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ABBREVIATIONS

AIS - Automatic Identification System
CDM - Collaborative Decision Making
DSS - Decision Support System
DWT - Deadweight tonnage
ECDIS - Electronic Chart Display and information System
GOFREP - Gulf of Finland Reporting scheme (supported by the VTS’s in the Gulf of Finland)
IALA - International Association of Lighthouse Authorities and Aids to Navigation
IMO - International Maritime Organization
INS - Information Service
MSI – Maritime Safety Information Service
NAS - Navigational Assistance Service
Port CDM - Port Collaborative Decision Making
SCC - Shore Control Centre
SIRE - Ship Inspection Report Programme
SMCP - Standard Maritime Communication Phrases
SOLAS - Safety of Life at Sea
SOP - Standard Operating Procedures
SOUNDREP – The Sound Reporting scheme (supported by the VTS The Sound)
SRS – Ship Reporting System
STM - Sea Traffic Management
TOS - Traffic Organisation Service
TSS – Traffic Separation Scheme
VDES - VHF Data Exchange System
VHF – Very High Frequency, radio frequency range. Common way of communicating at sea to sea & sea to shore
VTS – Vessel Traffic Services
VTSO - Vessel Traffic Service Operator
XTD – Cross-Track Distance
DEFINITIONS

Administrative burdens are defined as "administrative work which in the opinion of the stakeholder is not adding value proportionate to the resources the stakeholder will have put into the work to comply with specific rules and requirements".

Automatic Identification System – radio modem that automatically exchanges static (identity) and dynamic (navigation) data between ships and may transport ASM data structures.

Decision Support System, referring to the technical support system at hand in an operational environment in the Vessel Traffic Service or at bridge. It can incorporate several decision support tools, such as electronic charts.

Enhanced Monitoring: Enhanced monitoring will be an anomaly detection to detect if planned schedule is not kept or if ship deviates from planned route that is transferred to operators in a shore centres. Thus, shore centres can monitor that ships are following their planned route and foresee possible dangerous situations and suggest route modifications (geographic and/or speed) due to traffic or other impeding conditions.

Flow Line - A passage line used to mark the timing of ships passages in Flow Management.

Flow Management: Flow Management is the design, auditing and implementation of traffic control plans at shipping traffic projects. It describes a process through which the speed / timing of ships passage of a narrow strait is adjusted to achieve a safe and efficient traffic flow.

Flow Management Services will support both onshore organisations and ships in optimizing overall traffic flow through areas of dense traffic and areas with navigational challenges.

Route - a way or course taken in getting from a starting point to a destination. Shipping routes are the paths taken by ships across the world's seas. They are channels down to a hundred meters wide up to unrestricted , defined by compulsory points of passage (capes, straits, channels), physical constraints (current speed, depth, presence of reefs) and geopolitical contexts.

Voyage plan - A representation of the planned way to get from point A to point B, consisting of a list of waypoints (geometry) and information associated with the legs between waypoints, plus a Schedule, describing the planned time axis of a ships voyage.

Route exchange - Ships can choose to share their route with other ships, the electronic charts will show the surrounding ships routes for easy understanding of the situation. The standard format of the routes for exchange is RTZ.

Route Planning - can be defined as a method of deriving or computing the most cost/ time/ environmental effective route involving several waypoints/ nodes/stopovers by minimizing the distance traveled or time taken.
**Sea Traffic Management:** The aggregation of the seaborne and shore-based functions (sea traffic services, maritime space management and sea traffic flow management) required to ensure the safe and efficient movement of vessels during all phases of operation.

**Schedule** - The estimated timing of a voyage, i.e. ETA/ETD of waypoints, speed on legs, etc.

**Ship Reporting System** – SRS aims to keep a vigilant eye on the sea traffic. In cases of rendering help, the systems enable to give pieces of information about navigational hazards, medical advice, directing the closest ship towards the vessel in peril, and defining the area of searching SRS may be voluntary or obligatory.

**Shore center** – In a shore (control) centre the monitoring of several vessels or a dedicated area is performed by educated operators.

**Strategic Voyage plan** - Long-term planning that consists of

- A Route with
- A Voyage number (and other Route information)
- A list of waypoints (geometry)
- A Schedule (Time axis - ETA, ETD, Speed on legs, etc.)
- Charter parties, legal conditions, economic condition

When a Strategic voyage plan is given to the ship/captain as a voyage order it changes to Dynamic Voyage plan

**Tactical Voyage plan** - Tactical voyage plan is: A Dynamic Voyage plan in conning mode (tactical execution) The vessel is under Captains command and decisions are based on navigational and safety knowledge taken on legal basis (colreg). The tactical voyage plan can be transmitted between ships to increase situational awareness and enhance the planning of alternative legs to avoid close encounter

**STM compliance** implies that ships are equipped with STM compatible bridge systems or VTS with STM compatible VTS systems

**VHF radio** - Very High Frequency radio, the primary means of communication for VTS and vessels

**VTS area** - Area in territorial waters in which VTS is provided to the merchant fleet

**Vessel traffic services** - VTS - are shore-side systems which range from the provision of simple information messages to ships, such as position of other traffic or meteorological hazard warnings, to extensive management of traffic within a port or waterway.

**Vessel Traffic Management** - Vessel Traffic Management provides Vessel Traffic Service (VTS) to merchant shipping and other marine traffic and maintains safety radio operations. Vessel Traffic Services, a shore-based support service, are provided by the VTS Centres. The Centres' surveillance areas are typically
provided in constrained/ confined/ congested waters and in those with high shipping traffic intensity.

**Voyage Management Services** will provide support to individual ships in both the planning process and during a voyage, including route planning, route exchange, and route optimization services.

**Waypoint** A position marking the intersection between two legs in a Voyage Plan.
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1 General Information

In order to support STM BALT SAFE-project the initial definition of the situation and mapping of the compatible VTS-tools was made. This report was compiled by participants of the respective work package using their own expertise in defining the current traffic status.

VTS-centres already have a significant impact on traffic optimization in their areas. Now information is provided on VHF at reporting points, or when deemed necessary. The main improvement in focus is to digitalize the information to make it more user friendly and accurate for the ship board users. Other important effect of STM BALT SAFE project is that ships would have knowledge of each other’s routes in advance to have enough time to react accordingly. Never the less this will not lessen the importance of the VTS, who will always have the best overall picture of the traffic situation and the main interest to keep all vessels, people and environment safe at all times.

This document will describe the extension of concept that was initiated during earlier EU projects, Mona Lisa 2.0, STM validation and STM EfficientFlow

Flow Management concept developed earlier shall be extended to ensure safe traffic flow in densely trafficked areas. Information exchange ship-to-ship and ship-to-shore will be facilitated to make meetings, overtaking or crossing situations safer and more efficient.
2 Vessel Traffic Service

Vessel Traffic Services (VTS) contribute to the safety of life at sea, safety and efficiency of navigation, the protection of the marine environment, the adjacent shore area, worksites, and offshore installations from possible adverse effects of maritime traffic’ - SOLAS V-12

At its simplest, the main objectives of a VTS are to:

– Aid the mariner in the safe and efficient use of navigable waterways
– Afford unhindered access to pursue commercial and leisure activities, subject to any restrictions that may exist
– Contribute to keeping the seas and adjacent environment free from pollution.

Experience shows that, in general, these ideals are subject to potentially greater and more intense risks in coastal waters particularly at shipping congestion points and at the interface with ports and estuaries. The benefits derived from VTS can be of considerable value and, when properly implemented, outweigh the costs of provision.

IMO recognizes the importance and value of VTS as a vital tool in the management of several potentially high-risk geographic areas and for the protection of the environment.

Contracting Governments undertake to arrange for the establishment of VTS where, in their opinion, the volume of traffic or the degree of risk justifies such services (SOLAS V - Regulation 12). When planning and implementing VTS Contracting Governments shall, whenever practical, follow IMO Guidelines on VTS (IMO Resolution A.857(20)) and endeavor to secure participation in and compliance with, the provisions of VTS by ships entitled to fly their flag.

2.1 Vessel Traffic Service in Finland

Vessel Traffic Service Finland Ltd provides Vessel Traffic Service (VTS) to merchant shipping and other marine traffic and maintains safety radio operations. In Finland, Vessel Traffic Services are provided by the three VTS Centres of VTS Finland. The Centres’ surveillance areas encompass all coastal merchant shipping lanes and the Saimaa deep fairway. Service levels of different areas vary, Saimaa lake area, GOFREP and Åland TSS only provide Information Service (INS)

The goal of the Vessel Traffic Service is to improve the safety of marine traffic and facilitate the efficiency and free flow of vessel traffic. It also aims to prevent accidents and mitigate their potential environmental hazards.

To achieve these aims, the VTS Centres operate 24/7 all year round. Thanks to the continuous services, vessels receive information on matters related to safe marine traffic and navigation assistance at all hours. This also maintains a high service level of traffic organization service.

Operating from the Gulf of Finland Vessel Traffic Centre, Helsinki Traffic monitors international waters in the Gulf of Finland in cooperation with Russia and Estonia. The jointly organized ship reporting system GOFREP encompasses the entire Gulf of
Finland, except for territorial VTS areas. Traffic in the South Åland Sea TSS is monitored by Åland Sea Traffic at the Western Finland VTS Centre.

In addition to international cooperation, the VTS Centres work in close cooperation with authorities, ports and other partners.

Saimaa VTS maintains distress and safety radio traffic in the Saimaa region and forwards distress calls to the police, rescue authorities and other cooperation partners.

When necessary, VTS provides assistance to authorities and supervises compliance with the Pilotage Act.

2.2 Vessel Traffic Service in Estonia

Vessel Traffic Management provides Vessel Traffic Services (VTS) to merchant shipping and other marine traffic and maintains safety radio operations. In Estonia, Vessel Traffic Services are provided by one VTS Centres of Estonian Maritime Administration. The Centre surveillance areas encompass all coastal merchant shipping lanes.

The goal of the Vessel Traffic Service is to improve the safety of marine traffic and facilitate the efficiency and free flow of vessel traffic. It also aims to prevent accidents and mitigate their potential environmental hazards.

To achieve these aims, the VTS Centres operate 24/7 all year round. Thanks to the continuous services, vessels receive information on matters related to safe marine traffic and navigation assistance at all hours. This also maintains a high service level of traffic organization service.

Operating from the Gulf of Finland Vessel Traffic Centre, Tallinn Traffic monitors international waters in the Gulf of Finland in cooperation with Russia and Finland. The jointly organized ship reporting system GOFREP encompasses the entire Gulf of Finland, with the exception of territorial VTS areas.

In addition to international cooperation, the VTS Centre works in close cooperation with authorities, ports and other partners.

VTS centre maintains distress and safety radio traffic in the Gulf of Finland and forwards distress calls to the police, rescue authorities and other cooperation partners.

When necessary, VTS provides assistance to authorities and supervises compliance with the rules of pilotage.
3 Service levels

Vessel Traffic Services Finland has three different service types: information service (INS), traffic organization service (TOS) and navigational assistance service (NAS). These types of services can be used flexibly depending on the situation and position where the service is provided. Most of the operating is carried out on informative level but as soon as the situations get more complicated the VTS-operator starts organizing the traffic. Navigational assistance can be given where there is both AIS and radar coverage. It is used only for guiding a vessel to pilot boarding position or to a safe anchorage when a vessel has technical or other difficulties to navigate. The current situation is already quite optimized in Finland. A wide radar coverage with over 80 radars in VTS areas and VTS software-tools with a route library gives the operator possibilities to for example share information about meeting points and organizing traffic, if needed.

3.1 Information Service (INS)

Information Service provides relevant information at appropriate times and on request for the promulgated VTS area. An Information Service involves maintaining a traffic image and allows interaction with traffic and response to developing traffic situations. An Information Service should provide essential and timely information to assist the on-board decision-making process, which may include but is not limited to:

– The position, identity, intention and destination of vessels
– Amendments and changes in promulgated information concerning the VTS area such as boundaries, procedures, radio frequencies, reporting points
– The mandatory reporting of vessel traffic movements
– Meteorological and hydrological conditions, notices to mariners, status of aids to navigation
– Manoeuvrability limitations of vessels in the VTS area that may impose restrictions on the navigation of other vessels, or any other potential hindrances: or
– Any information concerning the safe navigation of the vessel.

More detailed examples of different types of information that may be provided by the VTS operating an Information Service will be found in IALA Guideline 1089 on Provision of Vessel Traffic Services (INS, TOS & NAS)

3.1.1 Provision of an Information Service

An Information Service should be provided when:

– Broadcasting information at fixed times and intervals, as promulgated in the appropriate navigational publications
– Deemed necessary by the VTS
– The vessel has requested information.
If a VTS is tasked with providing a maritime safety information service (MSI), guidance on this type of information is found in IMO Resolution A.706(17), as amended, – World-wide navigational warning service

3.2 Traffic Organization Service (TOS)

A Traffic Organization Service (TOS) is a service to prevent the development of dangerous maritime traffic situations and to provide for the safe and efficient movement of vessel traffic within the declared VTS area. It concerns the operational management of traffic and the planning of vessel movements and is particularly relevant in times of high traffic density or when vessel movements may affect the traffic flow. Traffic Organization Service may be provided in part, or all, of the declared VTS area.

3.2.1 Provision of a Traffic Organization Service

A Traffic Organization Service should be provided when the VTS is authorized to provide services, such as when:

–Vessel movements need to be planned or prioritized to prevent congestion or dangerous situations

–Special transports or vessels with hazardous or polluting cargo may affect the flow of other traffic and need to be organized

–An operating system of traffic clearances or sailing plans, or both, has been established

–The allocation of space needs to be organized

–Mandatory reporting of movements in the VTS area has been established

–Special routes should be followed

–Speed limits should be observed

–The VTS observes a developing situation and deems it necessary to interact and coordinate vessel traffic

–Nautical activities (e.g. sailing regattas) or marine works in-progress (such as dredging or submarine cable-laying) may interfere with the flow of vessel movement.

A Traffic Organization Service should be responsible for separating traffic in the interest of safety. This separation could be defined in space, time and/or distance. Enforcement may also be carried out within a Traffic Organization Service where the VTS should monitor adherence to applicable rules and regulations and to take appropriate action where required

3.3 Navigational Assistance Service (NAS)

Navigational Assistance Service is a service that provides essential and timely navigational information to assist in the on board navigational decision-making process and to monitor its effects. It may also involve the provision of navigational advice and/or instruction.

The Navigational Assistance Service is especially important in difficult navigational or meteorological circumstances or in case of defects or deficiencies.
A Navigational Assistance Service is an important supplement to the provision of other navigational services, such as pilotage. Navigational Assistance Service may be provided at the request of a vessel, irrespective of whether a pilot is on board, or when a navigational situation is observed and intervention by the VTS is deemed necessary.

Navigational Assistance Service requires positive identification and continuous communication throughout the process. If possible and if time permits, checks should normally be made prior to commencement of the provision of Navigational Assistance Service to assess the capability of the vessel to respond to the guidance given. An example of a checklist for provision of NAS is found in ANNEX B of IALA Guideline 1089, which should be modified as required for local requirements.

VTS operators should be appropriately trained and ready to deliver Navigational Assistance Service when a situation that compromises navigational safety occurs.

3.3.1 Provision of Navigational Assistance Service

It is recommended that a Navigational Assistance Service:

– Is provided to an individual vessel, at the request of the vessel or when deemed necessary by the VTS, to assist the decision-making process on board the vessel concerned. This service consists of navigational matters relating to a specific vessel and may include information, warning, advice and instruction subject to the authority of the VTS.

– Has a start and end time. It is important that information to assist the on-board decision-making is provided in a timely manner. It should be conducted in a clear and concise manner in order to maximise on board understanding and to eliminate the chance of misinterpretation and to minimize the risk of unwanted consequences.

Examples of developing situations where a Navigational Assistance Service may be provided:

– Risk of grounding
– Vessel deviating from the VTS sailing/passage plan
– Vessel unsure of its position or unable to determine its position;
– Vessel unsure of the route to its destination;
– Assistance to a vessel to an anchoring position
– Vessel defects or deficiencies, such as navigation or maneuvering equipment failure
– Severe meteorological conditions (e.g. low visibility, strong winds)
– Risk of collision between vessels
– Risk of collision with a fixed or floating object
– Assistance to a vessel to support the unexpected incapacity of a key member of the bridge team.

3.3.2 When should a Navigational Assistance Service be provided?

Navigational Assistance Service should be provided when:
A) Observed / deemed necessary by the VTS. This may occur when the VTS observes a developing situation (e.g. a vessel approaching shallow waters) and deems it necessary to interact with the bridge team. When the VTS observes a developing situation (e.g. a vessel deviating from a recommended route) and deems it necessary to intervene, it is likely that, under such circumstances, the immediate priority will be placed on providing the necessary assistance before attempting to formally negotiate the commencement of navigational assistance. However, once the immediate situation has been resolved, the continuation or completion of the service should be subsequently clarified, and the use of the checklist considered.

B) The vessel has requested the service. This may occur on request by a vessel in circumstances such as equipment failure or navigational unfamiliarity. Individual circumstances will dictate the degree of preparation that can be undertaken prior to commencing the Navigational Assistance Service on request. If possible, preparations should include an assessment of the capability of the vessel to undertake the passage safely and/or the risks involved if for any reason the VTS is not able to provide adequate navigational assistance.

The provision of navigational assistance does not absolve the master from the responsibility for the safety of the vessel; furthermore, the master should be made aware of any limitations that may affect the service provided. The VTS operator should also be aware of the specific responsibilities for collision avoidance that apply to the vessel. If possible and if time permits, check should normally be made prior to commencement of the provision navigational assistance to assess the capability of the vessel to respond to the guidance given. An example checklist for provision of NAS can be found in ANNEX B of IALA Guideline 1089, which should be modified as require for local requirements.

3.3.3 Methods of communicating Navigational Assistance

In providing a Navigational Assistance Service it is important that the interaction from a VTS centre to assist the on-board decision-making is conducted in a timely manner, is unambiguous and clearly understood by both parties and not open to interpretation.

Messages relating to Navigational Assistance Service should always be addressed by name to the vessel participating in the service so that there is no doubt to whom the content of the message is directed. Consideration should be given regarding the VHF radio frequency on which the Navigational Assistance Service should be provided depending on individual and local circumstances. An assessment should be made of the benefits of conducting the assistance on a discrete frequency so that interference from other users can be avoided, or the use of a common working frequency such that other users are aware of the likely actions of the vessel participating in the Navigational Assistance Service. Other options may be available if the participating vessel is able to monitor two or more frequencies.

3.3.4 Message Markers within Navigational Assistance

Although any message marker may be used when providing a Navigational Assistance Service, INSTRUCTION as a message marker should only be provided when the VTS Operator has been given the authority to use it within the Navigational Assistance Service. It is recommended as best practice that message markers are always used when delivering Navigational Assistance Service irrespective of the language ability of
the recipient. Navigational Assistance Service is often provided when a degree of stress or urgency exists, and the use of message markers can help to ensure that the purpose of each part of the message is clear and unambiguous.
4 GOFREP

Together with Estonia and Russia, Finland has set up a mandatory ship reporting system in the Gulf of Finland, GOFREP (Gulf of Finland Reporting). The system covers the international waters of the Gulf of Finland, east of the western reporting line. In addition, Estonia and Finland have implemented this mandatory ship reporting system in their territorial waters outside their VTS areas.

The Finnish area of responsibility covers the northern part of the GOFREP area, and it is monitored by Helsinki Traffic, operating in the Gulf of Finland VTS Centre. The southern area of responsibility of the GOFREP area is monitored by Tallinn Traffic in Estonia, and the eastern part of the Gulf of Finland is the monitoring area of St. Petersburg Traffic.

Instructions for vessels navigating in the GOFREP area are provided in the GOFREP Master’s Guide.

The Gulf of Finland has four traffic separation schemes, which are located in the sea areas south of Hankoniemi, Porkkala, and Kalbådagrund, and the western sea area of Kõpu. In addition, Russian territorial waters have traffic separation schemes maintained by Russia. With Traffic Separation Schemes (TSS), vessel traffic is directed to follow certain routes in sea areas of heavy traffic, and traffic in opposite directions is separated.

GOFREP is an information service. The Traffic Centres provide shipping information related to the safety of navigation, for instance navigational warnings and information about traffic, weather or conditions.

During the period when the Gulf of Finland is covered by ice, ships reporting to the traffic centres will receive information on the recommended route through ice as well as the name of the icebreaker and its working channel.

During difficult ice condition the traffic separation schemes in the Gulf of Finland, or parts of these schemes, may be temporarily withdrawn. Information about the decision is given on daily ice reports and navigational warnings.

4.1 Information provided

GOFREP is an information service. The Traffic Centres provide shipping information related to the safety of navigation, for instance navigational warnings and information about traffic, weather or ice conditions.

During the period when the Gulf of Finland is covered by ice, ships reporting to the Traffic Centres will receive information on the recommended route through the ice as well as the name of the icebreaker and its working channel.

During difficult ice conditions the traffic separation schemes in the Gulf of Finland, or parts of these schemes, may be temporarily withdrawn. Information about the decision is given in daily ice reports and navigational warnings.

4.2 Reporting requirements

Ships of 300 gross tonnage and over are required to participate in the mandatory ship reporting system.
Ships under 300 gross tonnage are required to report in circumstances where they:

a) Are not under command
b) Are at anchor in the Traffic Separation Scheme
c) Are restricted in their ability to maneuver; or
d) Have defective navigational aids

Ships under 300 gross tonnage are encouraged to listen to the relevant VHF traffic channel

4.3 Current traffic situation in GOFREP

The number of vessels transiting the Gulf of Finland has increased significantly during the last years and will further increase in the future. With the heavy passenger traffic between Helsinki and Tallinn, and the rapid development of Russian oil harbours, the traffic image has also diversified. The increase in maritime traffic along the Gulf of Finland has necessitated the introduction of risk control measures for the gulf area.

The main safety concern related to the increasing ship traffic in the Gulf of Finland is the increase of the risk of collisions between different types of vessels, and environmental damage due to subsequent oil spills. In particular, the passenger vessel and recreational boat traffic, intersecting the tanker routes in the area between Helsinki and Tallinn, is seen to cause a potential threat to the safety of navigation and to the marine environment.

4.3.1 Common traffic situations & incidents

As the traffic in GOFREP is closely monitored there are examples of different traffic situations to be found. VTS Finland produces incident reports to be sent to the respective flag states of the vessels in question. Following screenshots and reports are from actual reports produced by vessel traffic operators monitoring the GOFREP area traffic. Vessel names and other info identifying vessels are removed, also timestamps have been removed. Times presented are in form where initial report starts from time 00:00 and times following are just indicators to show how long was the time until different actions were made.
Close quarter situations

00:00 Vessel 1 passing reporting line northbound. VTS observed that the vessel 1 has a small CPA 0.1nm with two westbound vessels

00:01 VTS contacted the vessel 1 and asked about the vessel’s intentions. No action was made by the vessel so VTS advised the vessel to keep a safe distance and pass astern of the westbound vessels

00:03 VTS contacted the vessel again and advised to alter course more to starboard to keep a safe distance. The two westbound vessels also altered course to starboard to keep a bigger distance to the vessel
VTS monitored a close quarters situation with vessels A and B where the give way vessel was A. VTS called vessel A on channel 60,16 and made a DSC-call with no reply. VTS informed A about the close quarters’ situation. Vessel A informed VTS that they will go behind of vessel B.
00:00 Vessel B contacted Vessel A on channel 16 and asked about the vessel’s intentions, CPA was 0.2 Nm. Vessel A replied that they will alter course to starboard.

00:10 VTS observed that no actions were made by Vessel A to avoid the close quarter situation. VTS tried to contact Vessel A on channel 60 without success. After several calls Vessel A answered on channel 16. VTS advised the vessel to alter course to north to avoid a close quarter situation with Vessel A.

00:14 Vessel A informed VTS that they are also altering course to starboard.
Vessel A south-westbound was first contacted by Vessel B on their starboard bow. Vessel B asked for their intention due to small CPA. Vessel A said that they do not want to change course even though they were the give-way vessel. After some discussion they changed 3-5 degrees to starboard, CPA still close to zero. At this point VTS contacted Vessel A and informed them that they were the give-way vessel and had to turn to starboard immediately to avoid collision. After some discussion they altered course but reluctantly. Vessel B also had to turn to starboard to avoid collision.
Overtaking situation, congestion

00:00 VTS noticed that vessel A made a turn to starboard directly in front of the vessel B’s bow.

00:01 VTS asked from vessel A what was her intention.

00:02 The answer from the vessel was that "I alter my course and coming back to 296".

00:03 Vessel B called VTS and asked if the situation was noticed. They told that if they had not acted, they would have had a collision.
Vessel A entered the TSZ of Helsinki TSS. VTS informed the vessel about the situation. Officer answered that they are overtaking Vessel B and that was the reason they were inside the TSZ.
Wrong route selection

00:00 VTS noticed that vessel A with draught=10.6 m bound for anchorage area started to alter her course to starboard towards 9.0 m fairway. VTS asked the vessel about her route plan and the vessel confirmed that she was going to use the fairway north of Kalbådagrund lighthouse. VTS told the vessel that she cannot use 9.0m fairway with a draught of 10.6 m and requested the vessel to pass Kalbådagrund lighthouse on the south side. The vessel agreed to do so and altered her course to west.

00:25 VTS noticed that the vessel was going very close to the 9.9m shallow, warned the vessel about the shallow and advised to take more to south. The vessel agreed and altered her course to port away from the shallow.
5  VTS Operational procedures

Operational Procedures are an integral part of a verifiable safety management system for VTS. A properly implemented quality control system, approved by the Competent Authority, can ensure that the standards set for the types of service are consistently maintained and that the service is delivered safely and effectively.

The development and maintenance of VTS centre specific operational procedures is a continuous process. To ensure the safe and efficient management of the service, it is critical that:

• VTS Staff are made aware of changes and amendments; and
• Auditable and documented processes are developed that enable the early and effective update of operational procedures.

Best practice indicates that new or changed procedures should be communicated at the watch handover and incorporated into the operational procedures handbooks/manual.
6 Utilization of STM services in relation to IALA guidelines

According to IMO Resolution A.857(20) Vessel Traffic Services are implemented to improve the safety and efficiency of vessel traffic and to protect the marine environment. The service should have the capability to interact with the traffic and to respond to traffic situations developing in the VTS area.

Decision support is a way to help VTS personnel make decisions in routine or non-routine situations. It is especially useful for VTS personnel facing decisions about developing situations or emergency situations.

Decision Support Tools (DST) are used in VTS centres to enhance situation awareness by assisting VTS personnel. These tools can assist VTS personnel decision making activities at operational, tactical and strategic levels.

STM services are technical decision support tools and value adding services for shipboard- and VTS personnel.

6.1 Current STM services

By using standards and creating interoperability Sea Traffic Management is opening for an endless number of services. Below you find descriptions about the STM services that are currently in use or in validation.
6.1.1 Route Cross-check

The intended voyage plan is sent to a shore-based service provider for cross-checking. The purpose is to include updated regional area information that could affect ships voyage plan. The cross-checking can be done before the vessel’s departure or before arrival at a certain geographical area. The cross-check can include, but is not limited to, Under Keel Clearance (UKC), air draught, no violation of no-go areas, MSI and compliance with mandatory routeing.

No optimization service as such is included in the route validation.

6.1.2 Route Optimisation

The route optimisation tools will be different in nature with a common purpose to provide more information for the navigator on board. The STM concept will provide the means to get the ships route optimised from different service providers. The service providers have different focus including best route regarding; the weather forecast, surface currents, fuel consumption, no-go areas regarding draft, areas with sensitive nature, conflicts with other ships routes etc.

6.1.3 Ship to Ship Route Exchange

Introducing route exchange ship-ship, will give the intentions of other ships. The route exchange will solely introduce a new tool which helps the OOW to plan ahead, foresee possible dangerous situations and reduce route detours due to traffic conditions.

Nothing in the current “navigational process” will be changed, the master is still responsible and COLREGs are always in force. The route exchange should be used to avoid close quarter situations.
6.1.4 Navigational Warnings

With the new Baltic Navigational Warning Service, navigational warnings can be sent directly to the on-board ECDIS via digital communication, machine to machine. The new service allows warnings to be sent only to those affected and deleted when no longer relevant, thereby offering greater accuracy, relevance and less administrative burden and, thus, increased safety at sea. A huge step forward from Navtex.

6.1.5 Enhanced Monitoring

Enhanced monitoring will be supported by adding route information and a more detailed service than present VTS can be provided; shore centres will be able to detect if planned schedule is not kept or if ship deviates from planned route. Thus, shore centres can monitor that ships are following their planned route and also foresee possible dangerous situations and suggest route modifications (geographic and/or speed) due to traffic or other impeding conditions.

6.1.6 Port Call Synchronisation

To make sure that the ship does not arrive before the port is ready, the ship and the port Exchanges Estimates in order to find the first available time when all resources to handle the port call are available. This is made as early as possible to let the ship adjust the speed and possible save fuel. The goal is for all ships to arrive just-in-time, and thus remove the need for anchoring.
6.1.7 Port Call Optimisation

The key actors within a port call make their plans transparent to the others. Transparency automatically leads to efficiency in the whole process chain. By sharing towards the surrounding, the port actors increase predictability and create just-in-time processes; not only the arrivals and departures of ships, but just-in-time operations all thru the port call and further on just-in-time integration with hinterland transportation leading to optimized turn-around processes. This leads to improved resource utilization for all involved port actors.

6.1.8 Winter Navigation

Information regarding best route, waiting positions, preparations for assistance, position in convoy, time for departures from port is important for the Icebreaking services. The information should preferably be transmitted directly to ships navigation system. Introducing route exchange will give both Icebreaker services and assisted ships better information in more automated procedures reducing workload and risk for misunderstandings.

6.1.9 Importing Pilot Routes

By importing and merging the approach routes when planning the ship’s route, replanning is avoided. It also means that the bridge officers and pilots will have a shared mental model of the voyage during the piloting stages of the voyage. The service is currently available for all Swedish and Finnish ports.
6.1.10 SAR – Search and Rescue

Introducing STM in SAR services will greatly improve MRCCs overview and possibility to control SAR-units in search operations. The MRCC will be able to send areas and routes to SAR-units, which will be directly visible in the electronic charts on-board.
7 New added value services

7.1 Automatic route checking

VTS will have capability to perform automatic route check that considers the ships domain, draught and route plan with XTD-limits. Benefits of this service will be increased awareness of traffic and increased traffic monitoring support. Performing route check contributes to the safety of the business.

7.1.1 Use Case: Route Crosscheck (automatic)

Ship sharing route

1. Ship shares it VP with VTS using STM-compatible equipment
2. Receivers equipment shall send acknowledgement “route received” to ships equipment
   - VP must be visually presentable in VTS software
3. STM-compatible shore system performs automatic route check
   - Route check considers ships draught and XTD-limits in relation to fairway limits, AtoNs and depth contours
4. A) If VP has been validated by the STM-compatible shore system concerning the variables above, system sends “route checked” to ships STM-compatible system.
4. B) If VP has not been validated due to variables above, system sends notification of hazards within variables above with location
   - Location of hazards shall be shown visually in ships system

7.2 Identification of close-quarter situations

Identification of close-quarters situations contribute to the safety of the traffic. This solution will use the flow management capabilities developed in STM EfficientFlow.

7.2.1 Use Case: Close Quarters Situation

Meeting between two ships

1. Two ships (Ship A and Ship B) will have CQS if present voyage plans are followed
2. Both ships share their VPs (including planned speeds) with VTS using STM-compatible equipment
3. Meeting points to be calculated in STM-compatible system and presented in VTS software
   - VTS uses their own software to ensure meeting points with actual and/or planned ship speeds. Actual speed will be used for the current leg and planned speed for other parts of the route. Optionally, calculation can be done using actual and VTS software speeds (e.g. schedule calculated based on AIS speed and/or historical data).
To prevent getting CQ alerts constantly when normal meetings take place, only true route plans from ships are used even if simulated routes would be at hand due to the inaccuracy of simulated routes.

7.3 Predicting unsafe meeting points

Extension of flow management capabilities developed in STM EfficientFlow

7.3.1 Use Case: Predictions

Meeting with two or more ships in area where it’s unsafe/forbidden to meet or where there will be congestion

1. Two or more ships will meet in unsafe/forbidden/congested area if present voyage plans are followed
2. All ships share their VPs (including planned speeds) with VTS using STM compatible equipment
3. Meeting points to be calculated in STM-compatible system and presented in VTS software

- VTS uses their own software to ensure meeting points with actual and/or planned ship speeds. Actual speed will be used for the current leg and planned speed for other parts of the route. Optionally calculation can be done using actual and VTS software speeds

- Unlike with the CQ’s, simulated routes can be used in addition to STM- or other ship-sourced RTZ-routes. The assumption is that the meetings considered in this user story are taking place in relatively tight fairways, that makes the accuracy of simulated routes well enough to be used in this context.

7.4 Sending route proposals

VTS shall be able to send route proposals to ships. Typical example of use of this service is ship approaching port that has two fairways and due to variables, such as draught the route made by the ship is unsuitable.

7.4.1 Use Case: Route proposals

Ship using wrong/unsuitable route

1. Ship enters to monitoring area/ is to enter the area
2. VTSo checks visually the route and observes / gets notification from system of a CQS / somehow finds a need to changes in the planned route
3. VTSo opens FairwayLibrary and copies a link to a RTZ-route snippet that represents the altered path VTSo sees proper for the situation (select)
4. VTSo communicates the need for alteration to ship using STM Messaging/ RTZ/ the best possible means available (deliver)
5. VTSO pastes the link to the RTZ-route snippet to STM Messaging and sends it to the ship
6. OOW receives the link, downloads the snippet from the FairwayLibrary
7. OOW attaches the snippet to the Voyageplan and uploads the updated version to navigation system
8. VTSO receives acknowledgment of changes from the system
9. VTSO checks the new routeplan visually and sends acknowledgment to the ship

7.5 Detection of route corridor deviation
VTS system shall be able to detect if ship is deviating from her monitored route XTD-limits.

7.5.1 Use Case: Route Corridor Deviations
Ship drifts outside its route XTD-limits
1. (make basic level assumption first)
2. Ship enters area
3. Ship drifts slowly away from its planned route
4. Still navigating in safe waters, with a heading that is not too wrong, ship crosses areal default alert limits or ships planned XTD
5. VTSO gets a notification of deviating vessel from the system
6. VTSO focuses on the situation, analyzing that there is no obvious reason for the vessel not to follow her planned route
7. VTSO follows for a while the situation with no changes or excuse for the deviation
8. VTSO contacts the ship using STM Messaging/conventional means letting them know that an un-obvious deviation from the planned route is noted, asking if everything is OK
9. OOW acknowledges that everything is OK and ships course will be altered to lead to the original route plan
10. OR OOW observes first time the deviation and detects a fault in her navigation equipment’s
11. Or OOW informs VTSO that there is a conflict with the rudder under repair

7.6 Distribution of AtoN-faults
Distribution of AtoN-faults to STM-compatible onboard systems will provide more information for ships navigating the fairways. AtoN-faults shall be visually presented in the ships STM-compatible equipment. Technical solution is using the Baltic Navigational Warning Service.
8 Conclusions

The common incidents and traffic situations presented in this document provide justification for developing new decision support tools for vessel traffic services and the extension of Sea Traffic Management-concept. New added value services will contribute to the efficient, economic, safe and environmentally sound maritime transport in the Gulf of Finland.

Increased situational awareness and utilization of new technologies in vessel traffic services also enables the participating project partners in the Baltic Sea to cope with the increasing traffic in the area. In long run the development of services and technology also provide foundation for automated navigation and autonomy, which currently are the emerging trends in maritime transport along with increased and more open information exchange.
Using STM to increase BALTic Sea SAFEty

Making the Baltic Sea even safer by improving the situational awareness on ships and shore, building tools that automate work and provide decision support to prevent risk situations and accidents.

Making STM happen!

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