VDES: Flexible and affordable data transportation
24) Intelligent transfer of bulk data: Compression / congruence and robustness to interruption Utilization of available capacity
25) All reporting (to and from land): VTS, port etc. Passenger arrival/departure. Ship-to-ship operation

**26)** What can you do with VDES that you cannot do today? What is the driving force behind it? Limited capacity?

The developed technology offers new possibilities in term of more bandwidth, exchange of files, 2-way communication and it is free. One of the driving forces can be the safety regulations.

**27)** Reporting to authorities (customs, police etc.) and port/pilot
Exchange of loading plans etc. from ship to port or rig/platform

This could be an assisting and secure tool when preparing for port calls, e.g. reporting regarding cargo, ship, destination etc.
The communication flow could also be eased by plotting out a defined route instead of sending out needed navigation information when leaving the port.
In general, The HLUG mentioned the challenges of separating the personal (welfare) and the professional use of internet bandwidth, which can affect and influence the security level.

## Network

The session was initiated with an introduction to the subject, Network: The onboard side architecture.

Scope:

- Develop On-Board System Architecture
  - Low impact integration with existing infrastructure and architecture
  - Requirement of an "open" and harmonized architecture
    Implementation: Current standards, open source software, existing components, patents
  - Cyber security considerations (existing recommendations)
- Vessel <-> Shore communication protocols
- Prototype Demonstration & Standardization

With inspiration from cyber security recommendations from IMO and BIMCO, and the work of the ISA Committee and the National Institute of Cyber Security (on automation), the focus has been on developing standards and recommendations describing a process of ensuring continuous cyber security, rather than standards that describe cyber security risk mitigations, as these require continuous updating. The new architecture has been focusing on creating a structure that is open for updates and implementation of new mitigations.

MMS (Maritime Messaging Service) works like an information broker that intelligently exchanges information between communication systems connected to the Maritime Cloud. Web service messages can be send via a secure tunnel to a server, which gateways it to the Internet or sends the message to another vessel. It takes into consideration the current geographical positions and the available communication links.

## User cases and feedback

The discussion of Network was focusing on the integration and security:

- Which degree of integration is required on board?
- What are the requirements for network security to the outside and between network segments?
- Which degree of open access to the outside is wanted?
  - -Which features will typically require online connection with the outside world, if any?

**Idea outline:**

1) Access control to the ship's network
2) Federated authentication → authorization
3) Controlled access from administrator (ship/land)
4) All equipment must be continuously updated with password and anti-virus protection

**Detailed Specification:**

To access the network and validate identity username and password is required.
The process of clearing can be complex, therefore a "federated authentication", where several people/sources (e.g. other suppliers) are involved was suggested by the HLUG.
This is to clarify the identity of the person and will subsequently be followed up by the requirement of the subnetwork of the ship (authorization).
The EfficienSea2 project has worked on federated authentication but in the matter of industry organizations, being a member of the organization will make you federated.
Thus, this is a more strict risk mitigation than access granting via username/password

5) Network segmentation: Division between automation and navigation networks and administrative networks
6) Several access and separated network
7) Ship's network with segmentation, but with additional security when accessing all equipment. Firewall is not enough, all equipment must be protected

Segmentation between the different kinds of subnetworks: industrial, administrative, public separated by gateways are necessary.

**8)** Openness gives new business models
- Software applications targeted specific operation, geographic area etc.
- Additions to existing systems and features (apps)

**9)** Data sharing with free access to all sensor data from all systems, allowing for new third-party optimization and monitoring solutions (external innovation)

Expertise, knowledge and experience from surroundings (and not only the manufacturer) can be taken into consideration. In this way hands-on experience can be involved and perceived challenges addressed.

By being open to the possibilities of engaging e.g. entrepreneurial solutions and third party analysis innovation are sustained and solutions possibly more effective.

**10)** Security, reliability, efficiency:
You must be allowed to (externally) connect and change systems on board from the shipping company and the captain. It's acceptable that external parties can read data, but not change anything without permission. There are quite a few administrative programs, almost everybody require online access

The HLUG underlines that Internet/online access is the much needed in order to meet the reporting requirements.

It should be possible to make machine-to-machine communication; sensors in the navigation system, will directly – without intervention – communicate with data users.

This could also be handled by the supplier as part of the business model (e.g. maintenance and monitoring), in a dialogue focusing on how to secure data security level

**11)** Guide data from land-to-ship, ship-to-ship and ship-to-land directly to the place where data is to be used - without human intervention – except from confirmation of requested data

With a lot of administrative systems, keep in mind: Security, low cost, constant and reliable. Price and security can be limiting factors.

A proposed solution is to make a prioritizing of data (where functions can be deactivated for a period) and a particular way for “sensitive” data.

**12)** The ship's network should look like "landside" (high security)

When control systems are linked to “land” or something else outside the ship, a strict time control is necessary (from a registered sensor input until an output can be delivered), so that irrelevant messages do not interfere.

This requires a prioritized list, defining which operations have the highest priority, e.g. main engine vs. steering machine?

**The below potential perspectives are subject to further discussion:**

**13)** Development of an industry standard for security that is robust to technology development

**14)** Maritime cloud (security):
-White list-member validation
-Define channels
-Block chain as possible architecture

## Roaming

The last part of the HLUG meeting focused on Roaming challenges and solutions. Due to limited amount of time this subject can be further discussed at another HLUG meeting. The HLUG confirmed the basis for a future deepened discussion.

## Conclusions and recommendations for future work

The High Level User Group was highly engaged and gave a lot of valuable feedback to the project.
The feedback on the discussed communication technologies and solutions covered many aspects and specific ideas were suggested. These ideas to information and data sharing had requirements in terms of being manageable, efficient, customized, flexible and secure.

The team behind Work Package 2 will explore and investigate the potential in the given feedback further on in the project. Due to the limited time it will also be further investigated whether other sessions can be arranged within the project focusing on getting feedback on the roaming technologies.

The project team would like to thank the participants for their involvement and engagement and hope they will follow the projects development in the future.

# 6. Conclusion of the four HLUG's

The objective of the four HLUGs were to identify possibilities and barriers in the areas of

- Development of the Maritime Cloud with a focus on governance models, legal aspects as well as relevant business models for a successful development and operation of the Maritime Cloud;
- Implementation of e-maritime and increase of automated flow of information related to port calls among maritime stakeholders;
- Identification of expected costs and benefits, central partners as well as how to create a sustainable governance and business model for the deployment of the BalticWeb; and
- Gathering of expert input on the communication technologies and solutions developed as part of the EfficienSea2 project supporting the Maritime Cloud.

During all four sessions of the HLUGs stakeholders from the maritime industry were represented and gave their advice and expert input on possibilities and barriers within each area.

## HLUG meeting #1

A SWOT on the governance of the Maritime Cloud and the strengths, weaknesses, opportunities and threats were discussed. It was agreed that there is a need for a governing body for the Maritime Cloud and the general sentiment was that the governance model needed to accommodate a mixture of private and public data and services on the same system. Also, it was noted that someone needed to be responsible for access, and creating interfaces and rules.

The participants agreed that it was important creating a commercial business, and also feasible getting users to pay a small fee for the services. Also, the HLUG recommend that business value is more suited as a driver for the project than regulation. Legal aspects are important and will depend on the type of governance and service.

## HLUG meeting #2

Five different scenarios were discussed and the HLUG agreed that the most relevant scenario to proceed with was the exchange of information between ship and port.

The project should consider making the task relatively narrow and create a template that can be expanded with more information later on in order to gain speed. The preferred and most critical information should be selected and included. Furthermore, the best way forward would be to build on existing industry standards such as EPCglocal or ISO in order to maximize impact and secure fast development.

Is the role of the commercial players entirely clear? If commercial players are to be part of this solution it is necessary that their customers are interested in the solution. It is furthermore important to clarify the connection between the automated data exchange system and the Maritime Cloud being developed as part of the EfficienSea2 project. More information on how the Maritime Cloud works and how the business model for the Maritime Cloud is preferable.

It was suggested to look at some of the information being provided from the land side and not ship side and also to build the system in such a way that only new data is uploaded into the system and the rest is reused. Another important issue to solve is how to digitalize stamps and signatures as a way of reducing the administrative burden.

## HLUG meeting #3

Furthermore, the BalticWeb was introduced and the session aimed at developing a roadmap or deployment thereof. After various discussion, the HLUG agreed on the importance of defining how commercial players are involved in the development of BalticWeb as the will be key providers of data and services. A clear-cut business model is needed in order to motivate support of the BalticWeb. Again governance models will vary according to who provides the services and how the business model has been built. Also, it is important to obtain sufficient funding along with a stakeholder who can take ownership and maintain the BalticWeb.

## HLUG meeting #4

The challenges of weak connectivity and high-cost communication on ships were discussed in order to develop concepts for cost-effective and seamless switching between communication channels in a safe and efficient way. Also, requirements for a manageable, efficient, customized, flexible and secure data sharing were discussed.

## Results so far

The feedback from the HLUGs has been passed on has already resulted in

- Field testing of on-air parameters performed on a dedicated test platform of a new, globally interoperable and potentially cost-free ship-to-ship and ship-to-shore digital communication link that is dedicated to data transfer via radio channels;
- A working prototype of the communication framework with operational functions such as a single login for all services, identity management and discovery of maritime services has be introduced. Elements of MCP will be made operational in the Baltic Sea and Arctic waters;
- A working prototype of a cloud-embedded single point of access to e-Navigation and e-Maritime services in the Baltic Sea (based on the existing ArcticWeb) has been provided. With five to six integrated e-Navigation services, BalticWeb will be accessible on all internet connected systems, e.g. tablets and PCs; and
- More than 15 end-user services at different stages of maturity have been developed. Most services, like basic navigation and weather solutions, have very high technological readiness levels, close to the market, and will be tested and implemented in real-world platforms. Other, more advanced services will be tested at experimental levels. Focus is on open-source software and providing input to relevant standardization bodies. It is anticipated that services such as Maritime Safety Information and Notices to Mariners will reach new global standards within the project scope.