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Authors

Name	Organisation
Björn Andreasson	Swedish Maritime Authority
Håkan Heurlin	Swedish Maritime Authority
Anders Berg	Swedish Maritime Authority
Jouni Lindberg	Swedish Maritime Authority
Per Löfbom	Swedish Maritime Authority
Per Setterberg	Swedish Maritime Authority
Mikael Olofsson	Combitech
Cajsa Jersler Fransson	Swedish Maritime Authority

Review

Name	Organisation

Approval

Name	Organisation	Signature	Date

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1 Summary

1.1 General

This document contains the technical requirement for the procurement of STM ship system within the scope of the STM Validation Project. The document describes the scope of the required functional and technical characteristics of the systems. The technical specifications, APIs and xml-codes are anticipated to be accurate but some are yet to be prototyped. This means that minor updates might be necessary. Latest updates to the specifications will be presented at the latest before the negotiation phase of the tender is commenced in order to tenderers to take updates into consideration in their final bid.

1.2 Definitions

1.2.1 Terminology for denoting a requirement

The following requirement is valid throughout this document:

- A mandatory requirement is denoted with the word “shall” and must be fulfilled.
- A criteria is denoted with the word “should” and gives added value in the evaluation if fulfilled.
- NB. Other requirement specifications referring to this specification might stipulate that a should requirement is changed to a shall requirement.

All requirements are labeled with R-X.Y:Z, where X.Y is the current chapter number and Z is a consecutive numbering to separate each requirement within the chapter. There can be several “shall” or “should” in one numbered requirement, which means that all must be fulfilled in order for the requirement to be fulfilled.

Descriptive text occurs throughout the document but is not labeled.

1.2.2 Select, turn-on, set etc.

All functions that are said to be selectable, turned-on, set, etc. will implicitly also be said to be the reverse, i.e. de-selected, turned-off, de-set, etc. unless specified explicitly to something else.

2 General requirements on the STM ship system

In this chapter the requirements that cannot be categorized into one or more of the 5 different components of the STM ship system as depicted in Figure 1 below, is stated.

R-2.1.1. The Tenderer of STM ship system **shall** at milestone 2 prove that the STM ship system can exchange relevant payload formats defined in reference SeaSWIM specification.

R-2.1.2. The tenderer **should** be able to adopt to external standards and requirements i.e. RTZ that is being updated to S-421. See reference Standard forecast.

R-2.1.3. The tenderer **shall** assure that the delivered system adheres to all relevant requirements regarding normal functionality in all navigational equipment, The Supplier is fully responsible that all installations of software and/or hardware, fulfilling the tender specifications, does not interfere with existing navigational systems and that the System is compliant with existing rules and regulations including but not limited to SOLAS Ch V reg 17 on electromagnetic compatibility.

R-2.1.4. The Tenderer **shall** conduct appropriate training and provide documentation (manual) for onboard equipment users. The tenderer shall deliver all educational material to the ship in hard copy, CBT etc. The training material shall be held updated during the project period.

3 Functional/Technical Requirements

3.1 STM Ship system overall description

At least one navigation system workstation on the ship's bridge shall be able to interact with the STM Module. The main functions are; to receive voyage plan (VP) for further processing until used for navigation, to send the VP used for navigation to the STM Module, to send ETA to the STM Module.

Communication between the navigation system and the STM Module will ensure that the maximum possible degree of consistency is upheld between information held in the navigation system and the STM Module. If information consistency decreases due to the status of communication link between the navigation system and the STM Module, the communication status shall be known by both ends.

The STM Module is a set of software functions on some hardware that presumably is located on the ship. The STM Module may be integrated in the navigation system, if certification allows, it may be integrated into an existing planning station or it may be running on a dedicated device which is supplied by the supplier. If information consistency can be assured, the STM module can be placed ashore.

Communication between the STM Module and Online access point¹ will ensure that the maximum possible degree of consistency is upheld between information held in the STM Module and at the Online access point, depending on the online status of the ship. If information consistency decreases due to the status of communication links with the ship, the communication status and the age of information shall be known by both ends.

The online access point is constantly and stably connected to the internet and represents the ship towards other actors and services. The main functions in the online access point are the VIS, Port Information Service (optional) and the SeaSWIM Connector (SSC). The Online access point may be implemented onboard the ship or at another location. Each VIS is attached to a SSC and each ship has one (1) VIS instance.

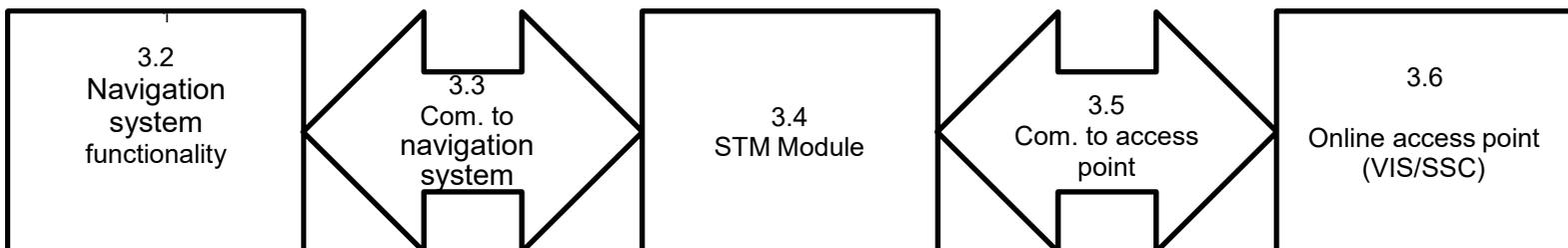


Figure 1

3.2 Navigation system functionality

Ship to Ship route Exchange

- R-3.2.1. The STM ship system **shall** be able to send and receive route segment via AIS, ASM message (8), according to Appendix 6 - Route Message system requirements, F1.
- R-3.2.2. The STM ship system **shall** be able to present route segment accordingly in navigation system.
- R-3.2.3. STM ship systems **should** be able to include legspeed in route message format.
- R-3.2.4. The STM ship systems **should** be able to make below mentioned calculations using RTZ (see requirement: R-3.2.7, R-3.2.8, R-3.2.9).
- R-3.2.5. In the STM ship system it **shall** be possible to make a default choice that the route message (and/or RTZs) will be shared or not, with other STM-ships.
- R-3.2.6. The STM ship system **shall** be able to present, via ASM message (8), according to appendix: Route message format (version1.0), info/flag on AIS targets that participates in STM test beds.
- R-3.2.7. STM ship systems **should** be able to calculate CPA and intersection points between own/other-ships route segments (including leg speed), even if the routes are not crossing each other.
- R-3.2.8. If a ship is deviating from its intended route (exceeding pre-set limits, geographically and in time, set by own ship), that **should** be presented on own ships STM ship system.
- R-3.2.9. It **should** be possible to do "Route Trial Manoeuvre" including own and other ships routes (including leg speed).
- R-3.2.10. There **shall** be a possibility to make a choice that **only** route messages from other ships that are chosen by the operator are displayed in the navigation system.

STM Ship System functionality in Navigation System

- R-3.2.11. The navigation system **shall** be able to upload and download VP to and from the STM Module. Communication between the navigation system and the STM Module will ensure that the maximum possible degree of consistency is upheld between information held in the navigation system and the STM Module.
- R-3.2.12. If information consistency decreases due to the status of communication link between the navigation system and the STM Module, the communication status shall be known by both ends. The

communication status shall be displayed to the operator.

R-3.2.13. When difference between real time ETA and PTA (to a predefined waypoint) is more than a preset value the operator shall get a question if the operator wants to update the PTA. (New PTA must be easy to set.) If yes, schedule in RTZ shall automatically be updated and sent to relevant STM actors.

R-3.2.14. It **shall** be possible to define which waypoint that is used for ETA calculations by setting a PTA at that waypoint (ETA in manual schedule in RTZ) to mark it as “synchronization” WP.

R-3.2.15. When RTA is received from STM-actors, the PTA shall be possible to be updated, using the received RTA. The route shall not have to be safety checked due to only updated schedule. When new PTA is set, the VP shall be shared.

R-3.2.16. It **should** be clearly visible that only the schedule has been changed.

R-3.2.17. Area received in STM text message format **should** be possible to display in navigation system.

3.3 Communication between STM Module and navigation system

R-3.5.1. The communication between the STM Module and navigation system **shall** have Information consistency (e.g. ship receives a VP in the STM module, accepts it, then the operator shall be able to choose it for monitoring in navigation system, it shall then be identical to the one in the STM module).

3.4 STM Module

R-3.4.1. STM module **shall** be able to send, receive and show text messages to/from other STM actor according to “STM text format”, in SeaSWIM specification, appendix 5 (e.g. Text body, Message subject, receiver id (actor id), sender id (actor id), reference to information object ID (e.g. UVID)).

R-3.4.2. The STM module **shall include** the functionality to communicate the following (but not limited to) to and from VIS/Online access point.

- Publish VP to VIS / Online access point.
- Retrieve VP proposals from VIS / Online access point.
- Send and receive VP, Area- and text messages to other STM services through VIS / Online access point.

R-3.4.3. The STM module **shall include** the functionality to show, create, edit and save VP. It **shall** be possible to graphically clearly distinguish received VP updates, e.g. route suggestions.

R-3.4.4. The STM module **should** by default attach an appropriate schedule to a monitored VP.

R-3.4.5. If an appropriate schedule is not attached to the monitored VP, operator **shall** get notified.

R-3.4.6. The STM module **shall** be able to set route status (by operator) according to RTZ format in SeaSWIM specification.

R-3.4.7. The route status “inactive” **shall** only be shared with other STM actors when the voyage is completed or cancelled.

R-3.4.8. OOW **shall** be made aware of relevant events such as incoming messages (VP updates, text messages new RTA etc.) The event shall be detectable from ships conning position. Above events shall not interfere with navigational information.

R-3.4.9. The STM Module **shall** be able to upload/download VP to/from the ships navigation system.

- R-3.4.10. Operator **shall** be able to search for service instances in STM module according to *SeaSWIM specification*, based on attributes available in service registry.
- R-3.4.11. Operator **shall** be able to search for services by means of Geometry (e.g. area search and/or Voyageplan search).
- R-3.4.12. STM module **shall** be able to present the service descriptions included in service registration.
- R-3.4.13. STM module **should** be able to present all relevant information available in instance descriptions as document (PDF, HTML).
- R-3.4.14. STM module **shall** be able to store lists of services (for offline purposes).
- R-3.4.15. The STM module **should** be able to support offline work when connectivity goes down, e.g. search for services and call them and when connectivity returns the “call” should be processed.
- R-3.4.16. If stored service list is used, the list **shall** be updated minimum once per day and/or when service is called to prevent old entries to be used.
- R-3.4.17. If search fails, the operator **shall** get an error message within 30 seconds.
- R-3.4.18. Operator **should** be made aware if “messages” has been sent or not, due to connectivity or other issues.
- R-3.4.19. Operator **shall** in the STM module be able to assign/remove access rights on information objects (VP) to services.
- R-3.4.20. STM module **shall** be able to present for the operator which actors that have been given access rights to VP.
- R-3.4.21. Operator **shall** in the STM module be able to share VP to selected services. It **shall** be possible to share a VP once or to set a service as a subscriber (i.e. automatically send future updates of VP).
- R-3.4.22. Operator **should** in the STM module be able to subscribe on a service.
- R-3.4.23. There **should** be a functionality in the STM Module to present relationship between different payload formats, e.g. a text message can be correlated to a VP.
- R-3.4.24. The STM Module **shall** be able to show navigational warning according to S-124 (See SeaSWIM specification).
- R-3.4.25. The STM Module **shall** be able to show area in STM text format.
- R-3.4.26. The STM Module **should** handle real time calculation (including

preplanned speeds) of ETA and or STG (Speed To Go to reach a WP at a given time) to one or more selected WP(s) (e.g. arrival traffic area or Pilot Boarding Position) along the route, not necessarily the last waypoint in the route.

R-3.4.27. The STM ship system **shall** automatically give the VP an Unique Voyage ID (UVID) using the maritime resource name (mrn) structure (see SeaSWIM specification).

R-3.4.28. When a STM actor has sent e.g. a VP to another STM actor (e.g Ship-Shore, Shore-Ship) the sender **shall** get information regarding that that message is “read” by the receiver. (Requires update of VIS technical design as an intermediary before the standardized service interface).

3.5 Communications between the STM Module and Online access point

R-3.5.1. Each ship ***shall*** have data link connectivity between the STM Module and the Online access point. The connectivity has the ability to be continuous with adequate capacity according the following:
Communication between the STM Module and Online access point ensures that the maximum possible degree of consistency is upheld between information held in the STM Module and at the Online access point, depending on the online connectivity status of the ship.
(Quantifying of above will be done in separate projects).

3.6 Online access point (Service Instance)

- R-3.6.1. The online access point **shall** hold a service instance that is the internet connected representation of the ship, the service instance shall represent the ship towards other actors via a SSC (service instance shall be based on latest service design VIS).
- R-3.6.2. The online access point **should** hold a service instance that is the internet connected representation of the ship, the service instance should represent the ship in receiving port call messages (PCMF) in port-call synchronization interactions towards other actors via a SSC.
- R-3.6.3. Online access point **shall** be able to expose and consume (to other STM actors) RTZ-format, S124-format and text format using VIS (See SeaSWIM specification).
- R-3.6.4. Online access point **should** be able to exchange PCM-format with other STM actors (See SeaSWIM specification).
- R-3.6.5. Online access point **shall** be permanently and stably internet connected.
- R-3.6.6. External events (according to service log specification) in and out to/from the system **should** be stored and logged for traceability. Events could include, but are not limited to: Exchange of VP and received S-124.
- R-3.6.7. Service **shall** be registered in service registry according to guideline (See SeaSWIM specification).
- R-3.6.8. All messages, sent and received, **shall** be validated against payload schema.

4 STM Cyber security requirements

4.1 STM Cyber security requirements

- R-4.1.1. Service instance in online access point **shall** adhere to requirements stated in SeaSWIM Connector Specification and SeaSWIM Connector Design.
- R-4.1.2. Each ship **shall** be individually identifiable for the receiver of information, hence a unique certificate for the ship shall be used as client certificate.
- R-4.1.3. The information owner **shall** implement authorization mechanism for external actors, that ensures only authorized external actors have access to its information (See also requirement R-3.4.19).
- R-4.1.4. Security events **should** be logged for traceability (time, denied access etc.) in Online access point.
- R-4.1.5. The communication between STM Module and Online Access Point **shall** be secured to hinder unauthenticated requests and unauthorized access to information. (e.g. VPN).

5 Non-Functional/Technical Requirements

5.1 STM identified non-functional requirements

- R-5.1.1. Information **shall** not be lost due to restart or due to no connection to internet.
- R-5.1.2. Information shared **shall** not exceed 400kb
- R-5.1.3. The online access point **shall** be available at least 99% of the time.
- R-5.1.4. The status of service call **shall** be clearly indicated (e.g. by symbols for OK, Error) to the operator. Reason for the error shall be presented in text. See VIS Technical Design for details.
- R-5.1.5. The response message from service call **shall** be possible for an operator to read. The response message may contain information regarding the service call even if call was technically a success, such as missing information in the voyage plan.
- R-5.1.6. The Online access point VIS-based instance **shall** return HTTP response (code and message/information) according to VIS Technical Design.

6 GDPR

6.1 GDPR requirements

- R-6.1.1. General Data Protection Regulation (GDPR) **shall** be applied.
- R-6.1.2. Personal information **shall** be avoided in the system.
- R-6.1.3. GDPR handling required in MCP **shall** be followed (See SeaSWIM specification).

7 References

- [1] SeaSWIM Specification v2.0, March 2019
- [2] SeaSWIM Connector Specification v2.2 March 2019
- [3] SeaSWIM Connector Technical Design
- [4] VIS (Voyage Information Service) Technical Design
- [5] Standard forecast v1.0, March 2019
- [6] [AIS] Route Message system requirement, F1, Oct 2017
- [7] Service Log Specification v3.0, March 2019
- [8] Updated STM Use Cases



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