Deliverable D1.29
MCP/VDES inter-operability report

Project no.	636329
Project acronym:	EfficienSea2
Project full title:	EFFICIENSEA2 – efficient, safe and sustainable traffic at sea
Funding scheme:	Innovation Action (IA)
Start date of project:	1 May 2015
End date of project:	30 April 2018
Duration:	36 months
Due date of deliverable:	30.03.2018
Actual submission date:	03.03.2018
Organisation in charge of deliverable:	IALA

"This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 636329".

DOCUMENT STATUS

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Document History

Version	Date	Initials	Description
V 1.0	31/01/2018	NW	Final document

Review

Name	Organisation

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1. Introduction

IALA provided a paper on MCP/VDES inter-operability to an IALA ENAV Committee WG3 Inter-sessional Meeting at ESTEC in January 2018. This Deliverable contains that report, together with the presentation given at the meeting.

2. Background

The Maritime Connectivity Platform (MCP) has been developed as the innovation centrepiece of the EfficienSea2 project. The MCP website (http://maritimeconnectivity.net/) notes that the MCP is a communication framework enabling efficient, secure, reliable and seamless electronic information exchange between all authorised maritime stakeholders across available communication systems.

The VHF Data Exchange System (VDES) is seen as one of the communication systems that the MCP could use to exchange information.

As both the MCP and the VDES have been developing in parallel it seems appropriate to look carefully at both to optimize the inter-operability of the two systems.

3. Purpose of the document

The purpose of this paper is to highlight the opportunity of VDES as a communication system to be used within the information exchange framework of the MCP.

4. Related documents

There are a number of related documents (see References) for both VDES and MCP. A key driver for the development of this paper has been the report of the E2 MCP Implementation Workshop, held at IALA in November 2017.

5. Background

The mission of the MCP (formerly the Maritime Cloud) is to enable an open vendor-neutral platform for the maritime sector that facilitates information exchange, boundary-free and secured across various communication channels such as internet, satellite, cellular phone network and digital radio links. Considering the divergent structures of the maritime sector in international, regional and national contexts, this concept should enable the use of heterogeneous software systems on-board various ship types as well as on offshore structures and ashore. This includes dedicated type-approved systems, smartphones, tablets and personal computers to interact according to standardized interfaces, protocols and access control rights (EfficienSea2, D3.2)[1].

The VHF Data Exchange System (VDES) is seen as an effective and efficient use of radio spectrum, building on the capabilities of AIS and addressing the increasing requirements for data through the system. New techniques, providing higher data rates than those used for AIS, are a core element of VDES. Furthermore, VDES network protocol is optimized for data communication so that each VDES message is transmitted with a high confidence of reception. VDES increases the capability for digital data exchange in a manner similar to AIS, which includes: provision of data to vessels in a geographic area (broadcast), to a specific vessel or a group of vessels in a geographic area (unicast or geographic multicast) or to a fleet of vessels (group multicast)[2].

1 E2MCPWS-5 ENAV20-9-19 Input Paper (Maritime Cloud Conceptual Model)
2 IALA Guideline 1117, ed 2 (Dec 2017) – VDES Overview

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6. Discussion

VDES and MCP have been developed in parallel over similar time-frames, but without close liaison between the two. For MCP to take advantage of VDES as a communication means there is a requirement to ensure the VDES can access the MCP, and vice versa.

As VDES technical aspects develop there is a need to carefully consider the requirement to connect with the MCP. Two approaches to interfacing with the MCP relevant to VDES were outlined in E2 deliverable D2.11 (Specification of protocols for ship-to-shore communication) and are discussed in the sections below.

It is expected that there are other approaches that will be presented for consideration.

7. TCP/IP over VDES

The MCP is based on the use of web services which are built on top of the TCP/IP protocol suite. Therefore, the natural way to interface the VDES with the MCP would be to ensure that the VDES can handle TCP/IP traffic. The details of how this could be achieved are not discussed here, but the assumption is that the VDES would be "transparent" to the MCP clients / servers. In this approach, an MCP component on-board would connect to a shore MCP component by establishing a standard TCP/IP connection, the same way as it would over a 3G router or an internet-connected Wi-Fi network.

Pros:

- Little or no change to the existing MCP components would be required;
- Possibly greater flexibility in the services that could be provided over VDES.

Cons:

- Increased complexity of the VDES design as it now needs to support TCP/IP communication;
- The TCP protocol was designed for wired networks; its performance over mobile networks (such as 3G or LTE) is known to be sub-optimal, and is especially problematic for satellite use. Optimising TCP for wireless/mobile applications is still an active area of research;
- TCP/IP and the higher-layer protocols used in the MCP add a significant data overhead. Transporting MCP traffic over VDES may result in poor performance, unless, perhaps, an efficient protocol compression scheme is implemented or additional VDES spectrum is secured.

8. Maritime Messaging Service (MMS) and 'Non-IP Media Gateways'

An alternative to providing native TCP/IP support in VDES is to interface to the MCP via 'Non-IP Media Gateways' 0 and route the traffic between these gateways and other MCP components using the Maritime Messaging Service (MMS).

As presented at the E2 MCP Workshop, the MMS is one of the standard services that will be registered on the Service Registry (SR) of the MCP, with three key functions: a maritime messenger for identity or location-based routing; a seamless roaming service with uninterrupted connections and providing communication between SOLAS and non-SOLAS ships; and a digital service broker where the MMS can relay a service request on behalf of a service consumer with a response from a service provider.

E2 D2.11 (section 6) looks at how the MCP may interact with non-IP Media Gateways providing access to systems such as AIS, ASM and Navtex. This is illustrated in Figure 1 (screen capture of Figure 14 from E2 D2.11), focusing on the ship-borne elements of the MCP architecture. The 'Client using MMS' represents an on-board application which needs to communicate with the shore. It can do so by requesting the services of the

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MMS Client Component via an HTTPS[3] / SOAP[4] interface. The MMS Client Component encapsulates both IP and non-IP communications and creates one seamless communication interface for the on-board application. Figure 1 also shows the Almanac which is essentially an on-board version of the Identity and Service Registries (see e.g. E2 deliverable D3.2, Conceptual model) and is used for security related operations and service discovery when communication with the corresponding shore-based registries is not possible. It may also contain information on local services available on the vessel.

The IEC62216-460 Firewall protects the on-board systems from cyber-attacks and is described in more detail in E2 deliverable D2.10 (On-board network architecture) and D2.11. The MCP architecture also includes a Roaming Device (RD). The main purpose of this device is to provide a seamless connection to the internet by roaming between different mobile networks (3G, LTE, satellite broadband, etc.). The RD also enables a system administrator to set up Quality of Service (QoS) policies for the different communication channels that may be available.

Finally, the non-IP Media Gateway provides an HTTPS / SOAP interface between the MCP components on-board and non-IP communication systems including, potentially, VDES.

Pros:

- No need for TCP/IP support in VDES;
- Further reduction in complexity of the VDES design may be possible as some higher-layer functions (such as network routing, user mobility management, etc.) could be outsourced to the MCP;
- Lower bandwidth requirements.

Cons:

- VDES MCP Gateways (and possibly other specialised MCP components) would need to be designed and developed in close cooperation with the MCP development team.

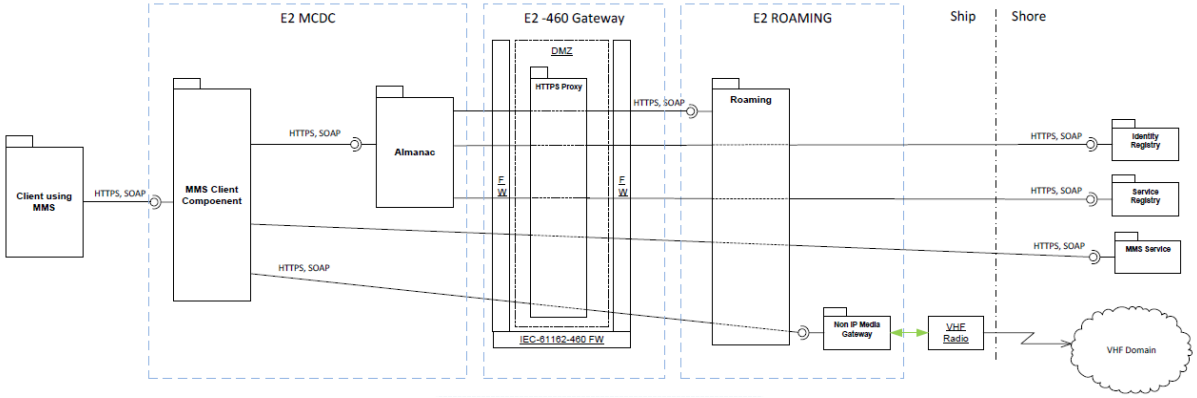

Figure 1: MCP architecture with a Non-IP Media Gateway 0.

9. References

E2 MCP Workshop Report (November 2017)

E2 MCP Workshop input paper E2MCPWS-5 ENAV20-9-19 Input Paper (Maritime Cloud Conceptual Model)

3 Hypertext Transfer Protocol Secure is an adaptation of the HTTP for secure communication over a computer network.
4 Simple Object Access Protocol is a protocol specification for exchanging structured information in the implementation of web services in computer networks.

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IALA Guideline 1117, Ed 2 (VDES Overview)

IALA Guideline 1139 (Technical Specification of VDES)

E2 deliverable D1.10 and D1.11 (Strategy and report on future digital communications in the maritime environment)

E2 deliverable D2.4 (Report on emerging communications technologies)

E2 deliverable D2.11 (Specification of protocols for ship-to-shore communication)

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