Welcome on board STM!

What is the concept of Sea Traffic Management (STM)?
STM is an information sharing framework that primarily deals with the benefits that different parties can get if they share their route with others in real time. This is one of the fundamental pillars of STM: The shipping company/ship is always the information owner and shares the information they want with the parties they want. But we believe in the principle, you share, you win. The more players that share, the better the common position and the more you can optimize.

Who wins what?
The concept is built on a just-in-time philosophy and in order to arrive, just in time, we need some help on the way. In order to gain access to all the information that you can benefit from, a lot of searching has to be done and if you trade to a lot of different countries, this is not that easy. But it is not just about information available today but also about new information and in STM, the new information comes from the vessels. With the ships sharing their voyage plan you can optimize for various things. To a great extent, it is already done today within large shipping companies that have the resources for it, but here we open up a market that everyone can use.

The central feature is that the routes are shared directly from and to an ECDIS, which allows you to see suggested routes, cut and paste and use the parts you want directly on the ECDIS. You can retrieve nautical information about the passage such as if there are any current Navigation Warnings on one's route or accept one of the Pilot suggested routes into the port. Shore Centres can actively monitor ships in their area of responsibility, not only if they are following their route at any moment but also if they have planned properly according to the latest information available.

Ports can get information of a ships ETA and Planned Time of Arrival (PTA) at a much earlier stage and this can make the port call much more efficient. Because of the port's ability to collaborate by means of the “Port CDM tool”, they can also convey a time when all port operators can receive the ship. This enables you to decide on slowing down and conducting “Just-In-Steaming” during the passage with the potential to save bunkers thereby having a positive impact on the environment etc. An amazing side effect of this information sharing will be that ships will be able to share routes with each other. That is, you can see another vessel's current route in your own ECDIS. Here, however, you will only share a segment of the route, which will be transmitted over the AIS system, because the AIS bandwidth is not sufficient to share more. STM helps you plan a traffic situation before you end up in it. Here comes our second pillar: STM should not be used in COLREG situations. That is, when you are in a close quarter situation, always observe COLREGs.
How to Get Started with STM and SeaSWIM

This HOW-TO describes how to get started with STM and SeaSWIM.

This description is targeted to an audience familiar with the STM Concept and wants to create and deploy their own services, or just consume a service.

This presentation summarises all information necessary to build Your own STM service and links to the documentation, source code etc.

The STM concept also includes ship-to-ship AIS Route communication which is not described in this document.

Main locations for information:

- STM Validation project homepage
  [http://stmvalidation.eu](http://stmvalidation.eu)
- STM Validation on Project Place
  [https://service.projectplace.com/pp/pp.cgi/r1380561671](https://service.projectplace.com/pp/pp.cgi/r1380561671)
CONTENT

• Introduction
• Required components and steps to build STM compliant services
• References and links
Actors in STM

The operational actors in STM service architecture can for simplicity be grouped into:

• Ships
  – Provides e.g. voyage and route information
• Shore Centres
  – Provides e.g. enhanced monitoring, route cross-check, SAR
• Ports
  – Provides e.g. port call synchronization service
• Service Providers
  – Provides e.g. route optimization, route cross-check, pilot routes, navigational warnings, winter navigation
Service Oriented Architecture

The STM Concept is realized using service oriented architecture. In MONALISA 2.0 a set of operational services where identified and the STM Validation project has created technical services that supports these operational services.

The conceptual idea is then that updated and new operational procedures can be supported more efficient with updated and added technical services on both onboard ships, in shore centres, ports and by other service providers.

In STM a lot of the information exchange is about voyage information, and the STM Validation Project has therefore created a service called **VIS (Voyage Information Service)** that provides support for exchanging voyage plans in RTZ, text messages in STM TXT format and area messages in S-124 format.

Based on the VIS Technical Design, several service instances has been created that enables ships to send and receive voyage plans, shore centres to perform monitoring on routes from ship, service providers to perform route optimization etc.
SeaSWIM

Introduction to STM, SeaSWIM and MCP

STM=Sea Traffic Management
MCP=Maritime Connectivity Platform
SeaSWIM=Sea System Wide Information Management
IR=Identity Registry
SR=Service Registry
SSC=SeaSWIM Connector

Safe information exchange according to SeaSWIM and MCP rules and procedures through SeaSWIM Connector

* Registered and documentation available in SR

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There are three different MCP environments deployed, each with its own root certificate, Identity Registry, Service Registry and Web Portal. Servers and services is the responsibility of the provider of service, not the MCP.

STM uses

• the MCP STAGING for development, test and simulation
• The MCP PRODUCTION for production (STM Live Testbed)
The Service Registry contains information about the services and is the main source of service information for both developers, providers and consumers of services.
Service Registry

The service descriptions in Service Registry is divided into three levels.

- **Service Specification**
  Technology agnostic description of the service, often in the operational context
  E.g. Voyage Information Service Specification

- **Service Technical Design**
  Technology dependant description of a service design that realizes the service specification
  E.g. Voyage Information Service Technical (REST) Design

- **Service Instance Description**
  The actual consumable service deployed and exposed public interface
  E.g. Ship Cinderella Voyage Information
Interoperability

Reference: [HOW-TO Find interoperable services to consume](#)

Interoperability is gained on several levels, common Service Technical Design and common payload Information Exchange Models (such as RTZ, TXT, S100-based messages) is two keys to interoperability.
Required components

- **Access to Maritime Connectivity Platform (MCP)**, includes access to
  - Service Registry, Identity Registry and enables issuing of certificates
- **SeaSWIM Connector**
  - Available as ready-to-go JAVA package (JAR)
  - Available as source code in JAVA and C#
  - Available as specification and technical design documents
- **<work> Service Implementation**
  - Available as ready-to-go VIS instance
  - Available as source code for VIS
  - Available as REST Service Technical Design with API description for own implementation
- **Server environment where <work> Service Instance is deployed and hosted**
  - Available as ready-to-go instance in Azure environment (governed by SMA)
  - Possibility to use your own server
- **Registration of Service in MCP Service Registry**
  - Available examples, guidelines and schemas
Step-by-step guide to provide a service

• Join Your organisation to MCP through MCP Portal
  – https://management.maritimecloud.net/

• Use SeaSWIM Connector
  – GitHub for source code
  – Specifications on http://stmvalidation.eu

• Create your work service instance based on chosen (or created) Service Technical Design.
  If exchanging RTZ, TXT and/or S124 there is an existing VIS Technical REST Design v2.2 that can be used.

• Deploy <work> service instance and expose a public interface according to the chosen Service Technical Design

• Register your work service in MCP Service Registry
  (STAGING for test, PRODUCTION when approved)

Your service is now published and available for others to consume!
VIS based service

If creating a service that exchanges RTZ, there is an existing VIS Technical REST Design v2.2 that is used within the STM Live Testbed. It has the basic operations designed, including subscriptions and acknowledgement. See references for documentation. Also recommend the [HOW-TO Use VIS Design for different operational purposes](#).

When it comes to implementations of VIS, there are several different approaches and decisions to make.

- **Get a quick start and ask for a service instance deployed on SMA Azure**
  You get Your own instance and a URL to the private side of this service instance.

- **Download the source code (C#) and use in Your own DOTNET environment.**
  The source code includes SSC. Deploy in Your server.

- **Download the VIS Technical REST Design and implement Your own VIS.**
  The implementation can then be done in JAVA, Python or any chosen language and environment.
Step-by-step guide to consume a service

• Join your organisation to MCP through MCP Portal
  – https://management.maritimecloud.net/
  – Mark STM checkbox when joining

• Use SeaSWIM Connector
  – GitHub for source code
  – Specifications on http://stmvalidation.eu

Find service in MCP Service Registry to consume!
References and links

STM Concept
STM overview
Movies
Definitions

Developer Forum
HOW-TO
Q&A
Terminology

User Forum
Validation

Payload formats
RTZ
TXT
S124
PCM

SeaSWIM descriptions
SeaSWIM TXT
SSC

MCP descriptions
MCP Portals
API

Service Documentation
VIS

Service Technical Designs
VIS
PortCDM

Source Code
VIS
SSC
STM Module

Test and Verification
Test Cases
Test Data
Test Tools

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STM Concept

• STM
  http://stmvalidation.eu/

• STM Use Cases
  http://stmvalidation.eu/operational-context-2/

• Link to the Video “Sea Traffic Management - Services in Practice”
  https://www.youtube.com/watch?v=JZgKnMMq1Eg

• Link to STM Definitions and Clarifications
  PPT: https://service.projectplace.com/pp/pp.cgi/r1404748950

References
References

Developer Forum

- Developer Forum Web
  http://stmvalidation.eu/ (Menu “For Developers”)

- Q&A
  http://stmvalidation.eu/qa/

- Terminology
  http://stmvalidation.eu/acronyms-and-terminology/

- Project Place – Developers Forum (requires access)
  https://service.projectplace.com/pp/pp.cgi/r1380561671

- Developers Info material
  - HOW-TOs: https://service.projectplace.com/pp/pp.cgi/r1386359763
  - Service Instance Descriptions: https://service.projectplace.com/pp/pp.cgi/r1524532323
  - Checklists for Production: https://service.projectplace.com/pp/pp.cgi/r1510102848
  - REST Examples: https://service.projectplace.com/pp/pp.cgi/r1386365661

  - Developer Forum meetings (incl recordings)
    https://service.projectplace.com/pp/pp.cgi/r1380626304
User Forum

- User Forum (under construction)
  http://stmvalidation.eu/user-forum/
Payload formats

- **RTZ**

- **TXT**

- **S124**

- **PCM**
SeaSWIM descriptions

- SeaSWIM
  http://stmvalidation.eu/seaswim-overview/
  https://service.projectplace.com/pp/pp.cgi/r1386363072

- SeaSWIM Connector
  http://stmvalidation.eu/ssc/
  https://service.projectplace.com/pp/pp.cgi/r1411380638
MCP description

- MCP
  [http://maritimecloud.net/](http://maritimecloud.net/)
- MCP Portal
- MCP Portal PRODUCTION
  [https://management.maritimecloud.net/](https://management.maritimecloud.net/)
- MCP Portal STAGING
  [https://staging-management.maritimecloud.net/](https://staging-management.maritimecloud.net/)
- MCP Portal TEST
  [https://test-management.maritimecloud.net/](https://test-management.maritimecloud.net/)
- MCP HOW-TO, including service guidelines and schemas
  [https://management.maritimecloud.net/#/pages/sr/howto](https://management.maritimecloud.net/#/pages/sr/howto)

OBS! The domain “maritimecloud.net” will be changed due to name changed to Maritime Connectivity Platform
References

**MCP TEST**
- Web Portal
  - [https://test-management.maritimecloud.net/](https://test-management.maritimecloud.net/)
- Identity Registry API using certificates
  - [https://test-api-x509.maritimecloud.net/x509/api/](https://test-api-x509.maritimecloud.net/x509/api/)
- Identity Registry API using OpenID Connect
  - [https://test-api.maritimecloud.net/oidc/api/](https://test-api.maritimecloud.net/oidc/api/)
- Identity Registry API doc. for certificates
  - [https://test-api-x509.maritimecloud.net/v2/api-docs](https://test-api-x509.maritimecloud.net/v2/api-docs)
- Service Registry API
  - [https://sr-test.maritimecloud.net/api/](https://sr-test.maritimecloud.net/api/)
- Service Registry API documentation
  - [https://sr-test.maritimecloud.net/v2/api-docs](https://sr-test.maritimecloud.net/v2/api-docs)

**MCP STAGING**
- Web Portal
  - [https://staging-management.maritimecloud.net/](https://staging-management.maritimecloud.net/)
- Identity Registry API using certificates
  - [https://staging-api-x509.maritimecloud.net/x509/api/](https://staging-api-x509.maritimecloud.net/x509/api/)
- Identity Registry API using OpenID Connect
  - [https://staging-api.maritimecloud.net/oidc/api/](https://staging-api.maritimecloud.net/oidc/api/)
- Identity Registry API doc. for certificates
  - [https://staging-api-x509.maritimecloud.net/v2/api-docs](https://staging-api-x509.maritimecloud.net/v2/api-docs)
- Service Registry API
  - [https://sr-staging.maritimecloud.net/api/](https://sr-staging.maritimecloud.net/api/)
- Service Registry API documentation
  - [https://sr-staging.maritimecloud.net/v2/api-docs](https://sr-staging.maritimecloud.net/v2/api-docs)

**MCP PRODUCTION**
- Web Portal
  - [https://management.maritimecloud.net/](https://management.maritimecloud.net/)
- Identity Registry API using certificates
  - [https://api-x509.maritimecloud.net/x509/api/](https://api-x509.maritimecloud.net/x509/api/)
- Identity Registry API using OpenID Connect
  - [https://api.maritimecloud.net/oidc/api/](https://api.maritimecloud.net/oidc/api/)
- Identity Registry API doc. for certificates
  - [https://api-x509.maritimecloud.net/v2/api-docs](https://api-x509.maritimecloud.net/v2/api-docs)
- Service Registry API
  - [https://sr.maritimecloud.net/api/](https://sr.maritimecloud.net/api/)
- Service Registry API documentation
  - [https://sr.maritimecloud.net/v2/api-docs](https://sr.maritimecloud.net/v2/api-docs)
Service descriptions

- Service Registry (Technical Designs)
  [https://staging-management.maritimecloud.net/#/pages/sr/designs](https://staging-management.maritimecloud.net/#/pages/sr/designs)

- VIS
  [http://stmvalidation.eu/vis/](http://stmvalidation.eu/vis/)
    - VIS Specification
    - VIS Technical REST Design – SeaSWIM side (mandatory)
    - VIS Technical REST Design – SMA Private side (optional)

- PortCDM - AMSS
  PortCDM - MB
Service Technical Designs

- Service Registry
  https://staging-management.maritimecloud.net/#/pages/sr/designs

- VIS Technical REST Design – SeaSWIM side (mandatory)
  http://s3-eu-west-1.amazonaws.com/stm-stmvalidation/uploads/20170407112931/VIS-REST-Design-for-SeaSWIM_v2.2.1.docx

- Swagger (REST API)
  Included in VIS Technical REST Design Description, Appendix Service Design as XML,
  <ServiceDesignSchema:model>
    - http://s3-eu-west-1.amazonaws.com/stm-stmvalidation/uploads/20170407113154/VIS_Swagger_Public_v2_2_0.json.txt

- Swagger UI (requires valid STM Client Certificate):
  https://smavistest.stmvalidation.eu/swagger/ui/index

- PortCDM
  http://specification.portcdm.eu/

References
Test Cases & Test Data

- Project Place – Test & Integration (requires access)
  https://service.projectplace.com/pp/pp.cgi/r1386412452
  - Test Cases: https://service.projectplace.com/pp/pp.cgi/r1437769891
  - Test Data: https://service.projectplace.com/pp/pp.cgi/r1437760556
    - RTZ
    - TXT
    - S124
    - PCM
    - AIS Route message

- STM Module Tool
  https://service.projectplace.com/pp/pp.cgi/r1562953493
Source Code

- GitHub
  http://stmvalidation.eu/github/
  https://github.com/SeaTrafficManagement

- SMA VIS including SeaSWIM Connector (C#)
  https://github.com/SeaTrafficManagement/VISReleases

- CIMNE SeaSWIM Connector (JAVA)
  https://github.com/SeaTrafficManagement/SeaSwimConnectorJava

- CIMNE VIS (JAVA)
  https://github.com/SeaTrafficManagement/VIS-JAVA

- SMA Test Tool (STM Module mockup)
  https://github.com/SeaTrafficManagement/StmModuleMockup

References
HOW-TO’s

HOW-TO Register service instance

HOW-TO Handle X.509 Certificates in SeaSWIM

HOW-TO Use HTTP Respond Codes from VIS

HOW-TO Encode characters (UTF-8)

HOW-TO Generate UVID

HOW-TO Test, Verify and Validate Your service

HOW-TO Use curl in Windows for API testing

HOW-TO Convert PEM to p12

HOW-TO Get started with STM

HOW-TO Find the Swagger API file for a Service Design

HOW-TO Use VIS Design for different operational purposes

HOW-TO Search for services along a route

HOW-TO Find interoperable services to consume

HOW-TO Get Your STM service released in PRODUCTION

HOW-TOs:
https://service.projectplace.com/pp/pp.cgi/r1386359763

References

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HOW-TO’s related only to SMA VIS Implementation

- HOW-TO Use SMA Voyage Information Service
- HOW-TO Implement HMAC authentication for SMA VIS and SPIPE Private Side.docx

References

HOW-TOs:
https://service.projectplace.com/#project/1145945756/documents/1386359763
Technologies

- REST (preferred in the STM Live Testbed)
- SOAP
- HTTPS TLS encryption
- X.509 Certificates (preferred in the STM Live Testbed)
- Open ID
SSC=SeaSWIM Connector
VIS Public Interface

References

STM
SEA TRAFFIC MANAGEMENT

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VIS Documentation

http://stmvalidation.eu/service-catalogue/

Private

VIS Specification Document

VIS Private REST Design Document

VIS Internal Application Design Document

VIS JAVA Implementation Document

VIS C# Implementation Document

VIS Instance as XML

SeaSWIM and Service Registry

STM

VIS REST Design Document

2.2

References

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VIS Technical (REST) Design

References

«Interface»
VIS Get REST Interface
+ getVoyagePlans(GetVoyagePlanObject): GetVPResonseObject

tag$
dataExchangePattern = REQUEST_RESPONSE

GET
instanceURL/voyagePlans

POST instanceURL/voyagePlans
{myVoyagePlan}

«Interface»
VIS Upload REST Interface
+ uploadVoyagePlan(URL, URL, rtz:route): void
+ uploadTextMessage(URL, stm:textMessage): void
+ uploadArea(S124:DataSet, URL): void

tag$
dataExchangePattern = REQUEST_CALLBACK

POST
instanceURL/textmessage
{myTextMessage}

POST
InstanceURL/area
{myArea}

«Interface»
VIS Subscription REST Interface
+ subscribeToVoyagePlan(MRN, URL): void
+ removeVoyagePlanSubscription(MRN, URL): void
+ getSubscriptionToVoyagePlan(MRN, URL): GetSubscriptionResponseObj

tag$
dataExchangePattern = REQUEST_CALLBACK

POST
InstanceURL/voyagePlans/subscription?
callbackEndpoint=myURL

GET
InstanceURL/voyagePlans/subscription?
callbackEndpoint=myURL

DELETE
InstanceURL/voyagePlans/subscription?
callbackEndpoint=myURL

«Interface»
VIS Acknowledgement REST Interface
+ acknowledgement(DeliveryAck): void

tag$
dataExchangePattern = ONE_WAY

POST
InstanceURL/acknowledgement/
{deliveryAck}
References

PortCDM services
SeaSWIM and MCP

SeaSWIM
- QoS monitoring for MarSI services
- Common information model
- SeaSWIM rules (e.g., subscription)
- Data model SeaSWIM, Application Service, SeaSWIM connector

Enhanced MCP
- STM Authorization
- STM Authentication
- Data model eMC (e.g., principles, affiliations)

MCP
- ID Registry / Broker
- Service Register
- Data model MC
- Access Control List

SeaSWIM connector
- SLA regulations
- Security Regulations
- Logging service

References

SeaSWIM Governance

[Co-financed by the European Union]
Connecting Europe Facility
Port Call Synchronization (part of PortCDM)

Reference: HOW-TO Find interoperable services to consume