STM AND VDES

E-Navigation underway 2018
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• Working 13 years for Saab Dynamics (cruise missile navigation and Gripen C/D integrated navigation)

• Working 19 years for Saab TransponderTech.

• Currently: Director of Strategy & Portfolio TransponderTech Products
  – Project Manager STM
  – Future products
  – Portfolio Management
STM AND VDES

- VDES – Next Generation AIS
- E-Navigation and Sea Traffic Management

VDES & STM are interlinked
BACKGROUND – WHAT IS VDES AND AIS

- Currently 140,000 merchant ships carry professional AIS Shipborne products (estimated).
- Traffic control centres globally can communicate dual way with the shipborne units via base stations.
- Saab is a leader in this field with an installed base of >23,000 shipborne units and >2,800 base stations.
- AIS has been in operations since year 2002 and VDES will be from ca 2019/2020.

AIS: Automatic Identification System
VDES: VHF Data Exchange System, next generation AIS
CURRENT SHIP BORNE (ON BOARD) AIS & DGNSS SYSTEM

Ship owner’s cost:
1) AIS/VDES 3600 EUR
2) DGNSS 2000 EUR
3) Installation + antennas 1900 EUR

Total cost for ship owner 7500 EUR
RATIONALE FOR VDES

• AIS has been successfully introduced by the International Maritime Organization (IMO) for maritime navigation in 2002. Since then, virtually all commercial ships and recreational vessels have been equipped with AIS – world wide.

• The expanding use of AIS has already caused a significant load on the capacity of the VHF Data Link (VDL) – its overloaded in some busy areas.

• The next generation AIS – internationally called the VHF Data Exchange System (VDES) – will take into consideration the future requirements for more data exchange capabilities. Thereby, the AIS radio channels (VHF Data Link VDL) will be protected from overload as AIS populations increase.

• VDES gives up to 32 times more bandwidth compared to AIS and also unique satellite to ship communication.

• VDES will be in initial operation from year 2020, and probable in operation beyond year 2040.

• Potentials also for replacing significant parts of GMDSS, including NAVTEX, VHF, MF and HF coastal stations.
WHAT IS TOTALLY NEW IN VDES COMPARED TO AIS

• Simultaneous reception and transmission for base stations.
• Satellite-to-ship world-wide communications.
• Up to 32 times more bandwidth compared to AIS.
• Base station and shore-network is more integrated for efficient spectrum management. This technology is denoted Bulletin Board services and can be cloud based and adapted for E-navigation /STM.
• Better cyber security and integrity

Core VDES international stake holders
R60 VDES MAIN FEATURES

- **Multi-GNSS capability**
  - GPS
  - Galileo
  - Glonass
  - BeiDou

- **Extended capacity AIS + ASM channels**

- **High bandwidth VDE channels**
  (optional, field upgradeable)

- **NTP Time Server**
  (optional)

- **Touch Screen**
  Colour Display

- **Future proof design**

- **Multi interface Cyber Security Protection**, including embedded support for Saab Secure VDES (optional)

- **Legacy interfaces**
  for direct replacement of R40 AIS Base Station

- **Fully compatible with existing AIS Networks from Saab**

- **Prepared for Rebranding**

- **Future proof design**
VDES STRATEGY – NEXT GENERATION AIS

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E-NAVIGATION AND SEA TRAFFIC MANAGEMENT

• STM will most probable be the future of e-Navigation and game-change the way sea traffic management (ship-ship, ship-shore-port) will be handled in the future.

• STM is probably the largest e-Navigation project in the world with soon over 300 sailing ships (currently 169) and connecting 13 ports and six shore centers.

• 39 partners cooperate with a joint budget of 43 million euros. Associated Partners of STM is currently 49 companies or organisations. More associated partners joins every quarter.

• STM is about sharing and coordination of information with routes as its core for optimizing sea traffic with cloud and big-data technology – for all stakeholders.

• The video-clip “STM services in practice” gives a short overview of the concept (4.47 minutes).

STM_Services in practice.mp4 (also on YouTube)
In total 75 million euros has been Invested in the STM technology, by EU and partners.
ORGANIZATION(S) INVOLVED IN STM

• Beneficiary partners:

• Swedish Maritime Administration (lead partner), Airbus, Carnival Corporation, Chalmers, CIMNE, Costa Crociere, Cyprus University of Technology, Danish Maritime Authority, Finnish Transport Agency, Flensburg University of applied sciences, Fraunhofer, Frequentis, Furuno, GS1, HiQ, Magellan, Maritiem Instituut Willem Barentsz, Ministry of Infrastructure and Transport in Italy, Navicon AS, Norwegian Coastal Administration, Novia University of Applied Sciences, OFFIS, Polytechnical University of Catalonia, Port Authority of Valencia, Port of Barcelona, RISE Viktoria, Rörvik Maritime Safety Center, SAAB, Sasemar, Southampton Solent University, SSPA, Sitzer, SMHI, Transas, University of Oldenburg, University of Southampton, Valenciaport Foundation and Wärtsilä SAM-Electronics.

• Associate Partners (**1)


**1) As of October 2018
STM COOPERATION PROJECTS

- Smart Navigation Project (ongoing)
- EfficienSea 2 project (finalized)
- International Taskforce on Port Call Optimisation (ongoing)
- Sesame Straits project II (ongoing)
HISTORY OF STM

• "STM journey started as MTS (Maritime Traffic System) in 2007-2010. A small research project: Saab TransponderTech, Chalmers Maritime University and SMA. We funded and inaugurated our Gothenburg demo site during this project (still in operation).

• MONALISA project was started 2010. Seven project members. 2010-2013. Saab had the industry lead. Presented the concept at IMO London in May 2012.

• MONALISA 2. 15 project members. Without Saab. 2013-2015. Transas (now Wärtslä) had the industry lead.

• STM Validation Project – current project. 39 partners and more than 45 associates. No individual company has the lead – STM is an eco-system-driven project, and SMA has a main role (lead partner) and run the project as a "standardisation project" aiming for IMO MSC and SOLAS.

SMA : Swedish Maritime Administration

IMO MSC: IMO Maritime Safety Committee
STM INTRODUCTION

• Sea Traffic Management (STM) is an answer to the need for improved efficiency in maritime transport; within port clusters as well as between ports.

• The STM concept takes a holistic view on services within shipping, from quay to quay.

• STM is a concept for optimizing the processes, interaction between stakeholders and exchange of information.

• Improved exchange of information is an important facilitator for increased situational awareness and thereby improved safety of navigation.

• STM has already showed great socio-economic benefits as well as business cases for the industry, i.e. by saving of bunker, decreased emissions from shipping, improved utilization of resources and improved maritime safety, not least in congested waters.

• When implemented, Sea Traffic Management will be the most efficient cost reducing innovation brought forward in maritime industry since the AIS.
STM INTRODUCTION CONT.

• STM route exchange
  - STM project developed the exchange protocol for onboard routes (RTZ). Source IEC 61174 Ed.4.0:2015.
  - STM project also developed close quarter routes for transmission over AIS & VDES as BBM (Binary Broadcast Messages). Saab took lead in this work.
  - RTZ and AIS/VDES BBM work coherent. When the ship start saling the route (called the monitored route) then the onboard ECDIS send the close quarter route to AIS/VDES in accordance with a proposed standard developed in the STM project.

• The route can be optimized onboard or on-shore before entering into monitored by different stakeholders. RTZ is the exchange format.

• Optimization criterias can be ETA in cooperation with the port and fuel consumption optimization (wind, sea current, squat effects etc).

Monitored Route: Active Route
ETA: Estimated Time of Arrival

Squat effect is a hydrodynamic phenomenon that will significantly increase drag in shallow water and reduce under keel clearance. Squat effects increase with speed and in confined channels.
MAIN DIFFERENCE BETWEEN AIS AND VDES
BINARY MESSAGES STRUCTUE

AIS can represent 7 legs maximum
VDES can represent 13 legs maximum

VDES can represent XTD port side and starboard

AIS cannot represent XTD port side and starboard, due to bit-restrictions.

Birka Stockholm journey screen recorded from CoastWatch VTMIS

XTD : Cross Track Distance
STM INTRODUCTION CONT.

- **Port CDM**

- Port Collaborative Decision Making Port CDM) services will make port calls more efficient for all stakeholders through improved information sharing, situational awareness, optimised processes, and collaborative decision making during port calls.

- The port has many stakeholders and collaborative decision making is necessary in order to give the ship a proper/fair Estimated Time of Arrival and other important information.

- Therefore the Port Call Message standard is developed for facilitating collaborative decision making.

Port CDM : Port Collaborative Decision Making
STM INTRODUCTION CONT.

- **SeaSWIM**
  - The fundamental goal for SeaSWIM is to provide and maintain a harmonized way of communicating within the maritime industry. Current maritime information is often restricted to a certain organization or department because of incompatible standards and technologies. Unifying the way maritime stakeholders communicate enable a common information marketplace and strengthen the ecosystem by providing new interoperable ways of interaction.
  - By defining a limited set of open industry standards and best practices, SeaSWIM provides an environment where different services can interoperate over organizational boundaries. Furthermore, by providing a standardized environment service developers can focus on value creation to a wider range of customers instead of working on compliance with redundant standards.

"STM and SeaSWIM is E-Navigation"

SeaSWIM is the "app store" for E-navigation services
STM INTRODUCTION CONT.

STM Live testbed

The technical architecture is a service oriented architecture with REST services and secure HTTP (HTTPS, TCL and X.509 certificates) for exchange of information through services. Identities and services are registered in the MCP through a web portal, and certificates are also issued through the MCP web portal.

The set of common message formats used are; Route Exchange Format (RTZ), Navigational Warnings (S-124), Port Call Message Format (PCM) and STM text message format (TXT). The set of common service interfaces used are: Voyage Information Service for RTZ, S-124 and TXT, and AMSS+MB for PCM.

IEC WG 17 is now developing the predecessor to RTZ; the S-421 Route Plan based on S-100. It’s a three year journey before CDV and a standard. Until then use, RTZ.

Saab Shore Center Gothenburg
CURRENT STM SERVICE TYPES

- Route Cross-check
- Route Optimisation
- Ship to Ship Route Exchange
- Navigation Warnings
- Enhanced Monitoring
- Port Call Synchronisation/Optimisation
- Winter Navigation
- Importing Pilot Routes
- Search and Rescue

See more on: http://stmvalidation.eu/

"STM and SeaSWIM is E-Navigation"

SeaSWIM is the "app store" for E-navigation services
– thousands of maritime services is envisioned
(now we have ca 20 services from 20 companies)

This can expand to many more areas
STM PROJECT OVERALL TIME SCHEDULE

- STM onboard system FAT april-17
- STM onboard system SAT sep-17
- 169 Ships sailing from oct-18
- Additional 165 remain to install
- STM shore center connections in operations since may-2018:
  - Saab
  - Kongsberg
  - Transas/Wärtsilä
- During 2018 – test, evaluation and dissemination
- Project ends Dec 2018 (new extended schedule, almost confirmed by EU, to June 2019)
- Plans for STM Governance is underway from 2019 and onwards.

SYSTEM OVERVIEW STM ONBOARD SYSTEM

- ECDIS from TRANSAS, WÄRTILÄ, ADVETO and FURUNO
STM/DEMO SETUP
WILL BE SHOWN DURING COFFEE-BREAKS

Showing route exchange
AIS and VDES

STM Enhanced monitoring
and warnings
SAAB IALA VDES/STM DEMO SETUP

Ship R6 VDES

VHF radio signal in coaxial cable

Route exchange over VDES.ASM (and AIS)

R60 VDES Base Station

STM ECDIS

STM Shore Center

Voyage plans

SeaSWIM

Internet

STM Enabled Ship

STM Enabled Ship

Internet

2018-05-23
IALA DEMO, rev A
LATEST OFFICIAL STM VERSION OF SCHEMAS AND HOW-TO

- [http://stmvalidation.eu/developers-forum/schemas/](http://stmvalidation.eu/developers-forum/schemas/)

- Thank You!