Monohakobi Technology Institute

NYK GROUP

Sea Asia 2019 in Singapore
FLEET PERFORMANCE OF THE FUTURE

Digitalization in Fleet Management

10th April 2019

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MTI (NYK Group)

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Outline

1. 7 technical challenge areas
2. Digitalization in Fleet Management

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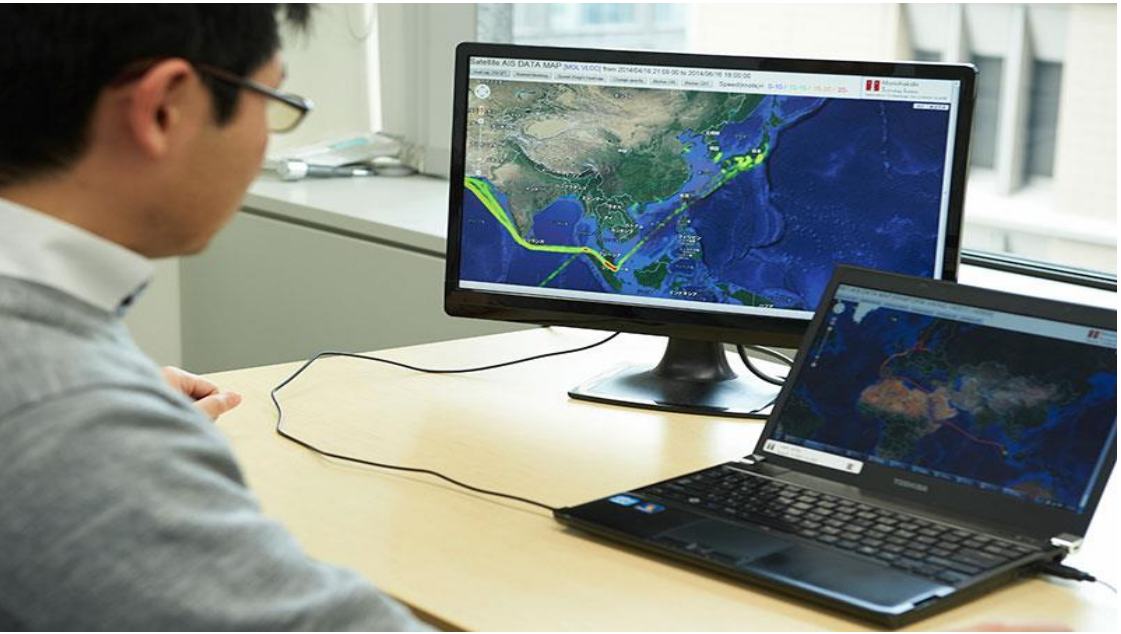
1. Big data analytics

Solve real business issues with big data, domain knowledge & data analytics



Examples of Big data in shipping

Voyage data
- Automatically collected data (IoT)
- Noon report

Machinery data
- Automatically collected data (IoT)
- Manual report data
- Maintenance data / trouble data

AIS data
- Satellite AIS / shore AIS (IoT)

Weather data
- Forecast / past records
- Anemometer / wave measurement (IoT)

Business data
- Commercial data
- Market data

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2. Digital Twin

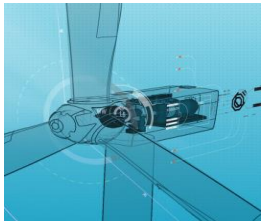
Capture real world by IoT, compute & simulate with vast computing power in digital, and solve & optimize real world problems

Physical (Product, Plant…)

IoT data

Problem solving
Optimization

Cyber (Engineering model, simulation)



Reference)
1. http://www.gereports.com/post/119300678660/wind-in-the-cloud-how-the-digital-wind-farm-will/
2. Michael Grieves, Virtually Perfect: Driving Innovative and Lean Products through Product Lifecycle Management (English Edition), 2012

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3. Prognostics & Health Monitoring (PHM)

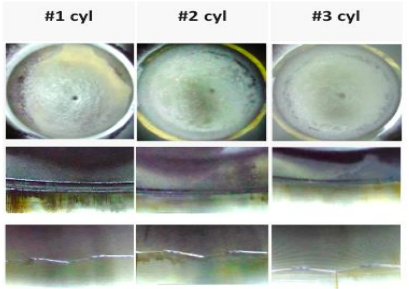
Organizational and inter-organizational learning by using data and computing technologies to improve the level of operation safety

Objectives

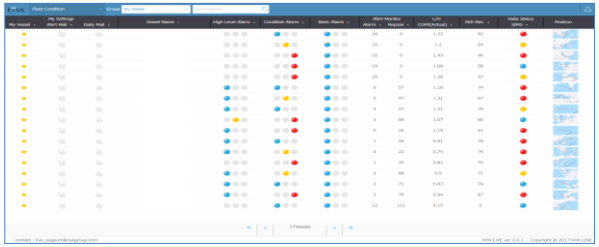
- Prevent unpredicted downtime
- Reduce maintenance cost

Measures

- SCADA data analysis
- Condition monitoring (image, vibration, AE and etc.)
- Anomaly detection
- Machine learning



Condition monitoring by using 360 camera



Fleet condition monitoring system

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4. Cyber Security & Cyber Resilient Ship

Cyber risk management need to be implemented. Protection of Industry Control System is crucial.

The Guidelines on Cyber Security onboard Ships - Version 3, BIMCO – Nov 2018

Source) BIMCO
https://www.bimco.org/products/publications/free/cyber-security

Cyber security guidelines in shipping

- **IMO, MSC (98)** – Cyber risk management onboard ships should be included in SMS as of 1 Jan 2021 (Jun 2017)
- **BIMCO** – the guidelines on cyber security onboard ships – version 3 (Nov 2018)
- **ABS, DNV-GL, LR, BV, NK etc.** – Guidelines and notations of cyber security onboard ships (2016)
- **IEC 61162-460** – Safety and security standards for navigation and radio communication equipment
- **IACS** Maritime Cyber System Recommendations (MCSR)

Cyber security guidelines

- **NIST Framework and 800-53** – computer security policies, procedures and guidelines
- **ISO 27001/2** – ISMS: Information Security Management System

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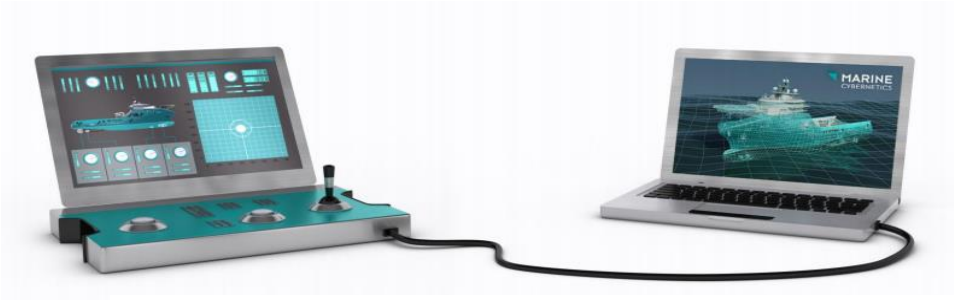
5. Software Quality & Reliability

Highly automated system requires more & more reliability of software. To develop, design and approve efficiently, simulation-based test environment become more indispensable.



...arine Cybernetics Advisory

https://www.dnvgl.com/services/hil-testing-concept-explanation--83385

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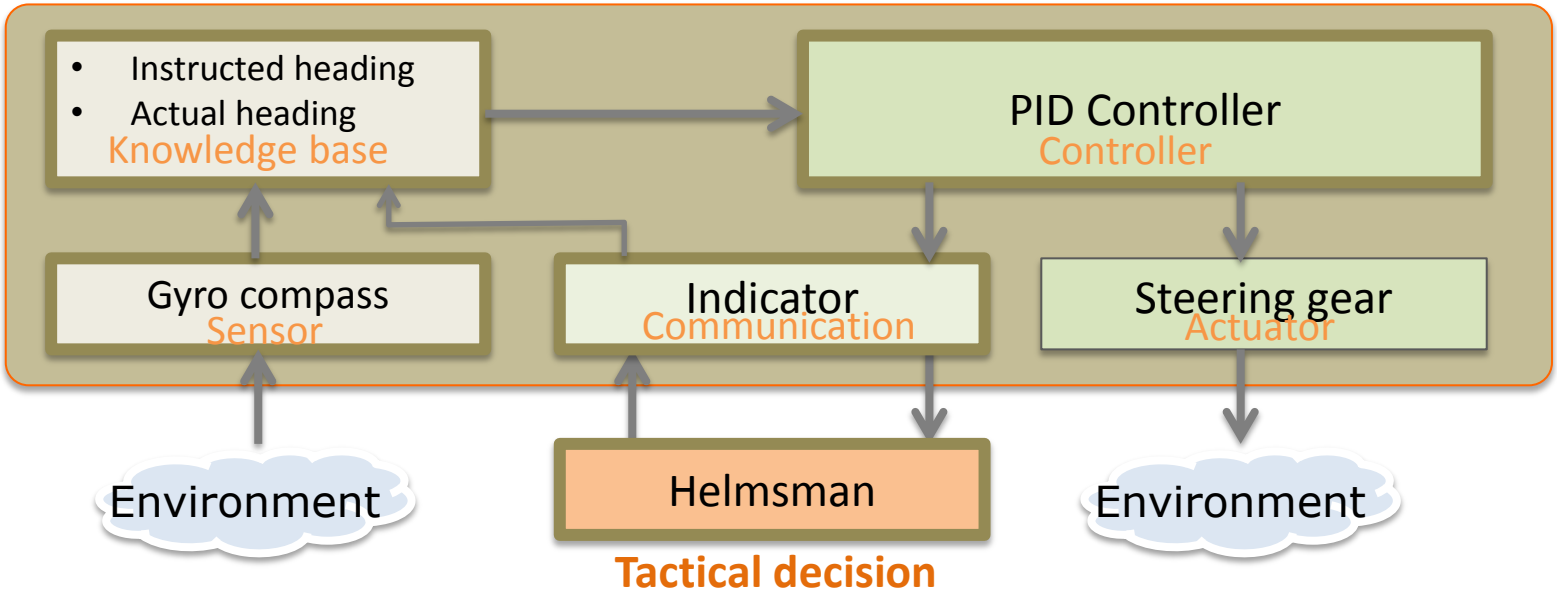
6. AI & Control (Cybernetics)

Improve the level of automation. But, limit scopes to solvable problems.

Example: Autopilot goal: maintain instructed heading



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7. Design & System Integration

Autonomous technologies complement human operations.

Objectives

- Prevent collisions
- Reduce workloads of crews

Measures

- Situation awareness
- Support from shore
- Highly automated / autonomous

Challenges

- Reliability of total system
- PPTO (People, Process, Technology & Organization)
- Regulation
- Education

Reference ULSTEIN BRIDGE CONCEPT

Outline

1. 7 technical challenge areas
2. **Digitalization in Fleet Management**

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Value creating digitalization in fleet management

- Analogy from mining industry -

1. **Deep understanding of operating fleet and market**
2. **Optimized logistics and operations**
3. **Anticipation of failures**

Better decisions

Continuous learning ↑

↓ Continuous Improvement

Pursuing total optimization of operation and ship design

4. **Incremental automation of ship functions**

5. **Monitoring of fleet performance and improvement**

Safer, more consistent operations

Reference) McKinsey Company, How digital innovation can improve mining productivity, 2015
https://www.mckinsey.com/industries/metals-and-mining/our-insights/how-digital-innovation-can-%20improve-mining-productivity

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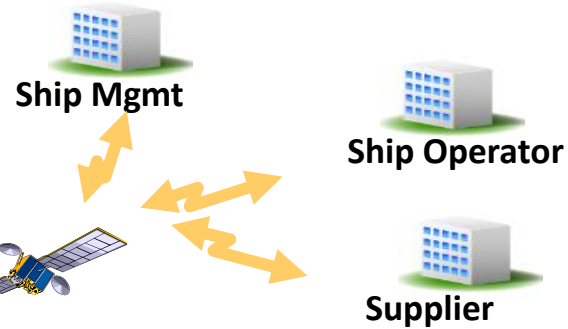
Digitalization in Future Fleet

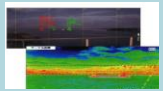
- Connected
- Highly-automated
- Human-centered
- Collaboration across companies



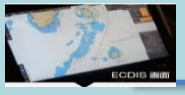
Navigation — Zero incident, Safe & efficient

Engine & power plant — Zero Down Time, Minimum emission

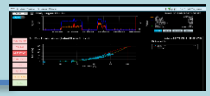
IT

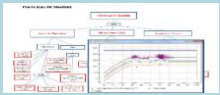

Vessel Performance

Navigation Assistance



Ship Gateway


Engine performance


Condition-based Maintenance

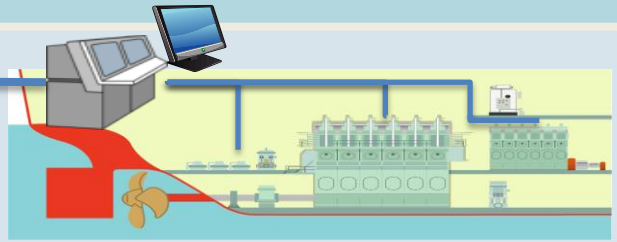
IT

OT

Ship IoT Platform

Highly-Automated Navigation

Continuous improvement of IT/OT functions


Highly-Automated Engine Room

OT

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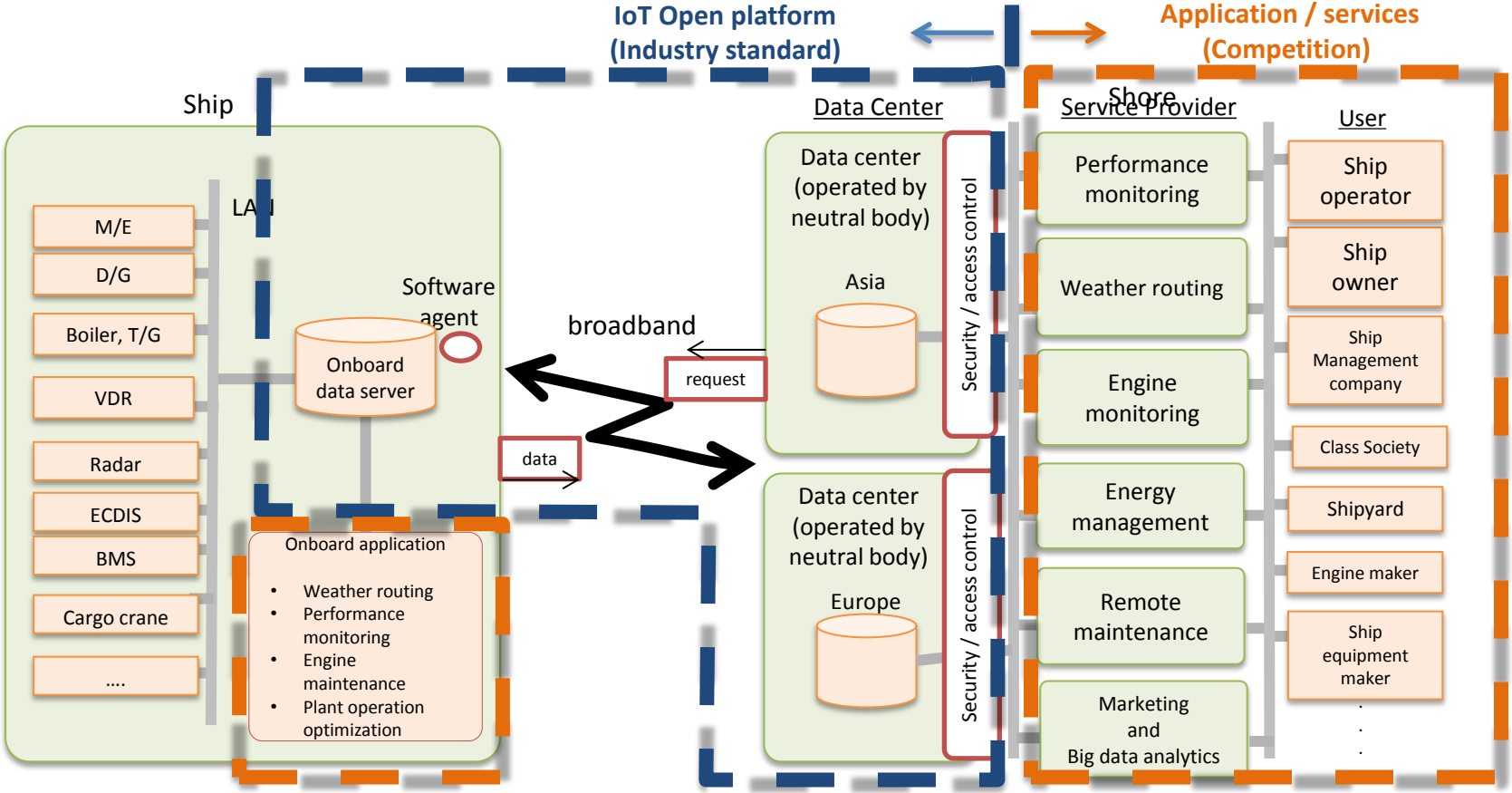
Concept of open platform for marine industry



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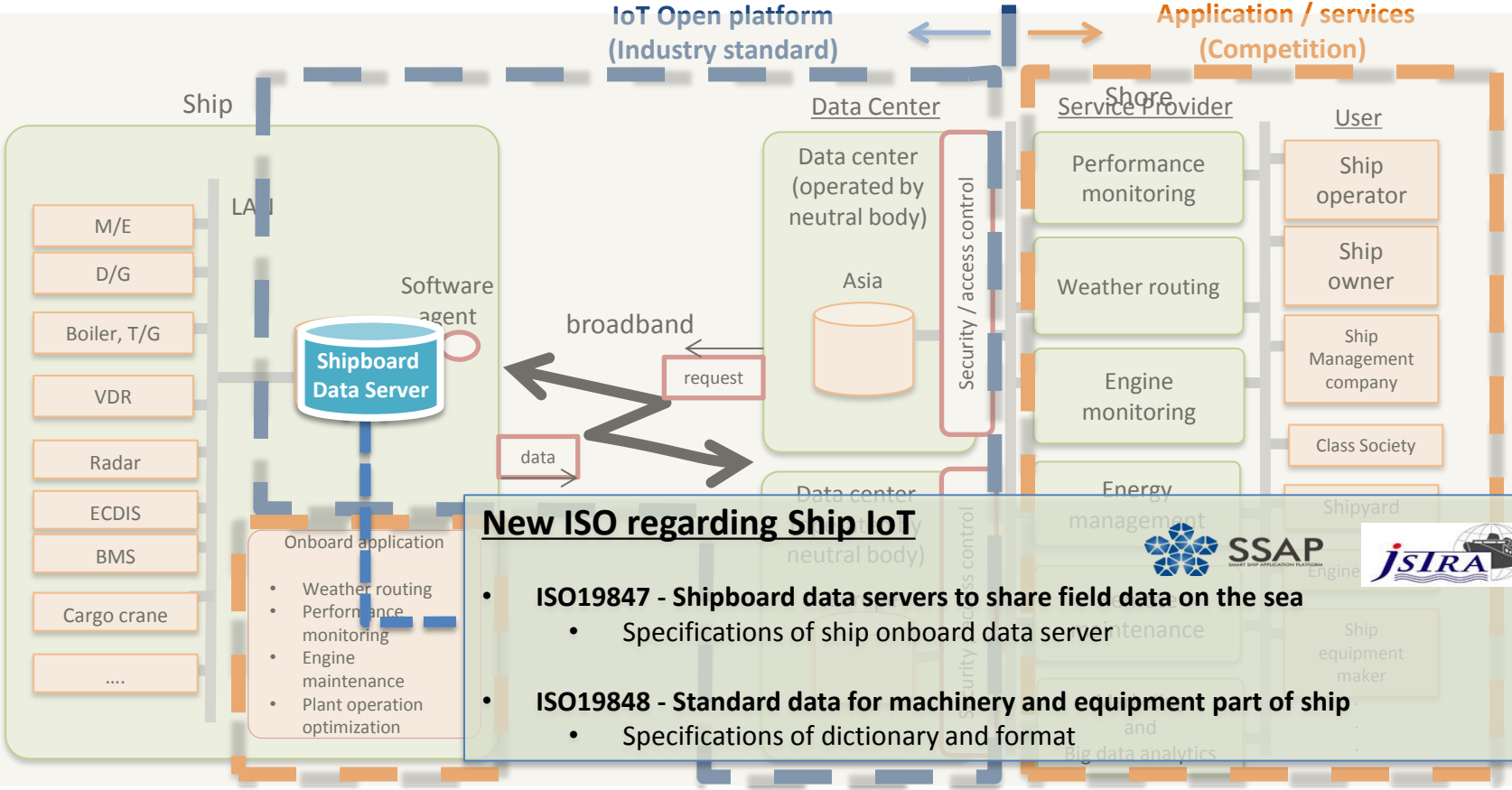
Concept of open platform for marine industry



New ISO regarding Ship IoT

- **ISO19847 - Shipboard data servers to share field data on the sea**
  - Specifications of ship onboard data server
- **ISO19848 - Standard data for machinery and equipment part of ship**
  - Specifications of dictionary and format

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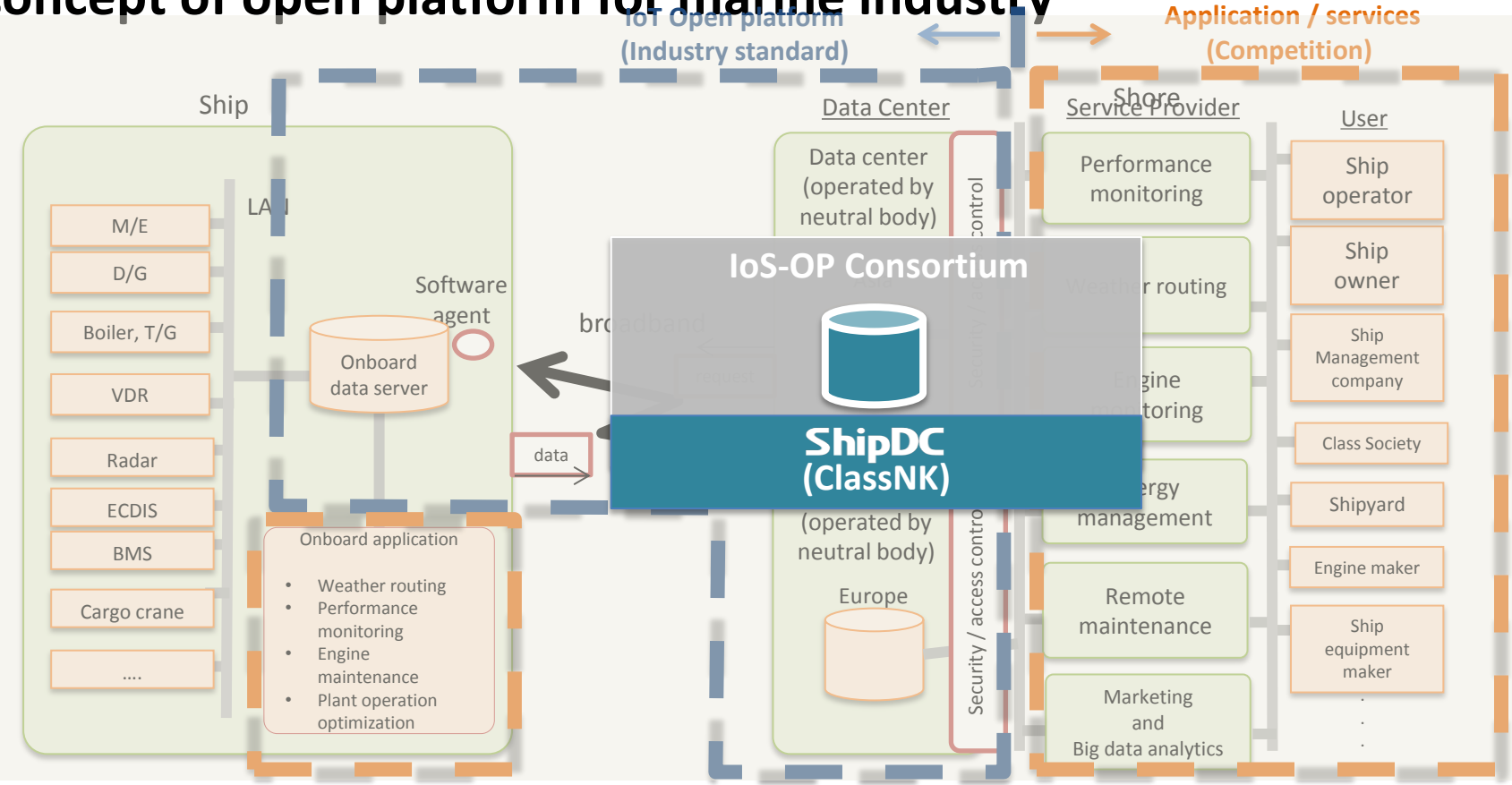
Concept of open platform for marine industry



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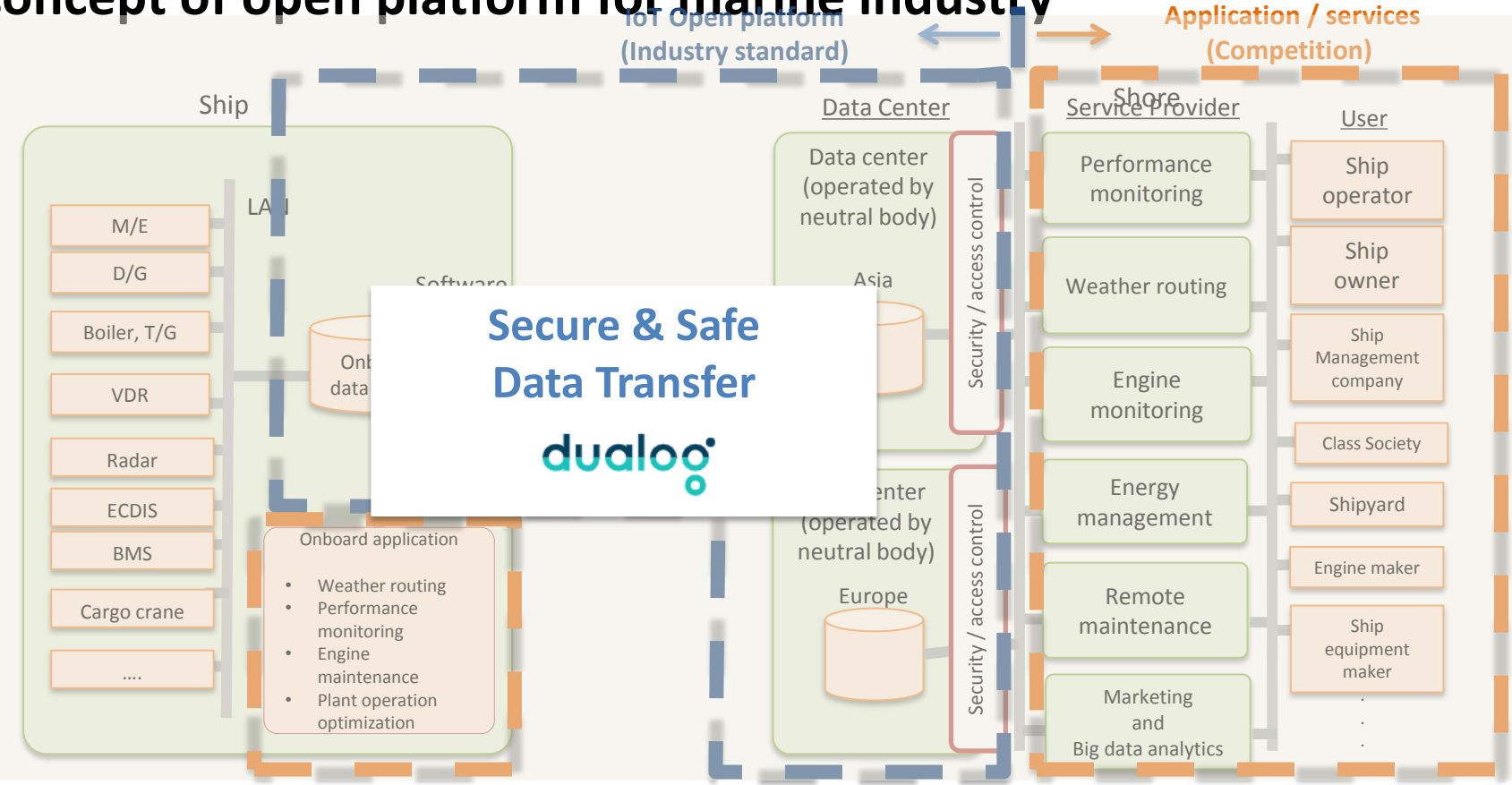

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How to tackle?

Collaboration and standardization is the keys

From NYK/MTI-Dualog-Furuno Workshop #3, @Tokyo 2017

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Thank you very much for your attentions

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