

Agenda item 9 – IALA TECHNICAL ACTIVITIES

9.4 e-NAV

9.4.1 Documents submitted for approval

9.4.1-6 Demonstration objectives in support of the development of VDES

Note by the Secretariat

1 SUMMARY

The VHF Data Exchange System (VDES) is described under e-NAV14-7.1.3.1 above.

This note describes desirable objectives and milestones needed for the development, evaluation and demonstration of the VHF Data Exchange System (VDES), in order to meet the deadlines of the related ITU World Radio Conference agenda items, as well as the IMO e-Navigation Strategy, and encourages IALA members to support R&D, test-bed and demonstration activities that could lead to a successful development of the VDES as a key part of e-Navigation.

If approved by the Council, the note will be distributed to IALA Members, CIRM, IEC, and RTCM.

2 ACTION REQUESTED

The Council is requested to Approve the document.

From: IALA e-Navigation Committee
To: IALA members and CIRM, RTCM,
IEC

e-NAV14-17.1.3.6
27 September 2013

Demonstration objectives in support of the development of VDES

3 INTRODUCTION

VHF Data Exchange System (VDES) is a technological concept under development by the IALA e-NAV Committee and now widely discussed at ITU, IMO and other organizations. It is a digital data exchange system envisaged to offer a globally interoperable and commonly available maritime data communication capability for ship/ship and ship/shore safety of navigation communications including an option for global coverage via a satellite component.

This note describes desirable objectives and milestones needed for the development, evaluation and demonstration of a VHF Data Exchange System (VDES), in order to meet the deadlines of the related ITU World Radio Conference agenda items, as well as the IMO e-Navigation Strategy, and encourages IALA members to support R&D, testbed and demonstration activities that could lead to a successful development of VDES as support for e-Navigation Implementation.

4 BACKGROUND

AIS is well recognized and accepted as an important tool for safety of navigation and is a carriage requirement for SOLAS vessels (Class-A). However, because of its effective and useful technology, the use of AIS has expanded to vessels not subject to the SOLAS carriage requirement, and to completely different applications. This expanding use of AIS technology has caused significant increase in VHF Data Link (AIS VDL) loading which has become an active concern in IMO and ITU, and it is considered necessary to urgently allocate new frequencies for new and emerging applications in order to mitigate overloading of the AIS VDL.

Simultaneously, because of increasing demand on radio spectrum for digital communication such as mobile phone and data, ITU now requests more efficient and effective use of radio spectrum. New techniques providing higher data rates than those used for AIS will become a core element of VDES. Furthermore VDES network protocol should be optimized for data communication so that each VDES message is transmitted with a very high confidence of reception.

VDES was originally developed to address emerging indications of overload of the VHF Data Link (VDL) of AIS and simultaneously enabling a wider seamless data exchange for e-navigation, potentially supporting the modernization of GMDSS.

The IALA e-Navigation Committee is the focal point for IALA co-ordination of technical input into ITU standards for the VDES. At present the direction of the development is still evolving. There are several alternative ideas as to which modulation and encoding schemes will be used, and many manufacturers are hesitating to commit resources to develop prototypes until these fundamental problems have been resolved.

There is a one year gap before the next IALA e-Navigation Committee meeting and it is imperative that progress is made in the interim, on the fundamental issues, so that manufacturers may construct and test prototypes to inform the forthcoming WRC-15.

The following strategy is proposed to provide a method for inputting alternative ideas and to provide a clear and structured approach to enable the development and testing (proof of concept) of Technical Standards for VDES.

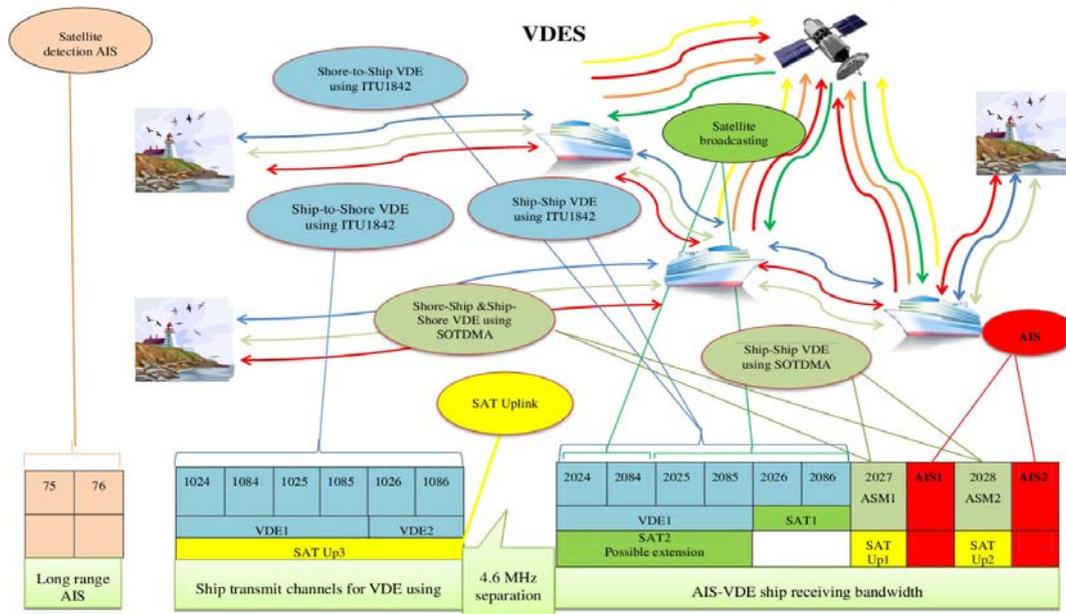


Figure 1: Proposed VDES radio links

The need for a VDES demonstration objective

Before VDES can play any role in the implementation of e-Navigation or support a modernized GMDSS, it must first be fully developed, demonstrated and validated and the allocation of frequencies for the system must be ensured.

The design, prototyping, demonstration and validation activities needed for VDES will require coordinated research & development as well as testbed activities involving competing suppliers, real users and information service providers working together. Some activities are needed to support the claim for frequency allocations needed for the system to become a reality.

Such coordinated R&D and testbed activities will need clear objectives and timelines to bring the relevant parties together and meet the timelines of the ITU and IMO processes.

This note describes specific demonstration objectives and milestones with regards to VDES, in support of focussing research & industry efforts into joint, coordinated testbed activities, to meet the relevant deadlines.

5 DRAFT ROAD MAP

It is anticipated that VDES may be implemented in several stages. Some radio manufacturers have already started to develop the prototype VDE transceivers that have the capability of VHF digital data exchange (VDE) functions and such prototypes are expected to be available for testing in 2014. Several modulation schemes and channel arrangements are being proposed, to generate an efficient system, reduce equipment costs and avoid causing harmful interference to – or being troubled by interference from – other services in the maritime VHF band such as the existing AIS, DSC and VHF voice communication. Robust protocols to ensure a high probability of information delivery also need to be further developed.

For WRC-15 to approve the allocation of the proposed frequencies for VDES, in light of the urgency to protect the AIS VDL, supporting studies, field trials and even partial implementation may be necessary, even before satellite assets envisaged to be part of the full system can be made available.

To facilitate a satellite frequency allocation for the VDES, sharing studies involving land mobile VHF stations are underway in ITU. It is expected that such studies will be completed during the development of the ITU Recommendations for VDES so that final decisions by WRC-18 can facilitate a fully featured VDES including the satellite aspects.

In order to ensure a coherent and globally interoperable system, comparative studies, field trials involving testbeds and harmonization of the results will be needed to fully develop the system and ensure a safe, efficient and globally interoperable implementation.

Figure 2 provides a possible roadmap for the development of VDES.

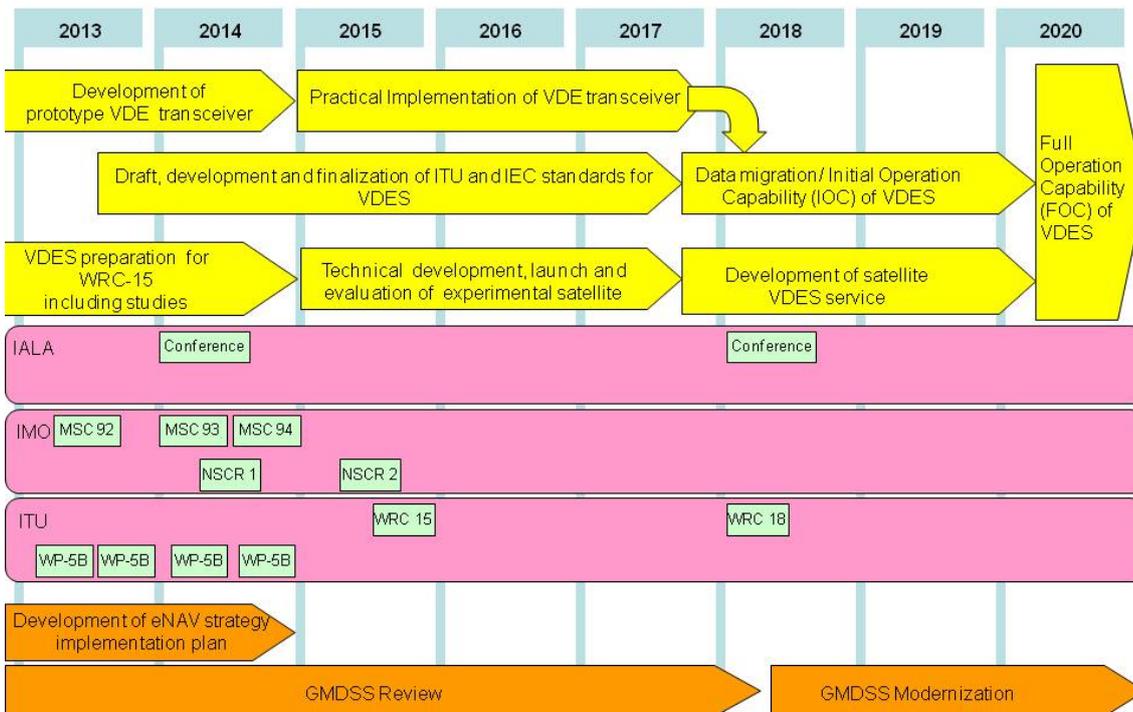


Figure 2: DRAFT Roadmap for VDES

6 DEMONSTRATION OBJECTIVES AND MILESTONES IN SUPPORT OF THE DEVELOPMENT OF VDES

6.1 General objectives

Testbed locations – are required to establish VHF data link characteristics in all of the different modes of operation (ship to ship, shore to ship etc.) through varying seasons, weather conditions and over locations with differing topographical features. These measured data can then be input into models to estimate the theoretical link performance for differing transmission schemes.

Defined Testbed areas – supported by competent authorities within which there is permission to transmit across all of the proposed VHF channels using a variety of modulation schemes within defined transmitter power limits. A list of these test bed areas with government and regulatory support shall be provided to manufacturers which will encourage fast track development and testing of the prototypes.

As a starting point general guidance for the technical aspects of the VDES can be found in the Preliminary Draft New Recommendation ITU-R M.[VDES] (e-NAV14-17.1.3.4).

A discussion group has been set up on LinkedIn (VDES Technical Standard Development), with members from the IALA e-Navigation Committee WG3/4, ITU WP5B, manufacturers and research institutions. The aim of the group will be to input ideas and pose questions on possible modulation / encoding schemes, allow peer review and report on the outcome of testing these schemes. In this way a body of knowledge will be built up to support the eventual decision on the final scheme to be used which will input into the VDES technical standard. Contributions to the further development of the Preliminary Draft New Recommendation ITU-R M.[VDES] are encouraged to be posted on the LinkedIn 'VDES Technical Standard Development' subgroup under IALA. <http://www.linkedin.com/groups?homeNewMember=&gid=5189068>

- 6.1.1.1 All schemes proposed in the forum will undergo the same scrutiny.
- 6.1.1.2 Members of the group will be expected to act in the common good, with the sole aim of developing the best solution for VDES.
- 6.1.1.3 Discussions will be moderated by one or more technical experts who will be the ultimate arbitrator and refer any contentious issues to WG3/4.
- 6.1.1.4 Regular summary monthly reports on progress will be provided to all group members, with additional highlight reports when there is a significant event (e.g. success or failure of a particular scheme under test)

Plans for conducting VDES testbeds and the planned operational context and validation activities should be announced, and documented results of the testbeds should as soon as possible be reported on the IALA testbed website <http://e-navigation.net> (refer to IALA Guideline on The reporting of results of e-Navigation testbeds e-NAV14-17.1.7.1) and on the LinkedIn 'e-Nav Test Beds' subgroup under IALA <http://www.linkedin.com/groups?gid=5068692>. A copy of the summary monthly reports and links to the locations containing the detailed testbed results will be provided on e-navigation.net.

6.2 Definition of testbeds and operational scenarios to validate terrestrial VDES (Q3 2014)

Parties willing to set up one or more testbed activities related to the development of VDES should seek to initiate such testbeds by Q3 2014 and, and should as a minimum:

Plan one or more operational scenarios relevant to the implementation of e-Navigation for testing information services using VDES as the communication link.

Develop a validation scheme for demonstrating the operational efficiency and effectiveness of VDES as a communication link, where possible involving comparison between alternative design solutions.

Testing on the ASM frequencies will be particularly valuable to the upcoming ITU WRC 2015 process.

Assessing interference with other services issues in the VHF band should be considered in the planning of testbeds.

Plan to perform initial operational testing in the timeframe Q4 2014 – Q2 2015

Provide the initial results of the testbeds to the IALA e-Navigation committee, as well as reporting relevant findings to ITU WRC 2015 through relevant national representation no later than their respective deadline for comments to WRC-15 (expected to be several months before WRC-15 to be held 2nd – 22nd November 2015), in support of the allocation of frequencies for VDES.

6.3 Proof of concept VDES stations ready for field testing (Q4 2014)

Manufacturers or research institutions willing to participate in developing and evaluating possible designs for VDES shipborne, shorebased and as well as satellite VDES stations and associated transmission protocols are encouraged to deliver the first proof of concept platforms for field testing in operational testbeds no later than Q4 2014.

Several modulation schemes and channel arrangements are currently proposed for different parts of the VDES. Where possible, the prototypes should either accommodate the comparative testing of several options for modulation and/or channel arrangements, or document the rationale behind any specific choices of modulation or channel arrangement, in support of evaluating and harmonizing chosen solutions to achieve a globally interoperable system.

6.4 Definition of testbeds and operational scenarios to validate Satellite VDE (Q4 2015)

Parties willing to set up one or more testbed activities related to the development and validation of full VDES capabilities including a satellite component should seek to initiate such testbeds by Q4 2015, and should:

Plan for one or more operational scenarios, including relevant needs for information security (authentication, integrity, confidentiality) relevant to the implementation of e-Navigation, testing the function of information services using satellite VDE as well as terrestrial VDES as the communication link;

Encourage the participation of several manufacturers in the same - or a number of coordinated - R&D or testbed projects addressing the same objectives, to ensure interoperability and broad industry support for the achieved results.

Develop a validation scheme for demonstrating the operational efficiency, effectiveness and information security of the terrestrial VDES as well as satellite VDE as a communications link, where possible involving comparison between alternative design solutions for VDES

Seek that the testbed includes

- High density traffic regions as well as low traffic
- Remote regions such as the polar areas
- A realistic maritime radio frequency environment (including the use of VHF voice, DSC, AIS or other VHF equipment) onboard real ships.
- Several different ships travelling the regions mentioned above

Plan to include field studies aimed at verification on feasibility of any necessary sharing of frequencies between satellite and terrestrial landmobile or maritime services.

Plan to perform operational testing in the timeframe Q1 2016 – Q3 2016.

Provide initial results of the testbeds to the IALA e-Navigation committee no later than Q3 2016 in support of the standardization of VDES to support the Implementation of e-Navigation.

6.5 Prototype VDES stations ready for field testing (Q1 2016)

Manufacturers or research institutions willing to participate in developing and evaluating possible designs for VDES shipborne (and satellite) VDES stations are encouraged to deliver the first prototype platforms supporting terrestrial as well as satellite VDES for field testing in operational testbeds no later than Q1 2016.

Several modulation schemes and channel arrangements are currently proposed for different parts of the VDES. Where possible, the prototypes should either accommodate the comparative testing of several options for modulation schemes and/or channel arrangements, or document the rationale behind any specific choice of modulation scheme or channel arrangement, in support of evaluating and harmonizing chosen solutions to achieve a globally interoperable system.

7 ACTION REQUESTED

The e-Navigation Committee invites IALA members as well as relevant organisations to consider planning or supporting coordinated R&D and testbed activities, which could support meeting specific objectives and timelines for the development of VDES. Coordinating and reporting such activities via the IALA e-Navigation committee could enable completion of the development of VDES, in time to fully support e-Navigation Implementation.