|  |  |
| --- | --- |
| From: e-NAV Committee | e-NAV12/output/26 |
| To: IALA Council | 28 September 2012 |

Information Paper

**The Architecture**

**for the Provision of e-Navigation Services from Ashore**

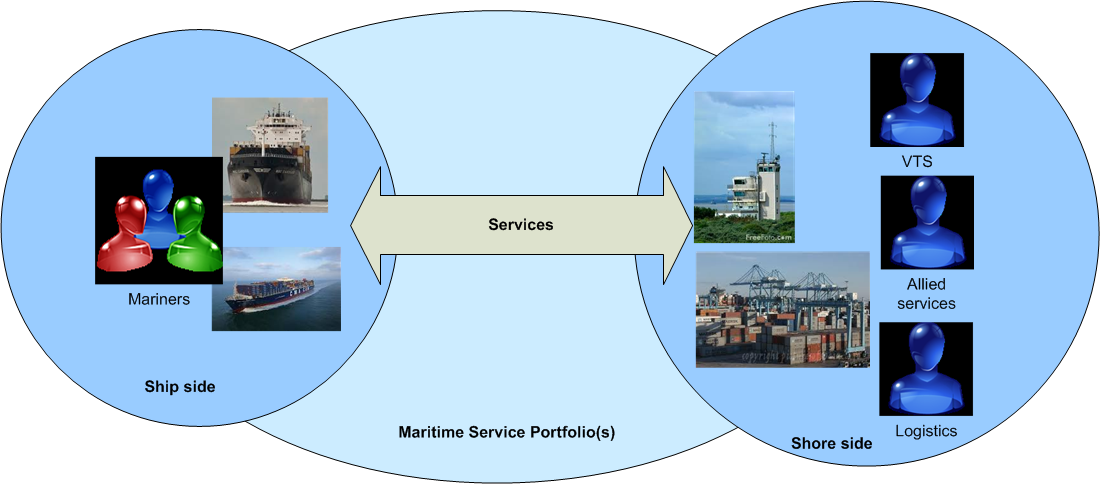
# Introduction

This is a high-level introduction to the shore-side part of the e-Navigation architecture. First, the document introduces the main elements of the complete e-Navigation architecture and then it continues with a description of the shore-based system architecture.

# The overarching e-Navigation architecture

One way of understanding the concept of e-Navigation is to look at it from a user’s perspective. As visualized in Figure 1, the architecture can be divided into three parts; ship side, shore side and the interaction between ship and shore. This represents the overarching architecture from a users’ perspective.

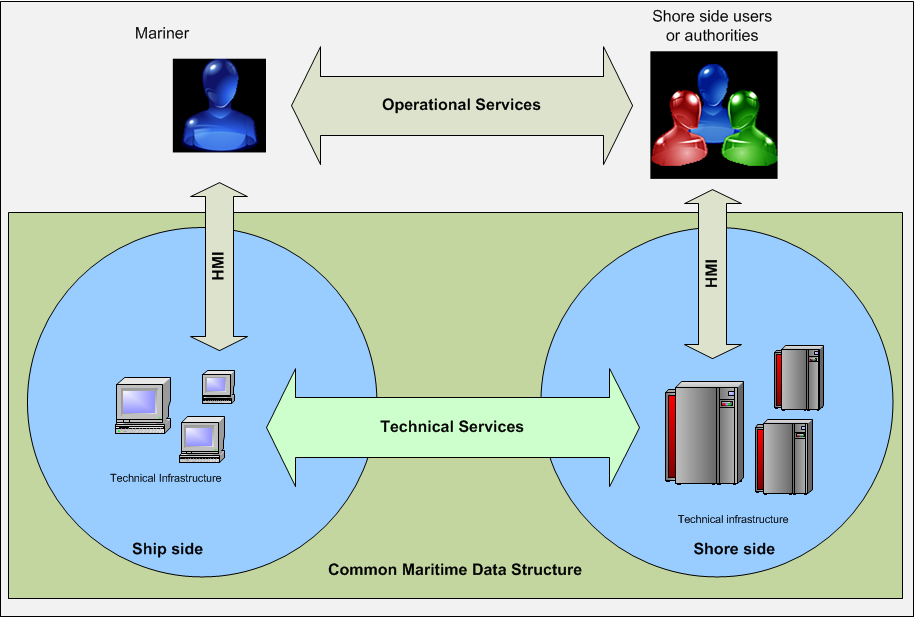
The ship side represents the users on-board a ship, whilst the shore side typically represents users from communities like Vessel Traffic Services (VTS), Allied Services and even users from communities within the logistics domain.



1. e-Navigation Users’ Perspective at a Given Moment and at a Given Place

To enable both sides to communicate and to exchange information, e-Navigation uses the general term “service”. From a user’s perspective, the important services will be the “operational services”. However, there also needs to be “technical services” to be able to provide these operational services (Figure 2). Altogether, these services are referred to as the Maritime Service Portfolio (MSP).

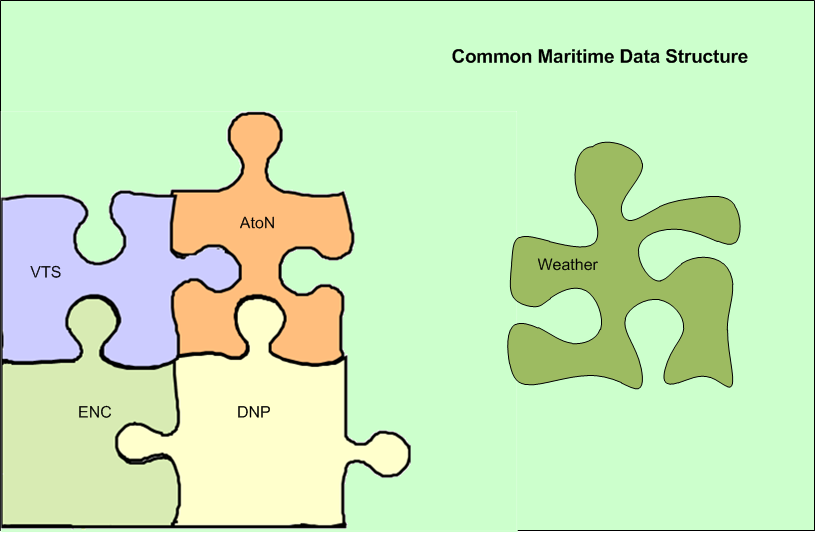
A MSP defines and describes the whole set of operational and technical services and the level of these services, as provided by a stakeholder in a given sea area, on a waterway, or in a port, as appropriate. The MSP concept was conceived to achieve harmonisation, simplification, and tighter interaction of services and systems on board and ashore. It will be further developed based upon the IMO concept of a “Common Maritime Data Structure” (CMDS).



1. The e-Navigation Services Concept

# The Common Maritime Data Structure

The purpose of the IMO defined Common Maritime Data Structure (CMDS, see Figure 3) is to harmonise data exchange in the maritime domain by providing a common, authoritative reference. The CMDS is an abstract representation of entities within the maritime domain. It should be accessible by any stakeholder or implementer and should be the reference for the development of maritime services, applications and databases.



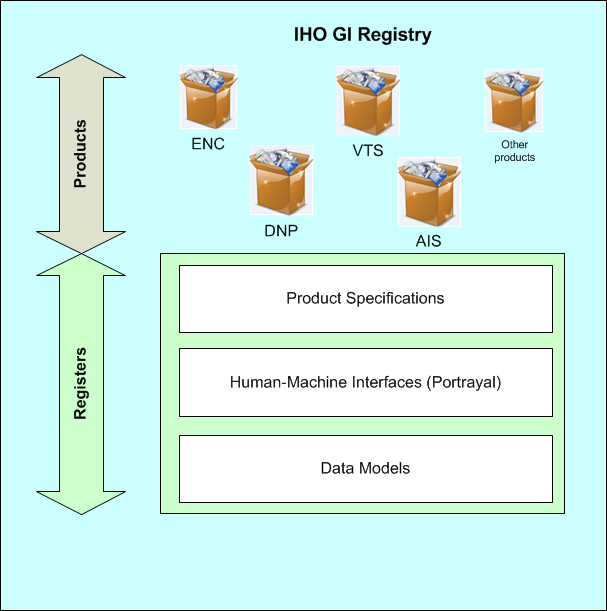
1. The Harmonised Common Maritime Data Structure

Considering the extent of the maritime domain, with all of its stakeholders, the responsibility for the CMDS is subdivided into smaller units, each of which is governed by a recognised authority. However, these authorities cooperate to harmonise the CMDS as a whole (e.g., to avoid duplication of entries). This is one of the main tasks of the IMO established IMO/IHO Harmonisation Group on Data Modelling (HGDM).

IHO developed the IHO GI Registry[[1]](#footnote-1), based on its S-100 standard, as a tool for data modelling for the specification and production of Electronic Navigational Charts (ENC) and Digital Nautical Publications (DNP). The GI Registry is generic in setup and has been adopted by IMO as the tool to develop the CMDS.

Figure 4 describes the simplified generic structure of the GI Registry. The major features of the registry include registers for:

* Product Specifications – includes everything needed to fully describe and specify a product such as data exchange protocols and references to HMI and CMDS entities from the GI Registry.
* Human-Machine Interface (HMI) – HMI definitions / specifications can also include references to CMDS entities from the GI Registry. (This register is named Portrayal by IHO.)
* Common Maritime Data Structure (CMDS) – (This register is named Feature Concept Dictionary by IHO.)



1. Simplified View of the IHO GI Registry

# THE SHORE-BASED SET UP FOR FACILITATING e-NAVIGATION

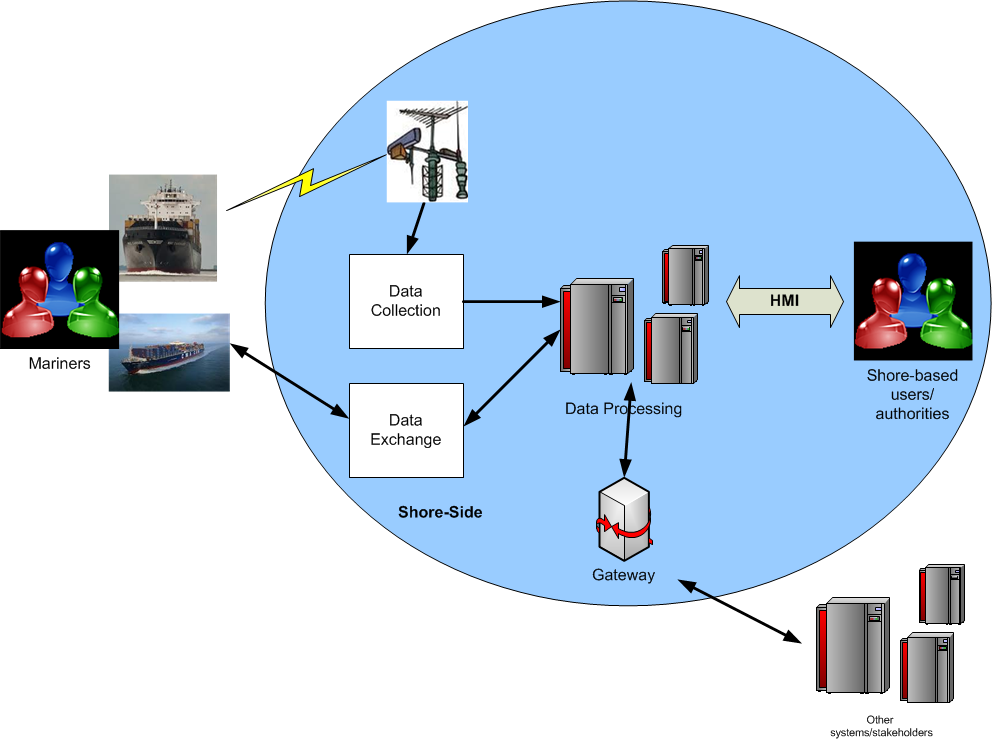
IALA members use shore-based systems (which are composed of products) to provide commonly recognised operational services, for example, in the realms of Aids-to-Navigation and VTS. Many of these shore-based systems have a similar architecture. This architecture has been captured in the Common Shore-based System Architecture (CSSA). In Figure 5, below, the responsibility of the shore-based service provider is within the oval.

Figure 5 also shows a more detailed representation of the technical services already introduced by Figure 2. The common elements of the technical services are:

* Data Collection (e.g., radar, AIS, etc.);
* Data Exchange (ship/shore and shore/ship; e.g., VHF Data Exchange, AIS, etc.);
* Data Processing;
* Gateway (shore/ shore; e.g., LRIT Service Centre, inter-VTS services, etc.);
* Human-Machine Interface (HMI).

Note that not all technical services require all of these elements.

The arrows indicate data flows between these common elements. The data that is exchanged is modelled within the CMDS.



1. Simplified View of the Common Shore-based System Architecture (CSSA)

In addition, e-Navigation will impact the shore-based systems by requiring harmonization. The concept of the CSSA was developed to accommodate the requirements imposed by provision of e-Navigation services.

Existing legacy systems do have varying degrees of compliance to e-Navigation. Most of these systems will require amendment or eventual replacement in order to support e-Navigation services and achieve full e-Navigation compliance.[[2]](#footnote-2)

The impact of e-Navigation may be different for each shore-based system and will also depend on the services provided, in line with the Maritime Service Portfolio(s) defined for the area.

# CONCLUSION

The above elements for the provision of e-Navigation services from ashore will be further developed and detailed in appropriate IALA documentation in due course:

* Recommendation on the e-Navigation Architecture – the Shore-based Perspective (e-NAV-140 Edition 2); and
* Recommendation on the Common Shore-based System Architecture (CSSA).[[3]](#footnote-3)

1. A registry is simply a bookkeeping device where definitions/ specifications are kept in organised locations known as registers. The registry eases the tasks of development of new things, by providing a centralised source for finding definitions/ specifications. [↑](#footnote-ref-1)
2. Refer in particular to MSC85/26, Annex 20, paragraphs 9.9.1, 9.1.5, and 9.9.3. [↑](#footnote-ref-2)
3. These documents are currently being worked on by the e-Navigation Committee and will be finalized in due course. [↑](#footnote-ref-3)