MONALISA 2 0_D2.3.1-4.1

The Strategic Voyage Management Description
Document Status

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TEN-T PROJECT NO: 2012-EU-21007-S

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1 General Information

The Sea Traffic Management (STM) concept has been introduced by the MONALISA 2.0 project. An overview description of STM can be found in the document “Sea Traffic Management – a Holistic View”.

Within STM, four enabling strategic concepts have been identified as crucial for reaching the target values. These are:

• **Port Collaborative Decision Making (PortCDM)**, in which the process for arrivals and departures is made more efficient through information sharing, common situational awareness and improved processes;

• **Strategic Voyage Management (SVM)**, which deals with route planning, route exchange and route optimization before the voyage has started;

• **Dynamic Voyage Management (DVM)** which deals with route planning, route exchange and route optimization whilst the ship is on its way;

• **Flow Management (FM)**, which includes services that will support both land organisations and ships in optimizing overall traffic flow through areas of dense traffic and areas with particular navigational challenges.

These are all enabled by:

• Information sharing by **Sea System Wide Information Management (SeaSWIM)**, which intends to be a common framework for information sharing and service distribution for maritime activities.

This document focuses on the definition and operational services included in the **Strategic Voyage Management** concept.

For a common, up-to-date list of abbreviations and definitions, please see The MONALISA 2.0 Definitions and Abbreviations List (STM Wiki, 2015\(^1\))

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\(^1\) [http://monalisa.viktoria.se/wiki/](http://monalisa.viktoria.se/wiki/)
2 Introduction

2.1 Background

Within the MONALISA 2.0 project, enabling operational concepts (strategic enablers) have been identified as crucial for reaching the performance target values. An initial set of performance targets for the future STM have been established in the STM Performance Framework.

The five identified enabling operational concepts are:

- Strategic Voyage Management (SVM)
- Dynamic Voyage Management (DVM)
- Flow Management (FM)
- PortCDM
- SeaSWIM

All of the above-mentioned operational concepts will be compiled together into a holistic STM Target Concept.

This document focuses on the Strategic Voyage Management operational concept, and is used as input to WP 1, Current Situation, WP 2, Target Performance, and WP 3, Target Concept.

2.2 Context and Scope

The operational concept Strategic Voyage Management (SVM) focuses on the initial planning phase of any sea voyage and the ability to monitor the execution of that plan. The overall objective of this operational concept is to:

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Optimize a company's initial planning phase of a voyage by enabling an up-to-date awareness of all influencing factors relating to the undertaking and success of the voyage being planned. This should be enabled at the earliest possible planning stage prior to voyage commencement. The planning horizon can be years, months, weeks or just hours.
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2.3 Expected Outcome of Strategic Voyage Management

2.3.1 Current Situation

The current operational situation related to the early planning of a voyage—the influencing factors and the areas of improvements that could increase the success rate of a voyage plan—is not adequately supported. There is at present a lack of support when it comes to planning a sea voyage from an initial scheme to the final
execution of an agreed plan in an efficient and collaborative manner amongst the involved actors. Furthermore, the involved actors who require sea traffic services are not able to commonly publish their needs, nor their available capacity and resources in the early planning phases.

Even though the European network SafeSeaNet is in use and is reducing the burden of administration, it does not sufficiently support collaboration such as the management of relevant regulations. SafeSeaNet is unable to address route alternatives for voyages between known locations in combination with existing geolocated regulations in various maritime sea areas. This is another influencing factor of the current administrative burden.

The initial planning and the execution of a sea voyage lacks a common approach which supports increased collaboration and the sharing of needs and intentions, and which takes into account existing regulations and changed influencing factors (e.g. weather). The current situation needs to be improved in order to maintain agreed-upon safety levels and improve the positive environmental impact and cost-effectiveness of sea transport.

2.3.2 The Administrative Burden in Current Sea Operations

The analysis of the current situation underpins the fact that the administrative burden is heavy in the current sea operations (ref “Understanding the Maritime Transport Ecosystem” in the Current Situation Report). This administrative burden is due to the complex and information-rich reporting requirements of operating ships within EU waters.

A ship which travels within EU waters is required to report to many different actors; there are regulations at international, national, and regional levels, and additional demand reports about different aspects of the transport. Companies, agents and service providers further require more “reporting” in order to coordinate and monitor the undertaking of the voyage.

The captains, shipping agents, or the ship operating company itself, do a lot of the reporting. Even though the information exists electronically, very little is shared and made available when the receiver demands it, without someone actually having to move it manually from one system to the other or by reporting or sending the information.

2.3.3 Performance Target

The analysis of the current situation has been an important foundation for developing and proposing a set of performance targets to be achieved in future sea operations. The main identified benefits of an improved strategic voyage phase of voyage management are:

• Safer, environmentally sound and more operationally efficient routes that take into consideration other ships, route conditions and the experiences of past voyages.
• More cost effective voyages by real-time, single-window coordination between customers and providers.
2.3.4 Strategic Voyage Management Target Concept

Purpose

The Strategic Voyage Management (SVM) concept focuses on the initial planning phase conducted by various maritime actors when planning what they need from a voyage. The content description of the operational concept covers a planned sea voyage and the lifecycle of a voyage plan (from the initial planning to the execution of the plan).

At the start, an idea of a cargo shipment or a shipping route is developed. If such an idea is to become a reality, several activities need to be coordinated. In the long run, efficiency is a key factor of reaching profit goals and being successful in a highly competitive transport market. But in this market, not only profit is central: safety and the environmental effects of operating are under scrutiny.

The main goal of the STM Voyage Management System is to enable an improved coordination between all involved parties by collecting and distributing up-to-date information to the right part immediately when it is needed. A maritime voyage is generally understood as the movement of a ship from one port to another. The successful execution of such a voyage involves a lot of parties (e.g. ports, authorities, charterers, pilots, port agents, traffic, crewing shippers, customs, emigrations office, etc.). In order to successfully execute the voyage, it is crucial that all parties know exactly when they are expected to take action, and what they are expected to achieve.

Connecting all service-providers related to a voyage in the strategic planning phase to the Voyage Plan STM services will keep all entitled parties up-to-date about changes such as delays in Estimated Times of Arrival (ETA), changes of the berth, changes of order, etc. The service-providers will then immediately request the influenced part to confirm the newly changed Voyage Plan. This will give actors a common situational picture which can enable each one to take pertinent action at the earliest time, based on high quality information. This will, in turn, aid in the achievement of higher success-rates on each voyage/transport.

A Voyage Operational Phase

A commercial maritime passage, or other type of sea voyage, consists of three major phases (depicted in Figure 1):

- Strategic Planning: The business plan mainly executed ashore by manufacturers, traders, ship owners/operators and charterers, with a time horizon of years, weeks, or days;
- Dynamic Operation: The nautical plan, the active navigation of the ship assisted by service providers with a time horizon of weeks or days;
- Tactical Action Mode: The interchange of near time fractions of the Dynamic Voyage Plan between ships, via AIS only, with a time horizon of hours or minutes.
In each phase, there may be different actors who focus on totally different aspects of the transport; business and contracting, legal aspects, nautical challenges, etc. (cf. Figure 2). The goals of the actors are intertwined and their success is thus dependent on each of the other actors in turn achieving their goal. Through STM services, they will all be connected in real-time and able to monitor the achievement of their goals; they will be able to act and react in a collaborative manner whenever deviations between voyage and plan occur.

The Future Life-cycle of a Voyage Plan

When defining the Strategic Voyage Management Operational Concept, one important aspect concerns the STM Planning Phases in relation to the life-cycle of the Voyage Plan.

The Voyage Plan is not to be understood as the pointed route of a voyage, although the route will at some point be part of the Voyage Plan. A Voyage Plan and its life-cycle (see Figure 3), connects all of the related actors and their individual plans. As
the execution of the plan is moving through different phases, each actor may monitor and react if the deviations from the plan affect them and their goals.

The Strategic Planning Phase is where the Voyage Plan is created using the STM services available to identify suitable solutions to the need at hand—be it a need for transport capacity or the need to fill a ship with cargo for the next trip. Through STM services, such as collaborator nomination, route catalogue services, identification of legal restraints on that route, post-voyage analysis reports, and Unique Voyage ID (UVID), the planner will be able to evolve the plan from an idea into a fully-developed voyage order.

**Figure 3: Voyage Plan life-cycle**

A Dynamic Voyage Plan is the Strategic Voyage Plan in an iterative condition; it shares information in real-time and updates voyage plans between involved parties in order to improve the safety, efficiency, environmental performance, and situational awareness on-board. The Dynamic Voyage Plan turns into a Tactical condition when enhanced situational awareness is required on the conning place on-board the ship.

**Description**

The Strategic Voyage Management operational concept focuses on the voyage planning process before the voyage commences. The target of SVM is to enable the voyage planners to make decisions at an early stage based on up-to-date and voyage-relevant information, thus increasing, even from a long-term perspective, the success rate of each Voyage Plan.

Whether there is a need for a scheduled shipping route or a single-ship voyage, a plan is needed to keep track of the necessary activities to be undertaken and the goals to be met. The STM Target Concept refers to this plan as the Voyage Plan. Sometimes this plan is nothing more than a string of basic ideas; at other times it describes the degrees of turn on a ship’s rudder necessary for clearing a reef. In order to make use
of the coordination benefits provided by the STM, the Voyage Plan needs to be shared amongst the various STM actors.

To achieve a successful cargo or passenger transport, it is important that all STM actors involved in the early planning do their job correctly, in the right order and at the right time. Today the plans of the different partners in the voyage activities each have their own individual operating-plan, and if the ship is early or late, the effect of this will only be known if the ship operator or captain informs them about this. If this is not done immediately and communicated to all parties who need to update their plans, they will all end up with deviating views on the situation. This results in an uncoordinated on-going operation and an uncontrollable outcome.

The consequences of delays in or poor handling of the information flow, normally lead to the ship being forced to adopt the service-provider’s window of opportunity instead of the other way around.

SVM will enable the user to follow and monitor a plan with various tools made available through the STM services:

• **Unique Voyage ID - Voyage Plan Identifier:** Through the use of a UVID, STM services will be able to coordinate individual voyages based on the voyage plan, and, during the ship’s journey, all collaborators’ statuses, such as quay availability, pilot-booking confirmation, tug, VTS, etc.;

• **Nomination of Collaborators:** As a consequence of the distributed nature of the STM design and the fundamental function that the data provider is the data owner and controller necessitates a flexible nomination of collaborators.

• **Post-voyage Analysis:** Initial voyage plans are available and updated through the entire lifetime of a voyage. This makes it possible to analyse the success of a plan and identify voyage elements which may be improved;

• **Route Catalogue:** By using the library of similar voyages in an STM route catalogue service, the planner will be able to choose a route path very close to that of a navigator, reducing the chance of big changes when the navigator is introduced to the plan;

• **Geographical Legal Restrictions for Maritime Operations:** STM will enable geo-located regulative restrictions to be more efficiently used as input in the optimization of a voyage. A Voyage Plan may at any stage be adjusted to comply with the regulations, or circumnavigate them. In both cases, the success of the initial (strategic) plan and its expected revenue will increase. In addition, geo-located regulations may reduce the administrative burden with regards to reporting requirements, as the navigational system will be able to identify and respond according to where the regulations and route intercept. This is done manually today, by either the agent or ship operator, and it is an administrative burden and thus a challenge for global transport today.
Figure 4: Voyage Plan life-cycle showing how the information flow enables collaboration (colours indicate the relation between the evolving Voyage Plan and the plan’s phases)

Through the sharing of the Voyage Plan at the initial planning phase, all entitled collaborators—such as ports, pilots, tugs, agents, terminal operator and maritime authorities—will have the same understanding of the status of the voyage. This will ensure that all actors are coordinated as the voyage commences, and, during the
dynamic phase, they will be kept up-to-date about any deviation and the need for new decisions to be made (c.f. Figure 4).

3 SVM Operational Services

3.1 Unique Voyage Identity Service

3.1.1 General Service Description
STM services will enable the flow of information to and from all parties participating in a voyage, be it a shipping company, ship, captain, authorities, agents, ports, etc. Each voyage will therefore be identified by a Unique Voyage Identifier (UVID) and all information related to the voyage will also contain this identity number. The UVID is like an ordering number in the world of commerce.

3.1.2 Objectives
The UVID is the technical enabler for correct information sharing by STM services. The objective is to make the voyage data secure, available, and easy to distribute and maintain.

3.1.3 Service Provider
The service provider is the accepted identity provider.

3.1.4 Area of Operation
The area of operation of the UVID is during the collection, distribution, and maintenance of voyage information.

3.1.5 Actors
STM services utilize the UVID; for example, voyage information services.

3.1.6 Operational Description
Each time a Voyage Plan is created, it will be given a UVID. The UVID is used as an identifier of information related to the plan. Any service provider taking part in fulfilling the plan will also use this UVID for his or her confirmation and updates to the plan.

3.2 Nomination of Collaborators Service

3.2.1 General Service Description
STM Voyage Plans will normally contain different types of information; some will be relevant to a certain actor/collaborator, some to another. Depending on what role the actors or collaborators are nominated for, they will be able to receive and update different parts of the information in the Voyage Plan.

During the strategic planning phase, STM focuses on the planning that takes place before the actual transport operation commences, be it years or days before.
Any information that is shared remains under the control of the actor owning it. However, in order to realise the full potential of the system, the information owner will need to distribute the information to other actors, such as captains, harbour-masters, port authorities, port states, etc. Some authorities and collaborators require mandatory reports, while other collaborators and actors will need the information in order to fulfil their part of the contracts regarding the voyages.

3.2.2 Objectives
The operational services that the STM introduces to the planner at this point are there to enable him to create an initial voyage plan, construct the framework of collaboration and make his or her needs available for the best-suited service provider to address and fulfil them.

3.2.3 Service Provider
The service providers are authentication and access-control services.

3.2.4 Area of Operation
The area of operation takes place during the planning and undertaking of a voyage/transport.

3.2.5 Actors
The actors are the creator and conductor of a Voyage Plan.

3.2.6 Operational Description
During planning there may be several services needed. By including the service providers in the Voyage Plan (however, only those parts of the plan that they require to fulfil their task) they will be able to ascertain, in an on-going fashion, when they are needed. Changes are visible to them in real-time, and therefore correct actions can be taken. Un-nominated service providers will not be able to see the Voyage Plan at all.

3.3 Post-Voyage Analysis Service

3.3.1 General Service Description
A Voyage Plan is created and validated in order to make a sea voyage as optimized and cost-effective as possible. This is elementary for any business. Nominated collaborators will be informed of changes and updates to the plan, thus making it possible for the plan-owner to identify and understand any deviations from the original plan. This, in turn, will enable corrective measures for future transports which can further the optimization process.

3.3.2 Objectives
The objective of this service is to enable a continuous optimization of maritime business through logging and analysis of KPI elements such as bottlenecks, deficiencies, service-providers not adhering to the plan, etc.
3.3.3 Service Provider
The Post-voyage Analysis Service is supplied by trusted post-voyage analysis service providers.

3.3.4 Area of Operation
• During the planning phase
• After voyage completion
• During the undertaking of the voyage, i.e. during sailing

3.3.5 Actors
• Shipping companies will have access to this service for both planning and analytical purposes, in order to improve and implement best practices.

3.3.6 Operational Description
A company which is planning a voyage takes many elements into account, such as efficiency, in-time-deliveries, and environmental aspects. All of these “planned” elements may be updated, deviated from, or completely changed during the undertaking of a voyage. The company will in this way be able to identify each deviation from the plan and take correct measures to ensure better practices during the next voyage, thus improving and optimizing its practices with each voyage.

3.4 Route Catalogue
3.4.1 General Service Description
For a long time, the shipping industry has been using AIS for position sharing. During coastal navigation, AIS data has also been sent to shore-based stations where the data has been logged and sometimes archived; even satellites receive AIS data. Together, this is creating a vast amount of historical data on the shipping routes of the world.

3.4.2 Objectives
This SVM service aims at improving transport/voyage planning by making this data available in a route-catalogue. This will reduce the amount of time spent on searching for optimal routes, changing planned routes, validating each route and finally undertaking the voyage. It also reduces the need for specific nautical expertise at this level of planning. In addition, as route-catalogues operate in a similar way to conventional road maps for on-shore transports, this will make cost-calculations faster and more precise.

3.4.3 Service Provider
The statistical data will be attainable through STM and supplied by route-catalogue service providers.
3.4.4 Area of Operation

- During the planning phase
- During the undertaking of the voyage, e.g. during sailing

3.4.5 Actors

- Shipping companies will have access to this service for planning purposes, route-selection, and cost-calculations.
- Ships will have access to this service for planning and validating, for route-selection and amendments.

3.4.6 Operational Description

With the AIS route history database available, a voyage plan for a ship could be created by searching the database for similar voyages; the database can offer a picture of different routes that have been used for a certain type of voyage. In general, this would improve the initial planner’s ability to plan quite reasonably without ever having set foot on-board a ship and without any specific nautical education. The ship will in turn receive the Voyage Plan with this route allocated and use the nautical expertise on-board to validate and update the route if necessary.

3.5 Geographical Legal Restrictions for Maritime Operations

3.5.1 General Service Description

There are numerous legal restrictions governing the operation of ships in various waters. By making use of established standards for electronically presenting geographic legal restrictions, this service will be made available to the maritime industry through the STM services and thereby reduce the administrative burden of planning, optimisation and reporting.

3.5.2 Objectives

Through SeaSWIM interface standards, SVM will enable the interaction and verification between an electronic route plan and the legal restrictions in the areas covered by the route. This “legal locational database” will increase the ability to plan and undertake a voyage from point A to point B without failing to consider all of the legal aspects regulating the waters to be traversed.

3.5.3 Service Provider

The digital maps of regulations will be provided by the governing body for those regulations—for example, international committees, flag states, harbours etc.

3.5.4 Area of Operation

- During the planning phase
- During the undertaking of the voyage, e.g. during sailing
• By the authorities, to monitor and detect deviations

3.5.5 Actors
• Shipping companies will have access to this service for planning purposes.
• Ships will have access to this service for monitoring and reporting services.
• Authorities will create and update their legal areas, and monitor and detect deviations by ships sailing through their areas.

3.5.6 Operational Description
During the planning phase, this service will make available a tool to validate the plan with regards to the legal aspects of a voyage. For example, if a transport of heavy fuel oil is to be made, by updating the STM Voyage Plan with these data the system will inform the planner of the legal implications of such a cargo, the sailing corridors, the need for piloting, the reporting requirements, and so on. In the past, this planning required legal assistance or at least knowledge that usually translated to extra costs or training.

4 Operational Services Outside the Scope of the STM Project
Based on the information flow that will be the basis for all services and benefits in the STM framework, other services are sure to evolve, even if they are outside the scope of the STM project today. The STM federation will of course have control of which “spin-offs” are to be included in the system. The services below are therefore merely examples of what could evolve.

4.1 Fleet Management.

4.1.1 Introduction
A route consists of several factors, such as the weather and current conditions throughout the route, regulations concerning the voyage/cargo/ship along the route, port-availability, traffic-congested areas, cargo handling, and “best-routes.” A ship uses several routes and a company uses several ships.

4.1.2 Objectives
The objective of Fleet Management is to enable companies to keep track of all their ship voyages and voyage plans, to analyse the success-rates of those voyages, and to identify areas of improvement for the company fleet as a whole or during individual voyages.

4.1.3 Service Provider
This service may be provided to any company within the maritime IT sector.

4.1.4 Area of Operation
Fleet Management may be undertaken on several levels; for example:
• A company/shipping agency may, in this way, keep track of its fleet
• A flag-state may, in this way, keep track of its flag members

4.1.5 Actors
• Shore-based controllers who monitor and support ships when deviations from(updates of the voyage plans are detected, or alterations are requested
• Ships which report their execution of the voyage plans or request to alter the voyage plans

4.1.6 Operational Description
Based on STM services, a company is able to monitor and support on-going operations from a strategic point of view. Earlier systems, which required continuous reporting by the captains/engineers/crew, will no longer be needed as the information systems communicate through standardised interfaces. Information will flow seamlessly between the different departments on-board and on-shore. The information flow will still be kept to a minimum with regards to bandwidth, as only necessary and updated information will be transmitted, and static information will not need to be re-transmitted.

4.2 Maritime Marketplace
The strategic phase of the planning process is when contracts and charterers are being confirmed and incorporated into a Voyage Plan. The need of cargo space of one part can thus be fulfilled by another part’s need for cargo capacity. When the Strategic Voyage Management phase is fully deployed, one could imagine an STM Marketplace emerging. The marketplace would be a virtual meeting place where different actors could update the STM system with their capacities and make them available for “purchase/booking” by another part who is in need of such capacities. The capacity could, for example, be a port for unloading/loading, or a ship-owner with available capacity to transport cargo. A pilot-dispatcher or tug-operator could also potentially use the marketplace to show and promote their capacity/availability.

If kept up-to-date about needs and availabilities of capacity, the marketplace would be the natural starting point of any Voyage Plan for many, if not all, actors. When in full use, the marketplace would ensure that a certain need for capacity is met in the most cost-efficient manner. Just-in-time (JIT) tie downs of capacities and delivery on time would be the key benefits of making the marketplace the starting point of any plan.

5 Discussion
Actors using STM services will be able to have a decision support system suited to their role in the maritime industry. A navigator will normally have a chart and radar system enabling him to understand the situation and act accordingly. Equally the shipbroker will use a system presenting the needs for transport and the availability of transport capacities, which allows him to understand and act accordingly.
The planner creating a Voyage Plan will be in need of information related to the plan he or she is creating. When a departure port and an arrival port are identified, the route options that are available would then be presented and the legal implications of each route would be made visible. When the type of cargo for the voyage is included in the plan, updated legal aspects could create a need for a different route selection. This elaboration and evolution of the plan at this stage is possible if the system in which the planner is working is connected to other STM services via standardised interfaces. The same is true both for the captain and shipbroker mentioned above.

The vast number of different actors within the information flow of the maritime industry will need an equal number of different decision-support systems; most of them already have such a system. The STM will not create a need for all of them to develop new systems, nor will the STM support many of them in this manner. However, by connecting their existing systems to other STM services, the flow of information will be available to all connected actors; that is, if nominated, the individual actor will receive information directly into her decision support system, which will give her the opportunity to see the situation from her point-of-view and act according to the business framework in which she is working.

In the strategic planning phase the focus is on the planning that takes place before the actual transport operation commences, be it years or just days prior to the operation. The operational services that STM introduces to the planner at this point are there to enable him or her to create an initial Voyage Plan, draw up the framework of collaboration through nomination, and make their needs available for the best-suited service provider to fulfill.

What follows is an example of several different actors working in different environments connected through STM:

A captain’s Voyage Plan is not the same as the harbourmaster’s berth-plan; their operational tasks are very different and based on different goals. Normally, their planning tools do not even look the same. However, there could be situations where the ship is planned for a port call that ties their plans together. In order for both the captain and harbourmaster to achieve their goals it is important that they both have the same updated information regarding the port –of-call. Any change in the captain’s plan—be it months ahead of the voyage’s start or during the final port approach—will be important to the harbourmaster for him to keep his operations at the highest possible standard. Likewise, any changes in the harbourmaster’s plan that affect the captain’s call to port should be communicated immediately, as the captain may choose to reduce to a more economical speed if the change forces a later arrival, or to choose another route if the harbourmaster’s change forces an earlier arrival. The timely sharing of updates in both of their plans in any phase of operation and planning will enable both to make the best decision about how to modify their on-going operations and increase their success rates. Similar situations where STM information sharing will provide positive effects between actors include:

- Ship owners – Captains
- Charterers – Captains (regarding availability and ETA)
• Charterers – Cargo receivers (regarding ETA, change of port, and just-in-time)
• Authorities – Ship owners or operators/captains
• Pilots – Harbour masters (regarding availability and ETA)
• Search and Rescue coordination centres – Captains (regarding positions, types of ships, speeds, etc.)
• Shore-based service providers – Captains (regarding positions, speeds, planned routes, optimization of routes)

All parties involved in the strategic voyage management phase of the Voyage Plan may later on, in the operational phase of the voyage, be kept up-to-date about any deviations. All parties will therefore be able to take immediate corrective actions and update the plan accordingly throughout the entire voyage; this will in turn make voyages greener, safer and more efficient from planning, through execution—all the way to the discharging point.

6 Conclusion

Actors using the standardised interfaces and services provided through STM will have a decision-making system suited to their role in the maritime industry. Navigators will have access to enhanced information which will enable them to understand a situation and act accordingly. Equally, shipbrokers will now be able to use information services which present the needs for transport and availability of transport capacities, and allow them to understand and act accordingly.
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