

## Activity 2 – Defining Sea Traffic Management

# STM Master Plan

MONALISA 2.0 D2.4.2, D2.5.1, D2.5.2, D2.6.1



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## 1 General Information

MONALISA 2.0 is a project with 39 private, public and academic partners from 10 different countries. Its overall objective is to strengthen efficiency, safety and environmental performance in maritime transportation. Coordinated by the Swedish Maritime Administration, the project is co-financed by TEN-T under the Motorways of the Sea Programme and is part of the EU's e-Maritime initiative. MONALISA 2.0 follows on from the MONALISA project (2010-EU-21109-S) and also incorporates results and experiences from the SESAR (Single European Sky Air Traffic Management Research) programme in the aviation sector. MONALISA 2.0 is divided into four Activities: Activity 1, STM Operations and Tools; Activity 2, STM Definition; Activity 3, Safer Ships; and Activity 4, Operational Safety.

This report is a deliverable from Activity 2 of the MONALISA 2.0 project. The objective of Activity 2 is to outline a framework for Sea Traffic Management (STM), elaborate its target concept, and develop a plan for further development and deployment. Activity 2 is divided into 7 sub-activities:

- **SA2.1 Current Situation Analysis** describes today's maritime transport industry, focusing on information sharing. It highlights its strengths, weaknesses, and current development, as well its needs. The results of this analysis are presented in report D2.1.1 STM The Current Situation.
- **SA2.2 STM Performance Target Development** is an analysis and elaboration of a performance framework including: performance targets, key performance areas, vision and goals. The results are presented in report D2.2.1 STM Performance Framework.
- **SA2.3 STM Target Analysis** develops the target concept(s) of Sea Traffic Management based on the current situation analysis and performance targets. The result of this work is summarised in report, D2.3.1 STM - The Target Concept.
- **SA2.4, 2.5 & 2.6 STM Strategic Roadmap and Master Plan Development and Work Programme for Development Phase** is a combination of three sub-activities that together establish a shared vision of the overall transition sequence for implementing the STM Target Concept. *Results are described in this report D2.4.2/D2.5.1/2.6.1 - STM Master Plan.*
- **SA2.7 Port CDM Demonstrator** developed and demonstrated initial versions of some information sharing services used in the Port CDM concept. Results are presented in the report D2.7.1 Port CDM Report.

## 2 Executive summary

The STM Master Plan provides a feasible transition sequence to realise the STM Concept in order to reach the performance targets and turn the vision into reality. This plan is also described in the e-Master Plan ([stmmasterplan.com](http://stmmasterplan.com)) which is a tool that will be updated continuously for the interactive dissemination the STM Master Plan to the industry.

Whereas the STM Target Concept is describing the final goal of how STM will transform the Maritime industry, the STM Master Plan is the guide to those stakeholders that will be essential to the fulfilment of the STM vision, what actions and efforts will be needed and not least, what effects and operational improvements can be expected for their businesses and at what point in time it generates business value. A first important step in ensuring the successful deployment of STM is the STM Validation Project where the STM concept will be tested and evaluated in large test beds.

The STM Master Plan is made up of three phases of transition, improvement phases, reflecting the incremental approach that is proposed for the introduction of STM

- Creating the foundation (2015-2020)
- Increasing operational capabilities (2020-2025)
- Achieving full STM capability (2025-2030)

The first improvement phase will initially be delivering proof of concept of the real effects of STM through the STM Validation Project to the industry. The early introduction of route exchange in a standardised format will give immediate effects on safety and efficiency when the route can be exchanged with shoreside actors and nearby ships. At the same time, introduction of Port CDM will contribute to early effects in the efficiency of ports and standards such as Unique Voyage ID and Maritime Actor Identities will be introduced to the industry. Further, the initiation of governance processes and bodies of STM will speed up the involvement and engagement of the industry in STM.

In the second improvement phase a maritime information sharing platform, SeaSWIM, is being established with full functionality. The different actors in the industry are now, directly or through their system suppliers, connected to the information-sharing infrastructure. The fact that all relevant information of the voyage now is available through SeaSWIM will create new services that automatically will provide port states, coastal states etc. with mandatory ship reporting information. It will reduce the administrative burden for the officers on board significantly. This also means that stakeholders along the transport chain can be notified much earlier regarding their involvement in a specific voyage, thus extending the planning horizon.

Port CDM enabled ports will be able to provide synchronisation services for approaching ships, enabling just-in-time arrival, reducing waiting time at anchor. The adjustment of transport contracts as a result of the possibility of arriving just in time will start to generate substantial savings in bunker consumption and reducing environmental footprint of shipping.

In the third improvement phase the full potential of the envisioned STM is presented. We will have achieved a functional eco-system of information providers and consumers and as a result new services will be offered. The federated model of governing common resources, such as SeaSWIM and various standards will be in place. Furthermore, the maritime ecosystem has been complemented with a large number of new actors, creating new knowledge and services out of information that was not possible to share in a structured way before STM.

The deployment strategy describes the path for rolling out the concept and is based on a number of assumptions on how the STM Master Plan can be deployed. The strategy describes an approach that builds more on voluntary participation, driven by incentives and benefits, rather than a mandated approach. It recognises the fact that STM gives different benefits to different stakeholders and segments of shipping. Further involve IMO and IALA in the future development is important and a key factor for taking STM from a European to a global perspective. Proving benefits, and ensuring stakeholder buy-in, have also been identified as important factors for the successful realisation of STM in the STM Master Plan risk management.

The STM Master Plan identifies the need for a number of research, development, validation, and demonstration activities, addressing different parts of the STM concept. In order to achieve a long-term solution, and a well-coordinated development the STM concept, it needs to be under constant development. The Master Plan is a tool that requires governance. The vision is for this to be adopted by a future European Economic Interest Group, EEIG, which will provide STM with a permanent structure and secretariat function for further development and deployment.

## 3 Introduction

### 3.1 Scope and Purpose: What is the STM Master Plan?

This document covers the overall STM Master Plan<sup>1</sup>, including an integrated Strategic Roadmap and Work Programme, as a description of an overall sequence to implement the STM Target Concept. As such, this document includes deliverables D2.4.2 STM Strategic Roadmap, D2.5.1 STM Master Plan, D2.5.2 Electronic STM Master Plan and D2.6.1 STM Work Programme description. These deliverables will be referred to as STM Master Plan in this document.

The STM Target Concept has been defined as a response to the Key Performance Objectives (KPO) and targets defined in the D2.2.1 STM Performance Framework. The purpose of the STM Master Plan is to provide a plan and a feasible transition sequence to realise the STM Target Concept as described in D2.3.1 STM – The Target Concept in order to achieve the performance targets.

The STM Master Plan is intended to be the key instrument in STM development and deployment. It will be used to turn the STM vision into reality, which in turn will provide benefits to the maritime community. The Master Plan must be managed in a dynamic and comprehensive manner, within the framework of a holistic approach. It must also have the full engagement of all stakeholders, at each stage of the decision-making process, and along the whole STM lifecycle.

The STM Master Plan is driving the introduction of Sea Traffic Management from 2015 to 2030 based on major operational changes required to fulfil the performance objectives. To meet these performance objectives, the STM Master Plan proposes a set of roadmaps; where each roadmap is organised in four main areas – Lines of Change (LoC) – detailing the essential progress planned to be made. The LoCs have been selected in order to encompass the STM Target Concept and with the capacity of delivering performance benefits for the stakeholders in the different operating environments (ports, coastal water, open seas). The identified four LoCs are:

- Information sharing environment
- Planning the voyage
- Voyage execution
- Integrated port operations

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<sup>1</sup> The STM Master Plan refers solely to the further development, validation and pre-deployment of Sea Traffic Management. Other transport policies are not included in the scope.

The STM Master Plan focuses on the above LoCs which in turn evolve around three Improvement Phases (IP):

- Short-term – creating the foundation IP1 2015-2020
- Medium-term – increasing operational capabilities IP2 2020-2025
- Long-term – achieving full STM capability IP3 2025-2030<sup>2</sup>

Each IP consists of needed changes related to institutional, procedural, human and technical systems aspects.

### **3.2 Methodology: Overview of the Master Plan development**

The content of the STM Master Plan consists of a set of foundational elements and information about how they interrelate. This chapter provides an overview of the STM Master Plan, the relation it has to the work packages and the results from the STM Definition Phase; i.e. D2.1.1 Current Situation, D2.2.1 STM Performance Framework, and D2.3.1 STM – The Target Concept.

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<sup>2</sup> STM will continue to develop after 2030 but the further development after 2030 is out of scope of this Master Plan

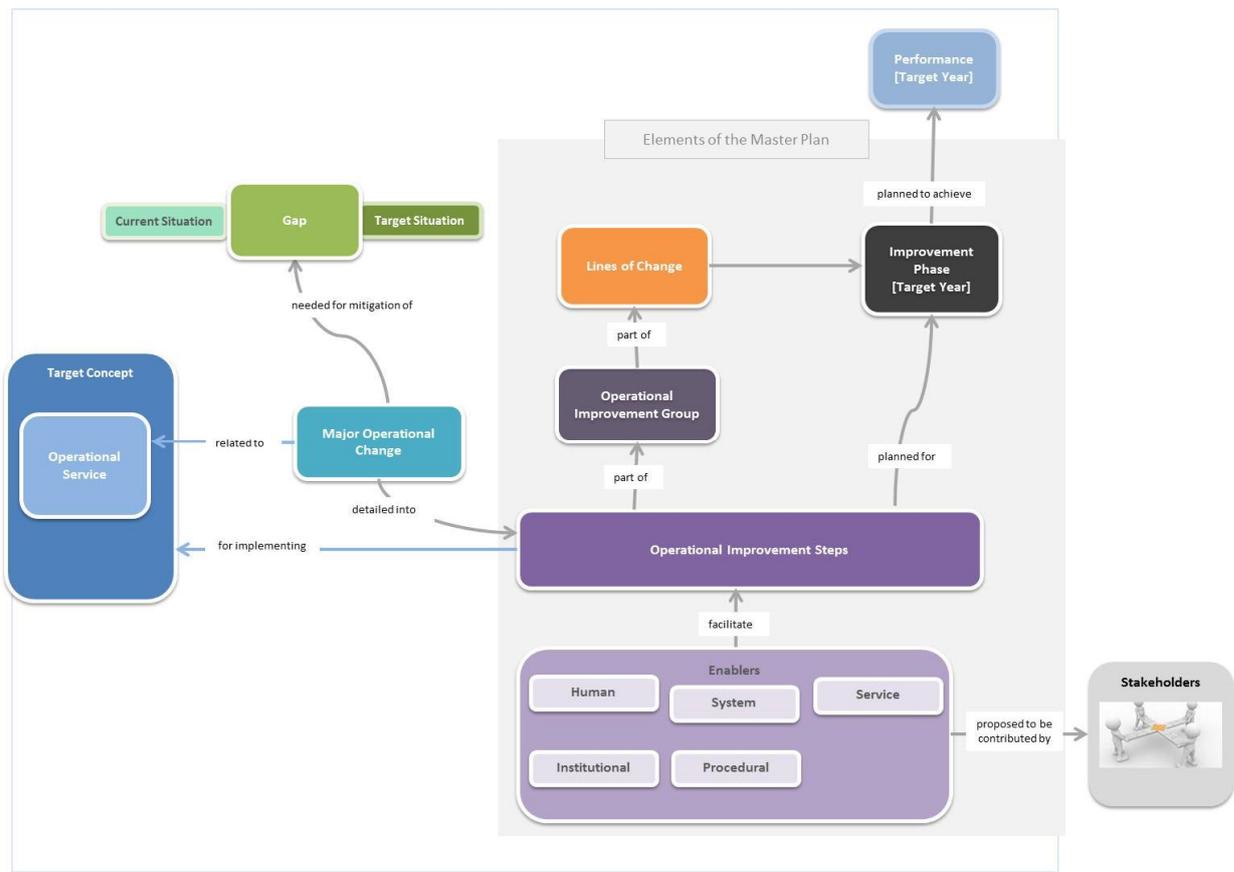


Fig. 1 Elements of the STM Master Plan

The STM Master Plan is based on the defined STM Target Concept. The goal is to deliver a number of expected services to European sea traffic domain that will be of benefit to the STM stakeholders and allow us to achieve the set performance targets. The combination of identified performance gaps, and anticipated future sea traffic operations, has served as the basis of the creation of a set of Major Operational Changes (MOC). These MOCs have in turn been elaborated into several steps of operational improvements; i.e. Operational Improvement Steps (OI Step). The implementation of an OI Step means that a number of actions need to be performed. These are enablers (Enabler) of the OI Steps and cover a variety of changes to the supporting infrastructure such as:

- Institutional – Changes in the regulation (e.g. new standards)
- Procedural – Changes in the operational procedures (e.g. new working methods)
- Human – Changes in the role and responsibilities of the human
- System – Changes in the Technical Systems (changed or new systems)
- Service – STM-services that are prerequisite for other services

The OI steps have further been allocated to one of three phases of improvement (Improvement Phase), depending on when they are deemed feasible to deploy; i.e., when all the Enablers of an OI Step have been developed and sufficiently validated and verified.

The Improvement Phases are set according to the STM Performance Framework, describing the planned transition from today's situation to the STM Target Concept achieving the set performance targets.

Four Lines of Change (LoC), which encompass the STM Target Concept, have been identified. The LoCs are identifiable and well defined operational areas of the STM environment, including all of its aspects (procedures, practices, processes, systems, institutions, etc.), that will need to undergo change in order to meet the declared performance objectives. Each Line of Change has been developed considering the STM Target Concept and its operational services. Therefore the actual operational services are not described further in the STM Master Plan. The development process of the STM Master Plan, and its road map, is further described in D2.4.1 STM Strategic Roadmap Approach and Method.

### 3.3 Structure of the report

This document is organised as follows:

- **Chapter 1** provides a brief introduction of the document
- **Chapter 2** provides an executive summary of the STM Master Plan
- **Chapter 3** provides an introduction and explanation of the foundational elements of the STM Master Plan
- **Chapter 4** provides the reader with definitions of the terms used in this document
- **Chapter 5** is the core chapter of the STM Master Plan itself. It describes STM deployment and the expected benefits for all stakeholders through each of the three phases of implementation, as the identified operational improvement steps are implemented. The chapter also contains the deployment strategy and risk management for the STM Master Plan.
- **Chapter 6** provides the reader with conclusions on the STM Master Plan
- **Chapter 7** provides the reader with a reference list.
- **Appendix A** provides information on E-OCVM, the European Operational Concept Validation Methodology

- **Appendix B** provides detailed specification of the risks for risk management of the STM Master Plan
- **Appendix C** provides a list of OI Steps and their Enablers for each STM Operational Service
- **Appendix D** provides a list of Enablers for each Stakeholder group
- **Appendix E** provides a list of the MONALISA 2.0 activity 2 deliverables

## 4 Terms and definitions

### 4.1 Glossary of key terms

Below is a table that covers the key terms, and their definitions, which are used in this document.

Name of term	Definition
Enabler (EN)	An EN is an identified necessary change to the supporting infrastructure. These changes are actions and are proposed to be performed by various Stakeholders for implementing OI steps.
Improvement Phase (IP)	The transition from today's situation to the STM Target Concept is made up of a sequence of Improvement Phases describing the evolution of the STM environment. The division of IPs are set according to the years specified in the STM Performance Target
Line of Change (LoC)	A grouping of related OI Groups to LoC that affects different operational areas. The LoC is a support to ensure that the planning of the evolution to the STM Target Concept will meet the required performance over time.
Major Operational Change (MOC)	A MOC refers to what needs to be changed operationally in order to close the gap between the current situation and the STM Target Operational Concept. Each identified major operational change is connected to a specific Operational Service within the STM Target Concept.
Operational Improvement Group (OI group)	Operational Improvement Steps that are related or contributing to the same benefit or process that are bundled into a group.
Operational Improvement Step (OI step)	An OIS refers to a specific operational change that can be implemented in a given period of time, and that results in enhanced performance.

Table 1 Terms and definitions

## 5 The STM Master Plan

This chapter provides an overview of the most important changes and operational improvements that are included in each of the Improvement Phases.

### 5.1 Performance view – The performance needs and targets

The STM Performance Framework based approach is essential to drive management decisions towards achieving the vision. MONALISA 2.0 aims to define the STM Vision and Goals by setting initial targets. These targets will continuously be refined within the lifetime of the STM Master Plan.

Three vision scenarios set for 2020, 2025 and 2030 have been defined in the framework of the MONALISA 2.0 project. For each of these milestones, a set of Performance Target Goals have been defined, taking into account the current situation of STM and the expectations for the years to follow. Moreover, different key variables such as regulation, technological development and market trends have been considered.

STM Performance covers a very broad spectrum of aspects that are represented through Key Performance Areas (KPAs). The KPA targets represent initial indicative values (working assumptions) and are subject to further analysis and validation. All KPAs are interdependent and will be the basis for impact assessment and consequent trade-off analysis for decision-making in the sub-subsequent MONALISA 2.0 Activity 2 Deliverables.

The Performance Target defines the following general goals that STM should achieve by 2020, 2025 and 2030 compared to the 2015 situation. In the Improvement Phase description, each OI-step is mapped to relevant KPOs to assess the contribution of the OI-steps to the performance targets.

	2020	2025	2030
<b>SAFETY</b>	A slight reduction of open sea and coastal incidents and accidents related to route management and traffic flow.	Progressive reduction of open sea and coastal incidents and accidents related to route management and traffic flow.	Open sea and coastal incidents and accidents related to route management and traffic flow reduction of 50% in relation to year 2015.
<b>ENVIRONMENTAL SUSTAINABILITY</b>	A slight reduction in fuel consumption and GHG emissions due to partial implementation of STM services.	Progressive reduction in fuel consumption and GHG emissions due to wide application of STM services.	Reduction of 7 % in fuel consumption and GHG emissions due to full deployment of STM services compared to year 2015.
<b>EFFICIENCY</b>	A slight reduction in the overall maritime voyage cost and in the average waiting time for berthing due to partial implementation of STM services.	Progressive reduction in the overall maritime voyage cost and in the average waiting time for berthing due to wide application of STM services.	Reduction of 10 % in the overall maritime voyage cost and of 30% in average waiting time for berthing due to full deployment of STM services compared to year 2015.

Table 2 STM Performance Target Goals for 2020, 2025 and 2030

## 5.2 Deployment overview

STM is a concept building on services made for securing relevant and timely maritime information between authorized service providers and users. This vision is enabled by a common framework and standards for information sharing and access management. To be able to implement the visions of STM, the Master Plan work in MONALISA 2.0 have been geared towards implementing the concept in a way that operational improvements are evident in all phases of the implementation period, thus, making it profitable and worthwhile for all stakeholders to participate in this process.

The Master Plan is described by three phases, and how STM will create changes throughout these.

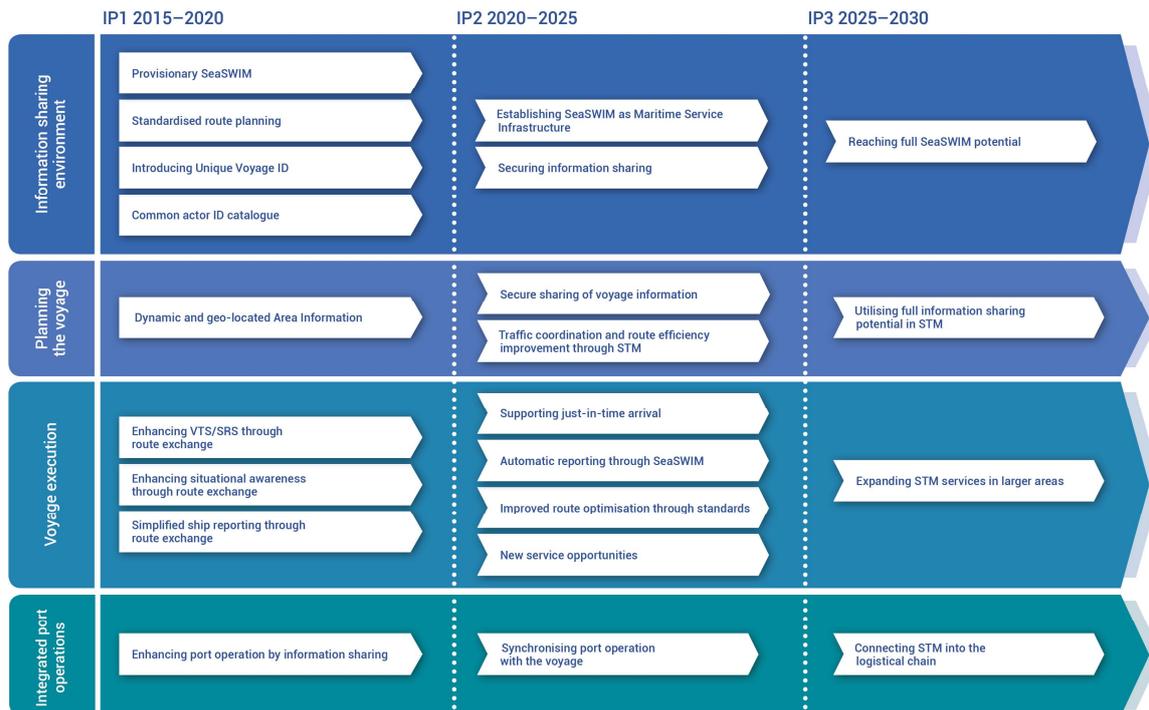


Fig. 2 The gradual implementation of STM

### 5.2.1 IP1 2015-2020 - Creating the foundation

The first improvement phase (IP1), see Fig. 5, sets out to show the initial benefits of STM to the industry, even though the heavier infrastructural, and organisational such as standardisation, harmonisation of formats and governance work won't be delivering effects until the second improvement phase. However, it is important to show that STM can make real impact on several of the targeted performance areas already in IP1.

In the beginning of IP1, the STM Validation Project, (2014-EU-TM-0206-S) is running, delivering proof of concept by demonstration and validating several of the concepts and services developed in the earlier MONALISA and MONALISA 2.0 projects. During this time also the foundation of the governance-bodies of the future STM is slowly being shaped and anchored among the stakeholders of the industry.

Since the common information infrastructure, SeaSWIM, will not be fully operational until IP2, the services utilising SeaSWIM will therefore not be able to reach its full potential during IP1. However, there are several new services envisaged during IP1 that are based on the Route Exchange format. By using transponder based exchange mechanism, or by other proprietary channels, this will give the possibility to launch services enhancing the situational awareness related to the sea voyage. During this period the standard developed and suggested in the MONALISA projects, are ratified by the IEC (International Electrotechnical Commission), amended to the revised ECDIS

performance standards (Resolution MSC.232(82)) by IMO, and implemented and included in the upgrades of all major ECDIS-suppliers.

Some essential building blocks for the industry to adapt to the service system that STM and SeaSWIM will enable, will be introduced in IP1. The establishment of a common actor catalogue and the Unique Voyage ID will be introduced and initially adopted in the industry, laying the foundations for the maritime service ecosystem to emerge. Supported by innovation infrastructure such as STM Developers Zone, where system providers can start utilising emerging standards and concepts, the innovation capacity will be strengthened already in the first IP. The governance structure, where the industry takes part in shaping these tools for future shipping, is also established in IP1.

On board the ship and in VTS and SRS operations, the possibility of a ship declaring its intentions by sharing the nearby route (route segment) will improve the navigational aspects of the sea voyage. The introduction and adaption of Route Exchange Format (RExF) is giving room for new services where land-based actors such as VTS and SRS can support the ships in various ways, increasing safety and efficiency. The fact that ships can beforehand share the route with reporting areas, it is envisaged that a major part of the required ship reporting can be simplified already in the first IP. The fact that the sharing of the route information will give direct benefits to the ships and thereby ship owners, the incentives for participating voluntarily in STM will be high, resulting in significant advantages for the coastal- and the port states, simplifying monitoring of the traffic and enabling the possibility to prevent accidents and incidents.

Within the ports, the validation of STM has shown how the information sharing among actors in the port has improved predictability and efficiency in such a degree that the participating ports can show a significant improvement of the turn-around time for a port call, increasing profitability for both the ship and the port. The larger software system vendors to the ports have started to adapt and adjusted their platforms to the Port CDM principles, and being able to implement some of the Port CDM services in the STM concept. This has been possible through the deployment of support-tools as the Port CDM Developer Zone and the Port CDM Service Infrastructure Platform (SIP). By this being gradually adopted by larger ports being in the forefront, the interest for participating in the development of Port CDM will be increasing rapidly during IP1. The broad spectra of projects and initiatives concerning e-navigation, e-maritime and e-freight are, during IP1, synchronised and co-governed with the forming of governing structure.

### **5.2.2 IP2 2020-2025 - Increasing operational capabilities**

In this second improvement phase, more of the envisioned operational services are coming into operation. The SeaSWIM is now in place supporting the possibility of seamless and secure information sharing throughout the transport chain and its actors.

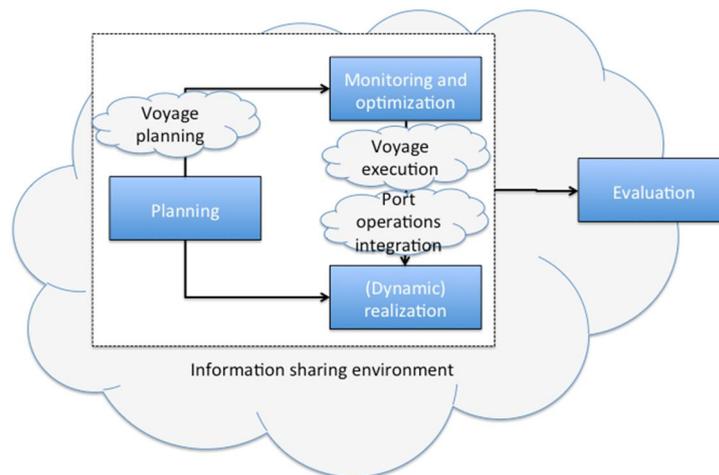


Fig. 3 Connecting STM services through SeaSWIM in IP2

The different actors in the industry are now, directly, or through their system suppliers, connected to the information-sharing infrastructure SeaSWIM through SeaSWIM connectors. This means that stakeholders along the transport chain can be notified much earlier of their involvement in a specific voyage. A voyage is identified through a unique voyage identifier, UVID. This possibility, together with the possibility to open up the whole, or parts of the Voyage plan, and related information, to those stakeholders that will need this information, for automatic delivery (subscription of information). Significant improvements can be done increasing quality and saving unnecessary work, for all actors involved.

The Route Exchange format (RExF) introduced in IP1 is now generally implemented in ships and shore functions involved and together with the possibility to subscribe for relevant and authorised information, a VTS area or port can be notified of the intentions of majority of approaching ships, long before their arrival, which will give a much better planning horizon for these actors. This in turn improves optimisation and efficiency of their operations.

The fact that all relevant information of the voyage is now available through SeaSWIM will create new services that automatically provide port states, coastal states etc. with mandatory ship reporting information. The administrative burden for the officers on board will also decrease significantly.

Having SeaSWIM together with the route exchange possibility, Port CDM enabled ports will be able to provide synchronisation services for approaching ships, enabling just-in-time arrival reducing waiting time at anchor. The adjustment of transport contracts to this enhanced possibility will start to generate substantial savings in bunker consumption and environmental footprint of shipping.

### 5.2.3 IP3 2025-2030 - Achieving full STM capabilities

In this third improvement phase, which represents the final part of the STM Roadmap and Master Plan, the full potential of the STM target is envisioned. A well working ecosystem of information providers, consumers and services based on this is established. The federated model of governing common resources such as SeaSWIM, Port CDM and various standards are well in place.

The real savings in fuel and efficiency have been realised since the “just-in-time arrivals” now are supported in most of the transport contracts and enabled STM information services such as Port Call Synchronisation. Also wider implementations of dynamic separation have created savings in route distance.

The rating of the world ports is now done based on the Port Maturity Model, which create a transparency for shipping companies and cargo owners of where efficiency gains can be found, is now widely implemented and used. Ports are now not only competing by geographical location and port fees, but also on predictability, turn-around times, and information transparency.

Port CDM has also connected the terminals and the hinterland transport to the shipping logistical information chain, seamlessly connecting the cargo owner with information about the voyage their goods is transported on.

STM has also proven to be useful, not only in the existing VTS and SRS areas, but in wider areas than initially targeted. Certified third parties are now offering services such as enhanced shore-based assistance, route crosscheck, dynamic route optimisation etc.

Also, the major part of the reporting requirements for the ships is now replaced with seamless access to relevant information for port states, coastal states and port authorities.

The three improvement phases have contributed in different steps to fulfil the high ambitions set out in the STM definition phase of improvements in maritime safety, efficiency and environmental footprint. Furthermore, the maritime ecosystem have been complemented with a large number of new actors, creating new knowledge and services out of information that before STM was unavailable for sharing in a structured way.

### 5.3 Detailed deployment per Improvement Phase and Line of Change

In this chapter the vision, from the performance target, per IP is presented. The operational improvements in each IP are described in corresponding tables and the performance benefits are assessed.

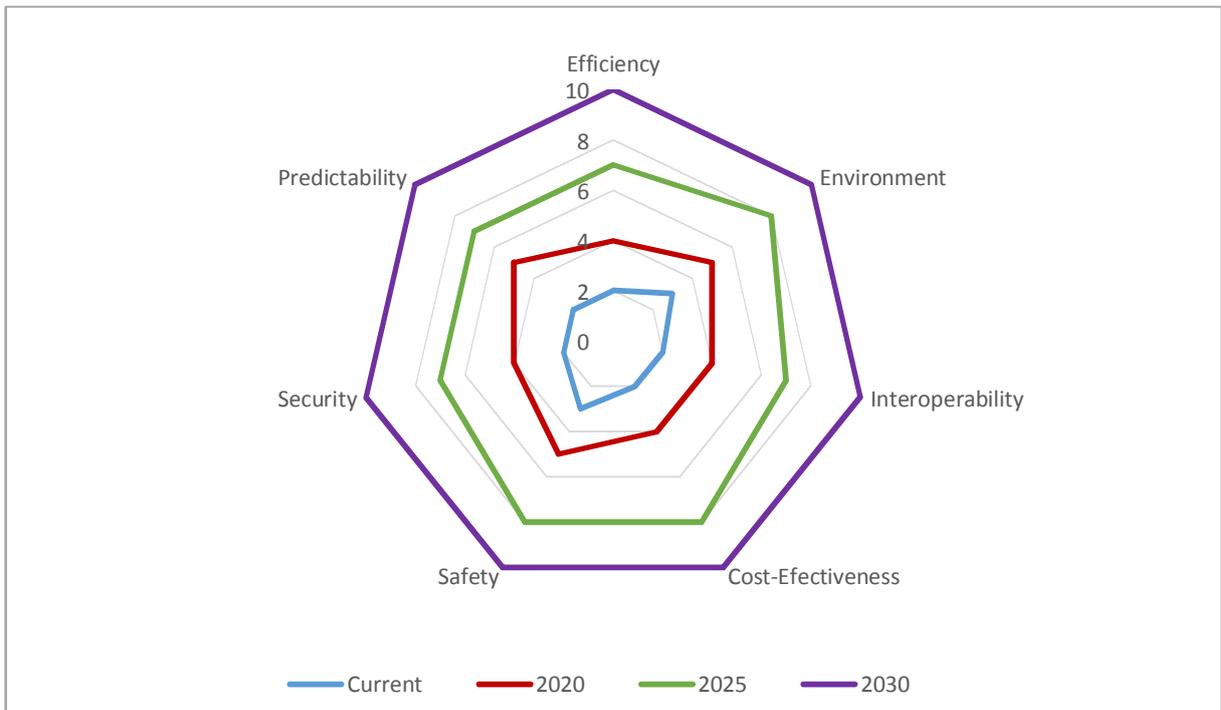


Fig. 4 Progressive performance increase towards the STM performance targets

### 5.3.1 IP1 2015-2020

#### 2020 Vision and Performance Goals

Regarding the 2020 scenario, the STM Performance Target states the following vision:

Sea Traffic Management (STM) is defined on a high level within the MONALISA 2.0 project. A roadmap for short-term developments is ready. Extensive pilot projects have been developed over critical European areas (Baltic Sea, North Channel, Gibraltar Strait, etc.) demonstrating feasibility for the adoption of STM concepts on a wide basis. The first complete services within the navigational field pertaining to route exchange are verified and put in place. STM's need for better developed transmission techniques for increased width of broadband have pushed manufacturers and governmental administrations to increase their effort to find feasible and cost-effective solutions.

Due to the short time frame (currently five years to 2020) the impact of STM will not be much evident until some years after its start-up. Nevertheless, the STM concept will be clearly defined and a roadmap for future actions will be established.

From the environmental perspective, it is worth mentioning that 2015 will introduce a significant milestone regarding emissions restrictions in Sulphur Emissions Control Areas (SECAs), thus being reduced the limit for Sulphur content to 0.1% in marine fuels. Liquefied Natural Gas (LNG) is probably the best candidate to meet this emissions limit, which combustion also reduces CO<sub>2</sub> emissions by 25%. This limit will directly affect the North and Baltic Seas in 2015 and most probably the Mediterranean Sea in 2025, both being areas where MONALISA 2.0 is deploying its actions. A first performance goal regarding sustainability can be expressed as:

In 2020, STM finds synergies with environmental regulations that will force the maritime industry to operate with stricter emission limits, especially regarding Sulphur content of marine fuels (0.1%). LNG is progressively adopted in SECA areas as main fuel. These improvements do not happen in a harmonised way but the path has started for a progressive implementation. First STM applications allow synergies achieving slightly average reduction in fuel consumption, generating also average saving of GHG emissions derived from maritime traffic due to improved route planning and execution as well better coordination of traffic flows.

From the safety and efficiency perspectives, STM starts to be considered as the right way to achieve significant improvements on those KPAs. Improved tools, procedures and human behaviour leads to a reduction of open sea incidents and accidents related

#### Information sharing environment

During the STM Validation Project, conducted in the beginning of IP1, several key features of SeaSWIM are being validated. Even though a firm governed and validated generic information sharing environment will not be available until the second improvement phase, IP2, there will be a provisional SeaSWIM functionality that will

work as a starting point for system developers in the industry planning to adopt their products to the SeaSWIM concept, e.g. Actor Identity information service.

In addition to the Actor identity register standards, such as Unique Voyage ID, Voyage Information Format and Port Call Format, are being developed and adopted. The system providers in the maritime industry are actively taking part in the development of these industry standards, and adjusting their products to encompass these when SeaSWIM will be operational on a wider basis. Meanwhile, these standardised objects are being used in the communication means and methods, currently available, giving integration advantages, even though it is not fully automated until IP2.

The governance structures for SeaSWIM is being defined and identified.

### **Planning the voyage**

The digitising of area information will give immediate benefits to the on-board planning process of a voyage. The implemented standardised route format, RExF, together with digitised area information and MSI (Maritime Safety Information), reduces much manual work, and increases the quality of the crosscheck of routes. The possibility to send the route to shore-side operators for crosscheck increases the operational safety, especially in sensitive sea areas.

### **Voyage execution**

The most significant change in the first IP regarding the voyage execution is the introduction of the Route Exchange Format (RExF). This is the key enabler, which lays the foundation to most of the concepts and services in STM. The fact that the RExF was developed already in the definition phase of STM, the industry has adopted the standard, and also taken it to the standardisation level. By standardisation of RExF in the IEC 61174 ed. 4 most of the ships will be provided with this capability during IP1, also opening up for a series of new capabilities and benefits in the voyage execution. The VTS and SRS are introduced to a whole new set of tools, enabling them to enhance several of their existing services such as monitoring and providing guidance to the seafarers. In some areas manual ship reporting will be complemented with the exchange of the route information, saving time and efforts on board and on shore.

Still the foremost benefit will be the increased situational awareness in the actual navigation at sea, where incidents and accidents will be avoided by sharing each other's intentions through the route exchange functionality.

### **Integrated port operations**

The introduction of the Port Collaborative Decision Making (Port CDM) concept will be the main driver for the work with improving port operations around Europe during this period. With the validation of Port CDM in 10 European ports in the beginning of IP1, the proven improvements in those ports are incentive enough for more ports to follow. Since SeaSWIM is not fully operational in IP1, the main focus during this period will be the information-integration and collaboration among actors within the port. By using tools, knowledge and experience shared through the Port CDM developer zone, the adaption to Port CDM standards can be made by the ports themselves together with

their system providers. Provisionally SeaSWIM supporting services enables this work to be performed in a generic way, preparing for the integration into SeaSWIM in IP2. The possibility of defining and measuring performance in a generic way increases the competitiveness for those ports which adopt Port CDM in an early stage.

The common situational awareness among the port's actors identifies slack and inefficiency in a way that gives immediate efficiency benefits for both ships and ports.

Ship-port synchronisation is starting to be implemented in Port CDM ports, even if the fully integrated synchronisation functionality will come with a fully implemented SeaSWIM in IP2.

### **Description of OI-steps in IP1**

In this chapter all OI-steps in the first improvement phase are listed and described. In order to provide a link to the STM Target Concept the service that the OI-step originates from is indicated in Table 3. To assess whether the OI-steps will bring required performance benefits, each OI-step is also mapped with relevant KPOs. This also includes expected performance benefits in terms of expected high/medium/low added value. The Enablers related to the OI-steps are included in Appendix C.

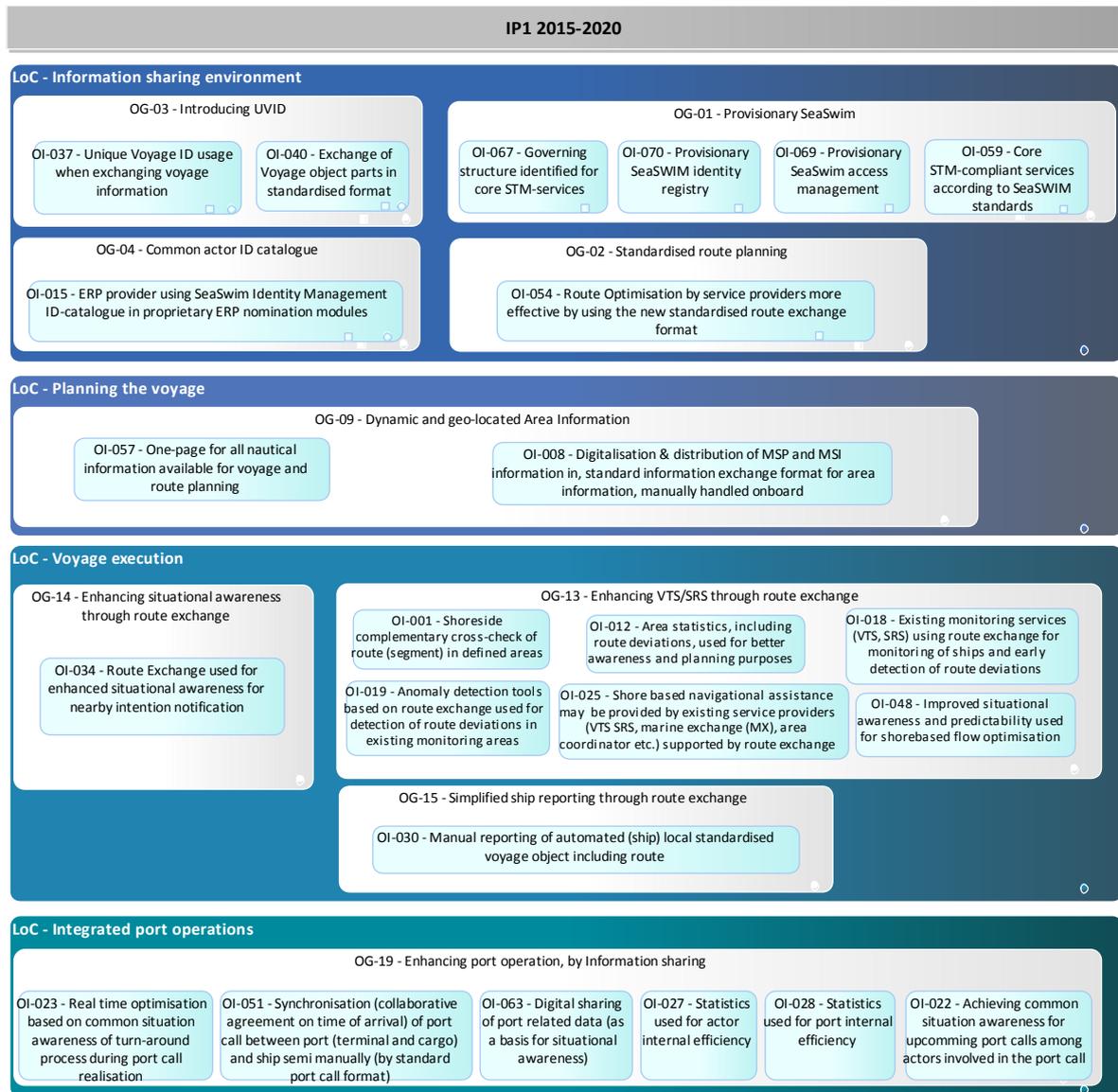


Fig. 5 OI steps in IP1

LoC	OI Group	OI Step	Service	KPO impact
Information sharing environment	Common actor ID catalogue	<p>OI-015 - ERP provider using SeaSwim Identity Management ID-catalogue in proprietary ERP nomination modules</p> <p>In this first stage there will be a SeaSwim Identity Catalogue available as web-service where all relevant actors will be listed. The Shipping ERP-providers (proprietary or service providers), will be able to include this global register of shipping actors in their software, so when an agent, tug operator, port etc. is nominated to a voyage, they will use this register instead of an internal. The benefit for the shipping company will be that the information and status of this actor will always be up-to-date. The benefit for the Shipping-ERP provider will be that the integration of this kind of yellow pages of shipping will be standardised and universal.</p>	Collaborator Nomination	Minimise Administrative Burden (Efficiency) (M)
	Introducing Unique Voyage ID	<p>OI-037 - Unique Voyage ID usage when exchanging voyage information</p> <p>A common standard of representing a Unique Voyage ID (UVID) is implemented in Shipping ERP systems, and are used in all (existing) communication between parties involved in the voyage. Benefits for the actors involved are a higher accuracy of communicated information, easier to integrate in existing systems, fewer misunderstandings and better traceability.</p>	Voyage ID	Minimise Administrative Burden (Efficiency) (M)

LoC	OI Group	OI Step	Service	KPO impact
	Introducing Unique Voyage ID	<p>OI-040 - Exchange of Voyage object parts in standardised format</p> <p>A standardised voyage object can be distributed in current communication channels to relevant parties. Relevant Shipping-ERPs can export a segment of the voyage-object to a standardised format, which can be distributed via existing communication channels, and imported of further processed electronically into other systems.</p> <p>The benefits for the shipping companies/ Agents/Ports are to reduce administrative burden for entry of manual information (which today is sent by email &amp; fax between actors and manually entered into respective ERP-systems. For system providers the standardised format means Less cost for integration, since all maritime ERP systems will be able to understand each other's exports. For all actors involved in a sea voyage it will mean (possibility for) Increased information transparency, since it will be easier to share information between systems, and thereby easier to disseminate it between operative actors in a sea voyage.</p>	Voyage Information	Minimise Administrative Burden (Efficiency) (M)
	Provisionary SeaSwim	<p>OI-059 - Core STM-compliant services according to SeaSWIM standards</p> <p>This step implies that services identified, as core STM services in the SeaSWIM portfolio, should be adapting defined SeaSWIM standards (SeaSWIM compliant services). The purpose with this step is to enable portfolio management for SeaSWIM services.</p>	Sea SWIM General Service Portfolio Management	Improve Infrastructure Interoperability for Information Sharing (Interoperability) (M)
		<p>OI-067 - Governing structure identified for core STM-services</p>	Sea SWIM Governance and	Improve Infrastructure Interoperability (M)

LoC	OI Group	OI Step	Service	KPO impact
		<p>This step requires that a structure for governance of core STM-services should be identified/defined/agreed. The structure should include roles and processes (for monitoring, service approval, and service liquidation as part of service lifecycle management) as well as principles for quality assurance.</p>	Monitoring	for Information Sharing (Interoperability)
		<p>OI-069 - Provisionary SeaSwim access management</p> <p>The service registry and identity registry are used as a basis for regulated provision and discovery of information services.</p>	Sea SWIM Access Management	Increase Information Exchange Security (Security) (H)
		<p>OI-070 - Provisionary SeaSWIM identity registry</p> <p>The identity registry captures all identities that are allowed to, in some situation, provide and/or consume information services The identity registry constitutes a core part of collaborator nomination services by enabling different (accredited) actors, identified by a unique identity, to be associated with different services. A board for allowing access to, and to register different identities has been established. Identities are used both for authentication and regulating service provision.</p>	Sea SWIM Identity Management	<p>Increase Technical and Operational Integration (Interoperability) (M)</p> <p>Improve Infrastructure Interoperability for Information Sharing (Interoperability) (H)</p> <p>Increase Information Exchange Security (Security) (M)</p>

LoC	OI Group	OI Step	Service	KPO impact
	Standardised route planning	<p>OI-054 - Route Optimisation by service providers more effective by using the new standardised route exchange format</p> <p>Optimisation of routes will be faster and less vulnerable due to translations of different formats will end with the new standardised route exchange format. Optimisation provided by different providers is made in a big variety of formats and translations back and forth are necessary. To have just one common format will reduce errors and make the handling more accurate and effective and also open up for modular optimisation where subcontractors to providers can easily plug in modules as part of the main optimisation.</p>	Route Optimisation	<p>Increase (M) Integration between Planning, Execution and Evaluation (Efficiency)</p> <p>Minimise (M) Administrative Burden (Efficiency)</p> <p>Reduce Total(L) Cost of Ownership (Cost Effectiveness)</p>
Planning the voyage	Area and geo-located Dynamic Information	<p>OI-008 - Digitalisation &amp; distribution of MSP and MSI information in, standard information exchange format for area information, manually handled on board</p> <p>Area information, such as MSI, is digitised in a standardised agreed format. MSI publisher publish MSI-information in files openly accessible on internet, for shipping companies to automate the distribution process to their ships in a proprietary way. Some system providers (nautical systems) include this in their service functions.</p>	Area Management	Minimise (M) Administrative Burden (Efficiency)

LoC	OI Group	OI Step	Service	KPO impact
	Secure sharing of voyage information	<p>OI-057 - One-page for all nautical information available for voyage and route planning</p> <p>The nautical information includes but is not limited to MSP, MSI, NtM Pilot Books. There are no international standards for this type of digitised information (TBC). Of these, MSP and MSI are the ones that are necessary to be able to broadcast dynamically. The other ones are more static and will be included when making voyage and route planning.</p>	Area Management	<p>Increase Information Transparency (Interoperability) (M)</p> <p>Increase Information Exchange Security (Security) (M)</p> <p>Minimise Administrative Burden (Efficiency) (M)</p> <p>Increase Voyage Situational Awareness (Predictability) (M)</p>
Voyage execution	Enhancing situational awareness through route exchange	<p>OI-034 - Route Exchange used for enhanced situational awareness for nearby intention notification</p> <p>Route Exchange Format is implemented in navigational equipment on board, and the routes can be exchanged between ships when asked upon from another ships nearby. The ASM message in the AIS transmission is used for this. Route exchange shall not interfere with tactical conning following COLREG as usual. For example, Route exchange must not be used as basis for collision avoidance when TCPA is under e.g. 30 minutes.</p>	Route Exchange	<p>Increase Voyage Safety (Safety) (M)</p> <p>Increase Accident/Incident Prevention (Safety) (M)</p>

LoC	OI Group	OI Step	Service	KPO impact
	Enhancing VTS/SRS through route exchange	<p>OI-001 - Shoreside complementary crosscheck of route (segment) in defined areas</p> <p>Crosscheck of routes in real time, is a new concept and will result in the possibilities for external part to double-check the routes of ships passing certain sea areas. Crosscheck can be performed in different ways in different areas depending on needs from Coastal State. The crosscheck is only to clarify that the intended route will pass clear over and under ground and obstacles issued by MSI services. If this possible service will be mandatory or not must be up to the actual coast state. Some sort of authorisation must be issued by NCA for the provider shouldering this task.</p> <p>A possible implementation strategy could be to introduce crosscheck of routes in a certain sea area as e.g. Baltic Sea or North Sea. This could be connected to some sort of discount of fairway fees or insurance fee if participating in the testbed.</p>	Route Crosscheck	<p>Increase (M) Voyage Safety (Safety)</p> <p>Increase (M) Accident/Incident Prevention (Safety)</p>
	Enhancing VTS/SRS through route exchange	<p>OI-012 - Area statistics, including route deviations, used for better awareness and planning purposes</p> <p>Capacity for collecting and analysing AIS exists today but with the possibility to see planned routes and deviations the area coordinator gets an increased awareness of traffic conditions</p>	Post Traffic Analysis	Decrease (L) Overall Fuel Consumption (Sustainability)

LoC	OI Group	OI Step	Service	KPO impact
	VTS/SRS	<p>OI-018 - Existing monitoring services (VTS, SRS) using route exchange for monitoring of ships and early detection of route deviations</p> <p>Monitor the ships with respect to the route and inform via VHF if any dangerous situations are detected.</p>	Enhanced Shore-based Monitoring	<p>Increase (L) Voyage Safety (Safety)</p> <p>Increase (L) Accident/Incident Prevention (Safety)</p>
	Enhancing VTS/SRS through route exchange	<p>OI-019 - Anomaly detection tools based on route exchange used for detection of route deviations in existing monitoring areas</p> <p>Anomaly detection tools already exists today but will be enhanced by route exchange which gives the possibility to detect route deviations.</p>	Enhanced Shore-based Monitoring	<p>Increase (L) Voyage Safety (Safety)</p> <p>Increase (L) Accident/Incident Prevention (Safety)</p>
	Enhancing VTS/SRS through route exchange	<p>OI-025 - Shore-based navigational assistance may be provided by existing service providers (VTS SRS, marine exchange (MX), area coordinator etc.) supported by route exchange</p> <p>With active route shared to shore side centre a more advanced kind of navigational assistance can be provided as is done today with the difference that with ships active route available on shore centre a more precise and correct assistance can be given since both parts will have the same picture of the route/passage plan. With all ships involved an overall common picture and situational awareness will be available thus opening up for more service functions as Flow management etc.</p>	Shore-based Navigational Assistance	<p>Decrease (H) Navigation within Sensitive Areas (Sustainability)</p>

LoC	OI Group	OI Step	Service	KPO impact
	Enhancing VTS/SRS through route exchange	<p>OI-048 - Improved situational awareness and predictability used for shore-based flow optimisation</p> <p>Flow optimisation could be used in narrow straits, canals, port entrances or areas with very high traffic density using exchange of route information between ship and shore.</p>	Flow Optimisation	<p>Increase (M) Voyage Situational Awareness (Predictability)</p> <p>Increase (M) Degree of Voyage Predictability (Predictability)</p> <p>Decrease (L) Overall Fuel Consumption (Sustainability)</p> <p>Increase (M) Accident/Incident Prevention (Safety)</p> <p>Increase (M) Voyage Safety (Safety)</p> <p>Decrease GHG(L) and Air Pollution - Ships (Sustainability)</p>
	Simplified reporting through route exchange	<p>OI-030 - Manual reporting of automated (ship) local standardised voyage object including route</p> <p>Simplified routines of gathering necessary reporting available through the standardisation of the Voyage Object in various supporting systems.</p>	Single Reporting	<p>Minimise (L) Administrative Burden (Efficiency)</p>

LoC	OI Group	OI Step	Service	KPO impact
Integrated port operations	Enhancing port operation by information sharing	<p>OI-022 - Achieving common situational awareness for upcoming port calls among actors involved in the port call</p> <p>Achieving common situational awareness is key for the actors' ability to coordinate their actions both in relation to each other and in their own operations. Common situational awareness is created by actors sharing the progress and status of specific port calls, using real time data for states identified as key events in a certain port call process. The shared image enables actors to plan and increase the ability to predict characteristics of upcoming port calls. Actors can use the shared image as a basis to communicate about specific service requests and availability for the achievement of optimal utilisation of resources and infrastructure.</p>	Port Call Optimisation	<p>Facilitate Just-(L) in-Time Concept (Efficiency)</p> <p>Reduce Cost of(L) Port Operations (Cost Effectiveness)</p> <p>Increase (L) Voyage Situational Awareness (Predictability)</p>

LoC	OI Group	OI Step	Service	KPO impact
	Enhancing port operation by information sharing	<p>OI-023 - Real time optimisation based on common situation awareness of turn-around process during port call realisation</p> <p>Achieving common situational awareness is key for actors' ability to optimally coordinate their actions both in relation to each other and in their own operations. Common situational awareness is created by actors sharing the progress and status of specific port calls, using real time data for states identified as key events in a certain port call process. The shared image enables actors to predict future events and take actions for an optimal port call realisation. For all key states identified in the port call process (from arrival to departure), the entire turn-around-process can be coordinated, performed just-in-time, and thereby optimised based on information about actors' intentions and performances.</p>	Port Call Optimisation	<p>Facilitate Just-(M) in-Time Concept (Efficiency)</p> <p>Reduce Cost of(M) Port Operations (Cost Effectiveness)</p> <p>Increase (M) Voyage Situational Awareness (Predictability)</p>
	Enhancing port operation by information sharing	<p>OI-027 - Statistics used for actor internal efficiency</p> <p>An increased digital collaboration and information sharing among port actors enables an increased awareness of process performance and the resulting analysis and statistics can be used to improve efficiency for respective actor.</p>	Port Call Improvement	<p>Facilitate Just-(M) in-Time Concept (Efficiency)</p> <p>Reduce Cost of(M) Port Operations (Cost Effectiveness)</p>
	Enhancing port operation by information sharing	<p>OI-028 - Statistics used for port internal efficiency</p> <p>An increased digital collaboration and information sharing among port actors enables an increased awareness of process performance and the resulting analysis and statistics can be used to improve efficiency in ports.</p>	Port Call Improvement	<p>Reduce Cost of(M) Port Operations (Cost Effectiveness)</p> <p>Facilitate Just-(M) in-Time Concept (Efficiency)</p>

LoC	OI Group	OI Step	Service	KPO impact
	Enhancing port operation by information sharing	<p>OI-051 - Synchronisation (collaborative agreement on time of arrival) of port call between port (terminal and cargo) and ship semi manually (by standard port call format)</p> <p>PortCDM should be regarded as an integrated part of STM. The intentions of the ship are an important factor in port call optimisation. Therefore, changes and updates from the ships intended route and ETA needs to be distributed to relevant actors and matched to relevant port capacity to ensure port of readiness. ETA (planned, updated etc.) is regarded as an important information component for STM in port operations. The step requires a standardised port call format for the agreement on time of arrival. The information should be in digital form and real time distribution is desirable, but not necessary to fulfil this improvement step. The standardised port call format regarding agreement on time of arrival might require some technical adaptation of existing system environment. To enable synchronisation based on the collaborative agreement on time of arrival between ship and port actors, the message should be according to a defined standard port call format, possibly via an add-on message translation service. The communication media can be digital or semi-digital media.</p>	Port Call Synchronisation	<p>Reduce Total(M) Cost of Ownership (Cost Effectiveness)</p> <p>Facilitate Just-(M) in-Time Concept (Efficiency)</p> <p>Increase Port(M) Operations Predictability (Predictability)</p> <p>Reduce Cost of(L) Port Operations (Cost Effectiveness)</p> <p>Decrease (M) Overall Fuel Consumption (Sustainability)</p> <p>Decrease GHG(M) and Air Pollution - Ships (Sustainability)</p>

LoC	OI Group	OI Step	Service	KPO impact
	Enhancing port operation by information sharing	<p>OI-063 - Digital sharing of port related data (as a basis for situational awareness)</p> <p>Digital sharing of port related data is data and information identified as important for coordinating one or several port calls. Digital sharing is a key component in creating the image for situational awareness, enabling well-informed and well-prepared actors. Monitoring of Port calls requires information about key events and progress to be provided from the involved actors. The information often exists, but needs to be digitised and shared to actors involved in a port call.</p>	Port Call Monitoring	<p>Facilitate Just-(L) in-Time Concept (Efficiency)</p> <p>Reduce Cost of(L) Port Operations (Cost Effectiveness)</p>

Table 3 OI Steps in IP1 with KPO contribution

### 5.3.2 IP2 2020-2025

#### 2025 Vision and performance goals

Regarding the 2025 scenario, the STM Performance Target states the following vision:

STM has taken a large step forward. Follow-on projects to MONALISA 2.0 have developed common structures and solutions for a wide range of services in the whole maritime transport chain. Commercial players are taking a larger part of the development. Better transmission techniques now are in use and the prices for use of bandwidth have fallen due to increased amount of customers.

The first commercial products are in wide use. Several regions require ships to use route exchange, and ship owners are progressively saving fuel costs due to route optimisation, saving GHG and pollutant emissions as well. Open sea incident and accident rates due to route management and traffic flows have fallen. The overall cost of the maritime voyage is also reduced in comparison with the 2015 situation. In the same manner, average waiting time for berthing at ports has been progressively reduced.

The vision perspective in the 2025 scenario states that the STM scope will be progressively extended to the whole maritime transport network as shown in the figure below.

STM will be the dynamic, integrated management of sea traffic and maritime space through the provision of facilities and seamless services in collaboration with all parties and involving seaborne and shore-based functions.

From the environmental perspective, 2025 represents another step in shipping emissions reduction as the Sulphur limits for marine fuels are established worldwide in 0.5% (from the current 3.5%). The Mediterranean Sea is already a SECA, thus being extended the regulation of the North and Baltic Seas to the South of Europe. The first contributions of STM to reduce shipping emissions by means of routes optimisation takes place in the Mediterranean Area.

#### Information sharing environment

In the second improvement phase, the SeaSWIM is becoming fully operational. There exists a governing body which is representing the different federated constellations of actors with a stake in the information sharing in the shipping community. This governing body have now established procedures and framework ensuring the quality and security of the information services provided by different actors in the industry.

The identity registry and the access management services in SeaSWIM are now accepted and commonly used by a majority of actors. This means that a major part of the shipping companies will have streamlined their information exchange, and at the same time made it more secure. It is also possible to subscribe for information relevant to the actor, giving a possibility for receiving relevant information, much earlier than today.

The Unique Voyage ID is now implemented so that practically all voyages performed are having a UVID assigned. Mechanisms for providing identities or unique number series to the shipping operators are in place and governed by the same body as SeaSWIM.

### **Planning the voyage**

In the second Improvement phase, the planning process performed in the shipping company, is now integrated with the supporting services provided by SeaSWIM. The global actor catalogue implemented in IP1 can now be used for authorising access to different parts of the information about the voyage, which is published in SeaSWIM. As the planning of the voyage progresses, the information owner can choose to publish parts of the information, which can be notified to a subscribing collaborator (e.g. Agent, Port). The process saves much time and effort compared to today's email, telex and fax to different collaborators.

Existing supporting services provided by VTS, route optimising service providers etc., can now provide enhanced, more capable services by having access to all needed information about the voyage, ship and digitised area information.

### **Voyage execution**

With the support of SeaSWIM the route can now be exchanged, not only to actors in the vicinity of the ship, but also in its complete, port-to-port format. This also gives forewarning to areas long before that a ship is planned to pass.

Now that the route exchange have become a well-accepted navigational aid, there will be possible for shore-based actors also to advice corrections and better routes based on local knowledge. VTS and SRS can suggest corrective actions to a passing ship, but there will also be third party service providers, servicing ships with shore-based navigational assistance.

SeaSWIM, enabling automated ship reporting, significantly reduces the administrative burden.

The provision, of routes well in advance, will create the possibility of dynamic separation of traffic, which will increase safety as well as save fuel by the use of more efficient routes.

### **Integrated port operations**

When SeaSWIM now is operational and the information about voyages is available for subscription, the port and the ship can dynamically synchronise the arrival of the ship, according to the contract and operational prerequisites, giving the possibility for just in time arrival and the reduction of waiting time.

Port CDM services and standardised ways of measuring performance of the port can now be shared with the outside through a common Port Maturity Model, a declaration of the performance metrics of a specific port.

### **Description of OI-steps in IP 2**

In this chapter all OI-steps in the second improvement phase are listed and described. In order to provide a link to the STM Target Concept the service that the OI-step originates from is indicated in Table 4. To assess whether the OI-steps will bring required performance benefits, each OI-step is also mapped with relevant KPOs. This also includes expected performance benefits in terms of expected high/medium/low added value. The Enablers related to the OI-steps are included in Appendix C.

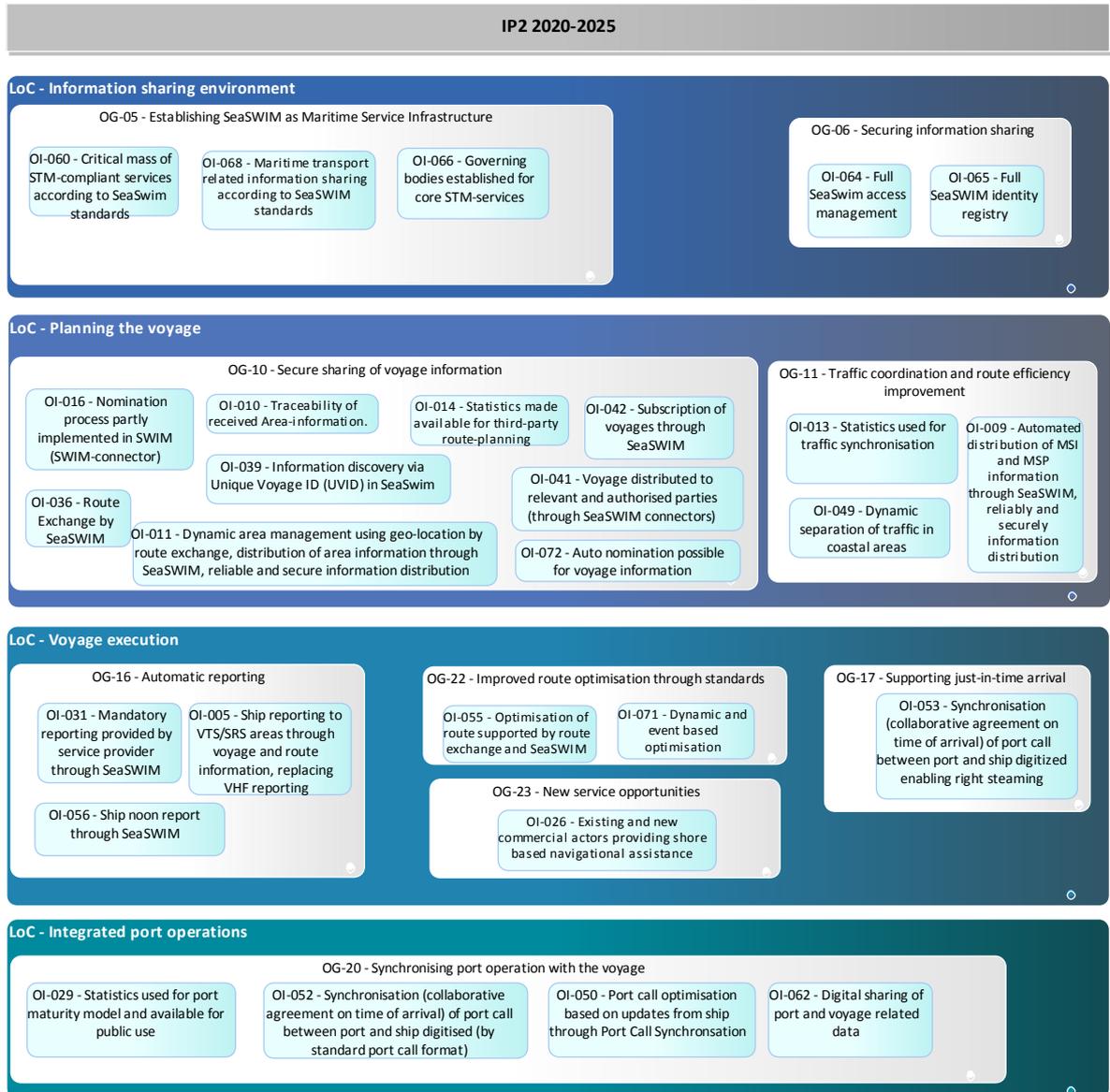


Fig. 6 OI-steps in IP 2

LoC	OI Group	OI Step	Service	KPO impact
Information sharing environment	Establishing SeaSWIM as Maritime Service Infrastructure	<p>OI-060 - Critical mass of STM-compliant services according to SeaSwim standards</p> <p>A critical mass of STM compliant services have been adapted to SeaSWIM standards thus creating a momentum of use of the STM for more efficient, sustainable, and safe Sea Transports. The use of the SeaSWIM standards are widely used by diverse service providers of STM services</p>	SeaSWIM General Service Portfolio Management	<p>Increase (M) Information Transparency (Interoperability)</p> <p>Increase (M) Information Quality (Interoperability)</p>
		<p>OI-068 - Maritime transport related information sharing according to SeaSWIM standards</p> <p>Besides STM related information sharing, the principles of SeaSWIM is applied in other domains of maritime activity (such as e.g. E-navigation, National Single Window, Cargo management)</p>	SeaSWIM General Service Portfolio Management	Increase (M) Information Transparency (Interoperability)
	Establishing SeaSWIM as Maritime Infrastructure	<p>OI-066 - Governing bodies established for core STM-services</p> <p>Organisational bodies as constituting members of the federation providing trust for the service ecosystem by adopting the governing structure (OI-067) has been established.</p>	SeaSWIM Governance and Monitoring	<p>Increase (M) Information Transparency (Interoperability)</p> <p>Increase Information Quality (Interoperability)</p>
		<p>OI-064 - Full SeaSwim access management</p> <p>Procedures for authentication and secure service discovery and provision based on identity, application, time, and space are fully implemented interoperable registers for services and identities existing on different platforms</p>	SeaSWIM Access Management	Increase (H) Information Exchange Security (Security)

LoC	OI Group	OI Step	Service	KPO impact
	Securing information sharing	<p>OI-065 - Full SeaSWIM identity registry</p> <p>By this step, the identity registry has reached such status that it used for international associations (such as e.g. International Shipping Associations, International Harbour Associations) to accredit their members to be a trusted identity in the registry. In this way the degree of reliability of the information about identities is substantially increased.</p>	SeaSWIM Identity Management	<p>Increase Information Exchange Security (Security) (H)</p> <p>Increase Information Transparency (Interoperability) (M)</p>
Planning the voyage	Dynamic and geo-located Area Information	<p>OI-011 - Dynamic area management using geo-location by route exchange, distribution of area information through SeaSWIM, reliable and secure information distribution</p> <p>Dynamic no go areas can be establish in a critical area during a certain period of time and/or for a certain type of ships. This critical area can e.g. be an environmental sensitive area.</p>	Area Management	Minimise Administrative Burden (Efficiency) (M)

LoC	OI Group	OI Step	Service	KPO impact
	Secure sharing of voyage information	<p>OI-010 - Traceability of received Area-information.</p> <p>SeaSwim functionality provides feedback to publisher of who have received which information. Used in Area-management for MSI-publisher to verify that relevant ships have taken part of vital information.</p>	Area Management	<p>Decrease (M) Navigation within Sensitive Areas (Sustainability)</p> <p>Minimise (M) Administrative Burden (Efficiency)</p> <p>Increase (M) Voyage Safety (Safety)</p> <p>Increase (M) Systems and Technologies Addressed by STM (Flexibility)</p> <p>Increase (M) Technical and Operational Integration (Interoperability)</p>

LoC	OI Group	OI Step	Service	KPO impact
	Secure sharing of voyage information	<p>OI-016 - Nomination process partly implemented in SWIM (SWIM-connector)</p> <p>In this stage, the SeaSwim Identity catalogue has been used for some years, and is well implemented in the different systems used by the shipping-actors. In SeaSwim, the Access management service is implemented, and by that, also in the SwimConnector. The connection the different service providers and actors have to the SeaSwim service infrastructure. This gives a possibility to integrate the actual nomination-process performed in the shipping company's commercial department with access-rights to the information that will be publicised throughout the voyage, to the nominated actor. What information that is to be available for the nominated party, is decided by the information owner (the shipping company) by assigning templates or profiles to the actor-type. When an actor is nominated to a certain voyage (a ship-agent in a specific port, or a port), these actors (as defined in the Identity register) can automatically obtain relevant information (according to the profile) through its SeaSwim connector (integration interface to SeaSwim). The benefit for the ship-owner at this stage is that they can easily, with one nomination-process within their own tools or systems, secure that the right receiver gets the right information about the voyage whenever that piece of information is updated. Several time-consuming processes on the office and at sea can now gradually be radically simplified. The benefit for the Shipping ERP-systems provider (internal or through service provider) is that a generic, global and secure way of giving information access to the nominated collaborators of the shipping company can be made in a standardised and globally accepted manner.</p>	Collaborator Nomination	Minimise Administrative Burden (Efficiency) (M)
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LoC	OI Group	OI Step	Service	KPO impact
	Secure sharing of voyage information	<p>OI-072 - Auto nomination possible for voyage information</p> <p>With auto nomination turned ON it is possible for voyage planner system to automatically give access to ports, authorities etc. to parts of the voyage information when appointing collaborators in the voyage, in ordinary planning system.</p>	Collaborator Nomination	<p>Minimise Administrative Burden (Efficiency) (M)</p> <p>Increase Technical and Operational Integration (Interoperability) (M)</p> <p>Increase Information Exchange Security (Security) (M)</p>
	Secure sharing of voyage information	<p>OI-014 - Statistics made available for third-party route-planning</p> <p>As the volume of traffic and other maritime activities increases congestion is becoming a problem in more areas e.g. canals, straits and port entrances. By gathering statistics on plans and actual occurrences, removing all business sensitive information and make it available for third-party route planning it will be easier to see e.g. times or areas where problems with congestion is likely to occur. The statistics can also be used for planning of new safety measures like VTS, aids to navigation or resource planning of operators.</p>	Post Traffic Analysis	Decrease Overall Fuel Consumption (Sustainability) (L)

LoC	OI Group	OI Step	Service	KPO impact
	Secure sharing of voyage information	<p>OI-036 - Route Exchange by SeaSWIM</p> <p>Routes are distributed through a common communication infrastructure by Route Exchange Format. With the introduction of SeaSwim the routes can be distributed by other means than by AIS, thus leading to new possibilities of providing services from remote location. The need to be in VHF range for providing services will be obsolete.</p>	Route Exchange	<p>Increase (H) Voyage Safety (Safety)</p> <p>Increase (H) Accident/Incident Prevention (Safety)</p>
	Secure sharing of voyage information	<p>OI-039 - Information discovery via Unique Voyage ID (UVID) in SeaSwim</p> <p>UVID can be used for publishing information &amp; discovery in SeaSwim for identifying Swim nodes with have information about the voyage (subscription).</p> <p>E.g. subscription for all voyages to my port. Benefits for the actors involved in the voyage are easier information retrieval. For system providers the UVID will mean that all information can be exchange between all other systems, and information precision can be obtained (information means the same in different systems).</p>	Voyage ID	<p>Minimise (L) Administrative Burden (Efficiency)</p>

LoC	OI Group	OI Step	Service	KPO impact
	Secure sharing of voyage information	<p>OI-041 - Voyage distributed to relevant and authorised parties (through SeaSWIM connectors)</p> <p>Shipping-ERPs providing the Voyage-object via Swim-connectors, identified via Unique Voyage ID, with targeted (point-to-point) distribution of the access-rights. This will be implemented by a shipping company connecting its different ERP-systems to SeaSwim through the SeaSwim connectors. This means that the system can distribute parts of the information to be available for other actors, which the information owner have granted access, for automatically receive in their systems through similar SeaSwim connectors. For a shipping company, regardless if the systems are developed and maintained internally, or through service providers, the crewing system, the Chartering and operations system, the cargo planning system, the Voyage planning system (ECDIS) can be connected through SeaSwim connectors to be able to publish, and subscribe for information which is tagged with a unique voyage ID. This means also that the Voyage Information Service can be distributed over several ERP-systems in a shipping company.</p>	Voyage Information	Minimise Administrative Burden (Efficiency) (H)

LoC	OI Group	OI Step	Service	KPO impact
	Secure sharing of voyage information	<p>OI-042 - Subscription of voyages through SeaSWIM</p> <p>Relevant parties to a voyage are notified through SeaSWIM of a relevant voyage, and can request and gain access to the information through SeaSWIM. Access is controlled by the information owner. This means that there will be a possibility to set up subscriptions also for the shipping company to receive information about its voyage through SeaSWIM (e.g. arrival to port, SoF in a port). For a shipping company this would mean easier overview over all information from supporting actors, involved in the ships voyage, and through that also easier integration with different actors, which is very hard for shipping companies working in a many-to-many environment (e.g. Tramp shipping, where shipping company dealing with many ship-agents, in ports where they not necessarily have visited before).</p>	Voyage Information	<p>Increase (M) Information Transparency (Interoperability)</p> <p>Minimise (H) Administrative Burden (Efficiency)</p>
	Traffic coordination and route efficiency improvement	<p>OI-009 - Automated distribution of MSI and MSP information through SeaSWIM, reliably and securely information distribution</p> <p>MSI publisher publish the information in SeaWIM, geo-location coded. Route exchange service triggers the subscription (or distribution) of the information to right receiver.</p>	Area Management	<p>Increase (M) Information Exchange Security (Security)</p> <p>Minimise (M) Administrative Burden (Efficiency)</p>

LoC	OI Group	OI Step	Service	KPO impact
	Traffic coordination and route efficiency improvement	<p>OI-049 - Dynamic separation of traffic in coastal areas</p> <p>Dynamic separation outside ships routeing systems including TSS areas.</p>	Flow Optimisation	<p>Increase (M) Voyage Safety (Safety)</p> <p>Increase (M) Accident/Incident Prevention (Safety)</p> <p>Reduce Delays(M) on Voyage derived from Congestion (Capacity)</p>
	Traffic coordination and route efficiency improvement	<p>OI-013 - Statistics used for traffic synchronisation</p> <p>As today it is important to analyses traffic statistics. With route information available the analyses can be performed based on more information.</p>	Post Traffic Analysis	Decrease (M) Overall Fuel Consumption (Sustainability)

LoC	OI Group	OI Step	Service	KPO impact
Voyage execution	Automatic reporting	<p>OI-005 - Ship reporting to VTS/SRS areas through voyage and route information, replacing VHF reporting</p> <p>Today all reporting to VTS normally takes place by voice/VHF and since VTS areas always are located close to land and in confined waters, attention for conduct of ships is reduced. With single reporting supported by route exchange all necessary data will be exchanged and the need for VHF call will be reduced dramatically. Before departure, the ship share its route with authorised stakeholders and by geotagging all authorised entities along the route will have access and all route information will be available by this single reporting extracted from the route provided. In the long run the manual operation by VTS centre can be dramatically streamlined and probably a number of VTS can be clustered and operated remotely by fewer operators.</p>	Single Reporting	<p>Minimise Administrative Burden (M) (Efficiency)</p> <p>Increase Technical and Operational Integration (M) (Interoperability)</p>
	Automatic reporting	<p>OI-031 - Mandatory reporting provided by service provider through SeaSWIM</p> <p>Dedicated service providers (agents or virtual agents) are offering reporting services (Single Window, Port etc.) for the ships by accessing voyage object through SeaSWIM connectors and route exchange, and making necessary reporting on behalf of the ship . This is a step towards full SeaSWIM functionality where information consumers will be granted access to the information directly through SeaSWIM.</p>	Single Reporting	<p>Minimise Administrative Burden (H) (Efficiency)</p> <p>Increase Operational Services Addressed by STM (M) (Flexibility)</p> <p>Increase Business Models Addressed by STM (M) (Flexibility)</p>

LoC	OI Group	OI Step	Service	KPO impact
	Automatic reporting	<p>OI-056 - Ship noon report through SeaSWIM</p> <p>Existing service but in proprietary solutions, will be replaced by standardised and continuous publication of data. The receiver of noon-reports will be able to retrieve information from any given point in time (not only noon) based on recorded information on board. The concept of 'noon report' will still exist, but as an information service retrieving recorded information at a specific point in time (noon).</p>	Single Reporting	<p>Minimise Administrative Burden (M) (Efficiency)</p> <p>Increase Technical and Operational Integration (H) (Interoperability)</p>
	Improved route optimisation through standards	<p>OI-055 - Optimisation of route supported by route exchange and SeaSWIM</p> <p>When the route is accessible via SeaSwim optimisation can be done very fast and the route can be sent around various times for recalculation depending on new values. All stakeholders that can affect the route in one way or another will subscribe for access to the route and immediately as something will be altered all stakeholders will be notified in order to update and recalculate the route once again. This is a everlasting process as long as the route is active. With SeaSWIM all actors will always have the up-dated route and they can also update the route by own new info if needed</p>	Route Optimisation	<p>Minimise Administrative Burden (H) (Efficiency)</p> <p>Increase Integration between Planning, Execution and Evaluation (H) (Efficiency)</p> <p>Reduce Total(M) Cost of Ownership (Cost Effectiveness)</p> <p>Decrease Overall Fuel Consumption (M) (Sustainability)</p> <p>Decrease GHG(M) and Air Pollution - Ships (Sustainability)</p>

LoC	OI Group	OI Step	Service	KPO impact
	Improved route optimisation through standards	<p>OI-071 - Dynamic and event based optimisation</p> <p>During a voyage many factors appears that more or less makes impact on both the initial route chosen, courses between WP's and the speed. It can be weather-traffic-resources-availabilities or object related like MSI etc. With constant access to reliable info, the whole picture will provide a swift and safer possibility to adjust the route dynamically.</p>	Route Optimisation	<p>Minimise Administrative Burden (Efficiency) (H)</p> <p>Increase Integration between Planning, Execution and Evaluation (Efficiency) (H)</p> <p>Reduce Total(H) Cost of Ownership (Cost Effectiveness)</p> <p>Decrease Overall Fuel Consumption (Sustainability) (H)</p> <p>Decrease GHG(H) and Air Pollution - Ships (Sustainability)</p>

LoC	OI Group	OI Step	Service	KPO impact
	New service opportunities	<p>OI-026 - Existing and new commercial actors providing shore-based navigational assistance</p> <p>With active route shared to shoreside centre a more or less advanced kind of navigational assistance can be provided. Today this is generally done by VTS centre located close to the ships but in the long run with modern technology this service function could be performed virtually anywhere as long as the internet is operative. Service providers not seen today can expand, depending on flag and coastal states demands and legislations.</p>	Shore-based Navigational Assistance	Decrease (M) Navigation within Sensitive Areas (Sustainability)

LoC	OI Group	OI Step	Service	KPO impact
Supporting just-in-time arrival		<p>OI-053 - Synchronisation (collaborative agreement on time of arrival) of port call between port and ship digitized enabling right steaming</p> <p>For enhanced synchronisation based on a collaborative agreement on time of arrival (in real time) between ship and port actors according to the standardised port call format should be automatically communicated. Such synchronisation of conditions for ships approach and port of readiness enables right steaming.</p>	<p>Port Call Synchronisation</p>	<p>Facilitate Just-(H) in-Time Concept (Efficiency)</p> <p>Reduce Total(H) Cost of Ownership (Cost Effectiveness)</p> <p>Increase Port(M) Operations Predictability (Predictability)</p> <p>Reduce Cost of(H) Port Operations (Cost Effectiveness)</p> <p>Decrease (H) Overall Fuel Consumption (Sustainability)</p> <p>Decrease GHG(H) and Air Pollution - Ships (Sustainability)</p> <p>Reduce (H) Congestion in All Voyage Phases (Efficiency)</p> <p>Increase (H) Degree of Voyage Predictability (Predictability)</p> <p>Increase (H) Business Models Addressed by STM (Flexibility)</p>
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LoC	OI Group	OI Step	Service	KPO impact
Integrated port operations	Synchronising port operation with the voyage	<p>OI-029 - Statistics used for port maturity model and available for public use</p> <p>An increased digital collaboration and information sharing in the port community implies a possibility to analyse information to be used for statistics, cause analysis and measurement. Revealing causes for certain effects serve as basis for actors in their improvement processes. Such statistics could also be used as a basis to determine port maturity and further be available for other actors to use.</p>	Port Call Improvement	<p>Facilitate Just-(M) in-Time Concept (Efficiency)</p> <p>Reduce Cost of(M) Port Operations (Cost Effectiveness)</p>
	Synchronising port operation with the voyage	<p>OI-062 - Digital sharing of port and voyage related data</p> <p>One step to increase port efficiency and to improve the port call, process improvement is to digitally share port and voyage related data. By sharing both port and voyage related data in a digital and in real-time minimises the administrative burden and enables a seamless Port-to-port sea voyage. Port operations are the beginning and the end in STM, why the strive is to, in an efficient way and in real time make information available to the right sources, in right time and to the right place.</p>	Port Call Monitoring	<p>Facilitate Just-(M) in-Time Concept (Efficiency)</p> <p>Reduce Cost of(M) Port Operations (Cost Effectiveness)</p>

LoC	OI Group	OI Step	Service	KPO impact
	Synchronising port operation with the voyage	<p>OI-050 - Port call optimisation based on updates from ship through Port Call Synchronisation</p> <p>PortCDM should be regarded as an integrated part of STM. The intention of the ship is an important factor in port call optimisation. Therefore, changes and updates from the ships intended route and ETA needs to be distributed to relevant actors in real time to ensure port readiness. ETA (planned, updated etc.) is seen as an important information component for STM in port operations. This operational improvement is a prerequisite for green steaming.</p>	Port Call Optimisation	<p>Facilitate Just-(M) in-Time Concept (Efficiency)</p> <p>Reduce Cost of(M) Port Operations (Cost Effectiveness)</p> <p>Increase (M) Voyage Situational Awareness (Predictability)</p>

LoC	OI Group	OI Step	Service	KPO impact
	Synchronising port operation with the voyage	<p>OI-052 - Synchronisation (collaborative agreement on time of arrival) of port call between port and ship digitised (by standard port call format)</p> <p>For enhanced synchronisation based on a collaborative agreement on time of arrival (in real time) between ship and port actors according to the standardised port call format should be automatically communicated. This is most likely to be communicated / exchanged via fleet operating centres being in direct contact with the ship.</p>	Port Call Synchronisation	<p>Facilitate Just-(M) in-Time Concept (Efficiency)</p> <p>Reduce Total(M) Cost of Ownership (Cost Effectiveness)</p> <p>Increase Port(M) Operations Predictability (Predictability)</p> <p>Reduce Cost of(L) Port Operations (Cost Effectiveness)</p> <p>Decrease (M) Overall Fuel Consumption (Sustainability)</p> <p>Decrease GHG(M) and Air Pollution - Ships (Sustainability)</p>

Table 4 OI Steps in IP2 with KPO contribution

### 5.3.3 IP3 2025-2030

#### 2030 Vision and Performance Goals

Regarding the 2030 scenario, the STM Performance Target states the following vision:

STM is a worldwide concept used everywhere. Data sharing has led to major changes in the maritime transport chain. Sea Traffic Coordination Centres assist traffic across the globe. The number of ships laying waiting for quay time is reduced by 50%. Intermodal efficiency has cut handling times in ports by half. STM has helped reducing emissions with 10%, through efficient routes, just-in-time speed adjustments and shorter times in port. Coastal and port incidents and accidents involving ships due to route management and traffic flows have fallen by 50% on the way to IMO's Zero Vision. The overall cost of the maritime voyage is reduced in average by 10% in comparison with the 2015 situation. In the same manner, average waiting time for berthing at ports has been reduced by 50%.

Under the STM umbrella, many new projects flower. All aspects of STM have been investigated but there is still work to be done and new products to be developed.

STM will ensure safe, efficient and environmentally friendly sea voyages in 2030. This management system will take the operations carried out at ports and beyond into consideration. Port operations and their efficiency, are important factors in the performance of the transportation system as a whole. STM will greatly contribute to this area as it was conceived with an emphasis on efficient collaboration between operations at sea and on land. STM will lead to the reaching of a high level of integration and operative coordination among different agents involved in maritime transport chain through information sharing.

### **Information sharing environment**

In this third Improvement phase, SeaSWIM have been integrated as a natural and trusted part of the shipping business. A major part of the actors in the shipping industry are in some way connected to SeaSWIM. Also other parts of the logistic chain are now integrated. Freight forwarders, cargo owners, hinterland transport modes – all are now subscribing for information relevant to their business. The Voyage Information Object is now covering all aspects of the information flow including cargo information. SeaSWIM is federated with major information infrastructures for freight transport.

### **Planning the voyage**

Crosscheck of routes is now being done using multiple information sources covering the whole voyage port-to-port and various STM-services are a naturally integrated part of the shipping companies planning systems. New actors have emerged creating more complex optimisation support, based on the availability of global statistical data for most areas of the world. The possibility for an information owner to assign access rights to different actors has now become a simple and fully integrated task in their daily IT-systems.

Area managers, such as VTS and SRS, monitoring tasks have become more automated since traffic anomalies can be automatically identified, and verification of

which ship has received what information can be tracked and the ships are equipped with more advanced tools based on high data availability. This enables larger areas than today to be monitored by the same number of operators leading to safety increases in larger areas.

### **Voyage execution**

At the same time, the area managers have received a more organising role, providing suggestions and even instructions to ships in some waters. The possibility of actively managing maritime traffic is there.

Practically all ship-reporting is now replaced with the requestors subscribing for the required information in SeaSWIM.

Dynamic traffic separation is being used in more areas around the world, making the routes more efficient.

### **Integrated port operations**

Port CDM has now become an integrated functionality in the existing Port Community Systems, and standards are governed by a federated governing body. Port CDM also provides interfaces to the distribution part of the transport (hinterland transport), and the terminals.

### Description of OI-steps in IP3

In this chapter all OI-steps in the third improvement phase are listed and described. In order to provide a link to the STM Target Concept the service that the OI-step originates from is indicated in Table 5. To assess whether the OI-steps will bring required performance benefits, each OI-step is also mapped with relevant KPOs. This also includes expected performance benefits in terms of expected high/medium/low added value. The Enablers related to the OI-steps are included in Appendix C.

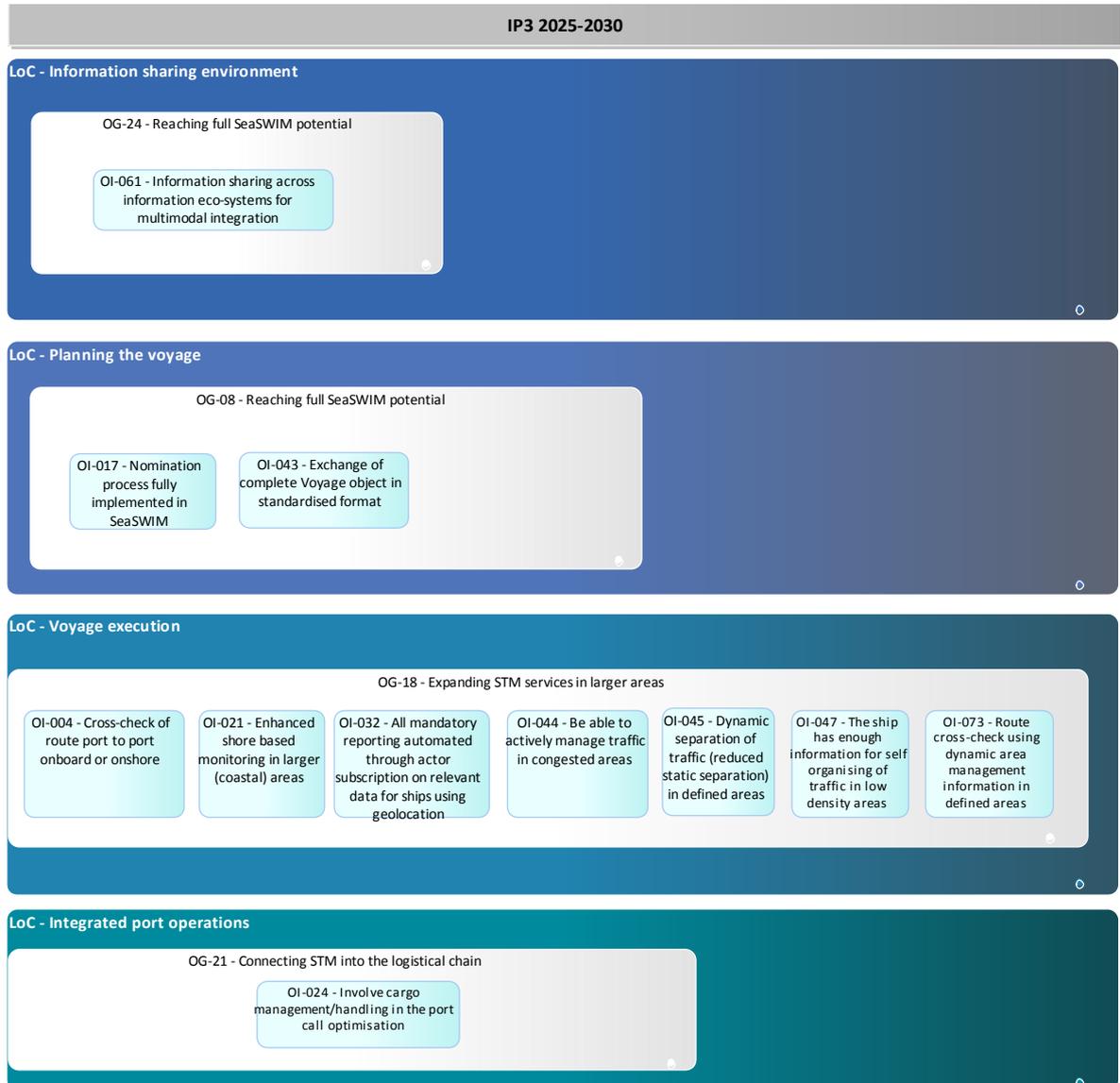


Fig. 7 OI-steps in IP3

LoC	OI Group	OI Step	Service	KPO impact
Information sharing environment	Reaching full SeaSWIM potential	<p>OI-061 - Information sharing across information eco-systems for multimodal integration</p> <p>Sharing of information according to SeaSWIM principals is not only of value for actors involved in the maritime part of the transport chain. The information provided by these actors can also be utilised by other transport modes. The sea voyage can be regarded as one part of a larger multi modal transportation system. Therefore, relevant information shared in the port community should be available to actors in integrated transportation systems and vice versa, to enable multimodal integration.</p>	Port Call Monitoring	<p>Facilitate Just-(H) in-Time Concept (Efficiency)</p> <p>Reduce Cost of(H) Port Operations (Cost Effectiveness)</p>
Planning the voyage	Reaching full SeaSWIM potential	<p>OI-017 - Nomination process fully implemented in SeaSWIM</p> <p>In this stage, also the possibility of Auto-nomination is implemented. This means that the information owner have the possibility to give automatic access to actors that are geographically connected to the voyage. E.g. a VTS area that is affected by the ship's route will be automatically nominated to access information that is relevant to that specific segment of the voyage. A port that is included in the voyage will equally be granted access to relevant information about the voyage, relevant to the port-call.</p>	Collaborator Nomination	<p>Minimise (M) Administrative Burden (Efficiency)</p>

LoC	OI Group	OI Step	Service	KPO impact
	Reaching full SeaSWIM potential	<p>OI-043 - Exchange of complete Voyage object in standardised format</p> <p>In this phase, more information segments have been added to the Voyage Information object standard, and almost all information (incl. cargo, maintenance, service etc.) are available through SeaSwim for authorised actors.</p>	Voyage Information	<p>Minimise Administrative Burden (Efficiency) (M)</p> <p>Improve Information Sharing (Interoperability) (H)</p> <p>Improve Infrastructure Interoperability for Information Sharing (Interoperability) (H)</p>
Voyage execution	Expanding STM services in larger areas	<p>OI-021 - Enhanced shore-based monitoring in larger (coastal) areas</p> <p>AIS and radar targets are combined with intended routes in order to create an enhanced traffic image. This image can support traffic monitoring.</p> <p>An enhanced traffic image consisting of both the targets and intended routes open up the possibility of performing an enhanced monitoring by a shore operator</p>	Enhanced Shore-based Monitoring	<p>Increase Voyage Safety (Safety) (H)</p> <p>Increase Accident/Incident Prevention (Safety) (H)</p>

LoC	OI Group	OI Step	Service	KPO impact
	Expanding STM services in larger areas	<p>OI-044 - Be able to actively manage traffic in congested areas</p> <p>Aims to enhance current VTS service Traffic Organisation where one operator can optimise the overall traffic flow in restricted areas.</p>	Flow Optimisation	<p>Increase (H) Voyage Safety (Safety)</p> <p>Increase (H) Accident/Incident Prevention (Safety)</p> <p>Decrease (H) Overall Fuel Consumption (Sustainability)</p> <p>Decrease GHG(H) and Air Pollution - Ships (Sustainability)</p> <p>Reduce (M) Congestion in All Voyage Phases (Efficiency)</p>
	Expanding STM services in larger areas	<p>OI-045 - Dynamic separation of traffic (reduced static separation) in defined areas</p> <p>Dynamic separation as complement to existing Traffic Separation Schemes (TSS).</p>	Flow Optimisation	<p>Decrease (M) Overall Fuel Consumption (Sustainability)</p> <p>Decrease GHG(M) and Air Pollution - Ships (Sustainability)</p>

LoC	OI Group	OI Step	Service	KPO impact
	Expanding STM services in larger areas	<p>OI-047 - The ship has enough information for self organising of traffic in low density areas</p> <p>In areas with low traffic density there will be no need for shore centres to assist with flow optimisation since the traffic situation is not as complex as it is in areas with dense traffic conditions. In these low traffic areas ships will organise traffic themselves, as today, but with support from Route Exchange.</p>	Flow Optimisation	<p>Reduce Total(M) of Ownership (Cost Effectiveness)</p> <p>Decrease (M) Overall Fuel Consumption (Sustainability)</p>
	Expanding STM services in larger areas	<p>OI-004 - Crosscheck of route port to port on board or onshore</p> <p>Route crosscheck service including the whole passage from Dep. to Arr. The crosscheck must be done following certain standard by authorized software etc. This could be done on board or by a service provider ashore. This service is very useful for the OOW and captain during initial planning phase and will most probably be of value for the owner and charterer including insurance company. All ships must have their full route crosschecked before departure hence Coastal states along the route will have route access and can plan accordingly well in advance if so needed.</p>	Route Crosscheck	<p>Increase (H) Voyage Safety (Safety)</p> <p>Increase (H) Accident/Incident Prevention (Safety)</p>
	Expanding STM services in larger areas	<p>OI-073 - Route crosscheck using dynamic area management information in defined areas</p> <p>On board or shoreside after a regular route crosscheck is presented by the ship to Coastal state, before the voyage starts, the route can be crosschecked again if new dynamic data is affecting the original route. This could be done both from shoreside and on board.</p>	Route Crosscheck	<p>Increase (H) Voyage Safety (Safety)</p> <p>Increase (H) Accident/Incident Prevention (Safety)</p>

LoC	OI Group	OI Step	Service	KPO impact
	STM Expanding services in larger areas	<p>OI-032 - All mandatory reporting automated through actor subscription on relevant data for ships using geolocation</p> <p>Single Windows are now subscribing and extracting information from relevant SeaSwim connectors for ships with route to this state.</p>	Single Reporting	Minimise Administrative Burden (Efficiency) (H)
Integrated port operations	Connecting STM into the logistical chain	<p>OI-024 - Involve cargo management/handling in the port call optimisation</p> <p>An optimal port call process is realised by coordinating involved actors intentions and performances. Information and communication between actors in port, between port actors and ship and between ports are therefore important to reach the full effects of PortCDM. By including berth planning (by terminals) and availability of resources and infrastructure for cargo operations, port of readiness can be communicated to an approaching ship well in advance of the actual arrival.</p>	Port Call Optimisation	<p>Facilitate Just-in-Time Concept (Efficiency) (H)</p> <p>Reduce Cost of Port Operations (Cost Effectiveness) (H)</p> <p>Increase Voyage Situational Awareness (Predictability) (H)</p>

Table 5 OI Steps in IP3 with KPO contribution

## 5.4 Deployment roadmaps for stakeholder groups

In this chapter summary descriptions of the participation needed from different stakeholder groups in realising the STM Master Plan are presented. Complete deployment tables with stakeholder groups that need to be involved in each enabler are found in Appendix D and in the e-master plan, <http://stmmasterplan.com>. Most enablers have more than one stakeholder group that needs to be involved, but rather than including all stakeholder groups, only the two or three most important groups have been identified. With important is meant that the stakeholder group will be responsible either for the majority of the development work, has the mandate to decide upon implementation or approval of new standards etc.

During the first improvement phase there will be a strong focus on standardisation and establishing the governing functions of STM. This means that standardisation and regulating bodies will need to be active and participant during this phase. A strong presence of system suppliers is also necessary so that proprietary efforts in the information sharing area can be deflected into common processes for developing standards in the industry instead. There is a strong need for research and development activities during this first improvement phase, which will not be covered by the STM Validation Project, but needs to be catered for in research programmes such as Horizon 2020 and national research funding schemes.

Naturally, the buy-in from ship owners is an important factor already during IP1, since early benefits from the standardisation of sharing routes, as described in the stakeholder business case, see D.3.2.1-3, will provide the incentives for the industry to proceed with further adoption of the STM concept. Even though required investments are limited for ship owners to participate in STM, a critical mass is important and therefore an early adoption of the concept is deemed necessary to reach early benefits of STM.

Even though the complete maritime service infrastructure, SeaSWIM, is not fully in place in IP1, the ports will be able to utilise large parts of the Port CDM concept for gaining internal efficiency during this first period. The involvement of port operators, port service providers and port states will be important, since this will be the base for increased predictability in the ports, which would incentivise ship owners in participating in STM to gain energy efficiency in the second improvement phase, IP2.

During the second improvement phase, there will be a stronger focus on implementing both infrastructure and procedural enablers, which will need a broader participation from stakeholder groups. Service and system suppliers are crucial for the deployment of those commercial and public operational services envisaged in the STM Target Concept. Many of those services also require coastal and port states to be actively involved creating those incentives which were identified during IP1.

With IP2 and the implementation of the maritime service infrastructure, many of the services thought to create major effects on shipping, are now coming into place. The

enabling of right-steaming and just-in-time arrival to port will require adaption of contracts-models and charter parties to STM. Ship-owners, cargo-owners and service providers have a large role in this.

Also when it comes to connecting the different actors to the SeaSWIM service infrastructure, the system suppliers and actors like ship owners, service providers are needed to commit to this transformation.

The establishment of new services and service providers will need both authorities such as port and coastal states and standardisation and regulating bodies, to develop regulations and standards to enable the full utilisation of STM services in the maritime domain.

In the third and last IP, most of the technical prerequisites are in place and focus shifts towards regulatory implementation and globalisation. The idea of fully automatic reporting, dynamic routing and other parts of STM generating the final pieces of the STM vision, is much of adapting regulations to the de-facto industry standards which has been implemented on a voluntary and regional basis in IP2, to become truly global and covering all parts of shipping.

Stakeholder group	Description
Authorities and Governments	Authorities and Governments include National Competent Authorities such as Administrations, including coastal state responsibilities, and agencies in the maritime field. Also Coast Guard, Military and customs are included in this group.
Cargo Owners	Cargo owners charters ships or contract ship operators for a transport need.
Port Operators	Port operators refer to all actors operating in the port area e.g. terminals, stevedoring, pilots, port control and port authority. Also other stakeholders related to a port call such as disposal, ship chandler and tendering boats.
Regulating and Standardisation	Standardisation organisation is typically a non-profit organisation where individual companies collaborate in developing standards used throughout the concerned industry e.g. CIRM for marine electronics companies. Regulating body refers to international organisations in the maritime field such as IMO and IALA.
Research and Development	A research and development (R&D) provider performs research and development activities. In the STM development, this could be new projects or research activities needed, including industrial R&D.
Service Providers	A service provider is an organisation that develops, maintains and provides services to consumers.

	Services could be both information services and operational services like optimisation services. Also ship agents are considered part of this group.
Ship Owners and Operators	Ship owners and operators refers to all different stakeholders involved in operation concerning planning, operation, and management of ships e.g. ship operators and on board crew.
System Suppliers	A system supplier is an organisation that provides human and technical systems and infrastructure e.g. manufacturers of Port Community Systems, navigational systems and shipping ERPs.

Table 6 Stakeholder groups

Complete deployment tables with stakeholder groups that need to be involved in realising each enabler is are found in Appendix D and in the e-Master Plan <http://www.stmmasterplan.com>

## 5.5 STM Master Plan deployment strategy

The STM Master Plan describes what is to be done, and in general terms, who should be responsible or take part in these developments, together with what effects and changes in the maritime industry is to be expected. However there are still several crossroads that will present themselves during the implementation periods.

The Master Plan describes foremost the development-path from a concept and functionality perspectives in that way that it should show when a capability or an improvement is ready to deliver benefits to the shipping domain.

The STM Master Plan does not in the same extent describe geographical deployment scenarios or in which segments of shipping changes are more likely to deliver initial benefit. This is not due to that these dimensions are not significant, but rather that this needs to be explored further when the industry begins to take a more active part in the validation and initial development and implementation of parts of the STM concept. As an example of geographical sequencing some services with STM tools could be to implemented in a smaller area like the Baltic Sea where the HELCOM Recommendation 34E/2 proposes "Further testing and developing the concept of pro-active route planning as well as other e-navigation solutions to enhance safety of navigation and protection of the marine environment in the Baltic Sea Region".

During the MONALISA 2.0 project, there have been extensive interactions with different parts of the maritime industry, and have seen that different parts of the STM concept appeals to different segments or actors of shipping. Whereas green-steaming and virtual arrival is of high significance in the product tanker segment, enhanced monitoring

and route crosschecking is of more importance to the cruise industry. The development towards more efficient and predictable port calls is of interest in all segments, and the future seamless integration towards land transportation holds promises related to shipping as transport mode as whole. STM represent a paradigm shift towards structured and standardised information sharing and it is important to see this process and strategy as an iterative process. Parts of the STM concept can be implemented and incentivised unilaterally by coastal states, whereas other parts need adoption across the whole industry.

A legal assessment carried out in the first MONALISA project strongly recommends an incentivised and voluntary implementation strategy based on showing direct benefits for key actors, such as ship owners, coastal states and ports, early in the implementation time-line, which is reflected in the STM Master Plan. This does not mean that parts of the STM concept cannot be mandated in the future when a strong adaption of STM is seen in the industry, but it is also important to create momentum for this paradigm shift, by implementing parts of the STM concept early to show immediate gains for the industry, this without long legislative or institutional processes.

Another benefit from showing early benefits is that STM can get support from key stakeholders on providing incitement if participating in solutions that enhances safety or efficiency for each stakeholder. An example of incitement could be coastal states, seeing benefits from higher safety and more efficient utilisation of existing systems and services by knowing ships routes, reducing their fairway or pilotage fee for ships that exchanges their routes. Another example could be insurance companies reducing their fees for participating ships when STM shows that the number of accidents can be reduced with STM solutions.

It is equally important to point out that, even though developed in the EU-project MONALISA 2.0, STM is not only a European concept. All efforts in the definition of STM have been with the aim of a global STM. An important task for the governance organisation of STM is the continuous anchoring of STM in global maritime organisations such as IMO and IALA.

### **5.5.1 STM relation to the developments in IMO and e-navigation**

The STM concept relates to the work conducted in IMO where user needs and potential e-navigation solutions have been identified.

The e-navigation Strategy Implementation Plan (SIP), which was approved by MSC 94 in November 2014 (IMO 2015), contains a list of tasks that is required to be conducted in order to address 5 prioritized e-navigation solutions, namely:

- improved, harmonised and user-friendly bridge design;
- means for standardised and automated reporting;

- improved reliability, resilience and integrity of bridge equipment and navigation information;
- integration and presentation of available information in graphical displays received via communication equipment; and
- Improved Communication of VTS Service Portfolio (not limited to VTS stations).

The STM concept supports four out of five of these prioritized e-navigation solutions and also most of the SIP development and implementation tasks, RCOs, and SIP Sub Solutions are in different extent supported by STM. In this respect STM is an enabler and support for realising the e-navigation as defined by IMO.

Also other IMO initiatives like the goals and actions in the IMO publication on A concept of sustainable maritime transportation system (IMO 2013) and the recommendations in the report of IMO's Public consultation on Administrative requirements in maritime regulations (IMO n.d.) are supported by STM. E.g. recommendation 1 and recommendation 6 that relates to electronic means for reporting and avoidance of multiple reporting which is supported by the STM concept of SeaSWIM where information owners and consumers can share information via an information sharing platform with secure and authorized access. This means that information will only be entered once and then be available for all authorized stakeholders.

## **5.6 Governance of the STM Master Plan**

STM was developed mainly in the MONALISA 2.0 project but upon the finalisation of this project a governing body with the purpose to administer, develop and maintain the concept of STM need to be established. Even though this is described as improvement steps in the STM Master Plan, the continuation of this responsibility is anticipated to be placed within an EEIG (European Economic Interest Group) for STM that is proposed by the MONALISA 2.0 project.

### **5.6.1 EEIG - a governing structure for STM development**

#### **Background**

MONALISA 2.0 will be followed by a multiple of development, validation, demonstration and deployment projects, addressing different parts of the Sea Traffic Management concept. Already identified projects and initiatives are included in the STM Master Plan and governance of the STM Master Plan is a key task for the EEIG.

These projects require coordination in a long term efficient manner. In order to carry out this coordination in an effective manner and in order to continue to market and communicate Sea Traffic Management, there is a need for a permanent structure and

secretariat function. The secretariat function will have a central role in supporting different Sea Traffic Management initiatives in applying for funding.

The proposed legal form for this secretariat is a European Economic Interest Grouping, a legal form established by the European Union through Regulation No. No 2137/85 of 25 July 1985 and with the aim to facilitate efficient addressing of challenges by transnational partnerships.

### **Vision**

The vision is to develop and manage Sea Traffic Management in a continuing process using the EEIG as a platform for development and coordination.

STM EEIG will contribute to take Sea Traffic Management from its Definition phase through Validation Phase, Development Phase and towards the final Deployment phase. Sea Traffic Management will act as a service function supporting the shipping industry in taking significant steps into the digital age, thus improving efficiency, environmental performance and safety of navigation.

### **Strategy and Business Model**

The strategy of the STM EEIG is to maintain and evolve a holistic Sea Traffic Management concept, develop Sea Traffic Management digital services and evaluate the potential benefits, test and demonstrate them under real conditions and roll them out to users as they become tested and operationally ready. The results and achievements of other projects will be incorporated in the development as appropriate.

The business idea behind the creation of STM EEIG is to ensure an efficient and speedy development and deployment of Sea Traffic Management beyond the lifetime of the current MONALISA 2.0 project, or the next STM Validation Project.

The STM EEIG will initiate, take lead in and coordinate initiatives in Sea Traffic Management, as well as, promote and communicate Sea Traffic Management developments to the international maritime sector. The role of communicating Sea Traffic Management will also encompass a role in ensuring coordination with other related initiatives and projects within the areas of e-Navigation, e-Maritime and Traffic Management within and outside the maritime sector.

By establishing STM EEIG, the following added values will be achieved:

- **A long-term strategy instead of a fragmented short-term project approach**  
Development and deployment of Sea Traffic Management requires a more long-term approach, with a clear vision and strategy and with a possibility to act with another time frame than individual projects. It's more than what can be achieved within certain projects.
- **More efficient coordination of large number of upcoming Sea Traffic Management projects**  
This will contribute to cost-efficient management of the STM concept as a whole and individual Sea Traffic Management projects and will therefore be of utmost importance for the implementation of the Sea Traffic Management Strategic Roadmap, the Sea Traffic Management Master Plan and the STM Work

Programme, all three elaborated within the MONALISA 2.0 project. This coordination also encompasses coordination with global initiatives and projects related to Sea Traffic Management deployment activities.

- **Stronger EU-dimension in Sea Traffic Management**

In MONALISA 2.0 stated that a European focus is the prime target; however a global aspiration is necessary. The European dimension in the Sea Traffic Management concept will be strengthened by the establishment of a proactive STM EEIG improving the competitiveness of relevant European business sectors.

- **Stronger partner engagement in Sea Traffic Management development**

The possibilities to engage partners (public, private, academic) in the further development of Sea Traffic Management will be improved by formalised partner engagement in the STM EEIG.

- **Enable improved support to EU policy making in the Sea Traffic Management domain**

STM EEIG can cooperate with the Digital Transport and Logistics Forum. If the European Commission decides to establish a Sea Traffic Management programme, STM EEIG can be instrumental in supporting that work.

The main business idea of the STM EEIG model proposed is to provide business and societal value to the shareholders and partners of the STM EEIG, instead of generating high profit to the STM EEIG, which will be a non-profit organisation.

The customers of STM EEIG will benefit from the work done by STM EEIG resulting in a more rapid and further development and deployment of Sea Traffic Management.

STM EEIG and its operations are mainly to be financed by member fees, project administration fees and by EU-funding from the projects that are coordinated by STM EEIG

#### Tasks

The STM EEIG will have the following main tasks:

- Evolvement of the Sea Traffic Management concept;
- Governance of the STM Master Plan
- Function as an information hub for Sea Traffic Management;
- Initiate and coordinate Sea Traffic Management projects;
- Foster a close relation with main actors in the areas of Sea Traffic Management;
- Stimulate Sea Traffic Management test beds;

- Roll out practical Sea Traffic Management applications and services

### Human resource management

The STM EEIG will be a rather small organisation with a limited of employed personnel, having main resources based on secondments and consultants. This approach will safeguard flexibility for growth and adaption of resources and competencies.

STM EEIG will strive for maximising cost-effectiveness with constant focus on providing customer value and will therefore search for third party sourcing solutions when financially efficient. Areas where sourcing might be applicable are mainly within the support processes.

### 5.6.1 The e-Master Plan – Disseminating STM into the maritime industry

The e-Master Plan is an intuitive and interactive tool for presenting the up-to-date view over how STM evolves, processes and is implemented. It is covering the same areas of information as the STM Master Plan document, but will be maintained and updated regularly as the STM concept evolves and the development progresses.

The e-Master Plan will also be used for increased stakeholder awareness and for communicating progress and status of different validation- and development activities in the future work with STM.



Fig. 8 e-Master Plan at <http://stmmasterplan.com>

The STM Master Plan is published on a website, for communication and availability purposes. For the improvement and further elaboration on the STM Master Plan, feedback can be given through the website. The published STM Master Plan is referred to as the e-Master Plan.

In the e-Master Plan, the user can follow STM from the following perspectives:

- Lines of Change
- Improvement Phases
- Stakeholder Groups

The e-Master Plan is proposed to be governed by the EEIG described in 5.6.1.

## 5.7 Risk Management

The STM Master Plan risk management addresses uncertainty associated with delivery of the STM Target Concept. This includes meeting the required performance targets as well as providing business benefits in a timely manner to all stakeholders. Risk management supports decision making and the overall aim of achieving agreement across all organisations that the Master Plan is the basis for the further work which will ultimately form the first part of the STM implementation phase.

Consequently, a risk to the Master Plan may be defined as an undesired event or a series of events, which reduce confidence in the Master Plan and, on occurring, may represent a potential obstacle towards delivering the Target Concept. Risks are treated through mitigation action plans to reduce the likelihood of the event materialising, thus increasing confidence and encouraging decision making. Fig. 9 below shows a generic risk management process that fits most development projects.

- 1)
- 2) At each level of the STM development phase there is a need to carefully manage any risks and issues, trying to minimise their impact, but also to look out for opportunities and to make maximum use of them. A standard element of managing a project or programme is to manage the risks (potential problems). This covers the identification of the relevant risks that may prevent the task from being successful and defining possible mitigating actions. It also covers assigning responsibility for managing a risk. However, such an assignment of responsibility is deemed to be too premature at this stage.

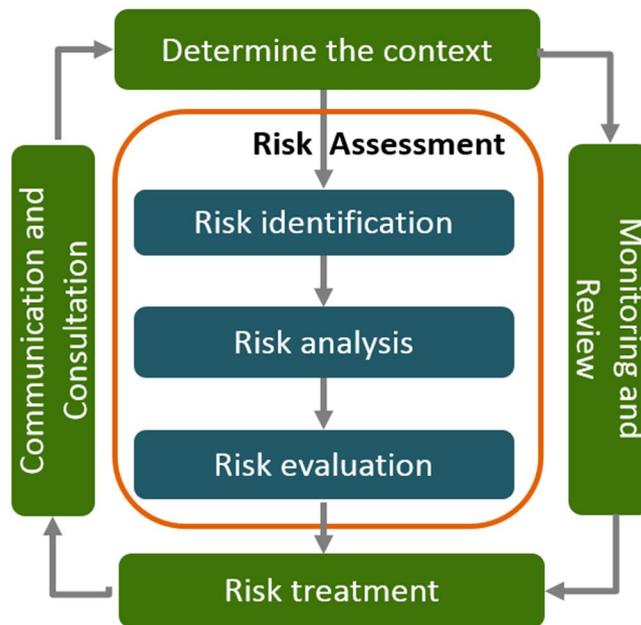


Fig. 9 Generic process for Risk Management

### 5.7.1 Risks in the STM Master Plan

This chapter addresses the main events needed/critical success factors for deployment of the STM Master Plan together with associated uncertainties and risks. The risks are evaluated and mitigating measures identified.

The most severe risks identified, concern a fear that harmonised and synchronised standards for concerned stakeholders will not be in place for the planned deployment of STM. The risk assessment also clearly indicated that there is a substantial risk that key stakeholders don't see the future potential of STM and its performance benefits and therefore are reluctant to provide required development support and investments. By identifying mitigating measures to be activated these identified risks have been assessed as acceptable for the project. However the risks require a continuous monitoring in the next project phases.

### Risk matrix covering very high/high priority risks

Based on assessment of identified risks, described in the Appendix B, Fig. 10 shows the summary of the risk assessment.

STM RISK SUMMARY					
Severity (number of risk events/colour)					
Likely-hood (1-4)	4	0	0	0	1
	3	2	5	0	2
	2	1	6	20	6
	1	1	3	6	0
		1	2	3	4
		Impact (1-4)			

Fig. 10 STM Risk assessment summary

The severity values are converted into a severity rating:

**Green:** low severity (score = 1, 2, 3)

**Yellow:** medium severity (score = 4 or 6)

**Orange:** High severity (score 8 or 9)

**Red:** Very High severity (score 12 or 16)

Analysis is showing 13 low severity (green) risks, 31 medium severity (yellow) risks, 6 High severity (orange) risks and finally 3 Very High severity (red) risks. The 3 Risk events with Very High severity and the 6 Risk events with High severity are described in the table below. The complete list with all the 53 main events (ME) are to be found in Appendix B.

ME	Domain	Risk Id	Risk event	Likely-hood VH-4 H-3 M-2 L-1	Impact VH-4 H-3 M-2 L-1	Severity	Mitigation Measure	Final risk (after mitigation measures) A = Acceptable
21	Regulation & Standardisation	R-21	Synchronised and global harmonisation of standards is not ensured	4	4	16	Ensure STM commitment from key stakeholders on a global scale. Ensure dialogue with maritime actors on a global scale.	A
6	Business	R-06	Future investment in	3	4	12	Ensure close coordination	A

			STM (e.g. to meet equipment and infrastructure requirements) by key stakeholders will not be secured				between R&D activities and performance targets Ensure that all affected stakeholders are involved in the process, not just consulted Stakeholder priority list	
23	Business	R-23	Key stakeholders do not agree that STM should be the modernisation tool for Traffic Management	3	4	12	Ensure STM commitment from key stakeholders on a global scale. Ensure dialogue with key stakeholders on a global scale.	A
20	Institutional	R-20	Trust in governance, access management and other functions are not enough for actors to safely and securely share information	2	4	8	Ensure Institutional partners commitment to govern development and acceptance of STM with SeaSWIM	A
42	Regulation & Standardisation	R-42	No implementation of STM Standards, tools and solutions by Authorities, Governments, service providers, system suppliers etc.	2	4	8	Ensure alignment with Master Plan and Work Program. Communicate and ensure dialogue with key stakeholders.	A
16	Regulation & Standardisation	R-16	Standards are not in place to support industrial participants development	2	4	8	Ensure industrial partners commitment to developed Standards according to STM Master Plan.	A
40	Business	R-40	Future STM projects do not	2	4	8	Ensure good communication	A

			receive any financing				with future financing bodies. Ensure good quality of STM deliverables.	
22	Business	R-22	There is no buy in from shipping actors for STM	2	4	8	From an enterprise perspective develop both a top-down and a bottom-up approach to engage all shipping actors in the advantage of STM.	A
36	Business	R-36	The business model for collaboration using STM information management do not meet expected improvement	2	4	8	Develop alternative business models. Provide ways of integrating new business models.	A

Table 7 STM Risks with Very High and High severity

## 5.8 STM Work Programme

This chapter describes the STM Work Programme, which encompasses the establishment of an EEIG, the validation of STM and the coordination of research and development activities identified in the STM Master Plan. The STM Work Programme covers the STM development in the period 2015-2020 (IP1) both in the STM Validation Project and other projects relating to STM.

STM will overcome many of the challenges of communication and information sharing between stakeholders in the maritime transport industry and create significant added value, in particular for ship- and cargo-owners and for shipping in the transport chain. Based on MONALISA (2010-EU-21109-S) and MONALISA 2.0 (2012-EU-21007-S), significant steps have been taken in bringing advancements in technology and innovation into the maritime sector for the future STM creating a more sustainable shipping industry, reduced environmental impacts and improved safety and efficiency. Both projects have defined and tested core STM components and shown very promising results. In the journey towards implementation of STM it is crucial to ensure effective implementation, pace, focus and continuity where the STM Master Plan plays a key role.

The next step in this development is to validate the STM Target Concept, see Fig. 11 that has been defined in the MONALISA 2.0 project. This is mainly done in the STM Validation Project, running from 2015 to 2018, by establishing large-scale test beds in order to test and validate different STM concepts. The output will be a validated target concept for STM and additional quantitative and qualitative support for the broader development of STM.



Fig. 11 The Development, Validation, and Deployment of STM

Many of the improvement steps in the first IP are covered by the planned tasks in the STM Validation Project. As progress is made and tasks are completed the Master Plan will be updated accordingly so that it always serves as a tool for governing the overall STM progress. Operational Improvement steps not covered in the project needs to be handled by other initiatives, other projects or by new projects.

STM cannot be developed in isolation; rather it needs to always be aligned with other development efforts in the maritime domain. There are several other projects, organisations and initiatives engaged in work and studies related to e-navigation and information exchange in the maritime domain and which are relevant to STM. A close relation to, and cooperation with, these projects, organisations and initiatives will be upheld in order to avoid duplication of work and to find out synergies. This is an already on-going process and coordination will take place for example during regular IALA events and by participation of partners in other projects.

The concepts of STM will be validated by the outcome of the results from testbeds, which involve rigorous, transparent and replicable testing of, for example, scientific theories, computational tools and new technologies. As there are linkages between

STM and IMO’s e-navigation Strategy Implementation Plan (SIP), these test beds would allow for early detection of new system functionality, operational usability, areas of enhancement and identification of weakness. The results will be submitted to IMO in accordance with the format outlined in MSC.1/Circ.1494 on Guidelines on Harmonization of Testbed Reporting.

The results of the project will thus also form the basis for policy making, further research and development of STM services and concepts, pre-deployment of STM services and concepts, and support for decision-making.

### 5.8.1 Enablers in the first Improvement Phase (IP1)

The STM Work Programme mainly describes the activities in the first improvement phase (IP1) where the STM Validation Projects will be the main activity for driving the STM concept forward according to this STM Master Plan. Of all enablers defined in the STM Master Plan, major part of these is to be started already during the first IP.

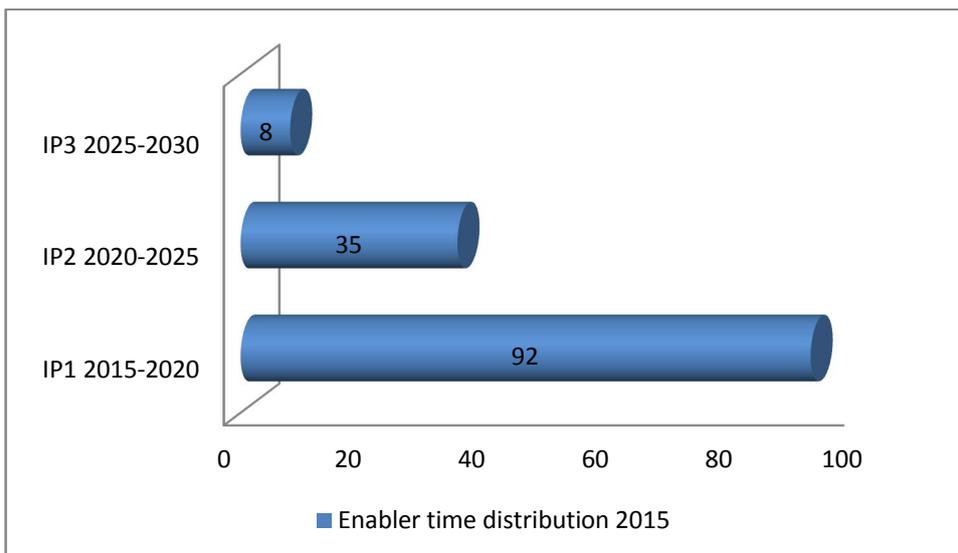


Fig. 12 Enablers distributed over Improvement Phases

Even though the STM Validation Project’s main purpose is to validate the concept, delivering proof of concept that STM can provide the benefits set out in the STM Target Performance document, in this process, very many of the identified enablers will be started, and part of the concept development taking place in the STM Validation project.

Of the 135 identified enablers identified to realise STM, 70% is started already, and most of them in the STM Validation Project.

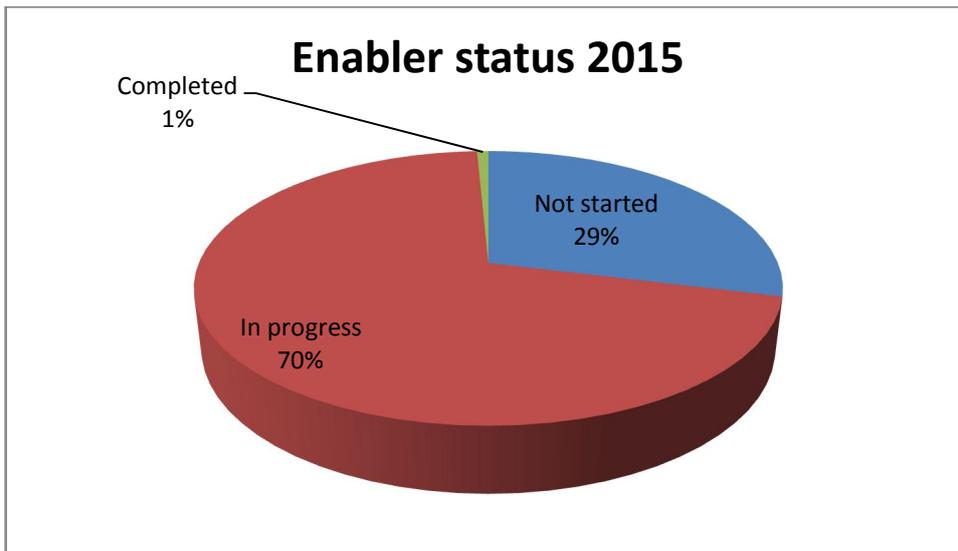


Fig. 13 Enabler status in 2015

### 5.8.2 Research and development needs

In the first improvement phase, there are more than 60 identified enablers where research and development is necessary. Research are spanning from standardisation and legislative areas, to human and technical enablers targeting everything from training to technical infrastructure.

This shows that there is a wide range of research competences needed for providing all necessary enablers for reaching the goals of IP1. The STM Validation Project will address some of these, but by the characteristics of this project, R&D task need to be catered for in other projects, funded by industry or other public R&D sources.

The governance of STM development must therefore span over several projects and activities, identifying what project addressing which R&D enablers. For this purpose the EEIG, described in 5.6.1, is defined and will be governing this STM development with a broader perspective.

### 5.8.3 STM Validation Project

This chapter briefly describes the scope and content of the STM Validation Project.

As described above STM is an important instrument for meeting the challenges and needs of the maritime sector. Before entering into the development phase of STM, however, there is a need to validate the target concept of STM.

The STM Validation Project, see Fig. 14, shall demonstrate and validate the target concept for STM by using the European Maritime Simulator Network and by establishing large-scale test beds in both the Nordic and Mediterranean Seas,

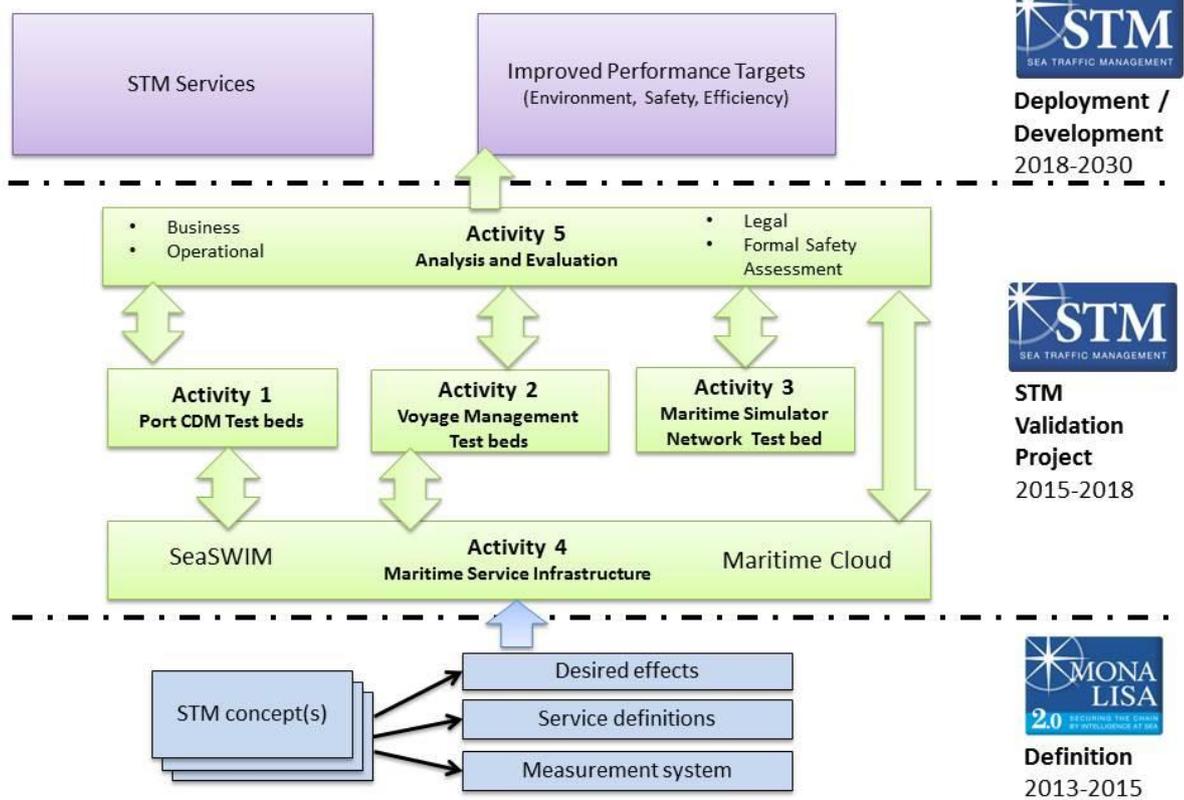
encompassing around 300 ships and 10 ports. Key strategic services of STM will be tested and validated. The project encompasses:

- **Validation of Voyage Management** in two test beds. In the Nordic region, the application of STM for more efficient winter navigation will be tested and validated. In the Mediterranean Sea, the application of STM for crisis management (i.e., Search and Rescue) will be tested and validated.
- **Validation of Flow Management** utilising the European Maritime Simulator Network and the test beds for Voyage Management. This simulator network was developed within the MONALISA 2.0 project and will be used both to simulate different traffic conditions and further test and validate other parts of STM, which are not possible to test and validate in real life at this stage, such as area management.
- **Validation of Port Collaborative Decision Making (Port CDM)** by expanding the network of ports and Port CDM services developed in MONALISA 2.0 in the Nordic and Mediterranean regions. The contextual differences between different port approaches will be gathered and analysed, together with other information that will serve as a basis for the concept's refinement. The test beds will also constitute a first step towards inviting both commercial and public service developers/distributors to further develop Port CDM Services.
- **Validation of System Wide Information Management (SeaSWIM)** using the Maritime Cloud as the infrastructure for information exchange in the validation test beds.

Extensive **Analysis and Evaluation** will be carried out and the different perspectives used in MONALISA 2.0: business, socio-economic, risk, technological, legal and institutional will be incorporated. Competencies and training requirements for STM implementation will also be considered within this activity.

The STM Validation Project strongly supports the development of e-Navigation within the international organisations IMO and IALA; the e-Maritime concept in the European Union as well as the implementation of HELCOM Recommendation no. 34E/2 which recommends "further testing and developing the concept of pro-active route planning as well as other e-navigation solutions to enhance safety of navigation and protection of the marine environment in the Baltic Sea Region".

The project will in no way duplicate the work done in projects like AnNa or the Single Window-initiative on the implementation of Directive 2010/65/EU on reporting formalities for ships, but STM can provide added value by providing for example updated ETA (Estimated Time of Arrival) to the Single Windows.



1.

Fig. 14 STM Validation Project

### 5.8.4 Concept development and validation process

Following chapter will give an introduction to the European Operational Concept Validation Methodology (E-OCVM). In the STM Master Plan this E-OCVM Validation Methodology is described to support validations of the operational concept elements and show an example of a way forward to bring the concept to industrialisation and deployment.

Additional details are described in Appendix A, including selected E-OCVM detailed methods when planning exercises, performing analysis and guidance when extracting validation results. These validation methods are examples and can be used during validations in test beds, real time simulations and in live trials.

When project use a well-defined validation model all project members and stakeholders, including the industry, can share an understanding of how far in this validation process the on-going validation activities has reached. Validation activities from initial phases to pre-industrial test systems can be visible in this process.

For Sea Traffic Management projects, an Operational Concept Validation Methodology can address the need of consistency to ensure the capabilities for the whole concept when validating concept elements and to bring the concept elements together. For planned STM validations, selected parts of the E-OCVM concept can also be used.

An important element to check is that the changes envisioned by the new concept are:

- Acceptable to those that operate and are a part of the Maritime system –
- e.g. Ship Masters, Pilots, Agents etc. (Operability)

Also in the maritime sector there is a great need of consistency between the different maritime projects, both in how objectives are set and how results are captured. There is a great value of a shared view with common targets and goals to be achieved by the developed concepts, operations and systems.

Focus for STM validations can be expected on Pre-Industrial Development and Integration (V3) with feedback and refinement of the Concept Definition (V1). After the V3 phase Industrialisation (V4) can take place, including approval and rollout to users, customers and market.

Fig. 15 describes an overview of the validation process including the Master Planning Decisions and Milestones. Validation activities are described in progressive validations V0 to V7.

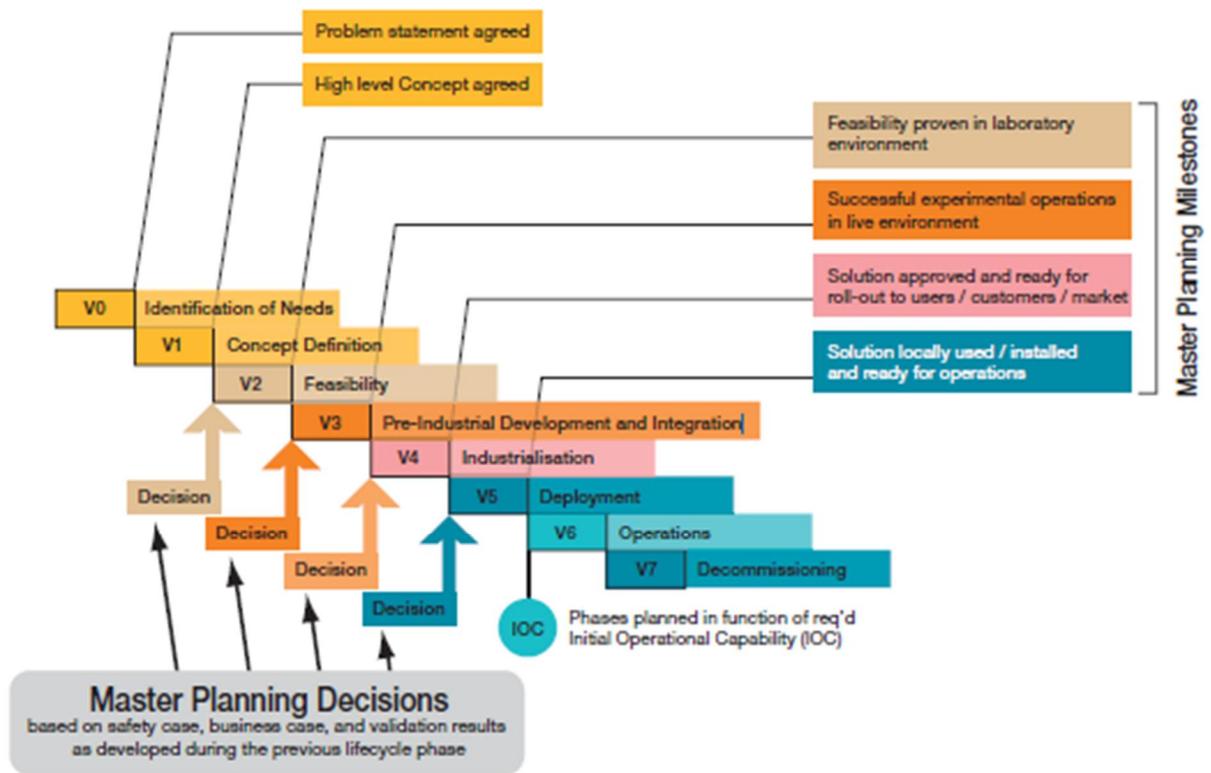


Fig. 15 E-OCVM Validation process

## 6 Conclusions

The STM Master Plan shows that the STM vision and concept can be realised and how it should be implemented. Different parts of the concept have reached different levels of maturity. Some parts are already ready for deployment and industrialisation and should be taken on by affected stakeholders while some parts are still in research and development stage and needs further development before being ready to handover to the industry.

An important conclusion from the STM Master Plan is that major improvements will not be reached during the first implementation phase, even though there are some early benefits, since this phase is more in to creating the foundations for future benefits which will not reveal until the second improvement period. To ensure stakeholder commitment and willingness to invest in STM it is therefore important to communicate the vision of STM but also to include the transition sequence in the STM Master Plan to clarify that the vision can be turned into reality.

To reach the full effects of STM a certain magnitude of the market needs to be participating and an identified key success factor in the STM Master Plan is stakeholder involvement, buy-in in the concept and agreeing on the way forward. Therefor it is essential to ensure participation from many different stakeholders, representing different areas of interest since STM takes a holistic approach on the maritime transport system.

It is anticipated that implementation will increase gradually e.g. services could initially be implemented in a specific area, at a specific group of users as a segment of shipping or by increasing levels of services. The deployment strategy describes an approach building more on voluntary participation, driven by incentives and benefits, rather than a mandated approach. This deployment path that has been underlying the assumptions on how the STM Master Plan can be deployed.

In order for the STM Master Plan to become a valuable tool giving added value in STM development and deployment it is essential that it is kept living and up-to-date as progress is made in the STM evolution. The best way to ensure this is to market the STM Master Plan and share its development with the maritime industry and for this purpose the e-Master Plan (<http://stmmasterplan.com>) has been developed. The purpose with the e-Master Plan is both to be an internal working document and at the same time disseminate progress in STM to the maritime community.

As the deployment has been based on assumptions and the fact that STM is naturally affected by the development in society in general and the maritime sector in particular it is a challenging task to lay out a plan for the transformation of an industry stretching 15 years ahead in time, and of course, the STM Master Plan will reflect a higher precision in the earlier time frame, as opposed to the latter time frame. The important thing though, is that the industry as whole, through this STM Master Plan, can see a general

direction of where the industry will lead, so that the different stakeholders can align their efforts for the benefit of shipping as whole.

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## Appendix A European Operational Concept Validation Methodology (E-OCVM)

This appendix will give additional information and details to the European Operational Concept Validation Methodology (E-OCVM).

In the STM Master Plan this E-OCVM is described to support validations of the Operational Concept elements and show the way forward to bring the concept to industrialization and deployment.

A selection of E-OCVM detailed methods is done when planning exercises, performing analysis and guidance when extracting validation results. These validation methods are examples and can be used during validations in test beds, real time simulations and in live trials.

When project use a well-defined validation model all project members and stakeholders, including the industry, can share an understanding of how far in this validation process the on-going validation activities has reached. Validation activities from initial phases to pre-industrial test systems can be visible in this process.

### *Validation of an Operational Concept*

Validation of an Operational Concept can be considered as the process of determining capabilities, performance and behaviour of the concept. Stakeholders' expectations and information needs should also be addressed.

When structuring an evaluation program it should be a clear understanding of definitions;

- **Validation** can also be defined as the process of answering the question 'Are we building the right system?'
- **Verification** can be taken as answering the question 'Are we building the system right?'

The E-OCVM focus on the consistent provision of information on performance capability and operability.

- E-OCVM only addresses 'validation'

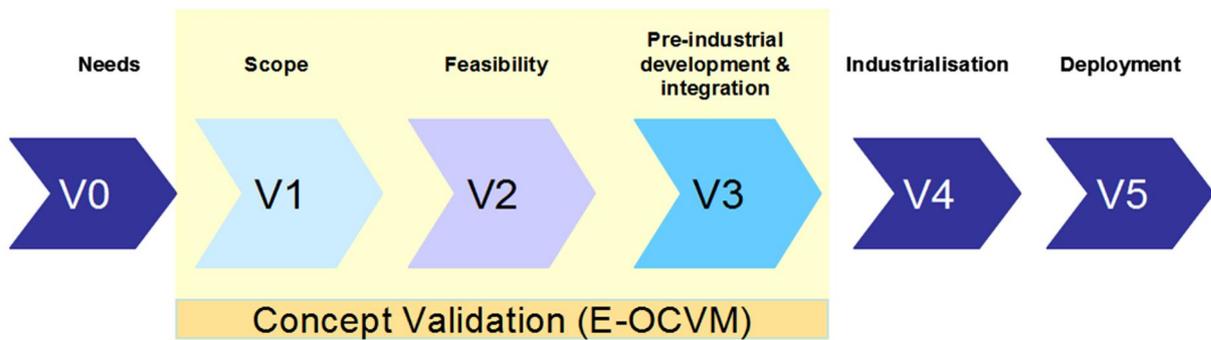
The overall validation goal should be to ensure consistency and transparency when moving from Research & Development to operations. The value is to have a shared view with common targets and goals for validation.

In the following parts of this chapter the European Operational Concept Validation Methodology is further described. This Validation concept is used in Single European Sky Research program (SESAR) to ensure consistency and high quality when developing new concepts.

### Validation Concept Lifecycle Model

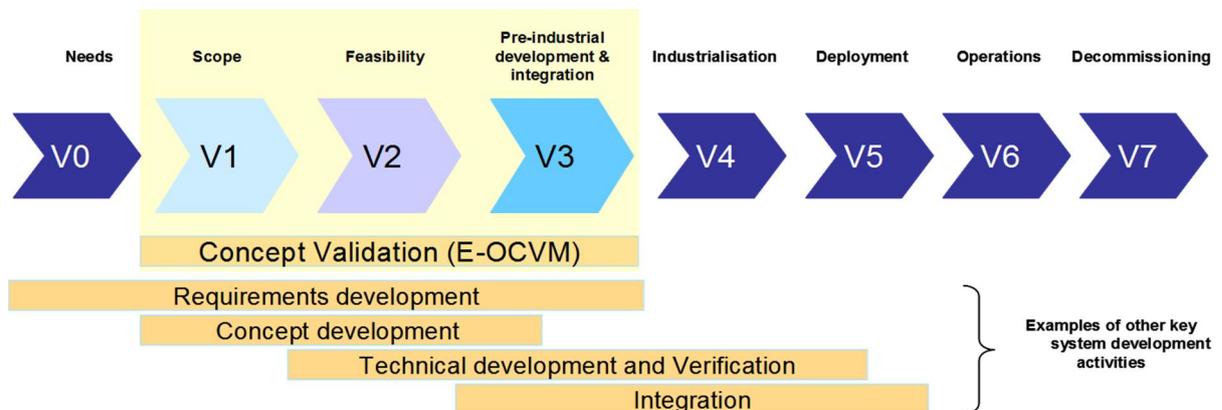
The Concept Lifecycle Model structures the lifecycle into phases with clear transition criteria to separate the phases. Main focus for E-OCVM is on Scope, Feasibility and Pre-industrial development and integration. With these focus areas the concept can be validated from idea to finally take a step closer to deployment.

An overview example from the Validation Concept Lifecycle phases including the validation maturity steps/process;



When project use this validation model all project members and stakeholders, including the industry, can share an understanding of how far in this validation process the on-going validation activities has reached. Validation activities from initial phases to pre-industrial test systems can be visible in this process.

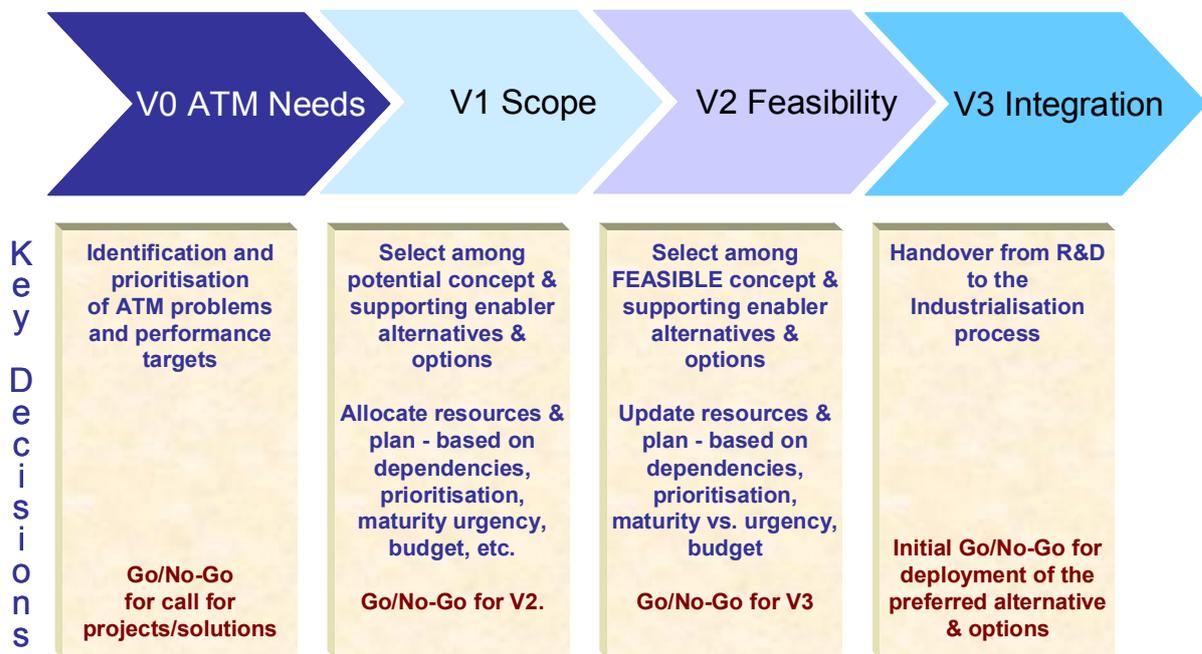
Key concept and system development activities can be linked to this Lifecycle Model. In the picture below these development activities are added.



### Validation Maturity steps and Activities

By identifying the Stakeholders needs and select alternatives and options to validate detailed parts of the concept the process will bring validation forward. With increased maturity of the operational solutions there are results to bring from Research & Development all the way to deployment. With use of the elements in this E-OCVM Concept the phases of validation and handover to industrialisation will be transparent to stakeholders and industry.

A detailed example from the Air Traffic Management (ATM) Concept Validation maturity steps, including the activities to support clear transition criteria between the steps and processes;



### Validation Methodology

It is considered that for a Concept Validation Methodology to be useful it should promote the following principles:

- **Consistency** – using a methodology and providing information on various concepts in a similar format and tested against similar situations (scenarios) helps ensure consistency of the evaluation process
- **Transparency** – show important issues that have not been tested as well as those that have, and make the information easily accessible.

- **Relevancy** – has two aspects, relevancy of the idea under development to;
  - stakeholders needs and relevancy of the experimentation
  - the eventual real world situation where it will be implemented.
- **Appropriateness** – to the key stakeholder information needs. Different stakeholders have different needs in terms of information on behaviour and performance capabilities. These various needs should be addressed by the development and evaluation program.

The Concept Validation Methodology can support the process where many stakeholders should come to a decision to either:

- Continue development to a state where implementation is a clearly acknowledged next step (an improvement has been identified)

or

- Stop or substantially modify developments due to some inadequacy of the overall performance or behaviour.

Where applicable, stating that the system has a negative impact is as valid as stating where a system has a positive impact as it will contribute to an improvement of the Operational Concept, procedures and functionalities.

### ***Structured Validation Planning***

By planning the validation in a structured way, the including validation exercises are designed, planned and conducted to meet the specific validation objectives set in advance. This structure should include details to be visualise understanding and expectations on what evidence should become available and when.

Stepwise approach to structure the planning of a validation;

1. State Concept and Assumptions
2. Set Validation Strategy
3. Determine the Exercise Needs
4. Conduct the exercise
5. Analyses of the Results

## 6. Disseminate Information to Stakeholders

Further details when planning a validation can be seen later in this section when guidance for an Experimental Plan is described.

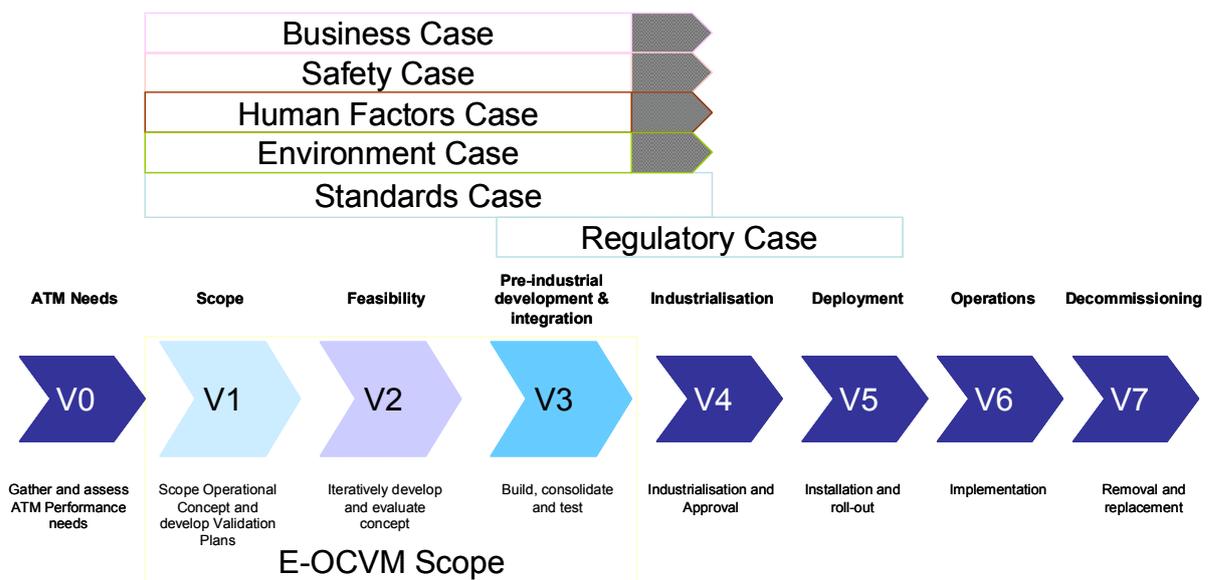
### Case-Based Validation Approach

Cases can be used to structure and highlight grouping of evidence about critical validation aspects.

Use of Cases to reflect stakeholder needs with following goals;

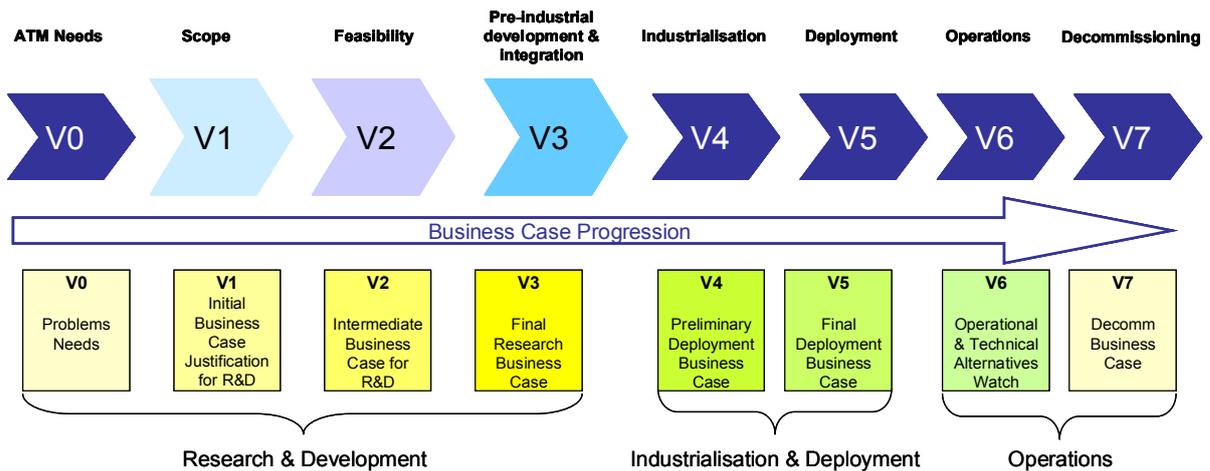
- Consolidation of evidence and performance on areas of special interest to stakeholders
- Provides guidance on the design of suitable exercises and objectives

Overviews of applicable cases extracted from E-OCVM used in the ATM validation process are described in the figure below;



### Validation maturity steps – Example

One example with use of Business Case progression from needs all the way to operations. The figure below show a detailed level were phases of research will move towards deployment used to support the ATM validation process;



### Validation concept for Sea Traffic Management

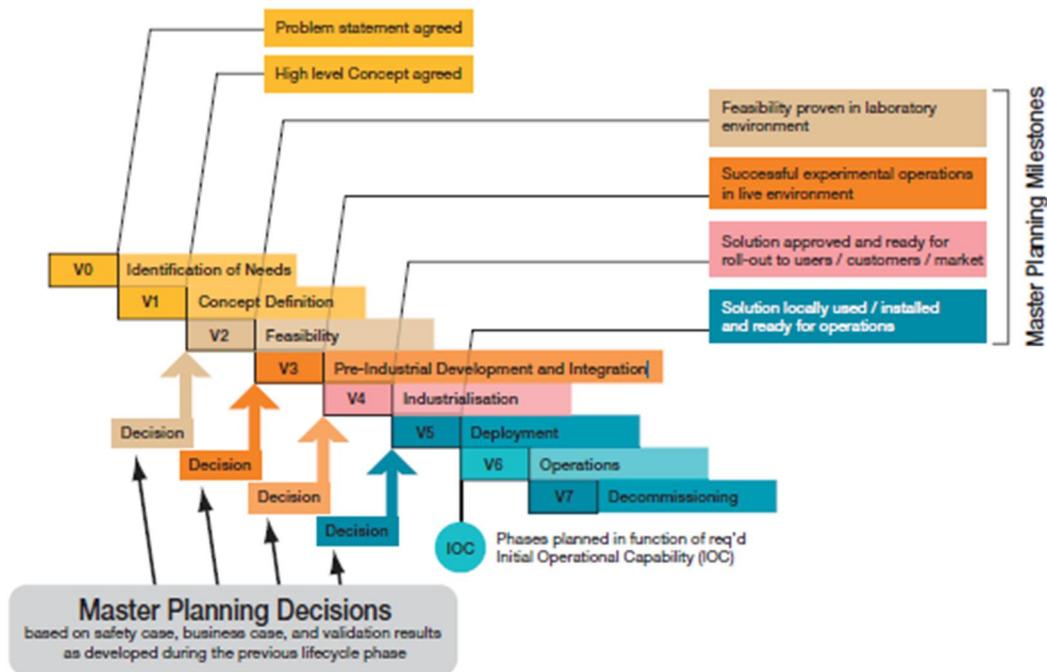
For this Sea Traffic Management project an Operational Concept Validation Methodology can address the need of consistency to ensure the capabilities for the whole concept when bringing the concept elements together. For planned STM Validations the E-OCVM concept can be partly used with selected elements.

An important element to check is that the changes envisioned by the new concept are:

- Acceptable to those that operate and are a part of the Maritime system –
- e.g. Ship Masters, Pilots, Agents etc. (Operability)

Also in the Maritime sector there is a great need of consistency between the different Maritime projects, both in how objectives are set and how results are captured. There is a great value of a shared view with common targets and goals to be achieved by the developed concepts, operations and systems.

The picture below describe an overview of a were Master Planning Decisions and Milestones are placed in the progressive validations;



## Validation Experimental Plan

The Experimental Plan will focus on an individual experiment. This plan should be produced to ensure that all parties are aware of the timing and scope of the activities in the validation exercise and to start developing a trial design.

In the experiment an operational scenario should be developed with representative events, actors, and interactions applied in the simulation environment. The objective is to excite the performance and interactions described or expected in the operational scenarios. The simulation environment refers to various configurations of areas, traffic sample, weather, failure modes, and any other controllable variables that might affect the performance of the system. In this way, a validation scenario will test the assumptions in the concept scenarios and thus the concept design.

The Validation/Experimental Plan information will be the main part of the Validation Report when filled with experiences from activities and analysed data.

The Experimental Plan will have three main focus areas:

### 1. Refined Experimental Strategy for this particular experiment, information on:

- Stakeholders and their Acceptance Criteria
- Low Level Validation objectives and KPA

- Choice of Indicators and metrics
- Overview of any interactions, relationships or dependencies between this and other planned studies or experiments

**2. Experimental Scope** with information on:

- Description of Maritime problem and concept (and configurations used)
- Tool(s), Technique(s) and where appropriate, platform(s)
- Environment used (Port, Sea etc.)
- Organisations chosen
- Length of Experiment (and thus an indication of likely number of exercises)
- Scenarios

**3. Experimental Planning and Management** with information on:

- Resources:
  - Manpower required/available
  - Budget required/available
  - Trade off if necessary
- The activities to be undertaken:
  - The tasks that need to be performed
  - The deliverables that will be prepared
- When the activities will be performed:
  - Planning of tasks and meetings in time (visualised in a time line chart or equivalent)
  - Key decision points

- The milestones in the project, such as, the acceptance of the validation platform, the execution of the exercise and the delivery of the final report
- How the activities are to be undertaken:
  - The approach applied and the method(s), technique(s) and tool(s) used
  - Procedures to ensure quality of the work

### **Responsibilities and Risk**

The Experimental Plan should contain information on:

- Responsibilities in the exercise:
  - The individuals that will undertake the exercise, these people will perform the work and will supervise and observe the exercise runs
  - Input and/or co-operation expected from the stakeholders
- Risk:
  - Risks involved
  - Mitigation of risks
  - Contingency Plans

### ***Validation Analysis Plan***

The Experimental Plan should contain an Analysis Plan for that experiment; The aim of the Analysis Plan is to show what kind of experiment will be conducted and detail states:

- Low Level Validation Objectives
- Data collection methods
- Training requirements
- Analysis methods

- Statistical hypothesis
- Operational and Statistical significance
- Outline reporting plans

### ***Performing Validation Exercises***

- For a real-time simulation the detailed plan will include the configuration for each measured run. There will also be planned sessions for debriefing and for visitors. The planning phase should also have identified the actions to be taken in case of equipment failure.
- Each exercise starts with briefing, to give the participants an idea of what to expect from the exercise runs and to know what they are expected to do. When this is complete, the measured runs start and the data is collected. The data collected may include logs recorded digitally, notes from observers, recordings from videos, and questionnaires completed after the measured run finishes. Periodically there should be debriefing sessions to collect feedback from the (measured) participants.
- There may also be data provided through the visits of invited expert stakeholders whose views on the operation of the operational concept also need to be recorded. In such cases it should be noted that controllers should be kept isolated from visitors, observes and stakeholders in order to avoid any interference in their work.

### ***Validation results***

The methods of analysis can be extracted from the Analysis Plan. Whatever the validation technique used, the analysis techniques available can be divided into different categories that can be applied to different types of data:

- **Qualitative Analysis:** Qualitative techniques aim to extract the meaning and conclusions from a set of non-numerical data, but without necessarily giving a specific numerical result. These techniques look at the ranking of factors or opinions, and the overall characteristics of the data, rather than the specific values. The techniques may involve ranking answers to questions, investigating the similarity between responses, following a line of logical reasoning and conducting a content analysis on a set of subjective responses. It is possible to generate numerical data, such as counts, through qualitative analysis and then subject this to quantitative analysis.

- **Quantitative Analysis:** Quantitative techniques intend to reach a specific numerical conclusion, often with an associated level of confidence. There are many quantitative statistical tests. The quantitative analysis can be sub-divided into descriptive and inferential techniques:
  - Descriptive techniques are concerned with making concise and intuitive descriptions of the data to aid interpretation, such as by making graphs and histograms;
  - Inferential techniques aim to derive a general result from a limited set of measurements and then testing hypotheses. This leads to statements such as "with 95% confidence, the number of e.g. accidents per day can be decreased by more than 5% by implementing a new procedure".

There should be a careful use of appropriate techniques when analysing the results, including a clear view of the assumptions made to enable the most value to be obtained from the data. When addressing results from a validation some dangers are:

- Implicit assumptions
  - Some analysis techniques will assume the nature of the distribution from which the data is chosen (in particular, they may assume a Normal probability distribution), and if such assumptions are not true, the analysis may be fundamentally flawed.
- Inappropriate generalisation
  - Any analysis will only be as reliable as the data used. Though the analysis should aim to generalise the specific results to a wider context, this should only be done when there is sufficient volume and variety of independent data.
- Over-reliance on statistical significance
  - Statistical significance is only related to the number of measurements and error model, the overall confidence should take into account the validation exercise fidelity and non-independent measurements and equipment inaccuracies.

### **Unexpected results**

During an experiment, unexpected results or behaviours occur. It is important that the validation team detect these unexpected results or behaviours and analyse why they have occurred. Such unexpected situations may be of vital importance to further development and should not be ignored or considered as a nuisance.

Any unexpected results should be analysed before the main bulk of the analysis, because of the unknown impact they may have, and also to give the opportunity to further investigate these already during the experiment. Once the impact of any unexpected results has been analysed, decisions can be taken as to whether any modifications are necessary.

## Appendix B Risk Management

### *Risk analysis methodology*

In the risk assessment 53 main events that must happen for implementation of STM Master Plan were identified. Several of these events are similar, but it was decided that all of them should be transposed to potential risk events and be assessed as such.

All risks have been classified in a common way using the following list of risk domains:

- 3) Institutional;
- 4) Regulation & Standardisation;
- 5) Business;
- 6) Performance;
- 7) Development;
- 8) Deployment.
- 9) Other (only to be used if no match can be made with any of the other domains)
- 10)
- 11) All risks are registered with a specific identification number. (Risk Id)
- 12) The risk event describes the risk associated with the main events described in chapter 8.2.2.

#### Likelihood of a risk

**Low (1):** One or no occurrence could happen in the course of the STM Development Phase

**Medium (2):** Only few occurrences may happen during the STM Development Phase

**High (3):** Several occurrences may happen during STM Development Phase

**Very high (4):** Will almost certainly happen (many occurrences expected during STM Development Phase)

#### Impact of a risk

The impact of a risk can be on cost, on performance, on the project schedule, on the reputation for the project and/or impact on legal issues. In this report the impact (severity of the risk) will be a consolidated one.

The impact rating described in the table below is based on assessment of the major impact if the risk event described is materialised.

**Low (1)**

**Medium (2)**

**High (3)**

**Very high (4)**

### Severity of a risk

The severity of the risk is calculated as a product of the likelihood of the risk and the impact of the risk.

### Mitigating measure

In order to mitigate the risk to make it acceptable for the project, one or several measures are planned.

### Final risk

Final risk is assessed after a mitigation measure is applied. The final risk is assessed as either acceptable or unacceptable. If final risk is assessed as unacceptable additional mitigating measures need to be applied in order to make the risk acceptable.

## ***Main events that must happen for implementation of the STM Master Plan***

All 53 main events that must happen for implementation of STM Master Plan were identified and presented in the list below. Several of these events are similar, but it was decided that all of them should be transposed to potential risk events and be assessed as such.

ME	Main events that must happen for implementation of the STM Master Plan
1	A governance structures for STM is established that is capable of executing the STM Master Plan
2	STM Validation Project proves initial STM benefits to maritime stakeholders
3	Alignment, harmonisation and collaboration with other e-nav, e-mar and e-freight initiatives and projects
4	Agreement on initial implementation and long term development of SEA SWIM
5	Target Concept proven to meet design and performance targets
6	Future investment from key stakeholders is secured
7	New technologies will be available
8	Regulatory arrangements support implementation of Target Concept
9	Successful management of Human Resources , Social Factors and Change Management
10	Performance based approach successfully implemented
11	Maritime operational actors work in line with STM implementation
12	Maritime agents support and work in line with STM new procedures
13	Key stakeholder share the STM vision and commits to development and implementation
14	All STM activities are aligned to make positive synergies
15	The industrial partners are keeping the timetable and keeping up the technical performance

16	Standards will be in place to support participants development
17	Standards for data sharing is established
18	International standards are established (formats, interfaces etc.)
19	Legislation and regulation are adapted to allow implementation of essential STM services
20	Governance, access management and other trust functions will be enough for actors to safely and securely share information
21	Synchronised and global harmonisation of standards is ensured
22	Get buy in from shipping actors for STM
23	All key stakeholders agree that STM should be the modernisation tool for Traffic Management
24	Key stakeholders are able to see the business case in STM
25	There will be a Governance structure for STM
26	Role of National level authorities will be clear
27	The SeaSWIM platform is working and reliable
28	Trusted STM service infrastructure
29	STM have strong support/representation in Governance Boards
30	The activity leaders are committed to lead the STM work forward
31	Acceptance for data security when sharing data is reached
32	Results (solutions) are delivered that are mature enough for the next phase
33	Results (solutions) are delivered providing the expected performance
34	Validation projects are successful and creates large interest for STM services
35	Ship officers sees the benefits of the STM tools
36	The business model for collaboration with data will be better (more profitable) than the current situation
37	Critical mass of the STM-enabled ships is reached in IP1
38	Set targets in STM are reached and proven
39	Efficient (fast) processes for identifying global standards
40	STM projects receive further financing/support from EU. STM proves itself. Good quality and deliverables. Good communication with EU
41	STM proves early (2015-2020) benefits to stakeholders
42	Authorities, Governments, service providers, system suppliers etc. implements STM Standards, tools and solutions
43	STM ensure continues maturity assessment of development

44	STM ensure/establish continues assessment and coordination of performance contribution of developed solutions
45	STM strengthen coordination activities amongst involved partners and stakeholders, focusing on alignment between Master plan and related “external” activities/plans
46	Maritime initiatives for information sharing are well coordinated with the STM project
47	STM project can handle the implementation over a long period well-coordinated with other initiatives
48	Terminals are involved in Port CDM
49	Experience sharing among ports
50	Industry acceptance of Unique Voyage ID
51	Industry acceptance for higher info-transparency (expanded Time Horizon)
52	Industry system suppliers buy-in to STM vision
53	Industry acceptance of just-in-time operations (right steaming)

The total number of 53 STM Risk Events assessed, organised per Domain and presented in the list below. Risk events with Risk-Id 1-10, were assessed amongst all the participants at the Risk Workshop, while the other were assessed on individual basis.

ME	Domain	Risk Id	Risk event	Likelihood VH-4 H-3 M-2 L-1	Impact VH-4 H-3 M-2 L-1	Severity	Mitigation Measure	Final risk (after mitigation measures) A = Acceptable
20	Institutional	R-20	Trust in governance, access management and other functions are not enough for actors to safely and securely share information	2	4	8	Ensure Institutional partners commitment to govern development and acceptance of STM with SeaSWIM	A
25	Institutional	R-25	There is no Governance structure for STM	2	3	6	Support selection of a Governance body on European level and/or Global	A

							level	
29	Institutional	R-29	STM do not have any strong support/representation in Governance Boards	2	3	6	Ensure STM has a strong governance body	A
4	Institutional	R-04	SEA SWIM is not implemented in its correct form nor sufficiently early	2	3	6	Ensure political action is taken immediately to start work on the institutional requirements for SEA SWIM, including standardisation, and that agreements are reached and implementations are started without delay Ensure that action is directed with urgency at developing the SEA SWIM Network on the basis of existing networks and then developments are carried out to achieve the required service quality appropriate even for the most demanding applications	A
9	Institutional	R-09	Management of Human Resources, Social Factors and Change Management issues in the development and implementation of the STM Target Concept is not successful	2	3	6	Issue regular recommendations and activity plans for Human Performance and Social Factors management in the area of R&D, regulation, standards, and management	A

							at industry level	
28	Institutional	R-28	The STM service infrastructure is not trusted by maritime actors	2	3	6	Ensure service providers are certified for STM tasks	A
26	Institutional	R-26	There is no clear role for National authorities to support STM	2	2	4	Support European Commission for the development of required European maritime regulations	A
8	Institutional	R-08	Regulatory Framework, is unable to keep pace with and enable the changes needed to implement the Target Concept	3	1	3	Early involvement of the regulator to assist in the rule making and the appropriate shaping of the required regulatory authorities	A
21	Regulation & Standardisation	R-21	Synchronised and global harmonisation of standards is not ensured	4	4	16	Ensure STM commitment from key stakeholders on a global scale. Ensure dialogue with maritime actors on a global scale.	A
42	Regulation & Standardisation	R-42	No implementation of STM Standards, tools and solutions by Authorities, Governments, service providers, system suppliers etc.	2	4	8	Ensure alignment with Master Plan and Work Program. Communicate and ensure dialogue with key stakeholders.	A
16	Regulation & Standardisation	R-16	Standards are not in place to support industrial participants development	2	4	8	Ensure industrial partners commitment to developed Standards according to STM Master Plan.	A
18	Regulation & Standardisation	R-18	International standards are not established	2	3	6	Ensure commitments from key	A

	disation		(formats, interfaces etc.)				stakeholders early in the process	
39	Regulation & Standardisation	R-39	There is no efficient (fast) process for identifying global standards	3	2	6	Initially introduce STM on a European level. Ensure IMO is involved and committed to the global standardisation of STM	A
19	Regulation & Standardisation	R-19	Legislation and regulation are not adapted to allow implementation of essential STM services. Implementation delayed due to slow process	3	2	6	Ensure commitments from key stakeholders early in the process When possible plan for part-time deliverables to ensure progress in the implementation process	A
3	Regulation & Standardisation	R-03	There is no alignment, harmonisation and collaboration with other e-nav, e-mar and e-freight initiatives and projects	2	3	6	Ensure alignment with IMO plans like A concept of Sustainable Maritime Transport System	A
31	Regulation & Standardisation	R-31	There is no acceptance for data security when sharing data	2	3	6	Use already accepted concepts/models for secure data sharing	A
17	Regulation & Standardisation	R-17	Standards for data sharing are not established	1	3	3	Ensure commitments from key stakeholders early in the process	A
6	Business	R-06	Future investment in STM (e.g. to meet equipment and infrastructure requirements) by key stakeholders (incl. EU) will not be secured	3	4	12	Ensure close coordination between R&D activities and performance targets Ensure that all affected	A

			Critical mass				stakeholders are involved in the process, not just consulted Stakeholder priority list	
23	Business	R-23	Key stakeholders do not agree that STM should be the modernisation tool for Traffic Management	3	4	12	Ensure STM commitment from key stakeholders on a global scale. Ensure dialogue with key stakeholders on a global scale.	A
40	Business	R-40	Future STM projects do not receive any financing	2	4	8	Ensure good communication with future financing bodies. Ensure good quality of STM deliverables.	A
22	Business	R-22	There is no buy in from shipping actors for STM	2	4	8	From an enterprise perspective develop both a top-down and a bottom-up approach to engage all shipping actors in the advantage of STM.	A
36	Business	R-36	The business model for collaboration using STM information management do not meet expected improvement	2	4	8	Develop alternative business models. Provide ways of integrating new business models.	A
24	Business	R-24	Key stakeholders do not see the business case in STM	2	3	6	Involve key stakeholders in development of the STM concept	A
2	Business	R-02	STM Validation Project does not prove initial STM benefits to maritime	1	3	3	Ensure close coordination between R&D activities and performance	A

			stakeholders				targets	
15	Performance	R-15	The industrial partners are not keeping the timetable and nor keeping up the technical performance	3	2	6	Ensure partners commitment to Work Plan and Master Plan. Important to have a good project follow up on critical progress areas.	A
38	Performance	R-38	Targets set in STM are not reached and nor proven	3	2	6	Elaborate realistic performance targets and monitor.	A
41	Performance	R-41	No early (2015-2020) benefits to stakeholders by STM	2	3	6	Communicate realistic expectations of benefits for STM IP-1	A
46	Performance	R-46	STM project is not well coordinated with other Maritime initiatives for information sharing. The benefits for each concept is ruined in another initiative and therefor doesn't get expected impact	3	2 (1/2)	6	Ensure STM validation activities, Work Plan and Master Plan are communicated with external maritime activities/plans. Ensure alignment with other maritime initiatives.	A
11	Performance	R-11	Maritime operational actors are not following new STM procedures	2 (1/2)	2	4	Ensure training and dialogue with operational actors	A
12	Performance	R-12	Maritime agents don't promote the new STM procedures	2	2	4	Ensure training and dialogue with operational actors	A

13	Performance	R-13	Key stakeholders do not share the STM vision and commits to development and implementation. Different vision for STM exists in parallel, stakeholders do not agree on a shared vision	2	2	4	Demonstrations early in the project, proven concepts. Ensure training and commitment before implementation	A
47	Performance	R-47	STM project cannot handle the implementation over a long period including coordination with other initiatives	2	2	4	Ensure STM Work Plan and Master Plan are communicated with external maritime activities/plans. Ensure alignment with other maritime initiatives.	A
35	Performance	R-35	Ship officers do not see benefits of the STM tools	3	1	3	Ensure commitments from key stakeholders early in the process. Demonstrations early in the project, proven concepts. Ensure training and commitment before implementation	A
37	Performance	R-37	Critical mass of the STM-enabled ships is not reached in IP1	1	3	3	Support quick standardisation including regular updates	A
10	Performance	R-10	Performance based approach is not successfully implemented	1	2	2	Establish the STM Performance Framework including the monitoring and achievement of performance targets Ensure	A

							appropriate enforcement mechanisms are available to ensure transition and implementation of the Performance Based approach	
14	Performance	R-14	All STM activities are not aligned to make positive synergies	2	1	2	Ensure that critical relations between activities are aligned	A
5	Performance	R-05	Results of future development and validation of the STM Target Concept expose shortcomings in meeting the required design and operational performance targets	1	1	1	Ensure validation exercises are monitored by affected and supportive stakeholder representatives to ensure that any concept is afforded its best opportunity to prove its worth	A
27	Development	R-27	The SeaSWIM platform is not working and nor reliable	2	3	6	Ensure development of SeaSWIM is in line with STM project requirements	A
32	Development	R-32	Delivered results (solutions) are not mature enough for the next phase	2	3	6	Ensure quality and performance are sufficient in further STM Validations	A
33	Development	R-33	Delivered results (solutions) are not providing the expected performance	2	3	6	Ensure quality and performance are sufficient in further STM Validations	A
43	Development	R-43	STM development cannot meet required and expected performance of	2	3	6	Ensure STM validation activities are in line with the Work Plan and	A

			the STM concept.				Master Plan.	
44	Development	R-44	STM cannot ensure/establish continued assessment and coordination of performance contribution of developed solutions	2	3	6	See R-43	A
45	Development	R-45	STM cannot strengthen coordination activities amongst involved partners and stakeholders, no focus on alignment between Master plan and related “external” activities/plans	2	3	6	Ensure STM validation activities, Work Plan and Master Plan are communicated with external maritime activities/plans.	A
51	Development	R-51	There is no Industry acceptance for higher info-transponder (expanded Time Horizon)	2	3	6	Ensure maritime industry involvement in development of STM solutions.	A
52	Development	R-52	Industry system suppliers are not accepting the STM vision	2	3	6	Ensure communication and dialogue with maritime industry in the development of STM solutions.	A
53	Development	R-53	There is no Industry acceptance of just-in-time operations (right steaming)	2	3	6	Ensure communication and dialogue with maritime industry in the development of benefits for right steaming.	A
7	Development	R-07	The availability (in terms of time, cost and performance) of new technologies to support the STM Target Concept	1	3	3	Ensure that R&D activities develop mature requirements to enable timely development of STM sub-	A

			will be delayed				systems, selection and implementation of the right technologies Establish processes for coordination of R&D and standardisation, and proactively manage and finance development of standards through European standardisation bodies	
30	Development	R-30	The STM Validation activity leaders are not committed to lead the STM work forward	1	3	3	Ensure strong commitments from activity leaders. Regular meetings to keep progress going.	A
50	Development	R-50	There is no industry acceptance of Unique Voyage ID	1	3	3	Ensure maritime industry involvement in standardisation activities (e.g. Unique Voyage ID)	A
34	Development	R-34	Validation projects are not successful and there is no large interest for STM services	1	2	2	Ensure STM project parts are mature for further validation activities. Ensure maritime stakeholders confirmation of validation results. Ensure a quality communication plan for positive results of STM validation activities	A
1	Deployment	R-01	The future governance structure is not	2	4	8	Ensure an STM governance structure is put	A

			capable of ensuring the successful deployment of STM Service				in place that can ensure a deployment	
49	Other	R-49	There is no experience sharing among ports	2	2	4	Ensure enhanced communication and dialogue between STM Ports. Introduce STM User Forums for STM operators.	A
48	Other	R-48	Terminals are not involved in Port CDM	1	2	2	Ensure commitment from all relevant stakeholders	A

## Appendix C OI Steps and Enablers for each STM Operational Service

### Service - Area Management

IP	OI-Step	Enabler	
IP1	<p>OI-008 - Digitalisation &amp; distribution of MSP and MSI information in, standard information exchange format for area information, manually handled on board</p> <p>Area information such as MSI, is digitised in a standardised agreed format. MSI publisher publish MSI-information in files openly accessible on internet, for shipping companies to automate the distribution process to their ships in a proprietary way. Some system providers (nautical systems) include this in their service functions.</p>	<p>Type</p> <p>«Institutional Enabler»</p> <p>«Institutional Enabler»</p> <p>«Procedural Enabler»</p> <p>«System Enabler»</p>	<p>Enabler</p> <p>EN-076 - Amend revised performance standards (resolution MSC.232(82)) to display dynamic areas on ECDIS</p> <p>EN-074 - Define standard for dynamic area information</p> <p>EN-079 - Establish procedures for production and distribution of dynamic area information</p> <p>EN-133 - Implement standards for dynamic area information dissemination and acknowledgement, on-shore and on board</p>
IP1	<p>OI-057 - One-page for all nautical information available for voyage and route planning</p> <p>The nautical information includes but is not limited to MSP, MSI, NtM Pilot Books. There are no international standards for this type of digitised information (TBC). Of these, MSP and MSI are the ones that are necessary to be able to broadcast dynamically. The other ones are more static and will be included when making voyage and route planning.</p>	<p>Type</p> <p>«System Enabler»</p>	<p>Enabler</p> <p>EN-195 - Digitised nautical information available</p>

IP	OI-Step	Enabler														
IP2	<p>OI-009 - Automated distribution of MSI and MSP information through SeaSWIM, reliably and securely information distribution</p> <p>MSI publisher publish the information in SeaWIM, geo-location coded. Route exchange service triggers the subscription (or distribution) of the information to right receiver.</p>	<table border="1"> <thead> <tr> <th>Type</th> <th>Enabler</th> </tr> </thead> <tbody> <tr> <td>«Service Enabler»</td> <td>EN-191 - SeaSWIM or equivalent Services</td> </tr> <tr> <td>«Service Enabler»</td> <td>EN-171 - SeaSWIM Access Management</td> </tr> <tr> <td>«Service Enabler»</td> <td>EN-029 - SeaSWIM Identity Registry</td> </tr> </tbody> </table>	Type	Enabler	«Service Enabler»	EN-191 - SeaSWIM or equivalent Services	«Service Enabler»	EN-171 - SeaSWIM Access Management	«Service Enabler»	EN-029 - SeaSWIM Identity Registry						
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IP2	<p>OI-010 - Traceability of received Area-information.</p> <p>SeaSwim functionality provides feedback to publisher of who have received which information. Used in Area-management for MSI-publisher to verify that relevant ships have taken part of vital information.</p>	<table border="1"> <thead> <tr> <th>Type</th> <th>Enabler</th> </tr> </thead> <tbody> <tr> <td>«Procedural Enabler»</td> <td>EN-078 - Procedures for acknowledgement of information between ship and area manager.</td> </tr> <tr> <td>«System Enabler»</td> <td>EN-075 - Signature (Verification) process for information reception and visualised. Both for on ship and onshore.</td> </tr> </tbody> </table>	Type	Enabler	«Procedural Enabler»	EN-078 - Procedures for acknowledgement of information between ship and area manager.	«System Enabler»	EN-075 - Signature (Verification) process for information reception and visualised. Both for on ship and onshore.								
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IP2	<p>OI-011 - Dynamic area management using geo-location by route exchange, distribution of area information through SeaSWIM, reliable and secure information distribution</p> <p>Dynamic no go areas can be establish in a critical area during a certain period of time and/or for a certain type of ships. This critical area can e.g. be an environmental sensitive area.</p>	<table border="1"> <thead> <tr> <th>Type</th> <th>Enabler</th> </tr> </thead> <tbody> <tr> <td>«Service Enabler»</td> <td>EN-186 - Route Exchange Service</td> </tr> <tr> <td>«System Enabler»</td> <td>EN-196 - Geo-located information service</td> </tr> <tr> <td>«Service Enabler»</td> <td>EN-191 - SeaSWIM or equivalent Services</td> </tr> <tr> <td>«Service Enabler»</td> <td>EN-194 - Voyage Information Service</td> </tr> <tr> <td>«Service Enabler»</td> <td>EN-171 - SeaSWIM Access Management</td> </tr> <tr> <td>«Service Enabler»</td> <td>EN-029 - SeaSWIM Identity Registry</td> </tr> </tbody> </table>	Type	Enabler	«Service Enabler»	EN-186 - Route Exchange Service	«System Enabler»	EN-196 - Geo-located information service	«Service Enabler»	EN-191 - SeaSWIM or equivalent Services	«Service Enabler»	EN-194 - Voyage Information Service	«Service Enabler»	EN-171 - SeaSWIM Access Management	«Service Enabler»	EN-029 - SeaSWIM Identity Registry
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### Service - Collaborator Nomination

IP	OI-Step	Enabler								
IP1	<p>OI-015 - ERP provider using SeaSwim Identity Management ID-catalogue in proprietary ERP nomination modules</p> <p>In this first stage there will be a SeaSwim Identity Catalogue available as web-service where all relevant actors will be listed. The Shipping ERP-providers (proprietary or service providers), will be able to include this global register of shipping actors in their software, so when an agent, tug operator, port etc. is nominated to a voyage, they will use this register instead of an internal. The benefit for the shipping-company will be that the information and status of this actor will always be up-to-date. The benefit for the Shipping-ERP provider will be that the integration to this kind of yellow pages of shipping, will be standardised and universal.</p>	<table border="1"> <thead> <tr> <th>Type</th> <th>Enabler</th> </tr> </thead> <tbody> <tr> <td>«Service Enabler»</td> <td>EN-029 - SeaSWIM Identity Registry</td> </tr> <tr> <td>«Procedural Enabler»</td> <td>EN-031 - Process for nominating actors.</td> </tr> <tr> <td>«System Enabler»</td> <td>EN-203 - System functionality for integration of global actor catalogue</td> </tr> </tbody> </table>	Type	Enabler	«Service Enabler»	EN-029 - SeaSWIM Identity Registry	«Procedural Enabler»	EN-031 - Process for nominating actors.	«System Enabler»	EN-203 - System functionality for integration of global actor catalogue
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«System Enabler»	EN-203 - System functionality for integration of global actor catalogue									

IP	OI-Step	Enabler	
IP2	<p data-bbox="300 300 805 405">OI-016 - Nomination process partly implemented in SWIM (SWIM-connector)</p> <p data-bbox="300 454 805 2228">In this stage, the SeaSwim Identity catalogue has been used for some years, and is well implemented in the different systems used by the shipping-actors. In SeaSwim, the Access management service is implemented, and by that, also in the SwimConnector. The connection the different service providers and actors have to the SeaSwim service infrastructure. This gives a possibility to integrate the actual nomination-process performed in the shipping company's commercial department with access-rights to the information that will be publicised throughout the voyage, to the nominated actor. What information that is to be available for the nominated party is decided by the information owner (the shipping company) by assigning templates or profiles to the actor-type. When an actor is nominated to a certain voyage (a ship-agent in a specific port, or a port), these actors (as defined in the Identity register) can automatically obtain relevant information (according to the profile) through its SeaSwim connector (integration interface to SeaSwim). The benefit for the ship-owner at this stage is that they can easily, with one nomination-process within their own tools or systems, secure that the right receiver gets the right information about the voyage whenever that piece of information is updated. Several time-consuming processes on the office and at sea can now gradually be radically simplified. The benefit for the Shipping ERP-systems provider (internal or through service provider) is that a generic, global and secure way of giving information access to the nominated collaborators of the shipping company, can be made in a</p>	Type	Enabler
		«Service Enabler»  «Procedural Enabler»	EN-191 - SeaSWIM or equivalent Services  EN-031 - Process for nominating actors.

IP	OI-Step	Enabler										
IP3	<p>OI-017 - Nomination process fully implemented in SeaSWIM</p> <p>In this stage, also the possibility of Auto-nomination is implemented. This means that the information owner have the possibility to give automatic access to actors that are geographically connected to the voyage. E.g. a VTS area that is affected by the ship's route will be automatically nominated to access information that is relevant to that specific segment of the voyage. A port that is included in the voyage will equally be granted access to relevant information about the voyage, relevant to the port-call.</p>	<table border="1"> <thead> <tr> <th>Type</th> <th>Enabler</th> </tr> </thead> <tbody> <tr> <td>«Service Enabler»</td> <td>EN-029 - SeaSWIM Identity Registry</td> </tr> <tr> <td>«Service Enabler»</td> <td>EN-171 - SeaSWIM Access Management</td> </tr> <tr> <td>«Service Enabler»</td> <td>EN-179 - Area Management service</td> </tr> </tbody> </table>	Type	Enabler	«Service Enabler»	EN-029 - SeaSWIM Identity Registry	«Service Enabler»	EN-171 - SeaSWIM Access Management	«Service Enabler»	EN-179 - Area Management service		
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«Service Enabler»	EN-171 - SeaSWIM Access Management											
«Service Enabler»	EN-179 - Area Management service											
IP2	<p>OI-072 - Auto nomination possible for voyage information</p> <p>With auto nomination turned ON it is possible for voyage planner system to automatically give access to ports, authorities etc. to parts of the voyage information when appointing collaborators in the voyage, in ordinary planning system.</p>	<table border="1"> <thead> <tr> <th>Type</th> <th>Enabler</th> </tr> </thead> <tbody> <tr> <td>«System Enabler»</td> <td>EN-084 - Automatic nomination granting access to route/voyage information by geo-location.</td> </tr> <tr> <td>«Service Enabler»</td> <td>EN-191 - SeaSWIM or equivalent Services</td> </tr> <tr> <td>«Service Enabler»</td> <td>EN-194 - Voyage Information Service</td> </tr> <tr> <td>«System Enabler»</td> <td>EN-196 - Geo-located information service</td> </tr> </tbody> </table>	Type	Enabler	«System Enabler»	EN-084 - Automatic nomination granting access to route/voyage information by geo-location.	«Service Enabler»	EN-191 - SeaSWIM or equivalent Services	«Service Enabler»	EN-194 - Voyage Information Service	«System Enabler»	EN-196 - Geo-located information service
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Table 8 OI Steps and Enablers for service Collaborator Nomination

### Service - Enhanced Shore-based Monitoring

IP	OI-Step	Enabler	
IP1	<p>OI-018 - Existing monitoring services (VTS, SRS) using route exchange for monitoring of ships and early detection of route deviations</p> <p>Monitor the ships with respect to the route and inform via VHF if any dangerous situations are detected.</p>	Type	Enabler
		«Procedural Enabler»	EN-083 - Standard Operating Procedures for route monitoring
		«System Enabler»	EN-200 - Shoreside equipment upgrade to be Route Exchange Format compatible
		«Human Enabler»	EN-081 - New monitoring procedures utilising route exchange
		«Service Enabler»	EN-186 - Route Exchange Service
		«Institutional Enabler»	EN-024 - Harmonise with the guidelines of VTS A857(20) ~1996
		«System Enabler»	EN-084 - Automatic nomination granting access to route/voyage information by geo-location.
IP1	<p>OI-019 - Anomaly detection tools based on route exchange used for detection of route deviations in existing monitoring areas</p> <p>Anomaly detection tools already exists today but will be enhanced by route exchange which gives the possibility to detect route deviations.</p>	Type	Enabler
		«System Enabler»	EN-086 - Anomaly detection algorithm/function for route deviation
IP3	<p>OI-021 - Enhanced shore-based monitoring in larger (coastal) areas</p> <p>AIS and radar targets are combined with intended routes in order to create an enhanced traffic image. This image can support traffic monitoring.</p> <p>An enhanced traffic image consisting of both the targets and intended routes open up the possibility of performing an enhanced monitoring by a shore operator</p>	Type	Enabler
		«Service Enabler»	EN-186 - Route Exchange Service

## Service - Flow Optimisation

IP	OI-Step	Enabler	
IP3	<p>OI-044 - Be able to actively manage traffic in congested areas</p> <p>Aims to enhance current VTS service Traffic Organisation where one operator can optimise the overall traffic flow in restricted areas.</p>	<p>Type</p> <p>«Procedural Enabler»</p> <p>«Institutional Enabler»</p> <p>«Human Enabler»</p> <p>«Human Enabler»</p>	<p>Enabler</p> <p>EN-122 - Standard operating procedures for flow optimisation</p> <p>EN-119 - Description of actors responsibilities</p> <p>EN-120 - Training in operation for new system and procedures</p> <p>EN-121 - New tools for operators providing shore-based traffic synchronisation.</p>
IP3	<p>OI-045 - Dynamic separation of traffic (reduced static separation) in defined areas</p> <p>Dynamic separation as complement to existing Traffic Separation Schemes (TSS).</p>	<p>Type</p> <p>«Institutional Enabler»</p>	<p>Enabler</p> <p>EN-199 - Revision of IMO regulations for TSS areas</p>
IP3	<p>OI-047 - The ship has enough information for self organising of traffic in low density areas</p> <p>In areas with low traffic density there will be no need for shore centres to assist with flow optimisation since the traffic situation is not as complex as it is in areas with dense traffic conditions. In these low traffic areas ships will organise traffic themselves, as today, but with support from Route Exchange.</p>	<p>Type</p> <p>«Service Enabler»</p> <p>«Procedural Enabler»</p> <p>«Human Enabler»</p>	<p>Enabler</p> <p>EN-186 - Route Exchange Service</p> <p>EN-122 - Standard operating procedures for flow optimisation</p> <p>EN-120 - Training in operation for new system and procedures</p>

IP	OI-Step	Enabler												
IP1	<p>OI-048 - Improved situational awareness and predictability used for shore-based flow optimisation</p> <p>Flow optimisation could be used in narrow straits, canals, port entrances or areas with very high traffic density using exchange of route information between ship and shore.</p>	<table border="1"> <thead> <tr> <th>Type</th> <th>Enabler</th> </tr> </thead> <tbody> <tr> <td>«Service Enabler»</td> <td>EN-186 - Route Exchange Service</td> </tr> <tr> <td>«Procedural Enabler»</td> <td>EN-122 - Standard operating procedures for flow optimisation</td> </tr> <tr> <td>«Human Enabler»</td> <td>EN-120 - Training in operation for new system and procedures</td> </tr> <tr> <td>«System Enabler»</td> <td>EN-200 - Shoreside equipment upgrade to be Route Exchange Format compatible</td> </tr> </tbody> </table>	Type	Enabler	«Service Enabler»	EN-186 - Route Exchange Service	«Procedural Enabler»	EN-122 - Standard operating procedures for flow optimisation	«Human Enabler»	EN-120 - Training in operation for new system and procedures	«System Enabler»	EN-200 - Shoreside equipment upgrade to be Route Exchange Format compatible		
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IP2	<p>OI-049 - Dynamic separation of traffic in coastal areas</p> <p>Dynamic separation outside ships routing systems including TSS areas.</p>	<table border="1"> <thead> <tr> <th>Type</th> <th>Enabler</th> </tr> </thead> <tbody> <tr> <td>«Institutional Enabler»</td> <td>EN-123 - Independent (country, benefit, flag etc.) organisation to do traffic synchronisation</td> </tr> <tr> <td>«Institutional Enabler»</td> <td>EN-118 - Define areas for traffic synchronisation</td> </tr> <tr> <td>«Procedural Enabler»</td> <td>EN-122 - Standard operating procedures for flow optimisation</td> </tr> <tr> <td>«Institutional Enabler»</td> <td>EN-119 - Description of actors responsibilities</td> </tr> <tr> <td>«Human Enabler»</td> <td>EN-121 - New tools for operators providing shore-based traffic synchronisation.</td> </tr> </tbody> </table>	Type	Enabler	«Institutional Enabler»	EN-123 - Independent (country, benefit, flag etc.) organisation to do traffic synchronisation	«Institutional Enabler»	EN-118 - Define areas for traffic synchronisation	«Procedural Enabler»	EN-122 - Standard operating procedures for flow optimisation	«Institutional Enabler»	EN-119 - Description of actors responsibilities	«Human Enabler»	EN-121 - New tools for operators providing shore-based traffic synchronisation.
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### Service - Port Call Improvement

IP	OI-Step	Enabler	
IP1	<p>OI-027 - Statistics used for actor internal efficiency</p> <p>An increased digital collaboration and information sharing among port actors enables an increased awareness of process performance and the resulting analysis and statistics can be used to improve efficiency for respective actor.</p>	<p>Type</p> <p>«Institutional Enabler»</p> <p>«Institutional Enabler»</p> <p>«Procedural Enabler»</p> <p>«System Enabler»</p> <p>«System Enabler»</p> <p>«Procedural Enabler»</p>	<p>Enabler</p> <p>EN-104 - Common model for port efficiency including common measurement system</p> <p>EN-100 - Definition of states</p> <p>EN-099 - Define procedures for evaluation</p> <p>EN-167 - SeaSWIM connectors for port actor support systems</p> <p>EN-161 - Tracking of data for evaluation</p> <p>EN-102 - Define type of data to be stored and evaluated, based on the port call process instance and the state chart defined for the specific port call.</p>
IP1	<p>OI-028 - Statistics used for port internal efficiency</p> <p>An increased digital collaboration and information sharing among port actors enables an increased awareness of process performance and the resulting analysis and statistics can be used to improve efficiency in ports.</p>	<p>Type</p> <p>«Institutional Enabler»</p> <p>«Institutional Enabler»</p> <p>«Procedural Enabler»</p> <p>«Procedural Enabler»</p>	<p>Enabler</p> <p>EN-105 - Incentive model in ports for info sharing and Port-CDM compliance</p> <p>EN-096 - Regulate (by contract) the possibility to use performance data (estimates and actuals) for evaluation purposes</p> <p>EN-103 - Nomination process (service) including access to historical data</p> <p>EN-166 - Standard operating procedures for information sharing (principles)</p>

IP	OI-Step	Enabler	
IP2	<p data-bbox="296 304 807 405">OI-029 - Statistics used for port maturity model and available for public use</p> <p data-bbox="296 461 807 909">An increased digital collaboration and information sharing in the port community implies a possibility to analyse information to be used for statistics, cause analysis and measurement. Revealing causes for certain effects serve as basis for actors in their improvement processes. Such statistics could also be used as a basis to determine port maturity and further be available for other actors to use.</p>	Type	Enabler
		«Institutional Enabler»	EN-106 - Model for Port-Call-Process (Port Call Optimisation)
		«Procedural Enabler»	EN-101 - Guidelines for evaluation will enable ports to compare data (Port Maturity Model)
		«System Enabler»	EN-097 - Allow the possibility to service providers to get access to performance data for analytics services
«System Enabler»	EN-095 - Allowed provision of sharing of performance data between different ports by using a standard way to address a port call (port call message format)		

### Service - Port Call Monitoring

IP	OI-Step	Enabler	
IP3	<p>OI-061 - Information sharing across information eco-systems for multimodal integration</p> <p>Sharing of information according to SeaSWIM principals is not only of value for actors involved in the maritime part of the transport chain. The information provided by these actors can also be utilised by other transport modes. The sea voyage can be regarded as one part of a larger multi modal transportation system. Therefore, relevant information shared in the port community should be available to actors in integrated transportation systems and vice versa, to enable multimodal integration.</p>	<p>Type</p> <p>«System Enabler»</p> <p>«Institutional Enabler»</p>	<p>Enabler</p> <p>EN-204 - Interoperable platforms between different transportation systems</p> <p>EN-206 - Established federation for definition of data to share</p>
IP2	<p>OI-062 - Digital sharing of port and voyage related data</p> <p>One step to increase port efficiency and to improve the port call, process improvement is to digitally share port and voyage related data. By sharing both port and voyage related data in a digital and in real-time minimises the administrative burden and enables a seamless Port-to-port sea voyage. Port operations are the beginning and the end in STM, why the strive is to, in an efficient way and in real time make information available to the right sources, in right time and to the right place.</p>	<p>Type</p> <p>«Institutional Enabler»</p> <p>«Procedural Enabler»</p> <p>«System Enabler»</p>	<p>Enabler</p> <p>EN-106 - Model for Port-Call-Process (Port Call Optimisation)</p> <p>EN-103 - Nomination process (service) including access to historical data</p> <p>EN-095 - Allowed provision of sharing of performance data between different ports by using a standard way to address a port call (port call message format)</p>

IP	OI-Step	Enabler	
		Type	Enabler
IP1	<p data-bbox="296 300 810 405">OI-063 - Digital sharing of port related data (as a basis for situational awareness)</p> <p data-bbox="296 454 810 978">Digital sharing of port related data is data and information identified as important for coordinating one or several port calls. Digital sharing is a key component in creating the image for situational awareness, enabling well-informed and well-prepared actors. Monitoring of Port calls requires information about key events and progress to be provided from the involved actors. The information often exists, but needs to be digitised and shared to actors involved in a port call.</p>	<p data-bbox="818 333 1066 367">«System Enabler»</p> <p data-bbox="818 454 1066 521">«Institutional Enabler»</p> <p data-bbox="818 571 1066 638">«Institutional Enabler»</p>	<p data-bbox="1074 333 1497 445">EN-167 - SeaSWIM connectors for port actor support systems</p> <p data-bbox="1074 454 1497 566">EN-105 - Incentive model in ports for info sharing and Port-CDM compliance</p> <p data-bbox="1074 571 1497 600">EN-100 - Definition of states</p>

### Service - Port Call Optimisation

IP	OI-Step	Enabler				
IP1	<p>OI-022 - Achieving common situation awareness for upcoming port calls among actors involved in the port call</p> <p>Achieving common situational awareness is key for actors' ability to coordinate their actions both in relation to each other and in their on operations. Common situational awareness is created by actors sharing the progress and status of specific port calls, using real time data for states identified as key events in a certain port call process. The shared image enables actors to plan and increase the ability to predict characteristics of upcoming port calls. Actors can use the shared image as a basis to communicate about specific service requests and availability for the achievement of optimal utilisation of resources and infrastructure.</p>	<table border="1"> <thead> <tr> <th>Type</th> <th>Enabler</th> </tr> </thead> <tbody> <tr> <td>«Service Enabler»</td> <td>EN-069 - Collaborator Nomination Service</td> </tr> </tbody> </table>	Type	Enabler	«Service Enabler»	EN-069 - Collaborator Nomination Service
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IP	OI-Step	Enabler	
IP1	<p>OI-023 - Real time optimisation based on common situation awareness of turn-around process during port call realisation</p> <p>Achieving common situational awareness is key for actors' ability to optimally coordinate their actions both in relation to each other and in their own operations. Common situational awareness is created by actors sharing the progress and status of specific port calls, using real time data for states identified as key events in a certain port call process. The shared image enables actors to predict future events and take actions for an optimal port call realisation. For all key states identified in the port call process (from arrival to departure), the entire turn-around-process can be coordinated, performed just-in-time, and thereby optimised based on information about actors intentions and performances.</p>	<p>Type</p> <p>«System Enabler»</p> <p>«Service Enabler»</p> <p>«Procedural Enabler»</p> <p>«Institutional Enabler»</p> <p>«Institutional Enabler»</p>	<p>Enabler</p> <p>EN-167 - SeaSWIM connectors for port actor support systems</p> <p>EN-069 - Collaborator Nomination Service</p> <p>EN-066 - Defining of the particular processes for a port.</p> <p>EN-072 - Establishment of PortCDM council</p> <p>EN-071 - Procedures for interaction b/w Service Providers</p>
IP3	<p>OI-024 - Involve cargo management/handling in the port call optimisation</p> <p>An optimal port call process is realised by coordinating involved actors intentions and performances. Information and communication between actors in port, between port actors and ship and between ports are therefore important to reach the full effects of PortCDM. By including berth planning (by terminals) and availability of resources and infrastructure for cargo operations, port of readiness can be communicated to an approaching ship well in advance of the actual arrival.</p>	<p>Type</p> <p>«Institutional Enabler»</p> <p>«Institutional Enabler»</p> <p>«Procedural Enabler»</p>	<p>Enabler</p> <p>EN-206 - Established federation for definition of data to share</p> <p>EN-100 - Definition of states</p> <p>EN-205 - Common understanding of timelines for optimised performance in multimodal integration</p>

IP	OI-Step	Enabler	
IP2	<p data-bbox="296 304 810 405">OI-050 - Port call optimisation based on updates from ship through Port Call Synchronisation</p> <p data-bbox="296 461 810 943">PortCDM should be regarded as an integrated part of STM. The intention of the ship is an important factor in port call optimisation. Therefore, changes and updates from the ships intended route and ETA needs to be distributed to relevant actors in real time to ensure port of readiness. ETA (planned, updated etc.), is seen as an important information component for STM in port operations. This operational improvement is a prerequisite for green steaming</p>	<p data-bbox="818 304 1054 338">Type</p> <p data-bbox="818 349 1054 405">«Institutional Enabler»</p> <p data-bbox="818 416 1054 472">«Institutional Enabler»</p>	<p data-bbox="1062 304 1497 338">Enabler</p> <p data-bbox="1062 349 1497 405">EN-053 - Standardised Port Call Message Format</p> <p data-bbox="1062 416 1497 562">EN-051 - Improved contracts including clauses that establish terms for implementing right steaming.</p>

### Service - Port Call Synchronisation

IP	OI-Step	Enabler																
IP1	<p>OI-051 - Synchronisation (collaborative agreement on time of arrival) of port call between port (terminal and cargo) and ship semi manually (by standard port call format)</p> <p>PortCDM should be regarded as an integrated part of STM. The intentions of the ship are an important factor in port call optimisation. Therefore, changes and updates from the ships intended route and ETA needs to be distributed to relevant actors and matched to relevant port capacity to ensure port of readiness. ETA (planned, updated etc.), is regarded as an important information component for STM in port operations. The step requires a standardised port call format for the agreement on time of arrival. The information should be in digital form and real time distribution is desirable, but not necessary to fulfil this improvement step. The standardised port call format regarding agreement on time of arrival might require some technical adaptation of existing system environment. To enable synchronisation based on the collaborative agreement on time of arrival between ship and port actors, the message should be according to a defined standard port call format, possibly via a add-on message translation service. The communication media can be digital or semi-digital media.</p>	<table border="1"> <thead> <tr> <th>Type</th> <th>Enabler</th> </tr> </thead> <tbody> <tr> <td>«System Enabler»</td> <td>EN-054 - Technologies enabling continuous updates on ETA</td> </tr> <tr> <td>«Institutional Enabler»</td> <td>EN-053 - Standardised Port Call Message Format</td> </tr> <tr> <td>«Procedural Enabler»</td> <td>EN-068 - Procedure at port for earlier synchronisation/coordination with ships</td> </tr> <tr> <td>«System Enabler»</td> <td>EN-055 - Enable access to recommended berth time from Port.</td> </tr> <tr> <td>«System Enabler»</td> <td>EN-173 - Port Call message standard implemented in proprietary system</td> </tr> <tr> <td>«Institutional Enabler»</td> <td>EN-187 - Time-stamp definition</td> </tr> <tr> <td>«Service Enabler»</td> <td>EN-197 - Port Call Optimisation Service</td> </tr> </tbody> </table>	Type	Enabler	«System Enabler»	EN-054 - Technologies enabling continuous updates on ETA	«Institutional Enabler»	EN-053 - Standardised Port Call Message Format	«Procedural Enabler»	EN-068 - Procedure at port for earlier synchronisation/coordination with ships	«System Enabler»	EN-055 - Enable access to recommended berth time from Port.	«System Enabler»	EN-173 - Port Call message standard implemented in proprietary system	«Institutional Enabler»	EN-187 - Time-stamp definition	«Service Enabler»	EN-197 - Port Call Optimisation Service
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IP	OI-Step	Enabler										
IP2	<p>OI-052 - Synchronisation (collaborative agreement on time of arrival) of port call between port and ship digitised (by standard port call format)</p> <p>For enhanced synchronisation based on a collaborative agreement on time of arrival (in real time) between ship and port actors according to the standardised port call format should be automatically communicated. This is most likely to be communicated / exchanged via fleet operating centres being in direct contact with the ship.</p>	<table border="1"> <thead> <tr> <th>Type</th> <th>Enabler</th> </tr> </thead> <tbody> <tr> <td>«System Enabler»</td> <td>EN-056 - Synchronising capability matching Requested ETA (port) with ETA (Ship)</td> </tr> <tr> <td>«Human Enabler»</td> <td>EN-057 - Training of Master and port operators using enhanced information as basis for decision making regarding planning and realisation of port call operations.</td> </tr> <tr> <td>«Procedural Enabler»</td> <td>EN-059 - New procedures on board to synchronise/coordinate time of arrival with ports</td> </tr> <tr> <td>«Service Enabler»</td> <td>EN-194 - Voyage Information Service</td> </tr> </tbody> </table>	Type	Enabler	«System Enabler»	EN-056 - Synchronising capability matching Requested ETA (port) with ETA (Ship)	«Human Enabler»	EN-057 - Training of Master and port operators using enhanced information as basis for decision making regarding planning and realisation of port call operations.	«Procedural Enabler»	EN-059 - New procedures on board to synchronise/coordinate time of arrival with ports	«Service Enabler»	EN-194 - Voyage Information Service
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IP2	<p>OI-053 - Synchronisation (collaborative agreement on time of arrival) of port call between port and ship digitized enabling right steaming</p> <p>For enhanced synchronisation based on a collaborative agreement on time of arrival (in real time) between ship and port actors according to the standardised port call format should be automatically communicated. Such synchronisation of conditions for ships approach and port of readiness enables right steaming.</p>	<table border="1"> <thead> <tr> <th>Type</th> <th>Enabler</th> </tr> </thead> <tbody> <tr> <td>«Institutional Enabler»</td> <td>EN-051 - Improved contracts including clauses that establish terms for implementing right steaming.</td> </tr> <tr> <td>«Service Enabler»</td> <td>EN-116 - Port Call Synchronisation Service</td> </tr> </tbody> </table>	Type	Enabler	«Institutional Enabler»	EN-051 - Improved contracts including clauses that establish terms for implementing right steaming.	«Service Enabler»	EN-116 - Port Call Synchronisation Service				
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### Service - Post Traffic Analysis

IP	OI-Step	Enabler	
IP1	<p>OI-012 - Area statistics, including route deviations, used for better awareness and planning purposes</p> <p>Capacity for collecting and analysing AIS exists today but with the possibility to see planned routes and deviations the area coordinator gets an increased awareness of traffic conditions</p>	Type	Enabler
		«Institutional Enabler»	EN-143 - Regulations of historic routes usage
		«System Enabler»	EN-157 - Storage and availability of historical route plans
		«Service Enabler»	EN-186 - Route Exchange Service
IP2	<p>OI-013 - Statistics used for traffic synchronisation</p> <p>As today it is important to analyse traffic statistics. With route information available the analyses can be performed based on more information.</p>	Type	Enabler
		«Procedural Enabler»	EN-137 - Procedure for capacity management
IP2	<p>OI-014 - Statistics made available for third-party route-planning</p> <p>As the volume of traffic and other maritime activities increases congestion is becoming a problem in more areas e.g. canals, straits and port entrances. By gathering statistics on plans and actual occurrences, removing all business sensitive information and make it available for third-party route planning it will be easier to see e.g. times or areas where problems with congestion is likely to occur. The statistics can also be used for planning of new safety measures like VTS, aids to navigation or resource planning of operators.</p>	Type	Enabler
		«Institutional Enabler»	EN-143 - Regulations of historic routes usage

## Service - Route Crosscheck

IP	OI-Step	Enabler	
		Type	Enabler
IP1	<p>OI-001 - Shoreside complementary crosscheck of route (segment) in defined areas</p> <p>Crosscheck of routes in real time, is a new concept and will result in the possibilities for external part to double-check the routes of ships passing certain sea areas. Crosscheck can be performed in different ways in different areas depending on needs from Coastal State. The crosscheck is only to clarify that the intended route will pass clear over and under ground and obstacles issued by MSI services. If this possible service will be mandatory or not must be up to the actual coast state. Some sort of authorisation must be issued by NCA for the provider shouldering this task.</p> <p>A possible implementation strategy could be to introduce crosscheck of routes in a certain sea area as e.g. Baltic Sea or North Sea. This could be connected to some sort of discount of fairway fees or insurance fee if participating in the testbed.</p>	<p>«Institutional Enabler»</p> <p>«Procedural Enabler»</p> <p>«Human Enabler»</p> <p>«Institutional Enabler»</p> <p>«Institutional Enabler»</p> <p>«Service Enabler»</p> <p>«Service Enabler»</p> <p>«System Enabler»</p>	<p>EN-113 - Authorisation of service providers</p> <p>EN-174 - SOP for route crosscheck by route exchange</p> <p>EN-178 - Training in operation of new functionalities and route crosscheck procedures</p> <p>EN-180 - Define liabilities and responsibilities</p> <p>EN-188 - Incentives for participating in route crosscheck</p> <p>EN-194 - Voyage Information Service</p> <p>EN-186 - Route Exchange Service</p> <p>EN-200 - Shoreside equipment upgrade to be Route Exchange Format compatible</p>

IP	OI-Step	Enabler	
IP3	<p>OI-004 - Crosscheck of route port to port on-board or onshore</p> <p>Route verification service including the whole passage from Dep. to Arr. The crosscheck must be done following certain standard by authorized software etc. This could be done on-board or by service provider ashore. This service is very useful for the OOW and captain during initial planning phase and will most probably be of value for the owner and charterer including insurance company. All ships must have their full route crosschecked before departure hence Coastal states along the route will have route access and can plan accordingly well in advance if so needed.</p>	Type	Enabler
		«Institutional Enabler»	EN-172 - Standardised certification protocol for on-board verification of routes
		«Institutional Enabler»	EN-113 - Authorisation of service providers
		«Service Enabler»	EN-179 - Area Management service
IP3	<p>OI-073 - Route crosscheck using dynamic area management information in defined areas</p> <p>On board or shoreside after a regular route crosscheck is presented by the ship to Coastal state, before the voyage starts, the route can be crosschecked again if new dynamic data is affecting the original route. This could be done either from the shoreside or on board.</p>	Type	Enabler
		«Service Enabler»	EN-179 - Area Management service
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		«Institutional Enabler»	EN-172 - Standardised certification protocol for on board verification of routes
		«System Enabler»	EN-196 - Geo-located information service

## Service - Route Exchange

IP	OI-Step	Enabler	
IP1	<p>OI-034 - Route Exchange used for enhanced situational awareness for nearby intention notification</p> <p>Route Exchange Format is implemented in navigational equipment on board, and the routes can be exchanged between ships when asked upon from another ships nearby. The ASM message in the AIS transmission is used for this. Route exchange shall not interfere with tactical conning following COLREG as usual. For example, Route exchange must not be used as basis for collision avoidance when TCPA is under e.g. 30 minutes.</p>	Type	Enabler
		«Institutional Enabler»	EN-020 - Develop a sufficient format for ship-ship Route Exchange
		«Procedural Enabler»	EN-026 - Define guidelines and criteria for Route Exchange
		«Human Enabler»	EN-124 - Education and Training how to use route exchange
		«Human Enabler»	EN-169 - Develop HMI for added route information on ECDIS
		«System Enabler»	EN-189 - ECDIS systems updated to be Route Exchange Format compatible
IP2	<p>OI-036 - Route Exchange by SeaSWIM</p> <p>Routes are distributed through a common communication infrastructure by Route Exchange Format. With the introduction of SeaSwim the routes can be distributed by other means than by AIS, thus leading to new possibilities of providing services from remote location. The need to be in VHF range for providing services will be obsolete.</p>	«Institutional Enabler»	EN-117 - Route Exchange Format
		Type	Enabler
		«Service Enabler»	EN-191 - SeaSWIM or equivalent Services

## Service - Route Optimisation

IP	OI-Step	Enabler																		
IP1	<p>OI-054 - Route Optimisation by service providers more effective by using the new standardised route exchange format</p> <p>Optimisation of routes will be faster and less vulnerable due to translations of different formats will end with the new standardised route exchange format. Optimisation provided by different providers is made in a big variety of formats and translations back and forth are necessary. To have just one common format will reduce errors and make the handling more accurate and effective and also open up for modular optimisation where subcontractors to providers can easily plug in modules as part of the main optimisation.</p>	<table border="1"> <thead> <tr> <th>Type</th> <th>Enabler</th> </tr> </thead> <tbody> <tr> <td>«Institutional Enabler»</td> <td>EN-117 - Route Exchange Format</td> </tr> <tr> <td>«Institutional Enabler»</td> <td>EN-115 - Area information available in standard format</td> </tr> <tr> <td>«Institutional Enabler»</td> <td>EN-114 - Format standardisation of ship particulars and manoeuvring characteristics</td> </tr> <tr> <td>«Procedural Enabler»</td> <td>EN-059 - New procedures on board to synchronise/coordinate time of arrival with ports</td> </tr> <tr> <td>«Service Enabler»</td> <td>EN-186 - Route Exchange Service</td> </tr> <tr> <td>«Service Enabler»</td> <td>EN-116 - Port Call Synchronisation Service</td> </tr> <tr> <td>«Service Enabler»</td> <td>EN-193 - Weather Routing Service</td> </tr> <tr> <td>«Service Enabler»</td> <td>EN-179 - Area Management service</td> </tr> </tbody> </table>	Type	Enabler	«Institutional Enabler»	EN-117 - Route Exchange Format	«Institutional Enabler»	EN-115 - Area information available in standard format	«Institutional Enabler»	EN-114 - Format standardisation of ship particulars and manoeuvring characteristics	«Procedural Enabler»	EN-059 - New procedures on board to synchronise/coordinate time of arrival with ports	«Service Enabler»	EN-186 - Route Exchange Service	«Service Enabler»	EN-116 - Port Call Synchronisation Service	«Service Enabler»	EN-193 - Weather Routing Service	«Service Enabler»	EN-179 - Area Management service
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IP2	<p>OI-055 - Optimisation of route supported by route exchange and SeaSWIM</p> <p>When the route is accessible via SeaSwim optimisation can be done very fast and the route can be sent around various times for recalculation depending on new values. All stakeholders that can affect the route in one way or another will subscribe for access to the route and immediately as something will be altered all stakeholders will be notified in order to update and recalculate the route once again. This is a everlasting process as long as the route is active. With SeaSWIM all actors will always have the up-dated route and they can also update the route by own new info if needed</p>	<table border="1"> <thead> <tr> <th>Type</th> <th>Enabler</th> </tr> </thead> <tbody> <tr> <td>«Service Enabler»</td> <td>EN-194 - Voyage Information Service</td> </tr> <tr> <td>«Service Enabler»</td> <td>EN-192 - Flow Optimisation Service</td> </tr> <tr> <td>«System Enabler»</td> <td>EN-112 - Enable nominated Optimisation service provider, submit optimisation parameters, route exchange, capture performances, access to area Management Traffic Weather</td> </tr> </tbody> </table>	Type	Enabler	«Service Enabler»	EN-194 - Voyage Information Service	«Service Enabler»	EN-192 - Flow Optimisation Service	«System Enabler»	EN-112 - Enable nominated Optimisation service provider, submit optimisation parameters, route exchange, capture performances, access to area Management Traffic Weather										
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IP	OI-Step	Enabler	
		Type	Enabler
IP2	<p data-bbox="296 315 810 371">OI-071 - Dynamic and event based optimisation</p> <p data-bbox="296 416 810 835">During a voyage many factors appears that more or less makes impact on both the initial route chosen, courses between WP`s and the speed. It can be weather- traffic-resources-availabilities or object related like MSI etc. With constant access to reliable info, the whole picture will provide a swift and safer possibility to adjust the route dynamically.</p>	<p data-bbox="818 315 1062 371">«System Enabler»</p> <p data-bbox="818 607 1062 674">«Institutional Enabler»</p> <p data-bbox="818 685 1062 752">«Institutional Enabler»</p>	<p data-bbox="1070 315 1497 595">EN-112 - Enable nominated Optimisation service provider, submit optimisation parameters, route exchange, capture performances, access to area Management Traffic Weather</p> <p data-bbox="1070 607 1497 674">EN-117 - Route Exchange Format</p> <p data-bbox="1070 685 1497 752">EN-115 - Area information available in standard format</p>

### Service - SeaSWIM Access Management

IP	OI-Step	Enabler	
IP2	<p>OI-064 - Full SeaSwim access management</p> <p>Procedures for authentication and secure service discovery and provision based on identity, application, time, and space are fully implemented interoperable registers for services and identities existing on different platforms</p>	<p>Type</p> <p>«Institutional Enabler»</p> <p>«Procedural Enabler»</p> <p>«System Enabler»</p> <p>«System Enabler»</p>	<p>Enabler</p> <p>EN-131 - Neutral and trusted body for SeaSWIM</p> <p>EN-138 - Procedures and framework for service publication</p> <p>EN-125 - Access key management system</p> <p>EN-145 - Service access classification framework</p>
IP1	<p>OI-069 - Provisionary SeaSwim access management</p> <p>The service registry and identity registry are used as a basis for regulated provision and discovery of information services.</p>	<p>Type</p> <p>«System Enabler»</p>	<p>Enabler</p> <p>EN-144 - SeaSWIM connector access verification module</p>

### Service - SeaSWIM General Service Portfolio Management

IP	OI-Step	Enabler																				
IP1	<p>OI-059 - Core STM-compliant services according to SeaSWIM standards</p> <p>This step implies that services that are identified as core STM services in the SeaSWIM portfolio should be adapting defined SeaSWIM standards (SeaSWIM compliant services). The purpose with this step is to enable portfolio management for SeaSWIM services.</p>	<table border="1"> <thead> <tr> <th>Type</th> <th>Enabler</th> </tr> </thead> <tbody> <tr> <td>«Institutional Enabler»</td> <td>EN-152 - Service specification standards</td> </tr> <tr> <td>«Procedural Enabler»</td> <td>EN-141 - Process/procedure for Service specification language changes</td> </tr> <tr> <td>«Procedural Enabler»</td> <td>EN-140 - Process/procedure for provisioning and consumption of SeaSwim Information services</td> </tr> <tr> <td>«Procedural Enabler»</td> <td>EN-158 - Technical implementation framework (Swim Connector Blueprint) for SeaSWIM information Services</td> </tr> <tr> <td>«Procedural Enabler»</td> <td>EN-153 - Service validation tools</td> </tr> <tr> <td>«System Enabler»</td> <td>EN-156 - STM information service templates (Swim Connector Specification)</td> </tr> <tr> <td>«System Enabler»</td> <td>EN-155 - STM information model</td> </tr> <tr> <td>«System Enabler»</td> <td>EN-148 - Service discovery mechanism (service)</td> </tr> <tr> <td>«System Enabler»</td> <td>EN-151 - Service registry</td> </tr> </tbody> </table>	Type	Enabler	«Institutional Enabler»	EN-152 - Service specification standards	«Procedural Enabler»	EN-141 - Process/procedure for Service specification language changes	«Procedural Enabler»	EN-140 - Process/procedure for provisioning and consumption of SeaSwim Information services	«Procedural Enabler»	EN-158 - Technical implementation framework (Swim Connector Blueprint) for SeaSWIM information Services	«Procedural Enabler»	EN-153 - Service validation tools	«System Enabler»	EN-156 - STM information service templates (Swim Connector Specification)	«System Enabler»	EN-155 - STM information model	«System Enabler»	EN-148 - Service discovery mechanism (service)	«System Enabler»	EN-151 - Service registry
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IP2	<p>OI-060 - Critical mass of STM-compliant services according to SeaSwim standards</p> <p>A critical mass of STM compliant services have been adapted to SeaSWIM standards thus creating a momentum of use of the STM for more efficient, sustainable, and safe Sea Transports. The use of the SeaSWIM standards are widely used by diverse service providers of STM services</p>	<table border="1"> <thead> <tr> <th>Type</th> <th>Enabler</th> </tr> </thead> <tbody> <tr> <td>«Institutional Enabler»</td> <td>EN-131 - Neutral and trusted body for SeaSWIM</td> </tr> <tr> <td>«Procedural Enabler»</td> <td>EN-146 - Service approval process</td> </tr> <tr> <td>«Procedural Enabler»</td> <td>EN-149 - Service feedback process</td> </tr> <tr> <td>«System Enabler»</td> <td>EN-147 - Service catalogue information service</td> </tr> </tbody> </table>	Type	Enabler	«Institutional Enabler»	EN-131 - Neutral and trusted body for SeaSWIM	«Procedural Enabler»	EN-146 - Service approval process	«Procedural Enabler»	EN-149 - Service feedback process	«System Enabler»	EN-147 - Service catalogue information service										
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IP	OI-Step	Enabler	
IP2	<p>OI-068 - Maritime transport related information sharing according to SeaSWIM standards</p> <p>Besides STM related information sharing, the principles of SeaSWIM is applied in other domains of maritime activity (such as e.g. E-navigation, National Single Window, Cargo management)</p>	<p>Type</p> <p>«Procedural Enabler»</p> <p>«Service Enabler»</p>	<p>Enabler</p> <p>EN-205 - Common understanding of timelines for optimised performance in multimodal integration</p> <p>EN-171 - SeaSWIM Access Management</p>

### Service - SeaSWIM Governance and Monitoring

IP	OI-Step	Enabler	
IP2	<p>OI-066 - Governing bodies established for core STM-services</p> <p>Organisational bodies as constituting members of the federation providing trust for the service ecosystem by adopting the governing structure (OI-067) has been established.</p>	<p>Type</p> <p>«Institutional Enabler»</p> <p>«Institutional Enabler»</p> <p>«Procedural Enabler»</p> <p>«Service Enabler»</p>	<p>Enabler</p> <p>EN-131 - Neutral and trusted body for SeaSWIM</p> <p>EN-142 - Quality standards for SeaSWIM enabled services</p> <p>EN-154 - SLA models for provisioning and consumption of SeaSWIM enabled services</p> <p>EN-150 - SeaSWIM Portfolio Management service</p>
IP1	<p>OI-067 - Governing structure identified for core STM-services</p> <p>This step requires that a structure for governance of core STM-services should be identified/defined/agreed. The structure should include roles and processes (for monitoring, service approval, and service liquidation as part of service lifecycle management) as well as principles for quality assurance.</p>	<p>Type</p> <p>«Institutional Enabler»</p>	<p>Enabler</p> <p>EN-131 - Neutral and trusted body for SeaSWIM</p>

### Service - SeaSWIM Identity Management

IP	OI-Step	Enabler										
IP2	<p>OI-065 - Full SeaSWIM identity registry</p> <p>By this step, the identity registry has reached such status that it used for international associations (such as e.g. International Shipping Associations, International Harbour Associations) to accredit their members to be a trusted identity in the registry. In this way the degree of reliability of the information about identities is substantially increased.</p>	<table border="1"> <thead> <tr> <th>Type</th> <th>Enabler</th> </tr> </thead> <tbody> <tr> <td>«Institutional Enabler»</td> <td>EN-131 - Neutral and trusted body for SeaSWIM</td> </tr> </tbody> </table>	Type	Enabler	«Institutional Enabler»	EN-131 - Neutral and trusted body for SeaSWIM						
Type	Enabler											
«Institutional Enabler»	EN-131 - Neutral and trusted body for SeaSWIM											
IP1	<p>OI-070 - Provisionary SeaSWIM identity registry</p> <p>The identity registry captures all identities that are allowed to, in some situation, provide and/or consume information services. The identity registry constitutes a core part of collaborator nomination services by enabling different (accredited) actors, identified by a unique identity, to be associated with different services. A board for allowing access to, and to register different identities has been established. Identities are used both for authentication and regulating service provision.</p>	<table border="1"> <thead> <tr> <th>Type</th> <th>Enabler</th> </tr> </thead> <tbody> <tr> <td>«Procedural Enabler»</td> <td>EN-129 - Framework for actor characterisation</td> </tr> <tr> <td>«System Enabler»</td> <td>EN-160 - Technical integration with existing actor registers in shipping</td> </tr> <tr> <td>«System Enabler»</td> <td>EN-159 - Technical infrastructure of identity registry</td> </tr> <tr> <td>«System Enabler»</td> <td>EN-127 - Actor identity information services (provisioning and consumption)</td> </tr> </tbody> </table>	Type	Enabler	«Procedural Enabler»	EN-129 - Framework for actor characterisation	«System Enabler»	EN-160 - Technical integration with existing actor registers in shipping	«System Enabler»	EN-159 - Technical infrastructure of identity registry	«System Enabler»	EN-127 - Actor identity information services (provisioning and consumption)
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## Service - Shore-based Navigational Assistance

IP	OI-Step	Enabler	
IP1	<p>OI-025 - Shore-based navigational assistance may be provided by existing service providers (VTS SRS, marine exchange (MX), area coordinator etc.) supported by route exchange</p> <p>With active route shared to shoreside centre a more advanced kind of navigational assistance can be provided as is done today with the difference that with ships active route available on shore centre a more precise and correct assistance can be given since both parts will have the same picture of the route/passage plan. With all ships involved an overall common picture and situational awareness will be available thus opening up for more service functions as Flow management etc.</p>	Type	Enabler
		«Procedural Enabler»	EN-089 - Route Exchange : New procedures for VTS and other monitoring bodies and for officers on board the ships
		«Institutional Enabler»	EN-094 - Develop of business models for navigational assistance
		«Institutional Enabler»	EN-090 - Liability regime for shore-based navigational assistance
		«Service Enabler»	EN-186 - Route Exchange Service
IP2	<p>OI-026 - Existing and new commercial actors providing shore-based navigational assistance</p> <p>With active route shared to shoreside centre a more or less advanced kind of navigational assistance can be provided. Today this is generally done by VTS centre located close to the ships but in the long run with modern technology this service function could be performed virtually anywhere as long as the internet is operative. Service providers not seen today can expand, depending on flag and coastal states demands and legislations.</p>	Type	Enabler
		«Institutional Enabler»	EN-091 - Define competent service provider providing the assistance
		«Service Enabler»	EN-194 - Voyage Information Service
		«Institutional Enabler»	EN-094 - Develop of business models for navigational assistance

## Service - Single Reporting

IP	OI-Step	Enabler	
IP2	<p>OI-005 - Ship reporting to VTS/SRS areas through voyage and route information, replacing VHF reporting</p> <p>Today all reporting to VTS normally takes place by voice/VHF and OOW attention for safely navigating the ship is withdrawn by reporting formalities. Since VTS areas are located close to land and in confined waters this is an even that increases the risk. With single reporting supported by route exchange all necessary data will be exchanged and the need for VHF call will be reduced dramatically. Before departure, the ship share its route with authorised stakeholders and by geotagging all authorised entities along the route will have access and all route information will be available by this single reporting extracted from the route provided. In the long run the manual operation by VTS centre can be dramatically streamlined and probably a number of VTS can be clustered and operated remotely by fewer operators.</p>	Type	Enabler
		«Service Enabler»	EN-194 - Voyage Information Service
IP1	<p>OI-030 - Manual reporting of automated (ship) local standardised voyage object including route</p> <p>Simplified routines of gathering necessary reporting available through the standardisation of the Voyage Object in various supporting systems.</p>	Type	Enabler
		«Institutional Enabler»	EN-183 - Standard Voyage Information Format
		«Institutional Enabler»	EN-044 - Harmonised with Single Window, SafeSeaNet by using voyage information and geo-location
		«Procedural Enabler»	EN-048 - Create procedures for ship single reporting to parties

IP	OI-Step	Enabler	
IP2	<p>OI-031 - Mandatory reporting provided by service provider through SeaSWIM</p> <p>Dedicated service providers (agents or virtual agents) are offering reporting services (Single Window, Port etc.) for the ships by accessing voyage object through SeaSWIM connectors and route exchange, and making necessary reporting on behalf of the ship . This is a step towards full SeaSWIM functionality where information consumers will be granted access to the information directly through SeaSWIM.</p>	<p>Type</p> <p>«Institutional Enabler»</p> <p>«System Enabler»</p> <p>«System Enabler»</p> <p>«Service Enabler»</p>	<p>Enabler</p> <p>EN-045 - SeaSWIM System &amp; Rule book (auth. For use of information)</p> <p>EN-043 - Enable access to single reported Ship information for the other systems</p> <p>EN-042 - Enable digital signature and control procedures to assess and check the declaration</p> <p>EN-191 - SeaSWIM or equivalent Services</p>
IP3	<p>OI-032 - All mandatory reporting automated through actor subscription on relevant data for ships using geolocation</p> <p>Single Windows are now subscribing and extracting information from relevant SeaSwim connectors for ships with route to this state.</p>	<p>Type</p> <p>«System Enabler»</p> <p>«Institutional Enabler»</p> <p>«Service Enabler»</p>	<p>Enabler</p> <p>EN-170 - Automated Single Window</p> <p>EN-046 - Automated reporting amended to SOLAS and IMO Convention</p> <p>EN-194 - Voyage Information Service</p>
IP2	<p>OI-056 - Ship noon report through SeaSWIM</p> <p>Existing service but in proprietary solutions, will be replaced by standardised and continuous publication of data. The receiver of noon-reports will be able to retrieve information from any given point in time (not only noon) based on recorded information on board. The concept of 'noon report' will still exist, but as an information service retrieving recorded information at a specific point in time (noon).</p>	<p>Type</p> <p>«Service Enabler»</p> <p>«System Enabler»</p>	<p>Enabler</p> <p>EN-191 - SeaSWIM or equivalent Services</p> <p>EN-201 - Subscription of relevant ship reporting data in shipping ERPs</p>

## Service – Unique Voyage ID

IP	OI-Step	Enabler	
IP1	<p>OI-037 - Unique Voyage ID usage when exchanging voyage information</p> <p>A common standard of representing a Unique Voyage ID (UVID) is implemented in Shipping ERP systems, and are used in all (existing) communication between parties involved in the voyage. Benefits for the actors involved are a higher accuracy of communicated information, easier to integrate in existing systems, fewer misunderstandings, better traceability.</p>	<p>Type</p> <p>«Institutional Enabler»</p> <p>«Institutional Enabler»</p> <p>«Institutional Enabler»</p> <p>«Procedural Enabler»</p> <p>«System Enabler»</p>	<p>Enabler</p> <p>EN-128 - Common (standard) format of voyage ID</p> <p>EN-134 - Issuer of Voyage ID</p> <p>EN-130 - Governance body of Voyage IDs</p> <p>EN-139 - Procedures and rules for issuing and using Voyage ID are in place</p> <p>EN-202 - Unique Voyage ID implemented in ship operators tools</p>
IP2	<p>OI-039 - Information discovery via Unique Voyage ID (UVID) in SeaSwim</p> <p>UVID can be used for publishing information &amp; discovery in SeaSwim for identifying Swim nodes with have information about the voyage (subscription).</p> <p>E.g. subscription for all voyages to my port. Benefits for the actors involved in the voyage are easier information retrieval. For system providers the UVID will mean that all information can be exchange between all other systems, and information precision can be obtained (information means the same in different systems).</p>	<p>Type</p> <p>«Service Enabler»</p> <p>«Procedural Enabler»</p>	<p>Enabler</p> <p>EN-171 - SeaSWIM Access Management</p> <p>EN-139 - Procedures and rules for issuing and using Voyage ID are in place</p>

## Service - Voyage Information

IP	OI-Step	Enabler	
		Type	Enabler
IP1	<p>OI-040 - Exchange of Voyage object parts in standardised format</p> <p>A standardised voyage object can be distributed in current communication channels to relevant parties. Relevant Shipping-ERPs can export a segment of the voyage-object to a standardised format, which can be distributed via existing communication channels, and imported of further processed electronically into other systems.</p> <p>The benefits for the shipping companies/ Agents/Ports are to reduce administrative burden for entry of manual information (which today is sent by email &amp; fax between actors and manually entered into respective ERP-systems.</p> <p>For system providers the standardised format means Less cost for integration, since all maritime ERP systems will be able to understand each other's exports.</p> <p>For all actors involved in a sea voyage it will mean (possibility for) Increased information transparency, since it will be easier to share information between systems, and thereby easier to disseminate it between operative actors in a sea voyage.</p>	<p>«Institutional Enabler»</p> <p>«Procedural Enabler»</p> <p>«Institutional Enabler»</p> <p>«System Enabler»</p> <p>«Institutional Enabler»</p>	<p>EN-005 - Establish standards and guidelines for information transfer/exchanges</p> <p>EN-002 - Define procedures for exchange of voyage information</p> <p>EN-039 - Establish standards for different segments of the voyage plan that needs to be developed.</p> <p>EN-006 - Need a cross industry group to implement new standards</p> <p>EN-164 - Develop guidelines for liability and responsibility for voyage information correctness in STM</p>

IP	OI-Step	Enabler	
IP2	<p data-bbox="296 304 810 405">OI-041 - Voyage distributed to relevant and authorised parties (through SeaSWIM connectors)</p> <p data-bbox="296 454 810 1597">Shipping-ERPs providing the Voyage-object via Swim-connectors, identified via Unique Voyage ID, with targeted (point-to-point) distribution of the access-rights. This will be implemented by a shipping company connecting its different ERP-systems to SeaSwim through the SeaSwim connectors. This means that the system can distribute parts of the information to be available for other actors, which the information owner have granted access, for automatically receive in their systems through similar SeaSwim connectors. For a shipping company, regardless if the systems are developed and maintained internally, or through service providers, the crewing system, the Chartering and operations system, the cargo planning system, the Voyage planning system (ECDIS) can be connected through SeaSwim connectors to be able to publish, and subscribe for information which is tagged with a unique voyage ID. This means also that the Voyage Information Service can be distributed over several ERP-systems in a shipping company.</p>	Type	Enabler
		«Service Enabler»	EN-019 - Voyage Id Service
		«System Enabler»	EN-038 - Introduce SeaSWIM connectors
		«Institutional Enabler»	EN-034 - A possible contractual arrangement to enable the service.
		«System Enabler»	EN-084 - Automatic nomination granting access to route/voyage information by geo-location.

IP	OI-Step	Enabler	
IP2	<p>OI-042 - Subscription of voyages through SeaSWIM</p> <p>Relevant parties to a voyage are notified through SeaSWIM of a relevant voyage, and can request and gain access to the information through SeaSWIM. Access is controlled by the information owner. This means that there will be a possibility to set up subscriptions also for the shipping company to receive information about its voyage through SeaSWIM (e.g. arrival to port, SoF in a port). For a shipping company this would mean easier overview over all information from supporting actors, involved in the ships voyage, and through that also easier integration with different actors, which is very hard for shipping companies working in a many-to-many environment (e.g. Tramp shipping, where shipping company dealing with many ship-agents, in ports where they not necessarily have visited before).</p>	Type	Enabler
		<p>«Procedural Enabler»</p> <p>«Service Enabler»</p> <p>«System Enabler»</p>	<p>EN-001 - Define method of access</p> <p>EN-191 - SeaSWIM or equivalent Services</p> <p>EN-008 - Access Rights for information object or parts of information object</p>
IP3	<p>OI-043 - Exchange of complete Voyage object in standardised format</p> <p>In this phase, more information segments have been added to the Voyage Information object standard, and almost all information (incl. cargo, maintenance, service etc.) are available through SeaSwim for authorised actors.</p>	Type	Enabler
		<p>«Institutional Enabler»</p>	<p>EN-182 - A standard definition of a complete Voyage object and Voyage Information exchange standard format</p>

## Appendix D Stakeholders and Enablers

### *Authorities and Governments*

Authorities and Governments include National Competent Authorities such as Administrations, including coastal state responsibilities, and agencies in the maritime field. Also Coast Guard, Military and customs are included in this group.

This group of stakeholders are involved in the following enablers.

IP	Type	Name	Description
IP1	«Human Enabler»	EN-081 - New monitoring procedures utilising route exchange	Training in procedures for monitoring actual against planned route and establish roles and responsibilities concerning route proposals to ship.
IP1	«Human Enabler»	EN-178 - Training in operation of new functionalities and route crosscheck procedures	Route crosscheck is a new service made possible by route exchange and training in new procedures for both ship and shore is needed.
IP1	«Institutional Enabler»	EN-044 - Harmonised with Single Window, SafeSeaNet by using voyage information and geo-location	Directive 2010/65/EU of the European Parliament and the Council Decision of 20 October 2010 on reporting formalities for ships arriving in and/or departing from ports of the Member States and repealing Directive 2002/6/EC: It should be noted that this Directive aims to simplify and harmonise the administrative procedures applied to maritime transport by establishing a standard electronic transmission of information and by rationalising reporting formalities for ships arriving in and ships departing from European Union (EU) ports. EU countries shall accept electronic reports via a single window as soon as possible and, at the latest, by 1 June 2015. The single window will be the place where all information is reported once and made available to various competent authorities and the EU countries. EU countries must ensure that information received in accordance with reporting formalities is made available in their national SafeSeaNet systems and make available

IP	Type	Name	Description
			parts of such information to other EU countries via the SafeSeaNet system.
IP1	«Institutional Enabler»	EN-091 - Define competent service provider providing the assistance	The nature role and function of this service provider, private or competent authority needs to be identified. The decision on the way the operation and function of this competent authority is conceived will have impact on the issues of liability connected to the service.
IP1	«Institutional Enabler»	EN-094 - Develop of business models for navigational assistance	Private service providers with high navigational competence in certain areas, like pilot organisations, are the most logical new actors that can offer different kinds of shore-based assistance. It can be mandatory assistance issued by NCA or additional navigational assistance services provided on commercial basis.
IP1	«Institutional Enabler»	EN-113 - Authorisation of service providers	The national competent authority, NCA, issues authorisation to service provider following the standardised procedures and values.
IP1	«Institutional Enabler»	EN-115 - Area information available in standard format	Nautical information of an area should be available in a standard format. Today, it is in paper form or not standard format.
IP1	«Institutional Enabler»	EN-143 - Regulations of historic routes usage	For providing historical data, regulations for third party usage must be established, e.g. commercial sensitive data.
IP1	«Institutional Enabler»	EN-188 - Incentives for participating in route crosscheck	To share routes or route segments is a cornerstone in enhancing several services described in STM. To increase incentives for route exchange it is important that ships/shipping companies receive benefits from sharing their route. Examples of incentives could be reduced need for manual reporting, or coastal/port states discount on fairway, pilotage or port fees. Also insurance companies, getting benefits from increases safety, may offer incentives for ships that take part in route exchange and associated services like enhanced monitoring and route crosschecking.
IP1	«Procedural Enabler»	EN-026 - Define guidelines and criteria for	Guideline, procedures and criteria need to be developed with regards to number

IP	Type	Name	Description
		Route Exchange	of waypoints to be exchanged, etc. The procedures and criteria needs to tested and validated in testbeds and simulator trials.
IP1	«Procedural Enabler»	EN-079 - Establish procedures for production and distribution of dynamic area information	Operating procedures for shore-based personnel.
IP1	«Procedural Enabler»	EN-083 - Standard Operating Procedures for route monitoring	Add procedure in IALA VTS operating procedures
IP1	«Procedural Enabler»	EN-089 - Route Exchange: New procedures for VTS and other monitoring bodies and for officers on board the ships	Modernise todays procedures
IP1	«Procedural Enabler»	EN-122 - Standard operating procedures for flow optimisation	Procedures for on board, shore and ship shore interaction. Use and update IALA VTS TOS procedures
IP1	«Procedural Enabler»	EN-174 - SOP for route crosscheck by route exchange	Route crosscheck is a new service made possible by route exchange and new procedures for ship and shore interaction is needed.
IP1	«Service Enabler»	EN-179 - Area Management service	The objective is to establish a single page for updated: - Legal and environmental requirements, - Nautical information, which is today contained in Pilot books, - Environmental information e.g. weather, ice, currents, tidal water, and - Safety warning.
IP1	«System Enabler»	EN-157 - Storage and availability of historical route plans	Technical infrastructure supporting the Route Catalogue service, enabling the storage of earlier published route plans.
IP1	«System Enabler»	EN-160 - Technical integration with existing actor registers in shipping	The possibility to connect the Identity registry to existing catalogue services providing actor registries (such as managed by IMPA, FONASBA, IHMA etc.).
IP1	«System Enabler»	EN-196 - Geo-located information service	Standards and technology for store/publish/share information valid for a specific area or place. There should be a

IP	Type	Name	Description
			possibility to match any route or location, and use as an index or key for obtaining data in the service providing the geo-located information.
IP1	«System Enabler»	EN-200 - Shoreside equipment upgrade to be Route Exchange Format compatible	To reach full benefits from the STM concept both ships and shore centres need to have systems that are STM and Route exchange compatible
IP2	«Human Enabler»	EN-121 - New tools for operators providing shore-based traffic synchronisation.	New roles or organisations providing shore-based assistance (e.g. VTS) or monitoring services.
IP2	«Institutional Enabler»	EN-051 - Improved contracts including clauses that establish terms for implementing right steaming.	Port call synchronisation and green / right steaming requires a change in existing contract templates (charter parties) providing incentives for just-in-time approaches and establishing / communicating / committing to port of readiness.
IP2	«Institutional Enabler»	EN-118 - Define areas for traffic synchronisation	Areas where traffic synchronisation can reduce traffic congestion and incidents needs to be defined and established.
IP2	«Institutional Enabler»	EN-119 - Description of actors responsibilities	Definition of roles, consider VTS TOS
IP2	«Institutional Enabler»	EN-123 - Independent (country, benefit, flag etc.) organisation to do traffic synchronisation	It is necessary that traffic synchronisation is done by an independent organisation, e.g. a coastal state, administration or other non-beneficial organisation, in order not to give benefits to particular ships or shipping companies.
IP2	«Procedural Enabler»	EN-078 - Procedures for acknowledgement of information between ship and area manager.	New technical function needed, standard needed
IP2	«Procedural Enabler»	EN-137 - Procedure for capacity management	Analysis of new possibilities for statistics with more information
IP2	«Service Enabler»	EN-192 - Flow Optimisation Service	The objective is to perform enhanced traffic optimisation in restricted geographical areas with high traffic density in order to increase safety of navigation and the efficiency of ship traffic.
IP2	«System Enabler»	EN-195 - Digitised nautical information	The nautical information, today broadcasted, in non-machine readable

IP	Type	Name	Description
		available	<p>format, will be digitised in standardised formats, so that the information can be automatically imported in any bridge system supporting these standards.</p> <p>Status: IHO on-going work</p>
IP3	«Institutional Enabler»	EN-046 - Automated reporting of amendments to SOLAS and IMO Convention	IMO Convention provisions tailored to accommodate the new concepts, namely SOLAS Reg V/28+ IMO FAL convention.
IP3	«System Enabler»	EN-170 - Automated Single Window	<p>The term Automated Single Windows refer to when the national reporting infrastructures (today referred as Single Window, NSW), have the capability to subscribe for the required information directly from SeaSwim. A route published by a ship, with a destination in any port state, would (if the option of Auto-nominate is set, give automatic notification to the NSW of the destination port state, enabling them to retrieve the information needed.</p>

## Cargo Owners

Cargo owners charters ships or contract ship operators for a transport need.

This group of stakeholders are involved in the following enablers.

IP	Type	Name	Description
IP1	«System Enabler»	EN-160 - Technical integration with existing actor registers in shipping	The possibility to connect the Identity registry to existing catalogue services providing actor registries (such as managed by IMPA, FONASBA, IHMA etc.).
IP2	«Institutional Enabler»	EN-034 - A possible contractual arrangement to enable the service.	A contract term for the relevant services is crucially connected to the predictability and certainty of legal consequences associated with the service transactions. Some aspects are particularly important such as the breach of confidentiality, privacy or data protection, or breaches of regulatory or security requirements such as breaches giving rise to regulatory fines. A contractual arrangement would make the operational requirements legally binding and enforceable against the participants, regulate content of operational requirements, define and govern the legal rights, responsibilities and liabilities of the participants. Such a contract could be part of the mandatory requirements for STM actors – ensuring ID registry and liability – “STM Rule book”.

## Port Operators

Port operators refer to all actors operating in the port area e.g. terminals, stevedoring, pilots, port control and port authority. Also other stakeholders related to a port call such as disposal, ship chandler and tendering boats.

This group of stakeholders are involved in the following enablers.

IP	Type	Name	Description
IP1	«Human Enabler»	EN-120 - Training in operation for new system and procedures	To be part of IMO STCW and detailed in IMO model course for deck officers at operational level.
IP1	«Institutional Enabler»	EN-053 - Standardised Port Call Message Format	A standardised port call format is to be established supporting the ship-to-shore, shore-to-ship, and shore-to-shore interaction supporting port call synchronisation.
IP1	«Institutional Enabler»	EN-071 - Procedures for interaction b/w Service Providers	Development of procedures of how different actors in a PortCDM-setting will interact with each other. Process maps/templates, shared in the PCDM community.
IP1	«Institutional Enabler»	EN-072 - Establishment of PortCDM council	Establishment of PortCDM council
IP1	«Institutional Enabler»	EN-096 - Regulate (by contract) the possibility to use performance data (estimates and actuals) for evaluation purposes	The system needs to keep track of usage. See also EN-161  For the purposes of users to assess service providers and their service quality there is a need for evaluative standards.
IP1	«Institutional Enabler»	EN-100 - Definition of states	A generic definition of important states to coordinate in enabling the efficient port approach.
IP1	«Institutional Enabler»	EN-104 - Common model for port efficiency including common measurement system	A port maturity model for evaluating the efficiency of a port including a measurement system covering which variables to measure is needed for governing the improvement processes.
IP1	«Institutional Enabler»	EN-105 - Incentive model in ports for info sharing and Port-CDM compliance	Incentives for sharing information objects need to be identified
IP1	«Institutional Enabler»	EN-187 - Time-stamp definition	A common standard for time stamps (ETA, ETD, ETB etc.) is approved by the international maritime community.
IP1	«Procedural Enabler»	EN-066 - Defining of the particular processes for	Based on the generic state chart the definition of different variances of

		a port.	processes for the particular port needs to be defined in order to identify which information object that are relevant to be shared.
IP1	«Procedural Enabler»	EN-068 - Procedure at port for earlier synchronisation/coordination with ships	Procedures for communicating port of readiness at a particular time providing basis for the ship to reduce speed to arrive just-in-time. This means that the port, some dedicated actor, could inform the ship at the same time as the port guarantees that no other ship is taken to berth occupying the quay that was aimed to that ship.
IP1	«Procedural Enabler»	EN-102 - Define type of data to be stored and evaluated, based on the port call process instance and the state chart defined for the specific port call.	Data to be used for evaluation need to be defined for the use for external service providers to log the port call process for evaluation purposes.
IP1	«Procedural Enabler»	EN-103 - Nomination process (service) including access to historical data	By an established process for nominating collaborators is to be defined in order to ensure that relevant can provide and access data. This also includes service providers that are accredited to log the conducted port calls and distribute those to others.
IP1	«Service Enabler»	EN-116 - Port Call Synchronisation Service	The objective is to coordinate the ships approach with port of readiness.
IP1	«Service Enabler»	EN-197 - Port Call Optimisation Service	The objective is to coordinate and adjust actions related to other actors shared intentions and performances based on the set of states for a particular port call.
IP1	«System Enabler»	EN-160 - Technical integration with existing actor registers in shipping	The possibility to connect the Identity registry to existing catalogue services providing actor registries (such as managed by IMPA, FONASBA, IHMA etc.).
IP2	«Human Enabler»	EN-057 - Training of Master and port operators using enhanced information as basis for decision making regarding planning and realisation of port call operations.	Responsibilities for ships and port operators using enhanced information as basis for decision making regarding planning and realisation of port call operations.  I.e. if berthing time will be delayed by 7 hours. Captain can choose to reduce speed to arrive just in time or maybe arrive as first planned.
IP2	«Institutional Enabler»	EN-051 - Improved contracts including clauses that establish terms for implementing right steaming.	Port call synchronisation and green / right steaming requires a change in existing contract templates (charter parties) providing incentives for just-in-time approaches and establishing /

			communicating / committing to port of readiness.
IP2	«Institutional Enabler»	EN-106 - Model for Port-Call-Process (Port Call Optimisation)	A common defined model for the port call process serves the basis for reflection about performance. A generic model for the port call process is used as a basis for instantiation serving as an important input for EN-101.
IP2	«Procedural Enabler»	EN-101 - Guidelines for evaluation will enable ports to compare data (Port Maturity Model)	As an important source for ports with its actors to improve is to look upon other actors' performance. Guidelines for evaluation covering what to look upon are therefore needed enabling ports to compare data with each other.
IP2	«System Enabler»	EN-095 - Allowed provision of sharing of performance data between different ports by using a standard way to address a port call (port call message format)	The port call optimisation service will provide statistics and performance measures for the port for internal use. This enabler is an information service accessible to other actors retrieving a standardised set of performance measures describing the port (potentially to be used for assessing the port's performance in accordance with the Port Maturity Model).
IP2	«System Enabler»	EN-097 - Allow the possibility to service providers to get access to performance data for analytics services	To establish a data analytics community is an important mean for the analysis and proposal of improvements of the port calls. By allowing service providers to get access to data, via collaborator nomination processes, analysis made of shared data combined with official data (such as e.g. AIS-data) and actor specific data advise can be given informing improvements of future port call processes and actor performances.
IP3	«Procedural Enabler»	EN-205 - Common understanding of timelines for optimised performance in multimodal integration	To develop a common model for understanding the effects of delays on available resources and efficiency in the process of arrival and departure in ports.

## Regulating and Standardisation

Standardisation organisation is typically a non-profit organisation where individual companies collaborate in developing standards used throughout the concerned industry e.g. CIRM for marine electronics companies. Regulating body refers to international organisations in the maritime field such as IMO and IALA.

This group of stakeholders are involved in the following enablers.

IP	Type	Name	Description
IP1	«Institutional Enabler»	EN-005 - Establish standards and guidelines for information transfer/exchanges	Develop and anchor standards and guidelines.  A standard voyage exchange format is established to be used in different services using parts of voyage exchange format in its realisation. The voyage exchange format builds further on the route exchange format.
IP1	«Institutional Enabler»	EN-020 - Develop a sufficient format for ship-ship Route Exchange	Standard IEC 61174 ed. 4 needs to be complemented with a format for the exchange of a route segment in AIS ASM compatible format.
IP1	«Institutional Enabler»	EN-024 - Harmonise with the guidelines of VTS A857(20) ~1996	Add procedure in IALA VTS operating procedures
IP1	«Institutional Enabler»	EN-039 - Establish standards for different segments of the voyage plan that needs to be developed.	Specification and standard of the initial Voyage object.
IP1	«Institutional Enabler»	EN-044 - Harmonised with Single Window, SafeSeaNet by using voyage information and geo-location	Directive 2010/65/EU of the European Parliament and the Council Decision of 20 October 2010 on reporting formalities for ships arriving in and/or departing from ports of the Member States and repealing Directive 2002/6/EC: It should be noted that this Directive aims to simplify and harmonise the administrative procedures applied to maritime transport by establishing a standard electronic transmission of information and by rationalising reporting formalities for ships arriving in and ships departing from European Union (EU) ports. EU countries shall accept electronic reports via a single window as soon as possible and, at the latest, by 1 June 2015. The single window will be the place where all information is reported once and made available to various competent authorities and the EU countries. EU countries must ensure that information received in accordance with

			reporting formalities is made available in their national SafeSeaNet systems and make available parts of such information to other EU countries via the SafeSeaNet system.
IP1	«Institutional Enabler»	EN-053 - Standardised Port Call Message Format	A standardised port call format is to be established supporting the ship-to-shore, shore-to-ship, and shore-to-shore interaction supporting port call synchronisation.
IP1	«Institutional Enabler»	EN-074 - Define standard for dynamic area information	This is a new area that needs to be specified Could be part of IHO S 121
IP1	«Institutional Enabler»	EN-076 - Amend revised performance standards (resolution MSC.232(82)) to display dynamic areas on ECDIS	Functional requirement for displaying safety information
IP1	«Institutional Enabler»	EN-090 - Liability regime for shore-based navigational assistance	A liability regime, possibly through a contractual arrangement, needs to be established. The liability question is anticipated to be similar to liability issues for existing VTS and pilotage services.
IP1	«Institutional Enabler»	EN-113 - Authorisation of service providers	The national competent authority, NCA, issues authorisation to service provider following the standardised procedures and values.
IP1	«Institutional Enabler»	EN-114 - Format standardisation of ship particulars and manoeuvring characteristics	The standard is a subset of the Voyage Information format standard. Covers all facts and specifications of the ship needed for carrying out STM services (e.g. Voyage Optimisation, Port call Synchronisation, etc.) Existing services like Q88.com, SIRE, FairPlay.
IP1	«Institutional Enabler»	EN-115 - Area information available in standard format	Nautical information of an area should be available in a standard format. Today, it is in paper form or not standard format.
IP1	«Institutional Enabler»	EN-117 - Route Exchange Format	All manufacturers of ECDIS and NAV systems have their own format elaborating and presenting routes. In order to eliminate errors and misinterpretations a new standardised format (IEC 61174 ed. 4) has been developed within the MONALISA Project and can now freely be used by any vendor.
IP1	«Institutional Enabler»	EN-128 - Common (standard) format of voyage ID	A common format for voyage id's is essential to ensure that relevant actors share information about the same unit of analysis, the voyage, and to enable that information associated with the voyage can be bundled to one and the same voyage. Such common format must be established and acknowledged by key actors in the maritime sector.
IP1	«Institutional Enabler»	EN-130 - Governance body of Voyage IDs	Establish organisation that will have the overall responsibility of governing voyage IDs from time of registering the voyage till

			the end of that voyage.
IP1	«Institutional Enabler»	EN-131 - Neutral and trusted body for SeaSWIM	The establishment of SeaSWIM has to address the creation of an appropriate organisational structure for the implementation and operation of SeaSWIM function. Careful consideration must be given regarding the SeaSWIM organisation's mission, actions, structure and performance. All the indicated aspects are important for the organisation to be viewed as trustworthy and reliable, which contribute to it being accorded legitimacy for it to be trusted by businesses and authority.
IP1	«Institutional Enabler»	EN-134 - Issuer of Voyage ID	Identify or establish organisation(s) that is responsible of issuing Voyage ID's.  The issuer of voyage ID's is the one that associate a certain ID to the voyage. The preferred way is to allow the actor that initiate a voyage to have his/her own number series of voyage ID's granted by the governance body (see EN-130).
IP1	«Institutional Enabler»	EN-143 - Regulations of historic routes usage	For providing historical data, regulations for third party usage must be established, e.g. commercial sensitive data.
IP1	«Institutional Enabler»	EN-152 - Service specification standards	The specification of SeaSWIM services, core and STM-compliant services, builds upon a standardised service specification language. The language constitutes the ontology of how to describe a service.
IP1	«Institutional Enabler»	EN-164 - Develop guidelines for liability and responsibility for voyage information correctness in STM	Guidelines for liability and responsibility to ensure voyage information correctness need to be established. The source of voyage information, and thereby the one that regulates the management of voyage information by others, is the shipping company. The shipping company is the owner of the voyage information which is why there needs to be routines established to ensure that the information associated with the voyage is managed in a correct way (see EN-109).
IP1	«Institutional Enabler»	EN-188 - Incentives for participating in route crosscheck	To share routes or route segments is a cornerstone in enhancing several services described in STM. To increase incentives for route exchange it is important that ships/shipping companies receive benefits from sharing their route. Examples of incentives could be reduced need for manual reporting, or coastal/port states discount on fairway, pilotage or port fees. Also insurance companies, getting benefits from increases safety, may offer incentives for ships that take part in route exchange and associated services like enhanced monitoring and route crosschecking.

IP1	«Procedural Enabler»	EN-026 - Define guidelines and criteria for Route Exchange	Guideline, procedures and criteria need to be developed with regards to number of waypoints to be exchanged, etc. The procedures and criteria needs to tested and validated in testbeds and simulator trials.
IP1	«Procedural Enabler»	EN-031 - Process for nominating actors.	Develop procedures on how the nomination of collaborators is to be executed.  All actors within STM need to be identified in order for the collaborators to “discover” them and for the STM information system to know where and to who the information is to be distributed.
IP1	«Procedural Enabler»	EN-079 - Establish procedures for production and distribution of dynamic area information	Operating procedures for shore-based personnel.
IP1	«Procedural Enabler»	EN-083 - Standard Operating Procedures for route monitoring	Add procedure in IALA VTS operating procedures
IP1	«Procedural Enabler»	EN-089 - Route Exchange: New procedures for VTS and other monitoring bodies and for officers on board the ships	Modernise todays procedures
IP1	«Procedural Enabler»	EN-122 - Standard operating procedures for flow optimisation	Procedures for on board, shore and ship shore interaction. Use and update IALA VTS TOS procedures
IP1	«Procedural Enabler»	EN-129 - Framework for actor characterisation	The identity registry needs to be structured in accordance with actor characteristics. The role of a certain actors in the Sea Traffic Management ecosystem forms the basis of such characterisation (as e.g. port, port actor, etc.) and then further appropriate specialisations.
IP1	«Procedural Enabler»	EN-139 - Procedures and rules for issuing and using Voyage ID are in place	Develop procedures and rules on how to issue and use Voyage ID's.  Procedures and rules for EN-134 as well as regulating the use of voyage IDs (such as e.g. for how long voyage ID's should be possible to access after the voyage has been conducted).
IP1	«Procedural Enabler»	EN-140 - Process/procedure for provisioning and consumption of SeaSwim Information services	Services constitute the core of the service-oriented-architecture applied in SeaSWIM allowing possible [peer-to-peer] interactions between information providers and information consumers. In order to allow for the provisioning and consumption of services, as carriers of the information being exchanged/shared, processes/procedures of how to publish and discover services need to be defined (as e.g. how does the process look for including a service in the service registry

			and for discovering a particular service).
IP1	«Procedural Enabler»	EN-141 - Process/procedure for Service specification language changes	In order to allow changes of the service specification language and keep the language up-to-date, there has to be processes/procedures for how to change the service specification language
IP1	«Procedural Enabler»	EN-153 - Service validation tools	In order to drive continual quality development and continuous improvement of services there will be tools associated with STM that allow for validating/assessing the used services. This both concern the possibility for "letting the crowd" give their remarks on used services as well as statistics for usage. The result of the validation is an important input for the process of improving existing services (service lifecycle management) by the service provider.
IP1	«Procedural Enabler»	EN-174 - SOP for route crosscheck by route exchange	Route crosscheck is a new service made possible by route exchange and new procedures for ship and shore interaction is needed.
IP1	«Service Enabler»	EN-029 - SeaSWIM Identity Registry	The objective is to manage an identity registry of maritime actors providing access rights to services.
IP1	«Service Enabler»	EN-171 - SeaSWIM Access Management	The objective is to provide functionality to access services and information sources based on the desires of the service provider to enable trusted information exchange.
IP1	«Service Enabler»	EN-179 - Area Management service	The objective is to establish a single page for updated: - Legal and environmental requirements, - Nautical information, which is today contained in Pilot books, - Environmental information e.g. weather, ice, currents, tidal water, and - Safety warning.
IP1	«Service Enabler»	EN-186 - Route Exchange Service	The objective is to enhance the situational awareness by providing surrounding ships routes and displaying them on on board ECDIS or shore-based equipment.  A common route exchange format for route sharing between ship and shore.
IP1	«Service Enabler»	EN-191 - SeaSWIM or equivalent Services	A set of services within SeaSWIM or other providers will have to be developed for the full implementation of the nomination process, including automatic nomination. Geo-location of; reporting lines, regulation, entering- or leaving, depth restrictions and so on, in addition to time-regulations (ETA-dependent) will need to be established in order for the full implementation of the nomination process.
IP1	«System Enabler»	EN-084 - Automatic nomination granting	Functionality in SeaSwim (connectors) to add option of Auto-nomination of geo-

		access to route/voyage information by geo-location.	location based actors (e.g. VTS, Ports, SRS, reporting areas).
IP1	«System Enabler»	EN-127 - Actor identity information services (provisioning and consumption)	The identity registry needs to be kept up-to-date and have such a status that it becomes used. This requires services for provisioning and consuming actor identities. To identify and qualify a certain actor as an identity in the identity registry existing registries, as managed by diverse associations, forms an important basis.
IP1	«System Enabler»	EN-133 - Implement standards for dynamic area information dissemination and acknowledgement, on-shore and on board	This is a new area that needs to be specified. Could be part of IHO S 121
IP1	«System Enabler»	EN-148 - Service discovery mechanism (service)	A generic functionality in SeaSwim enabling the discovery of a service as the carrier of the information that is requested. E.g. a port will be able through its SeaSwim connector, subscribe for VoyageIDs with planned destination to the port, without knowing anything about logical or physical address where the information can be retrieved. That information is provided by the service discovery mechanism.
IP1	«System Enabler»	EN-151 - Service registry	A universal service registry provides a list of all services possible to access when certain criteria are met – such as e.g. geographical region.
IP1	«System Enabler»	EN-159 - Technical infrastructure of identity registry	The identity registry constitutes one of the core enablers in the information-sharing environment. High accessibility is therefore required enabled by a good technical infrastructure.
IP1	«System Enabler»	EN-189 - ECDIS systems updated to be Route Exchange Format compatible	Actual implementation of Route Exchange Format in various equipment on board and on shore.
IP1	«System Enabler»	EN-196 - Geo-located information service	Standards and technology for store/publish/share information valid for a specific area or place. There should be a possibility to match any route or location, and use as an index or key for obtaining data in the service providing the geo-located information.
IP1	«System Enabler»	EN-200 - Shoreside equipment upgrade to be Route Exchange Format compatible	To reach full benefits from the STM concept both ships and shore centres need to have systems that are STM and Route exchange compatible
IP2	«Human Enabler»	EN-121 - New tools for operators providing shore-based traffic synchronisation.	New roles or organisations providing shore-based assistance (e.g. VTS) or monitoring services.
IP2	«Institutional	EN-045 - SeaSWIM	The establishment of SeaSWIM has to

	Enabler»	System & Rule book (auth. For use of information)	address the creation of an appropriate organisational structure for the implementation and operation SeaSWIM; legal basis for the implementation of SeaSWIM would be made possible by the Rule Book or the SeaSWIM contract. The Rule Book would ensure a clear environment ensuring the trust of the involved stakeholders.
IP2	«Institutional Enabler»	EN-051 - Improved contracts including clauses that establish terms for implementing right steaming.	Port call synchronisation and green / right steaming requires a change in existing contract templates (charter parties) providing incentives for just-in-time approaches and establishing / communicating / committing to port of readiness.
IP2	«Institutional Enabler»	EN-119 - Description of actors responsibilities	Definition of roles, consider VTS TOS
IP2	«Institutional Enabler»	EN-142 - Quality standards for SeaSWIM enabled services	Quality standards indicating requirements, specifications, guidelines or characteristics must be identified to ensure that the SeaSWIM services are fit for each of their purpose. Such standards are generally referred to as the evaluative standards that enable the users to assess service providers and their service quality. The discussion on quality standards also leads to the process of certification that is used to demonstrate compliance with the standards. It has been defined as 'the successful conclusion of a procedure to evaluate whether or not an activity actually meets a set of requirements'. Certification simply refers to quality assurance, which can either be provided by the service provider itself or by an assessment by a third party.
IP2	«Procedural Enabler»	EN-138 - Procedures and framework for service publication	A commonly accepted process for including a service in the service registry of a particular service as it has been approved for being provided in the STM eco-system.
IP2	«Procedural Enabler»	EN-146 - Service approval process	For each area of operations, i.e. in the coverage of the different concepts, there needs to be service approval processes established in which proposed services need to be met by certain criteria agreed among the members of the federation (such as the Port CDM council).
IP2	«Procedural Enabler»	EN-149 - Service feedback process	Established routines for how to feedback reviews, based primarily on use, to the service provider
IP2	«Procedural Enabler»	EN-154 - SLA models for provisioning and consumption of SeaSWIM enabled services	Establishing a set of specifications of how SeaSWIM enabled information services shall perform, in order to qualify as SeaSWIM service (availability, performance, data quality etc.)

IP2	«Service Enabler»	EN-019 - Voyage Id Service	The objective is to provide unique voyage identity.
IP2	«Service Enabler»	EN-150 - SeaSWIM Portfolio Management service	The objective is a lifecycle approach to the facilitation of the development, publishing, maintenance, use and liquidation of services necessary for the functionality of SeaSWIM.
IP2	«System Enabler»	EN-042 - Enable digital signature and control procedures to assess and check the declaration	As a complement to the Identity management services described in EN-125, SeaSwim will support the possibility to digitally sign the receiving or publication of a certain set of information. This will enable the digitalisation of documents which today needs a physical signature, and also provide digitally signed acknowledgements of crucial data (warnings, nautical updates etc.)
IP2	«System Enabler»	EN-145 - Service access classification framework	A framework supporting the implementation of SeaSWIM access management for SeaSWIM enabled information services (who, what, when, with what usage rights)
IP2	«System Enabler»	EN-147 - Service catalogue information service	A list of what information services (types) are available in SeaSWIM
IP2	«System Enabler»	EN-195 - Digitised nautical information available	The nautical information, today broadcasted, in non-machine readable format, will be digitised in standardised formats, so that the information can be automatically imported in any bridge system supporting these standards.  Status: IHO on-going work
IP3	«Institutional Enabler»	EN-046 - Automated reporting amended to SOLAS and IMO Convention	IMO Convention provisions tailored to accommodate the new concepts, namely SOLAS Reg V/28+ IMO FAL convention.
IP3	«Institutional Enabler»	EN-172 - Standardised certification protocol for on board verification of routes	IMO to issue standards for this verification protocol and to be implemented in IMO 893(21).
IP3	«Institutional Enabler»	EN-199 - Revision of IMO regulations for TSS areas	Dynamic separation of traffic, when traffic density is low and safety precautions allows it, requires revision of IMO regulations for TSS and possibly other ships routeing systems
IP3	«Institutional Enabler»	EN-206 - Established federation for definition of data to share	Established federation for the definition of which data to share and to quality assure that information sharing is made in a trustworthy way,
IP3	«Procedural Enabler»	EN-205 - Common understanding of timelines for optimised performance in multimodal integration	To develop a common model for understanding the effects of delays on available resources and efficiency in the process of arrival and departure in ports.
IP3	«System Enabler»	EN-170 - Automated Single Window	The term Automated Single Windows refer to when the national reporting infrastructures (today referred as Single Window, NSW), have the capability to

			subscribe for the required information directly from SeaSwim. A route published by a ship, with a destination in any port state, would (if the option of Auto-nominate is set, give automatic notification to the NSW of the destination port state, enabling them to retrieve the information needed.
IP3	«System Enabler»	EN-204 - Interoperable platforms between different systems	Interoperable platforms for sharing information between different transportation systems

## Research and Development

A research and development (R&D) provider performs research and development activities. In the STM development this could be new projects or research activities needed including industrial R&D.

This group of stakeholders are involved in the following enablers.

IP	Type	Name	Description
IP1	«Human Enabler»	EN-081 - New monitoring procedures utilising route exchange	Training in procedures for monitoring actual against planned route and establish roles and responsibilities concerning route proposals to ship.
IP1	«Human Enabler»	EN-120 - Training in operation for new system and procedures	To be part of IMO STCW and detailed in IMO model course for deck officers at operational level.
IP1	«Human Enabler»	EN-124 - Education and Training how to use route exchange	Consider to be a part of IMO STCW and detailed in IMO model course for deck officers at operational level.
IP1	«Human Enabler»	EN-169 - Develop HMI for added route information on ECDIS	Consider Human factor effects of added information in ECDIS All information should not be displayed on the ECDIS screen
IP1	«Institutional Enabler»	EN-020 - Develop a sufficient format for ship-ship Route Exchange	Standard IEC 61174 ed. 4 needs to be complemented with a format for the exchange of a route segment in AIS ASM compatible format.
IP1	«Institutional Enabler»	EN-024 - Harmonise with the guidelines of VTS A857(20) ~1996	Add procedure in IALA VTS operating procedures
IP1	«Institutional Enabler»	EN-039 - Establish standards for different segments of the voyage plan that needs to be developed.	Specification and standard of the initial Voyage object.
IP1	«Institutional Enabler»	EN-044 - Harmonised with Single Window, SafeSeaNet by using voyage information and geo-location	Directive 2010/65/EU of the European Parliament and the Council Decision of 20 October 2010 on reporting formalities for ships arriving in and/or departing from ports of the Member States and repealing Directive 2002/6/EC: It should be noted that this Directive aims to simplify and harmonise the administrative procedures applied to maritime transport by establishing a standard electronic transmission of information and by rationalising reporting formalities for ships arriving in and ships departing from European Union (EU) ports. EU countries shall accept electronic reports via a single window as soon as possible and, at the latest, by 1 June 2015. The single window will be the place where all information is

			reported once and made available to various competent authorities and the EU countries. EU countries must ensure that information received in accordance with reporting formalities is made available in their national SafeSeaNet systems and make available parts of such information to other EU countries via the SafeSeaNet system.
IP1	«Institutional Enabler»	EN-053 - Standardised Port Call Message Format	A standardised port call format is to be established supporting the ship-to-shore, shore-to-ship, and shore-to-shore interaction supporting port call synchronisation.
IP1	«Institutional Enabler»	EN-074 - Define standard for dynamic area information	This is a new area that needs to be specified Could be part of IHO S 121
IP1	«Institutional Enabler»	EN-076 - Amend revised performance standards (resolution MSC.232(82)) to display dynamic areas on ECDIS	Functional requirement for displaying safety information
IP1	«Institutional Enabler»	EN-090 - Liability regime for shore-based navigational assistance	A liability regime, possibly through a contractual arrangement, needs to be established. The liability question is anticipated to be similar to liability issues for existing VTS and pilotage services.
IP1	«Institutional Enabler»	EN-094 - Develop of business models for navigational assistance	Private service providers with high navigational competence in certain areas, like pilot organisations, are the most logical new actors that can offer different kinds of shore-based assistance. It can be mandatory assistance issued by NCA or additional navigational assistance services provided on commercial basis.
IP1	«Institutional Enabler»	EN-100 - Definition of states	A generic definition of important states to coordinate in enabling the efficient port approach.
IP1	«Institutional Enabler»	EN-104 - Common model for port efficiency including common measurement system	A port maturity model for evaluating the efficiency of a port including a measurement system covering which variables to measure is needed for governing the improvement processes.
IP1	«Institutional Enabler»	EN-105 - Incentive model in ports for info sharing and Port-CDM compliance	Incentives for sharing information objects need to be identified
IP1	«Institutional Enabler»	EN-114 - Format standardisation of ship particulars and manoeuvring characteristics	The standard is a subset of the Voyage Information format standard. Covers all facts and specifications of the ship needed for carrying out STM services (e.g. Voyage Optimisation, Port call Synchronisation, etc.). Existing services like Q88.com, SIRE, FairPlay.
IP1	«Institutional Enabler»	EN-115 - Area information available in standard format	Nautical information of an area should be available in a standard format. Today, it is in paper form or not standard format.
IP1	«Institutional Enabler»	EN-117 - Route Exchange	All manufacturers of ECDIS and NAV

	Enabler»	Format	systems have their own format elaborating and presenting routes. In order to eliminate errors and misinterpretations a new standardised format (IEC 61174 ed. 4) has been developed within the MONALISA Project and can now freely be used by any vendor.
IP1	«Institutional Enabler»	EN-130 - Governance body of Voyage IDs	Establish organisation that will have the overall responsibility of governing voyage IDs from time of registering the voyage till the end of that voyage.
IP1	«Institutional Enabler»	EN-131 - Neutral and trusted body for SeaSWIM	The establishment of SeaSWIM has to address the creation of an appropriate organisational structure for the implementation and operation of SeaSWIM function. Careful consideration must be given regarding the SeaSWIM organisation's mission, actions, structure and performance. All the indicated aspects are important for the organisation to be viewed as trustworthy and reliable, which contribute to it being accorded legitimacy for it to be trusted by businesses and authority.
IP1	«Institutional Enabler»	EN-152 - Service specification standards	The specification of SeaSWIM services, core and STM-compliant services, builds upon a standardised service specification language. The language constitutes the ontology of how to describe a service.
IP1	«Institutional Enabler»	EN-164 - Develop guidelines for liability and responsibility for voyage information correctness in STM	Guidelines for liability and responsibility to ensure voyage information correctness need to be established. The source of voyage information, and thereby the one that regulates the management of voyage information by others, is the shipping company. The shipping company is the owner of voyage information why there needs to be routines established to ensure that the information associated with the voyage is managed in a correct way (see EN-109).
IP1	«Institutional Enabler»	EN-180 - Define liabilities and responsibilities	Several risks arise from STM operation such as data breaches; data processing errors etc. and these risks should not be underestimated. Legal liability can arise in several areas in context of these risks connected to the STM operations. It is important to note liability issues are important for the creation of legal infrastructure of the STM. The agreements between the service providers and end users should regulate the liability issues which could include provisions for the limitation of liability, identification of dispute resolution mechanism etc.
IP1	«Institutional Enabler»	EN-183 - Standard Voyage Information	All the information related to a ships voyage e.g. route, cargo, next port of call

		Format	etc. needs to be standardised.
IP1	«Institutional Enabler»	EN-187 - Time-stamp definition	A common standard for time stamps (ETA, ETD, ETB etc.) is approved by the international maritime community.
IP1	«Procedural Enabler»	EN-002 - Define procedures for exchange of voyage information	Establish procedures and rules for creating, updating and exchange of voyage information.
IP1	«Procedural Enabler»	EN-026 - Define guidelines and criteria for Route Exchange	Guideline, procedures and criteria need to be developed with regards to number of waypoints to be exchanged, etc. The procedures and criteria need to be tested and validated in testbeds and simulator trials.
IP1	«Procedural Enabler»	EN-048 - Create procedures for ship single reporting to parties	Create processes to maintain data up to date. Procedure to allow automatic, semi automatic or manual reporting (selected by the operator).  Route exchange acceptance as alternative to VHF-based ship reporting
IP1	«Procedural Enabler»	EN-066 - Defining of the particular processes for a port.	Based on the generic state chart the definition of different variances of processes for the particular port needs to be defined in order to identify which information object that are relevant to be shared.
IP1	«Procedural Enabler»	EN-083 - Standard Operating Procedures for route monitoring	Add procedure in IALA VTS operating procedures
IP1	«Procedural Enabler»	EN-099 - Define procedures for evaluation	Generic procedures for evaluation to be used for each actor are defined for supporting them to perform evaluations of their role in conducted port calls.
IP1	«Procedural Enabler»	EN-122 - Standard operating procedures for flow optimisation	Procedures for on board, shore and ship shore interaction. Use and update IALA VTS TOS procedures
IP1	«Procedural Enabler»	EN-129 - Framework for actor characterisation	The identity registry needs to be structured in accordance with actor characteristics. The role of a certain actors in the Sea Traffic Management ecosystem forms the basis of such characterisation (as e.g. port, port actor, etc.) and then further appropriate specialisations.
IP1	«Procedural Enabler»	EN-139 - Procedures and rules for issuing and using Voyage ID are in place	Develop procedures and rules on how to issue and use Voyage ID's.  Procedures and rules for EN-134 as well as regulating the use of voyage IDs (such as e.g. for how long voyage ID's should be possible to access after the voyage has been conducted).
IP1	«Procedural Enabler»	EN-140 - Process/procedure for provisioning and consumption of SeaSwim Information services	Services constitute the core of the service-oriented-architecture applied in SeaSWIM allowing possible [peer-to-peer] interactions between information providers and information consumers. In order to allow for the provisioning and consumption of services, as carriers of the information

			being exchanged/shared, processes/procedures of how to publish and discover services need to be defined (as e.g. how does the process look for including a service in the service registry and for discovering a particular service).
IP1	«Procedural Enabler»	EN-141 - Process/procedure for Service specification language changes	In order to allow changes of the service specification language and keep the language up-to-date, there has to be processes/procedures for how to change the service specification language
IP1	«Procedural Enabler»	EN-153 - Service validation tools	In order to drive continual quality development and continuous improvement of services there will be tools associated with STM that allow for validating/assessing the used services. This both concern the possibility for "letting the crowd" give their remarks on used services as well as statistics for usage. The result of the validation is an important input for the process of improving existing services (service lifecycle management) by the service provider.
IP1	«Procedural Enabler»	EN-166 - Standard operating procedures for information sharing (principles)	Procedural templates for organisations, system users, information providers, service providers of SeaSWIM enabled information services, in how information can be shared in SeaSWIM information sharing environment.
IP1	«Procedural Enabler»	EN-174 - SOP for route crosscheck by route exchange	Route crosscheck is a new service made possible by route exchange and new procedures for ship and shore interaction is needed.
IP1	«Service Enabler»	EN-069 - Collaborator Nomination Service	The objective is to nominate and set access rights to collaborators around information object (e.g. Voyage Object).
IP1	«Service Enabler»	EN-171 - SeaSWIM Access Management	The objective is to provide functionality to access services and information sources based on the desires of the service provider to enable trusted information exchange.
IP1	«Service Enabler»	EN-179 - Area Management service	The objective is to establish a single page for updated: - Legal and environmental requirements, - Nautical information, which is today contained in Pilot books, - Environmental information e.g. weather, ice, currents, tidal water, and - Safety warning.
IP1	«Service Enabler»	EN-186 - Route Exchange Service	The objective is to enhance the situational awareness by providing surrounding ships routes and displaying them on on board ECDIS or shore-based equipment.  A common route exchange format for route sharing between ship and shore.
IP1	«Service Enabler»	EN-191 - SeaSWIM or	A set of services within SeaSWIM or other

		equivalent Services	providers will have to be developed for the full implementation of the nomination process, including automatic nomination. Geo-location of; reporting lines, regulation, entering- or leaving, depth restrictions and so on, in addition to time-regulations (ETA-dependent) will need to be established in order for the full implementation of the nomination process.
IP1	«Service Enabler»	EN-193 - Weather Routing Service	The objective is to provide weather information on route.
IP1	«Service Enabler»	EN-194 - Voyage Information Service	The objective is to provide information regarding a particular voyage according to access rights.
IP1	«Service Enabler»	EN-197 - Port Call Optimisation Service	The objective is to coordinate and adjust actions related to other actors shared intentions and performances based on the set of states for a particular port call.
IP1	«System Enabler»	EN-006 - Need a cross industry group to implement new standards	Standards simply indicate how things should be done and they have significant consequences for all stakeholders. The process of standard making is important and it must reflect the choices by industry. In addition, standards should be flexible enough to appeal to the wider community and not only to certain stakeholders. Connected to this is also the process of their development and the consideration of the organisation through which the standards will be developed.  Making the systems STM compliant.
IP1	«System Enabler»	EN-054 - Technologies enabling continuous updates on ETA	Technologies enabling continuous updates on ETA and Port of Readiness (e.g. estimated, requested, confirmed, committed and actual times)
IP1	«System Enabler»	EN-084 - Automatic nomination granting access to route/voyage information by geo-location.	Functionality in SeaSwim (connectors) to add option of Auto-nomination of geo-location based actors (e.g. VTS, Ports, SRS, reporting areas).
IP1	«System Enabler»	EN-127 - Actor identity information services (provisioning and consumption)	The identity registry needs to be kept up-to-date and have such a status that it becomes used. This requires services for provisioning and consuming actor identities. To identify and qualify a certain actor as an identity in the identity registry existing registries, as managed by diverse associations, forms an important basis.
IP1	«System Enabler»	EN-144 - SeaSWIM connector access verification module	In order to access information services there is a need for SeaSWIM connectors. The permission of accessing these do however need to be done by (electronically) asking the information provider whether the information service is allowed to be accessed by checking the nomination schema. For each connector

			such access verification module needs to be implemented according to the standards for access management.
IP1	«System Enabler»	EN-148 - Service discovery mechanism (service)	A generic functionality in SeaSwim enabling the discovery of a service as the carrier of the information that is requested. E.g. a port will be able through its SeaSwim connector, subscribe for VoyageID's with planned destination to the port, without knowing anything about logical or physical address where the information can be retrieved. That information is provided by the service discovery mechanism.
IP1	«System Enabler»	EN-151 - Service registry	A universal service registry provides a list of all services possible to access when certain criteria are met – such as e.g. geographical region.
IP1	«System Enabler»	EN-155 - STM information model	The commonly accepted information model describing all used information objects of STM, the parts of which the object consists, and the elements specified in those parts. A logical model, not a technical.
IP1	«System Enabler»	EN-156 - STM information service templates (Swim Connector Specification)	The description of any SeaSwim governed information service, covering technical, logical, description of requirements, service level and other delimiting characteristics.
IP1	«System Enabler»	EN-159 - Technical infrastructure of identity registry	The identity registry constitutes one of the core enablers in the information-sharing environment. High accessibility is therefore required enabled by a good technical infrastructure.
IP1	«System Enabler»	EN-161 - Tracking of data for evaluation	The system needs to keep track of contract that regulates the possibility to use performance data (estimates and actuals) for evaluation purposes
IP1	«System Enabler»	EN-167 - SeaSWIM connectors for port actor support systems	Real time and historical data extraction from actors port community systems. Enabled tracking of historical state changes. Connectors to existing systems necessary or more data generated manually requiring good interfaces.  When a Port Actor System (Agent system, port community system, Tug-operator system etc.), is to be integrated with SeaSWIM, this will be done by a specified and well-defined set of rules and standards, identifying with information services the actor system can (and will) support. Vendors of standard systems will develop standard connectors which can be used in every implementation of the system, whereas proprietary actor systems, will develop a dedicated

			SeaSWIM connector based on standardised framework, open source code or blueprints for SeaSWIM connectors.
IP1	«System Enabler»	EN-196 - Geo-located information service	Standards and technology for store/publish/share information valid for a specific area or place. There should be a possibility to match any route or location, and use as an index or key for obtaining data in the service providing the geo-located information.
IP2	«Human Enabler»	EN-121 - New tools for operators providing shore-based traffic synchronisation.	New roles or organisations providing shore-based assistance (e.g. VTS) or monitoring services.
IP2	«Institutional Enabler»	EN-045 - SeaSWIM System & Rule book (auth. For use of information)	The establishment of SeaSWIM has to address the creation of an appropriate organisational structure for the implementation and operation SeaSWIM; legal basis for the implementation of SeaSWIM would be made possible by the Rule Book or the SeaSWIM contract. The Rule Book would ensure a clear environment ensuring the trust of the involved stakeholders.
IP2	«Institutional Enabler»	EN-051 - Improved contracts including clauses that establish terms for implementing right steaming.	Port call synchronisation and green / right steaming requires a change in existing contract templates (charter parties) providing incentives for just-in-time approaches and establishing / communicating / committing to port of readiness.
IP2	«Institutional Enabler»	EN-106 - Model for Port-Call-Process (Port Call Optimisation)	A common defined model for the port call process serves the basis for reflection about performance. A generic model for the port call process is used as a basis for instantiation serving as an important input for EN-101.
IP2	«Institutional Enabler»	EN-119 - Description of actors responsibilities	Definition of roles, consider VTS TOS
IP2	«Institutional Enabler»	EN-142 - Quality standards for SeaSWIM enabled services	Quality standards indicating requirements, specifications, guidelines or characteristics must be identified to ensure that the SeaSWIM services are fit for each of their purpose. Such standards are generally referred to as the evaluative standards that enable the users to assess service providers and their service quality. The discussion on quality standards also leads to the process of certification that is used to demonstrate compliance with the standards. It has been defined as 'the successful conclusion of a procedure to evaluate whether or not an activity actually meets a set of requirements'. Certification simply refers to quality assurance, which can either be provided by the service

			provider itself or by an assessment by a third party.
IP2	«Procedural Enabler»	EN-001 - Define method of access	In STM there will be information services that continually provide with information reaching a certain set of criteria. Methods for accessing such services, that either could be provided by the information owner or by a third-party actor, is defined by this enabler.
IP2	«Procedural Enabler»	EN-078 - Procedures for acknowledgement of information between ship and area manager.	New technical function needed, standard needed
IP2	«Procedural Enabler»	EN-101 - Guidelines for evaluation will enable ports to compare data (Port Maturity Model)	As an important source for ports with its actors to improve is to look upon other actors' performance. Guidelines for evaluation covering what to look upon are therefore needed enabling ports to compare data with each other.
IP2	«Procedural Enabler»	EN-137 - Procedure for capacity management	Analysis of new possibilities for statistics with more information
IP2	«Procedural Enabler»	EN-138 - Procedures and framework for service publication	A commonly accepted process for including a service in the service registry of a particular service as it has been approved for being provided in the STM eco-system.
IP2	«Procedural Enabler»	EN-146 - Service approval process	For each area of operations, i.e. in the coverage of the different concepts, there needs to be service approval processes established in which proposed services need to be met by certain criteria agreed among the members of the federation (such as the Port CDM council).
IP2	«Procedural Enabler»	EN-149 - Service feedback process	Established routines for how to feedback reviews, based primarily on use, to the service provider
IP2	«Procedural Enabler»	EN-154 - SLA models for provisioning and consumption of SeaSWIM enabled services	Establishing a set of specifications of how SeaSWIM enabled information services shall perform, in order to qualify as SeaSWIM service (availability, performance, data quality etc.)
IP2	«Service Enabler»	EN-019 - Voyage Id Service	The objective is to provide unique voyage identity.
IP2	«Service Enabler»	EN-150 - SeaSWIM Portfolio Management service	The objective is a lifecycle approach to the facilitation of the development, publishing, maintenance, use and liquidation of services necessary for the functionality of SeaSWIM.
IP2	«Service Enabler»	EN-192 - Flow Optimisation Service	The objective is to perform enhanced traffic optimisation in restricted geographical areas with high traffic density in order to increase safety of navigation and the efficiency of ship traffic.
IP2	«System Enabler»	EN-008 - Access Rights for information object or parts of information object	Access rights to information services are designed so that the information owner can assign rights to segments (and parts of segments) of the information object, using

			templates for different actor categories. E.g. an appointed agent for a certain port call of the voyage shall have access to the route-segments from the prior port to the actual port.)
IP2	«System Enabler»	EN-038 - Introduce SeaSWIM connectors	Introduce standards for implementing connectors to existing systems to allow services of STM to access and distribute voyage information to/from different systems
IP2	«System Enabler»	EN-095 - Allowed provision of sharing of performance data between different ports by using a standard way to address a port call (port call message format)	The port call optimisation service will provide statistics and performance measures for the port for internal use. This enabler is an information service accessible to other actors retrieving a standardised set of performance measures describing the port (potentially to be used for assessing the port's performance in accordance with the Port Maturity Model).
IP2	«System Enabler»	EN-125 - Access key management system	A generic public-key-infrastructure provided by SewSwim (implemented in the SeaSwim connector), ensuring the identity of the information requester/publisher so that the information owner/consumer do not have to provide any information security measures other those prescribed/implemented in the SeaSwim connector.
IP2	«System Enabler»	EN-145 - Service access classification framework	A framework supporting the implementation of SeaSWIM access management for SeaSWIM enabled information services (who, what, when, with what usage rights)
IP2	«System Enabler»	EN-147 - Service catalogue information service	A list of what information services (types) are available in SeaSWIM
IP2	«System Enabler»	EN-195 - Digitised nautical information available	The nautical information, today broadcasted, in non-machine readable format, will be digitised in standardised formats, so that the information can be automatically imported in any bridge system supporting these standards.  Status: IHO on-going work
IP3	«Institutional Enabler»	EN-046 - Automated reporting amended to SOLAS and IMO Convention	IMO Convention provisions tailored to accommodate the new concepts, namely SOLAS Reg V/28+ IMO FAL convention.
IP3	«Institutional Enabler»	EN-172 - Standardised certification protocol for on board verification of routes	IMO to issue standards for this verification protocol and to be implemented in IMO 893(21).
IP3	«Institutional Enabler»	EN-182 - A standard definition of a complete Voyage object and Voyage Information exchange standard format	Develop a standard framework for the information elements in the voyage object (plan).
IP3	«Institutional	EN-199 - Revision of IMO	Dynamic separation of traffic, when traffic

	«Enabler»	regulations for TSS areas	density is low and safety precautions allows it, requires revision of IMO regulations for TSS and possibly other ships routeing systems
IP3	«Institutional Enabler»	EN-206 - Established federation for definition of data to share	Established federation for the definition of which data to share and to quality assure that information sharing is made in a trustworthy way,
IP3	«System Enabler»	EN-170 - Automated Single Window	The term Automated Single Windows refer to when the national reporting infrastructures (today referred as Single Window, NSW), have the capability to subscribe for the required information directly from SeaSwim. A route published by a ship, with a destination in any port state, would (if the option of Auto-nominate is set, give automatic notification to the NSW of the destination port state, enabling them to retrieve the information needed.

## Service Providers

A service provider is an organisation that develops, maintains and provides services to consumers. Services could be both information services and operational services like optimisation services. Also ship agents are considered part of this group.

This group of stakeholders are involved in the following enablers.

IP	Type	Name	Description
IP1	«Human Enabler»	EN-120 - Training in operation for new system and procedures	To be part of IMO STCW and detailed in IMO model course for deck officers at operational level.
IP1	«Institutional Enabler»	EN-115 - Area information available in standard format	Nautical information of an area should be available in a standard format. Today, it is in paper form or not standard format.
IP1	«Institutional Enabler»	EN-183 - Standard Voyage Information Format	All the information related to a ships voyage e.g. route, cargo; next port of call etc. needs to be standardised.
IP1	«Procedural Enabler»	EN-048 - Create procedures for ship single reporting to parties	Create processes to maintain data up to date. Procedure to allow automatic, semi automatic or manual reporting (selected by the operator).  Route exchange acceptance as alternative to VHF-based ship reporting
IP1	«Service Enabler»	EN-179 - Area Management service	The objective is to establish a single page for updated: - Legal and environmental requirements, - Nautical information, which is today contained in Pilot books, - Environmental information e.g. weather, ice, currents, tidal water, and - Safety warning.
IP1	«Service Enabler»	EN-186 - Route Exchange Service	The objective is to enhance the situational awareness by providing surrounding ships routes and displaying them on on board ECDIS or shore-based equipment.  A common route exchange format for route sharing between ship and shore.
IP1	«Service Enabler»	EN-193 - Weather Routing Service	The objective is to provide weather information on route.
IP1	«Service Enabler»	EN-194 - Voyage Information Service	The objective is to provide information regarding a particular voyage accordance to access rights.
IP1	«System Enabler»	EN-086 - Anomaly detection algorithm/function for route deviation	The technical development of reliable software services that can identify (and predict) when a pattern of a source for a ship, deviates from the published route (and risk assessment of these deviations).
IP1	«System Enabler»	EN-160 - Technical integration with existing actor registers in shipping	The possibility to connect the Identity registry to existing catalogue services providing actor registries (such as managed

			by IMPA, FONASBA, IHMA etc.).
IP1	«System Enabler»	EN-202 - Unique Voyage ID implemented in ship operators tools	Technical infrastructure for providing UVID (Unique Voyage ID ) to Ship-operators (UVID, ID-series, Actor identification ID, etc.). The UVID must also be implemented in Shipping ERPs so that the UVID is used for all external communication about the Voyage.
IP2	«Service Enabler»	EN-192 - Flow Optimisation Service	The objective is to perform enhanced traffic optimisation in restricted geographical areas with high traffic density in order to increase safety of navigation and the efficiency of ship traffic.
IP2	«System Enabler»	EN-038 - Introduce SeaSWIM connectors	Introduce standards for implementing connectors to existing systems to allow services of STM to access and distribute voyage information to/from different systems
IP2	«System Enabler»	EN-042 - Enable digital signature and control procedures to assess and check the declaration	As a complement to the Identity management services described in EN-125, SeaSwim will support the possibility to digitally sign the receiving or publication of a certain set of information. This will enable the digitalisation of documents which today needs a physical signature, and also provide digitally signed acknowledgements of crucial data (warnings, nautical updates etc.)
IP2	«System Enabler»	EN-043 - Enable access to single reported Ship information for the other systems	This is implemented through a Voyage Information object information service, provided by the Voyage Information Service (operational).
IP2	«System Enabler»	EN-097 - Allow the possibility to service providers to get access to performance data for analytics services	To establish a data analytics community is an important mean for the analysis and proposal of improvements of the port calls. By allowing service providers to get access to data, via collaborator nomination processes, analysis made of shared data combined with official data (such as e.g. AIS-data) and actor specific data advise can be given informing improvements of future port call processes and actor performances.
IP2	«System Enabler»	EN-201 - Subscription of relevant ship reporting data in shipping ERPs	The provision of an information service for subscription of data reported to by a specific voyage (time-stamps, Statement of facts, statistics).
IP3	«Institutional Enabler»	EN-182 - A standard definition of a complete Voyage object and Voyage Information exchange standard format	Develop a standard framework for the information elements in the voyage object (plan).

## Ship Owners and Operators

Ship owners and operators refers to all different stakeholders involved in operation concerning planning, operation, and management of ships e.g. ship operators and on board crew.

This group of stakeholders are involved in the following enablers.

IP	Type	Name	Description
IP1	«Human Enabler»	EN-120 - Training in operation for new system and procedures	To be part of IMO STCW and detailed in IMO model course for deck officers at operational level.
IP1	«Human Enabler»	EN-124 - Education and Training how to use route exchange	Consider to be a part of IMO STCW and detailed in IMO model course for deck officers at operational level.
IP1	«Human Enabler»	EN-178 - Training in operation of new functionalities and route crosscheck procedures	Route crosscheck is a new service made possible by route exchange and training in new procedures for both ship and shore is needed.
IP1	«Institutional Enabler»	EN-114 - Format standardisation of ship particulars and manoeuvring characteristics	The standard is a subset of the Voyage Information format standard. Covers all facts and specifications of the ship needed for carrying out STM services (e.g. Voyage Optimisation, Port call Synchronisation, etc.) Existing services like Q88.com, SIRE, FairPlay.
IP1	«Institutional Enabler»	EN-143 - Regulations of historic routes usage	For providing historical data, regulations for third party usage must be established, e.g. commercial sensitive data.
IP1	«Institutional Enabler»	EN-187 - Time-stamp definition	A common standard for time stamps (ETA, ETD, ETB etc.) is approved by the international maritime community.
IP1	«Procedural Enabler»	EN-059 - New procedures on board to synchronise/coordinate time of arrival with ports	Preparations on board based on information given i.e. delay. Develop new process to synchronise actors.  Virtual ETA (to implement that to involved parties)
IP1	«Procedural Enabler»	EN-079 - Establish procedures for production and distribution of dynamic area information	Operating procedures for shore-based personnel.
IP1	«Procedural Enabler»	EN-139 - Procedures and rules for issuing and using Voyage ID are in place	Develop procedures and rules on how to issue and use Voyage ID's.  Procedures and rules for EN-134 as well as regulating the use of voyage IDs (such as e.g. for how long voyage ID's should be possible to access after the voyage has been conducted).
IP1	«Service Enabler»	EN-116 - Port Call Synchronisation Service	The objective is to coordinate the ships approach with port of readiness.
IP1	«System Enabler»	EN-157 - Storage and	Technical infrastructure supporting the

		availability of historical route plans	Route Catalogue service, enabling the storage of earlier published route plans.
IP1	«System Enabler»	EN-160 - Technical integration with existing actor registers in shipping	The possibility to connect the Identity registry to existing catalogue services providing actor registries (such as managed by IMPA, FONASBA, IHMA etc.).
IP1	«System Enabler»	EN-189 - ECDIS systems updated to be Route Exchange Format compatible	Actual implementation of Route Exchange Format in various equipment on board and on shore.
IP1	«System Enabler»	EN-202 - Unique Voyage ID implemented in ship operators tools	Technical infrastructure for providing UVID (Unique Voyage ID ) to Ship-operators (UVID, ID-series, Actor identification ID, etc.). The UVID must also be implemented in Shipping ERPs so that the UVID is used for all external communication about the Voyage.
IP2	«Human Enabler»	EN-057 - Training of Master and port operators using enhanced information as basis for decision making regarding planning and realisation of port call operations.	Responsibilities for ships and port operators using enhanced information as basis for decision making regarding planning and realisation of port call operations.  I.e. if berthing time will be delayed by 7 hours. Captain can choose to reduce speed to arrive just in time or maybe arrive as first planned.
IP2	«Institutional Enabler»	EN-034 - A possible contractual arrangement to enable the service.	A contract term for the relevant services is crucially connected to the predictability and certainty of legal consequences associated with the service transactions. Some aspects are particularly important such as the breach of confidentiality, privacy or data protection, or breaches of regulatory or security requirements such as breaches giving rise to regulatory fines. A contractual arrangement would make the operational requirements legally binding and enforceable against the participants, regulate content of operational requirements, define and govern the legal rights, responsibilities and liabilities of the participants. Such a contract could be part of the mandatory requirements for STM actors – ensuring ID registry and liability – “STM Rule book”.
IP2	«Institutional Enabler»	EN-051 - Improved contracts including clauses that establish terms for implementing right steaming.	Port call synchronisation and green / right steaming requires a change in existing contract templates (charter parties) providing incentives for just-in-time approaches and establishing / communicating / committing to port of readiness.
IP2	«Procedural Enabler»	EN-078 - Procedures for acknowledgement of information between ship and area manager.	New technical function needed, standard needed
IP2	«System Enabler»	EN-201 - Subscription of relevant ship reporting data in shipping ERPs	The provision of an information service for subscription of data reported to by a specific voyage (time-stamps, Statement of facts,

			statistics).
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## System Suppliers

A system supplier is an organisation that provides human and technical systems and infrastructure e.g. manufacturers of Port Community Systems, navigational systems and shipping ERPs.

This group of stakeholders are involved in the following enablers.

IP	Type	Name	Description
IP1	«Human Enabler»	EN-120 - Training in operation for new system and procedures	To be part of IMO STCW and detailed in IMO model course for deck officers at operational level.
IP1	«Human Enabler»	EN-169 - Develop HMI for added route information on ECDIS	Consider Human factor effects of added information in ECDIS All information should not be displayed on the ECDIS screen
IP1	«Institutional Enabler»	EN-005 - Establish standards and guidelines for information transfer/exchanges	Develop and anchor standards and guidelines.  A standard voyage exchange format is established to be used in different services using parts of voyage exchange format in its realisation. The voyage exchange format builds further on the route exchange format.
IP1	«Institutional Enabler»	EN-020 - Develop a sufficient format for ship-ship Route Exchange	Standard IEC 61174 ed. 4 needs to be complemented with a format for the exchange of a route segment in AIS ASM compatible format.
IP1	«Institutional Enabler»	EN-039 - Establish standards for different segments of the voyage plan that needs to be developed.	Specification and standard of the initial Voyage object.
IP1	«Institutional Enabler»	EN-053 - Standardised Port Call Message Format	A standardised port call format is to be established supporting the ship-to-shore, shore-to-ship, and shore-to-shore interaction supporting port call synchronisation.
IP1	«Institutional Enabler»	EN-074 - Define standard for dynamic area information	This is a new area that needs to be specified Could be part of IHO S 121
IP1	«Institutional Enabler»	EN-076 - Amend revised performance standards (resolution MSC.232(82)) to display dynamic areas on ECDIS	Functional requirement for displaying safety information
IP1	«Institutional Enabler»	EN-100 - Definition of states	A generic definition of important states to coordinate in enabling the efficient port approach.
IP1	«Institutional Enabler»	EN-117 - Route Exchange Format	All manufacturers of ECDIS and NAV systems have their own format elaborating and presenting routes. In order to eliminate errors and misinterpretations a new standardised format (IEC 61174 ed. 4) has

			been developed within the MONALISA Project and can now freely be used by any vendor.
IP1	«Institutional Enabler»	EN-183 - Standard Voyage Information Format	All the information related to a ships voyage e.g. route, cargo, next port of call etc. needs to be standardised.
IP1	«Procedural Enabler»	EN-002 - Define procedures for exchange of voyage information	Establish procedures and rules for creating, updating and exchange of voyage information.
IP1	«Procedural Enabler»	EN-031 - Process for nominating actors.	Develop procedures on how the nomination of collaborators is to be executed.  All actors within the STM need to be identified in order for the collaborators to “discover” them and for the STM information system to know where and to who the information is to be distributed.
IP1	«Procedural Enabler»	EN-066 - Defining of the particular processes for a port.	Based on the generic state chart the definition of different variances of processes for the particular port needs to be defined in order to identify which information object that are relevant to be shared.
IP1	«Procedural Enabler»	EN-079 - Establish procedures for production and distribution of dynamic area information	Operating procedures for shore-based personnel.
IP1	«Procedural Enabler»	EN-083 - Standard Operating Procedures for route monitoring	Add procedure in IALA VTS operating procedures
IP1	«Procedural Enabler»	EN-102 - Define type of data to be stored and evaluated, based on the port call process instance and the state chart defined for the specific port call.	Data to be used for evaluation need to be defined for the use for external service providers to log the port call process for evaluation purposes.
IP1	«Procedural Enabler»	EN-103 - Nomination process (service) including access to historical data	By an established process for nominating collaborators is to be defined in order to ensure that relevant can provide and access data. This also includes service providers that are accredited to log the conducted port calls and distribute those to others.
IP1	«Procedural Enabler»	EN-139 - Procedures and rules for issuing and using Voyage ID are in place	Develop procedures and rules on how to issue and use Voyage ID's.  Procedures and rules for EN-134 as well as regulating the use of voyage IDs (such as e.g. for how long voyage ID's should be possible to access after the voyage has been conducted).
IP1	«Procedural Enabler»	EN-140 - Process/procedure for provisioning and consumption of SeaSwim Information services	Services constitute the core of the service-oriented-architecture applied in SeaSWIM allowing possible [peer-to-peer] interactions between information providers and information consumers. In order to allow for the provisioning and consumption of services, as carriers of the information being exchanged/shared, processes/procedures of

			how to publish and discover services need to be defined (as e.g. how does the process look for including a service in the service registry and for discovering a particular service).
IP1	«Procedural Enabler»	EN-141 - Process/procedure for Service specification language changes	In order to allow changes of the service specification language and keep the language up-to-date, there has to be processes/procedures for how to change the service specification language
IP1	«Procedural Enabler»	EN-158 - Technical implementation framework (Swim Connector Blueprint) for SeaSWIM information Services	The establishment of an implementation framework supporting maritime actors to integrate to the Maritime Service infrastructure for provisioning and/or consuming data leveraged by SeaSWIM.
IP1	«Procedural Enabler»	EN-166 - Standard operating procedures for information sharing (principles)	Procedural templates for organisations, system users, information providers, service providers of SeaSWIM enabled information services, in how information can be shared in SeaSWIM information sharing environment.
IP1	«Service Enabler»	EN-029 - SeaSWIM Identity Registry	The objective is to manage an identity registry of maritime actors providing access rights to services.
IP1	«Service Enabler»	EN-069 - Collaborator Nomination Service	The objective is to nominate and set access rights to collaborators around information object (e.g. Voyage Object).
IP1	«Service Enabler»	EN-171 - SeaSWIM Access Management	The objective is to provide functionality to access services and information sources based on the desires of the service provider to enable trusted information exchange.
IP1	«Service Enabler»	EN-179 - Area Management service	The objective is to establish a single page for updated: - Legal and environmental requirements, - Nautical information, which is today contained in Pilot books, - Environmental information e.g. weather, ice, currents, tidal water, and - Safety warning.
IP1	«Service Enabler»	EN-186 - Route Exchange Service	The objective is to enhance the situational awareness by providing surrounding ships routes and displaying them on on board ECDIS or shore-based equipment.  A common route exchange format for route sharing between ship and shore.
IP1	«Service Enabler»	EN-191 - SeaSWIM or equivalent Services	A set of services within SeaSWIM or other providers will have to be developed for the full implementation of the nomination process, including automatic nomination. Geo-location of; reporting lines, regulation, entering- or leaving, depth restrictions and so on, in addition to time-regulations (ETA-dependent) will need to be established in order for the full implementation of the nomination process.
IP1	«Service Enabler»	EN-194 - Voyage	The objective is to provide information

		Information Service	regarding a particular voyage according to access rights.
IP1	«Service Enabler»	EN-197 - Port Call Optimisation Service	The objective is to coordinate and adjust actions related to other actors shared intentions and performances based on the set of states for a particular port call.
IP1	«System Enabler»	EN-006 - Need a cross industry group to implement new standards	Standards simply indicate how things should be done and they have significant consequences for all stakeholders. The process of standard making is important and it must reflect the choices by industry. In addition, standards should be flexible enough to appeal to the wider community and not only to certain stakeholders. Connected to this is also the process of their development and the consideration of the organisation through which the standards will be developed.  Making the systems STM compliant.
IP1	«System Enabler»	EN-054 - Technologies enabling continuous updates on ETA	Technologies enabling continuous updates on ETA and Port of Readiness (e.g. estimated, requested, confirmed, committed and actual times)
IP1	«System Enabler»	EN-055 - Enable access to recommended berth time from Port.	Port (some port actor founded in the terminals ability/desire to take the ship to berth) providing recommended arrival time at berth.
IP1	«System Enabler»	EN-084 - Automatic nomination granting access to route/voyage information by geo-location.	Functionality in SeaSwim (connectors) to add option of Auto-nomination of geo-location based actors (e.g. VTS, Ports, SRS, reporting areas).
IP1	«System Enabler»	EN-086 - Anomaly detection algorithm/function for route deviation	The technical development of reliable software services that can identify (and predict) when a pattern of a source for a ship, deviates from the published route (and risk assessment of these deviations).
IP1	«System Enabler»	EN-127 - Actor identity information services (provisioning and consumption)	The identity registry needs to be kept up-to-date and have such a status that it becomes used. This requires services for provisioning and consuming actor identities. To identify and qualify a certain actor as an identity in the identity registry existing registries, as managed by diverse associations, forms an important basis.
IP1	«System Enabler»	EN-133 - Implement standards for dynamic area information dissemination and acknowledgement, on-shore and on board	This is a new area that needs to be specified. Could be part of IHO S 121
IP1	«System Enabler»	EN-144 - SeaSWIM connector access verification module	In order to access information services there is a need for SeaSWIM connectors. The permission of accessing these do however need to be done by (electronically) asking the information provider whether the

			information service is allowed to be accessed by checking the nomination schema. For each connector such access verification module needs to be implemented according to the standards for access management.
IP1	«System Enabler»	EN-148 - Service discovery (service) mechanism	A generic functionality in SeaSwim enabling the discovery of a service as the carrier of the information that is requested. E.g. a port will be able through its SeaSwim connector, subscribe to VoyageIDs with planned destination to the port, without knowing anything about logical or physical address where the information can be retrieved. That information is provided by the service discovery mechanism.
IP1	«System Enabler»	EN-151 - Service registry	A universal service registry provides a list of all services possible to access when certain criteria are met – such as e.g. geographical region.
IP1	«System Enabler»	EN-160 - Technical integration with existing actor registers in shipping	The possibility to connect the Identity registry to existing catalogue services providing actor registries (such as managed by IMPA, FONASBA, IHMA etc.).
IP1	«System Enabler»	EN-161 - Tracking of data for evaluation	The system needs to keep track of contract that regulates the possibility to use performance data (estimates and actuals) for evaluation purposes
IP1	«System Enabler»	EN-167 - SeaSWIM connectors for port actor support systems	Real time and historical data extraction from actors port community systems. Enabled tracking of historical state changes. Connectors to existing systems necessary or more data generated manually requiring good interfaces.  When a Port Actor System (Agent system, port community system, Tug-operator system etc.) is to be integrated with SeaSWIM, this will be done by a specified and well-defined set of rules and standards, identifying with information services the actor system can (and will) support. Vendors of standard systems will develop standard connectors which can be used in every implementation of the system, whereas proprietary actor systems, will develop a dedicated SeaSWIM connector based on standardised framework, open source code or blueprints for SeaSWIM connectors.
IP1	«System Enabler»	EN-173 - Port Call message standard implemented in proprietary system	The technical and information standard Port Call Message, is implemented in various proprietary (or service provided) systems. ECDIS-equipment (including support services provided by the manufacturer), Port community systems, port approach systems, fleet operating centres.
IP1	«System Enabler»	EN-189 - ECDIS systems	Actual implementation of Route Exchange

		updated to be Route Exchange Format compatible	Format in various equipment on board and on shore.
IP1	«System Enabler»	EN-200 - Shoreside equipment upgrade to be Route Exchange Format compatible	To reach full benefits from the STM concept both ships and shore centres need to have systems that are STM and Route exchange compatible
IP1	«System Enabler»	EN-202 - Unique Voyage ID implemented in ship operators tools	Technical infrastructure for providing UVID (Unique Voyage ID) to Ship-operators (UVID, ID-series, Actor identification ID, etc.). The UVID must also be implemented in Shipping ERPs so that the UVID is used for all external communication about the Voyage.
IP1	«System Enabler»	EN-203 - System functionality for integration of global actor catalogue	Including information services, infrastructure and operations of a global actor catalogue (API, maintenance, etc.)
IP2	«Institutional Enabler»	EN-142 - Quality standards for SeaSWIM enabled services	Quality standards indicating requirements, specifications, guidelines or characteristics must be identified to ensure that the SeaSWIM services are fit for each of their purpose. Such standards are generally referred to as the evaluative standards that enable the users to assess service providers and their service quality. The discussion on quality standards also leads to the process of certification that is used to demonstrate compliance with the standards. It has been defined as 'the successful conclusion of a procedure to evaluate whether or not an activity actually meets a set of requirements'. Certification simply refers to quality assurance, which can either be provided by the service provider itself or by an assessment by a third party.
IP2	«Procedural Enabler»	EN-001 - Define method of access	In STM there will be information services that continually provide with information reaching a certain set of criteria. Methods for accessing such services, that either could be provided by the information owner or by a third-party actor, is defined by this enabler.
IP2	«Procedural Enabler»	EN-078 - Procedures for acknowledgement of information between ship and area manager.	New technical function needed, standard needed
IP2	«Procedural Enabler»	EN-146 - Service approval process	For each area of operations, i.e. in the coverage of the different concepts, there needs to be service approval processes established in which proposed services need to be met by certain criteria agreed among the members of the federation (such as the Port CDM council).
IP2	«Service Enabler»	EN-019 - Voyage Id Service	The objective is to provide unique voyage identity.
IP2	«System Enabler»	EN-008 - Access Rights for information object or parts of information object	Access rights to information services are designed so that the information owner can assign rights to segments (and parts of

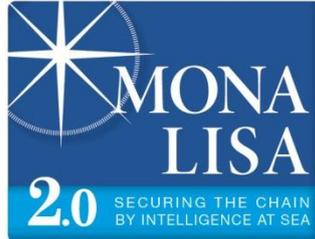
			segments) of the information object, using templates for different actor categories. E.g. an appointed agent for a certain port call of the voyage shall have access to the route-segments from the prior port to the actual port.)
IP2	«System Enabler»	EN-038 - Introduce SeaSWIM connectors	Introduce standards for implementing connectors to existing systems to allow services of STM to access and distribute voyage information to/from different systems
IP2	«System Enabler»	EN-056 - Synchronising capability matching Requested ETA (port) with ETA (Ship)	Standardised communication (information service enabling synchronisation of ETA and RTA. (Based on Port call format)
IP2	«System Enabler»	EN-075 - Signature (Verification) process for information reception and visualised. Both for on ship and onshore.	New technical function needed, standard needed
IP2	«System Enabler»	EN-095 - Allowed provision of sharing of performance data between different ports by using a standard way to address a port call (port call message format)	The port call optimisation service will provide statistics and performance measures for the port for internal use. This enabler is an information service accessible to other actors retrieving a standardised set of performance measures describing the port (potentially to be used for assessing the port's performance in accordance with the Port Maturity Model).
IP2	«System Enabler»	EN-112 - Enable nominated Optimisation service provider, submit optimisation parameters, route exchange, capture performances, access to area Management Traffic Weather	Information service giving access to Ship Particulars  Also needs EN-196.
IP2	«System Enabler»	EN-125 - Access key management system	A generic public-key-infrastructure provided by SeaSwim (implemented in the SeaSwim connector), ensuring the identity of the information requester/publisher so that the information owner/consumer do not have to provide any information security measures other those prescribed/implemented in the SeaSwim connector.
IP2	«System Enabler»	EN-145 - Service access classification framework	A framework supporting the implementation of SeaSWIM access management for SeaSWIM enabled information services (who, what, when, with what usage rights)
IP2	«System Enabler»	EN-147 - Service catalogue information service	A list of what information services (types) are available in SeaSWIM
IP2	«System Enabler»	EN-201 - Subscription of relevant ship reporting data in shipping ERPs	The provision of an information service for subscription of data reported to by a specific voyage (time-stamps, Statement of facts, statistics).
IP3	«Institutional Enabler»	EN-172 - Standardised certification protocol for on	IMO to issue standards for this verification protocol and to be implemented in IMO

		board verification of routes	893(21).
IP3	«Institutional Enabler»	EN-182 - A standard definition of a complete Voyage object and Voyage Information exchange standard format	Develop a standard framework for the information elements in the voyage object (plan).
IP3	«Institutional Enabler»	EN-206 - Established federation for definition of data to share	Established federation for the definition of which data to share and to quality assure that information sharing is made in a trustworthy way,
IP3	«Procedural Enabler»	EN-205 - Common understanding of timelines for optimised performance in multimodal integration	To develop a common model for understanding the effects of delays on available resources and efficiency in the process of arrival and departure in ports.
IP3	«System Enabler»	EN-204 - Interoperable platforms between different transportation systems	Interoperable platforms for sharing information between different transportation systems

## Appendix E MONALISA 2.0 Activity 2 Deliverables

- This Appendix lists the MONALISA 2.0 deliverables on which this report is based and where further details can be found.
- Collaboration in the Maritime Transport Ecosystem, MONALISA 2.0 – D2.3.1-12-3.
- DVM Concept Description, MONALISA 2.0 – D2.3.1-4.2, 2015.
- Envisioning Sea Traffic Management 2030, MONALISA 2.0 – D2.3.1-12-4.
- Finding Information in the Maritime Transport Ecosystem, MONALISA 2.0 – D2.3.1-12-2, <http://monalisaproject.eu/wp-content/uploads/Finding-Information-in-the-Maritime-Transport-Ecosystem-final.pdf>
- FM Concept Description, MONALISA 2.0 – D2.3.1-4.3, 2015.
- Formal Safety Assessment Case, MONALISA 2.0 – D2.3.1-11, 2015.
- Green Steaming: A Methodology for Estimating Carbon Emissions (2015) Avoided, Watson, R., H. Holm, and M. Lind, Thirty Sixth International Conference on Information Systems, Fort Worth.
- Performance Assessment Case, MONALISA 2.0 – D2.3.1-9.
- Port CDM Concept Description, MONALISA 2.0 – D2.3.1-4.4, 2015.
- Sea Traffic Management: A Holistic View, MONALISA 2.0 – D2.3.1-4.0, 2015.
- SVM Concept Description, MONALISA 2.0 – D2.3.1-4.1, 2015.
- Target Business Description, MONALISA 2.0 – D2.3.1-3, 2015.
- Target Human Aspects Description, MONALISA 2.0 – D2.3.1-7, 2015.
- Target Information-Systems and Information-Technology Description, MONALISA 2.0 – D2.3.1-6, 2015.
- Target Institutional Description, MONALISA 2.0 – D2.3.1-1, 2015.
- Target Systems Technical and Technology Description, MONALISA 2.0 – D2.3.1-5, 2015.
- Target Concept Business Case, MONALISA 2.0 – D2.3.1-2, 2015.
- Target Transversal Aspects Description, MONALISA 2.0 – D2.3.1-8, 2015.

- Understanding the Maritime Transport Ecosystem, MONALISA 2.0 -- D2.3.1-12-1, <http://monalisaproject.eu/wp-content/uploads/Understanding-the-Maritime-Transport-Ecosystem-final.pdf>



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