ISO/TC8/WG10 #4 – smart shipping
9th & 10th May 2019 @ Yangzhou

# Progress Reports of Proposed PWIs from SSAP (Japan)

Hideyuki Ando, MTI
Mineyuki Morimoto, Terasaki Electric
Hiroyuki Kawasaki, BEMAC
Takashi Yamada, BEMAC

Smart Ship Application Platform 3 (SSAP3) Project

JSMEA Japan Ship Machinery and Equipment Association

# Outline

1. Background – open platform concept

2. SSAP3 Project

3. ISO/PWI19847: Ships and marine technology - Shipboard data servers to share field data at sea (ISO/TC8/SC6)

4. ISO/PWI 16425, Ships and marine technology - Guidelines for the installation of ship communication networks for shipboard equipment and systems (ISO/TC8/SC6)

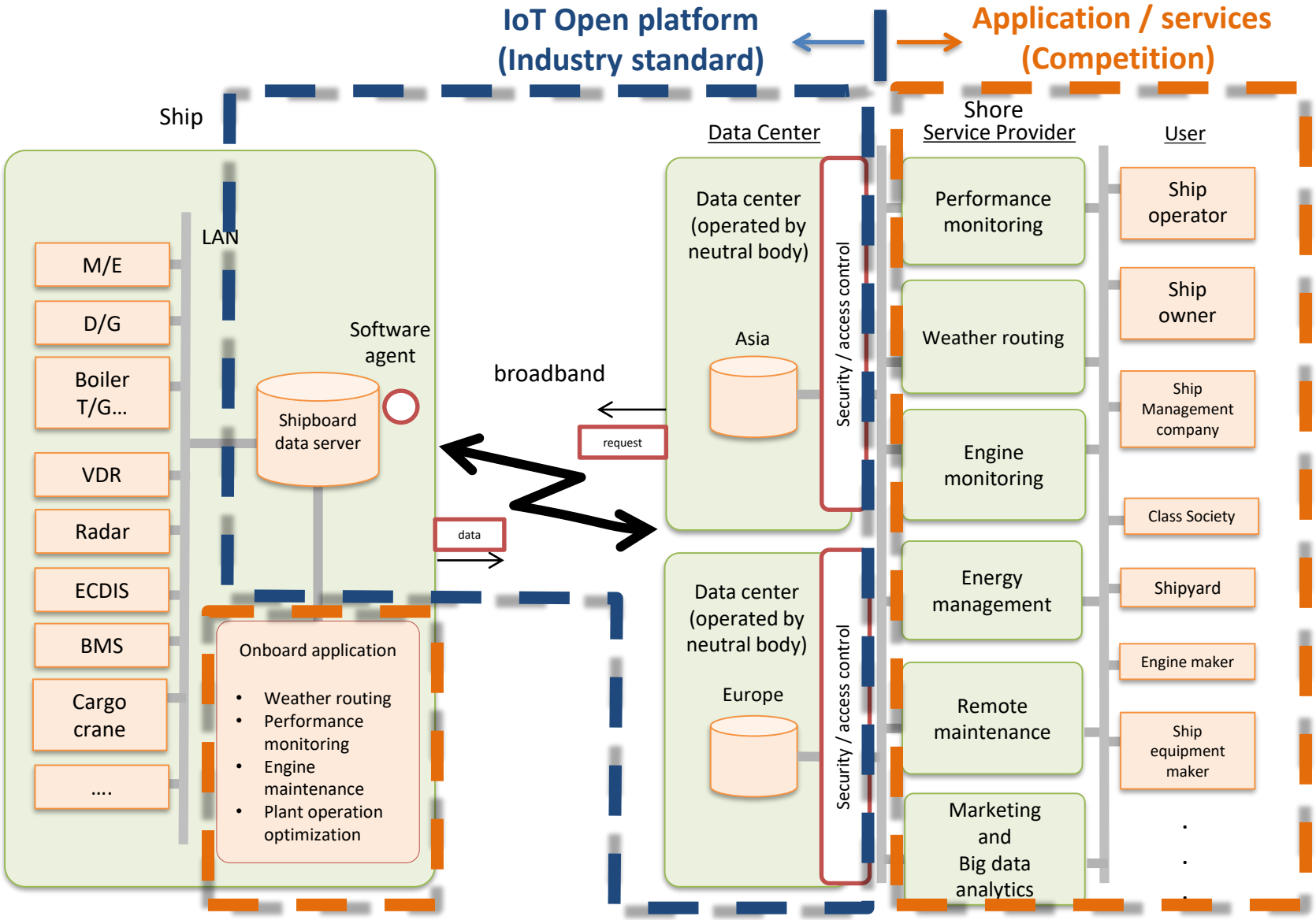
5. ISO/PWI 19848, Ships and marine technology - Standard data for shipboard machinery and equipment (ISO/TC8/SC6)

6. ISO/PWI 23807, Ships and marine technology -- Ship-shore data communication (ISO/TC8/WG10)

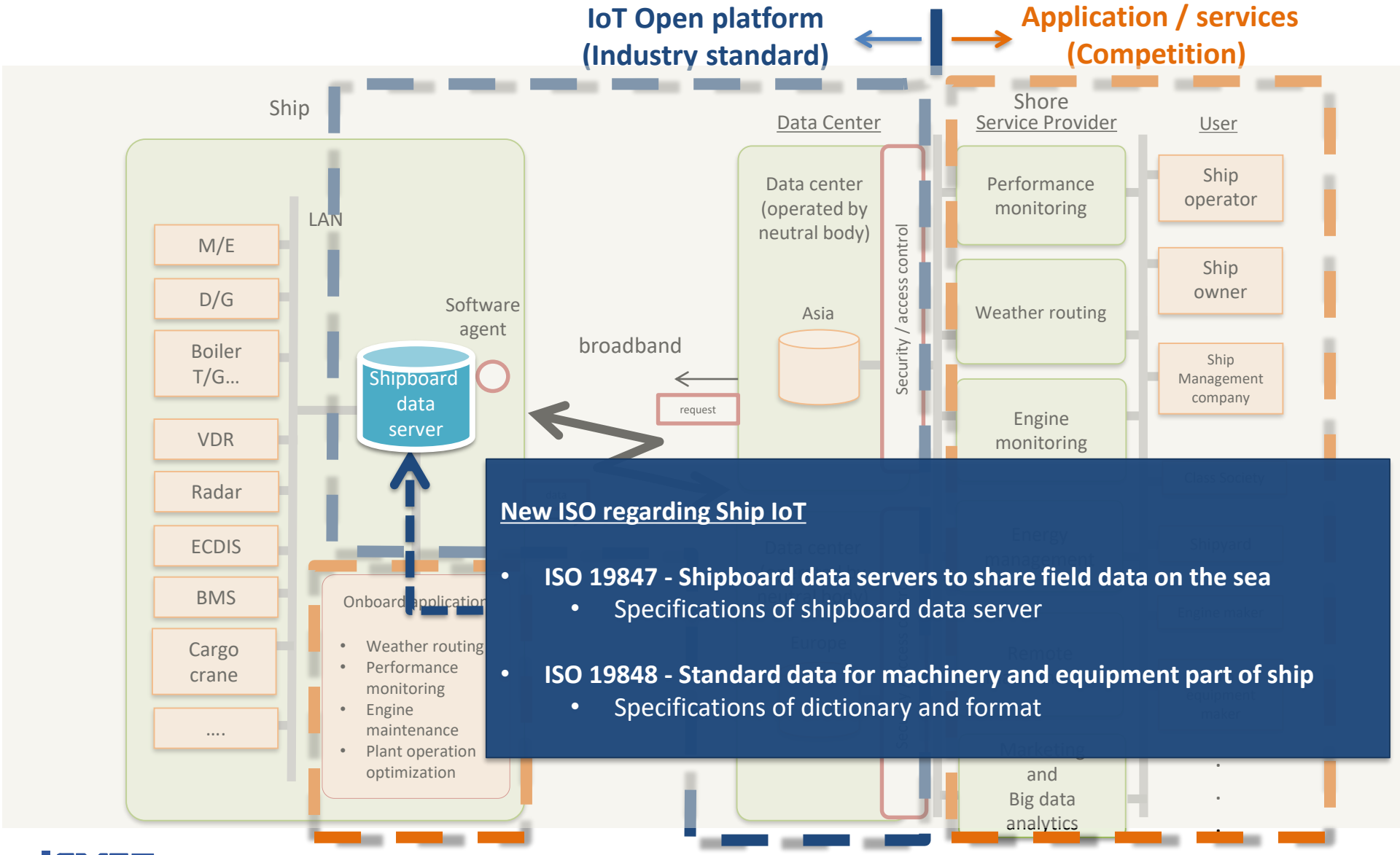
# Outline

1. **Background – open platform concept**
2. SSAP3 Project
3. ISO/PWI19847: Ships and marine technology - Shipboard data servers to share field data at sea (ISO/TC8/SC6)
4. ISO/PWI 16425, Ships and marine technology - Guidelines for the installation of ship communication networks for shipboard equipment and systems (ISO/TC8/SC6)
5. ISO/PWI 19848, Ships and marine technology - Standard data for shipboard machinery and equipment (ISO/TC8/SC6)
6. ISO/PWI 23807, Ships and marine technology -- Ship-shore data communication (ISO/TC8/WG10)

# Open platform for data sharing in maritime industry



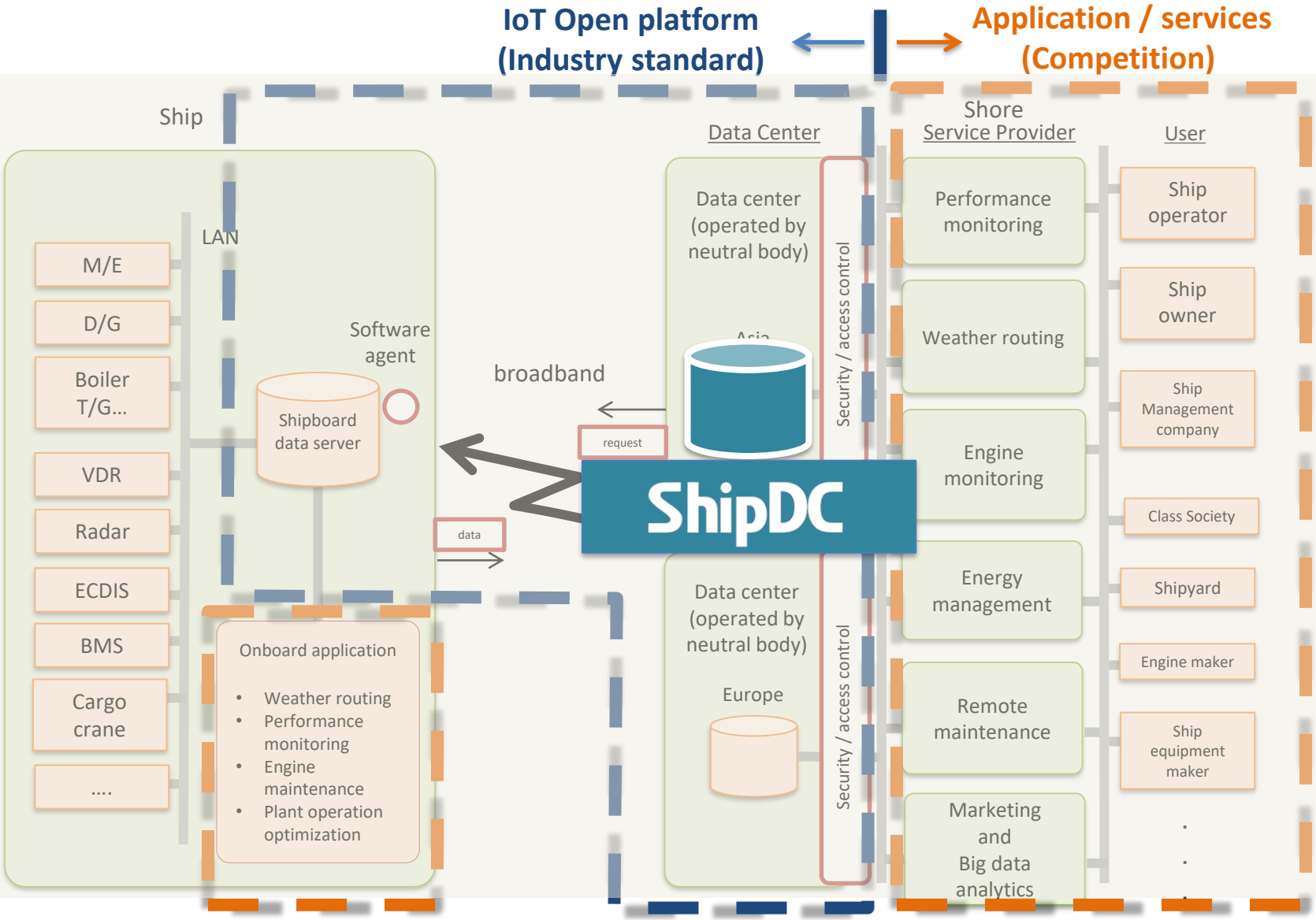
# Open platform for data sharing in maritime industry



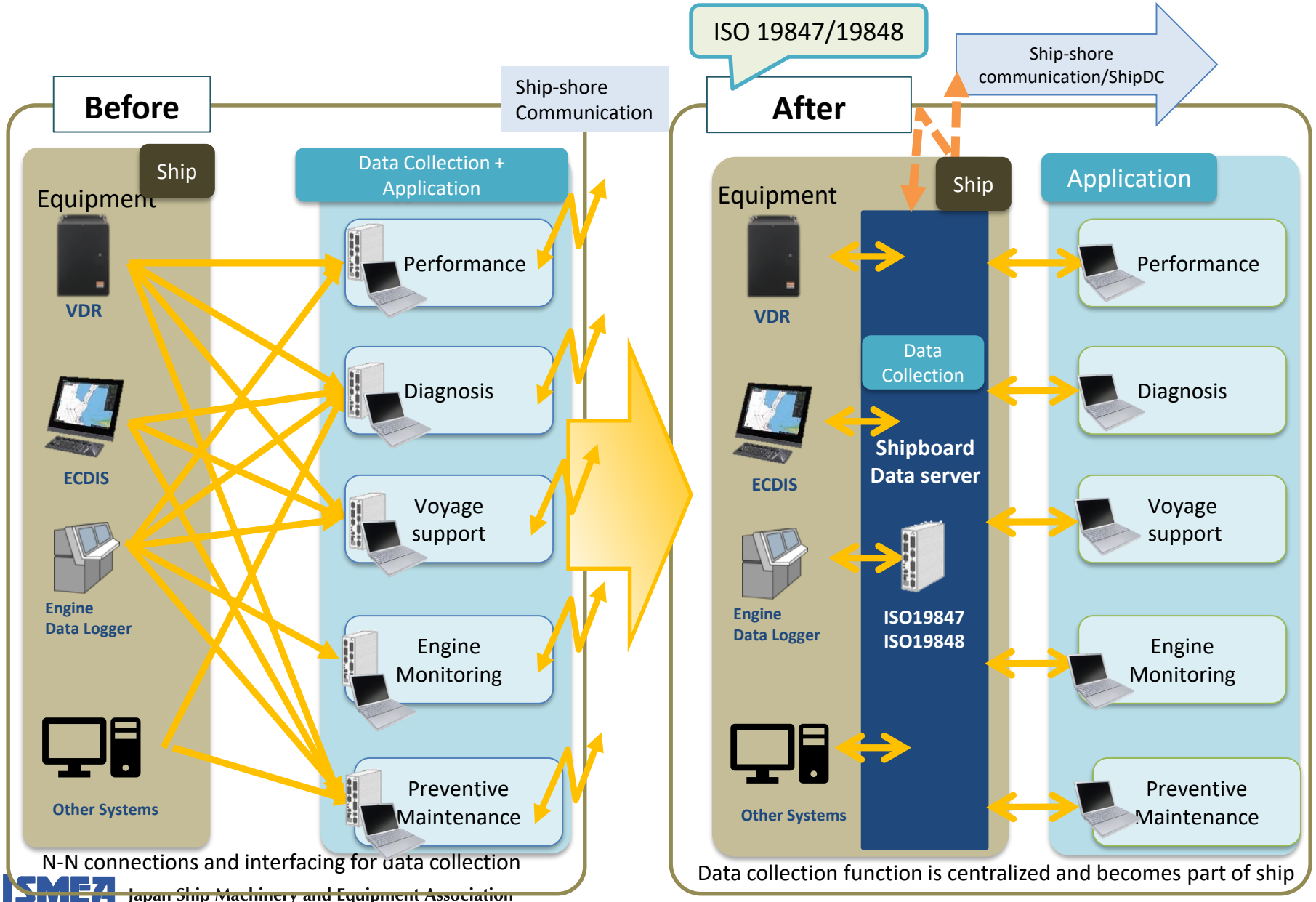

**New ISO regarding Ship IoT**

- **ISO 19847 - Shipboard data servers to share field data on the sea**
  - Specifications of shipboard data server
- **ISO 19848 - Standard data for machinery and equipment part of ship**
  - Specifications of dictionary and format

# Open platform for data sharing in maritime industry



# Role of shipboard data server (ISO19847 &19848)



# Use case scenario images of open platform

**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

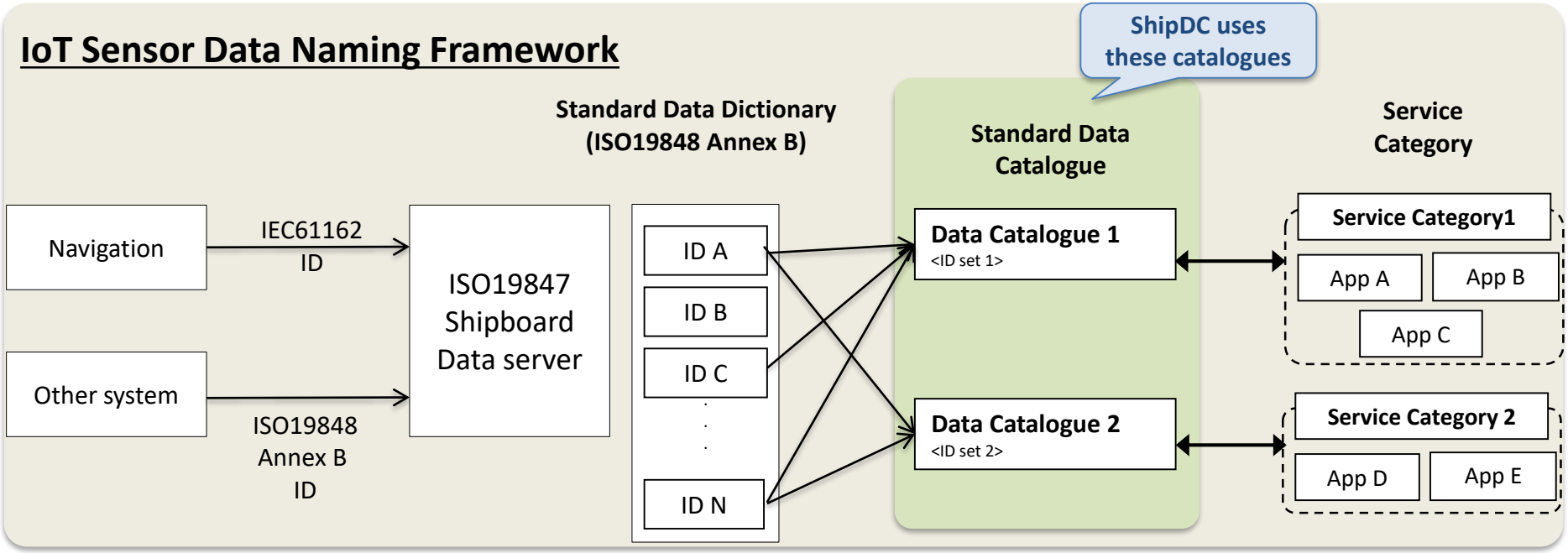
**Insurance**
- New services

**Regulatory use**
- Data reporting

ShipDC

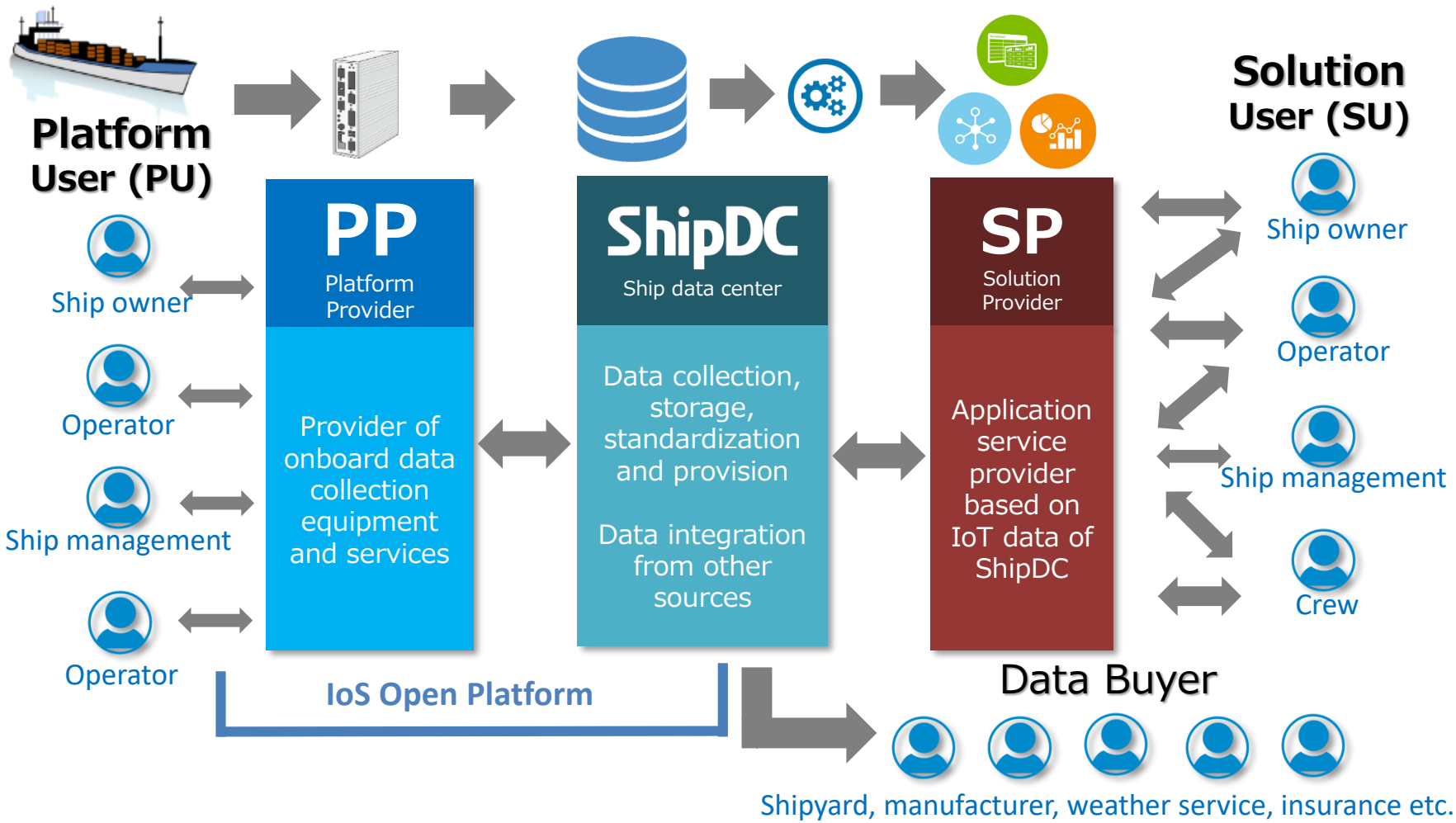
# IoT Sensor Data Naming Framework

- Make common naming rules for IoT sensor data are fundamental to utilize IoT for AI and Big data
- Theoretically, standard data dictionary (naming rules and codebooks, written in ISO 19848 Annex B) and data catalogue are a generic framework for any IoT data and applications, as far as properly maintained



# Internet of Ships (IoS) open platform

Roles are defined and each player provides their expertise on the Internet of Ship(IoS) platform. Data governance and business rules had been built by IoS OP consortium under ShipDC.



# Outline

1. Background – open platform concept

2. **SSAP3 Project**

3. ISO/PWI19847: Ships and marine technology - Shipboard data servers to share field data at sea (ISO/TC8/SC6)

4. ISO/PWI 16425, Ships and marine technology - Guidelines for the installation of ship communication networks for shipboard equipment and systems (ISO/TC8/SC6)

5. ISO/PWI 19848, Ships and marine technology - Standard data for shipboard machinery and equipment (ISO/TC8/SC6)

6. ISO/PWI 23807, Ships and marine technology -- Ship-shore data communication (ISO/TC8/WG10)

# SSAP3 Project (Oct 2018 – Sep 2020)

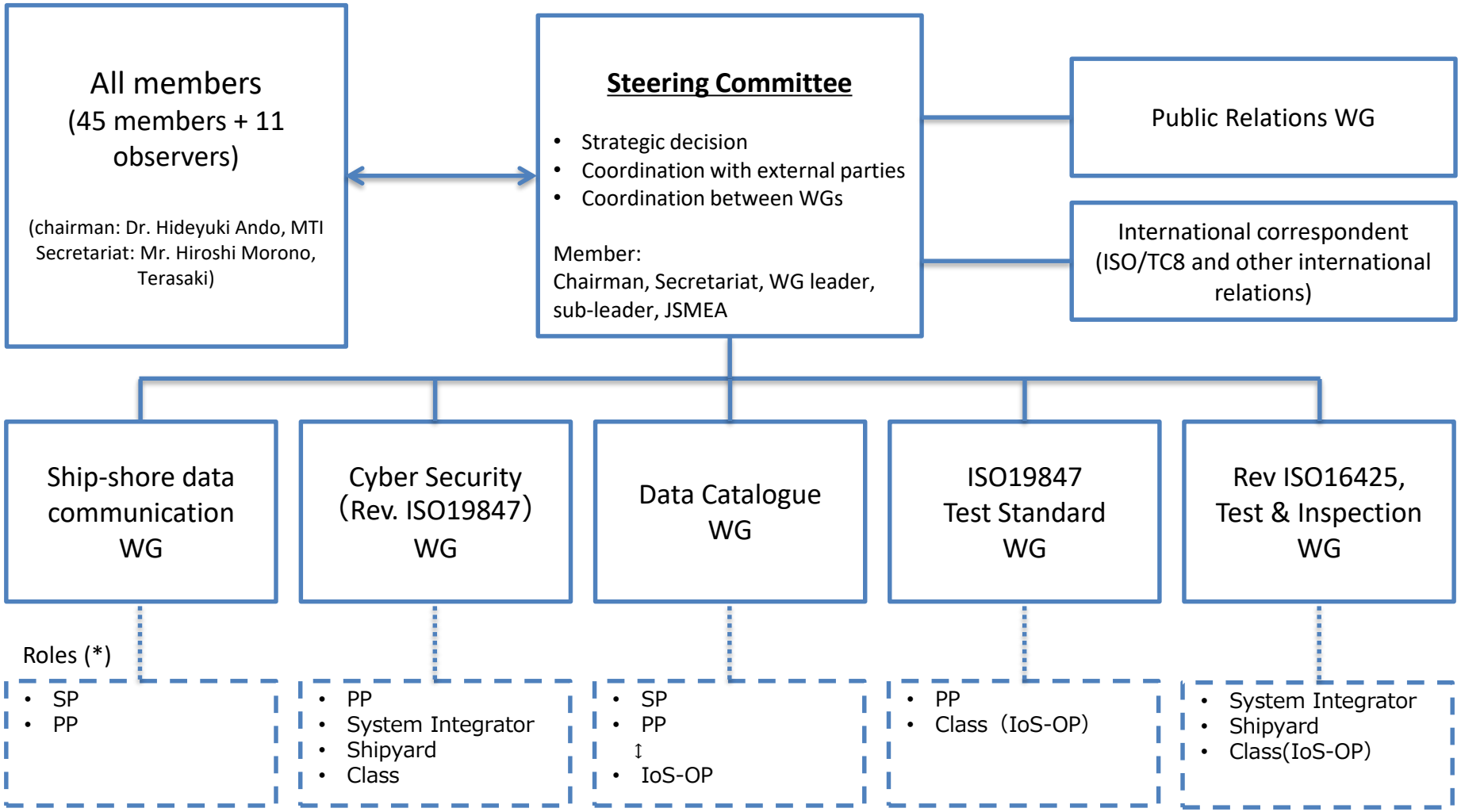
- Participants
  - 45 members
  - 11 observers


- Joint Industry Project (JIP)
  - JSMEA + ClassNK

- Action items (WG)
  - Ship-shore data communication for ISO 23807 (WG1)
  - Cyber security for ISO 19847 (WG2)
  - Data catalogue (WG3)
  - Test methods of ISO 19847 (WG4)
  - Test & inspection methods of ISO 16425 (WG5)
  - Public relations

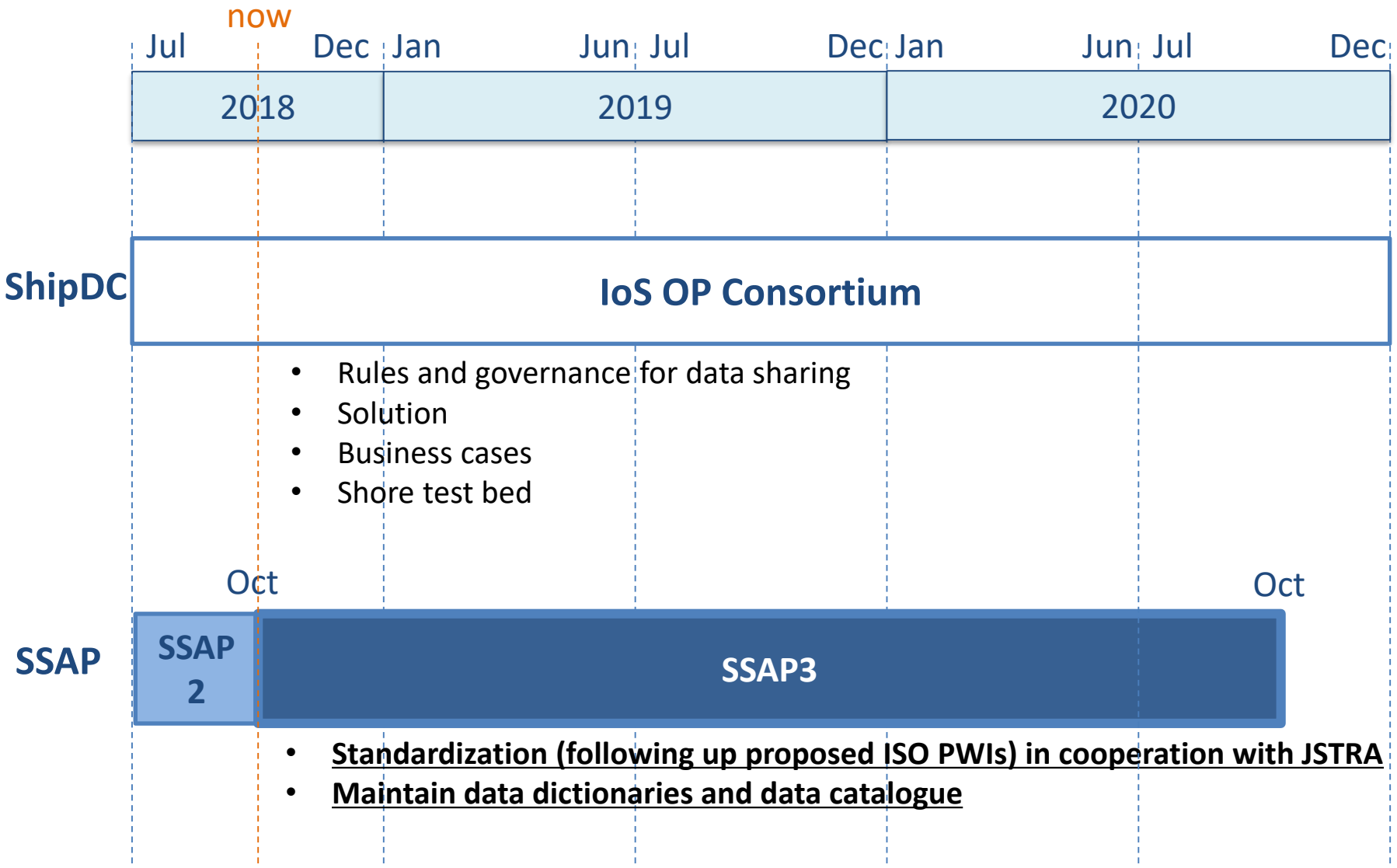
# Organization of SSAP3 Project

(Project schedule: Oct 2018 – Sep 2020, 2 years)




* SP: Solution Provider, PP: Platform Provider
Definition in IoS-OP Consortium

# Timeline of ShipDC and SSAP



# Proposed PWIs

1. Standard for test methods of ISO 19847 (ISO/TC8/SC6)
2. Revision of ISO 16425 (ISO/TC8/SC6)
3. Test & inspection methods of ISO 16425 (ISO/TC8/SC6)
4. Enhance cyber security of ISO 19847 (ISO/TC8/SC6)
5. Ship – shore data communication (ISO/TC8/WG10)

# Status of Proposed PWIs

- Standard for test methods of ISO 19847 (TC8/SC6)
- Enhance cyber security of ISO 19847 (TC8/SC6)

[Registered as PWI] ISO/PWI 19847, Ships and marine technology - Shipboard data servers to share field data at sea (10th April 2019)

- Revision of ISO 16425 (TC8/SC6)
- Test & inspection methods of ISO 16425 (TC8/SC6)

[Registered as PWI] ISO/PWI 16425, Ships and marine technology - Guidelines for the installation of ship communication networks for shipboard equipment and systems (10th April 2019)

- Ship – shore data communication (TC8/WG10)

[Registered as PWI] ISO/PWI 23807, Ships and marine technology -- Ship-shore data Communication (22nd October 2018)

- Data Catalogue & Dictionary (TC8/SC6)

[Registered as PWI] ISO/PWI 19848, Ships and marine technology - Standard data for shipboard machinery and equipment (10th April 2019)

# Outline

1. Background – open platform concept

2. SSAP3 Project

3. **ISO/PWI19847: Ships and marine technology - Shipboard data servers to share field data at sea (ISO/TC8/SC6)**

4. ISO/PWI 16425, Ships and marine technology - Guidelines for the installation of ship communication networks for shipboard equipment and systems (ISO/TC8/SC6)

5. ISO/PWI 19848, Ships and marine technology - Standard data for shipboard machinery and equipment (ISO/TC8/SC6)

6. ISO/PWI 23807, Ships and marine technology -- Ship-shore data communication (ISO/TC8/WG10)

# Standard for test methods of ISO 19847

## Objective

Revising the section 7 (Test requirements) of ISO19847 to clarify how to inspect and verify conformity of shipboard data sever to ISO19847



**7.2.2 Test items**

a) Processing performance

(See 5.1.1.1)

Confirm by inspection of the manufacturer's documentation that the shipboard data server has processing performance to input data for 30 data sample at one-second from at least five simultaneous sessions by using the request-response transport service.

(See 5.1.1.2)

Confirm by inspection of the manufacturer's documentation that the shipboard data server has processing performance to read requests for 30 data sample at five seconds intervals on at least five simultaneous sessions by using the request-response transport service.



**7.3.2 Test items**

a) Management of the system clock

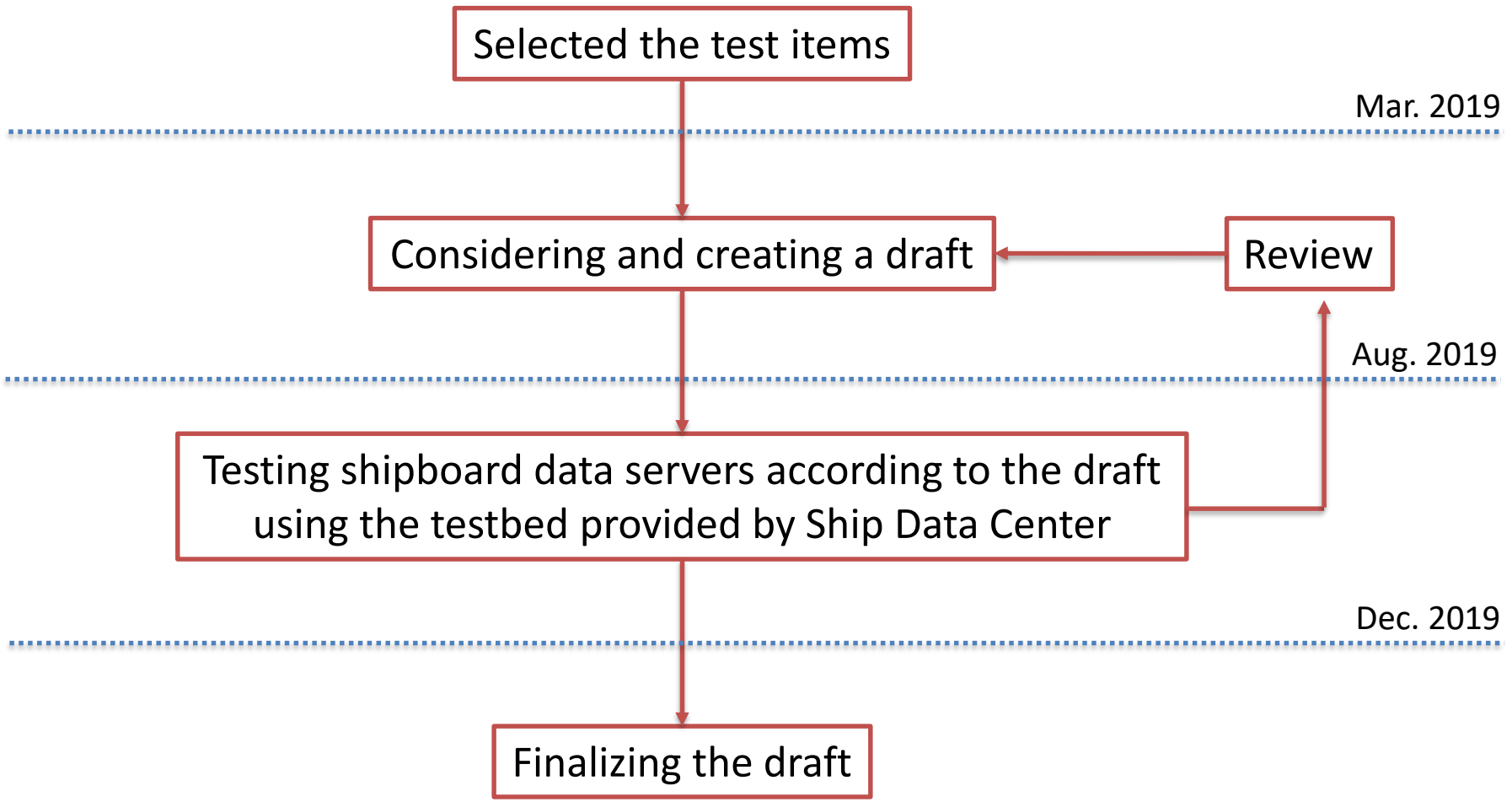
(See 6.2.1)

Confirm by inspection of the manufacturer's documentation that the shipboard data server has a function to synchronise the internal system clock with UTC.

It is necessary to confirm that the shipboard data server's system clock has a precision of one second or less per hour, regardless of whether the shipboard data server is synchronised to UTC or not.

Confirm that the shipboard data server has a function to release an alert when it is no longer synchronised with UTC.

# Schedule


Selected the test items
Mar. 2019
Considering and creating a draft
Review
Aug. 2019
Testing shipboard data servers according to the draft using the testbed provided by Ship Data Center
Dec. 2019
Finalizing the draft
Jun. 2020

# Test items to check conformity to ISO19847

| Test items of general requirements(7.2) | Necessity |
|---|---|
| a) Processing performance | Y |
| b) Storage function | Y |
| c) Interface function | N |
| d) Data backup and restoration functions | Y |
| e) Function to have connections with external storage devices | Y |
| f) Function to be protected from unauthorised access | Y |
| g) Function to be protected from REDS | Y |
| h) Status reporting | Y |
| i) Power-supplying function | N |
| j) Vibration-resistant feature | N |
| k) Requirement for Electromagnetic immunity and Emission | N |
| l) Temperature and humidity resistant requirements | N |

| Test items of general requirements(7.2) | Necessity |
|---|---|
| m) Installation manual | N |
| adding) Condition monitoring function | Y |

| Test items of input/output and management functions(7.3) | Necessity |
|---|---|
| a) Management of the system clock | Y |
| b) Management of data to be processed | Y |
| c) Management of Management data | Y |
| d) Request-response data transport service | Y |
| e) Streaming data transport service | Y |
| f) File transport service | Y |
| g) Alias function | Y |
| h) Data calculation function | Y |
| i) Log management function | Y |

# Enhance cyber security of ISO 19847

## Objective

- Clarify functional requirements to ISO19847 to enhance cyber security

## Procedures

- Study existing guidelines & notations regarding cyber security.
- Study current status and on-going activities in IACS and class societies.
- Study requirements from authorities and charters.
- Study requirements from various stakeholders to shipyards and suppliers regarding cyber risk management.

- Clarify requirements to ship-shore data communication
- Clarify functional requirements to ISO19847
- Clarify requirements to ISO 16425
- Clarify additional requirements through trials (e.g. pen-test)

# Enhance cyber security of ISO 19847

SSAP3 Cyber Security WG

| 2019 | 2020 |
| --- | --- |
| • Study cyber security guidelines and notations<br>• Clarify functional requirements to ISO19847 | • Clarify requirements ISO 16425 revision<br>• Clarify requirements to ship-shore data communication<br>• Clarify additional requirements based on trials (e.g. pen-test) |

cooperation

SSAP3

- ISO19847 Test Standard WG
- Rev. ISO16425 Test and Inspection WG
- Ship-shore data communication WG

IoS-OP

- Solution WG

The Shipbulders' association of Japan

- Cyber Security WG

# Outline

1. Background – open platform concept

2. SSAP3 Project

3. ISO/PWI19847: Ships and marine technology - Shipboard data servers to share field data at sea (ISO/TC8/SC6)

4. **ISO/PWI 16425, Ships and marine technology - Guidelines for the installation of ship communication networks for shipboard equipment and systems (ISO/TC8/SC6)**

5. ISO/PWI 19848, Ships and marine technology - Standard data for shipboard machinery and equipment (ISO/TC8/SC6)

6. ISO/PWI 23807, Ships and marine technology -- Ship-shore data communication (ISO/TC8/WG10)

# Revision of ISO 16425

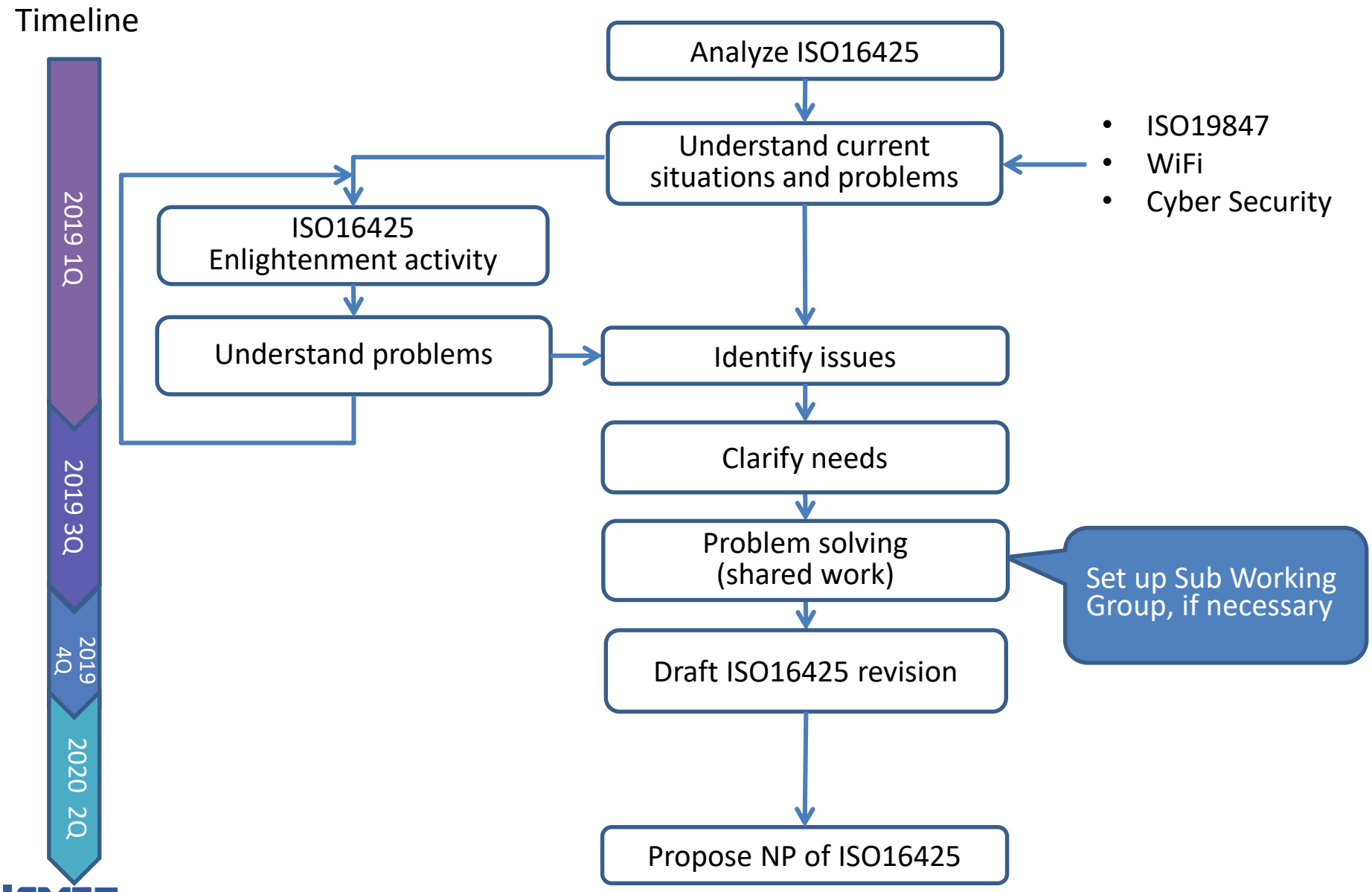
**Problems to be solved**

- Clarify responsible actors, such as ship owners, shipyards & suppliers, and their roles in design and construction of communication networks.
- Clarify methods of tests and inspections of equipment connected to the network.
- Clarify requirements of network redundancy and network monitoring.
- Clarify requirements of connection with other networks.
- Clarify requirements for equipment installed in ISO 16425 network.
- Clarify methods for wireless network design, construction, test and inspections.

**Policy**

- Incorporate with the essence of IEC 61162-460

# Revision of ISO 16425 - Schedule



# Outline

1. Background – open platform concept

2. SSAP3 Project

3. ISO/PWI19847: Ships and marine technology - Shipboard data servers to share field data at sea (ISO/TC8/SC6)

4. ISO/PWI 16425, Ships and marine technology - Guidelines for the installation of ship communication networks for shipboard equipment and systems (ISO/TC8/SC6)

5. **ISO/PWI 19848, Ships and marine technology - Standard data for shipboard machinery and equipment (ISO/TC8/SC6)**

6. ISO/PWI 23807, Ships and marine technology -- Ship-shore data communication (ISO/TC8/WG10)

# JSMEA dictionary current status

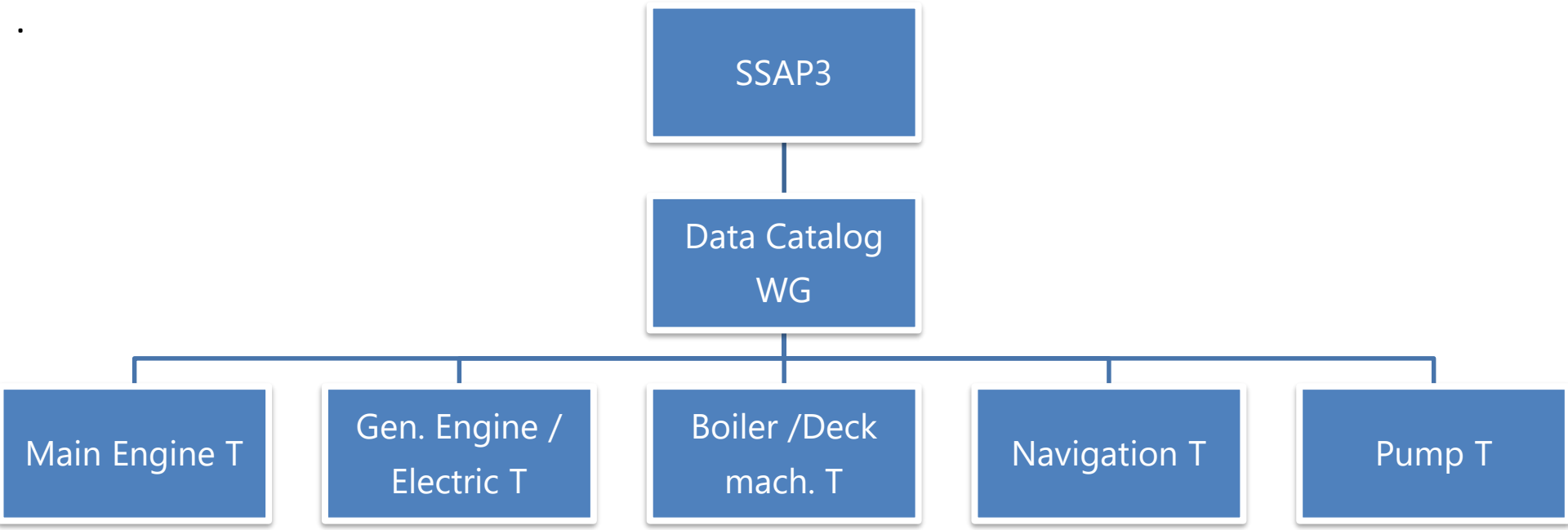
| Naming Rule | Status | | Content |
|---|---|---|---|
| | Naming Rule | Code book | |
| jsmea_mac | Done | In revision (1st draft) | Engine machinery |
| jsmea_nav | 1st draft | In revision (1st draft) | Navigation machinery |
| jsmea_voy | 1st draft | 1st draft | Voyage report |
| jsmea_mot | 1st draft | 1st draft | Ship motion |
| jsmea_oil | 1st draft | 1st draft | Oil constituent |
| jsmea_wea | 1st draft | 1st draft | Weather |

- SSAP2 project published the first draft of the dictionary to project members in September 2018
- SSAP3 Data Catalog WG is currently reviewing the dictionaries from both user and manufacturer perspectives

# Formation of dictionary review

Each dictionary is being reviewed by professional manufacturers based on data catalog .

.




| Main Engine T | Gen. Engine / Electric T | Boiler /Deck mach. T | Navigation T | Pump T |
|---|---|---|---|---|
| • 2st. D/E mfr.<br>• Sensor mfr.<br>• Class | • Ship yard<br>• 4st. D/E mfr.<br>• Automation sys mfr.<br>• Switch gear mfr. | • Burner mfr.<br>• Boiler mfr.<br>• Deck mach. Mfr. | • Nav. Sys. mfr.<br>• Propeller mfr.<br>• Research inst.<br>• App. Vender<br>• Trading company | • Pump mfr. |

mfr. manufacturer

# Example of jsmea_mac T1 dictionary (1/2)

| Name | Description |
|---|---|
| AirConditioner | A system for heating, ventilation and air conditioning consisting of air conditioners, fans and dampers. It is mainly for accommodation areas, and does not include systems for engine room and cargo area ventilation. |
| AuxBoiler | Steam generation and supply system those are not used for propulsion and power generation. In addition, boilers that uses exhaust gas as a heat source is not included for any purposes. It includes auxiliary equipments (Feed Water Pump, etc.), equipped specifically for the boiler. |
| BallastSystem | Ballast system consisting of tanks, valves, pumps, etc. includes BWTS/BWMS/tank/pump for heel control. |
| BilgeSludgeSystem | |
| BoilerWaterSystem | Condensate feed water system for main/aux boilers. It may also includes cascaded tanks. It does not includes auxiliary equipments installed in individual boilers. |
| CargoPumpSystem | Pumps and their drives (steam, electric, hydraulic) used to transfer fluids. It may includes motor / turbine and does not includes generator / boiler. |
| CompressionAirSystem | A system for supplying compressed air for control and/or drive, may consisting of a compressor a valve and a Reservoir. It includes control air and does not include non-compressed air such as air conditioning. |
| CoolingFreshWaterSystem | A system for cooling and supplying fresh water for machinery cooling, consisting of pumps, valves, heat exchangers, etc. |
| CoolingSeaWaterSystem | A system for supplying seawater for cooling, consisting of pumps, valves, heat exchangers, etc. |
| DieselGeneratorSet | Generators used for power supply, diesel engines, and auxiliary equipments and piping systems are included in each GenSet. |
| DrinkWaterSystem | A system for supplying fresh water for beverages consisting of pumps, valves and distillation devices. |
| PowerElectricSystem | Equipment for supplying and distributing power such as switchboards and power control devices. Generators and drive devices (drive inverters etc.) are not included. |
| EmergencyGeneratorSystem | Emergency power generation and power supply equipment consisting of an emergency generator, a battery, an emergency switchboard, etc. |
| EngineRoomAmbience | Engine room atmosphere such as temperature and humidity. |
| ExhaustGasEconomizer | Steam generation and supply system that uses exhaust gas as a heat source installed independently of the equipment. The source of exhaust gas does not matter. |
| ExhaustGasRecirculationSystem | Low pressure EGR system (recirculation from the T/C turbine outlet to the compressor inlet). It includes valves scrubbers, coolers and blowers. |
| FinStabilizerSystem | Anti-rolling device with movable fins. It includes Fin and its drive unit and control unit. |
| FireFightingSystem | Special purpose fire extinguishing system excluding seawater system shared with other applications. Regardless of method such as steam, Co2. |
| FreshWaterSystem | Fresh water not used for cooling and drinking. It includes hot water. |

# Example of jsmea_mac T1 dictionary (2/2)

| Name | Description |
|---|---|
| FuelGasSystem | A system for supplying fuel gas used in various devices such as main machines, generators and boilers. It does not include auxiliary equipments that are uniquely equipped to each device. |
| FuelOilSystem | A system for supplying fuel oil used in various machines such as main machines, generators and boilers. It does not includes auxiliary equipments that are uniquely equipped to each device. |
| HydraulicSystem | Control valve drive oil pressure etc. Main Engine servo oil is taken by the Main Engine. |
| Incinerator | Incinerator for waste, waste oil etc. |
| InertGasSystem | A system for producing, cleaning and supplying inert gas (cleaning and cooling of exhaust gas and combustion gas of N2) |
| LubOilSystem | A system for collectively storing and supplying lubricating oil used in various machines such as main engine, generators and boilers. |
| MainEngine | A prime mover mainly used for promote ships. It includes dual fuel engine, gas engine, propulsion generator engine. It does not include turbines. |
| NOxSCRSystem | A low-pressure NOX SCR system installed downstream of the T/C turbine and installed independently of the prime mover. |
| PropulsionDriveSystem | Propulsion device and its transmission system. It includes CPP, CRP, gear, clutch, shaft, etc. In the case of electric propulsion, it also includes motors and inverters. |
| ProvisionRefrigerator | Food freezer |
| ReLiquefiedSystem | Equipment for reliquefying LNG / LNG BOG consisting of compressor, heat exchanger etc. |
| SeaWaterSystem | A seawater system not used for cooling, shared with other applications. It includes FireBlgePump, and FireGSPump. |
| ShaftGeneratorMotorSystem | A generator coupled to the propulsion shaft by some means. It includes reduction gears and inverters. |
| SOxScrubberSystem | SOX Scrubber equipped independently of the prime mover. |
| SteamSystem | Steam supply system. Consumers (e.g. steam generators) are not included, |
| SteeringGear | A set of related devices such as actuators, gears, pumps, motors, and control devices for driving the rudder. |
| Thruster | Propulsion device used other than promoting a ship, such dynamic positioning and lateral movement (e.g. side thruster and azimuth thruster). |
| TurbineGeneratorSet | Generator driven by a steam turbine. It does not include gas turbine generators. The source of steam does not matter. |
| VentilationFan | Ventilation system for the engine room, cargo hold, etc. it includes a damper. |
| MainSwitchingBoardRoomAnbience | Switchboard room atmosphere such as temperature and humidity. |

# Outline

1. Background – open platform concept

2. SSAP3 Project

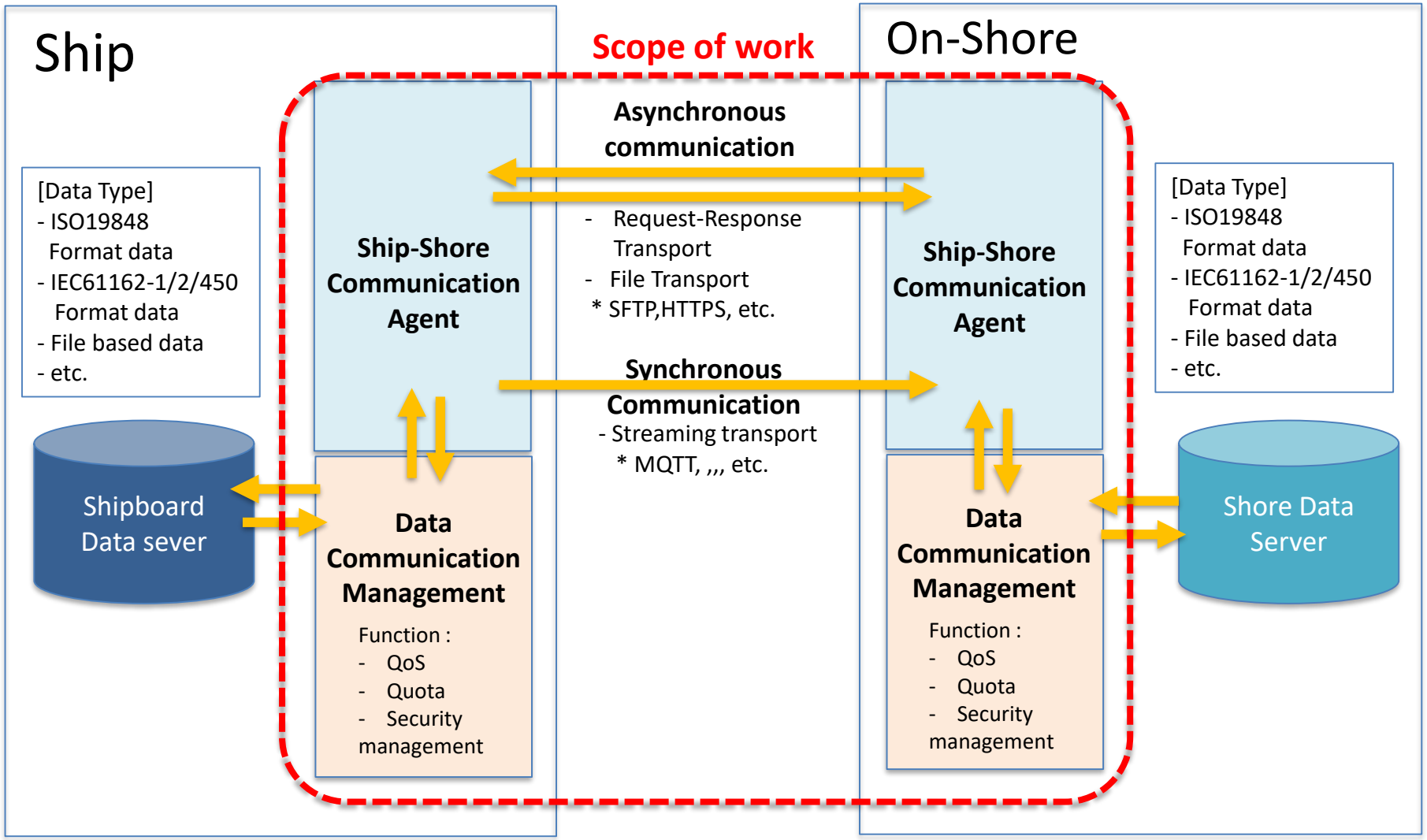
3. ISO/PWI19847: Ships and marine technology - Shipboard data servers to share field data at sea (ISO/TC8/SC6)

4. ISO/PWI 16425, Ships and marine technology - Guidelines for the installation of ship communication networks for shipboard equipment and systems (ISO/TC8/SC6)

5. ISO/PWI 19848, Ships and marine technology - Standard data for shipboard machinery and equipment (ISO/TC8/SC6)

6. **ISO/PWI 23807, Ships and marine technology -- Ship-shore data communication (ISO/TC8/WG10)**

# Standard for ship-shore data communication



# Standard for ship-shore data communication

## 1.Ship-shore communication agent

### 1) Asynchronous Communication

| | |
|---|---|
| Function | Transport the data which requested from shore or ship （both direction） |
| Transport timing | Periodically / One-time as requested |
| Data Type | ISO19848 format data, ISO61162-1/2 data, File-based data, etc. (TBD) |
| Protocol | FTP, SFTP, HTTPS, etc. (TBD) |

### 2)Synchronous Communication

| | |
|---|---|
| Function | Transport the data to shore synchronously （ship to shore direction） |
| Transport timing | Synchronously as requested |
| Data Type | ISO19848 format data, ISO61162-1/2 data, etc. (TBD) |
| Protocol | MQTT, etc. (TBD) |

## 2.Data communication management agent

| | |
|---|---|
| QoS management (Quality of Service) | Managing the network traffic based on the priority of each transport data in congested network. |
| Quota management | Managing the maximum data volume and traffic quota. |
| Security | Protecting the ship-shore data communications from the security threat. (monitoring , permission control , etc. ) (TBD) |

# Thank you very much for your attention