



STM Onboard Systems

Introduction

The purpose of this document is to describe the needs on onboard systems that will be able to support the operational needs for Sea Traffic Management (STM) and a System-Wide Information Management architecture (SeaSWIM) to be used in the Voyage Management test bed in the STM Validation Project. Further draft operational and functional needs on the onboard systems are outlined. Note that these are only draft needs, used for information purpose, and that the final specifications and requirements will only be detailed in the procurement tender for the onboard systems.

This document will be complemented with use cases and descriptions of operational services, together with processes and information needs, that will be included in the test beds.

Background

STM Target Concept

The goal of STM, as defined in the MONALISA 2.0 project, 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 normally understood as the movement of a vessel from one port to another. The successful execution of such a voyage involves a lot of parties (e.g. ports, authorities, charterers, pilots, traffic, crewing and more). 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.

By connecting all service providers related to a voyage in the strategic planning phase to the Voyage Plan via unique voyage IDs STM will keep all parties up to date on changes - such as delays in Estimated Time of Arrival (ETA), change of berth, change of order and other - and immediately request the influenced part to confirm the newly changed Voyage Plan. This will give all actors a common situation awareness enabling each actor to take correct action at the earliest time, based on high quality information and thus achieving higher success-rates on each voyage/transport.

SeaSWIM will support current and future systems used by the maritime industry by providing distributed, flexible, and secure information management architecture for sharing information. SeaSWIM will also help reduce infrastructure costs by decreasing the number of unique interfaces between systems by providing a common interface framework. Furthermore, human interaction is a scarce resource and shall be used effectively by allowing interactions to be automated where appropriate. It is desirable that service interaction can be

established without the need to make changes to the underlying systems, i.e. the services are encapsulated and self-contained, may be composed of other services and appear as "black boxes" to consumers. This foundational logic is mimicked from SWIM for aviation and from the definition of Service Oriented Architecture.

The basic logic behind STM builds upon the following principles:

- 1) A voyage is identified by a unique voyage identifier where information and all attributes are linked to the ID which enables information sharing
- 2) Operative intentions of sea- and land based actors are provided to authorized actors well in advance and kept up to date;
- 3) Trust is put in focus in the shift from personal contacts to ICT services;
- 4) A collaborative attitude is empowered in information sharing and decision making;
- 5) One single point of information entry;
- 6) Situational awareness is derived from multiple informational sources;
- 7) Secure and authorized service realization; and
- 8) Discovery and distribution of services are realized through an infrastructure governed by a federation.

Further, the following prerequisites are used in the STM definition:

- Master is in command;
- UNCLOS/COLREG not violated;
- Existing systems and initiatives are considered; and
- Information ownership is managed by access control and authentication.

STM is a framework, harmonization of data formats and standards for information management and operational services. Some of the standards enabling STM are:

- route exchange format;
- port call message format;
- text message format;
- time stamp definitions;
- service specification language;
- processes for approval, distribution, and discovery of services;
- processes for federated governance of service portfolio;
- access management;
- other STM message formats to be developed in STM Validation Project

Operational phases of a voyage

A voyage can be divided in the following operational phases where the route plays a vital role as carrier of information related to the voyage and vessels proceeding to the destination port.

Strategic Voyage Management (SVM):

- To optimise the voyage plan of a sea voyage before sailing; and
- To nominate collaborators and govern access rights to services and information.

Dynamic Voyage Management (DVM):

- To continuously adjust the voyage plan in order to run the ship in the most cost efficient, safe and sustainable way; and
- To enable information services giving a complete real-time picture for optimisation.

Flow Management (FM):

- To optimize throughput and increase safety of the sea traffic flow in congested areas; and
- To recommend arrival time to specific waypoints, denoted Flow Points, by using slot allocation.

Port Collaborative Decision Making (PortCDM):

- To provide a basis for collaboration between key actors within the port and towards its surroundings based on shared situational awareness enabling increased predictability;
- To enable just-in-time arrivals of ships, just-in-time operations and further on just-in-time integration with hinterland transportation leading to optimized turn-around processes; and
- To enable improved resource utilization for all involved port actors and optimized operations.

Distributed Information Management – SeaSWIM:

- To provide trustworthy information sharing and service framework including common standards, infrastructures, processes and governance.
- To enable federations taking responsibility for parts of the ecosystem such as:
 - IALA/CIRM – navigational data, infrastructure
 - IHMA/ESPO/IPCSA/Port CDM Council – port (reporting) data
 - IMO – definitions
 - Transport associations/BIMCO – goods information
- To enable automation of information exchange and reporting related to e.g.:
 - Single Window interaction
 - Traffic area report
 - Noon reports

Draft functional and operational needs for STM compliant onboard systems

In the Voyage Management test beds within the STM Validation Project the following functions and operations is anticipated to be supported by the onboard systems. Note that these are only draft requirements and that the final specifications and requirements will only be detailed in the procurement tender for the onboard systems.

Functionality and system design shall be made with the user need and system usability in focus where simplicity and intuitive shall be the guiding words.

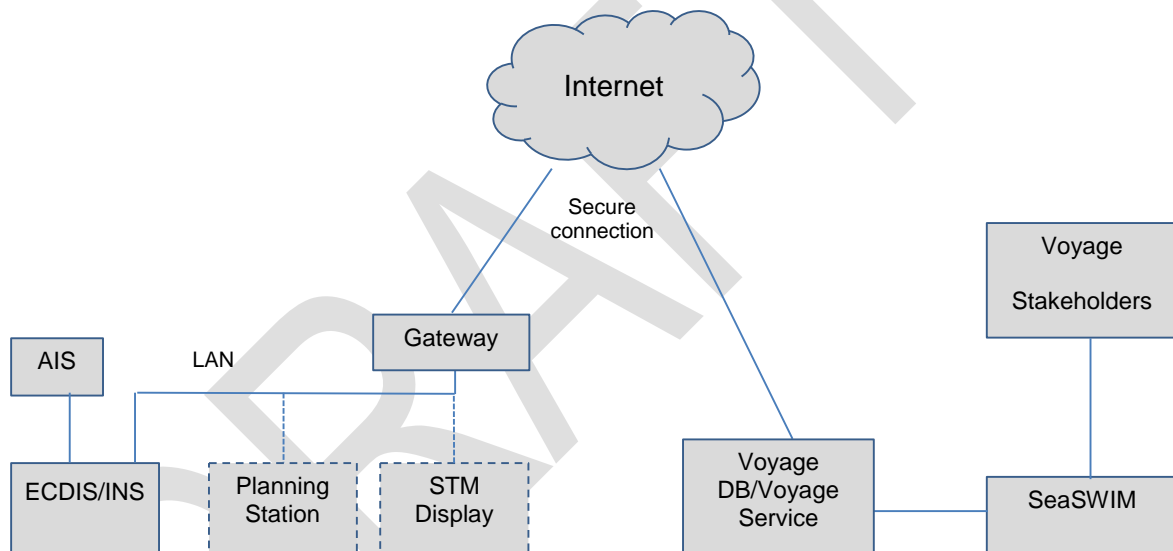
- SeaSWIM compliant according to architecture requirements to be put forward in the procurement tender of onboard system E.g. of expected SeaSWIM functions that needs to be supported
 - > Access rights
 - > Unique Voyage ID
 - > Identity registry
- Send and receive (Machine to Machine) routes in .rtz format (described in IEC61174 ed4.0 Annex S August 2015) between ship and shore.
- If not integrated system, see possible STM onboard system connection to ECDIS below: export, import and use voyage plans (route and schedule) that complies with the route exchange format (.rtz)
- Send and receive routes (segments) ship to ship via AIS (message 8) SN.1/Circ.2892 June 2010
- Other ships routes received via AIS (message 8) shall be presented in ship's ECDIS/INS.
- Send and receive updated voyage information e.g. new vessel time of arrival (PTA/ETA/RTA/ATA), position and other online navigation data in defined message format (preliminary port call message format)
- Communicate via text message function ship to shore and ship to ship from ECDIS and/or STM display (format to be specified)
- Support Maritime Spatial Planning information (S-121)
- Present areas (No-Go Areas or SAR-areas) in ECDIS and/or STM display. Format TBD.
- Carry out real time calculation of ETA to a selected WP (e.g. arrival traffic area or Pilot Boarding Position) along the route.

Possible STM onboard system connection to ECDIS

The onboard system that shall support Sea Traffic Management can be built, but not limited to, according to one of the three alternatives described below. Other alternative can be accepted as long as the functional requirements described above are fulfilled.

Integrated System

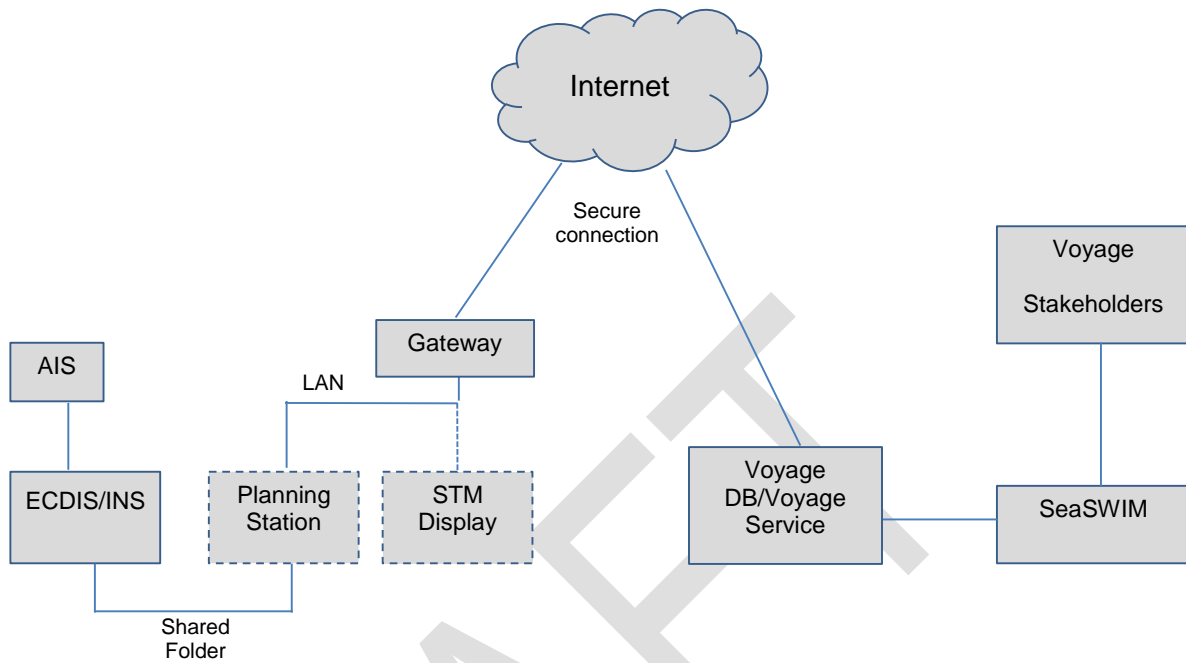
A fully integrated system where functionality is available in the ECDIS/INS or partly in Planning Stations and/or a STM Display (APP). Communication and information exchange with shore based stakeholders can be done machine to machine via a shore based service provider.



Interconnected System

A system where functionality is divided between ECDIS/INS that is interconnected to Planning Stations and/or a STM Display (APP) where the ECDIS/INS share the route folder with the Planning station.

ECDIS/INS shall as minimum be able to use Voyage Plans (route and schedule) as described above. The Planning Station and the STM Display shall provide support for all other STM functional requirements as described above. The system can be built on components from different vendors



Disconnected System

Same as Interconnected system but no physical connection between the ECDIS/INS and Planning station/STM Display.

Voyage plans are manually transferred between ECDIS/INS and Planning station by means of USB memory or similar.

