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衛星VDES国際フォーラム

社会実装にむけた取り組みと今後求められる国際的協働について

Satellite VDES Forum

International cooperation toward its social implementation

24/February/2023, 2:30～6:00PM (JST)

【Opening remarks／開会挨拶】
Dr. Hide SAKAGUCHI (President, OPRI-SPF)
阪口 秀（笹川平和財団海洋政策研究所長）

【Introduction to the Forum／趣旨説明】
Dr. Tomonari AKAMATSU (Director, OPRI-SPF)
赤松 友成（笹川平和財団海洋政策研究所海洋政策研究部長）

【Keynote Speech／基調講演】
RADM Tsuguo AWAI (Japan Coast Guard/IALA Councilor for Japan)
粟井 次雄（海上保安庁／国際航路標識協会理事）

【Session 1: Construction of Infrastructure/System／
セッション①（インフラ・システムの構築・整備）】
Mr. Lars MOLTSEN (Sternula)
Mr. Peter BERGLJUNG/ Mr. Magnus Nyberg (Saab)
Mr. Hans Christian HAUGLI (Space Norway)
Mr. Akira SHISA (志佐　陽) (IHI)
Mr. Takayoshi FUKUYO (福代 孝良) (ArkEdge Space)
Mr. Koichi NISHIMURA (西村 浩一) (TST)

【Session 2: Operation, Business Model and Training／
セッション②（実利用・ビジネス化促進・トレーニング）】
Ms. Jillian CARSON-JACKSON (JCJ Consulting)
Mr. Yoshihiro SANO (佐野 義浩) (MOL Techno-Trade)
Prof. Dr. Axel HAHN (German Aerospace Center)
Dr. Koichi YOSHIDA (吉田 公一) (OPRI-SPF)

【Closing remarks／総評】
Dr. Tomonari AKAMATSU (Director, OPRI-SPF)
赤松 友成（笹川平和財団海洋政策研究所海洋政策研究部長）

Presenters（ご登壇のみなさま）

RADM Tsuguo AWAI (Japan Coast Guard/ IALA Councilor for Japan)

RADM AWAI started his professional career in 1984 after graduating from the Coast Guard Academy and was given a first assignment on board JCG cutter as a radio officer. Since then, he has engaged in a variety of shore/sea services of the JCG across the country. He has served the Maritime Safety Division of the International Maritime Organization in London from 1989 to 1991 as a professional officer in charge of GMDSS, SAR and STCW.
He retired from the Coast Guard in March 2022 and was re-assigned to the present senior post responsible for maritime security and international strategy, including Japan's MDA policy making and the maritime surveillance UAV program. He is also serving the JCG maritime traffic safety services as the IALA Councilor for Japan.

粟井 次雄（海上保安庁／国際航路標識協会理事）

海上保安大学校を卒業後、1984年に海上保安庁の巡視船に無線担当として配属される。その後、海上保安庁の陸上・海上業務に従事し、現在に至る。1989年から1991年までロンドンの国際海事機関海上安全部に勤務し、GMDSS、SAR、STCWを担当する専門官として活躍。2022年3月に海上保安庁を退職し、日本のMDA政策立案や海上監視UAV計画など、海洋安全保障や国際戦略を担当する現職に着任した。また、海上保安庁の海上交通安全業務に国際航路標識協会理事として従事している。

Mr. Lars MOLTSEN (Sternula)

Mr. Lars Moltsen is a Danish tech entrepreneur and one of two founders of Sternula. Mr. Moltsen holds a master's degree in Computer Science and Mathematics from Aalborg University. He started his professional career as a software and algorithm developer in 1996. Gradually, he changed focus to applications within telecommunications and space. After a number of years at Nokia, he started his first company in 2003, and Sternula is his fourth and latest start-up. Over the years, Lars Moltsen has contributed to a range of international R&D projects and published more than 20 conference articles, journal papers, and patents.

ラース・モルトセン（Sternula）

ラース・モルトセン氏はデンマークの技術系起業家で、Sternula社の2人の創業者のうちの1人。オールボー大学にてコンピューターサイエンスと数学の修士号を取得。1996年にソフトウェアとアルゴリズムの開発者としてキャリアをスタートさせた。その後、徐々に通信・宇宙分野での応用に注力するようになり、ノキア社で数年間勤務した後、2003年の最初の起業を経て、Sternulaが4つ目の企業となる。長年にわたり、さまざまな国際的研究開発プロジェクトに貢献しており、20以上の会議論文、雑誌記事、特許を発表している。

Mr. Peter BERGLJUNG (Saab)

Mr. Peter Bergljung has been working with AIS since 2000 and VDES since 2012. Peter holds a Master of Science in Digital Control from Linköping University in Sweden. Currently Peter have a position as Strategy and Product Portfolio Director at Saab AB TransponderTech. Peter is also the co-chairman of VDES Alliance. Peter's expert areas are radio communication, guidance and Control and inertial navigation.

ペーター・ベルクユンク（Saab）

ペーター・ベルクユンク氏は、2000年からAISに、2012年からVDESに関わる活動を行っている。スウェーデンのリンショーピン大学でデジタル制御に関する理学修士号を取得。現在、Saab AB TransponderTechで戦略および製品ポートフォリオ・ディレクターを務めるとともに、VDESアライアンスの共同議長も務めている。専門分野：無線通信、誘導制御、慣性航法。

Mr. Magnus Nyberg (Saab)

Mr. Magnus Nyberg started his work with AIS in 1997 as systems engineer/product manager and was actively part in the development of the AIS standards and products, such as the Saab R3, R30, R4 and R40. He left the AIS community in 2013 for development of products using the RF spectrum for transfer power for telecom, automotive and aviation applications. Magnus is since 2021 back at Saab and the AIS community. Magnus has a background as hydrographic surveying officer at Swedish Maritime Authorities, he also holds a Master of Science in Industrial Electronics from Royal Institute of Technology in Sweden. Currently Magnus have a position as Sales Director at Saab AB, TransponderTech.

マグヌス・ニーバーグ（Saab）

マグヌス・ニーバーグ氏は1997年にシステムエンジニアおよびプロダクトマネージャーとしてAISに入社し、AIS規格の策定のほか、Saab R3、R30、R4、R40などの機器の開発に参画した。2013年にAISのコミュニティを離れ、通信、自動車、航空アプリケーションの電力伝送にRFスペクトルを使用する製品の開発に従事した。2021年、SaabおよびAISコミュニティに復帰している。スウェーデン海事局で水路測量官を務め、スウェーデン王立工科大学で産業電子工学に関する理学修士号を取得。現在、Saab AB TransponderTechでセールスディレクターを務めている。

Presenters（ご登壇のみなさま）

Mr. Hans Christian HAUGLI (Space Norway)

Mr. Haugli has more than 30 years experience in designing, deploying and operating low data rate systems for the European Space Agency, Inmarsat, Vistar Telecom and Space Norway. He led a team at Inmarsat that developed the first Inmarsat-C prototype in 1985, this system became a low cost entry to GMDSS which still has around 250,000 users. At Space Norway, he and his colleague dr. Løge concluded that LEO VDE-SAT would be well suited for provision of maritime digital services in the Arctic. Strong national support led to the launch of NorSat-2 with a VDE-SAT payload in 2017. ESA awarded Space Norway several VDE-SAT contracts and Haugli and Løge, prepared system analysis, specifications and test reports for IALA, ITU and the World Radio Conference which in 2019 allocated VHF frequencies to the satellite component of VDES. The VDE-SAT ITU standard 2092 was approved in 2022.

ハンス・クリスティアン・ハグリ（Space Norway）

ハンス・クリスティアン・ハグリ氏は、欧州宇宙機関、インマルサット、ビスターテレコム、スペースノルウェーにおいて、低データレートシステムの設計、実装、運用に関する30年以上の経験を有している。インマルサットでは、1985年に最初のインマルサットCプロトタイプを開発するチームを率いた。このシステムはGMDSSへの低コスト参入の端緒となり、現在でも約25万人のユーザーを抱えている。Space Norwayでは、同僚のローゲ博士とともに、LEO VDE-SATが北極圏での海上デジタルサービスの提供に最適との結論を踏まえ、政府の強力なサポートを受けて、2017年に大極域VDE-SATペイロードを搭載したNorSat-2の打ち上げを実現させている。

Mr. Akira SHISA (IHI)

Mr. Akira SHISA graduated from Tokyo University in March 1987(Naval Architecture and Marine Engineering). In 1987, he entered in IHI Corporation, Space Development Division and joined the design team of the Japanese Experiment Module for the International Space Station. In 2003, he entered in IHI Aerospace Inc and in charge of propulsion systems for the Japanese transfer vehicle, satellites, and stratospheric platforms (airships). Also assigned as manager of GX launch vehicle, the first rocket led by a private company. In 2014, he returned to IHI Corporation. Also assigned as manager of GX launch vehicle, the first rocket led by a private company. In 2014, he returned to IHI Corporation. He was assigned as General Manager of Sales and Marketing Group and in charge of business development of space utilization, such as Maritime Domain Awareness, Space Situation Awareness. At that time, start AIS data business. In 2018, He was assigned as General Manager of Business development Group and started the business development for solving social issue using space such as VDES or Forest Management. Chair of Satellite VDES Consortium.

志佐　陽（IHI）

昭和62年、東京大学工学部船舶工学科を卒業し、石川島播磨重工業株式会社（現IHI）に入社。国際宇宙ステーションの設計に参加する。平成15年、株式会社IHIアエロスペースへ出向し、宇宙ステーションへの輸送機「こうのとり」、衛星「いぶき」や、成層圏プラットフォーム（飛行船）の推進システムを担当。また、民間初主導の新型ロケットとなるGXロケット開発の技術とりまとめを担当。平成26年、株式会社IHIに復帰し、営業グループ部長を拝命。宇宙利用の事業開発などを担当し、AISデータ利用事業を開始。平成30年、宇宙開発事業推進部事業企画グループ部長を拝命し、VDESや森林管理など宇宙を活用した社会課題解決の事業化に取り組んでいる。衛星VDESコンソーシアム代表幹事。

Mr. Takayoshi FUKUYO （ArkEdge Space）

Mr. Takayoshi Fukuyo is the CEO of ArkEdge Space Inc. He founded Space Edge Lab (currently ArkEdge Space Inc.) in 2018 after his career as an expert at the National Space Policy Secretariat, the Cabinet Office and as a JICA expert. He was also an official at the Ministry of Foreign Affairs and the Cabinet Office's Space Development Strategy Secretariat. He has experience in international cooperation work in forest, marine and natural resource management in South America and Africa. In the Cabinet Office, he engaged in international cooperation concerning outer space development and its use in South America, Asia, the Middle East and Africa. Currently he is promoting the development and commercialization of 6U size nano-satellite constellations for IoT communications and earth observation. As for VDES satellites, he is working to develop the basic infrastructure for future vessel identification, safe navigation and maritime digital transformation (DX) through the realization of early in-orbit demonstrations.

福代 孝良（アークエッジ・スペース）

アークエッジ・スペース代表取締役CEO。内閣府宇宙政策委員会専門委員。JICA専門家、外務省、内閣府宇宙開発戦略事務局を経て、2018年に株式会社スペースエッジラボ創業（現:株式会社アークエッジ・スペース）。南米、アフリカ地域の森林・海洋・自然資源管理の国際協力業務に実績。内閣府では、南米・アジア・中東・アフリカと宇宙利用に関する国際協力業務に従事してきた。現在は、IoT通信や地球観測に対応した６Uサイズの超小型衛星コンステレーションの開発、事業化を進めている。VDES衛星についても、早期の軌道上実証の実現を通じて、今後の船舶識別、安全航行、海洋デジタル化に向けた基盤インフラ整備に取り組む。

Mr. Koichi NISHIMURA (TST)

Mr. Koichi NISHIMURA graduated from Tokyo University of Mercantile Marine in the faculty of navigation in 1981. After graduating university, he joined TOKYO KEIKI INC. which is one of the leading manufacturers of navigational equipment in Japan. He involved in a wide range of product developments not only navigational equipment but VTS system integration. In 2018, he joined TST Corporation which provides information services for the purpose of safety of navigation and contributes a lot to the efficiency of port operation in major ports in Japan. He holds a CTO position in TST Corporation. He is active in IALA on the VTS committee and the ENAV committee. Also, he is a board member of the VDES Alliance.

西村 浩一（東洋信号通信社）

1981年、東京商船大学商船学部航海学科卒業。大学卒業後、日本を代表する航海機器メーカーのひとつである株式会社東京計器に入社。航海機器から、VTSシステムインテグレーションなど幅広い製品開発に携わる。2018年、航行の安全を目的とした情報サービスを提供し、日本の主要港の港湾業務の効率化に大きく貢献する株式会社TSTにCTOとして入社。IALAの活動にも参加しておりVTS委員会とENAV委員会のメンバーである。また、VDES Allianceのボードメンバーでもある。

Presenters（ご登壇のみなさま）

Ms. Jillian CARSON-JACKSON (JCJ Consulting)

A transplanted Canadian, now living in Australia, Jillian has almost four decades of experience in the maritime industry. She has experience both afloat and ashore, she has management experience in different government areas, including aids to navigation (AtoN), Vessel Traffic Services (VTS), shore station radio operations, regulation of maritime pilots, vessel tracking and maritime technology related fields. She is passionate about education and training, diversity, equity and inclusion, with a focus on the maritime industry. Jillian continues to work on matters related to the digitalisation of the maritime industry, risk assessment and mitigation, and maritime education and training. She is a Director of GlobalMET, an adjunct senior researcher with the University of Tasmania (Australian Maritime College) and a Board member of Captains without Borders. Jillian is the immediate Past President of the Nautical Institute (International) and an active member of the NI South East Australia branch. Jillian's expertise in navigation, education, vessel tracking, and maritime radio communication technology has been recognised by the award of Fellowships with both the Royal Institute of Navigation and the Nautical Institute. For many years Jillian has been promoting digital communications in maritime, including VDES.

ジリアン・カーソン＝ジャクソン（JCJコンサルティング）

ジリアン・カーソン＝ジャクソンは海事産業において約40年の経験を有し、航路標識（AtoN）や船舶交通サービス（VTS）、陸上無線操作、水先人の規制、船舶追跡、海事技術関連分野などに関する行政分野での多くの管理経験を有している。また、海事産業を中心に、教育・訓練、DEI（多様性、公平性、包括性）に情熱を注いでおり、海事産業のデジタル化、リスク評価と軽減、海事教育・訓練に関連する事柄に取り組み続けている。Global METのディレクターやタスマニア大学の非常勤上席研究員、Captains without Bordersの評議員を務めるとともに、Nautical Institute (International)の前会長であり、NI南オーストラリア支部の会員として活躍している。彼女が有する経験や見識は高く評価されており、王立航海協会と航海協会の両方からフェローシップを授与されている。長年にわたって、海事分野におけるデジタル通信の普及に努めており、VDESもそのうちの１つである。

Mr. Yoshihiro SANO (MOL Techno-Trade)

After graduating from the Electronic Navigation Laboratory, Tokyo University of Mercantile Marine, in 1988, Mr. Yoshihiro SANO joined Toshiba Corporation. First, he started the career as a radar engineer. Then, he was transferred to the sales division and was mainly involved in the defense system for the Air Self-Defense Force for about 20 years. After that, he worked in gallium nitride semiconductor sales, building electricity, Building Energy Management Systems, and Smart-City-related businesses. He then joined MOL Techno-Trade in October 2019. He is mainly in charge of navigational instruments maintenance, DX, data utilization, and cyber security measures for commercial vessels.

佐野 義浩（商船三井テクノトレード）

1988年に東京商船大学航海学科電子航法研究室を卒業し、株式会社東芝にレーダーの技術者として入社。その後、営業部門に異動し主に航空自衛隊の装備品に従事。窒化ガリウム半導体の営業、ビルの受変電設備、BEMS、スマートシティ関連の事業に携わった後、輸入専門商社で1年半勤務した後、2019年10月に商船三井テクノトレード株式会社に入社。航海計器の維持整備を主に、商船のDX、データ活用、サイバーセキュリティ対策にも取り組んでいる。

Prof. Dr. Axel HAHN (German Aerospace Center)

Prof. Dr.-Ing. Axel Hahn is the director of the DLR Institute of Systems Engineering for Future Mobility, which was founded in June 2020 and has been in existence since January 1, 2022. Until taking up this post, he was, among other things, head of the "System Analysis and Optimization" group at Carl von Ossietzky University of Oldenburg, where he coordinated research into maritime transport systems. In addition, Prof. Hahn served for many years as a member of the board of the Oldenburg computer science institute OFFIS. Prof. Hahn is a founding member of the Maritime Connectivity Platform Consortium and chairs the Data Exchange and Harmonization working group of IALA (International Association of Lighthouse Authorities). His research activities at the DLR are focusing on the design, simulation, and analysis as well as the development of new, efficient systems engineering methods and tools for proving functionality (verification) and practicality (validation) of reliable and sustainable IT architectures for maritime transportation systems. In addition, Prof. Hahn and his team are researching and developing the evolution of trustworthy systems as the main challenges for the introduction of future generations of transport systems.

アクセル・ハーン（German Aerospace Center）

アクセル・ハーン教授は、2020年6月に設立され、2022年1月1日に発足したDLR Institute of Systems Engineering for Future Mobilityの所長を務めている。このポストに就くまで、オルデンブルク大学の「システム分析・最適化」グループ長などを務め、海上輸送システムに関する研究をコーディネートしていた。また、オルデンブルクコンピュータ科学研究所（OFFIS）の理事を長年にわたって務めた。また、Maritime Connectivity Platform Consortiumの創設メンバーであり、IALA（International Association of Lighthouse Authorities）のData Exchange and Harmonizationワーキンググループの議長も務めている。海上輸送システムのための信頼性が高く持続可能なITアーキテクチャの機能性と実用性を実証するために必要な、効率的な方法やツールを新たに開発すること、そしてそれに関わる設計・シミュレーション・解析について、DLRでは主に取り組んでいる。さらに、ハーン教授と彼のチームは、次世代の輸送システム導入のための主要な課題として、信頼性の高いシステムの進化を研究開発している。

Dr. Koichi YOSHIDA (OPRI-SPF)

Dr. Koichi Yoshida, visiting professor of Kobe University and Yokohama national University, has been working on IMO GMDSS (Global Maritime Distress and safety System) since middle of 1980s. He also joined activities of COSPAS-SARSAT since middle of 1980s. He chaired Sub-Committee and various working and expert groups of IMO, and Sub-Committees and working groups of ISO and IEC. Since 2015, he has been working for the development of VDES at OPRI, and since 2020 he has joined IALA E-NAV Committee.

吉田 公一（笹川平和財団海洋政策研究所）

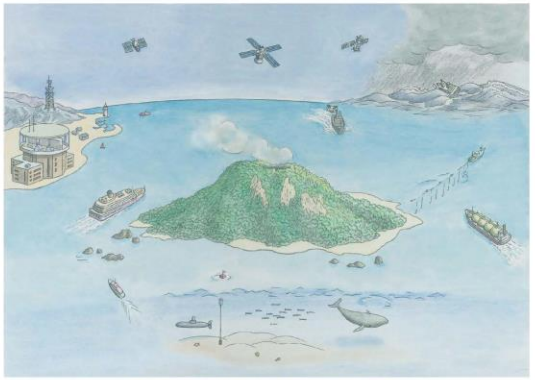
神戸大学および横浜国立大学の客員教授を務めるとともに、1980年代半ばからIMOのGMDSS（Global Maritime Distress and Safety System）に取り組んでいる。また、1980年代中頃からCOSPAS-SARSATの活動にも参加。IMOの小委員会や専門家グループ、ISOやIECの小委員会や作業部会で議長を務める。2015年よりOPRIにてVDESの開発に従事、2020年よりIALA E-NAV委員会に参加。

Purpose Explanation:
OPRI's current activities and perspectives for VDES application

Tomonari Akamatsu, Ph.D
Director, Division of Ocean Policy Research,
Ocean Policy Research Institute (OPRI) of the Sasakawa Peace Foundation (SPF)

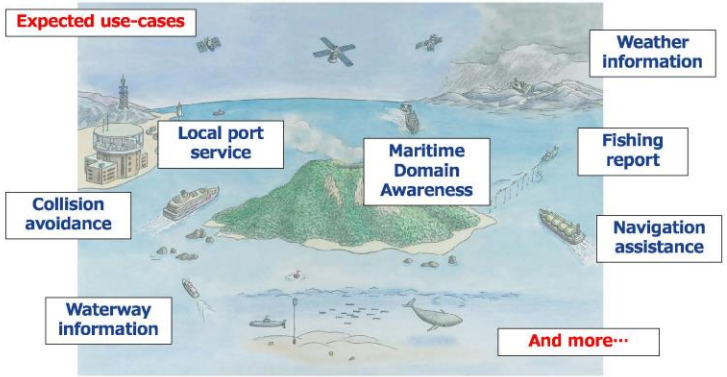
Satellite VDES

■Next-generation maritime digital communication infrastructure



Satellite VDES

■Next-generation maritime digital communication infrastructure

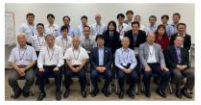


Satellite VDES and OPRI

■Workshop on the International Standardization of Next Generation AIS (2012)
- ➢ Named "VHF Data Exchange System (VDES)"

■Study group on Ocean-Space collaboration 1st, 2nd (2018-2019)
- ➢ Explored the possibility of satellite VDES

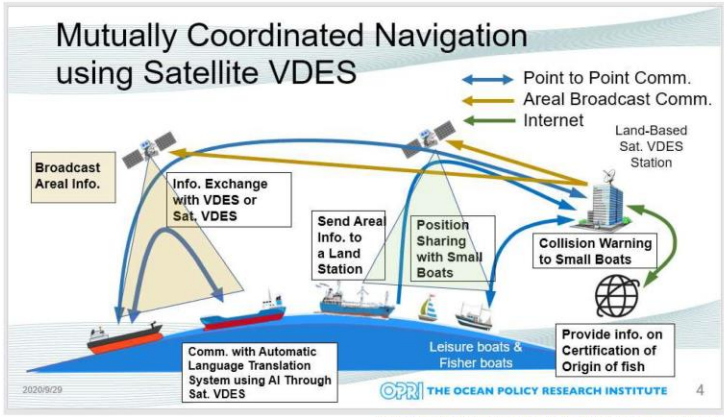
■Study group on Navigation with Satellite VDES
- ➢ Conceptualized "Mutually Coordinated Navigation"



■Committee of Satellite VDES (2020, 2021)
- ➢ Discussed technical / user-side aspects
- ➢ Considered necessity of VDES resource sharing and coordination/cooperation

■Idea exchanging meeting toward commercialization of Satellite VDES (2021)
- ➢ Led to launch of Satellite VDES Consortium

OPRI's idea regarding the satellite VDES

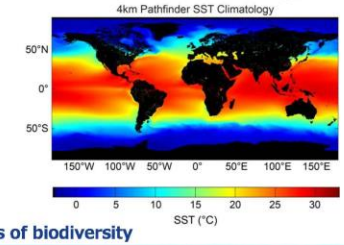


Presentation material on IALA eNAV26 (Sept. 29th, 2020)

Global Ocean Issues

Decline of fisheries resources & IUU fishing

Climate change & ocean warming/acidification



Marine pollution

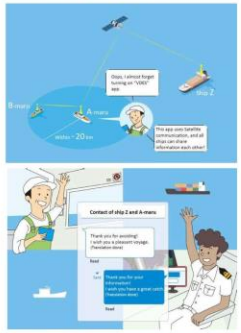
Loss of biodiversity

Outputs of OPRI's activity

Connecting end users - industries - government and moving forward

■Policy Brief

■Promotion



■Symposiums

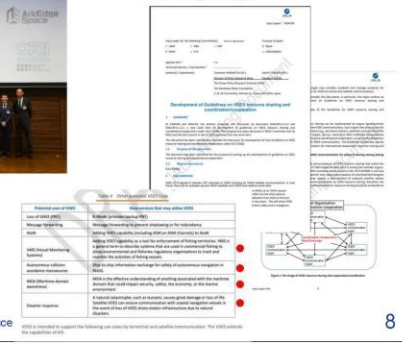
Outcome of OPRI's activity

Making efforts toward the social implementation of satellite VDES

■Consideration in national policies

■Launch of the consortium

■Discussion in IALA eNAV (Ongoing)

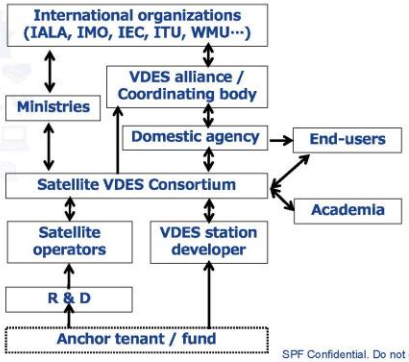


https://www8.cao.go.jp/space/hq/dai27/siryou2.pdf
https://www.kantei.go.jp/jp/singi/kaiyou/dai19/shiryou1-2.pdf

Future plan of OPRI

Contributing to expansion of Satellite VDES as an ocean-specific independent think tank

■Bridging stakeholders



■Contributing to standardization
- ➢G1117 Use-cases deepening
- ➢VDES resource sharing and international cooperation/coordination

■Further exploration
- ➢Management of collected data
- ➢VDES Application development center

Today's objective

No need to achieve formal goal — open discussion is welcome

■Finding "allies"
- ■Who is working for what?

■Share challenges
- ■Different sector—different perspective
- ■Not only technical aspect — social, operational, commercial…

■Exchanging idea about future potential collaboration
- ■Domestic / bilateral / multilateral opportunities…

Today's program

■Keynote speech

■RADM Tsuguo AWAI
- ■ Director, International Maritime Security Group, Japan Coast Guard
- ■ IALA Councilor for Japan

Expected efforts toward the social implementation
International cooperation required in the future

Today's program

■Session 1: Construction of Satellite VDES infrastructure / systems

■Lars MOLTSEN (Sternula) — **VDES Alliance**

■Peter BERGLJUNG / Magnus Nyberg (Saab)

■Hans Christian HAUGLI (Space Norway)

■Koichi NISHIMURA (TST) (Moderator)

■Akira SHISA (IHI)

■Takayoshi FUKUYO (ArkEdge Space) — **Satellite VDES Consortium**

Today's program

■Session 2: Use-case, operation and human factor

■Jillian CARSON-JACKSON (JCJ Consulting) (Moderator) **Human Factor**

■Yoshihiro SANO (MOL Techno-Trade) **Use-case from shipping company**

■Axel HAHN (German Aerospace Center) **Maritime Connectivity Platform**

■Koichi YOSHIDA (OPRI-SPF) **Resource sharing**

Summary from organizer

Satellite VDES

■Several aspects, not only technical issues, need to be paid attention

OPRI's activity

■Policy proposal, promotion, input to IALA, etc…

■Keep contributing to bridging stakeholders, considering data management and application development…

Today's Forum

■Share challenges and explore future potential collaborations from different aspects among international stakeholders

■Not a formal committee—free and open discussion is welcome

INTERNATIONAL FORUM ON SATELLITE VDES

SPF – Ocean Policy Research Institute

Efforts toward the social implementation of satellite VDES and the international collaboration required in the future".

RADM AWAI Tsuguo
Japan Coast Guard

24 February 2023

Changes in the Information Technology Environment

Internet, smartphone, cloud services, API, AI/ML, sat-constellation, SNS, ・・・

FEATURES	VALUES	GOALS
▪ Multi-functionality	Ocean transparency	▪ Universality
▪ Flexibility	Sustainability	▪ Viability
▪ Scalability	Safety	(Bigger market)
▪ Simple/open architecture	Security	
▪ Shore/sea seamlessness	Environment	
▪ User driven system design	Efficiency	
▪ Cyber resilience	Daily convenience	

What are needed for VDES implementation?

- **Collaboration** – Industry/Government
- **Standardization** – Sound competition
- **Coordination** – International system operation
- **Harmonization** – Sea/shore seamlessness
- **Application** – User convenience

Lars Moltsen
Founder, CEO

February 2023

AIS 2.0 (VDES)

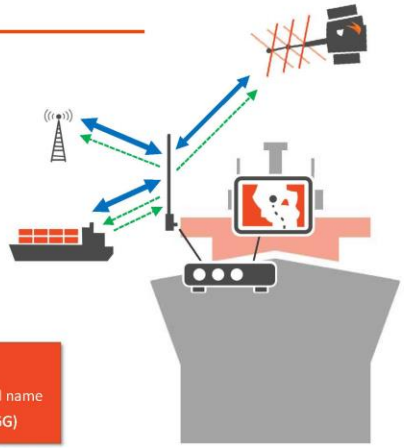
- **Becoming world's largest maritime communications network...**

Quick recap of the launch on 3rd January...

What is AIS 2.0 (VDES)?

AIS 1.x
- Digital exchange of identity, position, etc.
- A global standard since 2001 (ITU-R M.1371-1)
- SOLAS requirement

AIS 2.0
- Digital exchange of data!
  - Enabler of e-Navigation
- A global standard since 2022 (ITU-R M.2092-1)
- To be a SOLAS requirement



Why "AIS 2.0"? Why not "VDES"?
- VDES (VHF Data Exchange System) is the formal name
- AIS 2.0 is the "commercial" name (like 4G and 5G)

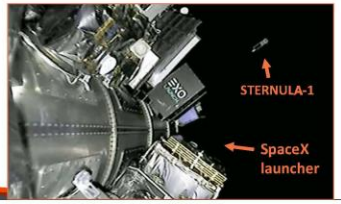
About Sternula

World leader in AIS 2.0 / VDES
- Chairmanship at IALA e-Nav WG3
- Co-founder of the VDES Alliance
- Advisor to Danish authorities on VDES

Stefan Pielmeier

Lars Moltsen

World's first AIS 2.0 satellite operator
- **"STERNULA-1" launched on 03 January 2023**



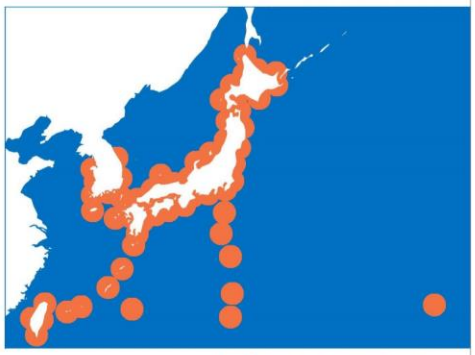
When?

VDE-SAT operational from 2023 (Sternula)

- First satellite launched on 3rd January
- Realtime coverage from 2028

VDE-TER operational from 2026?

- Depends on local authorities...



Expected development

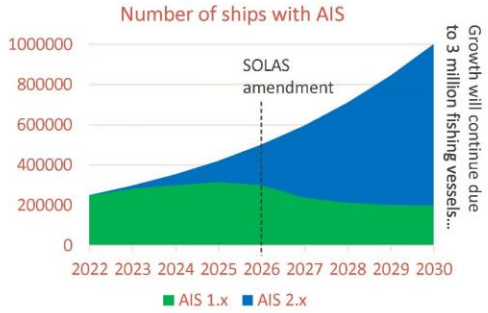
How many AIS (1.x + 2.x) terminals?

2022: 250,000 (VesselTracking, Lloyd's)
2030: 1,000,000 (15-20% growth rate)

How many AIS 2.x terminals?

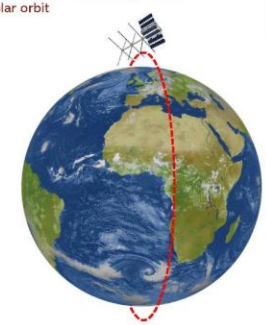
2022: 0
2030: 800,000 (80%)

World's largest maritime communications network...



Sternula satellite roadmap

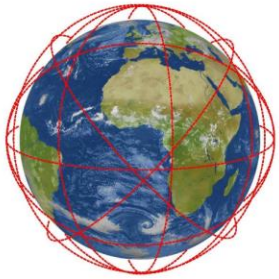
G0
First satellite in January 2023
• Polar orbit



2023
2024
2025
2026
2027
2028

G1 – G3
60 satellites until 2028
• Mixed orbits
• Global realtime

G1 (+4 sat's)
G2 (+16 sat's)
G3 (+40 sat's)



Lars Moltsen
Founder, CEO

February 2023

AIS 2.0 (VDES)

- **Becoming world's largest maritime communications network...**

VDES (AIS 2.0)

R6, R60 and VDES In Orbit Demonstration Satellite

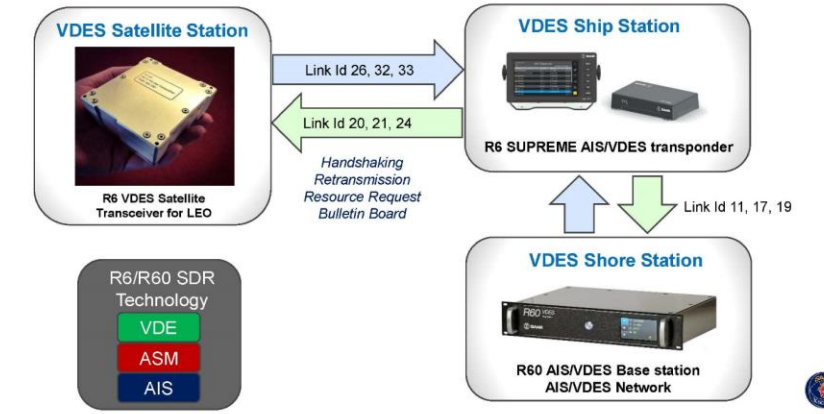
peter.bergljung@saabgroup.com, Saab AB, TransponderTech
magnus.g.nyberg@saabgroup.com, Saab AB, TransponderTech

2023-02-24, Japan, Tokyo, International Satellite VDES Forum
Ocean Policy Research Institute (OPRI), SASAKAWA Peace Foundation Building.

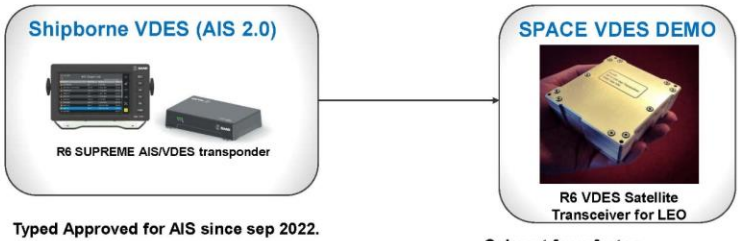
Agenda

- Saab R6/R60 AIS/VDES Stations
- VDES In Orbit Demonstration (IOD) Satellite
- VDES Alliance (separate presentation)

SAAB TRANSPONDERTECH



Development path from VDES shipborne transponder to space IOD payload



Typed Approved for AIS since sep 2022.

Including optional testbed for VDES ASM, TER-VDE and SAT-VDE

Cubesat form factor

Shipborne R6 SUPREME AIS/VDES as the base

Memory circuits: radiation compliant

Total Ionizing Dose (TID) tested

Thermal Vacuum Chamber (TVAC) tested

AOS Consortium, https://aos-vdes.com/

- Our Vison

Our vision is to create the first global maritime communication system, enabling great improvements for seafarers and their loved ones, the shipping industry as well as our planet.

- IOD project, supported by Swedish Transport Agency

We're building, launching and commissioning the first satellite in the IOD project, the satellite, Njord-1, is expected to be followed by a larger constellation of satellites that will form a new part of the maritime communication infrastructure.

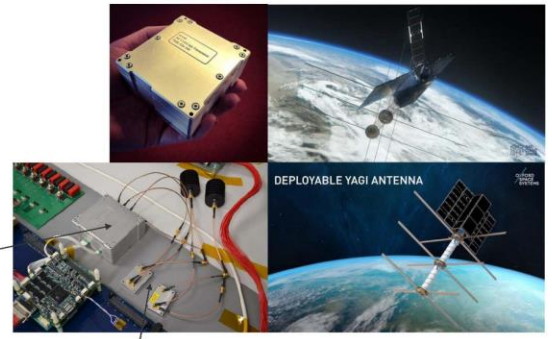
Our Njord-1 / IOD project

AAC CLYDE SPACE ORBCOMM SAAB

SAAB

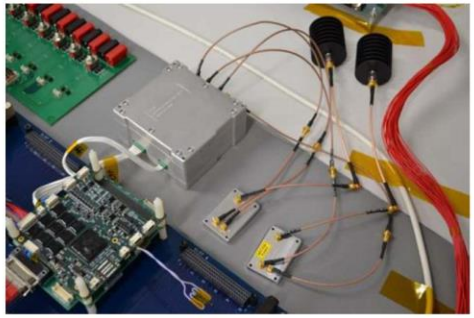
Time Schedule

- SpaceX Falcon 9 rocket, Transporter-9 mission, will place our VDES IOD payload into orbit scheduled for launch 17 November 2023.
- Saab delivered VDES IOD payload to satellite company AAC Clyde Space in the beginning of December 2022.



SAAB

VDES IOD Payload Interface



Antenna Interface:

SMP RF connectors (2 x RX + 2 x TX), vertical & horisontal polarisation

System Computer Interface:

CAN: CubeSat Space Protocol (CSP)

RS422: In orbit FW upgrade for the evolving VDES standard. In orbit VDES RF raw data recording.

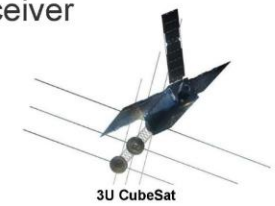
Ethernet: Used for config/monitoring, data transfer and software update.

SAAB

SAAB

Saab VDES satellite transceiver

- Dimension: 93x88x48mm (CubeSat mechanical)
- Form factor: PC/104
- Enclosure: Aluminium
- Weight: <500g
- Power consumption: Average <10W, Peak 40W (during transmission)
- RX Functions: 2 x AIS, 2 x LongR AIS, 2 x ASM, 2 x VDE according to relevant parts of ITU R.M 2092, G1139
- Frequency range: 155 to 163MHz
- Channel bandwidth: 25/50/100/150kHz
- TX functions: VDE-SAT according to ITU R.M 2092, G1139
- TX output power: 1 to 6W average (configurable)



3U CubeSat

Saab VDES Sat Transceiver

Abstract from PT-21-0029, Saab VDES Satellite Transceiver issue A

Leading in VDES technology – AIS 2.0

VDES ALLIANCE

Introduction of the VDES Alliance

Peter Bergljung
Strategy & Portfolio
Saab AB, TransponderTech
Co-chair in VDES Alliance

Agenda

1. Why VDES Alliance
2. How becoming a member of VDES-Alliance

Why VDES Alliance

- VDES technical working group progress in IALA, ITU and IEC is good, but lack "interoperability power" between vendors. Non interoperability of VDES units is a risk and VDES Alliance can mitigate this with physical test campaigns.
- Marketing of VDES need to be enhanced and IALA/ITU/IEC has not that "VDES focus".
- A global network of VDES stakeholders can stimulate the usage of the technology.
- Alliance types of non-profit organisation is "common" in advanced communication technologies, like Wifi Alliance, PNT alliance and 5G Alliance (5GACIA)

How becoming a member

Becoming a member of VDES-Alliance is a natural next step for your company to bring VDES products and services to the market.

Apply at www.vdes-alliance.org

Observer Membership: EUR 750/Annually

Contributor Membership: EUR 1500/Annually

VDES Alliance Membership Comparison

Rights	Observer Membership	Contributor Membership
Newsletter	✔	✔
VDES Alliance internal documents access	✔	✔
General Assembly participation	✔	✔
Voting		✔
Workshop participation		✔
VDES Alliance confidential documents access		✔

Observer Membership: Designed for Non-Industrial Observers like Maritime Security organisations, governmental, Non Governmental organizations and Inter Governmental organizations such as IALA, Coast Guards etc.

Contact Information

+45 40 77 77 41

www.vdes-alliance.org

vdes_alliance@sternula.com

C/O Sternula A/S
Danalien 1,
9000 Aalborg,
Denmark

THANK YOU FOR ATTENTION

Supported by THE NIPPON FOUNDATION

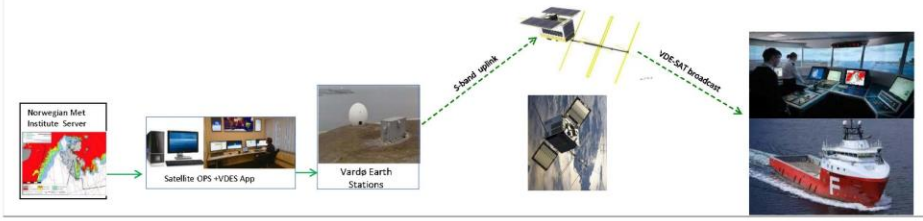
Satellite VDES Forum
International cooperation towards its social implementation
Tokyo 24.2.2023

SPACE NORWAY

Satellite VDES testing with NorSat-2

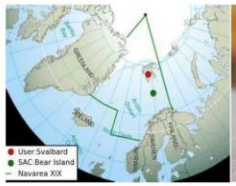
Five years of testing and service demonstrations v6

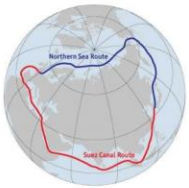
Hans.Christian.Haugli@spacenorway.no
Head of Innovation and Development



SPACE NORWAY

Arctic perspective





Navarea XIX
- Norway responsible
- Search and Rescue
- Safe Navigation
- "0 vision"

Natural resources race
- Rare metals
- Oil /Gas
- Fish
- Minerals
- Bio prospecting
- Sensitive environment

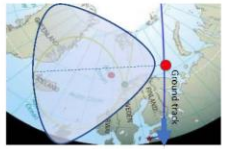
Russias military expansion
- New bases
- Expanding Northern Fleet
- New Artic Fleet
- GNSS interference

Northern Sea Route
- 30% shorter than Suez
- 25% of Suez traffic
- Large Russian investments

SPACE NORWAY

Why is Norway so active in VDE-SAT?

- 2000x1500 km area of Arctic ocean
- 50-80% of Arctic vessels in Norwegian sector
- Limited availability of affordable communications beyond 70 °N
- Drive digitalization of the maritime industry
- Small country – High level of trust
- Good R&D cooperation and clear stakeholder roles
  - Norwegian Maritime Authority
  - Norwegian Coastal Administration
  - Norwegian Space Agency
  - Norwegian Communications Authority
  - European Space Agency
  - European Maritime Safety Agency
  - Kongsberg Seatex satellite payload, mobile station and base station manufacturer
  - Comrod high performance ship antenna manufacturer
  - Space Norway government owned space infrastructure provider
  - Statsat small satellite operator
- Active in IALA from 2015 defining the satellite specification
- Active in ITU work that resulted in satellite frequency allocation in 2019
- Tested many aspects of VDE-SAT since 2017
- Constellation plan

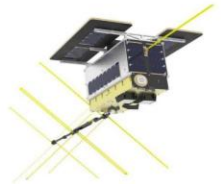


8 dBi antenna boresight rotated during pass

SPACE NORWAY

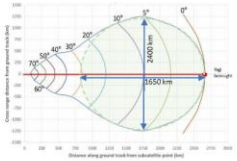
The first VDES satellite

- Norwegian Space Agency NorSat-2
  - Launched 2017 – still going strong
  - 16 kg - 20x30x40 cm
  - Commercial SDR payload from Kongsberg Seatex
  - Novel 8 dBi Yagi reduced power requirement 80%
- Many learnings
  - < 30 degrees elevation most of pass time
  - Median linkbudgets within +/- 1.5 dB of theory
  - Significant slow specular fading
  - Time and location dependent very strong uplink interference
  - Time and location dependent local interference
  - < 30 degrees elevation most of pass time
  - Creative solutions implemented to obtain low PER
  - Need for Quality Monitor Nodes to obtain high availability
  - New software like an onion– many layers and tears
- **Many "world first" services demonstrated with Seatex**
  - Svalbard Icechart broadcasting demo in 2018
  - Position reporting near Northpole in 2018
  - EGNOS low latency broadcasting in 2019
  - AIS rebroadcasting to KV Svalbard at Northpole in 2019
  - Met Office Icechart broadcasting pre-op from 2021
  - SAR search pattern delivery and search positions in 2022
  - Mandatory Harbour Reporting with NCA and EMSA in 2022 and 2023
  - Quality Monitoring System in 2023
- Next Norwegian satellite scheduled for launch April 2023
- Third satellite planned for launch in 2025



NorSat-2 with deployable 8 dBi Yagi antenna

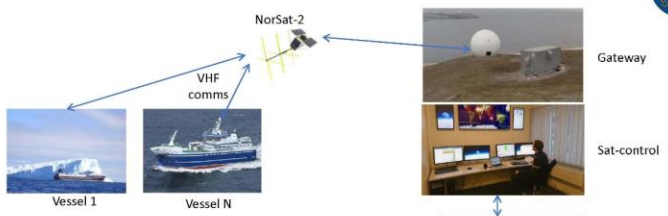
Kongsberg Seatex VST x50



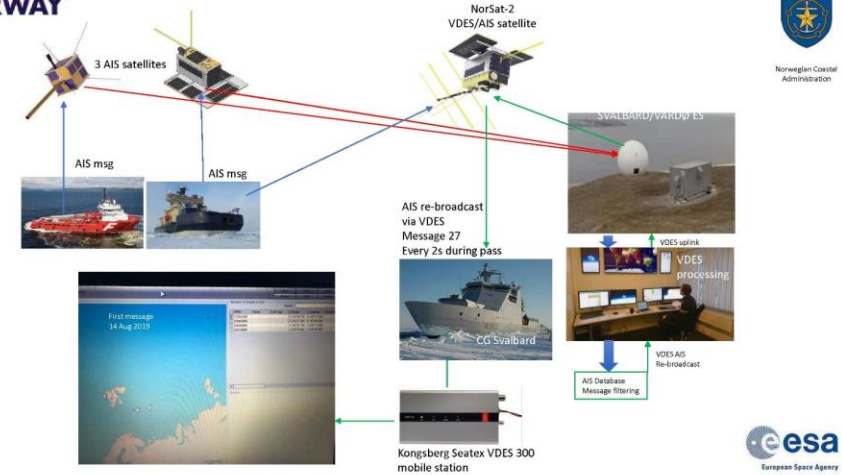
Satellite coverage

Kongsberg Seatex VDES 300 mobile station

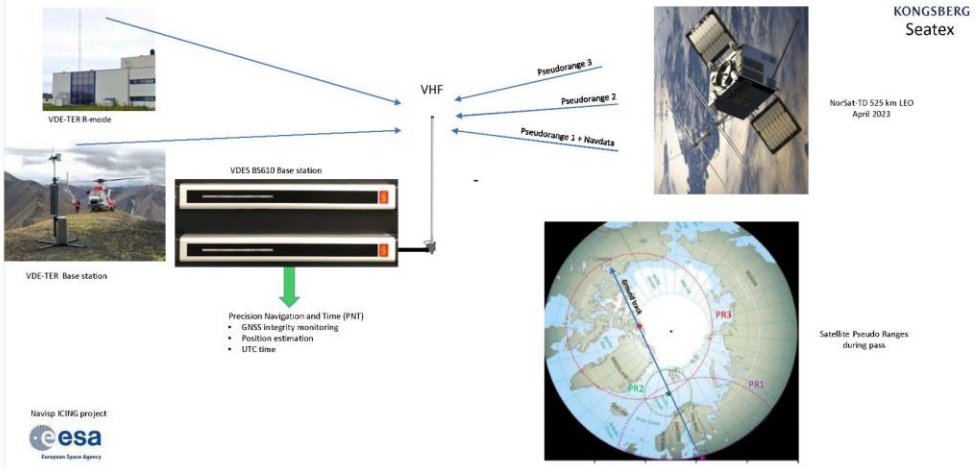
Arctic VDE-SAT SAR coordination concept tests 2022



AIS re-broadcasting to CG Svalbard at Northpole August 2019

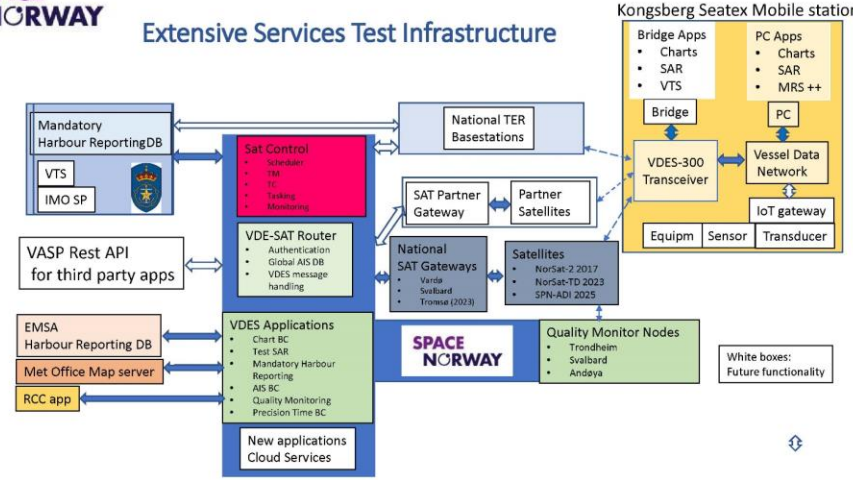


VDES Precision Time Broadcasting 2023



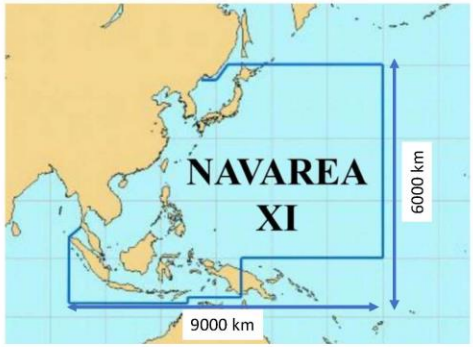
Navisp ICING project

Extensive Services Test Infrastructure



SPACE NORWAY

Conclusions



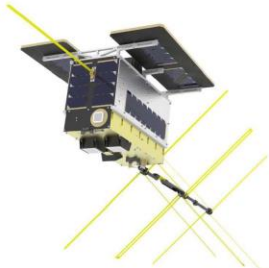
- Space Norway has spent many years testing and developed test infrastructure with Kongsberg Seatex
- Additional VDE-SATs in 2023 and 2025
- Debugging software in many new elements is very time consuming
- Maritime cloud promising, but have missing elements
- Simple safety services is a good start
  - Weather charts broadcasting
  - Maritime Safety Information broadcasting
  - Search and Rescue
  - Vessel Traffic Services
  - Mandatory Harbour Reporting
  - GNSS integrity monitoring
- We are looking for partners to strengthen global VDE-SAT and VDE-TER services deployment
  - Hans.Christian.Haugli@spacenorway.no
  - Lars.Loge@spacenorway.no

Backups

SPACE NORWAY

NorSat-2 specifications

Primary coverage area:	Norwegian Arctic regions
Launch:	Soyuz 2.1 14 July 2017
Bus manufacturer:	UTIAS SFL
Antenna manufacturer:	UTIAS SFL
AIS payload manufacturer:	Kongsberg Seatex
VDES payload manufacturer:	Kongsberg Seatex
Satellite owner:	Norwegian Space Centre
AIS payload user:	Norwegian Coastal Authority
VDES payload owner:	Space Norway
Key technical parameters:	
Polar orbit:	600 km SSO
Attitude control:	3 axis stabilized
Solar power generation:	56 W peak
Mass:	15.7 kg
Satellite body size:	200 x 300 x 400 mm
AIS payload weight:	1.3 kg
VDES payload weight :	1.5 kg
Antenna weight:	0.3 kg
VDES transmit duty cycle:	15% of orbit, adjustable
VDES receive band:	157.1875-157.3375 MHz
VDES transmit RF power:	2 W linear (28 dB C/I_3)
VDES transmit band:	161.7875-161.9375 MHz
Feeder link:	S-band, 1 Mbps in both directions
Payload technology:	Software Defined Radio
Yagi antenna size:	800 x 975 x 975 mm (deployed)
Peak antenna gain:	8.0 dBi in RHCP
Rx noise figure:	2 dB nominal



Version 3.0 subject to change

Kongsberg Seatex

VDES 300 Mobile station

- Supports AIS, ASM and VDE, both terrestrial and satellite
- Same form factor as AIS 300
  - Replaces AIS 300 through reuse of brackets, connectors and cabling
- Improved AIS sensitivity to approximately -118 dBm
- Tested towards the VDES payload in NorSat-2 throughout 2020 in several expeditions and testbeds WW
- **Multifunction display (7")**
- 3 LAN to support A, B and C network

VDES BS610 Base station

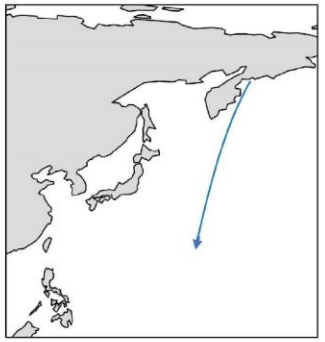
Kongsberg Seatex

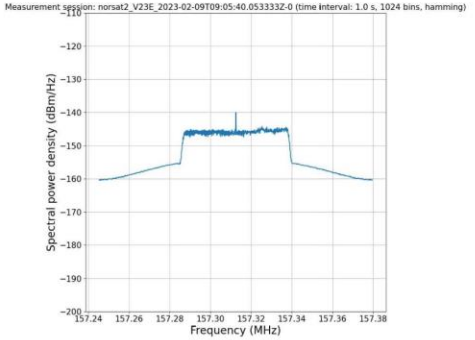
Same form factor as AIS BS610

Improved AIS sensitivity to approximately -118dBm

- Optional R-mode support
- Optional separate RX and TX
- Optional local storage and filtering (VDES BS620)
- WEB interface
- Supports AIS, ASM and VDE
- Combined 230VAC and 24VDC
- Redundancy support
- Planned conformance test during 2023

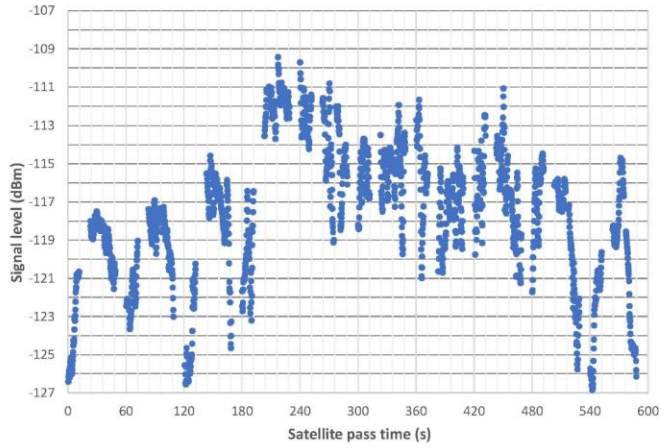
NorSat-2 uplink VDE-SAT measurements near Japan 9.2.2023





NorSat-2 signal level vs time

(KV Harstad 14 Nov 2017, -1.1 dBW EIRP, 2 dBi Comrod AV7 antenna)



Satellite VDES Forum

IHI Space Utilization
- Realize Safer Ocean -

IHI

February 24, 2023

IHI Corporation
Aero Engines, Space & Defense Business Area
Space Development Department

Company Profile

IHI

Year of establishment
1853

Number of employees (consolidated)
29,149

Revenue(Consolidated)
1,112.9 billion yen
(fiscal 2020)

Resources, Energy & Environment Business Area

Industrial Systems & General-Purpose Machinery Business Area

Social Infrastructure & Offshore Facilities Business Area

Aero Engine, Space & Defense Business Area

IHI Space Technology

IHI

H-IIA

Epsilon

Launch Vehicles

Space Utilization

Satellite Propulsion System

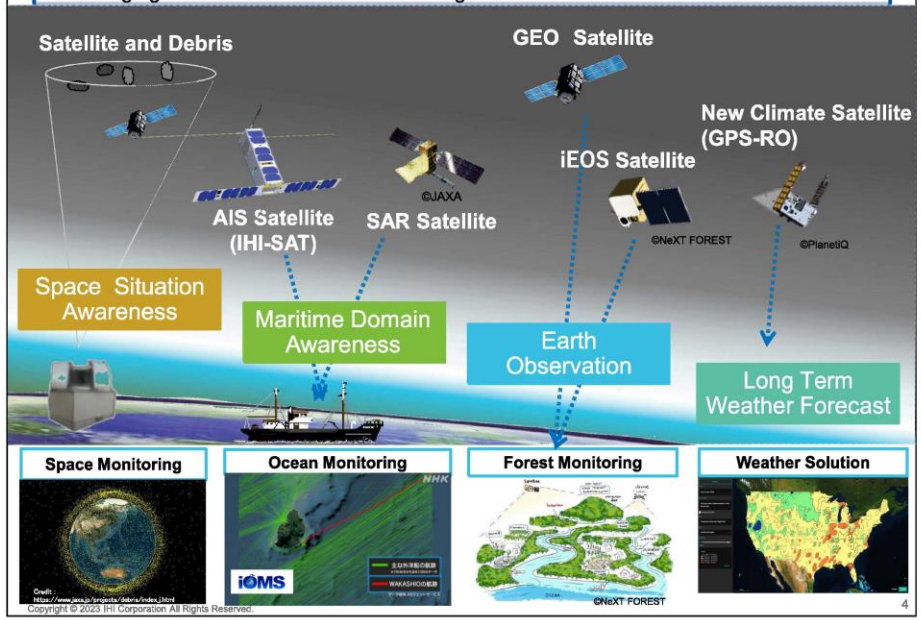
Test Facilities

Satellites

IHI Space Technology – Space Utilization

Leveraging satellite data across a wide range of industries.

IHI

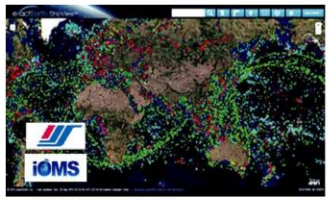


IHI Activities - Track Ships from Space -

IHI

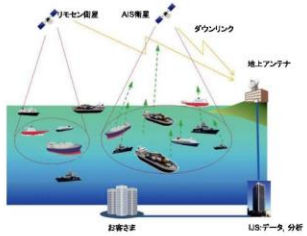
Provide safer and optimized marine logistics using Automatic Identification System (AIS)

■ Ships monitoring



AIS情報で取得した船舶の動静©exactEarth

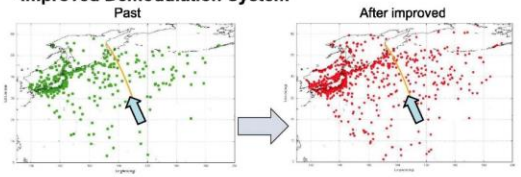
■MDA (Maritime Domain Awareness)



■ R&D - AIS Receiver System -

・Spaceborne AIS Receiver for Micro Satellite

・Improved Demodulation System



600 vessels captured

Over 1,200 vessels captured

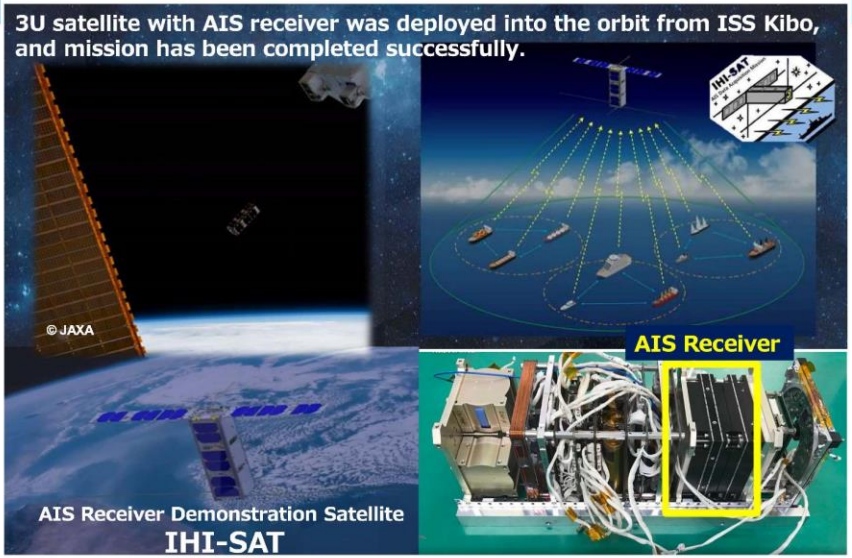
⇒ improved by 2 times

出典:IHI 技報 Vol.57 No.3 (2017), 株式会社 IHI. 宇宙から船を追う

On-Orbit Demonstration

IHI

3U satellite with AIS receiver was deployed into the orbit from ISS Kibo, and mission has been completed successfully.



Satellite VDES

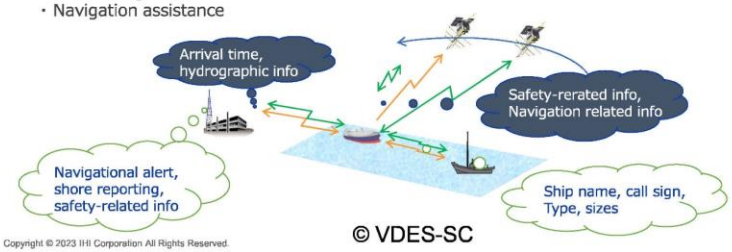
IHI

VDES (VHF Data Exchange System)

- **VDES : Next generation AIS (Automated Identification System)**
- **32 times higher data rate than AIS**
- **Evolved from one-way (AIS) to two-way (VDES) communication**

VDES communication via satellite is expected to improve maritime safety and security on a global scale and support real-time navigation and communication.

Traffic support	Safety Support	Satellite Communication
・Local port service ・Nautical chart ・Hydrographic info ・Route assignment ・Navigation assistance	・"Mutually coordinated navigation" Collision avoidance by route plan exchange	・Expanding communication range ・Collecting environmental info ・Covering polar region



© VDES-SC

Satellite VDES Consortium launch

IHI

- **IHI and other 6 companies with the Ocean Policy Research Institute (OPRI) of the Sasakawa Peace Foundation (SPF) launched the Satellite VDES Consortium in Japan**
- **This Consortium aims to create a platform to facilitate the commercialization and promotion of Satellite VDES through partnerships between industry, academia, and government including other countries.**

出典:IHIプレスリリース 海と宇宙の連携による海上安全の向上に向けて「衛星VDESコンソーシアム」設立のお知らせ-2022年10月25日-

Consortium members at the preparatory meeting (Sept. 15, 2022)

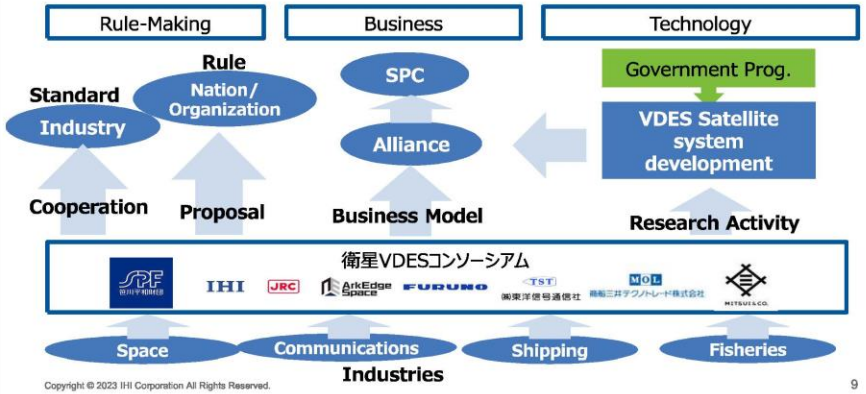
Satellite VDES Consortium Members

- ✓ **IHI Corporation (Chair)**
- ✓ **MOL Techno-Trade, Ltd. (Co-Chair)**
- ✓ **Furuno Electric Co., Ltd. (Co-Chair)**
- ✓ **ArkEdge Space Inc.**
- ✓ **TST Corporation**
- ✓ **Japan Radio Co., Ltd. (JRC)**
- ✓ **Mitsui & Co., Ltd.**
- ✓ **Ocean Policy Research Institute (OPRI), Sasakawa Peace Foundation**

Satellite VDES Consortium activity

IHI

- Platform for creating a sustainable VDES business with space utilization.
- Private-sector stakeholders gather to promote utilization that simultaneously realizes rule-making, securing business feasibility, and establishing technology.
- Through this activity, we will contribute to ocean DX in cooperation with related countries by leveraging our strengths as a maritime nation.



Challenge using satellite VDES

IHI

AIS location spoofing or discontinuation of AIS signal	✓ Spoofing prevention function ✓ Signal information layering and encryption functions ✓ Position estimation without AIS signal ✓ Mechanism of alerts, fines, etc.
No AIS of small ship such as fishing boats	✓ Incentives with VDES ✓ Simplification of license ✓ Law to promote VDES installation
Business model that balances public and private use	✓ Public burden rules for communication ✓ Killer contents for business success

Public: safety and security, Private : logistics, fishing, etc.

IHI

IHI

Realize your dreams

VDES satellite and its Constellation

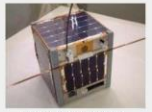
February 24, 2022
Takayoshi Fukuyo
ArkEdge Space Inc.

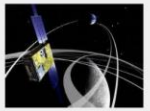
Company Profile

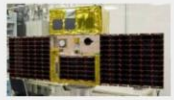
Company name	ArkEdge Space Inc.
Date of establishment	July 18, 2018
Location	Ariake, Tokyo
Employees	60 (Incl. intern and part-time)
Capital	JPY 2.7 Billion (appx. USD 22 Million)
Main Business	● Design, manufacturing, and operation service of spacecraft (nanosatellites), ground stations and related components. ● Software development, education and consulting services.

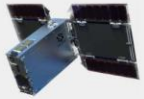
Founded in 2018 to commercialize nanosatellite technologies in collaboration with "The University of Tokyo"

Micro/nano-satellite developed by the University of Tokyo


XI-IV 2003/6


EQUULEUS 2022/11

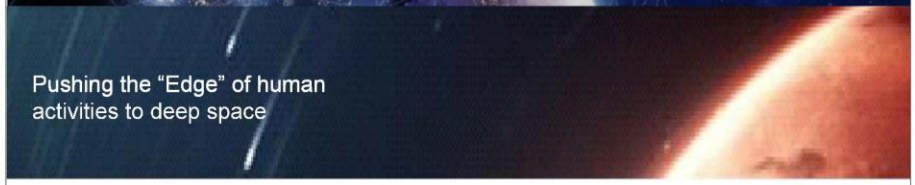

HODOYOSHI-1,3,4 2014/6,11


EYE 2023/1


CEO
Fukuyo Takayoshi


ArkEdge Space HQ in Ariake, Tokyo

Our Missions



Our Main Achievements

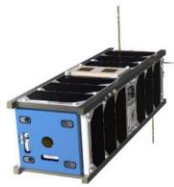
RWASAT-1

launched in 2019/11 and operated until 2022
3U Cubesat for Rwanda

ONGLAISAT

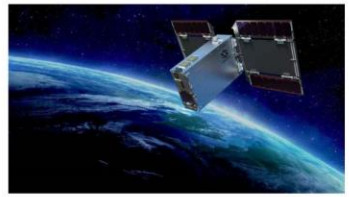
to be launched soon
6U CubeSat for Taiwan Space Agency

Optimal-1



launched in 2023/1 and in operation now
3U Cubesat

EYE (Sony's CubeSat)



launched in 2023/1 and in operation now
Developed by Sony, UTokyo, and JAXA
ArkEdge Space supports its operation

ArkEdgeSpace

Solutions Line-up

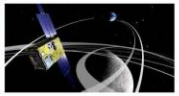
6U satellites to meet various demonstration and business needs
- Flexible and efficient production system
- Multiple manufacturing technologies

3U

6U series

★Development and on-orbit demonstration of around ten satellites for next 2 years through Japanese government subsidized projects

★On-orbit demonstration of VDES by the end of FY2023

Education and Research	IoT Comms for SDGs	Optical / IR for SDGs	VHF antenna for marine DX	Lunar infrastructure
				
● IoT communication for SDGs ● Education, advertising and demonstration opportunities	● IoT Communications for SDGs ● Advertising and demonstration opportunities	● High-resolution optical, infrared, spectroscopic missions ● Adapted to high-spec	● VDES communication, ship monitoring ● Marine DX on marine safety, weather, and logistics	● Technology demonstration for future lunar infrastructure
				

ArkEdgeSpace

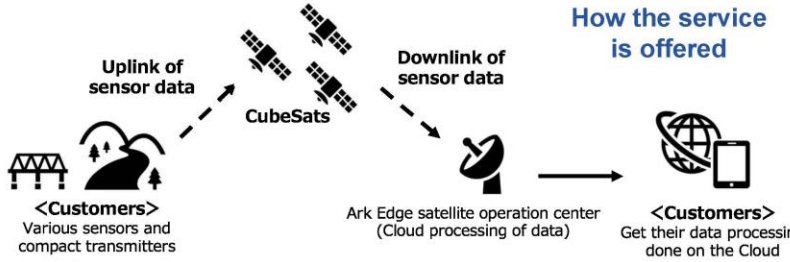
What is Microsatellite IoT Data Collection Service?

A completely new IoT network service that efficiently collects data from space using Ark Edge Space's microsatellite technology. Equipped with a unique LoRa communication payload as standard, it can also be used for IoT in places without any Internet access.

<Merits of this service>

1. **Accessibility:** Supports places that are difficult for people to enter (forests, seas, remote islands, etc.)
2. **Wide area support:** Easy observation of a wide area to collect data from space
3. **Easy management:** Devices installed on the ground have ultra-low power consumption and are easy to manage

How the service is offered



ArkEdgeSpace

Application examples

Data collection in remote areas without any communication infrastructure can be easily achieved using satellites

Agriculture, Forestry and Fishery

●Soil analysis data ●Water resource information for agriculture
●Acquisition of data for fishing grounds ●Management of fishing gear


Disaster Prevention・Emergency Signaling

・Warning for river floods, landslides, forest fires, tsunamis, etc.
・Sending distress SOS; realizing the state of evacuation shelters


Management of environment / infrastructure

・Collection of various data for forest management
・Management of mountain bridges and water intake facilities

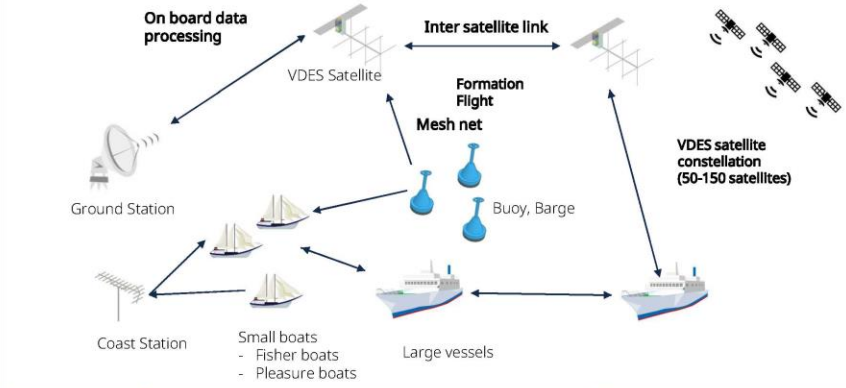

Logistics・Monitoring cargo location

・Container tracking across land, sea and borders
・Theft prevention and collateralization through centralized management of vehicles

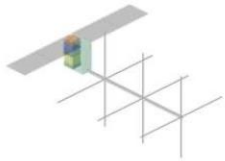

ArkEdgeSpace

Future of VDES

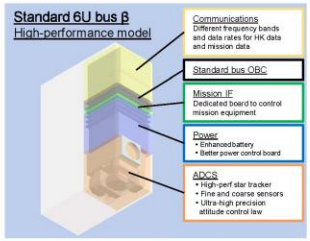
Maritime DX:
VDES is an extension to AIS, adding two-way data channels over VHF. By using special satellite channels (up and down), every ship with a VHF antenna is able to communicate globally.



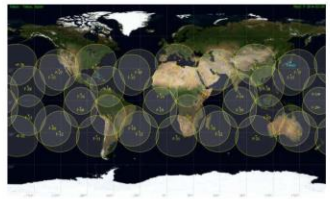
ArkEdge Space is studying and prototyping for VDES satellites.



Deployable antenna:
Design and Prototyping



Satellite Bus Design



Constellation study

OPRI OCEAN POLICY RESEARCH INSTITUTE
SASAKAWA PEACE FOUNDATION

ABOUT US RESEARCHERS REPORTS BLOGS ACCESS CONTACT

Keyword Search

HOT TOPICS ▶ Blue Econ Blue Finance Eco-DRR Renew Energy more

Ocean-space collaboration for maritime safety and security
-Seven companies and OPRI launch the Satellite VDES Consortium in Japan-

OPRI News

October 25, 2022

Ocean Policy Research Institute (OPRI) of the Sasakawa Peace Foundation and seven companies launched "Satellite VDES Consortium" after the inaugural meeting which was held on October 13, 2022. OPRI joined the consortium as a secretariat.

OPRI has been conducting research to promote satellite VDES, the next-generation maritime communications infrastructure, with the aim of fostering cooperation between the ocean and space. Based on the results of these studies, OPRI also released policy proposals in August 2022 and handed them over to the relevant ministries. The consortium plans to cooperate with companies specializing in various fields, and discuss multiple elements including the promotion, use-cases and business models of satellite VDES.

Press release page is hear.

And also available in PDF format below.

Press Release (547.1 K B)

(C) SPF/OPRI
https://www.spf.org/opri-intl/blogs/news/20221025.html

Our new ground station in Pref. Shizuoka

Test operation scheduled for spring 2023

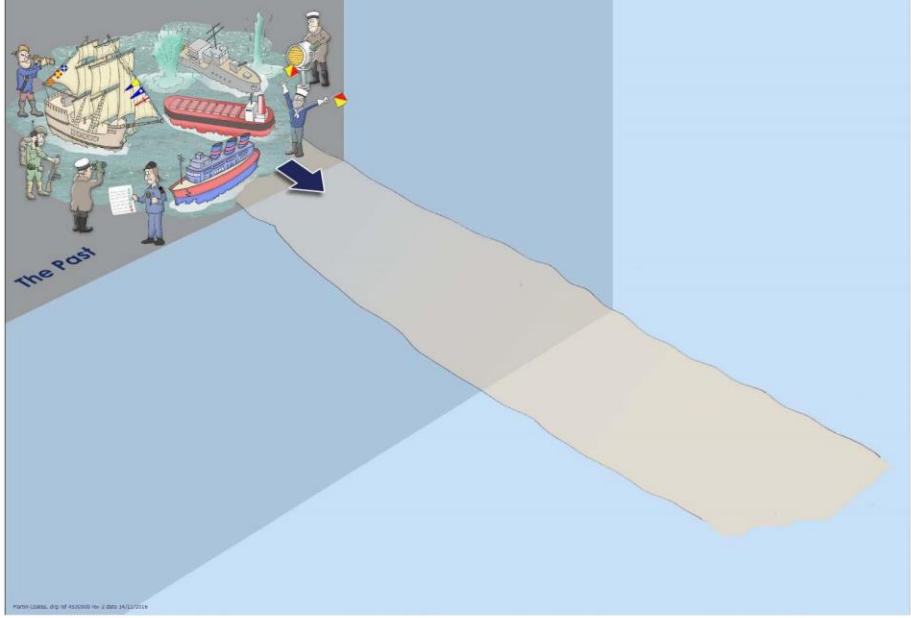
Evolution of Digital MarCom

J Carson-Jackson, FNI, FRIN

JCJ CONSULTING

JCJ CONSULTING

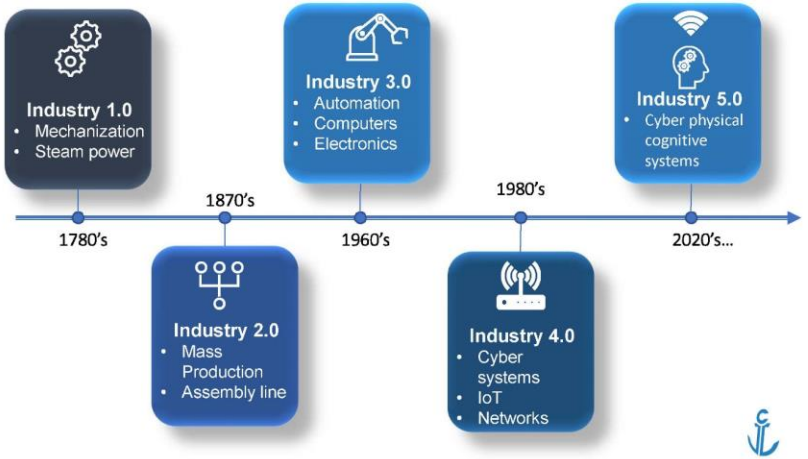
The Future of Maritime Information Exchange and Sharing



The Future of Maritime Information Exchange and Sharing

The Future of Maritime Information Exchange and Sharing

How we work – always evolving…

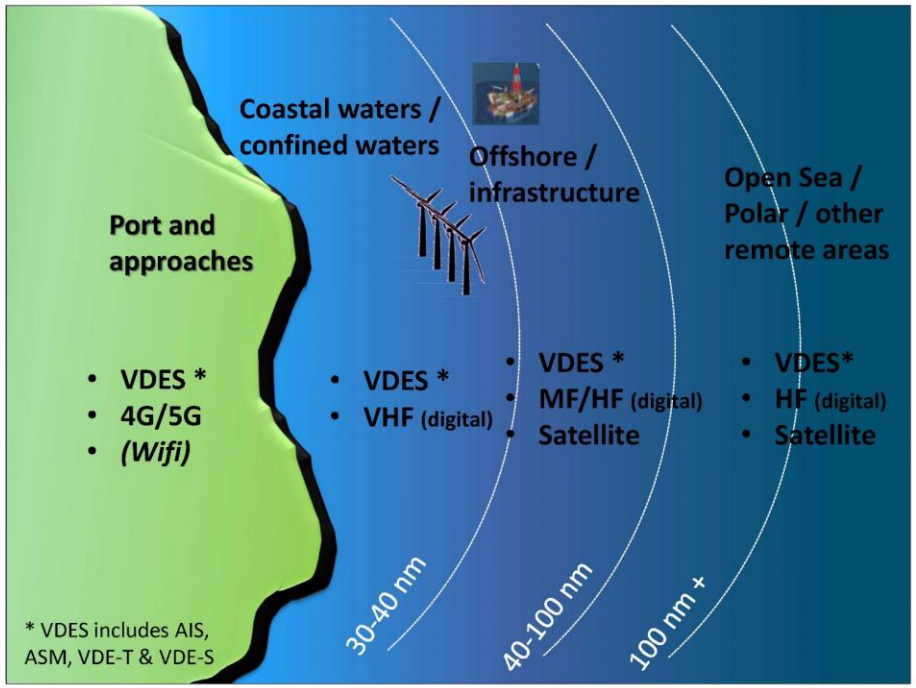


JCJ CONSULTING

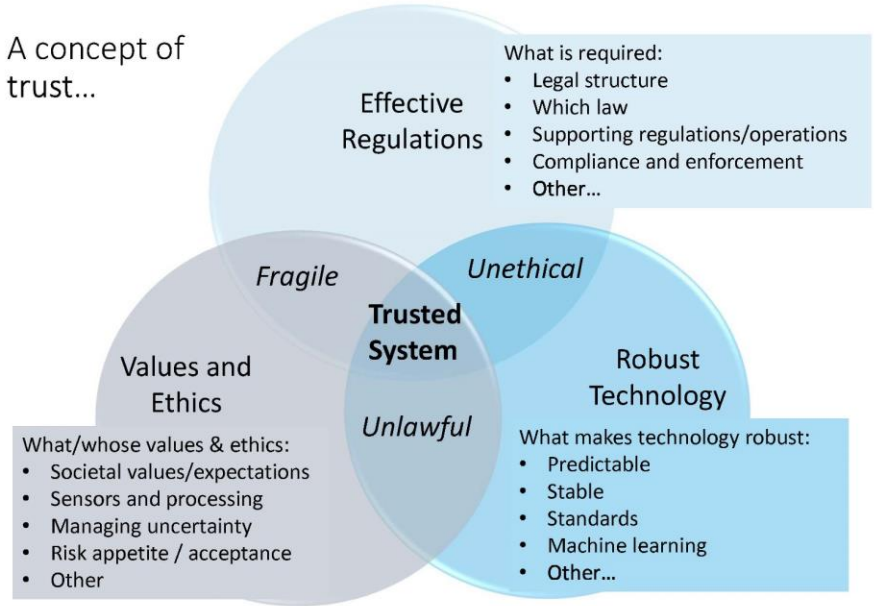
Communications – always evolving…
AIS to VDES

Workshop on the International Standardization of Next Generation AIS 3-7 Dec 2012

JCJ CONSULTING



A concept of trust…



EVOLUTION OF DIGITAL MARCOM

J CARSON-JACKSON, FNI, FRIN

JCJ CONSULTING

JCJ CONSULTING

MOL Techno-Trade, Ltd.

Satellite VDES

Expected use-case

From the Shipping company's point of view

Yoshihiro SANO
MOL Techno-Trade, Ltd.

2023-02-24

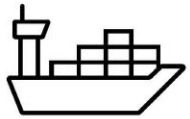
Use Cases we expect to see

Satellite VDES as maritime social infrastructure

Business, Safety, Compliance, Environment, Data Correction

We expect Satellite VDES to become a social infrastructure that everyone living at sea can use inexpensively, constantly, and efficiently. The Internet, a relatively simple system, has become a near-universal infrastructure for users around the world. We hope that satellite VDES will grow into such an infrastructure. We have therefore considered the use cases we expect to see for satellite VDES from the perspectives of maritime business, navigational safety, legal compliance, environmental protection, and oceanographic data collection.

Use Cases in Shipping Business



- Total navigation control
- Cargo monitoring
- Save marine insurance rates

MOL MOL Techno-Trade, Ltd.

Use Cases in Navigational Safety

- Cooperative navigation
- Backup of satellite navigation
- Easy communication with fishing boat

MOL MOL Techno-Trade, Ltd.

Use Cases in Legal Compliance

- Automatic sharing of ship data
- Discovering no satellite VDES ships
- Sharing of updated rules

MOL MOL Techno-Trade, Ltd.

Use Cases in Environmental Protection

- Sharing emissions from ship data
- Minimize disaster damage
- Slow down and efficient navigation

MOL MOL Techno-Trade, Ltd.

Use Cases for Marine Data Collection

- Collecting meteorological and oceanographic data
- Pollution, debris, drifting ice, other sea information
- Tracking Life. Information for academic research.

Need a highway for the use cases?

・Now we can already use a high-speed satellite communication on board.

For instance,

- Inmarsat FX 1~8Mbps
- OneWeb 50Mbps ⟺ Satellite VDES 307.2kbps
- Starlink 1Gbps

Maritime Connectivity Platform for Satellite-based Data Exchange

2023-02-24 / Prof. Dr.-Ing. Axel Hahn

DLR

Maritime Services

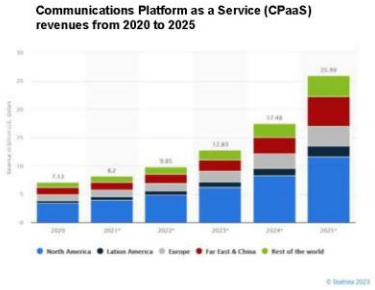
DLR

- Public…
  - Navigational Warnings
  - Weather Forecast
  - Vessel Shore Reporting
  - …
- **… and commercial services**
  - Voyage Planning
  - Fleet Monitoring
  - Nautical Charts Delivery
  - Port Services (e. g. tug planning)
  - …

The „MS-DOS effect“

DLR

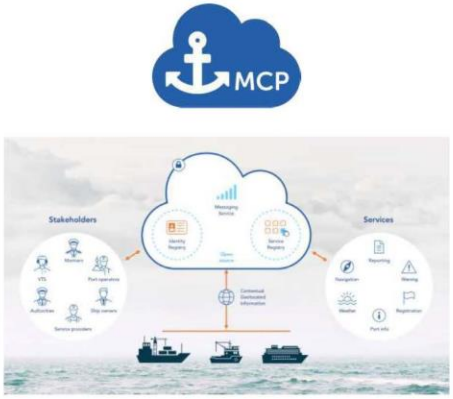
- Offering a Provider friendly platform for maritime services facilitates service implementation and creates a more accessible market for the consumers.
- One of the earliest examples: Introduction of MS-DOS led to an explosion of innovative software solutions in the 1980s.
- But what are the requirements in 2023?



The Maritime Connectivity Platform

DLR

- Trust between maritime Stakeholders.
  - **Identity Registry**: securely authenticate and authorize maritime stakeholders and devices.
- Service Discovery for Users.
  - **Service Registry**: increase the discoverability of services to facilitate offering and finding them.
- Reliable messaging infrastructure.
  - **Messaging Service**: efficiently exchange message and provide new functionalities digitally.

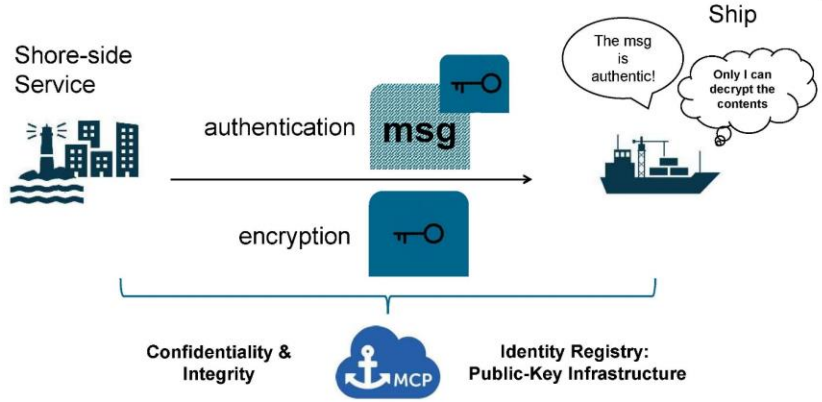


Means of Communication

- Problem: Many existing technologies are not secure.
- Currently, new infrastructure, protocols and data models are in the process of being standardised.
- Not only hardware, but also software components to **ensure secure, efficient and interoperable maritime services** must be harmonized.

→ How to protect sensible (customer) data and establish means of authentication?

MCP Authentication and Encryption



Realization of Satellite-based Data Exchange

- IP-based:
  - Using modern Internet-technologies as a basis for service delivery
  - Transmit large amounts of data via broadband connection
  - IHO S-100, REST APIs, IEC SECOM, …

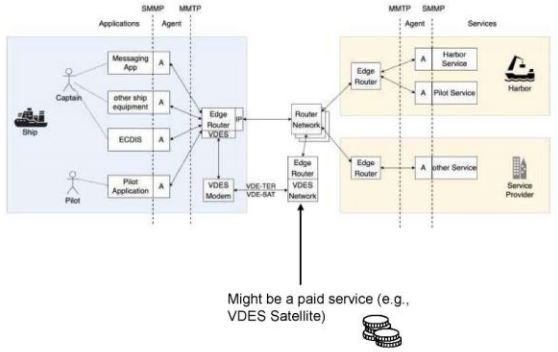
STARLINK OneWeb amazon | project kuiper

- VDES-Based:
  - Using VDES on-board equipment for data transmission
  - Smaller amounts of data in application specific format
  - VDES-SAT + VDES-TER

sternula

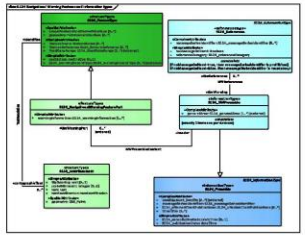
The Maritime Messaging Service (MMS)

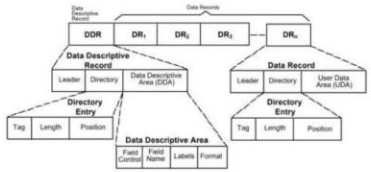
- Idea: Seamless information transfer across different communication links:
  - IP-based
  - VDES
- Automatic selection of "best" communication channel
- Geocasting to send messages to all ships in a specific area
- Routing-based Architecture ("store and forward")
- Supports VDES-SAT
- Addressing via Maritime Resource Names (MRN)
- End-to-End encryption via MCP



S-100 over VDES – Call for Contributions

- Many Maritime Services rely on S-100-based data models (e.g. S-124 for navigational warnings or S-125 for AtoN information).
- Feasibility of existing S-100 encodings for the transmission of data over VDES has to be evaluated.
- Harmonisation is required to establish interoperability.
- IALA ENAV WG1 can provide the framework to host the discussions and produce IALA guidance documents as an output (or input to the IHO S-100 WG).





Join the Open Digital Incubator Initiative!

- End-to-End Evaluation of e-Navigation services in a collaborative testbed.
- Verification and validation of new reference implementations.
- Collaboration hub – Demonstration and Harmonization of new solutions in the context of IALA.
- Use existing reference implementations to check feasibility / compatibility with existing systems – for developing transition strategies.
- Focusing (initially) on technical services that are under development in IALA (and IHO)
- Anyone is invited to join the initiative and contribute to the Digital Incubator. Contact: Thomas Christensen (thomas@dmc.international) or Axel Hahn (axel.hahn@dlr.de)

Partners:

Australian Government

KRISO

SWEDISH MARITIME ADMINISTRATION

DLR

Fintraffic

WÄRTSILÄ

sternula

GRAD

Entering the Market – How?

… as PaaS Provider

Offer a secure and efficient way for maritime data exchange (with built-in data protection)
Become a MCP instance provider and charge for platform usage

Example:

NAVELINK

… as Service Provider

Provide Maritime Services
Charge for Service usage

Example:

Route optimization, Chart updates, …

… as a Satellite Communications Provider

Provide access to a communications network via satellite / MMS Router
Charge for bandwidth

Example:

sternula

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OPRI OCEAN POLICY RESEARCH INSTITUTE
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1

Development of VDES Coordination/Cooperation Standard for IALA

Ocean Policy Research Institute
Koichi Yoshida
Visiting professor of Kobe University and
Yokohama National University

POTENTIAL USES OF VDES
IALA G1117 VHF DATA EXCHANGE SYSTEM (VDES) OVERVIEW

Items in pink have been proposed by OPRI

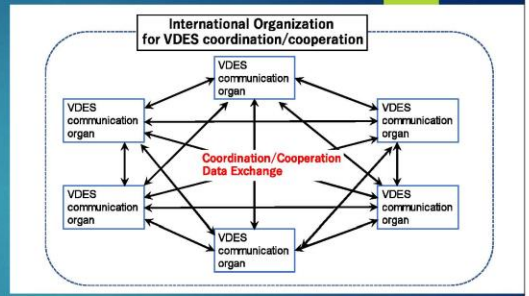
2

- Integrity check / authentication (Authentication for position reports, **Fish Catch certification**)
- MASS
- Positioning, Navigation and Timing (R-Mode, Broadcasting GNSS augmentation data)
- SAR communications (6)
- Safety Related Information (5, Maritime safety Information under SOLAS)
- Ship Reporting (7, VTS)
- Vessel Traffic Services (5) (**ship-to-ship**, ship-to-shore, shore-to-ships, Navigational Disruption, High priority ship)
- Charts and Publications (2)
- Route Exchange (5)
- Logistics / Services (2)
- **Maritime Domain Awareness (MDA)**
- **Disaster response**

Why cooperation/collaboration is necessary?

3

- The distance of direct communication of VDE is limited due to the characteristic of VHF radio-communication.
- Several VDES systems (ship stations, land stations, satellites) have been started and are planned for various use cases.
- In order to realize such use cases and extend the communication distance and capability, cooperation and coordination among VDES systems is anticipated.



4

VDES cooperation/collaboration rink

- Therefore, it is necessary to consider the establishment of an international collaboration on the following points for the establishment of international cooperation and resource management of VDES communications, in line with IRU-R M2092-1 Annex 6 Resource sharing method for VDES terrestrial and satellite services, as IALA Guidelines. The major contents of the Guidelines should be as follows:
  - 1 Coverage of land-based stations (control station of communication);
  - 2 Sharing resources among land-based stations (control station of communication);
  - 3 co-operation between VDE-TER and VDE-SAT; and
  - 4 cooperation and resource sharing among VDES satellites.

In order to implement the coordination and cooperation of VDES communications, It would be necessary to establish an international organ among interested parties for international cooperation, resource sharing and management for VDES communications. Such an international organ may consider, establish and manage protocols for harmonization of scenarios of use and application for VDES terrestrial and satellite communications.

An IALA project is going on!

- OPRI proposed to IALA E-NAV28 in October 2021 a new work item of "Development of Guidelines on VDES resource sharing and coordination/cooperation", and ENAV28 agreed with proposal in general.
- IALA E-NAV 30 in September 2022 agreed to include this new work item into the next work plan in 2023-2027.
- IAL E-NAV 31 (EM1) agreed to start up the development of the guidelines in correspondence with the coordinator of Koichi Yoshida.
- IALA E-NAV 32 (or name will be change by IALA Council) will do actual drafting work on the guidelines.

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Thank you very much!
And hope you to

- Joining to IALA E-NAV WG3 for the project of development of Guidelines of VDES Coordination/cooperation
- See you at IALA E-NAV Committee

OPRI OCEAN POLICY RESEARCH INSTITUTE
SASAKAWA PEACE FOUNDATION

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