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## Special Feature 2 | Digital Innovation for Sustainable Development

### Innovation 2

## Improving Fuel Efficiency in Shipping through the Use of Navigational Data

Fine-Tuning Estimates of Vessel Performance with  
High-Dimensional Statistical Analysis Technology  
Using Fujitsu's "Zinrai" AI Technology

Annual CO<sub>2</sub> emissions associated with marine transportation are about 900 million tons, or about 3% of global CO<sub>2</sub> emissions\*. The marine transportation industry is being asked to improve fuel efficiency in order to reduce CO<sub>2</sub> emissions. Fujitsu has developed technology for applying and analyzing ships' operational data and precisely estimating fuel efficiency in actual sea conditions. Through this, we will contribute to increased fuel efficiency in ships.

\* Values for FY 2012.



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## Special Feature 2 | Digital Innovation for Sustainable Development

### Innovation2 Improving Fuel Efficiency in Shipping through the Use of Navigational Data

## Fine-tuning estimates of vessel performance with highdimensional statistical analysis technology using Fujitsu's "Zinrai" AI technology

In recent years, the environmental impacts, economy, and safety of marine transport have become major issues for the shipping industry. Annual CO<sub>2</sub> emissions associated with marine transportation are about 900 million tons, or about 3% of global CO<sub>2</sub> emissions. In 2013, global CO<sub>2</sub> emissions regulations for new shipbuilding were adopted. Moreover, the annual cost of fuel is hundreds of billions of yen, making the reduction of fuel consumption an important issue.

To overcome such issues, movements have begun in the marine transportation industry to collect, store, and analyze navigational data under stormy weather for use in planning safe and economical ships and in navigating ships in rough seas. However, estimation of ship performance in the past has relied on physics model simulations and water tank experiments using models, techniques that are unable to take into account the complex interactions of ship status, wind, waves, currents, and so on in actual seas, thus significantly

compounding prediction errors.

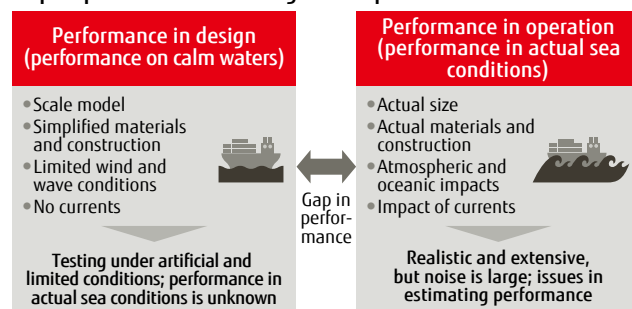
In response, Fujitsu Laboratories Ltd. has applied and analyzed big data from actual sea conditions and has developed technology that precisely estimates fuel efficiency, speed, and other ship performance factors with an error of 5% or less. The technology uses proprietary high-dimensional analytical technology based on Fujitsu's "Zinrai" AI technology to analyze and learn from meteorological and hydrographical sensor data, ship engine log data, ship speed and location data, and other big data collected during actual passage, in order to estimate ship performance.

By incorporating the research results into the Weather Routing Simulation of Tokyo University of Marine Science and Technology and performing evaluation, the technology

confirmed that fuel efficiency improvement of about 5% compared with shortest-route passage is possible. The technology has enabled the accurate prediction of actual ship performance in actual sea conditions, and will enable significant fuel efficiency improvements that can be fed back into ship performance evaluations and design and can be applied to ship navigation.

We plan to further improve the precision of predictions through joint research with Tokyo University of Marine Science and Technology. We will further carry out demonstrations applying the technology to diverse routes and vessel types, and aim to offer services through Fujitsu's location information cloud service, FUJITSU Intelligent Society Solution SPATIOWL, in fiscal 2016.

### Gap in performance in design and operation



### High-precision Estimate of Vessel Performance in Actual Sea Conditions

