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1 Executive summary

The eMAR project aims at facilitating an extensive and more symmetrical participation of the European maritime public, business and research community in a knowledge development process leading to the specification of an e-Maritime Strategic Framework and the associated enabling eMAR Platform, lately renamed the eMAR Ecosystem. The eMAR Framework and platform are seen as high impact strategic and technological tools and interventions in making the EU maritime sector more competitive and part of an integrated sustainable EU transport system.

eMAR had high ambitions for standardisation, inspired by the fact that electronic documents developed as part of the Common (e-Freight) Framework are now part of the official UBL version 2.1 [1]. UBL 2.1 has been submitted to the International Organisation for standardisation ISO[2]. The approval process is quite progressed, and ISO/IEC 19845 is issued as a Draft International Standard (DIS)

Originally, the plan was to make the Common Reporting Schema (CRS) for reporting to authorities an international standard. Other project has now taken the initiative to make the CRS part of the next release of the UBL and ISO standards. The maritime sector in Europe should make not of this.

eMAR will therefore investigate standardisation possibilities for messages developed in the e-Maritime Strategic Framework (EMSF) and elements of the eMAR Ecosystem (Platform). The latter should be adapted to the specification being promoted and governed by the iCargo project [3] so that maritime transport may be integrated in a logistics network.

List of Abbreviation

CEN	European Committee for Standardisation
CRS	Common Reporting Schema
DIS	Draft International Standard
EMSF	e-Maritime Strategic Framework
PCS	Port Community System
ISO	International Organisation for Standardisation
TEP	Transport Execution Plan
TPS	Transport Progress Status
TS	Transport Status
TSD	Transport Service Description
UBL	Universal Business Language

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2 Introduction

The eMAR project aims at facilitating an extensive and more symmetrical participation of the European maritime public, business and research community in a knowledge development process leading to the specification of an e-Maritime Strategic Framework (EMSF) and the associated enabling eMAR Platform, lately renamed the eMAR Ecosystem. The eMAR Framework and platform are seen as high impact strategic and technological tools and interventions in making the EU maritime sector more competitive and part of an integrated sustainable EU transport system. eMAR targets the exploitation of the capabilities of emerging technologies, new governance models and novel application scenarios in the area of maritime e- governance and e-maritime operations.

eMAR primarily aspires to introduce a relatively new approach to maritime governance. As until recently there have been limited joined-up approaches and actual initiatives in maritime transport, IT, logistics, energy, and the environment sectors, whereas current policies and strategy in maritime transport areas have developed in a disjoint fashion with limited efforts for coordination. eMAR aims at integrating strategic, economic, security, environmental and information technology perspectives in order to deal more effectively with maritime threats and opportunities by a set of fundamental changes in the rationale and power balance behind maritime governance and e-maritime operations.

Virtualization and cloud computing, collaboration tools, as well as pervasive computing devices and techniques, advanced wired and mobile networks and improved security and privacy protection technologies, as well as sophisticated algorithms for analysing big data and performing simulation and new visualisation tools, are expected to become mainstream in the next 10–20 years in the e-maritime domain, thus having a profound impact on both the governance and operation of maritime transport.

In particular, eMAR contributes to the EU e-Maritime Programme in terms of:

1. an e-Maritime Strategic Framework (EMSF) specifying a coherent view of the way Maritime Transport could operate at a future date (i.e. 2020) to achieve the mission and strategic goals specified by a continuous consultation process, collaborative policy modelling and e-governance enabling tools and related eMAR empirical testing/market surveys. The EMSF will be formally linked to enabling technological artefacts, i.e. policy models, reference process models and common/standard messages and optimization services provided by the eMAR platform. Special attention will be given to e-Maritime Standards to promote interoperability between e-governance enabling tools, ship systems and maritime transport operations and applications.
2. Connectivity Infrastructure to support internet-based interactions between all the different maritime transport stakeholders and the exchange information effectively utilising the EMSF conventions and messages and support eMAR platform and applications.

3. Common Digital Resources in the form of data, knowledge and applications and optimization services for key activities of the EMSF framework and eMAR Platform, which can be combined and used with existing applications, services and IT infrastructures by end users.
4. Impact analysis and recommendation on policy, standardisation and future research

eMAR aims at conceptually developing and empirically testing the vision of the e-maritime governance in an integrated, holistic and coherent manner, by challenging the prevailing governing structure and trends, in particular by establishing a permanent yet evolving digital mechanism for dynamic, symmetrical and highly automated process of maritime governance and policy/strategic management modelling, on the basis of a network form of policy consultation and collaboration, on international , regional and national level for trade, shipping and transport development.

With this insight, various policy and strategic cases can be simulated, tested and eventually be enacted on the basis of the eMAR integrated e-maritime strategic framework and IT platform where stakeholders of the maritime transportation sector including ship owners, ship managers, shipbuilders, charterers, the maritime administrations, port authorities and terminal operators, classification societies, insurers and financiers also academia and R&D actors actively participate to establish and co-develop an open, transparent cooperation network.

This is the final version of this report and reflects the situation at the completion of the eMAR project.

3 Standardisation

3.1 Motive

Shipping is a global business. If new concepts are to be used, particularly those about to be developed in eMAR, they need global acceptance.

One way to achieve such acceptance is to have the relevant results accepted by international standardisation organisations. It is not a sufficient requirement for acceptance by industry, but it is a good starting point. The process of standardisation ensures a validation of the results way beyond what the project is able to do. Furthermore, this acceptance by neutral parties (the participants in the standardisation activities), gives the relevant results credibility in the industry beyond what can be given by the project and by the EU Commission.

3.2 Context

Standards, if they are to be used, need to give the stakeholders as much freedom as possible to shape and structure business and processes. Hence, standards should not include elements that as about how businesses are performing their activities. Hence, what eMAR aim to standardise is related interaction between stakeholders, that is, the information that is to be exchanged between them in the form of information objects (messages). These are messages that will be defined in the eMaritime Strategic Framework (EMSF), described in eMAR Deliverable D1.3.

This is in line with the standardisation that has taken place in the Common Framework (see Figure 1), where the messages Transport Service Description (TSD), Transport Execution Plan (TEP), GII (Goods Item Itinerary) , Transport Status (TS), and TPS have been accepted by OASIS/UBL and included in UBL 2.1 that was officially released in November 2013 [4].

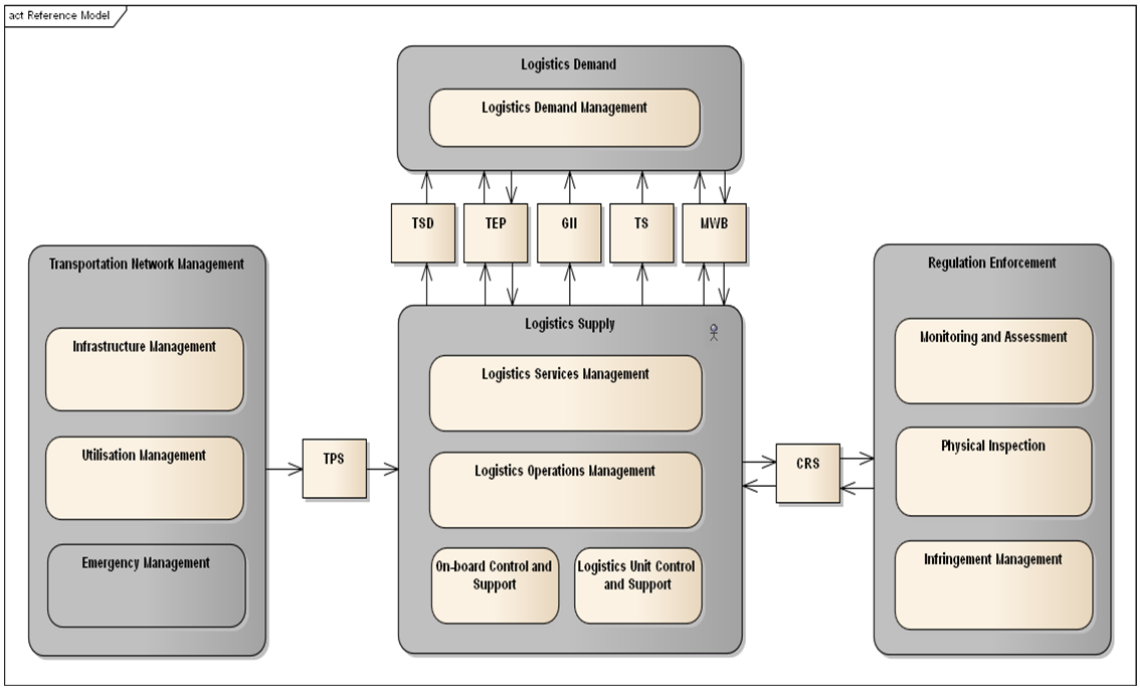

Figure 1 Common Framework

In 2014, OASUS/UBL decided to promote UBL 2.1 as an ISO standard. This process, supported by EU projects, has reached a stage where there has been issued a so-called Draft International Standard (DIS), namely ISO/IEC DIS 189845. This means that TSD, TEP, GII, TS, and TPS now are about to become an official international standard. The ISO process will continue into 2015, and, since ballot has already taken place, only editorial changes are now perceived. Hence, ISO/IEC 19845 should be an official global standard in 2015.

ISO/IEC DIS 19845 has already been launched as and the basis for semantic interoperability for all modes of transport (see, Figure 2), particularly to the Neal-Net initiative in Asia (China, Korea, Japan)

It should be noted that SMDG [5] (Figure 2) develops and promotes UN/EDIFACT EDI-messages for the Maritime Industry. There are already efforts being made to ensure conversion between SMDG messages and the multimodal messages in ISO/IEC 19845, thereby linking maritime transport closer to the global, multimodal information exchange standard.

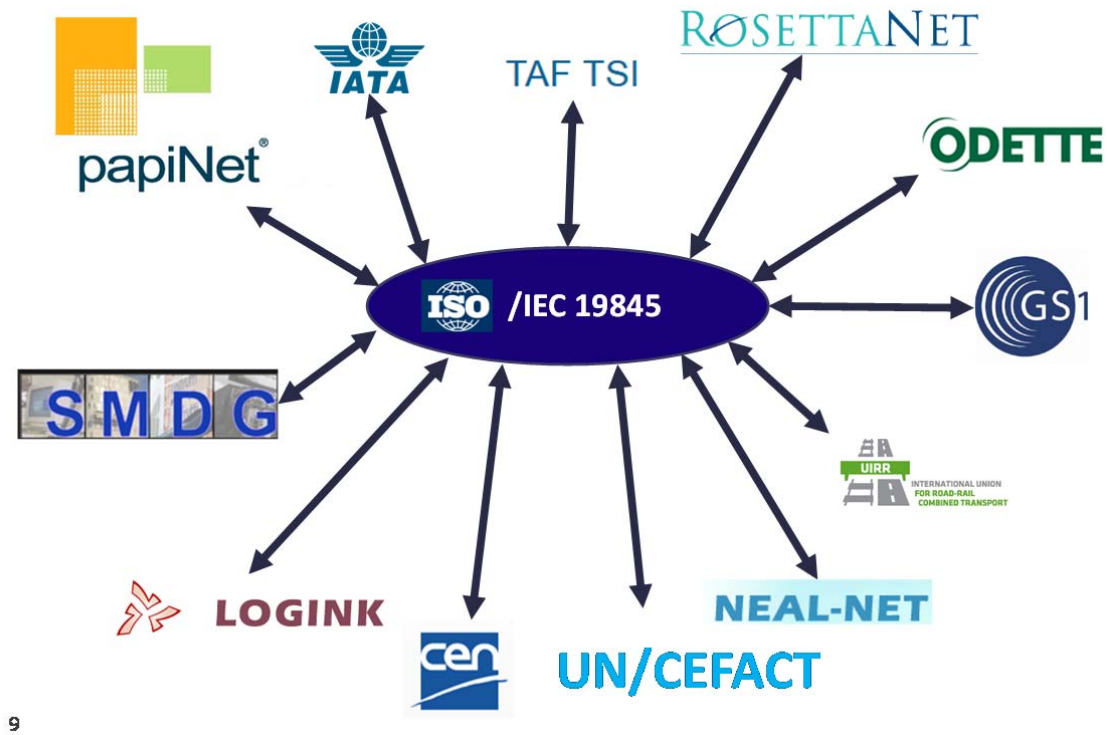

Figure 2 Semantic interoperability using ISO/IEC 19845 as an "intermediary"

3.3 eMAR Outputs

3.3.1 Initial Reflections

As can be seen in Section 3.2, a number of the electronic documents of the Common Framework are now included in an international standard.

eMAR Deliverable 1.2 "Policy, Legal and Standardisation Requirements Analysis Report" examines a wide set of standardisation requirements. From these, eMAR, at the start of the project, envisioned the possibilities of contributing to standardisation of the following types of messages (electronic documents):

- The Common Reporting Schema (CRS)
- New related messages developed as part of the EMSF.

The eMAR Ecosystem described in deliverable D2.1: eMAR Ecosystem Architecture and Technology introduces the concept of Access Point. In order to ensure that several suppliers are able to provide Access Points to the eMAR ecosystem, the specification of the Access Points need to be standardised.

3.3.2 The Common Reporting Schema

When the Common Reporting Schema was developed in the e-Freight project [6] , enhanced in the COMCIS Project [7] and to be further improved in eMAR, it was in a response to the EU Commissions need to develop "**Establish a single window (single access point) and one stop shopping for administrative procedures in all modes**." This ambition was initially voiced in the Freight Transport Logistics Action Plan [8], and it was strengthened with Directive 2010/65/EU [9] where it was required that Member States should "**Accept the fulfilment of reporting formalities in electronic format and their transmission via a single window as soon as possible and in any case not later than June 1, 2015**".

Having validated the CRS in other projects, it was the ambition of eMAR to make the CRS the basis for a standardised interface to all maritime single windows in the EU.

As the eMAR project is progressing, three other initiatives within the EU Commission also aim to develop data models for providing an interface to national single windows, focusing on the maritime:

- The e-Maritime Expert Group (eMS group) [10] - the group is to develop specifications and services for the electronic data exchange and single windows.
- The AnNa project [11] - an EU Member States driven project in close cooperation with the European Commission to support the effective implementation of the ship formalities directive
- The eManifest – an initiative from the Commission to create a harmonised electronic cargo declaration. This new "eManifest" allows the shipping company to provide in all manifests (intra-EU and extra-EU) information on the status of goods to customs officials.

In addition, ISO has developed a new standard related to a "single window for port clearance", ISO 28005-2:2011 [12].

It became clear that in order to establish the Common Reporting Schema (CRS) as a standard, it was important to have all these initiatives accepting the CRS as a basis for their development. Hence, rather than focusing on organisations like the European Committee for standardisation (CEN) and ISO, it was necessary for eMAR to establish relationships with these three initiatives before aiming to get acceptance from CEN and ISO.

Significant efforts have been spent to interact with all of these initiatives. eMAR was able to have some influence on the development of ISO 28005, and the 28005 development also influenced the development of the CRS.

With the ISO/IEC DIS 19845 being a reality and reporting to authorities being an integral part of multimodal freight transport management, the next logical step is to include the CRS into this standard. An initiative has been taken from the iCargo project to make the CRS part of this international standard.

It should also be noted that the conclusion from eMAR deliverable D4.1 (e-Maritime services supporting interactions with Class, Safety, Security and Environmental risk management systems) concludes that: "the CRS is a promising candidate for international standardization within the maritime industries".

3.3.3 Messages from the EMSF

The development of the eMaritime Strategic Framework (EMSF) has progressed significantly during the second year of eMAR.

Figure 3 illustrates a large set of business models that are being investigated in the process of developing the EMSF. As can be seen, the information flow between processes is significant. Part of this information flow is already standardised, and the development process will define where new messages are needed and where standardisation is seen as an asset related to putting it to use.

The initial set of messages that have been defined in EMSF is listed in Figure 4.
This list includes the following messages that are already mentioned before in this document or are already part of an international standard:

- The Common Reporting Schema - CRS
- TS – Transport Status is already included in ISO/IEC DIS 19845 (UBL 2.1).
- Booking – This is equivalent to the Transport Execution Plan (TEP), which is also part of ISO/IEC DIS 19845.
- ETA - that is a "special case" of the Transport Status message for the cargo. The Transport Progress Status (TPS) (included in ISO/IEC DIS 19845) provides ETA information for the ship.
- FS – Fleet Schedule is included in the Transport Service Description

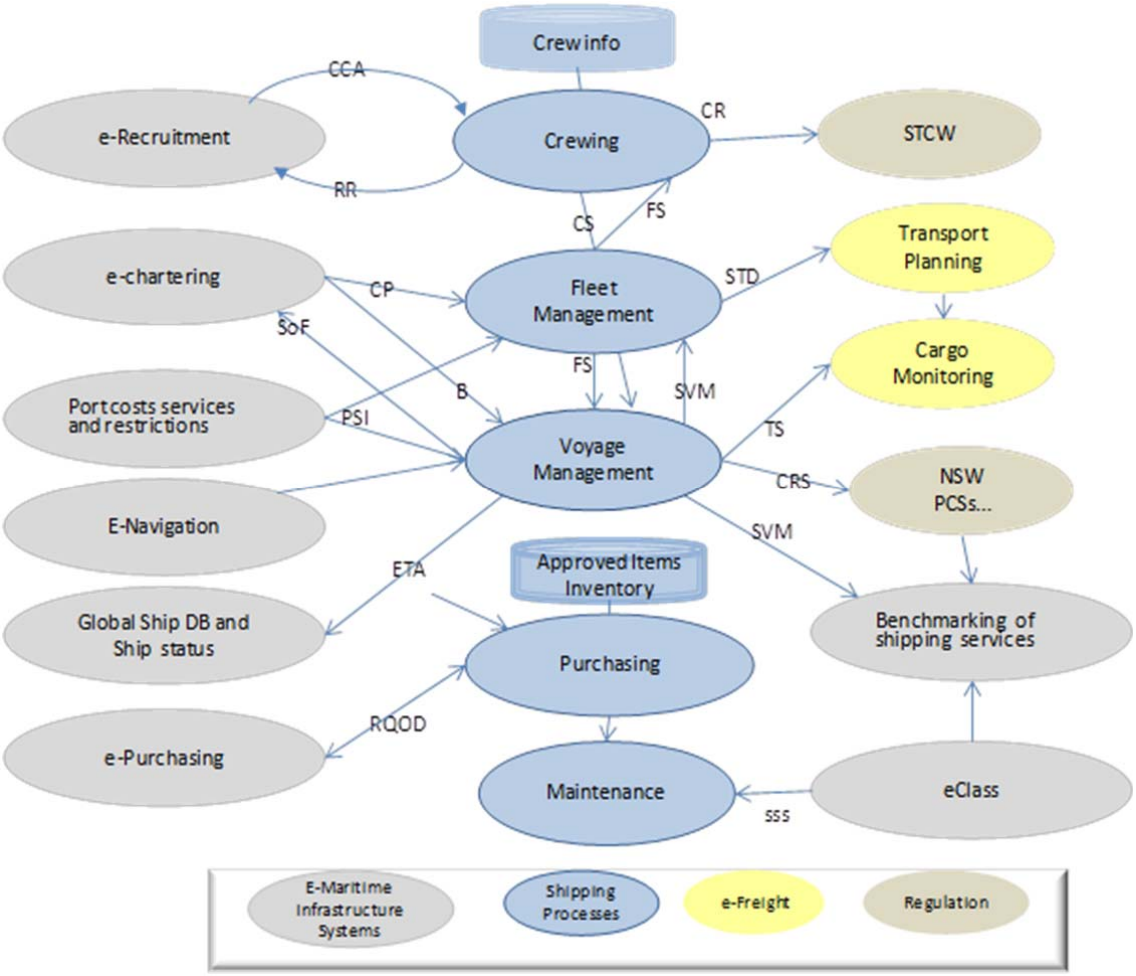

Figure 3 The initial EMSF Shipping process model

eMAR Message	Description
CCA RR CS CR	Candidate Crew Application Recruitment Request Crew Schedule Crew Record
FS STD CP FS PSI SoF B TS SVM ETA	Fleet Schedule Ship Service Description Charter Party Fixture Slip Port Ship Information- costs/services/restrictions Statement of Fact Booking Transport Status Ship voyage monitoring (Noon Report /EEOI) Expected Time of Arrival
CRS	Common Reporting Schema
PQOD	Requisition/ Quotation / Purchase Order/Delivery
SSS	Ship Survey Status

Figure 4 Initial eMar messages

The remainder of the messages in Figure 4 will be validated in eMAR Pilot studies, these are listed in Table 1. Experience with these and the acceptance of them among the involved stakeholders will be used as a basis for evaluating which one of them will be recommended for standardization and which standardization organisation to engage with.

Table 1 eMAR Pilot Studies

Title	Maritime Context	Description / Objectives
Ship Voyage Monitoring	Ship Operations	Standard data model for ship monitoring particularly addressing environmental issues IMO Energy Efficiency Operational Indicator (EEOI) SVM service for on-board and office use Ship voyage optimisation services Global ship status database
e-Recruitment / e-Crewing	Ship Operations	Posting and viewing information about vacancies and job applicants Integration of existing systems (Access Point)
e-Purchasing	Ship Operations	Information matching component Data/process modelling and standardisation Access Point connectivity
Shipping Service Descriptions	Ship Operations	Use and test Transport Service Descriptions from e-Freight Enhanced searches, planning, input to optimisation, benchmarking
Benchmarking of shipping services	Ship Operations	Standard data model for benchmarking of services provided by shipping companies (related to e.g. detentions) “Service Quality Report"- eBay seller/buyer rating for ships, credit rating
Survey Status Message	Ship Operations	Create a Survey Status standard message
eMAR ecosystem access to PCS Services	Port Operations	Access to Port Community System (PCS) services to send lists of equipment (vessel loading lists) to the terminal Access to PCS services to consult lists of equipment status Connect the eMAR ecosystem with PCS services (interfacing)

Paperless environment for export container release at ports	Port Operations	Paperless environment for the transmission of vessel loading lists and customs verification and goods/container release process for export flows. Sending electronic vessel loading list (see previous) Matching loading lists with single administrative documents (allowing paperless customs release)
PCS Service	Port Operations	Real-time information container terminal for customs. Providing customs and with real-time information of the arrival of export goods to the port terminal
Logistics Integration	Logistics Chain	Data model on information to be supplied to port/terminal system responsible for terminal and hinterland operation (TSD, TS) Linked to extended gateway concept/practices Links with TEP and TS
Multimodal Logistics Optimisation	Logistics Chain	Optimisation and scheduling of multimodal logistics operations including port activity and ship, rail & truck movements. Demonstration of scheduling and optimisation using simulated data centred on Valencia
Maritime Single Window	Administration	Common reporting schema & MSW Building Blocks. Maritime Reporting Formalities
Statement of Fact	Ship Operations	Electronic version of SoF, standard data model for communicating statement of fact information handled normally by ship agents. Log management service with data quality checks and distribution management
DNV Navigator	Administration	DNV Navigator will be extended to be able to directly send CRS message to a Single Window using web services. Maritime Reporting Formalities

The areas that have matured most in eMAR are:

- Ship Voyage Monitoring (Cooperation between Shipping Company and Charter)
- e-Purchasing (Cooperation between Shipping Company and Supplier)
- e-Drawing (Cooperation between Shipping Company and Technical/Repair Yard/Purchasing)
- e-Crewing (implemented by eBOS) (Interaction between shipping companies and crew candidates)

The two messages that are considered to be matured for standardisation based on these activities are:

- RR – Recruitment Request
- CCA – Candidate Crew Application

The plan was to submit suggestions to ISO/TC8 during the last year of the project. However, preparations has taken longer than anticipated and the filing for making these messages international standard will be pursued after the completion of eMAR.

Regarding e-Purchasing, standardisation is more complex. First of all, ShipServe is a well-established operation with its own defacto standard messages in the sector. Furthermore, ISO/IEC DSI 19845 includes messages for procurement in the form of e-order, e-Catalogue, etc. Since these are included in the same standard as the multimodal transport messages TSD, TEP, etc. Efforts are already ongoing for automatically generating transport bookings (TEPs) from the e-Order and e-Catalogue messages. Introducing a new e-purchasing standard at this time is not recommended.

3.4 Ecosystem Standardisation

The conceptual architecture of the eMAR ecosystem is illustrated in Figure 5.

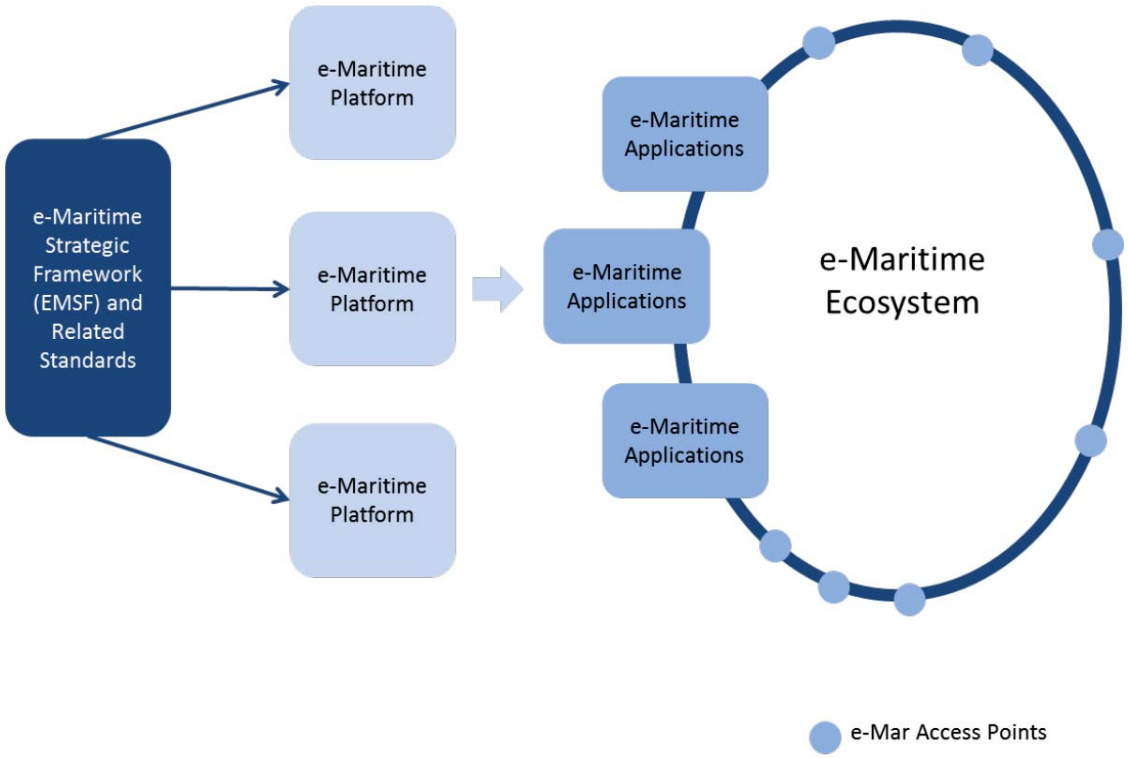

Figure 5eMAR Ecosystem Conceptual Architecture

Stakeholders connect (once only) to the ecosystem through Access Points. According to eMAR Deliverable D2.1, “Access point is the main entry point to the eMAR Technology Ecosystem and provides controlled access to software services. Access points are configured according to profiles defined and shared within a specific business community. They include semantically defined interfaces that are used to dialogue with services or other Access points and so incoming requests can result in one or more responses to activate other services and retrieve data.”

In order to be attractive, numerous providers of applications and Access Points should support the e-Maritime Ecosystem, like the case is for OpenPEPPOL that is operating a similar ecosystem for public procurement. To achieve this, the core specifications of Access Points need to be common to all providers of these. OpenPEPPOL has standardised their Access Point description in OASIS (Buz Docs).

Access Points have been developed in a number of projects: e-Freight, iCargo, EcoHubs and eMAR, etc.) Experience has shown that the PEPPOL Access Point specifications are not suitable for transport and logistics. The iCargo project is taking the lead for ensuring standard specifications for Access points in the transport and logistics sector. A permanent organisation will be established in 2015 to secure governance of these specifications. It is recommended that the maritime sector subscribes to these specifications and does not establish a separate standard.

Efforts have been taken to deploy an infrastructure based on the iCargo specifications to China, Korea, and Japan for tracking container movement (expanding the Neal-Net collaboration).

4 Conclusions

eMAR had high ambitions for standardisation, inspired by the fact that electronic documents developed as part of the Common (e-Freight)Framework are now part of the official UBL version 2.1.

Originally the plan was to make the Common Reporting Schema (CRS) for reporting to authorities an international standard. Other projects have now taken the initiative to make CRS and international standard (to be included in the next release of the UBL standard)

Two messages have been identified for international standardisation in the e-Recruitment sector. These will be submitted to ISO/TC8 after the completion of the eMAR project.

The specification for the maritime Access Points need to be coordinated with the specifications developed in other projects (e-Freight, EcoHubs, iCargo, etc.). The maritime sector should not develop special Access Point specifications, but coordinate with the specifications now promoted and governed by the iCargo project.

5 Reference

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