JAPAN JSMEA

Japan Ship Machinery and Equipment Association

Activities of Smart Ship Application Platform 2 Project (SSAP2)

18th September 2017

JUNGO SHIBATA

Member of SSAP2

(Maritime Technology Group , MTI Co. ltd.,)

Outline

1. IoT and Big data
2. SSAP (Smart Ship Application Platform) Project
3. Standardization - ISO DIS 19847/19848
4. Ship data center
5. Roadmap and summary

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1. **IoT and Big data**
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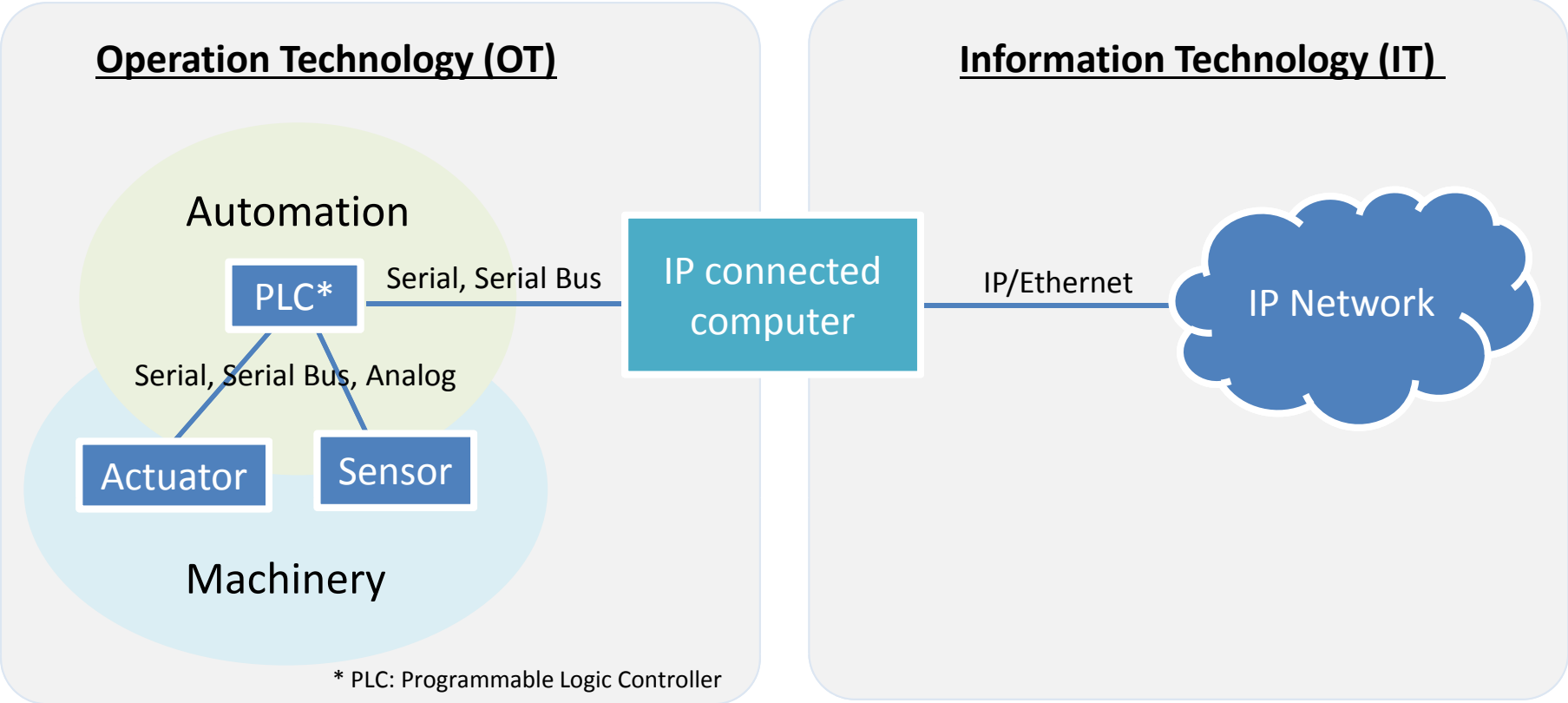
IoT (Internet of Things)



"Operation Technology (OT)" and "Information Technology (IT)" are to be bridged.
The era of "transparency" where user can access field data.

Big data in shipping

For operational efficiency, safety operation and business decision support

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

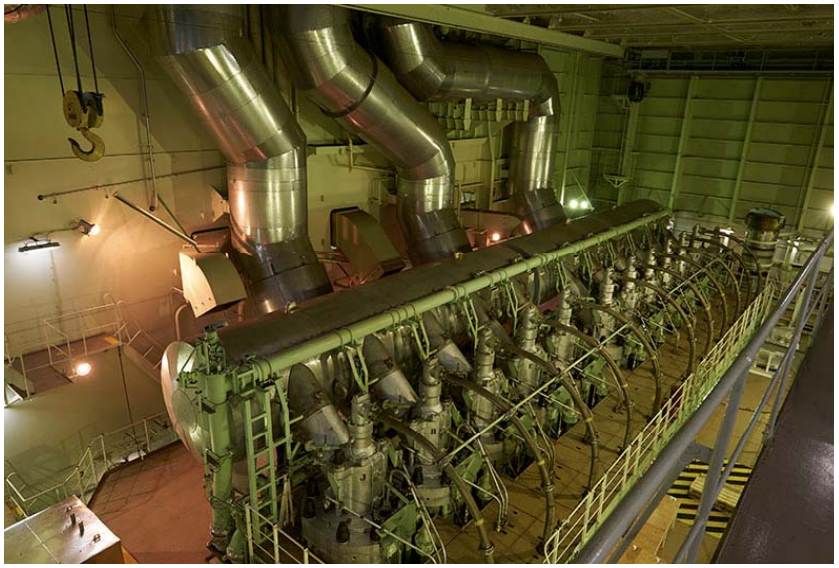
Coming IoT applications in marine industry

Target

- Prevent unpredicted downtime
- Reduce maintenance cost
- Energy efficiency in operation

Measure

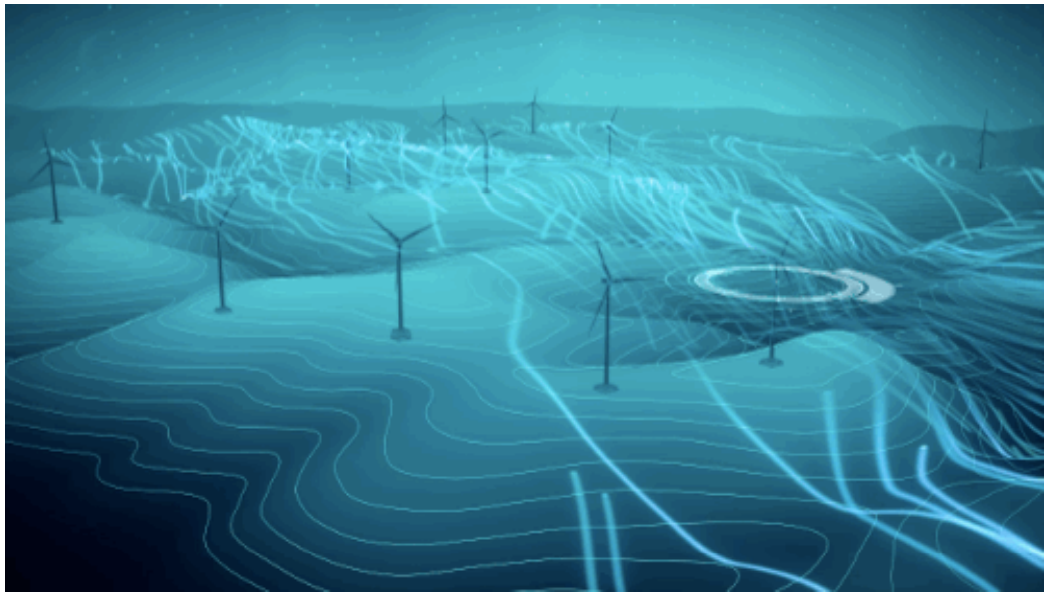
- Condition monitoring
- Big data analysis
- Support service engineer
- Intelligent machinery
  - Self diagnostics



Working style will be changed

Digital Twin

Digital representations of artifacts in computer simulations.
Real and virtual are linked closely by IoT data.

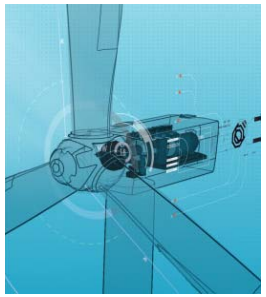


Real
(Product, Plant…)

IoT data →

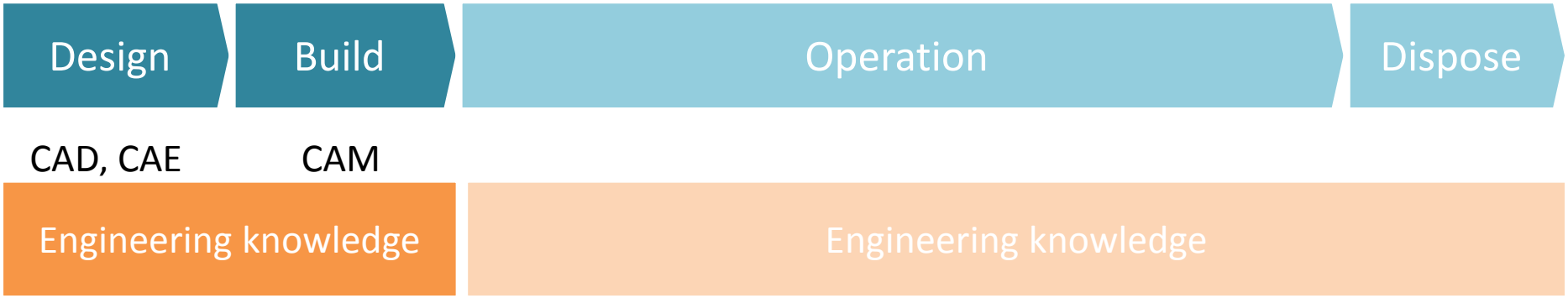
← Information & Service

Virtual
(3D model, simulation)



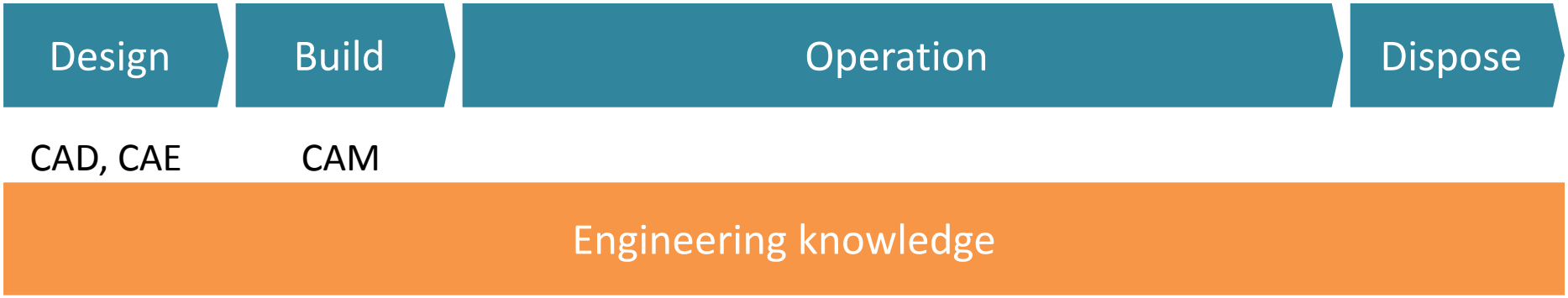
Reference)
1. http://www.gereports.com/post/119300678660/wind-in-the-cloud-how-the-digital-wind-farm-will/
2. Michael Grieves, Virtually Perfect: Driving Innovative and Lean Products through Product Lifecycle Management (English Edition), 2012

Before IoT:
Engineering knowledge, simulations and tools have been used for design and production



- Designers and engineers consider life cycle values of products only at design stage
  - Manufacturability, usability, maintainability, disposability …

Era of IoT:
Engineering knowledge, simulations and tools are now demanded through life cycle of products



- Designers and engineers can access actual products via IoT data
  - New services in operation
  - Feedback to new design
- Engineering knowledge become more available in operation

IoT and Big data applications

Role	Function	Example of IoT and Big data application
Ship owner	**Technical management**	• Safety operation • Condition monitoring & maintenance • Environmental regulation compliance • Hull & propeller cleaning • Retrofit & modification
	New building	• Design optimization
Ship operator	**Operation**	• Energy saving operation • Safe operation • Schedule management
	Fleet planning	• Fleet allocation • Service planning • Chartering
Shipyard	**In-service ship**	• Ship performance analysis
	New building	• Design optimization
Manufacturer	**Maintenance**	• Remote monitoring & diagnosis

Other partners in value chains, such as cargo owners, class societies and insurance companies, have also interests in ship Big data. With appropriate data governance and business rules, IoT data will be widely used.

Outline

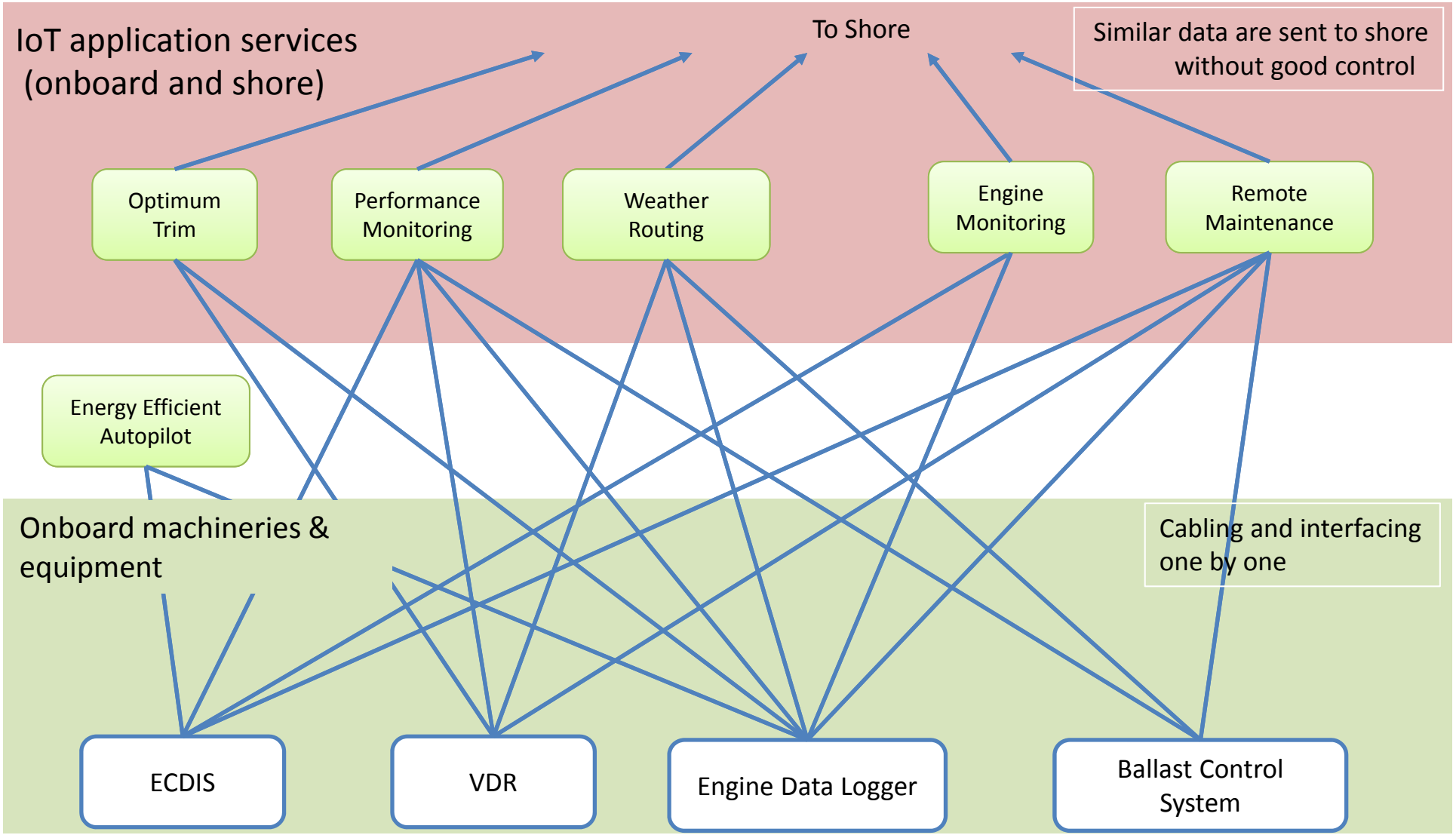
1. IoT and Big data
2. **SSAP (Smart Ship Application Platform) Project**
3. Standardization - ISO DIS 19847/19848
4. Ship data center
5. Roadmap and summary

Smart Ship Application Platform (SSAP) project

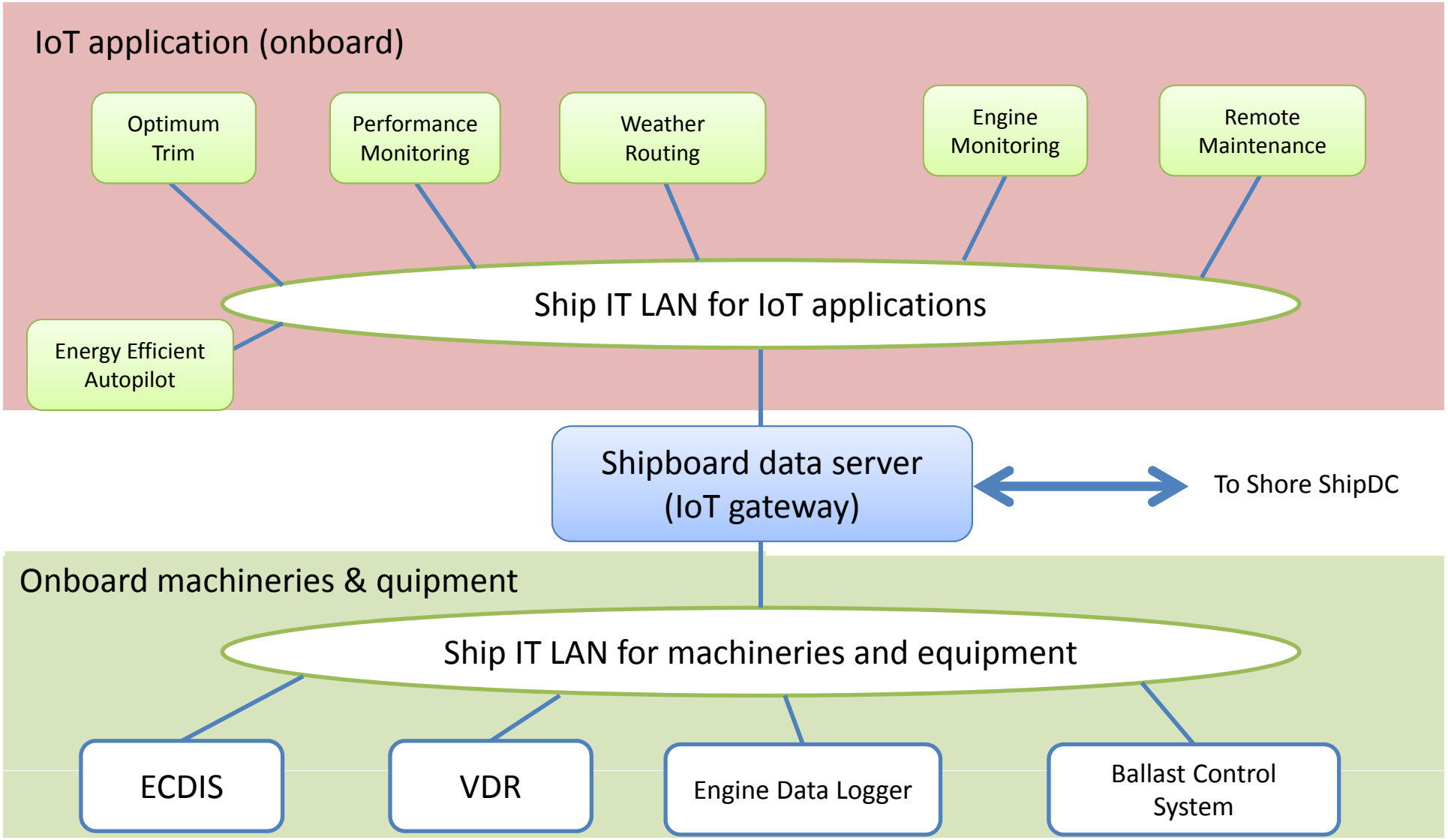
- The concept of “smart ship” is to utilize automation and IoT application services to achieve optimum ship operation in terms of safety and energy efficiency

- The target of Smart Ship Application Platform Project (SSAP1 & SSAP2) is to provide better and controlled accessibility to ship machinery and equipment data for IoT application services onboard and ashore by providing a standardized platform.

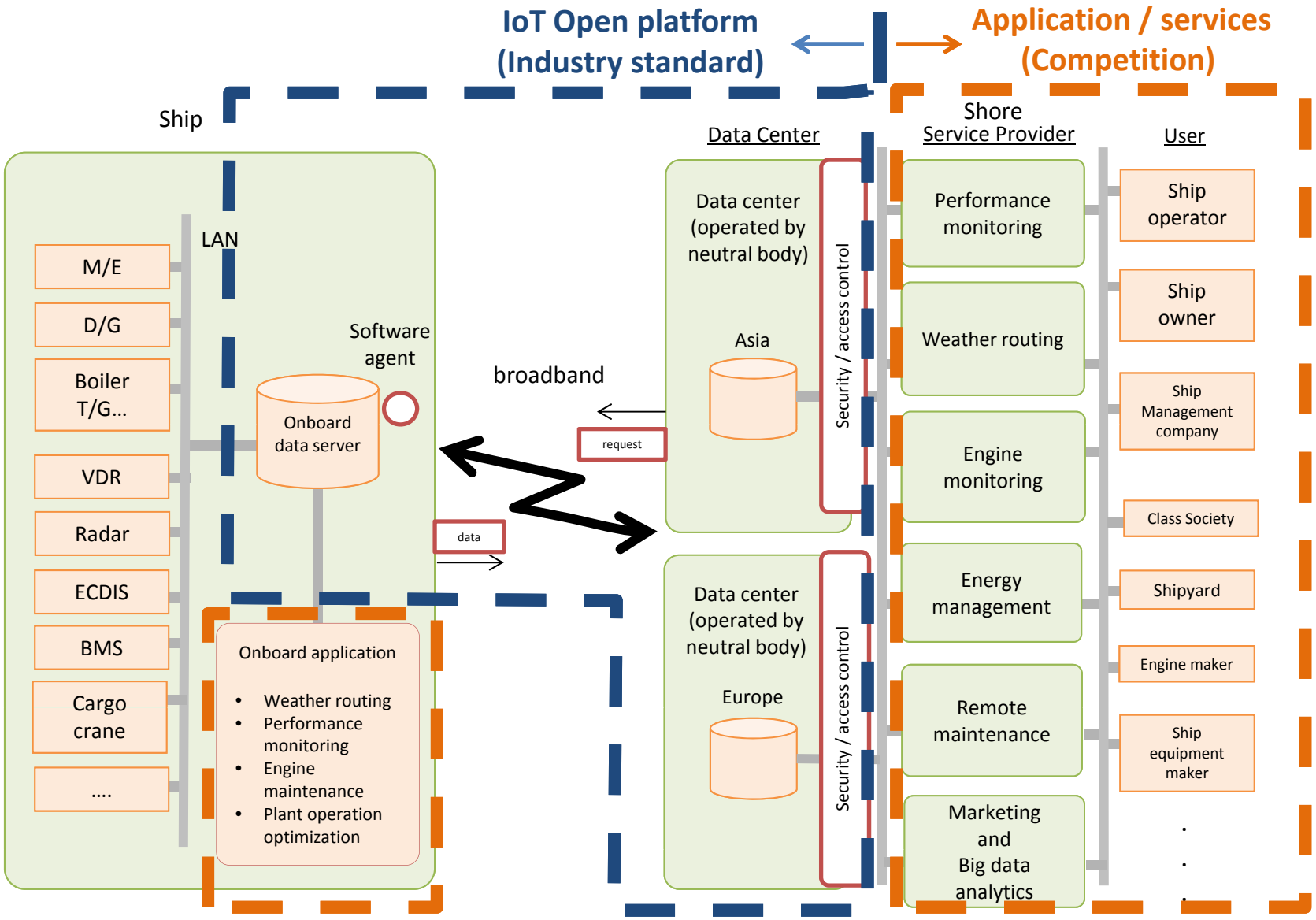
IoT application services (without common platform)



IoT application services (target of SSAP1&2)



Open platform of maritime industry for sharing data



What are the benefits of such platform ?

- ✓ Application providers can easily provide data analysis services to ship owners, who accumulate vast amount of ship operation data.
- ✓ Ship owners investment cost (CAPEX and OPEX) for onboard applications and shore services will be reduced by sharing data collecting platform
- ✓ Shipyards and equipment manufactures can access their product operation data through life-cycle and can provide new services
- ✓ Ship owners can manage/control data transmission between ship and shore
- ✓ Standardized format and protocol will enhance more IoT application services development

SSAP1 Project (Dec 2012 – Mar 2015)

- Participants
  - Members: 27 organizations
  - Observers: 9 organizations

- Joint Industry Project (JIP) supported by JSMEA + Class NK

- Achievements
  - Design specification of shipboard data server
  - Implementation of shipboard data server and trials on 2 domestic vessels
  - Ship – shore open platform design for ship IoT
  - Proposed 2 ISO NPs (ISO NP19847 / ISO NP19848)

Onboard trials in SSAP1 (2014)

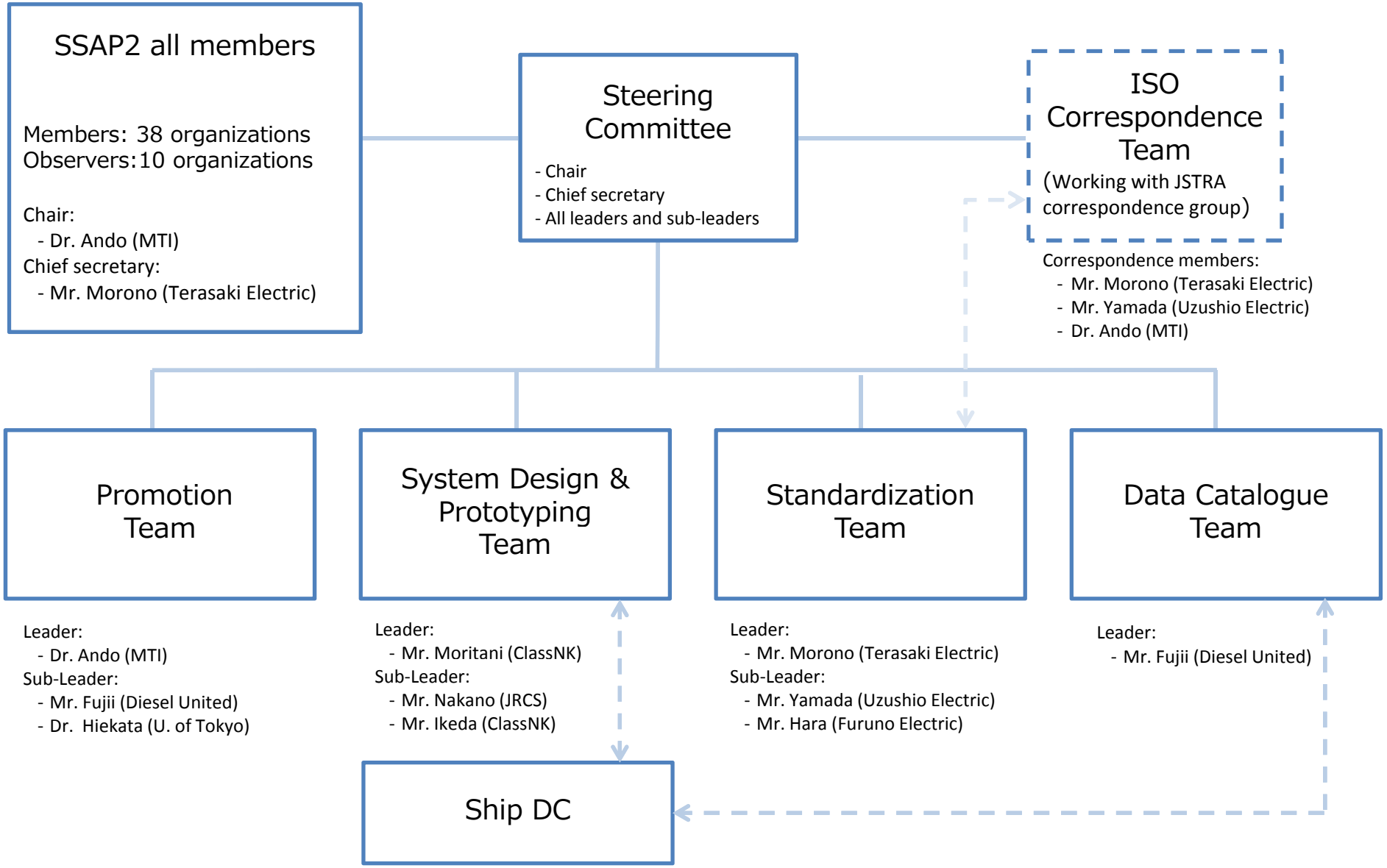
RORO Ferry
SUNFLOWER SHIRETOKO

Crude-Oil Tanker
SHINKYOKUTO MARU

SSAP2 Project
(Smart Ship Application Platform 2 Project)

- Participants
  - 38 members + 10 observers (as of Sep. 2017)
- Schedule
  - Aug. 2015 – Sep. 2018 (revised)
- Action items
  1. Promotion of SSAP2 concept
  2. System design and prototyping of SSAP2
  3. Standardization – ISO DIS19847/DIS19848
  4. Public relations

Organization of SSAP2 Project



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MOL Mitsui O.S.K. Lines

"K" LINE KAWASAKI KISEN KAISHA, LTD.

ClassNK

IINO MARINE SERVICE CO.,LTD.

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JSMEA Japan Ship Machinery and Equipment Association

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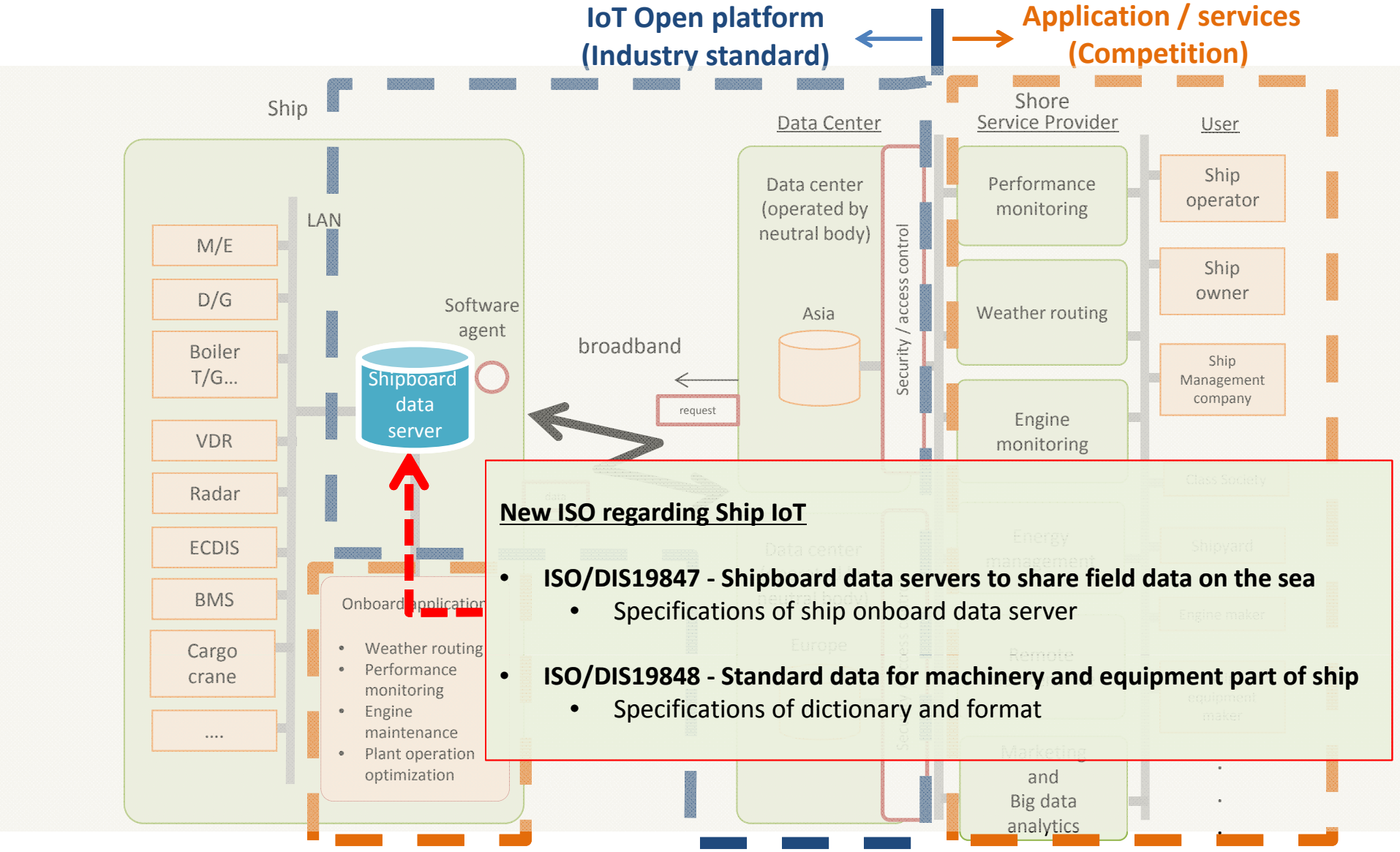
ISO DIS 19847/19848 for Ship IoT



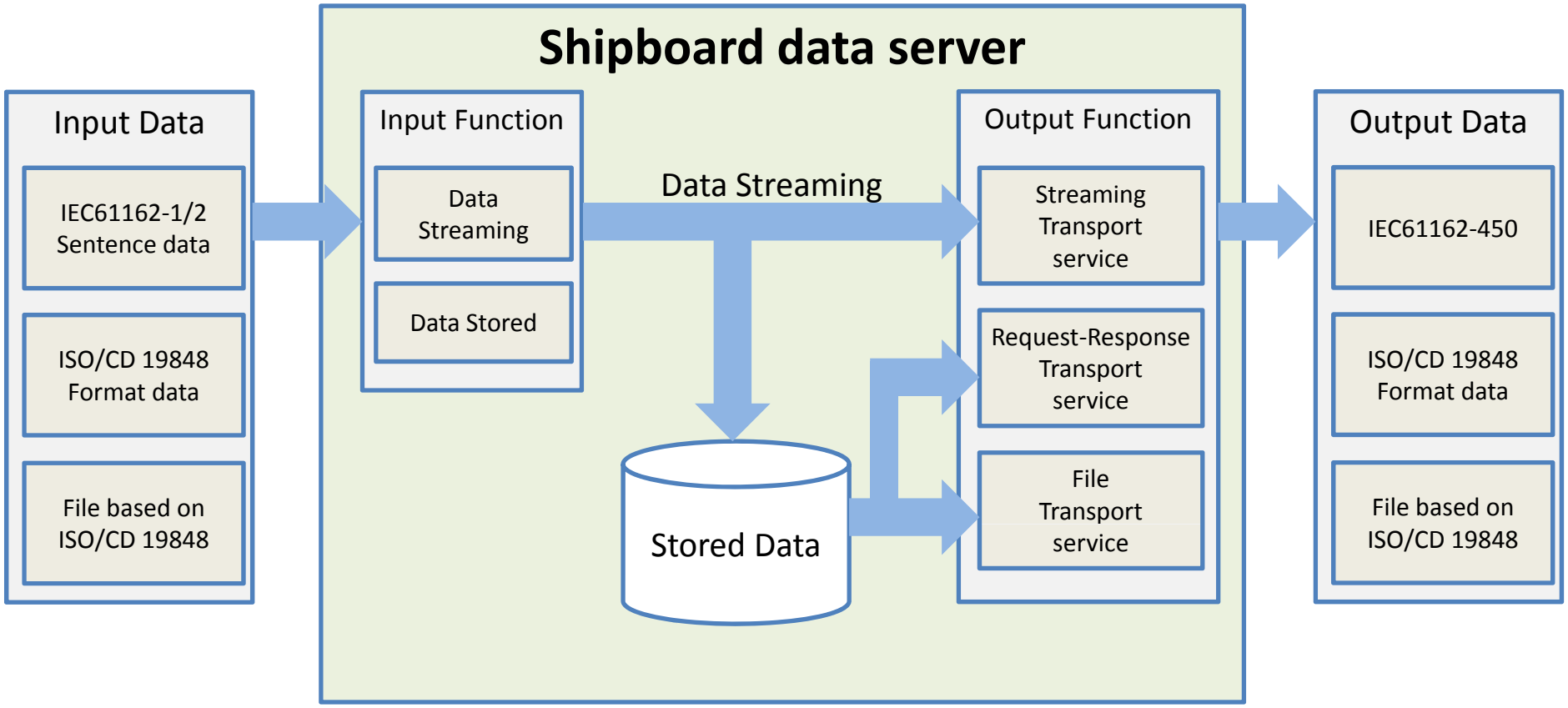
New ISO regarding Ship IoT

- **ISO/DIS19847 - Shipboard data servers to share field data on the sea**
  - Specifications of ship onboard data server
- **ISO/DIS19848 - Standard data for machinery and equipment part of ship**
  - Specifications of dictionary and format

ISO DIS 19847

Shipboard data servers to share field data on the sea

- Requirements for shipboard data servers to collect and share field data



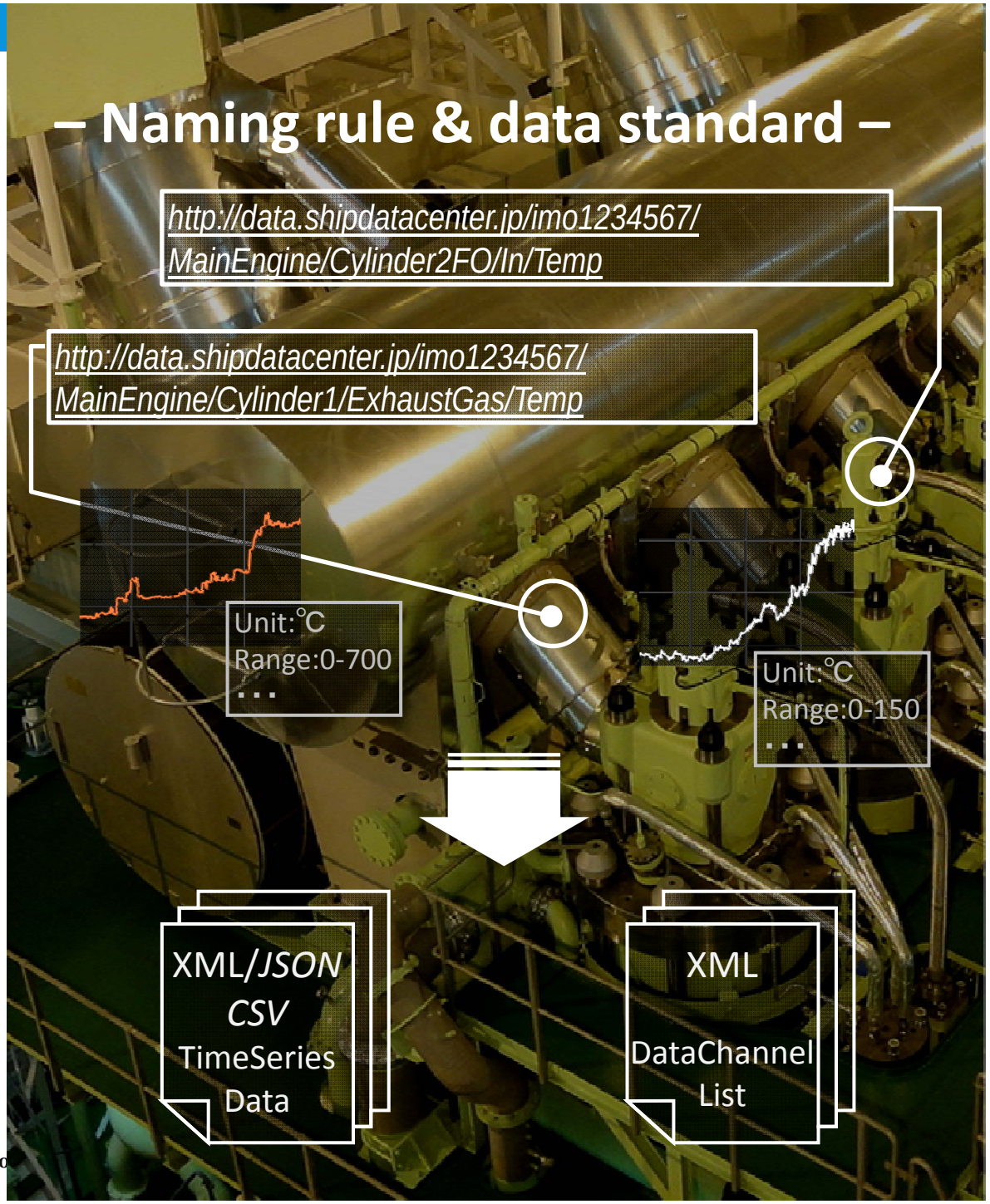
ISO DIS 19848

- ***Standardized ID of sensors, common data model & format***

- **ID of sensors**
  - ***URL*** compliant naming scheme
  - Dictionaries (*informative*)
    - JSMEA
    - DNV-GL

- **Data model**
  - Data channel list (meta data)
  - Time series data (data)

- **Data format**
  - ***XML*** with schema definition
  - *JSON (informative)*
  - *CSV (informative)*



Examples of sensor naming in ISO DIS 19848

Universal ID

http://data.shipdatacenter.jp/imo1234567/MainEngineAirCooler3//CFW/Out/Temp

Naming Entity | Ship ID | Loal ID

Universal ID

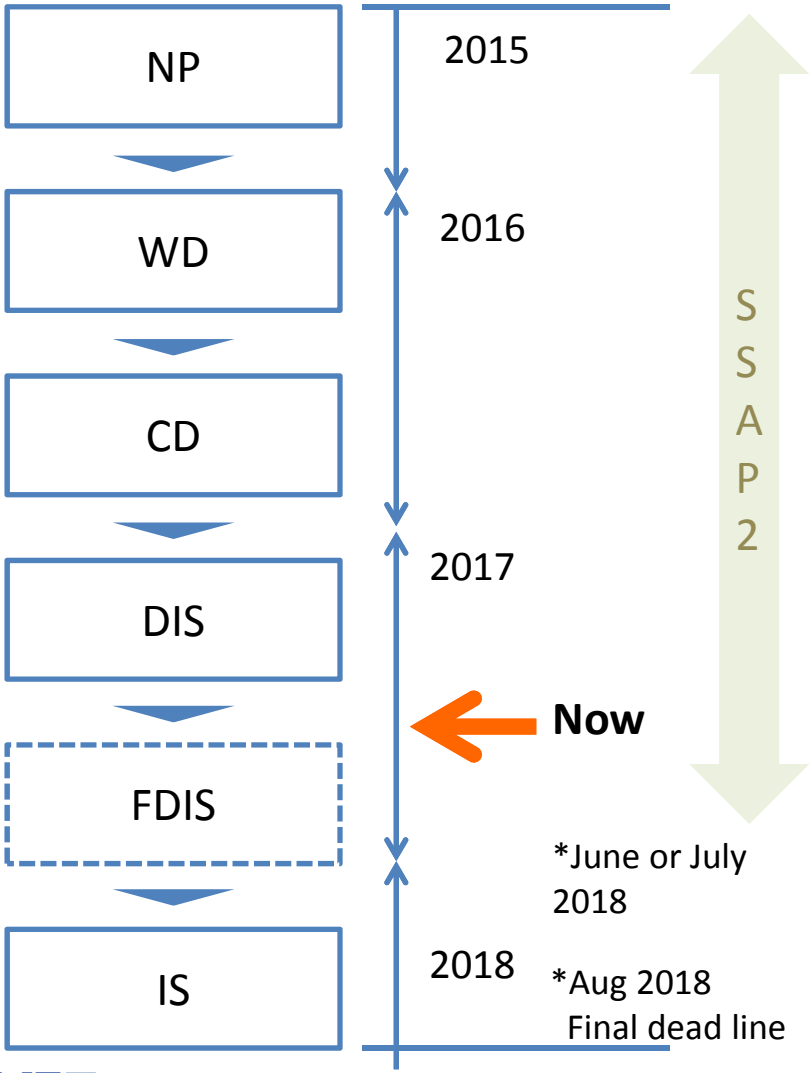
http://data.dnvgl.com/imo1234567/dnvgl-vis/411.1/C101.31+1/ExhGas+t(C)

Naming Entity | Ship ID | Loal ID

Policy of standardization

- Corroborate and harmonize with
  - Existing standards
    - IEC61162-450/460(Digital Interface – Part 450 Multiple taker and multiple listeners – Ethernet interconnection)
    - ISO16425 (Guidelines for the installation of ship communication networks for shipboard equipment and systems)
  - New proposed standards
    - IHO S-100series
    - IEC BAM(Bridge alert management – Operational and performance requirements, methods of testing and required test results)
  - Associated projects / Organization
    - e-Navigation(IALA)
    - SMART-Navigation(Korea)
    - IEC etc.,
  - Cyber security discussions

Process for ISO (ISO 19847, ISO 19848) *



- ISO PWI 19847/19848 were accepted as NP by ISO/TC8/SC6 in Jan. 2016.
- 2 CDs were accepted as CD in Nov.2016 and moved into DIS phase.
- 2 DISs are now in voting (until 20th Sep. 2017)

・NP: New work item Proposal, WD: Working Draft
・CD: Committee Draft, DIS: Draft International Standard
・FDIS: Final Draft International Standard, IS: International Standard

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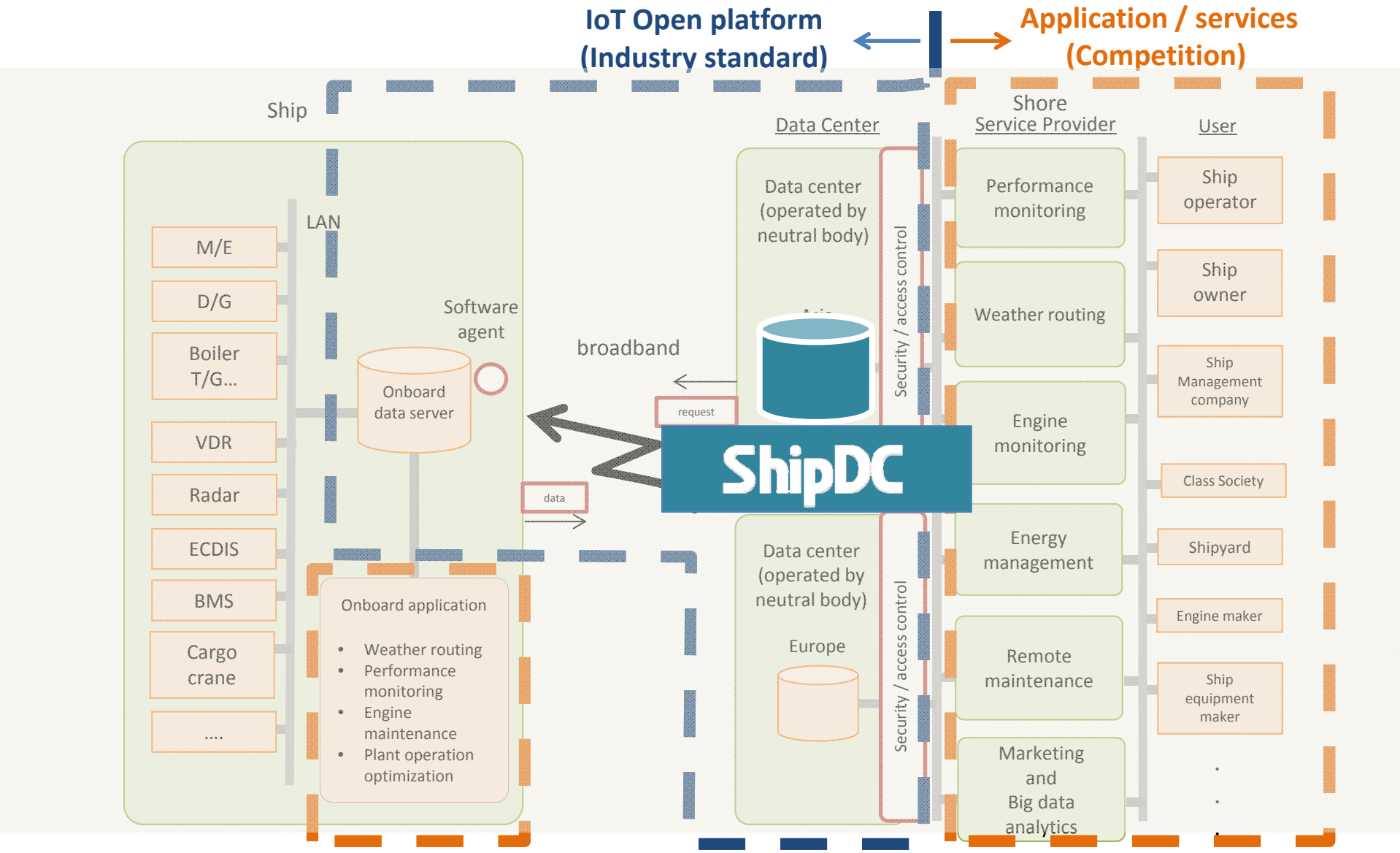
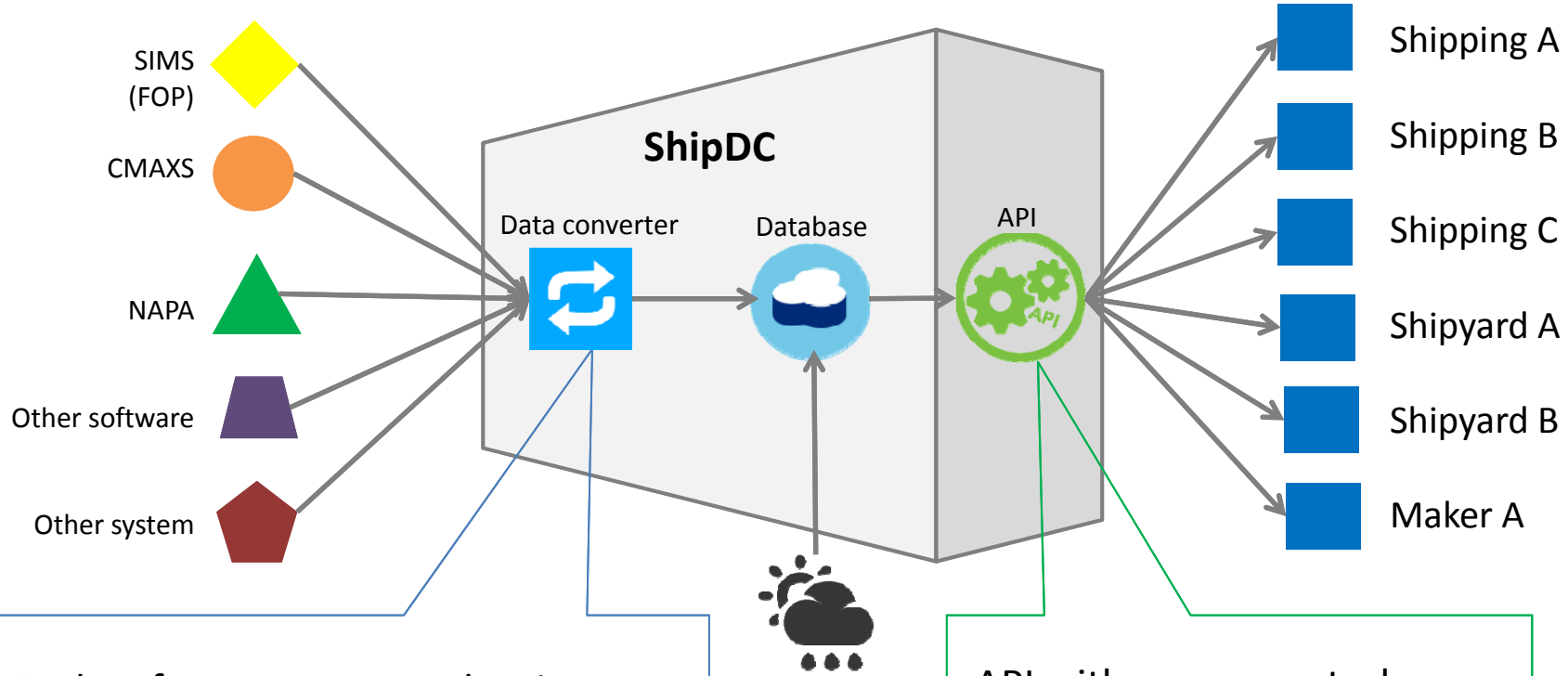


ShipDC – ship data center at shore

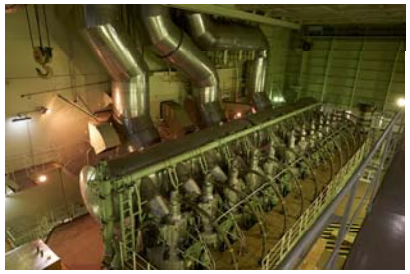
Ship data center provides a platform to access ship IoT data safely, easily and reasonably. With the platform, utilizations of ship IoT data at shore will become much easier and it will enhance development and operation of ship IoT application services.



Each software or system has its specific data format. SDC convert them to the standardized ISO format.

API with access control provides ship IoT data to application services.

Use Case Scenarios of Ship DC



Shipping
- Safety operation
- Vessel performance analysis
- Fleet operation optimization
- Weather routing

Shipyard
- In-service performance analysis of delivered ships
- Feedback to new ship design

Manufacturer
- Remote condition monitoring
- Remote diagnostics
- After service support

Class Society
- Utilization in class inspection

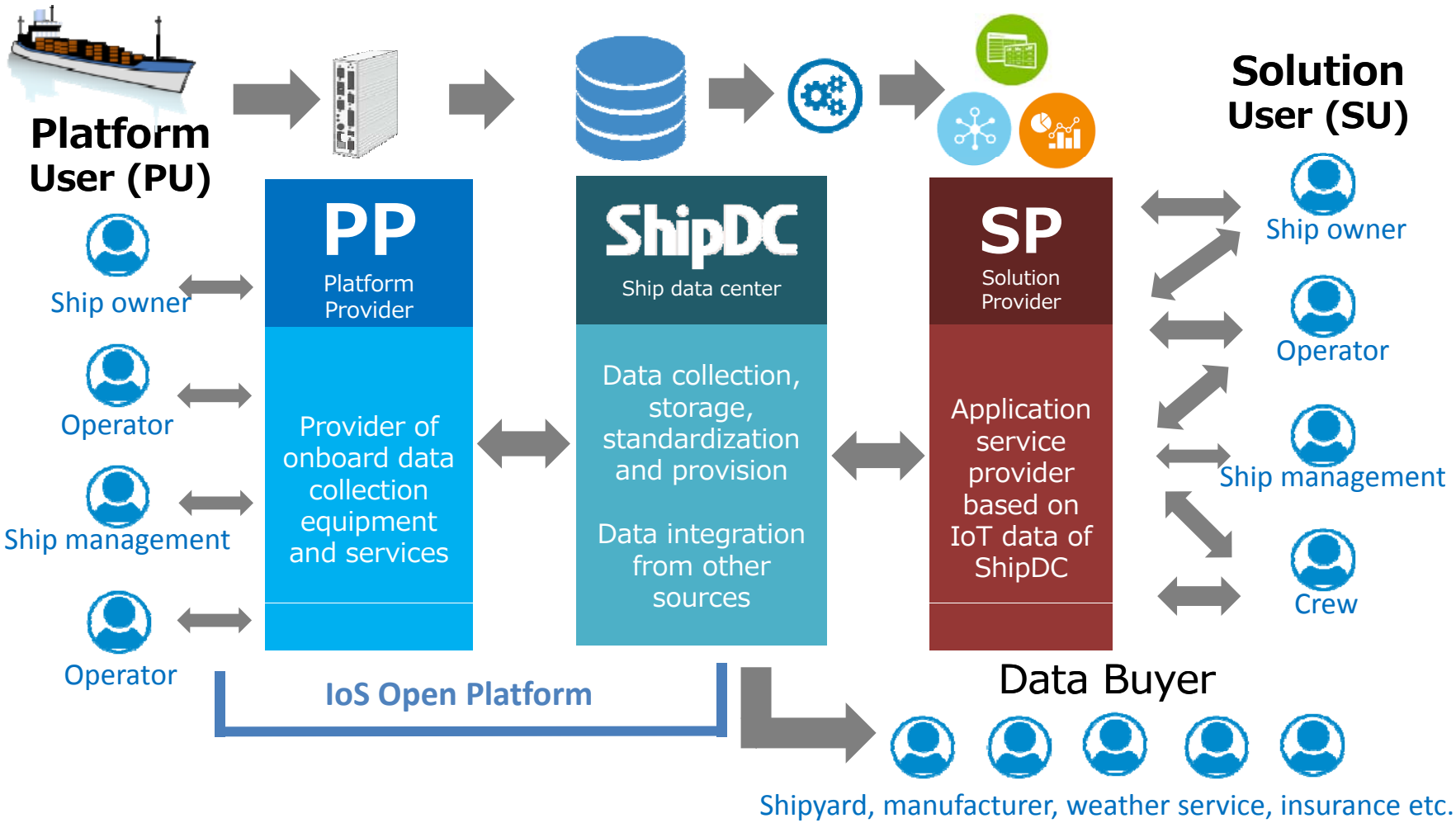
Software vendor
- Application services

Insurance/Bank
- New services

ShipDC

Internet of Ship (IoS) open platform

Roles are defined and each player provides their expertise on the Internet of Ship(IoS) platform. Data governance and business rules are under discussion in the IoS promotion council.



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Roadmap of ship Big data & IoT toward 2020

	Topic	2016	2017	2018	2019	2020
Application	R&D projects (e.g. i-Shipping in Japan and autonomous ships in Europe)	R&D projects (navigation, engine, hull, cargo, operation and etc.)				
	CBM*1 & PHM*2 services & class inspections	Condition based maintenance and PHM for main engines, machineries and equipment.		Condition-based class inspection services ?		
	Big data and IoT utilization in fleet operation	Integration of ship with shore operation system. Optimization, automation and simulation technologies.				
Platform	SSAP2 and standardization (ISO DIS 19847/19848)	ISO CD/DIS 19847/19848		(FDIS)		
		SSAP 2			SSAP 3 ?	
	Ship data center and IoS (Internet of Ship)		Preparation for IoS program		Ship Data Center in operation	
Regulatory	Cyber safety and cyber resilient ship	Cyber safety (BIMCO guideline, IMO MSC guideline, Class guidelines)				
				Cyber resilient ship (IACS, class system integration regulations)		
	EU MRV *3 and IMO DCS *4				IMO DCS	
					EU MRV	
	e-Navigation and autonomous ship projects	Model development	Standardization		Implementation	Operation
		Remote control/autonomous ship projects in Norway, Finland and other nations				

*1 CBM: Condition-Based Maintenance, *2 PHM: Prognostics and Health Monitoring
*3 MRV: Monitoring Reporting and Verification, *4 DCS: Data Collection System

JSMEA Japan Ship Machinery and Equipment Association

Summary

- JSMEA, Class NK, 38 member organizations and 10 observers are working together for SSAP2 (Smart Ship Application Platform 2) Project

- The aim of SSAP2 Project is to design and to implement an open platform for supporting Ship IoT service development and operation

- SSAP2 follows up ISO DIS 19847/ 19848 standardization process

- SSAP2 works closely with Ship DC and contribute to discussions of data governance and business rules

Thank you very much for your attention

For further information, please contact

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