IoS-OP

Internet of Ships Open Platform

Examples of fair and impartial data sharing and data utilization

ShipDC

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Examples of fair and impartial data sharing and data utilization

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Greetings

Tomoyuki Koyama
Adviser
Japan Marine Science Inc.
Chair of the IoS-OP Consortium

Marine transportation services are significantly changing due to decarbonization and digitization. There are limitations to what individual companies can do to respond to these significant changes that the maritime industry is facing, and they need to work together even with competitors in cooperative domains.

The IoS-OP Consortium was inaugurated in 2018 and has built fair and impartial data utilization and application rules and mechanisms for the purposes of clarifying the cooperative and competitive domains within the utilization and application of ship operational data and promoting data-driven services without harming the interests of data providers.

The initial participants were 47 companies mainly in Japan, but membership was permitted regardless of nationality as long as the rules were followed. Currently, the Consortium has expanded to 68 companies including overseas members to gather together diverse industries such as maritime transport, shipbuilders, marine manufacturers, and service providers to develop into an initiative which is unparalleled anywhere in the world.

This guidebook is being published for the purpose of introducing our initiatives and the participating companies. It is our hope that this booklet will contribute to the decarbonization and digitization of everyone involved in the maritime industry.

Hiroaki Sakashita
President & CEO
Nippon Kaiji Kyokai

The CII fuel economy performance rating system started on January 1, 2023, and the importance of GHG emission management has further increased. At Nippon Kaiji Kyokai (hereinafter, "NK"), we provide the "ClassNK ZETA" tool to support the GHG emission management of all companies, and it is already being used on 3,500 ships. In order to conduct management in line with actual daily operation, the introduction of Vessel Performance Management System using sensor data rather than one data point per day is advancing, and the expectations are rising further with respect to the IoS-OP initiative to promote the utilization and application of ship operational data.

As for NK, we are strengthening the provision of up-to-the-minute information such as the development of decarbonization and digital technologies, various initiatives being advanced around the world, and ongoing discussions of new regulations to support the business evolution through the evaluation and certification of everyone's initiatives.

NK will continue to actively engage in IoS-OP activities as a member of the IoS-OP Consortium and through the operation of the Ship Data Center subsidiary which serves as the data utilization infrastructure.

Yasuhiro Ikeda
President
Ship Data Center Co., Ltd.
IoS-OP Consortium Secretariat

IoS-OP was launched to promote the creation of innovation in the maritime industry with the operational rules for data utilization and application and the shore data center based on rules as cooperative domains. The IoS-OP Consortium was inaugurated as an organization to support these cooperative domains, and the Ship Data Center is responsible for the operation of the Secretariat and the shore data center. The Consortium engages not only in issues relating to IoS-OP operation but also a wide range of participant-driven activities that lead to solving the issues of all participants such as discussions concerning the rules for data sharing, study of technical issues, planning and hosting of seminars, and the development of human resource development programs.

In this booklet, we introduce the activities of the IoS-OP Consortium while also explaining the structure and results of IoS-OP and introducing participant initiatives in each topic. We hope that you pick up this booklet and seriously consider joining the IoS-OP Consortium. We look forward to the registration of your operating ship data as well as your provision of solutions and proposals for collaboration.

History

ShipDC was established in 2015 as a wholly-owned subsidiary of Nippon Kaiji Kyokai (hereinafter, "NK"). Through activities such as demonstrations of onshore storage facilities for ship operational data and the formulation of rules concerning data ownership and data usage rights, the IoS-OP Consortium was launched in 2018 with industry members.

Year	Primary activities	Registered providers (related pages)	Members
2015	● Established Ship Data Center Co., Ltd. as a wholly-owned subsidiary of NK		
2016	● Developed the ship IoT data distribution platform infrastructure		
2017	● Developed rules concerning ship IoT data usage rights with industry organizations		
2018	● IoS-OP Consortium inauguration ● MOL Senior Managing Executive Officer Yoshikazu Kawagoe appointed as the first Chair		44 companies
2019	● Recognized by the government as Japan's first data sharing business ● Danelec joins as the first overseas company ● Start of data sharing in actual business (for ONE)	PP: Terasaki Electric (p. 30), BEMAC (p. 18), Furuno Electric (p. 27) SP: NAPA (p. 22), NKCS (p. 10, p. 16, p. 24)	55 companies
2020	● ShipDC portal construction ● NYK Line agrees to register the operational data for all ships equipped with SIMS (approx. 200 ships)	PP: AOT (p. 20)	58 companies
2021	● "K" LINE agrees to register the operational data for all ships equipped with K-IMS (approx. 140 ships) ● MOL agrees to register the operational data for all ships equipped with the FOCUS project (approx. 180 ships) ● marineworks joins as the first South Korean company ● Full-scale overseas activities (hosting of the Taiwan seminar) ● Shin Kurushima Sanoyas Shipbuilding and Tsuneishi Shipbuilding start to utilize IoS-OP ● Japan Fisheries Information Service Center joins to improve the precision of their current assessment of fishing conditions and to predict future fishing conditions	PP: MES-S (p. 36) SP: HCS, NYK (p. 11)	58 companies
2022	● NYK Line Senior Managing Executive Officer Tomoyuki Koyama appointed as Chair ● Start of connection verification services for shipboard data servers and application software ● Think Nature joins to protect biodiversity through the linking of ship operational data ● Shipowners (MISUGA KAIUN) start utilizing IoS-OP ● Hosting of the Singapore seminar	SP: Tsuneishi Shipbuilding, ONE, Nautilus Labs, Nabtesco, Hitachi Zosen Marine Engine (p. 19), Weathernews, Chugoku Marine Paints (p. 17)	65 companies
2023	● Shipowners (Sumisho Marine) share IoS-OP data	PP: SSH SP: seawise, NMRI, SSH	67 companies

Scheme

IoS-OP organizes and defines the roles of stakeholders based on the data flow. They are classified as Platform Users (hereinafter, "PU") who manage the data usage rights, Platform Providers ("PP") who provide shipboard data collection services, Solution Providers ("SP") who provide onshore solutions, Solution Users ("SU") who use data for the purpose of contributing to ship operation, and Data Buyers ("DB") who use data for the purpose of advancing their own products and improving customer services to promote the utilization and application of ship operational data according to the data handling rules introduced in Topic 2.

Role organization within IoS-OP
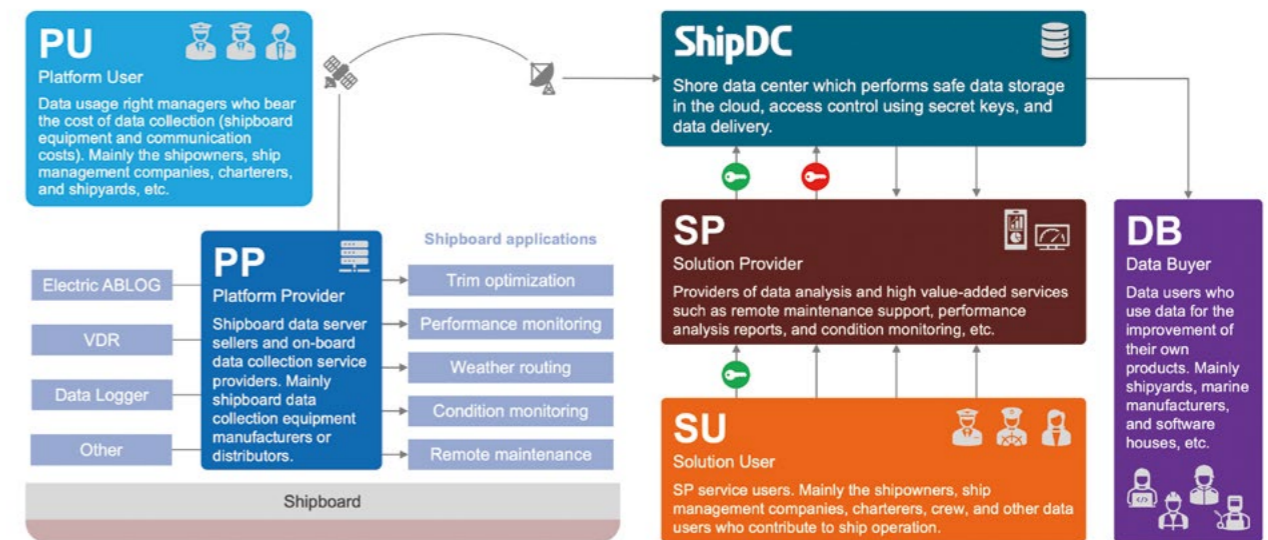
Organizations

The IoS-OP Consortium is composed of the following organizations.

[General Meeting]

Revises member terms and conditions and approves business and budget plans. The General Meeting is held four times a year and allows all Consortium members to attend.

[Steering Committee]

Engages in the operation principles of the IoS-OP Consortium, matters concerning sub-committee operation, establishment, operation and appointment of leaders of the Working Groups (WG), and the amendment or abolition of IoS-OP Terms of Use, etc. The Steering Committee is held twice a year and can be attended by responsible parties from platinum members (mainly the officer class) and elected members.

[Sub-committee]

Discusses and proposes IoS-OP Consortium operation principles, makes adjustments between each WG and formulates policies. The Sub-committee is held four times a year and can be attended by persons in charge from platinum members (mainly the section chief class), elected members, and WG leaders.

[Working Groups ("WG")]

The study of issues in the IoS-OP Consortium is carried out by each

IoS-OP Consortium composition

WG (held irregularly), and the activities of each WG are as follows. Consortium members may participate in the desired WG.

1. Rule Establishment and Data Governance WG

Studies and formulates rules regarding data utilization and application in IoS-OP and exchanges opinions on legislation relating to data transactions, etc. Recently, this WG has discussed data use for the purpose of AI development and the provision of data to public institutions for public purposes.

2. Solutions WG

Extracts and studies issues in solutions which utilize IoS-OP, formulates security guidelines, links with various technology standards, and operates testbeds, etc. Recently, this WG has discussed the connection verification of shipboard servers and apps as well as data quality indexing.

3. Business Promotion WG

Plans and implements various seminars to promote data utilization and application as well as on-going IoS-OP dissemination and public relations activities. Recently, this WG has conducted coastal shipping digital seminars and seminars for foreign and domestic shipping companies.

4. Human Resource Development WG

Conducts operational performance analysis study meetings for shipping companies to increase the number of operational data analysts and ideathons for the purpose of developing human resources capable of creating innovation. This WG plans to hold these meetings this year as well.

Using IoS-OP

To use IoS-OP, one must apply after agreeing to the data handling rules (IoS-OP Terms of Use) introduced in Topic 2.

Contact: IoS-OP Consortium Secretariat
consortium@shipdatacenter.com

Examples of Ship Data Utilization, Expanding Further

Increasing the role of IoS-OP as infrastructure

This year marks five years since the full-scale operation of the "IoS Open Platform (IoS-OP)" ship IoT data sharing platform promoted by Ship Data Center (ShipDC). IoS-OP is playing a more prominent role in the sharing of operational data by maritime shipping companies and data utilization by shipowners, etc.

Data sharing by ONE

The General Meeting to establish the IoS-OP Consortium was held in May 2018.

The first large-scale business case utilizing this sharing platform after the full-scale operation of IoS-OP was the container shipping company Ocean Network Express (ONE).

ONE was launched in April 2018 when "K" LINE, MOL, and NYK Line spun out and integrated each of their regular container ship business divisions. One issue with this integration was how to handle the ship data from each company.

Within the maritime shipping companies, container ships are one type of ship which utilized operational data from the earliest stages. Due to their high daily fuel consumption and the significant impact of operational efficiency improvements, each company built voyage data collection systems from around 2010 to support fuel-saving operation, and they promoted the utilization of such systems in container ships. Container ships were equipped with monitoring equipment to collect data concerning fuel consumption performance such as the RPM, speed, fuel consumption, wind speed and direction, and the companies advanced initiatives which led to operational

The three major Japanese shipping companies are sharing container ship operational data with ONE through IoS-OP.

improvements and ship handling support through the verification of this measurement data. After verifying the effect in container ships, the monitoring systems were expanded to other types of ships as well, and each company built their own data utilization platforms.

The utilization of ship data is absolutely essential in the business management of container ships. However, each of the three companies individually operated their own ship data platforms and utilized data with different standards, and the question of how to share data became a major theme with the integration of their container ship businesses. Accordingly, IoS-OP came to play a major role as it began full-scale operation around the same time as the launch of ONE.

First, with respect to the question of how to share operational data on different platforms, IoS-OP was the appropriate

solution as a fair and impartial sharing platform for handling the data of the three companies. In addition, IoS-OP also had arrangements regarding the handling of data, which was a major issue in the data sharing between the companies. The three companies participated in the promotion conference before the launch of IoS-OP and discussed data collection and utilization. The data ownership approach and data usage rules were completed in February 2018 (see "Data Handling Rules" in Topic 2). IoS-OP provided contractual provisions indicating the obligations and rights of data users, which enabled the smooth facilitation of the contract procedure for data use within ONE.

As a result, "K" LINE, MOL, and NYK Line were able to start sharing the operational data acquired from each of their container ships with the charterer ONE through IoS-OP in the year following the launch of ONE.

Effect of data name standardization

The effect of IoS-OP utilization is not limited to rules and platform usage. In particular, it has a large effect on data "standardization."

When it comes to ship data, the data names obtained from sensors differ by company and ship. Because each of the three companies managed data with different standards, ONE initially had to convert this data to names which complied with the ISO 19848 (see "Standardization Initiatives" in Topic 4) ship data international standard. At the same time, ShipDC implemented AI which assigned the ISO 19848 standard names. By utilizing this AI, it became possible to convert data with different names collected by each ship into the standard data names and provide it to ONE. This reduced the burden of data conversion work by ONE and made it easy to analyze and manage operational data integrated across the entire fleet.

In addition, the centralization of the container ship data platform into IoS-OP by the three companies integrated the application programming interface (API) which links apps and produced significant benefits when external companies provided apps, etc. to ONE. This eliminated the complexity for vendors to receive data provided by different companies, which improved the convenience and cost, etc.

The example of IoS-OP utilization in ONE holds major implications.

First, it can be described as a successful example of data portability during business integration. When the question of how

to handle data during future corporate restructuring in the maritime industry becomes an issue, the utilization of IoS-OP by ONE will serve as one model case.

Moreover, the problem of data names is an issue occurring throughout the world. Naturally, data names differ by maritime shipping company and shipyard, but they may differ by manager even within the same company. The ability to automatically convert data names will not only produce smooth data sharing as in the business integration by ONE but it is also likely to accelerate data sharing across companies and create an environment which makes it easy for external companies to participate.

Shipowners also utilize data

Not only ship operators such as ONE but also shipowners are starting initiatives to collect and utilize data.

In May of last year, the companies involved in the building of MISUGA KAIUN's new ship, the "MV MAINE SOLEIL," started utilizing IoS-OP. In this ship, approximately 800 operational data points including the draft and shaft horsepower are automatically collected in addition to information from the voyage data recorder (VDR), fuel and power consumption from the main engine, generator engine, and the auxiliary equipment, and other data.

Through the utilization of IoS-OP, the MISUGA KAIUN superintendent understands the manufacturer's analysis of the ship's condition in real time to prevent problems in advance. In addition, the main feature is that it aims to systematize the ability to monitor the rate of increased fuel consumption

to prevent declines in the actual fuel consumption rating to comply with future environmental regulations.

The ship collects and sends data through the "TERASAKI Marine Information Platform (TMIP)" onboard data platform provided by Terasaki Electric. The shipboard data server collects navigational data from the VDR and engine-related data from the Data Logger and sends it to the IoS-OP data center. This data is analyzed by the "HiZAS®VDA (Vessel Data Analysis)" provided on IoS-OP by Hitachi Zosen. This is application software provided by Hitachi Zosen which possesses performance monitoring, report functions, performance analysis, and an engine condition diagnosis system.

The Terasaki Electric platform complies with the ISO 19847 onboard server standard specification. Because ISO-compliant apps can be freely selected, apps may be configured later. At one time, it was necessary in some cases to significantly change the onboard equipment, etc. depending on the app, so shipowners could not configure the app until the charterer was specified or incurred replacement costs based on requests. However, if you prepare a system in advance which can collect and send data to an ISO-compliant server, it can be utilized by connecting to ShipDC even if the apps that the charterer wishes to use are specified after the vessel operator is decided or changed.

Demonstrating the effectiveness with preventive maintenance

Until now, the primary aim for shipowners of ship data utilization has been to prevent problems in advance through remote

Environmental Regulations and Operational Efficiency

Expanding places for operational data utilization and sharing

condition monitoring. The importance of this aspect is still unchanged. There have been many cases in which anomalies were detected through remote monitoring to prevent off-hires and ensure the ship operation time.

For example, there are several cases of utilizing the "CMAXS" anomaly diagnosis and remote condition diagnosis system for main engines provided by ClassNK Consulting Service to detect nozzle ring blockages in the supercharger through main engine condition monitoring. If the sludge deposition on the nozzle ring of the supercharger continues, the supercharger will surge and become unable to increase the load, and the fuel consumption will also deteriorate. If this condition is neglected for a long period of time, the main engine will ultimately stop operating, and there is a risk that it will need to be shut down for an overhaul and cleaning of the supercharger. If an anomaly can be detected in advance before reaching this stage, downtime can be avoided by preparing in advance and performing the work while at anchor.

Thus far, there have been several case studies of detecting sludge deposition on the nozzle ring with CMAXS based on the high trending of anomaly scores. They say, as a result, it is now currently possible to quantitatively assess the extent of the blockage. The blockage of the nozzle ring is inferred and a proposal is made to clean it at a feasible time to remove the sludge via cleaning and handle the issue without impacting the operational schedule.

The benefits of these types of preventive maintenance cannot be easily converted into

MISUGA KAIUN's "MAINE SOLEIL" has started utilizing IoS-OP.

a financial figure, but in the event that an engine shutdown or other situation occurs, in addition to the loss of time and operation expenses, explaining the situation to the shipper and other invisible costs and the impact on trust are not insignificant. The number of shipowners who are evaluating such effects appears to be increasing.

Moreover, while the majority of engine condition diagnosis via monitoring systems targets the main engine and generators, there are also ships which monitor and diagnose not only those components but also the intermediate shaft bearing and boiler, etc. In addition, there are also case studies of linking and utilizing the data from multiple pieces of equipment in the engine room with each of the manufacturers.

Increasing importance of data sharing

In addition, cases are also emerging in which shipowners share ship operational data with the charterers through IoS-OP.

Until now, charterers would request that the shipowners equip the operating ship with monitoring systems to perform data collection and analysis in the majority of cases, but some shipowners are introducing monitoring equipment into their own ships

in advance to start utilizing data in-house.

When one major shipowner in Japan equipped their own ship with monitoring equipment, they received a request from the charterer to use that data. A substantial cost would have been required if the charterer had newly installed their own data servers on the ship, but as the shipowner shared the collected data via IoS-OP, the charterer was also able to access the data without introducing additional equipment, etc.

Going forward, it is expected that opportunities for shipowners and charterers to share data will also increase to improve operational efficiency through the introduction of the fuel economy performance rating system, or the Carbon Intensity Indicator (CII), by the International Maritime Organization (IMO) (see "Environmental Regulations and Operational Efficiency" in Topic 1). At one time, there was a strong tendency not to make data open, but because costs are required to collect data, efficiency will increase if the same data can be shared between charterers, shipowners, and other relevant parties. Moreover, as the importance of ship data analysis increases going forward, there is also the issue that some companies may lack the resources to perform the analysis on their own. Therefore, there is also the possibility that companies who specialize in analysis and external services which propose operational efficiency improvements will spread, and the sharing of ship data will become important in the future. The utilization of IoS-OP is likely to further expand as a common platform which enables access to data based on access privileges. [Kaiji Press]

Operational efficiency improvements are becoming essential

Rules concerning ship emissions and fuel consumption are being introduced one after another aimed at reducing the emissions of greenhouse gases (GHG) from the international maritime transportation. It is expected that the necessity of utilizing ship data to improve operational efficiency will increase more than ever. An era in which shipowners and charterers share operational data is anticipated to arrive.

The fuel economy performance rating system, or the Carbon Intensity Indicator (CII), started this year to newly regulate GHG emission targeting large ocean-going vessels around the world. The CII rates one year of fuel consumption results across five levels and requires ships with a low evaluation to submit an improvement plan and receive approval from a supervisory agency. Interest in operational efficiency improvements aimed at this CII rating improvement is increasing in the maritime industry.

Moreover, the maritime transportation sector is scheduled to be newly added to the EU Emissions Trading System (EU ETS) in Europe. A system (EU MRV) which requires the monitoring, reporting and verification of emissions is already established for international ship trade to and from the EU, but emissions from ships with a total tonnage of 5,000 tons or more that are

covered under this system are scheduled to gradually be covered by EU ETS from 2024. Ships going to and from the EU are required to purchase emission allowances according to the amount of emissions. Naturally, efforts to reduce emissions are required through operational efficiency improvements.

Thus far, there have been initiatives to collect data during ship operation from onboard equipment and utilize this data to improve operational efficiency, but such efforts were independently carried out by the ship operator from the perspective of reducing fuel costs. However, with the introduction of a series of environmental regulations, shipowners and other stakeholders are also strengthening their interest in operational efficiency and data. Operational data will become essential for examining ship performance improvement measures and verifying their effects.
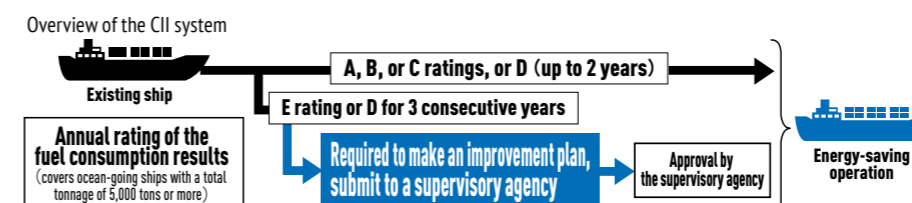
Places for data sharing are also increasing

Various services are also appearing which utilize ship data to support environmental regulation compliance by shipowners, etc. For example, Nippon Kaiji Kyokai (ClassNK) released the "ClassNK ZETA (Zero Emission Transition Accelerator)" tool which can efficiently manage GHG from ships in April of last year. This service has already registered more than 4,000 ships.

"ClassNK ZETA" has functions for real time monitoring of the CO_2 emissions and CII

rating for individual ships and an entire fleet, simulating how the CO_2 emissions and CII rating change with the addition of energy-saving additives, and the reporting of CO_2 emissions. In an environment marked by the needs of the maritime industry, ClassNK is working to strengthen the functions for compliance with the CII system. They are planning to add a function which can simulate the CII rating of a corresponding ship even in the middle of the year. Moreover, because CII is an absolute evaluation, the overall positioning is unknown. Accordingly, they plan to also add a benchmarking function which utilizes ClassNK data to show a comparison of the corresponding ship rating with its surroundings. Preparations are underway to incorporate functions which support measures for EU ETS in Europe from next year onwards.

Going forward, it is expected that scenarios in which shipowners, operators, and ship managers utilize platforms such as "ClassNK ZETA" to consult about operation while verifying the operational status of the corresponding ship will also increase. Until now, there have been almost no opportunities for multiple parties to share ship-related data. Prior arrangements are essential for data sharing, but fortunately agreed-upon rules concerning data usage rights, etc. exist in IoS-OP (see "Data Handling Rules" in Topic 2). Smooth data sharing is enabled by utilizing these rules. For example, each function of "ClassNK ZETA" can be used by shipowners and operators with the usage permission of the ship management companies, and this data usage mechanism also uses the IoS-OP framework. [Kaiji Press]

Overview of the CII system

Existing ship

A, B, or C ratings, or D（up to 2 years）

E rating or D for 3 consecutive years

Annual rating of the fuel consumption results (covers ocean-going ships with a total tonnage of 5,000 tons or more)

Required to make an improvement plan, submit to a supervisory agency

Approval by the supervisory agency

Energy-saving operation

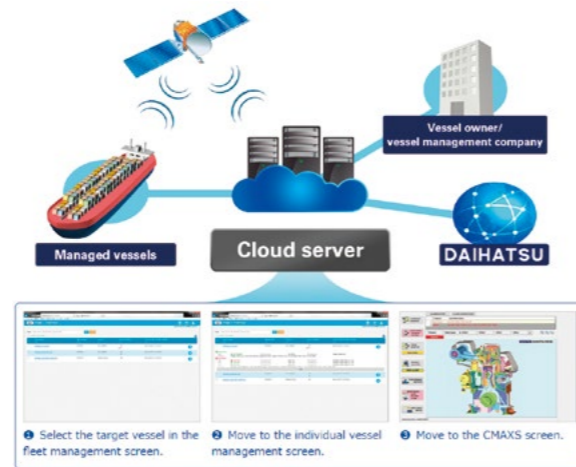# DAIHATSU DIESEL MFG. Co., LTD.

CMAXS LC-A

DAIHATSU'S NEW SERVICE SOLUTION, CMAXS LC-A, utilizes cloud-based engine condition monitoring (ECM) and diagnostic and troubleshooting technologies for the safer operation of vessels and reductions in life-cycle costs.

Building up our range of IoT-supported products and services the CMAXS LC-A integrates the management and monitoring of main engines, auxiliary engines and auxiliary devices in one, easy to use internet-based platform. And with trouble-shooting functions connected directly to Daihatsu you can be ensured of quick and relevant maintenance support.

By accessing this website via the Internet, it is possible to ascertain the condition of any vessel from any location.

As the same data can be viewed by jumping from the fleet list to the same monitoring screen as that onboard the vessel, you can address device management problems from the same viewpoint as that of the crew.

This new, Cloud-based engine condition monitoring (ECM) and diagnostic solution supports the safer operation of vessels and helps to reduce life-cycle costs. Retrieve a target vessel's data at any time thanks to safe cloud storage.

Safer operation and reduction of life-cycle costs

Managed vessels — User

DAIHATSU

Managed vessels — Cloud server — DAIHATSU — Vessel owner/ vessel management company

❶ Select the target vessel in the fleet management screen.
❷ Move to the individual vessel management screen.
❸ Move to the CMAXS screen.

DF Dual-Fuel Engines

e-Diesel

DAIHATSU
DAIHATSU DIESEL MFG.CO.,LTD.

1-30, Oyodo Naka 1-chome, Kita-ku, Osaka, 531-0076 Japan TEL: +81-6-6454-2393 FAX: +81-6-6454-2686
www.dhtd.co.jp

KAWASAKI KISEN KAISHA, LTD.

We aim to accomplish our goals in GHG reduction and achieve enhancement in operational management by using data from our vessels

"Kawasaki - Integrated Maritime Solutions" - our company's management system for monitoring vessel operations & performances - is comprised of route optimization system for safe operation and efficient fuel consumption, based on digitalized AB-LOG, performance analysis, latest weather database and analysis models for performance in actual sea conditions, which is integrated with automatic data collection and monitoring systems.

Data from each vessel is visualized by our internal platform called "K-IMS for Office". We aim to strengthen our vessel management by allowing multiple data processing, incorporating external databases, introducing AI technologies etc. in order to meet var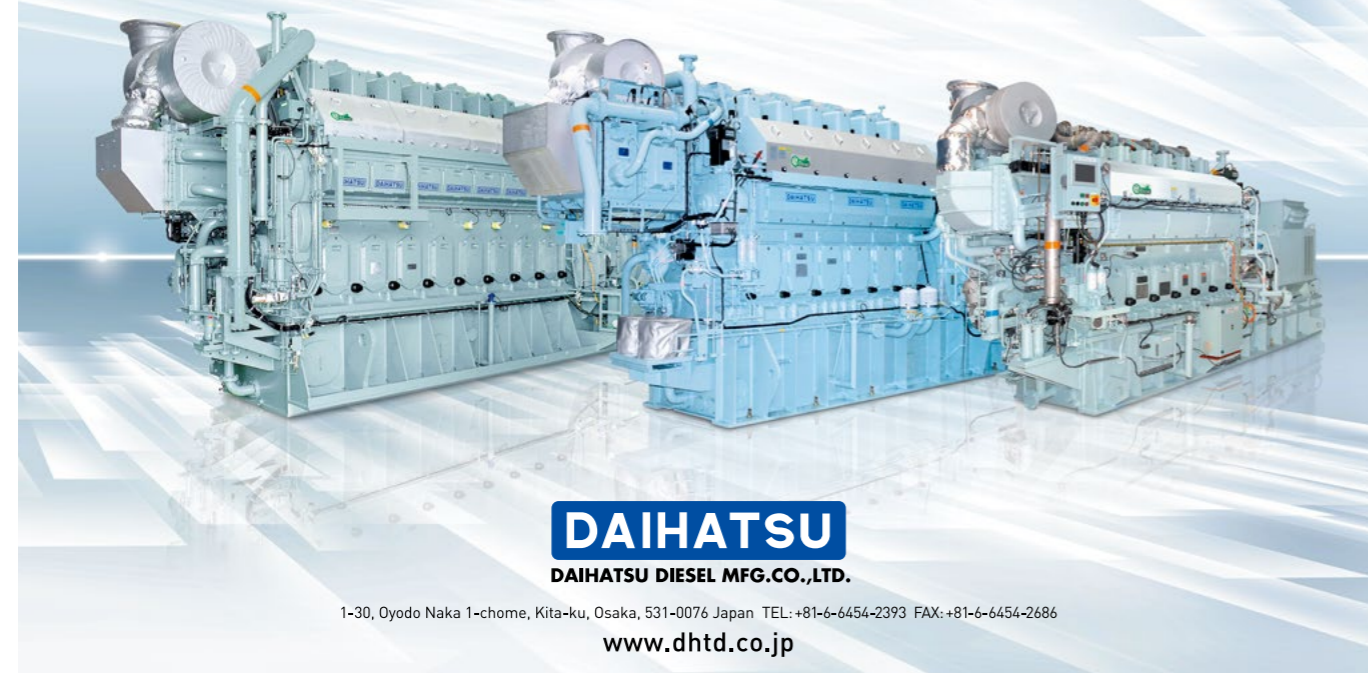ious requests/objectives of users, which is also supported by the flexibility when customizing the needed information. Moreover, owing to recent additions of monitoring function of current CII rating and CII simulating function using cutting-edge AI technologies, this system has become an indispensable factor for accomplishing our goals in GHG reduction.

Currently, operational data of 127 vessels from our fleet have already been registered at ShipDC *. We believe that the data provided from our company will be of some help to any party related to the marine industry - those of whom share the common objective in GHG reduction - and we hope the data will be utilized to enhance performances and monitoring qualities of vessels and the various machineries on board.

(* as of Jan 2023)

ClassNK
Innovation
Endorsement
for Product & Solutions
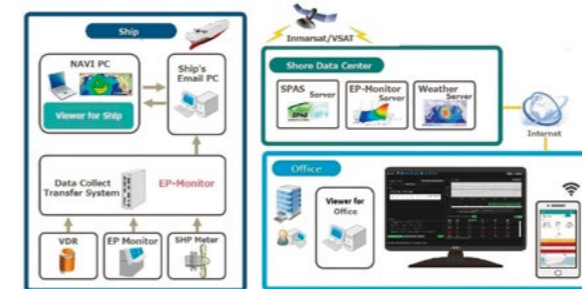
K LINE
川崎汽船株式会社

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MITSUI E&S Co., Ltd.

Engineering & Services for Evolution & Sustainability

Established in 1917 as the shipbuilding division of the former Mitsui & Co., Ltd., we have enlarged business domains such as marine engines, industrial machinery and port cranes.

On April 1, 2023, we have changed our trade name to MITSUI E&S to make a fresh start and turn toward achieving our growth strategy. We have defined the core of the growth strategy as two major pillars, the green strategy and the digital strategy. We will increase the added value of both products representing our strengths, marine engines and port cranes, by the greening

and the digital transformation (DX) and achieve continued improvement. We will remain a manufacturer. Going forward, we will strive to become an engineering supplier capable of providing comprehensive services encompassing single products as well as their peripheral equipment and systems to be more than just a supplier.

In accordance with the quick shift to a sustainable society and environmental change, we reviewed the meaning of the "E" and "S" of our company name as "Engineering & Services for Evolution & Sustainability." It conveys the significance of our existence (purpose), namely contributing to the achievement of a sustainable society through our engineering and services.

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Mitsui O.S.K. Lines, Ltd.

Ship big data utilization platform "FOCUS"

With the rapid development of ICT such as IoT and big data, the possibilities for ship data utilization onboard and shore side are expanding. We are improving our communication infrastructure and promoting the introduction of high-speed, high-capacity communication services using the latest satellite system. As a result, it has become possible to collect sensing

data from a wide variety of operating vessels and it is available in almost real time at shore side just like onboard.

We are promoting the "FOCUS" (Fleet Optimal Control Unified System) project with the aim of further enhancing of safe operation and reducing environmental impact by utilizing the operational data collected in this way. As a core project for MOL's ICT utilization, MOL collects detailed voyage and machinery data from over 200 operating vessels in service and develops applications for advanced operation monitoring and propulsion performance analysis. Collecting data during actual operation >> Analyzing the collected data >> Giving feedback to the vessel and maritime cluster based on the analysis results >> Collecting data during actual operation >>… We are running the data utilization cycle.
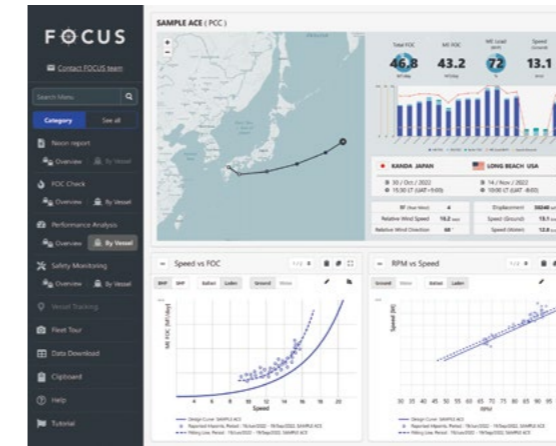
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Engineering & Services
for Evolution & Sustainability

MITSUI E&S

To deliver is to fulfill.

To fulfill your desire for better days. To fulfill your hope for a more secure tomorrow.

To fulfill the various wishes of many different people.

Mitsui O.S.K. Lines delivers the goods needed for our daily lives and industry,

from resources and energy to goods of every kind.

MOL
Mitsui O.S.K. Lines

https://www.mol.co.jp/en/

NIHON SHIPYARD CO., LTD.

Data & Operation Support Integrated Platform Sea-Navi®2.0

Sea-Navi®2.0 is an integrated platform that provides various applications to data monitoring and operations.

The platform collects various types of big data, such as voyage information and equipment operation data, in real time and combines them with R&D and design data for analysis, as well as providing services that are interoperable with various marine data applications from various external sources.

This enables users to not only visualization of the big data collected, but also immediate feedback of the results to actual operations and equipment manufacturers for seamless use in operational support, improvement, and trouble-shooting of managed vessels, as well as in studies of next-generation vessels.

Sea-Navi®2.0 provides high-performance evaluations using ship R&D and design data for environmental performance and energy loss, hull and propeller fouling analysis, weather routing, structural monitoring, parametric rolling measures, LNG fuel monitoring, and more. The platform also offers a wide variety of optional functions such as equipment maintenance, ordering, inventory management, and linkage with useful external applications such as those provided by marine equipment manufacturers, and we are actively developing new functions upon request.
- ClassNK Digital Smart Ship Notation: Available
- ClassNK Innovation Endorsement: Certified

Sea-Navi®2.0

NIHON SHIPYARD

[Contact Details] URL: https://www.nsyc.co.jp/en/contact/
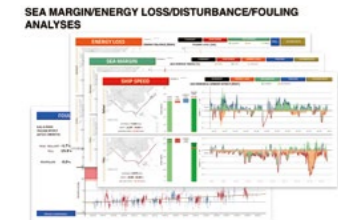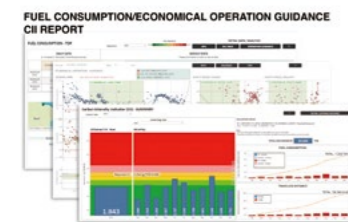
Nippon Yusen Kaisha (NYK Line)

Utilizing the data for ship safety and optimized operations

NYK Group promote "Digitalization" initiatives for solving the various issues faced by our sites by making use of digital technologies and analyzing collected data to create new value.

Through the implementation of SIMS (Ship Information Management System) in 2008, the NYK Group has been able to share data among workplaces on land and sea in real time, including detailed hourly updates on shipping operations and data related to fuel consumption. Optimized economic vessel operations and energy-saving operations are realized by visualization of information and close information-sharing among crew members, shipowners, ship operators, and ship managers. SIMS has been installed on 200 of our operating vessels.

From December 2020 NYK and Ship Data Center Co., Ltd. have agreed to use the latter's IoS-OP to share data received from all NYK-operated vessels equipped with SIMS, expanding the total to about 200 NYK vessels.

NYK Group also developed Ship Data Viewer* for the purpose of sharing vessel safety and optimized operations.

Dramatically increasing the amount of data being transferred via the IoS-OP and makes it possible to increase corporate value by utilizing the data for ship safety, economic pursuits, environmental efforts, and innovation within the shipping industry to enhance international competitiveness.

*Ship Data Viewer is a registered trademark of NYK Line.

NYK LINE
NIPPON YUSEN KAISHA

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Japan Radio Co.,Ltd.

J-Marine Cloud

J-Marine Cloud uses a common platform to collect various types of information, including meteorological and oceanographic information and AIS information. Various data such as voyage data, route plans, and navigational equipment status are also collected on a common platform via VDR, J-Marine NeCST, and other shipboard equipment. These data can be combined to provide advanced vessel management and operational support solutions for onshore fleet managers. J-Marine Cloud also provides a variety of services to vessels, such as meteorological and oceanographic information

services and optimal route support services, to boost on-board decision-making capabilities of vessels.
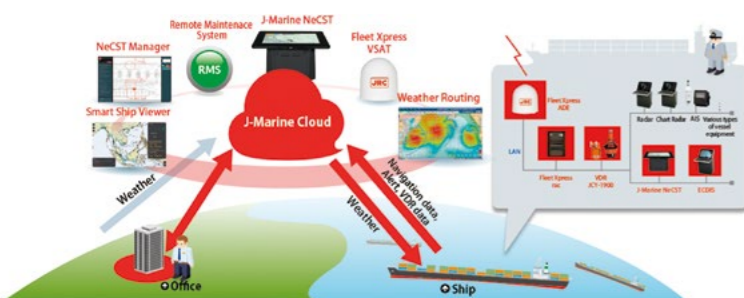
These features contribute to improving and resolving various navigation-related issues, such as energy-saving navigation, environmentally friendly measures, and anti-piracy measures.

JRC has received certification for its J-Marine Cloud, a maritime information service that enables safe, secure, and smart ship operation management, under the "Innovation Endorsement" certification service for innovative technologies offered by ClassNK for products and solutions.

JRC will continue to provide effective solutions for realizing the practical application of automated vessels by 2025.

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Oshima Shipbuilding Co., Ltd.

World's Leading Bulk Carrier Supplier

Oshima Shipbuilding Co., Ltd. has been a leading and reliable partner in the bulk carrier shipbuilding industry with 50 years of experience. By specializing in bulk carrier construction, we lead the shipbuilding industry with the highest productivity in the world.

We understand that every bulk carrier has unique requirements for each of our customers. Therefore with our extensive experience, we are designing and building the best ships that meet those needs.

At Oshima, we are constantly pursuing to produce bulk carriers with the world's highest fuel and cargo handling efficiency. We are also boldly challenging ourselves to develop environmentally-conscious new technologies to reduce GHG emissions with ships that use alternative fuels designs, and wind-powered hard-sails such as the WindChallenger.

By providing world-class products and services, we strive to contribute to the development of a better world for people around the globe. Oshima Shipbuilding Co., Ltd. are proud to be a reliable partner in the industry, and we look forward to working with you to build a vessel that suits your needs and exceeds your expectations.

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Kawasaki Heavy Industries, Ltd.

ICT/IoT Solution for the Maritime Industry: SOPass and CMS

Kawasaki Heavy Industries, Ltd. is a conglomerate that operates in multiple industries—including both shipbuilding and marine equipment. In addition to manufacturing, we provide solution services that support the operation of vessels and marine equipment using ICT/IoT technologies based on data collected from ships.

1) SOPass (Ship Operation and Performance Analysis Support System)

SOPass provides "improvement of voyage safety" and "reduction of operating costs" functions for vessels by proposing optimal operations. In particular, for LNG carriers, it has the function of maximizing transportation efficiency by accurately predicting BOG (boil-off gas) generated during transportation and proposing optimal operations.

2) CMS (Condition Monitoring System) for Marine Propulsion Equipment

Collecting data from onboard machinery including our environmentally friendly propulsion system with battery, gas only engine.

Display samples of CMS for Marine Propulsion Equipment

It enables grasping the condition of onboard machinery from the office, supporting economical operation & prompt troubleshooting for safe operation.

3) CMS for Rudder and Mooring Winch

Collecting data from Steering gear and provide to on-land teams, for safe navigation and quick troubleshooting. While at mooring, this system improves safety and reduces workload for seafarers, by visualizing the tension of mooring rope.

Going forward, Kawasaki will integrate the above services with our aim to continue providing maritime solutions for a wider spectrum of users.

YouTube URL
for SOPass

YouTube URL
for Kawasaki Electric
and Hybrid Propulsion
System for ships

Kawasaki
Powering your potential

[Contact Details]
SOPass: https://kawasaki-corporate.spiral-site.com/SOPass_EN
CMS for marine propulsion equipment: marine-machinery-sales@khi.co.jp
CMS for rudder and mooring winch: https://kawasaki-corporate.spiral-site.com/hyd_product_EN

YANMAR POWER TECHNOLOGY CO., LTD.

Supporting generator engine control with AI/ICT

Yanmar Power Technology Co., Ltd., a group company of Yanmar Holdings Co., Ltd., has since 2019 been providing SHIPSWEB, which provides information support services to support the control of generator engines mounted in ocean-going ships with AI/ICT technology.

Furthermore, electric vessels cannot navigate safely without a stable onboard power supply. However, it has become

more difficult to maintain the quality of engine control in recent years due to diversified crews, spending less time on board vessels and environmental regulations leading to more complex inboard equipment.

With a focus on these issues, SHIPSWEB provides various functions such as Engine Performance Analysis, Maintenance Guide, Parts Catalog and Troubleshooting as a platform for information provision services to enable customers to obtain the technical information they need at the appropriate timing to complement their own experience and knowhow.

These services are linked with other companies' data platforms, and SHIPSWEB SMART-LiNK, a smartphone app which can be used offline, is also being released.

Yanmar will continue to do our best to help customers solve problems by providing better ICT services.

YANMAR

[Contact Details]
Smart Service Promotion Office
Large Power Products Business

BEMAC Corporation
"MaSSA Insight", power distribution system troubleshooting application

MaSSA Insight ~WADATSUMI~ is a web application that automatically collects data, analyzes the cause, and proposes troubleshooting solutions when a problem happens in the power distribution system.

The following are the four main features:

1) When a trouble happens, a troubleshooting guidance automatically pops-up by the application. No special operations are required during the hectic time when a problem happens. Simply launch the application to confirm the next steps for recovery.

2) The application can be used on board and shore. The application can be used anytime on a PC connected to the ship's LAN on board or the Internet at the shore office. In the event of trouble, the exact same situation can be monitored both on board and shore simultaneously to support the quick recovery.

3) The only preparations required are the installation of a shipboard data server and a data output device to the main switchboard.

4) Compliant with international standards ISO 19847/19848. The data collected are converted to unified data format and commonly utilized.

MaSSA Insight is also equipped with other data analysis/monitoring functions such as "Engine Monitor," which enables monitoring of engine conditions from various angles, and "Knowledge Alarm," which allows setting alarms under multiple conditions based on the knowledge of skilled engineers.

Troubleshooting guidance

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Hitachi Zosen Marine Engine Co., Ltd.
HiZAS® VDA (Vessel Data Analysis)

In recent years, due to tightening of regulations and growing need for safe vessel operation management has become sophisticated, data amount collected from vessels is increasing. Shipowners/Ship management companies spend time and effort analyzing, and there is urgent need to improve work efficiency through DX. We have developed "HiZAS®VDA" as

new service that utilizes our main engine performance analysis know-how and latest ICT technology, to support analysis for vessels with data collecting platform service.
We will continue to accurately grasp customers needs and provide further functions as sustainable growth service.

● Service
  Cloud base web application
● Contract
  Annual contract (subscription)
● Main functions
  · Main engine performance analysis
  · Alarm notification
  · Vessel operation performance visualization and evaluation
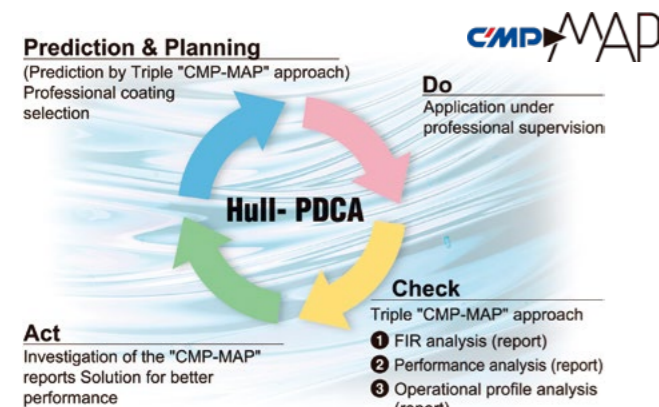 · Parts measurement data management

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Chugoku Marine Paints, LTD.
CMP-MAP CMP Monitoring & Analysis Program

Greenhouse gas (GHG) emissions are an international concern due to the adverse environmental effects of climate change. The IMO agreed to reduce the total annual GHG emissions by at least 50% from 2008 levels by 2050. EEDI regulation and CII rating have been started from January 2023. GHG emission and vessel performance will be evaluated more strictly. Therefore, maintaining the hull performance by antifouling systems will be more important than ever.

CMP - Monitoring & Analysis Program (CMP-MAP) developed based on our years of experience. The methods visualise the hull performance through the triple "CMP-MAP" approach. "FIR theory" visualises the effects of low-friction antifouling and surface treatment such as full blasting by Friction Increase Ratio calculated from roughness measured by 3D hull roughness analyser. "Performance analysis" visualises hull performance using performance indicator defined in ISO 19030. "Operational profile analysis" helps to find more appropriate antifouling specification using operational profile calculated by AIS or GPS data. The methods continuously improve hull performance through our original PDCA cycle called "Hull-PDCA". CMP will provide the program as solution provider, also using the IoS-OP data platform.

Prediction & Planning
(Prediction by Triple "CMP-MAP" approach)
Professional coating selection

Do
Application under professional supervision

Hull- PDCA

Act
Investigation of the "CMP-MAP" reports Solution for better performance

Check
Triple "CMP-MAP" approach
❶ FIR analysis (report)
❷ Performance analysis (report)
❸ Operational profile analysis (report)

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# IHI Power Systems Co., Ltd.
The new lifecycle support services for domestic vessels with ClassNK CMAXS LC-A

By utilizing self-development remote monitoring system for marine propulsion system with 4stroke main engine, IHI Power Systems had made efforts to serve quickly understanding and troubleshooting for abnormal situations while sharing operation data with customer.

And now, we are launching the new support services with ClassNK CMAXS LC-A for domestic vessels in which is taken over the knowhow cultivated with CMAXS LC-A for ocean-going vessels.

Through the diagnostic support including predictive maintenance by reducing "secondary damage", "non-operating loss", and "unscheduled work", we will serve more reliable and valuable support in life cycle of products for the customer.

We also confident that ClassNK CMAXS LC-A for domestic vessels could contribute to be realize energy saving and economic operation with labor shortage and society ageing as a background.
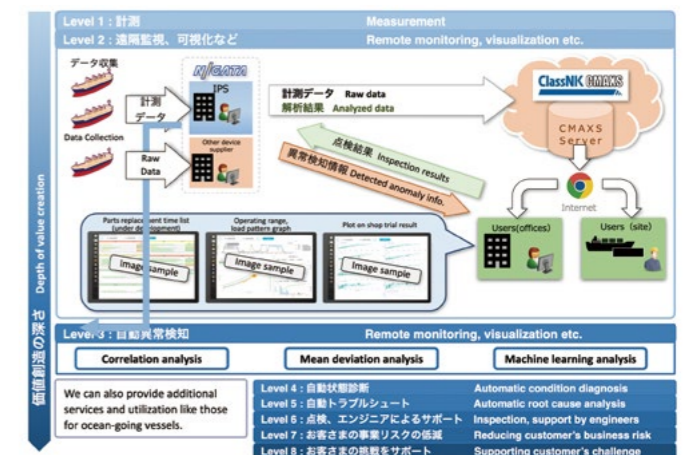
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Nabtesco Corporation
NEW Main Engine Remote Control System M-800-Ⅶ

Nabtesco has released a new model main product, the M-800-VII main engine remote control system.

The M-800-VII inherits the advantages of previous type M-800-V, in addition pursuing a system that is easier to use. Features include a variety of input/output ports for inter-system coordination, improved processing power, and redesigned "display" and "telegraph handle". In addition to the 8.4-inch display, which is the same size as the current model, a 12-inch display with twice the screen area has been added to the lineup.

The telegraphic handle inherits and improves on the company's original linear design, with a structure that emphasizes operability and visibility. In addition, the M-800-VII offers stable quality through the use of non-contact sensors and highly durable parts.

Furthermore, the M-800-VII is equipped with a function for cyber security and is in the process of obtaining classification society certification.

Nabtesco will continue to promote technological development to meet the challenges and needs of the marine industry, such as safe navigation and environmental protection, and provide safety, security, and comfort to our customers.

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# Nakashima Propeller Co., Ltd.
Ship monitoring system (NASCA) which utilized a shaft horsepower meter
(NASCA: Nakashima Ship Cruise Assist System)

NASCA system is to a superior product in the visibility that can read main measurement items related to grasp the navigation situation (vessel speed, shaft revolution, shaft horsepower, fuel consumption, propeller efficiency, CO₂). In addition, this system can grasp the tendency of the navigation status by utilizing a shaft horsepower measurement results and propeller performance information. The deterioration situation can be found from the propulsion performance and

CO₂ discharge obtained from shaft horsepower meter. Consequently, the timing of the dry dock (ship and propeller cleaning) can be judged by a series of data analyzed. Moreover, the cause analysis of fuel oil consumption can be employed. The alert function in this system can be activated when a propeller was damaged.

The loss of data less occurs when malfunction occurs for communication between land and ocean as the PC installed Data base itself, therefore data can be restored if communication becomes normal. It can thereby be employed as a trustworthy data archive.

Main Screen (Image)　Chart (Image)　Shaft horsepower meter
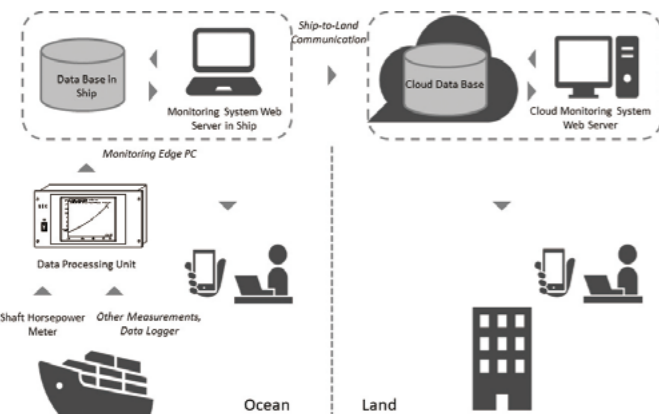
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Fukuda: k-fukuda@nakashima.co.jp

Taiyo Electric Co., Ltd.
System Integrator for Marine Electric Equipment

Contribute to realize carbon-free society in shipping by our "Power Electronics Technology" accumulated many years.

Shaft Generator System

Permanent magnet type shaft power generation system that further improves the efficiency of the power generation system cultivated through the development of the conventional thyristor method.

Electric Propulsion System

Electric propulsion system that combines optimal rotating machines and control equipment.

Photo : Tokyo University of Marine Science and Technology

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Chiyoda-ku, Tokyo 101-0047

Alpha Ori Technologies Pte. Ltd.
SMARTShip and SMARTVoyager tech solutions

SMARTShip™: Connect, control, optimize
SMARTShip™ collects live data and provides real time analytics to Ship's crew and Shore management to increase operational efficiency, drive sustainability, loss prevention & ensure compliance to regulations. SMARTShip™ is based on state-of-the-art technology that can process over 5000 data points from various systems on board in real time, combining weather overlay and statutory and regulatory information to enable users to harvest unique insights that boost performance.

SMARTVoyager: Make every voyage a smart one
This is a path breaking solution that provides Commercial Operators with a range of applications designed to optimize your fleet's performance, maximum earnings while helping to reduce environmental impact. The product has been developed after deep consultations with leading commercial operators to ensure SMARTVoyager answers their demands.

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3 Fusionopolis Way, #13-20 Symbiosis,
Singapore 138633
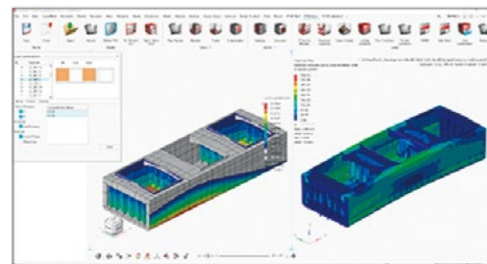Tel: +65-6463-5546
E-mail: info@alphaori.sg

Altair Engineering
Digital Twin Platform changing existing processes

Altair has been supporting decision-making through simulation technology (CAE) for product design and manufacturing.

In the shipbuilding industry, Altair HyperWorks has been adopted as the platform for PrimeShip-HULL, a hull structure design support system being released by Nippon Kaiji Kyokai, and is contributing to efforts to streamline the shipbuilding design process and achieve hull structure design and 3D data approval with 3D models as the core (Figure 1). We are striving to contribute to efforts to streamline the shipbuilding design process and to realize hull structure design and 3D data approval with 3D models as the core (Figure 1).

At the same time, data science technology has developed remarkably in recent years, and the shipbuilding industry has the potential to transform existing processes by utilizing data for marine transportation, hull design, and ship operations.

Altair's product offerings can provide advanced and comprehensive assistance, including Digital Twin. For example, we can build a dashboard that visualizes sensor data from a vessel in operation, and then incorporate machine learning models based on CAE data into this dashboard to create a digital twin environment that predicts vessel behavior and abnormalities during operation, as well as repair schedules, in real-time using products such as Altair Panopticon and other products (Figure 2).

Altair provides not only software sales and support, but also technical consulting services. If you are interested in our services, please contact us at the contact information below.

(Figure 2)
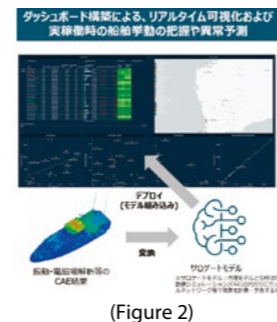
[Contact Details]
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(Figure 1)   PrimeShip-HULL image

FUJI ELECTRIC CO., LTD.
## Ship condition monitoring and optimal maintenance

Fuji electric supply the IoT system which can achieve **"visualization"** and **"predictive maintenance by Condition Based Maintenance (CBM)"**.

This system can optimize the timing of maintenance and realize quick response.

Check the data anytime, anywhere on the monitoring platform. Fuji ,Ship owner and Ship crew can access this platform via PC.

Previously, if ship crew faced any trouble, ship owner and ship communicated by e-mail mainly, however they spent a lot of time to recover these trouble. Fuji's IoT service have effective tools for Trouble shooting and communication with the maker in real time. So our solution can solve that trouble easily.

Through the above measures, the EGCS can be operated continuously without stopping, while considering the environment, using competitive fuel oil to reduce operating costs, and reducing the burden on the crew due to unexpected troubles.
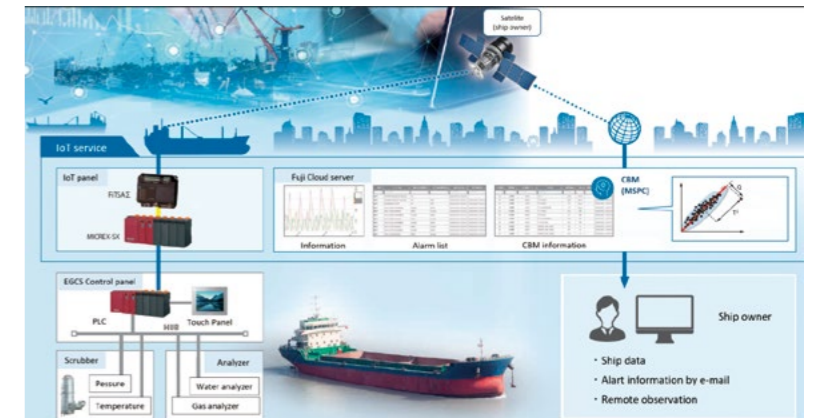
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Danelec
Value from Maritime data.

- Danelec simplifies data capture for ship owners, enabling them to future-proof their fleet and compete effectively in tomorrow's data-dependent, net-zero economy. We develop technologies to optimize the safety, cost, and performance of marine operations as a leading manufacturer of **Voyage Data Recorders** (VDR) and **Ship Performance Monitoring** (Kyma) systems. We also provide dependable, cost-effective **maritime IoT infrastructure** and are an innovative enabler of digital solutions developed in-house and by expert partners.
- Danelec is committed to provide the most effective products and services that help customers meet changing regulations and to operate more efficiently through the application of data collected on board and accessed in the cloud.
- With offices in Denmark, Norway, Greece, Germany, Poland, Singapore, South Korea and China as well as over 600 factory-trained personnel in more than 50 countries worldwide, Danelec has a truly global presence ensuring reliable, cost-efficient and fast service and support to our customers anywhere.

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JRCS
infoceanus: Digitalizing the Maritime Industry

As a company with a strong motivation to help achieve the marine industry's vision of zero-emission sailing, digital transformation, and automated vessels, JRCS has created infoceanus, a digital series that maximizes the potential of ships and provides support for all those who work in the industry.

infoceanus provides multiple solutions, one of which is "assist", a maintenance solution that centralizes onboard troubleshooting management and reduces the burden on the ship's crew. The solution "command", is an AI solution that supports safe ship operations through situational awareness using cameras and computer vision. There is also the solution, "connect", which collects and analyzes vessel operation status in real time to support operational management.

These solutions work by connecting the onboard Edge server with the cloud, using IoT technology. The data collected has real time analyzation capability to ensure safe vessel operations.

Through their infoceanus series, JRCS will continue innovating as a comprehensive solution provider for all those involved in the industry and will maintain a progressive motivation to make new changes and provide positive support.
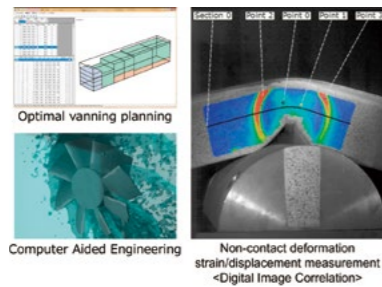
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E-mail: jrcs@jrcs.co.jp

KOZO KEIKAKU ENGINEERING Inc.
Design, Manufacturing and Operation Support by Engineering

Kozo Keikaku Engineering Inc., as an engineering consulting firm based on engineering knowledge, is working to solve complex social issues. Since our founding as a structural design office in 1956, we have expanded our business into various fields such as construction, disaster prevention, telecommunications, manufacturing, logistics and decision-making support for various corporate activities. Using our diverse technologies such as data analysis, optimization, simulation, and image analysis, we offer solutions suitable for clients' challenges and support the installation of them.

Optimal vanning planning

Computer Aided Engineering

Non-contact deformation strain/displacement measurement <Digital Image Correlation>

<Examples of Design and Manufacturing Support>
- Improving design efficiency and preventing defects by CAE and past findings
- Non-contact deformation strain/displacement measurement using image analysis

- Magnetic non-destructive testing
- Cargo lashing safety assessment
- Production management
- Quality risk management

<Examples of Operation Support>
- Improving transportation efficiency through optimal repositioning and vanning planning
- Seafarer and worker shift scheduling
- Condition monitoring and maintenance by vibration analysis and abnormality detection
- Ship performance diagnosis by big data analysis
- Accident sign detection of engine section
- Inspection automation with image recognition
- 3D data measurement and platform of inboard space
- Container stowage operation support at Advanced Ocean Container Transportation Engineering Lab

構造計画研究所 KOZO KEIKAKU ENGINEERING Inc.

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Sunflame Co., Ltd.
Sunflame Smart Support System

The "SUNFLAME SMART SUPPORT SYSTEM" is an operation monitoring and performance analysis system for auxiliary boiler burners and marine incinerators. It offers real-time data collection and visualizes operation data using IoT and provides advice on parts replacement and engineer dispatchment along with operation monitoring and performance analysis. Using the system, SUNFLAME offers suggestions for parts replacement and equipment maintenance as well as advice for effective operation for trouble prevention and fuel efficiency. The system allows its users to maximize operation safety and cost performance of their equipment.

The operational data, which is collected using the data logging function in our products, is sent to shore real-time using ship-to-shore communication infrastructure. The system can be installed with minimal changes to the preexisting infrastructure because the data used for analyses can be sent without passing through the vessel's data logger. The data is then accumulated by SUNFLAME's own internal server for further analysis of its operation. The data is then distributed to the users in forms of daily and monthly reports, which displays the equipment's operational status, and critical reports, which provides an explanation of troubles that have occurred on the vessel.

The communication device used for SUNFLAME SMART SUPPORT SYSTEM can also be used by non-SUNFLAME products as a stand-alone data transfer gateway.

SH SUNFLAME

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Napa Ltd
NAPA Fleet Intelligence

NAPA Fleet Intelligence is a user-friendly cloud-based solution for improving ship efficiency and safety. This software enables you to analyze and optimize vessel and voyage performance with high accuracy, helping you reduce emissions, increase profitability, and even validate new technologies.

NAPA Fleet Intelligence software combines a variety of data sources, such as weather, AIS data, navigable routes, and noon reports or automation data, with highly accurate ship performance models to create insights and advice for improved performance.

NAPA Fleet Intelligence modules include
- NAPA Voyage Optimization, for safe and fuel-efficient weather routing
- CII Simulator, to monitor and manage the CII rating
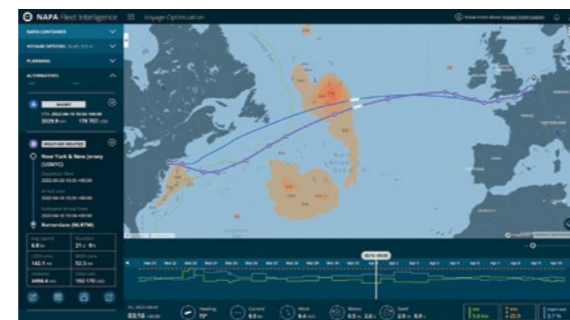
- Fleet and Voyage Monitoring
- Regulatory Reporting, for regulatory compliance
- Technical Performance, advanced analysis of vessel performance
- Charter Party, for monitoring of commercial contract compliance
- Stability & Emergency, to follow up on stability, strength and vulnerability
- Navigational Risk Monitoring, to be alerted on grounding risks
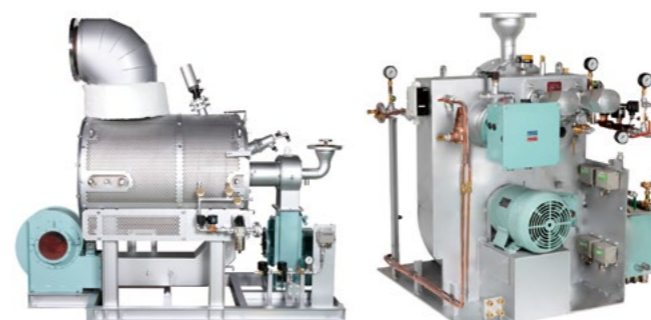- Logbook Reporting
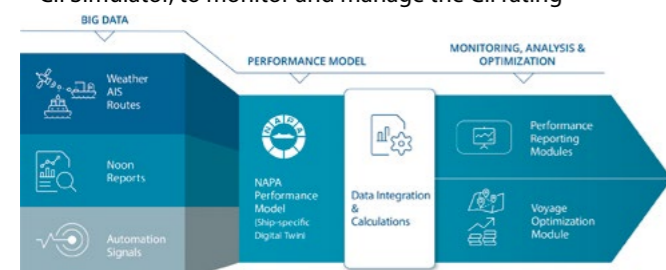
NAPA

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VOLCANO CO., LTD.
VOLCANO GHG Reduction Initiatives

In international shipping sector, various efforts are being made to reduce GHG emissions in order to achieve carbon neutrality by 2050.

Volcano has been developing various products that contribute to GHG reduction by utilizing its combustion technology, which has been refined over 94 years, and the vast amount of data it has accumulated. For LNG fueled vessels, which are becoming increasingly popular, Volcano has introduced the Gas Combustion Unit "MECS-GCU" and the Gas/Oil mixed combustion DF (Dual Fuel) burner for auxiliary boilers "Vignis", and is currently developing new products for use of next generation fuels in vessels, such as ammonia, methanol, and hydrogen. These fuels' utilization also contribute to GHG reductions.

Volcano has delivered DF burners to more than 270 vessels, which include LNG carriers, offshore vessels, and LNG fueled vessels for over 40 years. Volcano has built an automatic control system based on the data of our knowledge, including extensive test results and our engineers' experience in actual operation. "MECS-GCU" and "Vignis" can accumulate various operation data by monitoring the status of the equipment itself, and we can provide the demanded data upon customer needs. "MECS-GCU" and "Vignis" are also designed to be easy to operate, and are equipped with a touch panel with easy-to-understand visual graphics. Customers can select an operation mode or perform automatic operation by operating switches on the screen.

Volcano will continue to contribute to environmental conservation around the world by providing products and services that utilize its core combustion technology and the latest data application technology.

Volcano

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Mitsui E&S DU Co., Ltd.

Next-generation CBM with customer and ClassNK CMAXS

Nowadays, quite a few general data analysis tools are widely recognized, and development of plain anomaly detection system of machinery equipment has become rather easy. However, sophisticated "cause estimation of detected anomaly" (hereafter referred as "Diagnosis") cannot be performed just with those general data analysis tools. It requires proper consideration of physics, dynamics and engineering design.

The CMAXS Alliance already has implemented "appropriate diagnosis" even in daily operation to carry out our "predictive maintenance" of vessels. That has been applicable with shared diagnosis system and engineering support by manufactures of machinery.

CMAXS not only reduces direct losses including "secondary damage", "non-operating loss" and "unscheduled works". CMAXS also contributes to develop human resource including know-how of maintenance, skills for trouble shooting and deeper understanding of machinery, by its systematic data accumulation of incidents and knowledge extracted from those incidents. In summary, Users of CMAXS not only improve their business risk control, but also develop their staff to conduct their business.

We will continue our efforts to develop Next-Generation CBM, while introducing new technologies to our business which consists of hardware realm, software realm and support services.
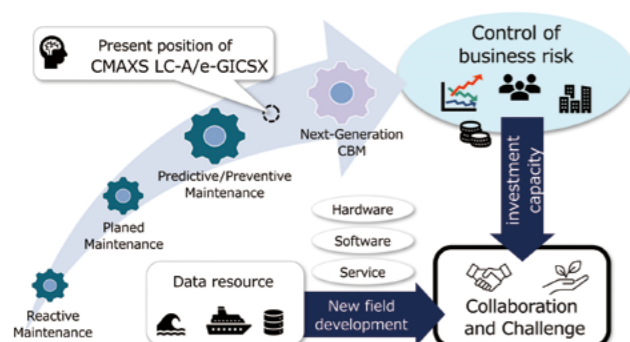
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Mitsui E&S DU Co., Ltd.

Data Handling Rules

Realizing fair and impartial data sharing

Due to the thinking around data hoarding and concerns about unexpected uses, the sharing of operational data with relevant parties has not made much progress, but it is expected that innovative value will be created through open innovation by means of cross-industry collaboration. To dispel the concerns of data holders in IoS-OP, we define the relevant parties for data distribution, establish various terms, and aim to promote data utilization and application.

IoS-OP terms of service

Legal basis of data use

Data is intangible and not covered by ownership under the Civil Code. Moreover, factual data such as operational data has no creativity and is not covered by copyright. Therefore, rights are organized as usage rights in IoS-OP, and safe and smooth data sharing is realized without creating unnecessary friction by establishing data usage rights and usage conditions through contracts.

Definition of relevant parties

When arranging data usage rights in IoS-OP, we establish data ownership and organize the relevant parties by determining which parties need to sign a contract.

[Data ownership]

The shipowners or businesses which collect data at their own expense with the consent of the shipowners as data usage right managers are called Platform Users ("PU") in IoS-OP. Furthermore, PUs decide who should be allowed to use the data. In many cases, this is handled by charterers, but it can be taken on by shipowners and shipyards, etc. regardless of business attributes. Data use
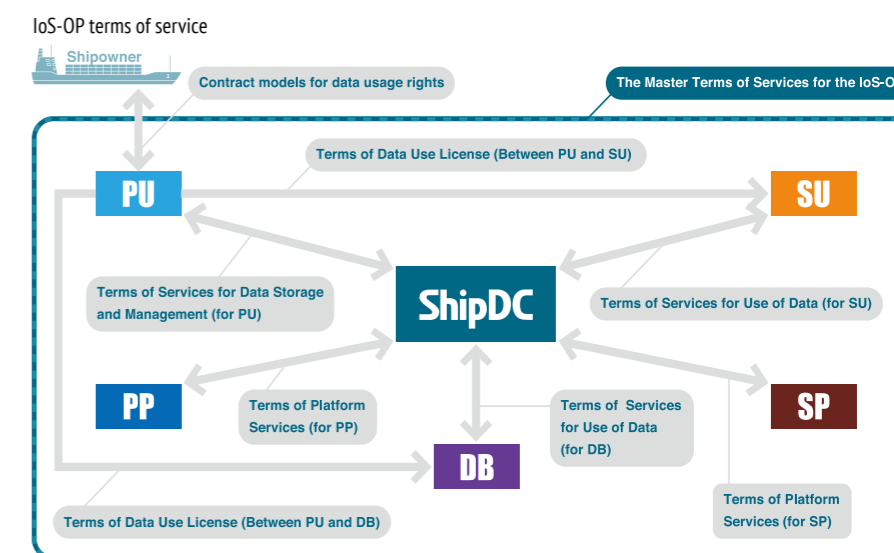
consent is decided based on the attributes of the party who wishes to use it and the purpose of use.

[Who can use the data?]

Based on PU consent, use is possible in the case where the business attributes and purpose of data use match the rules (e.g. party concerned with the corresponding ship) from the perspective of a Solution User ("SU") who uses the data through IoS-OP-registered application software as a party involved with the ship operation and a Data Buyer ("DB") who receives the data provided by ShipDC. SUs may optionally join the IoS-OP Consortium. However, it is essential for DBs to participate in the IoS-OP Consortium and register as a business, and the obligations and privileges are defined in the terms.

[For what purpose can data be used?]

Data can be used for various purposes with PU consent if the purpose of use is clear and without unreasonableness such as contributing to ship operation or providing feedback to a company's own products.

However, the provision of data to competitors for any purpose is prohibited.

[Providers]

Businesses which provide servers to collect data on ships are called Platform Providers ("PP"), and businesses which provide application software are called Solution Providers ("SP"). Participation in and business registration with the IoS-OP Consortium as a data distribution business is essential, and the obligations and privileges are defined in the terms.

Ensuring security

Businesses involved in the data distribution process are required to observe the security guidelines designated by IoS-OP. Moreover, ShipDC has acquired information security management (ISO 27001) certification as a data custodian and is also recognized by the Japanese government as a data sharing project which can utilize the System for Permitting Businesses to Request Public Data.

Topic **3**

High-speed Marine Communication Network

Becoming more convenient through bandwidth expansion and price reduction

Increasing importance as infrastructure

In the maritime industry, the environmental response centered on decarbonization, safety improvements, and crew labor environment improvements are important themes which should be addressed. To respond to these issues, various applications and other digital tools are rapidly being developed and introduced. Improvements in ship connectivity centered around ship-to-shore communications via satellite communication are essential to maximize the utilization of such digital solutions and draw out their potential, and communications are playing an increasing role as platform infrastructure in the maritime industry.

The volume of maritime data usage is expanding each year. According to a survey by Inmarsat, the volume of maritime data usage related to ship business applications increased by 131% from June 2021 to May 2022, and the volume of crew-related data usage increased by 149% during the same period as well. Viewing the results by ship type, container ships saw an increase of 207%, and even bulk carriers, which had the lowest rate of increase, grew by 148%.

International Maritime Organization (IMO) started establishing a new maritime communication system based on satellite technology in 1973. Satellite technology developed with the introduction of the Global Maritime Distress and Safety System (GMDSS) in 1980. Currently, there are more than 5,400 satellites orbiting the earth, and proven and reliable Geosynchronous Equatorial Orbit (GEO) satellites link with low-latency Low Earth Orbit (LEO) and Medium Earth Orbit (MEO) satellites to provide various forms of connectivity according to the application.

Technologies such as artificial intelligence (AI) and big data analysis, which require communication, have also appeared, and the demand for communication connectivity is further increasing.

Contributing to the improvement of crew benefits

With the development of communication infrastructure, high-volume broadband communications services that are always connected even on the ocean have started, and seamless, near real-time ship-to-shore exchanges have become possible. Currently, shipboard data including video can also be sent. The computerization and networking of shipboard equipment is advancing, and the transmission of ship and shipboard equipment measurement data to shore has become easier in terms of technology and cost. This has enabled systems which provide support for ships from the shore such as optimal operation support which contributes to environmental regulations compliance and reduced fuel consumption and the condition monitoring and predictive diagnosis of equipment to improve safety.

Moreover, the utilization of remote inspections dramatically expanded with the COVID-19 pandemic. As ship visits became more difficult with movement restrictions, such inspections played a major role in resolving the challenging situation of on-site interactions. Personnel at one satellite communication provider commented, "The number of customers who realized the necessity of broadband communication increased during the COVID-19 pandemic, which accelerated the introduction of their services."

During the COVID-19 pandemic, the number of ships introducing communication services increased from the perspective of crew benefits. The inability of crew members to disembark for long periods of time has been highlighted as a major issue for the entire maritime industry, but satellite communication providers started free and open satellite calls to support crews. According to one survey, when crew members consider working with a new employer, 33% answered that they place the highest emphasis on access to digital technologies. This number was higher than the figures for salary or vacation, which indicates that preparing a full broadband communication environment is essential for ensuring a stable crew going forward.

Regarding crew members, not only benefits but also training methods changed with the COVID-19 pandemic. An increasing number of ship management companies introduced remote crew member education services instead of conventional face-to-face training. Manufacturers, etc. are also promoting the introduction of remote training services. Because remote services can be expected to reduce training costs, this trend is likely to continue going forward. In addition, telemedicine and other remote forms of support based on high-speed communication have become possible.

The satellites which are essential to providing broadband communication are expected to continue increasing in the future. Satellite communication providers are expanding bandwidth and promoting other service network improvements, and it is expected that prices will also decrease going forward. Highly safe and reliable connection environments are expected to be developed by combining multiple networks through 5G terrestrial connections and LEO satellites. It is expected that maritime communication environments will further improve through increased speed, higher capacity, and lower prices, and the infrastructure is being prepared to utilize ship data. [Kaiji Press]

SKY Perfect JSAT Corporation
JSATMarine MAX 50Mbps high-speed communication service

In response to accelerating digitalization in the maritime industry and ever-growing demand for crew internet connectivity, SKY Perfect JSAT uses its own HTS (high throughput satellite) to provide high-speed internet access as fast as 50Mbps (shore-to-ship) and 3Mbps (ship-to-shore) at monthly fixed rates. Its platform operates from SKY Perfect JSAT's teleport, together with enhanced network security such as encryption and managed firewalls. Its service covers major shipping routes from Western Pacific Ocean region to Indian Ocean region.

With the introduction of "JSATMarine", shipping companies can take advantage of its connectivity in promoting maritime IoT solutions to achieve higher standards of safety navigation and operational efficiency. Also, by having faster Wi-Fi access, it can support more video communications and improve crew welfare as the maritime industry cope with COVID-19 crew change crises. In addition, SKY Perfect JSAT will continue to work towards developments of autonomous ships in the future of the Japanese maritime industry.

Furthermore, as part of our commitment to achieve SKY Perfect JSAT's SDGs target, "JSATMarine" platform and teleport facility are fully powered by renewable energy.

海洋 ブロードバンドサービス

JSATMarine
ジェイサットマリン

DAIKIN MR Engineering Co., Ltd.
## Remote Monitoring Technology for Marine Air Conditioning Systems

Daikin MR Engineering is working to realize remote monitoring and operation of marine air conditioning systems by controlling air-conditioning performance from the land via maritime broadband. We aim to realize a system that supports comfortable voyage.

Daikin has more than 30 years of expertise in remote air conditioning monitoring and operation technology for land use air conditioner. Based on the experience, we are striving to develop a system to support comfortable voyage for marine use air conditioner, aiming to create an environment where

people feel as if they are at the office even when they are on the sea.

What our technology provides:

- Energy saving and cost reduction with optimal and comfortable temperature and humidity settings by remotely monitored ON/OFF of air conditioner
- Avoids sudden air conditioning problems with failure prediction function
- Advanced arrangements for the faulty parts and repair service at the next port of call
- Comfortable work environment and reduced working hours for crews by automating the air conditioning function
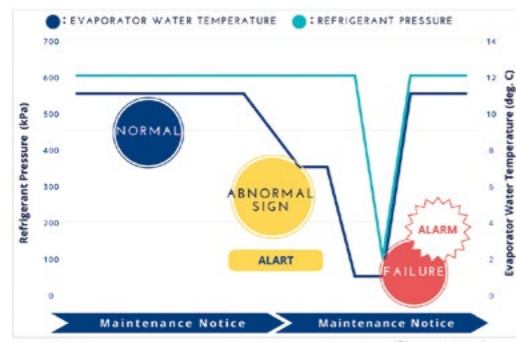
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Inmarsat K.K.
Satellite Communications Service Provider

Inmarsat is a global leader in providing mobile satellite communications worldwide. It owns and operates the world's most diverse global portfolio of mobile communications satellite networks, with a multi-layer global frequency portfolio covering L-band, Ka-band and S-band, enabling unparalleled breadth and diversity in the solutions it offers.

Inmarsat has established its own strong direct sales network as well as the world's leading channel partners,

enabling an end-to-end customer service guarantee. It also operates the world's most reliable global mobile satellite communications network, with an unrivalled track record of supporting business and mission-critical safety and operational applications for over 40 years. It drives innovation in mobile satellite communications and maintains its leadership through significant investment and a strong network of technology and manufacturing partners. It also has the financial resources necessary for its business strategy and operates in a diverse range of sectors. It occupies a leading position in the maritime, government, aviation and corporate satellite communications markets, and is consistently a trusted, responsive and high-quality partner for customers worldwide.
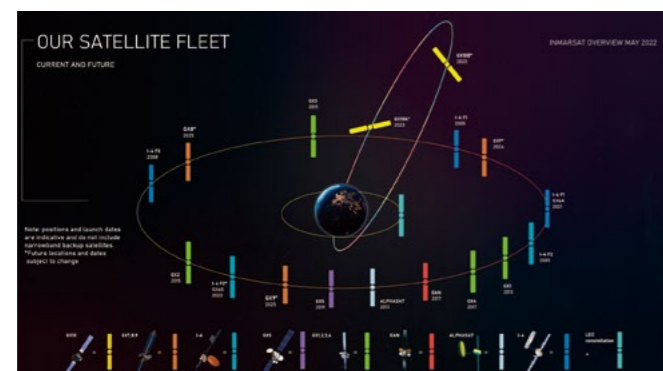
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Standardization Initiatives
International standards and IoS-OP

Standardization trends

The Smart Ship Application Platform (SSAP) project of the Japan Ship Machinery and Equipment Association (JSMEA) is proposing the revision of international standards for related technologies and the formulation of new ones to make it easy to develop and introduce shipboard and ship-to-shore applications.

To realize ship operation which considers safety, the environment, and energy conservation, many operation support

Standards that SSAP is working on

International standard	SSAP activity description
ISO 16425 Guidelines for the installation of ship communication networks for shipboard equipment and systems	The standard is being revised to take into account design methods, test and inspection standards, cybersecurity requirements, and guidelines for the installation of Wi-Fi and other wireless LAN
ISO 19847 Requirements for shipboard data servers to share field data at sea	The standard is being revised to take into account test and inspection standards and cybersecurity requirements, etc.
ISO 19848 Standard data for shipboard machinery and equipment	The standard is being revised to develop and extend the ISO 19848 codebook and data catalog
ISO 23807 General requirements for the asynchronous time-insensitive ship-shore data transmission	The standard is being formulated for ship-shore data sharing covering ship-shore asynchronously shared data exchange as in the data aggregated on the shipboard data servers of ISO 19847

Productivity improvements through international standards

services which can be utilized from ship to shore are needed. Therefore, data collection to be able to assess the condition of ships on the actual seas is important.

For this reason, SSAP has thus far created international standards for shipboard data collection servers (ISO 19847) and sensor data name standardization (ISO 19848), etc.

Moreover, taking into consideration the acceleration and adoption of satellite communication as well as cybersecurity, they are engaged in activities such as incorporating security requirements in related international standards and creating new standards for general requirements for asynchronous ship-shore communication.

International standards and IoS-OP

IoS-OP contributes to the safe operation of ships and environmental problems, pursues economic rationality, and naturally it can be said that ShipDC has marched in step with SSAP activities.

ShipDC recommends ISO 19847 compliance to the Platform Providers who provide shipboard data collection servers, and the ShipDC shore data center is equipped with functions that automatically assign 19848

codes to the sensor data names utilizing AI. These standard technologies and IoS-OP provide the following advantages to users.

- Optimization of server installation costs and ship-shore communication costs
- Reduction of security risks through easy-to-manage shipboard network configuration
- Reduction of the effort to introduce shipboard apps
- Improved convenience through name unification of not only the shipboard systems but also data use on the shore and solution services
- Realization of data sharing with effective data governance through a centralized shore data center
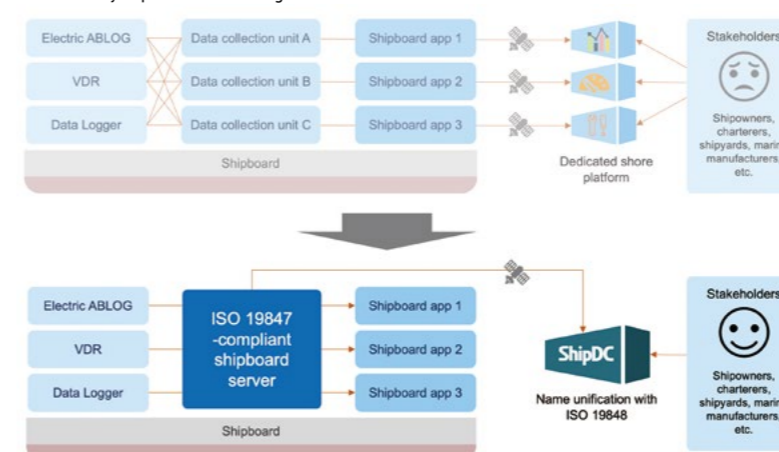
Moreover, regarding the general requirements for asynchronous time-insensitive ship-shore data transmission in the newly proposed ISO 23807, currently one-way ship-to-shore data communication is mainstream. However, there is a growing need for shore-to-ship data transmission such as making requests from the shore and retrieving data when detailed data is needed for shipboard system updates or during accidents and failures, it is essential to develop a certain level of requirements from the perspective of cybersecurity, and SSAP is standardizing these requirements. It is thought that these standard technologies will also need to be implemented in ShipDC in the future.

ShipDC supports these international standardization activities while also hoping to contribute to safe ship operation and environmental problems by utilizing international standards, increasing user convenience, and realizing cost optimization.

MOL Techno-Trade, Ltd.
Providing Resilient PNT and Remote Cyber Security Measures

Global Navigation Satellite Systems (GNSS) have enabled the widespread adoption of Positioning, Navigation, and Timing (PNT) services in many applications across modern society. On the other hand, GNSS signals are fragile and vulnerable to jamming and spoofing. The loss of PNT information can result in crippling critical infrastructure that is necessary for survival.
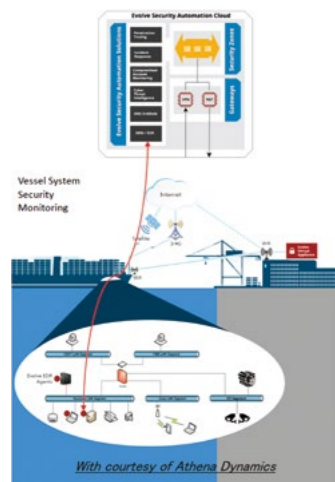
The maritime sector, which until a while ago was considered safe due to the lack of Internet connectivity, is showing an increase in cybersecurity breaches as it enters the digital era. Therefore, cyber security measure needs to be in place to handle the safety considerations and risks new technology brings with it, as well as to ensure that we keep vessel operation and crew and passengers safe.

MOL Techno-Trade now works on developing cyber safety solutions to ensure the safe future of maritime digitalization. As a marine cyber security expert, we combine specialist industry knowledge and the best solution systems to provide customers with strategic solutions to prevent and recover from cyber incidents.

We provide the latest range of PNT and cyber security services below.
- Safran: GNSS Anti-Jamming and Spoofing Device
- Athena Dynamics: Remote Cyber Security Service

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Marine Net Co., Ltd.
Vessel IT network and equipment status monitoring using MN-Station®

Marine Net helps ship owners/ship management companies build IT infrastructure on their ships.

As part of this, we will provide the "MN-Station® Service", a service for realizing the monitoring and management of onboard IT equipment through the "MN-Station®" unit developed in-house.

Management and understanding of IT assets
When introducing MN-Station®, we will understand the ship's network environment and propose improvements. After installation, based on remote status monitoring information, we will provide support and proposals for the appropriate maintenance and management of shipboard IT assets.

Reduce the burden on customers involved in IT operations!
With the introduction of MN-Station®, alerts will notify you of daily troubles, risks, and replacement of devices. We can take countermeasures in a timely manner, start updating the IT asset ledger, and reduce the customer's work burden.

Cyber Security Management System (CSMS) and MN-Station®
In order to build and operate a cyber security management system (CSMS), it is necessary to manage the IT assets onboard and grasp the situation appropriately. must be done. MN-Station® supports your company's CSMS operation through the onboard IT network/equipment status report required for CSMS operation.

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TERASAKI ELECTEIC CO.,LTD.
Onboard Data Platform TMIP

In recent years, the use of various ship data is progressing for the purpose of improving energy efficiency during navigation, reducing maintenance costs, and ensuring safe operation of ships. Therefore, a flexible data sharing system is required, such as a data platform for collecting and using onboard data, ship-land communications for sharing data with land, and data centers on land. Terasaki Electric provides TMIP (TERASAKI Marine Information Platform) as an onboard data platform.

TMIP can be connected to monitoring systems such as TERANET50X and other onboard equipment to collect and store data and share it with various devices and applications.

In addition, the marine computer series, which is the main component of TMIP, is a highly reliable product developed for marine use, and has sold more than 1,000 units in total. It is mainly used in the distributed integrated monitoring and control system TERANET50X installed on large ships.
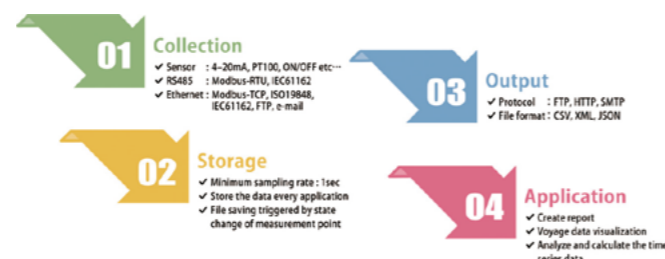
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Technology

IoS-OP platform

Platform functions

The platform provided by ShipDC is equipped with functions that control access based on the IoS-OP Terms of Use, and functions are provided based on each role which organizes the stakeholders in the data distribution.

The Platform Users (PU) who are data usage right managers have data access setting and management functions, Platform Providers (PP) who are data collection server providers have functions for checking the data reception status, Solution Providers (SP) who are shore solution service providers have a data retrieval interface through an Application Programming Interface (API), and the Solution Users (SU) who are the SP service users transfer and receive access keys called "data keys" based on the PU access settings.

These functions are provided in the "ShipDC portal" web system for each role via robust security authentication. In addition, a simple wake display for PUs, data downloading, and other functions are implemented so that the platform may also be used as a data vault.

Data reception

The platform can receive and store data in various formats. It can receive and store not only time-series text data (CSV) but also file-formatted data, and depending on the communication line, it can handle PDFs, photos, videos, and binary files, etc. Moreover, it provides two types of methods for data transmission protocols that can be freely selected by the user: API-based data transmission and the transmission of email with a compressed data file attachment.

Role organization within IoS-OP
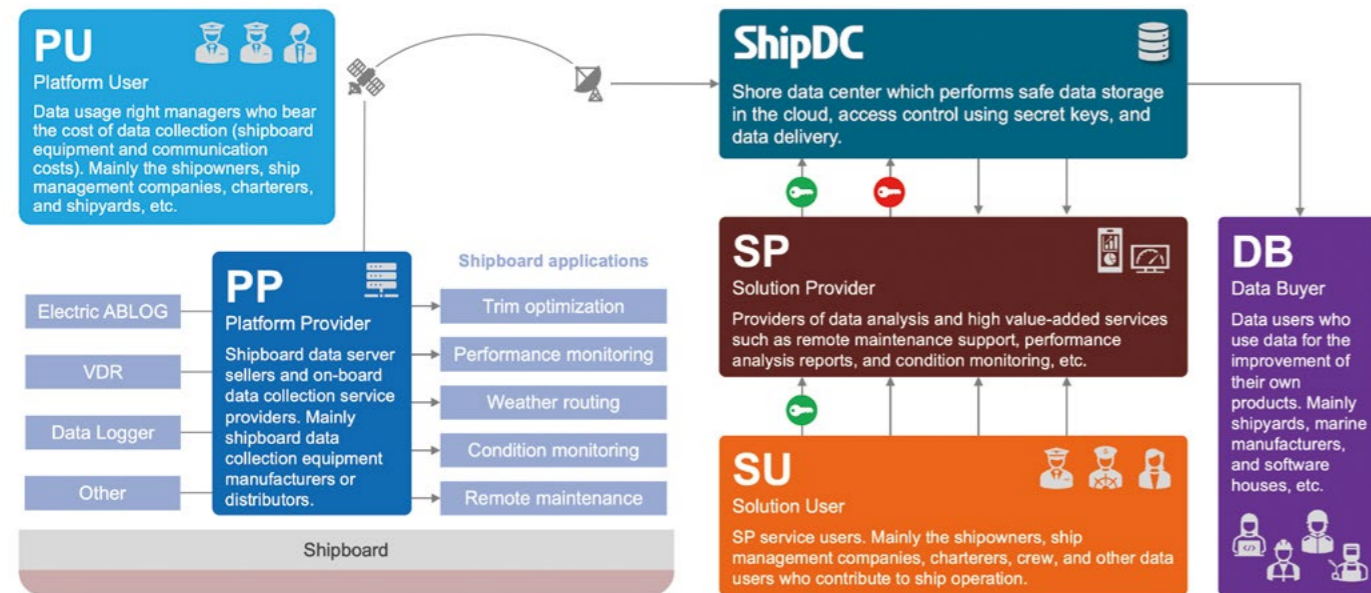
IoS-OP platform functions
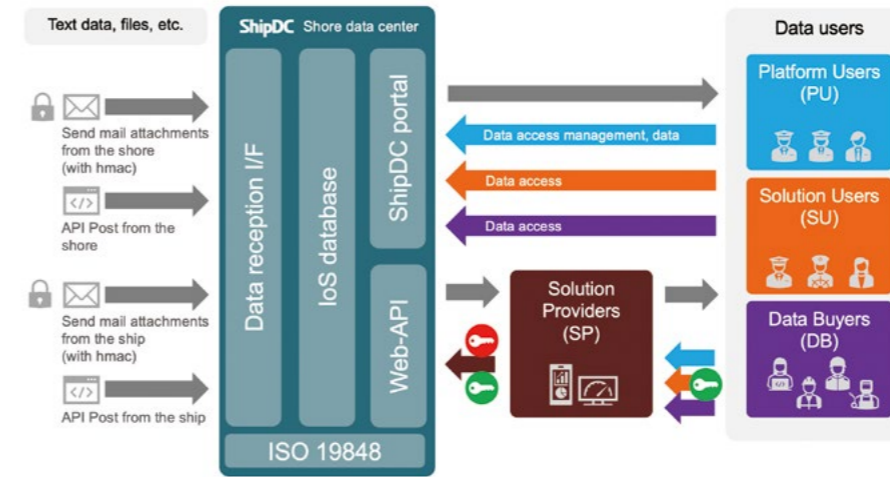
Data storage

The data names use a mechanism which retains both the original name and the code specified by ISO 19848 (machine-readable name) only when the received and stored data is text data, and the data user can freely switch between both names. The codes specified by ISO 19848 are automatically assigned by natural language AI.

Moreover, the platform provides a data reception monitoring function that can be freely configured by the PU and is equipped with a system that sends mail notification when nothing is received for a certain period of time or when a data item that is outside of the monitoring item setting range is detected. In addition, when an SP discovers a data error and reports the details, the PP is contacted, and there is a function for managing the bug fix.

Access control

In IoS-OP, the PUs register and issue the data key to the SUs who share data. Moreover, they can specify in detail what ships and what data items to grant access to for each data key.

In addition, the registered SUs can check the frequency at which they are retrieving data and with which SP apps to provide highly transparent sharing management.

Data retrieval (API)

The SPs who provide ship performance monitoring, weather routing, engine monitoring, and other services must register to use IoS-OP in advance and obtain a key called the "app key" for API connections. SPs use both this app key and the data key possessed by the SUs who are permitted data use to call the API and retrieve the data.

Application-specific APIs are provided to assess the data storage conditions, check the scope of permissions, retrieve the channel names, identify differential data, and retrieve time-series data, etc. With the exception of files, data retrieved via the API is provided in JSON format, which is easy to handle in programming. SPs need to parse this JSON-formatted data, convert it into a format according to the app, and store it in a database.

Data management system
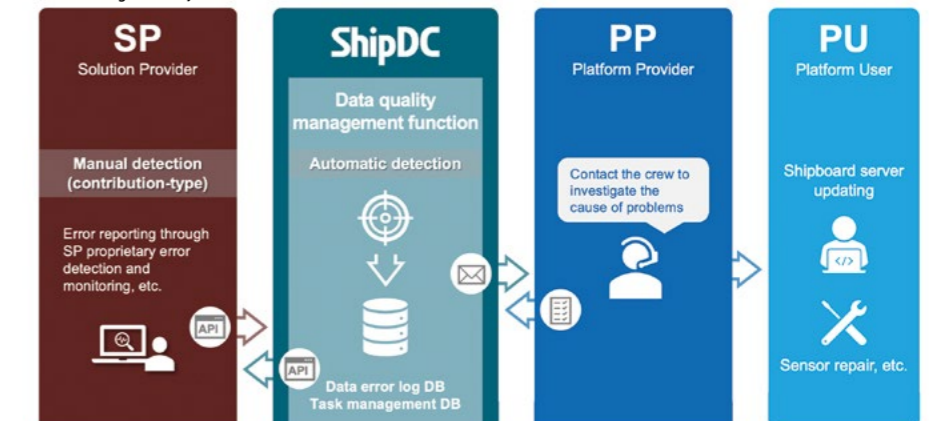
ClassNK
Innovation Endorsement

ClassNK has offered Innovation Endorsement as a certification service to promote the spread and development of innovative technologies and initiatives. In the pursuits of environmental issues, including decarbonization, safety, working environment improvement, and acceleration of digital technology utilization, ClassNK supports the spread and development of advanced initiatives of those involved in the maritime industry through third-party certification.

Among the certification categories, "Products & Solutions" covers equipment and software technology installed for use on vessels. ClassNK has so far certified a wide variety of innovations; various types of monitoring, ship-shore communication, weather routing, fuel efficiency improvement, remote assistance, cyber security support, freshness preservation in chambers, and AR utilization, based on our expertise of rulemaking, survey, and evaluation refined through classification services.

For "ships", ClassNK also supports the ship's value enhancement by granting notations: Digital (DSS), Environment (a-EA), Safety (a-SAFE), Working Environment (ELW), on the certificates of the ships in which innovative technologies are adopted.

For "providers" engaging in the innovative initiative, ClassNK offers three levels of certification: Concept Stage (Class C), Development Stage (Class D), and Sustainable Implementation Stage (Class S).

The scope and methods of Innovation Endorsement are expanded and improved flexibly through dialogues with customers. Please feel free to contact us to find out how ClassNK can offer the best tailored options for your products and solutions.

ClassNK Innovation Endorsement
SAMPLE

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ClassNK Innovation Endorsement

For more information, please access our website:

Third-party certification of innovations and initiatives (concepts and real services)
Convincing stakeholders of feasibility and value of the innovations
Developing adequate and accountable standards for emerging tech

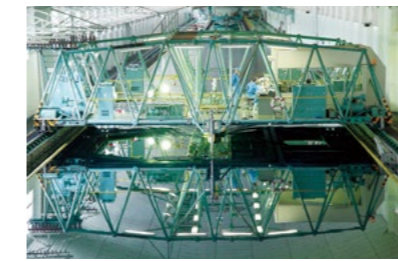|	Digital	Green	Safety	Labor	
Ships Notation on Class Cert.	Digital Smart Ship (DSS)	Advanced Environmental Awareness (a-EA)	Advanced Safety (a-SAFE)	Excellent Living and Working Environment (ELW)	**& YOURS**
Products & Solutions	CBM, E-Log Book, Data Quality	HW/SW for Energy Efficiency	Navigation Monitoring, Alerting	Low Cabin Vibration	
Providers - Concept - Development - Sustainable Implementation	Management Optimization	Decarbonization, Environmentally Sound Facility	Fleet Control Support, Advanced Monitoring	Working Condition Improvement, Remote Hospital	

MITSUBISHI SHIPBUILDING CO., LTD.
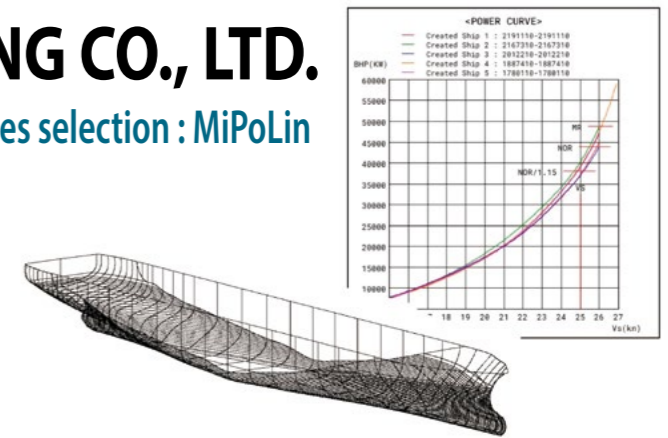## Mitsubishi Shipbuilding Power prediction & Lines selection : MiPoLin

Power prediction & Lines selection system "MiPoLin" is an easy-to-use, highly accurate web application based on the huge database of model test results accumulated in MHI Nagasaki Experimental Tank.

This system was originally a tool for initial design used in-house. And through this tool, we hope that MSB's technology will be widely used to solve problems related to the maritime industry. We improved this tool more user-friendly and started offering it in 2022 as "MiPoLin".

By utilizing the more than 1,200 tank test results accumulated for over 100 years and the experience and know-how acquired in shipbuilding, this tool can accurately estimate propulsion performance from simple input data of design ship such as hull form parameters and engine output. In addition, based on the more than 300 hull form data of model ships in "MiPoLin" database, this tool creates a hull form data that inherits the performance of MSB model ship, and that can be used for ship design work.

As the need for environmentally friendly ships and operations grows, "MiPoLin" can be used in a variety of situations, including the development and evaluation of ships with superior propulsion performance, and also the new ships that are developed for achieving zero GHG emissions.

[Home Page]
(EN) URL: www.mhi.com/products/ship/engineering_mipolin.html
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SHIN KURUSHIMA DOCKYARD Co., Ltd.
New ship buildings, ship repairs

In October 2020, Shin Kurushima Toyahashi Shipbuilding Co., Ltd. built SAKURA LEADER, Japan's first LNG-fueled car carrier. SAKURA LEADER up to about 40% more energy efficient (by reducing carbon dioxide (CO_2) emissions per unit of transport) compared with ships using conventional heavy oil fired engines. The vessel is also expected to reduce sulfur oxide (SOx) emissions by about 99% and nitrogen oxide (NOx) emissions by about 86% compared with ships using conventional heavy oil fired engines. Shin Kurushima Dockyard plan to build various LNG-fueled car carriers, and we continue to work on global warming countermeasures through LNG-fueled ships. In addition, we are working on technological development for the future. In November 2021, we obtained basic approval for the design of an ammonia-fueled car carrier that does not emit CO_2.
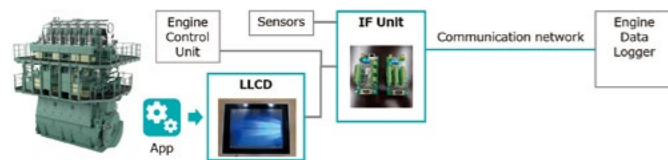
The destination is you.

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Japan Engine Corporation
Towards Comprehensive Digitalization for UE Engine

In addition to focusing on the development of engines compatible with new fuels toward carbon neutrality in international shipping, mass-producing engines compliant with CO_2/SO_x/NO_x emission regulations is currently underway. To comply these regulations, it is essential for each stakeholder to cooperate throughout the product's life cycle, and we believe that using digital technology is one of the effective means of strengthening such cooperation. We will continuously develop products and services utilizing digital technology so that our stakeholders can use UE Engine with confidence and safety.

Upgrading Engine Control System to 5th Generation;
By installing an IO board equipped with communication functions on the engine, the number of wirings for sensors can be significantly reduced. In addition, system integration with the general-purpose computer enables improved functionality for engine performance and/or condition monitoring through application expansion.

Data and ICT-based After-Sales Service;
Along with proposing comprehensive maintenance plans, mainly for coastal vessels, we have built the system in which our in-house developed condition diagnostic system determines the operational status based on vessel operation data and notifies our engineers via SNS. This service will provide that enable planned maintenance and reduce downtime in emergency.

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Akishima Laboratories (Mitsui Zosen) Inc.
Our solid technology supports you to achieve zero emissions

Using statistical methods and AI technology to analyze vast amounts of data measured on actual vessels, it is becoming possible to evaluate the fuel efficiency of vessels in actual sea areas and the effects of disturbances. Unfortunately, however, it appears to be difficult to understand physical phenomena and obtain guidelines for improvement simply by processing data.

To make effective use of the data, analyzing with high precision the various factors that affect a vessel's actual performance at sea, such as the effects of fouling, aging, wind resistance, and added resistance in waves is indispensable. Relating these factors to physical phenomena, developing effective countermeasures targeting hardware improvements and software improvements such as highly efficient operation is also necessary.
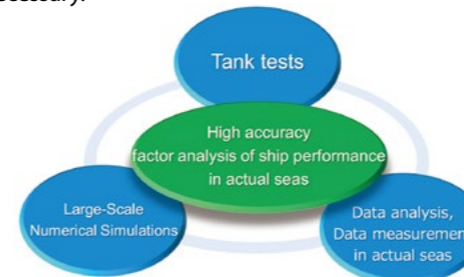
Akishima Laboratories (Mitsui Zosen) Inc. , originated from a shipyard, is now "independent from the shipyard". We can make various proposals for effective use of data based not only on data analysis technology measured on actual vessels, but also on performance improvement technology backed by our proven results based on high-precision tank testing technology and large-scale numerical simulations. Akishima Laboratories (Mitsui Zosen) Inc. will assist you to achieve zero emissions through planning effective measures for highly efficient operation.
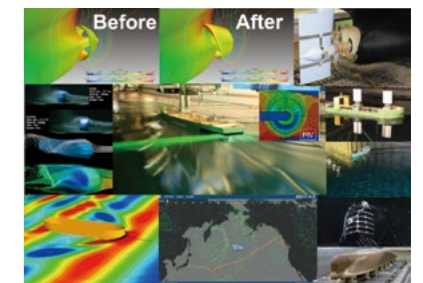
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Mitsui E&S Shipbuilding Co., Ltd.
Fleet Monitor & Fleet Transfer

In 2006, we have launched portal site comprehensive information service for ship operation and started the service. As a core of our service, we developed in-house "Fleet Monitor". We install small industrial PC on board for "Fleet Monitor".

It collects data from VDR and Data Logger and send data to portal site automatically via the ship's mail system. Customers can monitor data of their vessel data on portal site.

In 2017, we also developed "Fleet Transfer" as more enhanced model and began to provide the service.

1) Extend the number of measure points
   15,000 measure points / at 1 sec interval
2) Enhance data send function
   Variable number of measure points and sending interval
3) Add edge processing function
   processing on board such as mean, maximum/minimum value and deviation
   send to shore only result of the process

Both of the services have been installed on more than 380 vessels. We are developing additional function to meet the demands of customers.
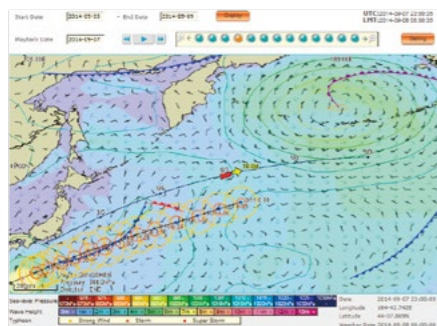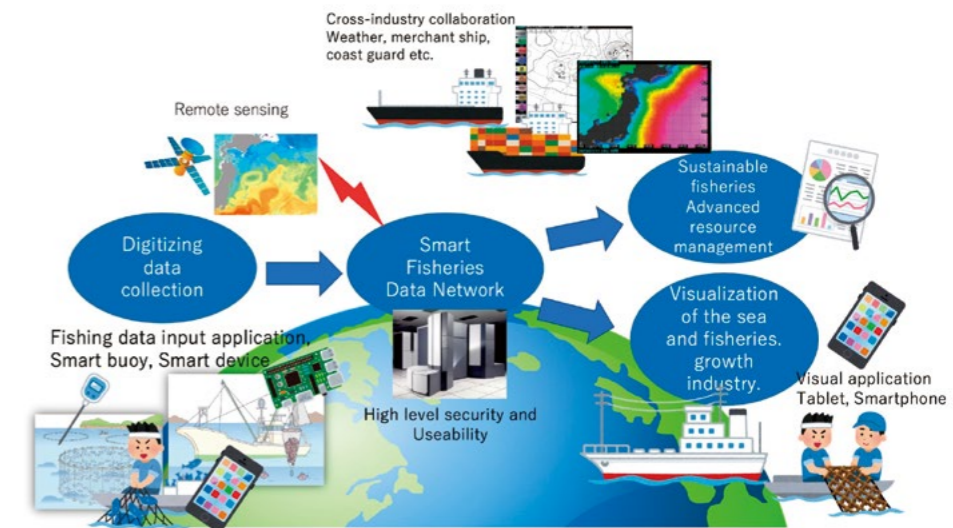
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MITSUI E&S
Mitsui E&S Shipbuilding Co., Ltd.

Japan Fisheries Information Service Center
Smart fisheries and cross-industry collaboration

Smart fisheries is a new trend in the Japanese fisheries. The points are collection of digital data necessary for fishing and the linkage with various data relating fisheries and marine environment. An example of data linkage is the use of merchant ship data. Merchant ships collect marine data such as water temperature, and this data will be used in fisheries field.

Cross-industrial collaboration is expected to progress further.

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Marineworks Co., Ltd.
MyFleet Solution, Smart Fleet Management

The shipping industry is making various attempts to effectively respond to digital transformation and decarbonization.

'MyFleet solution model' powered by marineworks secures the business competitiveness of the shipping companies.

Smart Fleet Management solution of marineworks consists of an optimal ship management solution based on a ShipDC compatible structure and a smart ship data platform that meets the standards of cyber security.

In the Korean market, innovative changes are taking place in ship management solutions to comply with the guidelines of TMSA and RightShip based on the state-of-the-art ICT environment.

Our solution's development productivity and operation efficiency are 30% or more higher than existing solutions.

So it can maximize the utilization of IT resources and provide a flexible user environment.

In addition, flexible interface with ERP, HR, operation system as well as smart ship platform is harmonized. And real-time data synchronization between ship and shore is possible through an optimized data transmission system based on satellite communication.

If the existing IT system is outdated or does not fit the digital transformation strategy, marineworks proposes the core digital solution.

<References>

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Sumisho Corvus Energy Co., Ltd.
Li-ion Battery Energy Storage System for Maritime Industry manufactured by Corvus Energy

The lithium-ion battery system of Corvus Energy of Norway is a provider of ESS (Energy Storage System) developed specifically for the maritime industry. The company boasts the largest market share in the industry by its proven technical capabilities and safety standard. The ESS ensures hardware safety through single cell isolated thermal runaway insulation, waterproofing and vibration resistance of the enclosure, and software safety through monitoring system, thus satisfying the strict standards required by classification societies.

Sumisho Corvus Energy is a joint venture established in 2021 between Sumitomo Corporation and Corvus Energy.

The company also has an engineer stationed in Japan to promote sales of Corvus ESS, provide technical support for delivery, and provide after-sales service after delivery. Sumisho Corvus Energy will contribute to the low-carbon and decarbonization of the maritime industry through the electrification and hybridization of ships and port facilities.

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Navarino
Quazar, IT-as-a-service from Navarino

Quazar is Navarino's easy to deploy and cost-effective way to acquire, install and manage a vessel's IT infrastructure. It includes all onboard hardware and software combined with a 24/7 personal Navarino IT Manager, backed up by a dedicated team of IT specialists. All for one fixed monthly fee per vessel.

Using an 'IT-as-a-service' concept, Quazar removes the CAPEX for hardware or software acquisition, replacing it with hardware leasing, software licensing, and support fees that are all included in one monthly fee. Quazar also allows for the implementation of advanced security policies that safeguard

all digital infrastructure and devices; making systems more robust against cyber-attacks while complying with regulations. In addition, a personal Navarino IT manager assigned per fleet offers an expert, personalized understanding of a vessel's IT infrastructure, and implements any service or support request that the ship operator requires.

To provide Quazar, we have partnered with the world's biggest technology providers including Microsoft, Dell, ConnectWise, Canon, and more. Thanks to Navarino's economies of scale, we are able to offer ship operators these technology providers' solutions at much lower cost than if they were purchased alone.

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TRIPLE CROWNS CO.,LTD.
You can always count on us for your system development needs!

Since its establishment in 2016, TripleCrowns has been engaged in contract system development with consistent development phases from requirements definition to testing. In addition to developing web-based systems, we are excellent at developing contents using Unity, such as interactive content for exhibitions and showrooms, and application development for smart glasses and XR devices. We also have many achievements in system development for device linkage such as LeapMotion, haptics, and NFC.

We entered the maritime industry four years ago, and as a member of the Japan Ship Machinery and Equipment

Association and the IoS-OP Consortium, we have worked on remote monitoring of marine equipment, real-time status display systems, and simulator development. If you are considering transforming your products into digital native, such as equipment monitoring and management, cloud migration, crew support AR, VR applications, etc., please contact us.

Experienced engineers will help you to realize your ideas and provide a guidance to lead your company to a successful digital transformation (DX).

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Guide to Joining the IoS-OP Consortium

To participate in the IoS-OP Consortium, you must join Ship Data Center.

We are seeking members who support the purpose of our activities and wish to take part in activities together with Ship Data Center.

Be sure to read the Ship Data Center member terms and conditions when applying.

1. Ship Data Center membership qualifications

Membership is subject to business use of IoS-OP and is limited to companies, corporations, organizations, and groups that support the purpose of the company's activities who can actively participate in these activities and observe the Ship Data Center member terms and conditions and the IoS-OP Terms of Service (provided after joining) established by the company.

2. Membership classifications and fees

Ship Data Center members are primarily classified by sales as follows.

1) **Gold members**   : companies with group consolidated sales of 100B JPY or more
(annual membership fee: 900,000 JPY)

2) **Silver members**   : ompanies with group consolidated sales of 10B JPY or more and less than 100B JPY
(annual membership fee: 600,000 JPY)

3) **Bronze members** : companies with group consolidated sales of less than 10B JPY
(annual membership fee: 300,000 JPY)

4) **Green members**   : government institutions, local municipal organizations, universities
and other educational and research institutions
(annual membership fee: 150,000 JPY)

In addition to the annual membership fee, an initiation fee is required during the first fiscal year (two years of the annual membership fee). (Taxes are not included in the fees)

Moreover, the membership term is from January to December of each year.

IoS-OP Consortium