



Deliverable D1.23 Introducing The VHF Data Exchange System



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



The need for effective, efficient and robust communications is critical. Data is at the essence of what we do – collection, evaluation, sharing – these are all core to decision making – whether it is part of the bridge team, the ashore side or the combined ship/shore process for route exchange and transits.

The core elements really aren't changing – but the technology is changing. Just as we now expect to have access to digital communications capabilities in our day to day lives ashore, we are looking to have access in the maritime operational environment. A maritime digital evolution is underway – one that is truly revolutionary! This is the development of the VHF Data Exchange System.

VDES builds on the success of the Automatic Identification System – a digital maritime exchange capability on limited bandwidth. This overview will highlight the basics of what VDES is, and what it isn't...



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INTRODUCING THE VHF DATA EXCHANGE SYSTEM

Bringing maritime communications into the digital age!

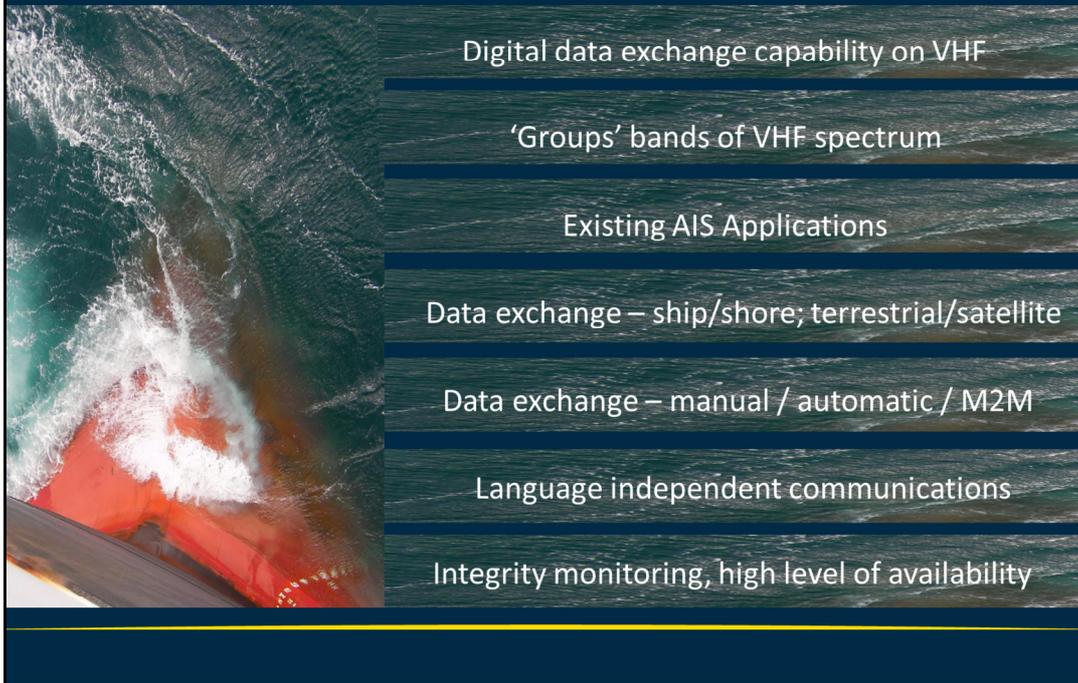
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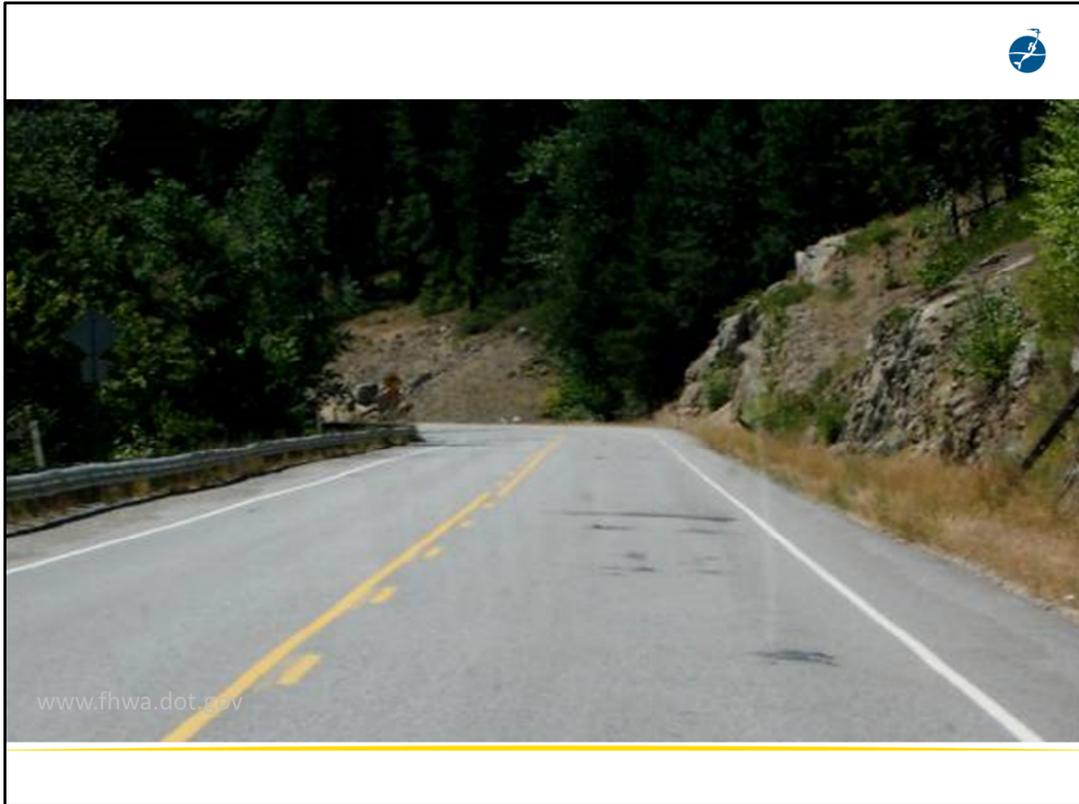
VHF Data Exchange System



Well, VDES is a mobile, digital data exchange capability over VHF maritime mobile radio spectrum that could see digital data transferred pretty much anywhere, anytime. VDES will 'group' bands of VHF spectrum together which will enable more data to be transferred.

As a 'system' it includes existing AIS applications – but it goes beyond that. (go through bullets)



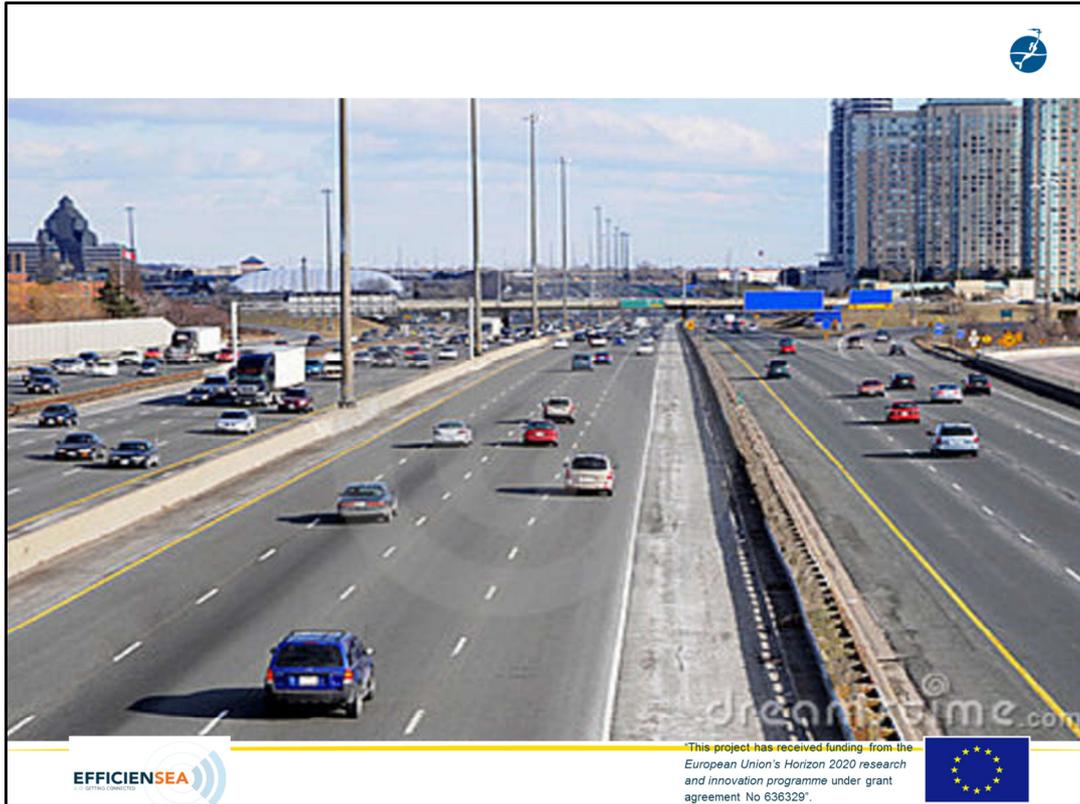


Why VDES – why not just AIS or more AIS?

Think of a road in your town or neighbourhood. A road with a single lane each way, with a speed limit of 50 km/hr (30 miles / hr for those non-metric folks...) – probably even a road that trucks don't use...

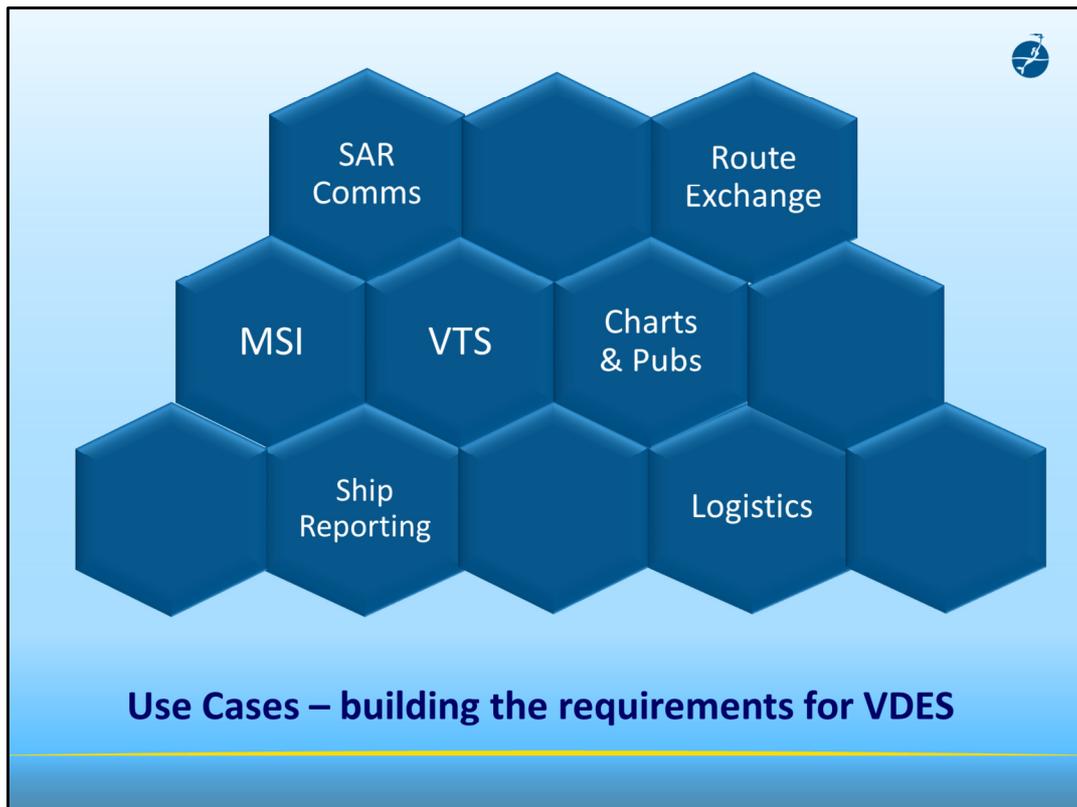
That is like AIS. Although there are two 25 kHz VHF 'channels' data only travels over one 'lane' at a time. There are 'cars' on the 'lane' (the data packets) that travel, but they are only so big, can only go so fast – and there can't be too many 'cars' on the road every minute.

We have seen that, due to the success of AIS, we are already getting some 'traffic jams' on the two AIS frequencies. Just like your neighbourhood when you get a 30 story condominium going up and the road infrastructure needs to change to address the additional traffic, digital data capabilities need to evolve to meet the ever growing needs for more data transferred, more quickly, more often...



So, what happens when the city gets bigger? The infrastructure changes to meet the new requirements. Think of a multi-lane highway – something like the [name of highway in your area] – there are more lanes for the traffic, and more cars can travel on the highway at a time. In addition, the speed limit is higher, so you can get more ‘cars’ on the road each minute. And, there can be bigger ‘cars’ on the road – carrying more ‘stuff’ – in this case, data.

Using developments in technology – software defined radios - that enable multiple ‘bands’ of 25 MHz VHF channels to be grouped together, VDES can take existing frequencies (single lanes) and group them together to create a multi-lane highway that will enable more data to be transferred. VDES is also looking at changing the ‘speed limit’ for the data transfer, using different approaches (or modulation schemes) which can lead to more data, more often, being transferred on more spectrum.



Why should you be excited by the thought of digital data over a ‘multi-lane highway’ of VHF channels? Just imagine the opportunities of a stable, robust, machine to machine communications system which can be developed to be language independent!

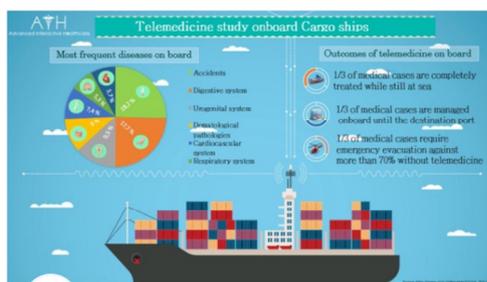
A core group of folks at IALA have been doing just that, working with real-world scenarios to develop use cases for VDES that take into account the work on e-Navigation and GMDSS modernization. These operational use cases will assist in determining the technical requirements of VDES and have been aligned with the development of the Maritime Service Portfolios.

Each use case has a number of scenarios that support the use case – for example, take SAR Communications. One of the scenarios is telemedical...



Scenario - Telemedical

- Person injured or sick onboard / medical attention required
- Conversation with doctor ashore by voice via radio or phone



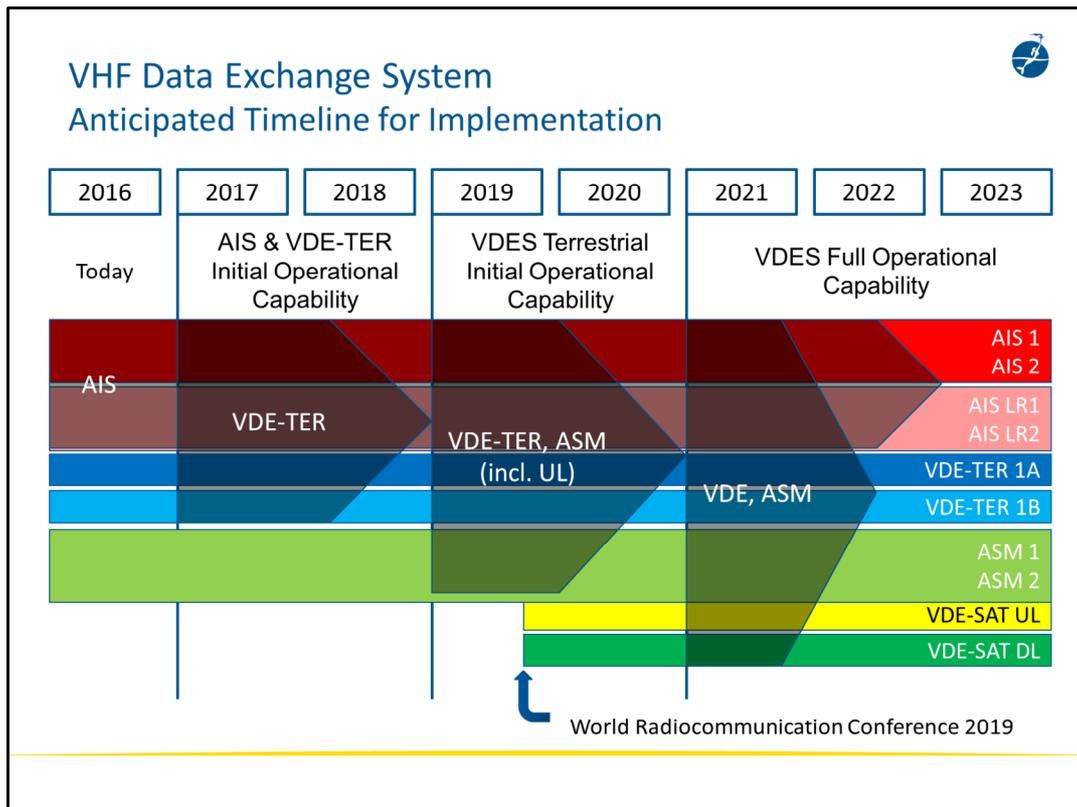
<http://aih-telemed.com/>

VDES could be used to:

- Transfer advice by text, avoided misunderstanding of accents
- Transfer images, indication from medical equipment
- Information could be integrated and portrayed on systems onboard or ashore

Narrative for Scenario

- Person injured or sick onboard a vessel or platform which requires the need to communicate with a doctor ashore for medical assistance and prognosis.
- Conversation with doctor could be by voice, with transfer of images / photos / indication from medical equipment on patient condition.
- Doctor providing assistance could use VDES to transfer advice, images or other information.
- In case of language difficulties, VDES could assist with machine to machine communications and/or language independent communication.
- The doctor providing tele-medical advice ascertains the severity of the injured or sick seafarer on board and to decide possible medical evacuation (MEDEVAC)
- Information exchange may be integrated with and portrayed on external systems onboard or ashore (medical facility)
- Information may be provided using existing formats.



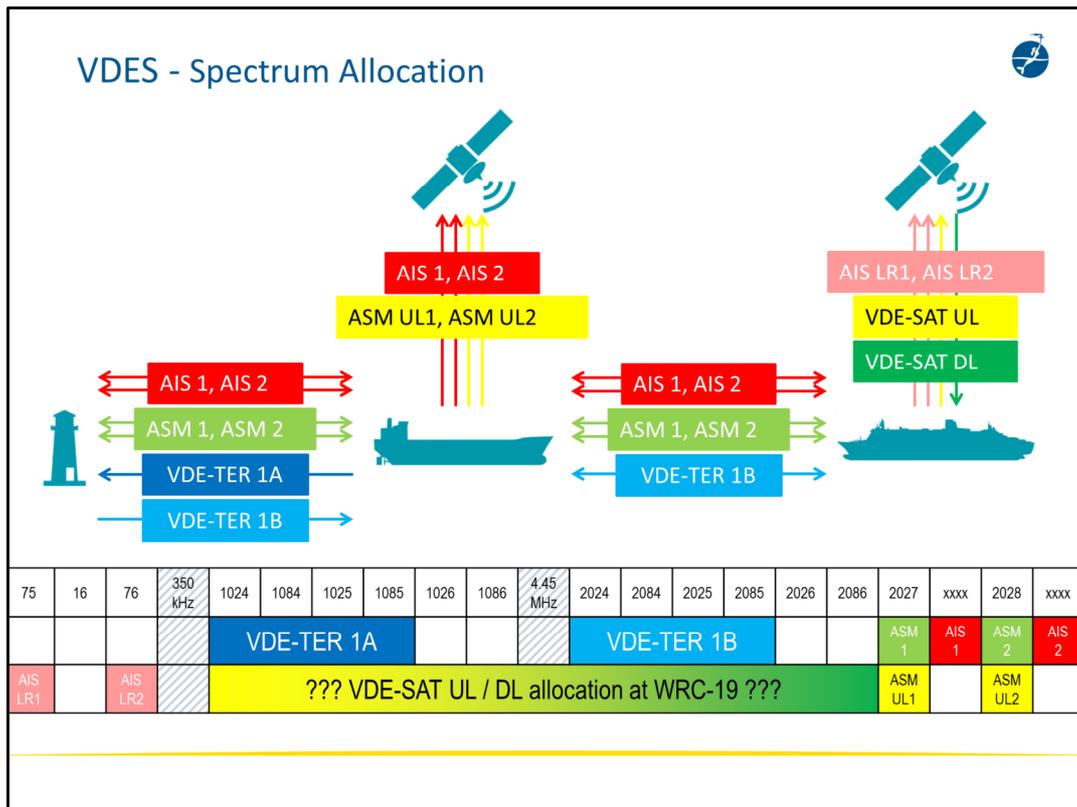
The full capability of VDES imagined is a truly global approach, with satellite and terrestrial data exchange.

VDES is well on its way to implementation, with the initial allocation of spectrum for the additional VDE – Terrestrial frequencies identified at the World Radio Conference 2015. In addition, at WRC-15 spectrum was allocated for ASM satellite reception (ASM uplink)

While the full satellite component for the VDE frequencies – both uplink and downlink – were not agreed at WRC-15, taking into account the ongoing work for the satellite component, and recognising the results of the terrestrial trials, WRC2015 agreed to promote further analysis of the satellite VDE component (both uplink and downlink). What this means is that ITU has a work programme item to further study the satellite component of VDES, with an expected resolution at WRC 2019. The results of the trials will be critical to achieve agreement for the full VDES (including satellite components) at WRC-19.

While practical trials continue, some equipment is being developed for market to take advantage of the VDES capabilities using software defined radios.

In the lead up to WRC-19 there are a number of focus e-navigation testbeds for the satellite uplink / downlink components of VDE-Satellite.



What does the full system look like?

As saw, VDES is a system of capabilities and includes:

AIS – existing (red)

AIS LR – existing (pink)

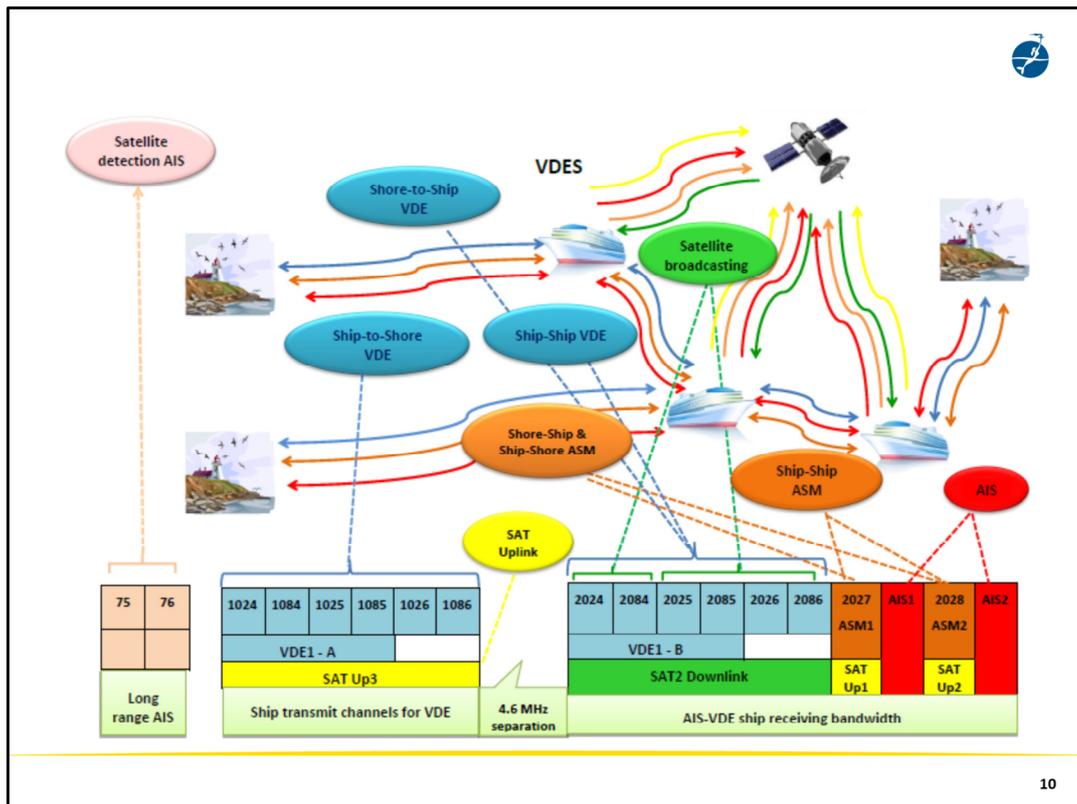
VDE – Terrestrial (1A – ship to shore) (dark blue) – agreed at WRC 2015

VDE – Terrestrial (1B – ship to ship; shore to ship) (light blue) – agreed at WRC2015

ASM – terrestrial and satellite uplink – (light green) agreed at WRC 2015

VDE – Satellite (uplink) (yellow) – WRC15 indicated need for further study in the lead up to WRC19 (goal – to be agreed at WRC19)

VDE – Satellite (downlink) (dark green) - WRC15 indicated need for further study in the lead up to WRC19 (goal – to be agreed at WRC19)



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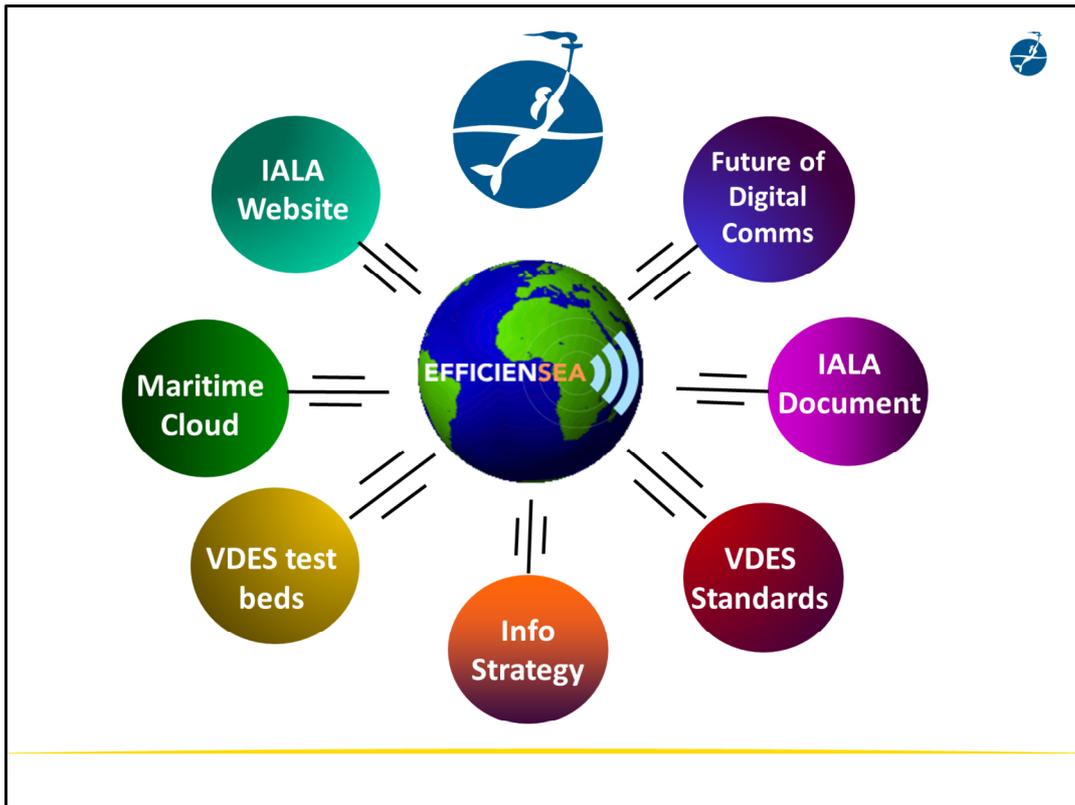
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IALA has been instrumental in the development of VDES, providing leadership on both the technical and operational / user requirements of the system.

To support the development of VDES, and ensure the capability is developing in line with other international initiatives, IALA is working closely within the Efficiency 2 program.

IALA has agreed to deliver on a number of key elements for Efficiency 2, items related to both VDES (as an enhanced capability for communications) and the maritime cloud.



This package of work includes 12 tasks with a focus on Documentation

Bullet one

- Prepare a draft strategy/policy document on the future of digital communications, using ENAV17-11.20 as a basis and taking into account the IMO review of GMDSS;

Bullet two

- Review existing IALA documentation relating to AIS and provide a recommendation on suitable consolidation / revision / inclusion of text relating to introduction of VDES;

Bullet three

- Noting the above, propose IALA documentation structure for VDES with the inclusion of AIS documents as part of VDES;
- Draft an overview document for VDES (high level introduction to VDES covering operational and basic technical aspects – similar to the IALA Guideline 1082 (Overview of AIS));

Bullet four

- Develop preliminary standards for VDES in IEC

Bullet five

Information sharing strategy

- Draft an strategy to promote VDES and share information on VDES – this is for inter-committee aspects of VDES as well as the broader maritime community.



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Included in this work is a process to ensure input on VDES is provided to / received from other IALA Committees; and draft chapters on VDES for IALA Aids to Navigation Guide and IALA VTS Manual;

- Draft plan for shaping opinion in ITU-R to raise the level of understanding of VDES and its significance, in particular the importance of the sat-down link

Bullet six

Operational VDES

- Design and plan a VDES compatibility test bed;
- Implement VDES test bed;

Support development of Maritime Cloud

The maritime cloud is defined as *a communication framework enabling efficient, secure, reliable and seamless electronic information exchange between all authorized maritime stakeholders across available communication systems*. The focus for the IALA work related to the maritime cloud includes:

- Draft an information document and presentation on the Maritime Cloud, for possible use at IMO;
- Prepare a plan/strategy for standardisation of the Maritime Cloud

And

- Prepare pages for the IALA website on standards and test beds, using information gathered in the E2 databases.



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www.iala-aism.org

Visit the IALA website for more information on VDES, including access to the IALA VDES Overview Guideline and a frequently asked question area for VDES.

Please contact IALA through the 'contact us' button on the IALA website to provide your comments, questions or further thoughts on VDES. You are also welcome to participate in IALA meetings, or provide comments or input to IALA meetings through your IALA national representatives.

