Definition of the future VHF Data Exchange System for maritime applications

Introduction to the VDES
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Objective

The objective of this questionnaire is to introduce the VHF Data Exchange System (VDES), its expected benefits, and to collect the needs, requirements and experiences of potential users.

VDES design is currently under construction. This questionnaire is a unique opportunity for you to influence the construction of a new system, designed to serve you. For greatest impact, we suggest completing this questionnaire by telephone, and by the most relevant contact in your organization for detailed technical aspects.

Why user input is important

VDES is based on the Automatic Identification System (AIS), and therefore, some technical elements of the VDES are already in place (AIS, Application Specific Messages (ASM), etc.). However, you can influence the construction of this new system. Your needs and requirements, as a potential user of the VDES, are crucial in shaping the system. They will be the justification for new functionalities that the VDES will offer in the future.

You contribution is essential because it is at the heart of the development process of the VDES. Moreover, this is a good opportunity to express your needs and make your own voice heard within the maritime community about issues you are confronted with, and for which the VDES could bring an efficient solution.

Why you

VDES is intended for you, as part of the institutional users community. As representatives of your entity, you have the knowledge of the whole environment that pertains to your country’ maritime field, and you can express the interests of your entity to benefit from specific services that the VDES could offer.
Therefore, it is very important that you are involved in this user requirements collection process, and that you provide your requirements and priorities.

As a member of the Maritime community, your input is crucial to the development of the new VDES system...
What is VDES?

The VHF Data Exchange System (VDES) is a future maritime communication system which has two main goals:

- To protect the AIS basic function of ship to ship collision avoidance.

- To enhance maritime communication applications, based on robust and efficient digital transmission at a much higher rate (up to 32x) than the current AIS.

Since 2009, the ITU has accepted to consider the allocations of new VHF frequencies (WRC-15, agenda item 1.16). The attribution of new dedicated maritime frequency bands by ITU for digital maritime communications is a rare opportunity for all maritime actors and all the range of applications. In addition, the VDE Satellite Component (VDE-SAT) will allow long range communications between ships and shore.

Figure 1. All communication links envisaged for the VDES
Rationale for VDES

Since the implementation of the system and the IMO carriage requirement onboard Class-A ships, the use of AIS has expanded significantly. Recent studies in Japan, Northern Gulf of Mexico and Korea have shown a worrisome overload of the AIS system. The additional AIS applications include: Class-B vessels, Aids to Navigation (AtN), Application Specific Messages (ASM), Search and Rescue Transmitter (SART), Man Over-Board unit (MOB) and EPIRB-AIS.

National Maritime authorities and IALA anticipate a serious risk that the AIS basic mission, that is to avoid ship to ship collision avoidance, may be compromised if alternative solutions to off-load such services from AIS are not provided.

Main VDES components: terrestrial and satellite

The VDES will naturally have a terrestrial component with support of the AIS coastal stations. Marine traffic routinely collects and distributes AIS data from more than 2000 stations. However, as shown in the following figure, the use of a satellite provides a relevant extension of the terrestrial coverage that is typically limited to several tens of nautical miles into high seas.

![Figure 1. Ship AIS position report message distribution: terrestrial AIS data (left), satellite AIS (right) [green points are location of the terrestrial coastal AIS stations].](image)

Similarly, the VDE Satellite component complements the terrestrial component and extends the range beyond the shore coverage.

The VDE Satellite component will also make it possible to establish communications with vessels in the Polar region, as new navigational routes open.

![Figure 2: Traffic estimation in Arctic based on climate model and ice projections](image)
(Source: Smith, L.R. and Stephenson, S.R. 2013)
VDES: An example of user needs

In this example, one use case is considered as an example of VDES applications, and the expected user needs and added value of the new system are extracted.

UKCM - Under Keel Clearance Monitoring (AMSA)

UKCM for Under Keel Clearance Management is a VDES use case identified by the Australian Maritime Safety Authority. In Northern Australia, the Torres Strait lies between two seas – the Arafura Sea on the west and the Coral Sea on the east. The Arafura Sea has a diurnal tidal system – one high / one low a day; while the Coral Sea has a semi-diurnal tidal system – two highs / two lows each day. The result is some very confused seas, with currents up to 7 knots or about 15 km/h. The pilots use information from tide and current gauges transmitted on VHF radio in Morse code.

A system has been put in place that takes the predicted tidal information, the existing data from the gauges, the weather information and the specifics of the vessel type (including information about the vessel stability, handling, etc) as well as the vessels position and information from AIS. It provides a means to assist the mariner with more accurate, timely and consistent information to help with the transit (voyage waypoints, go/no go areas)...

What is expected from VDES for the UKCM operations?

- Application Specific Message (ASM) broadcast including Met Ocean measurement/forecast data broadcast
- UKC ‘gate’ information
  - ‘gate’ (4 gates per transit transmitted every 5 mins ~ 12 kbyte/hour/ship)
  - Calculation results (‘live’) (10 kbyte/result, every 5 mn ~ 120 kbyte/hour/ship)
  - Chart overlay (‘live’) (20 kbytes, every 5 mn ~ 240 kbyte/hour/ship)

List of VDES use cases that have been identified: SAR Communications, Marine Safety Information and Notice to Mariners, Automated Reporting (IMO FAL forms), VTS Service Portfolio, Updated charts and publications, Ship reporting, Route Exchange Ship to Ship, Logistic services