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## **Ships and marine technology — Shipboard data servers to share field data at sea**

*Navires et technologie maritime — Serveurs de données embarqués  
pour partager les données de terrain en mer*

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 6, *Navigation and ship operations*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

Shipboard computer applications for operating ships safely and efficiently are becoming more and more popular.

These applications need to access data provided by shipboard machinery and equipment.

Navigational instruments may use the IEC 61162 series of standards when exchanging data, but access to other shipboard machinery and systems to obtain data has not yet been standardised.

For the purpose of sharing field data at sea, including non-standardised machinery data, ISO 19847 specifies requirements for performance, function, service and safety for the shipboard data server that stores data from shipboard machinery and equipment, and sends stored data off the ship.

The shipboard data server is connected to an information network that is governed by ISO 16425. The requirements to cyber security of shipboard data server refer to ISO 16425.

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# Ships and marine technology — Shipboard data servers to share field data at sea

## 1 Scope

This document specifies requirements for the shipboard data server that is used to collect data from other shipboard machinery and systems and to further share the collected data in a safe and efficient manner.

This document specifies communication protocols with reference to the data structure of ISO 19848.

## 2 Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8601, *Data elements and interchange formats — Information interchange — Representation of dates and times*

ISO 16425, *Ships and marine technology — Guidelines for the installation of ship communication networks for shipboard equipment and systems*

ISO 19848, *Ships and marine technology — Standard data for shipboard machinery and equipment*

IEC 60092-504:2016, *Electrical installations in ships — Part 504: Special features — Control and instrumentation* <https://standards.iteh.ai/catalog/standards/sist/8fede06c-cfaF-4a40-bb3c-b26db87bd65e/iso-19847-2018>

IEC 61162-1, *Maritime navigation and radiocommunication equipment and systems — Digital interfaces — Part 1: Single talker and multiple listeners*

IEC 61162-450, *Maritime navigation and radiocommunication equipment and systems — Digital interfaces — Part 450: Multiple talkers and multiple listeners — Ethernet interconnection*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

### 3.1

#### **actual recorded data**

actual (sensor) data acquired from *data providers* (3.10) and recorded to the *shipboard data server* (3.32)

### 3.2

#### **Alias ID**

symbol to refer to one or more *Local IDs* (3.20) with different names

### 3.3

#### **Alias List**

defined list

### 3.4

#### **Comma-Separated Value**

##### **CSV**

method of storing tabular data in plain text in a file where each row of the file forms a data record and where fields within one data record are separated by a comma character

### 3.5

#### **Data Channel**

virtual channel for data transmission from shipboard machinery and equipment to the *shipboard data server* (3.32), defining static properties of data

[SOURCE: ISO 19848:2018, 3.5]

### 3.6

#### **Data Channel ID**

identifier for *Data Channel* (3.5) that identifies Data Channel universally and on-board a ship

Note 1 to entry: There are three types of Data Channel ID: Universal ID, *Local ID* (3.20) and Short ID.

[SOURCE: ISO 19848:2018, 3.6]

### 3.7

#### **Data Channel List**

list of definitions for *Data Channel* (3.5) that define *Data Channel ID* (3.6) and *Data Channel Property* (3.8), and is shared through the *shipboard data server* (3.32)

[SOURCE: ISO 19848:2018, 3.7]

### 3.8

#### **Data Channel Property**

attributes of *Data Channel* (3.5), such as units, ranges and others

[SOURCE: ISO 19848:2018, 3.8]

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### 3.9

#### **Data Channel Type**

identification of the types of *Data Channels* (3.5), such as row numeric value, average value, alarms and status

Note 1 to entry: See ISO 19848:2018, 5.3 a).

### 3.10

#### **data provider**

equipment that provides (sends) data to the *shipboard data server* (3.32) and has interfaces for providing data

### 3.11

#### **Data Source Information**

definition of communication protocols and formats in which a *data provider* (3.10) sends data

### 3.12

#### **data sample**

one measurement datum that has one timestamp

### 3.13

#### **Extensible Markup Language**

##### **XML**

text-based data description language used for exchanging data on the Internet



**3.14****File Transfer Protocol****FTP**

protocol for transferring files between a server and clients

**3.15****File Transfer Protocol over SSL/TLS****FTPS**

protocol that encrypts data transmitted and received by *FTP* (3.14) with Secure Sockets Layer (SSL) or Transport Layer Security (TLS)

**3.16****Hypertext Transfer Protocol****HTTP**

communication protocol used to exchange HTML(Hyper Text Markup Language) or other contents on the Internet

Note 1 to entry: See RFC 2616 "Hypertext Transfer Protocol".

**3.17****Hypertext Transfer Protocol over SSL/TLS****HTTPS**

protocol in which Web servers and clients encrypt data transmissions

**3.18****JavaScript Object Notation****JSON**

open and text-based exchange format

Note 1 to entry: Data transmitted in JSON formats make it easy to read and write (for humans), parse and generate (for computers). <https://standards.iteh.ai/catalog/standards/sist/8fede06c-cfaf-4a40-bb3c-d6b87bd65e/iso-19847-2018>

Note 2 to entry: It is similar to XML (3.13). <https://standards.iteh.ai/catalog/standards/sist/8fede06c-cfaf-4a40-bb3c-d6b87bd65e/iso-19847-2018>

**3.19****Local Data Name**

identifier for *Data Channels* (3.5) that is named in accordance with a *Naming Rule* (3.23)

Note 1 to entry: The syntax of the identification string shall be disclosed and precisely defined using ABNF.

Note 2 to entry: See ISO 19848:2018, 5.2.2 b).

**3.20****Local ID**

identification of an on-board *Data Channels* (3.5) locally, consists of a *Naming Rule* (3.23) and a *Local Data Name* (3.19)

Note 1 to entry: See ISO 19848:2018, 5.2.2.

**3.21****management data**

catalogues that allow access to and interpretation of recorded data

EXAMPLE      Timestamped *Data Source Information* (3.11), *Data Channel List* (3.7) and *Alias List* (3.3).

**3.22****MQTT Protocol**

machine-to-machine (M2M)/"Internet of Things" connectivity protocol designed as an extremely lightweight publish/subscribe messaging transport

Note 1 to entry: It is standardised by the Advancing Open Standards for the Information Society (OASIS).

### 3.23

#### **Naming Rule**

sets of requirements that define a naming scheme (or an identification scheme) for components and systems on-board the ship

Note 1 to entry: See ISO 19848:2018, 5.2.2 a).

### 3.24

#### **Network File System**

##### **NFS**

distributed file system and a protocol for distributed file systems defined by RFC 1094, RFC 1813, RFC 3530 and other protocol specifications

### 3.25

#### **owner**

restrict editors and users by a specifying owner

### 3.26

#### **Removable External Data Source**

##### **REDS**

user removable non-network data source

EXAMPLE Compact Disc (CD), USB memory stick, Bluetooth®<sup>1)</sup> devices.

[SOURCE: IEC 61162-460:2018, 3.32]

### 3.27

#### **REST API**

program invocation convention for using Web systems from outside, developed in accordance with the architectural style called REST

Note 1 to entry: Resource operations are designated by *HTTP* (3.16) sources. Results are sent back in *XML* (3.13), *JSON* (3.18) and other formats.

### 3.28

#### **Secure File Transfer Protocol**

##### **SFTP**

protocol that uses the *SSH* (3.29) protocol to securely transfer files between computers

### 3.29

#### **Secure Shell**

##### **SSH**

cryptographic protocol that allows secure communications over an unsecured network

### 3.30

#### **session**

stateful or stateless dialogue established to exchange data between a *shipboard data server* (3.32) and shipboard equipment or systems

### 3.31

#### **Server Message Block**

##### **SMB**

protocol for sharing files and printers among several Windows computers in networks

### 3.32

#### **shipboard data server**

ship's "information hub" that stores data from shipboard machinery and equipment, shares data at sea including machine data, and sends stored data outboard

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1) Bluetooth® is the trademark of products supplied by Bluetooth Special Interest Group. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of these products.

**3.33****Syslog**

standard for message logging

**4 Abbreviated terms**

|       |   |
|-------|---|
| AMS   | Alarm Monitoring System                         |
| CSV   | Comma-Separated Value                           |
| ECDIS | Electronic Chart Display and Information System |
| FTP   | File Transfer Protocol                          |
| FTPS  | File Transfer Protocol over SSL/TLS             |
| GNSS  | Global Navigation Satellite System              |
| HTML  | Hyper Text Markup Language                      |
| HTTP  | Hypertext Transfer Protocol                     |
| HTTPS | Hypertext Transfer Protocol over SSL/TLS        |
| JSON  | Java Script Object Notation                     |
| MQTT  | Message Queuing Telemetry Transport             |
| NFS   | Network File System                             |
| REDS  | Removable External Data Source                  |
| RFC   | Request for Comments                            |
| SFTP  | Secure File Transfer Protocol                   |
| SMB   | Server Message Block                            |
| SSH   | Secure Shell                                    |
| SSL   | Secure Sockets Layer                            |
| TLS   | Transport Layer Security                        |
| URI   | Uniform Resource Identifier                     |
| UTC   | Coordinated Universal Time                      |
| VDR   | Voyage Data Recorder                            |
| XML   | Extensible Markup Language                      |

5 General requirements for the shipboard data server

5.1 Function and performance of the shipboard data server

5.1.1 Processing performance

Manufacturers supplying the shipboard data server shall specify how much data their products can process. If the product exceeds the amount of data that can be processed, it is necessary to notify the requesting party by returning the status code, etc.

5.1.1.1 Input data processing performance

The shipboard data server using the request-response transport service shall have a processing performance to input data for 30 data sample sets at less than one-second from at least five simultaneous sessions (e.g. VDR, GNSS, alarm and monitoring systems, ballast systems and cargo systems). See [Figure 1](#).

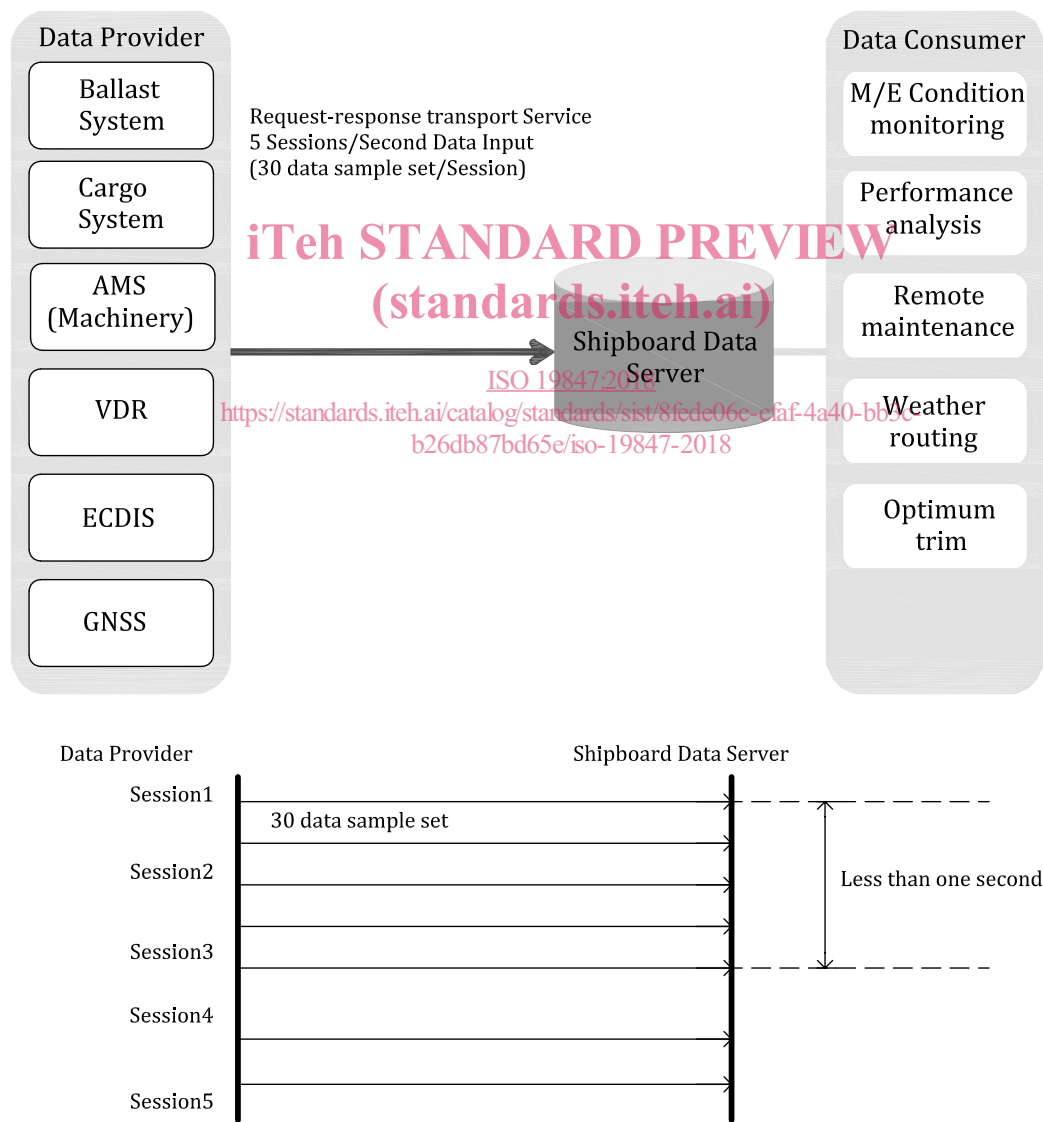
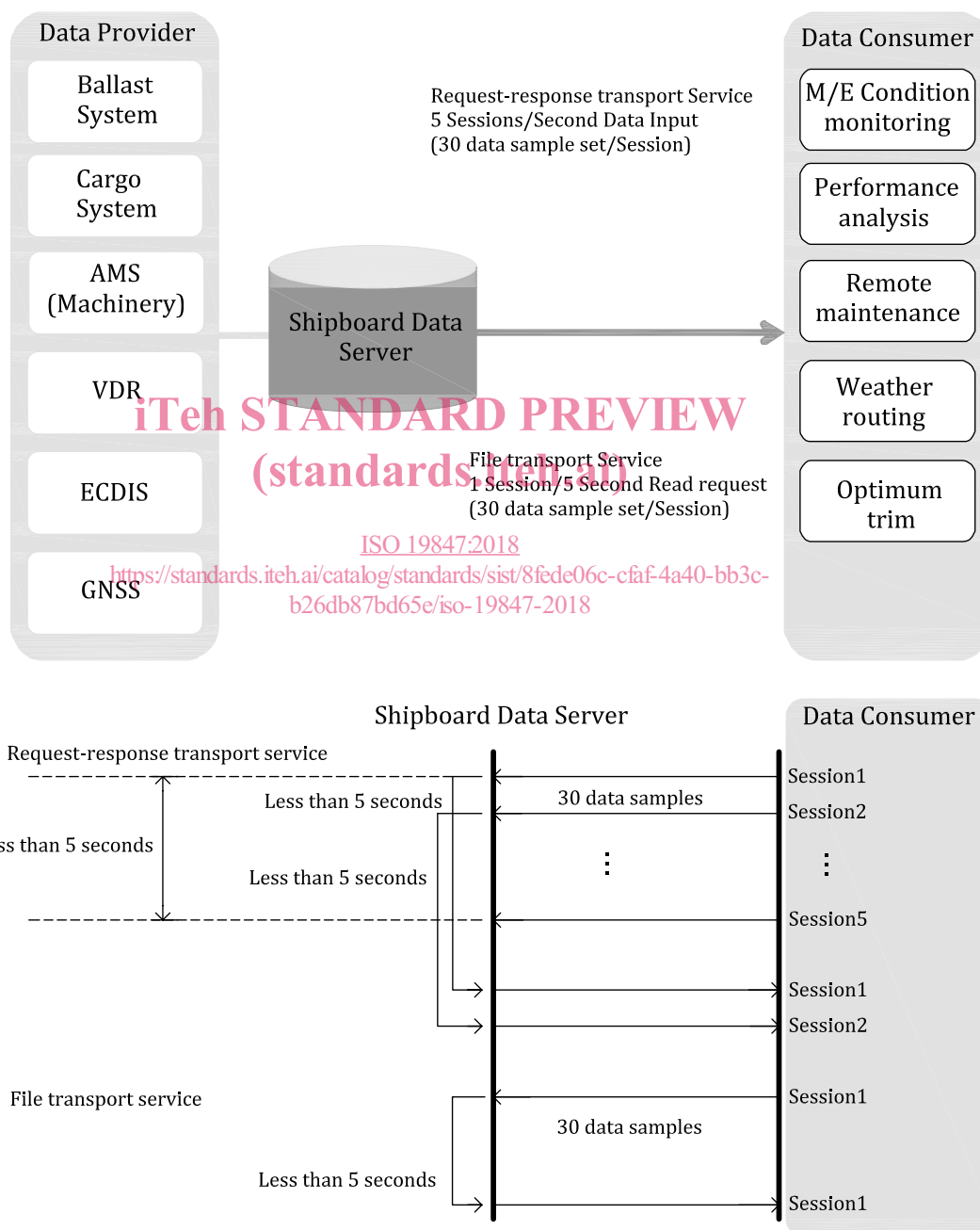


Figure 1 — Input data processing performance requirement

### 5.1.1.2 Output data processing performance

The shipboard data server using the request-response transport service shall have a processing performance to respond within five seconds against read requests for 30 data sample sets from a database having a maximum size as declared by the manufacturer and simultaneously from at least five sessions (for example main engine condition monitoring, weather-routing, optimum trim, remote maintenance and performance analysis). See [Figure 2](#).

The shipboard data server using the File transport service shall have a processing performance to respond within five seconds against read requests for 30 data sample sets from database having a maximum size as declared by the manufacturer on at least one session. See [Figure 2](#).



**Figure 2 — Output data processing performance requirement**

### 5.1.1.3 Streaming transport processing performance

The shipboard data server using the streaming transport service shall have a processing performance to input of 150 data sample sets at less than one-second to at least one session.

The shipboard data server using the streaming transport service shall have a processing performance to output of 150 data sample sets at less than one-second to at least two sessions by 150 input data sample sets (e.g. condition monitoring and performance analysis system). See [Figure 3](#).

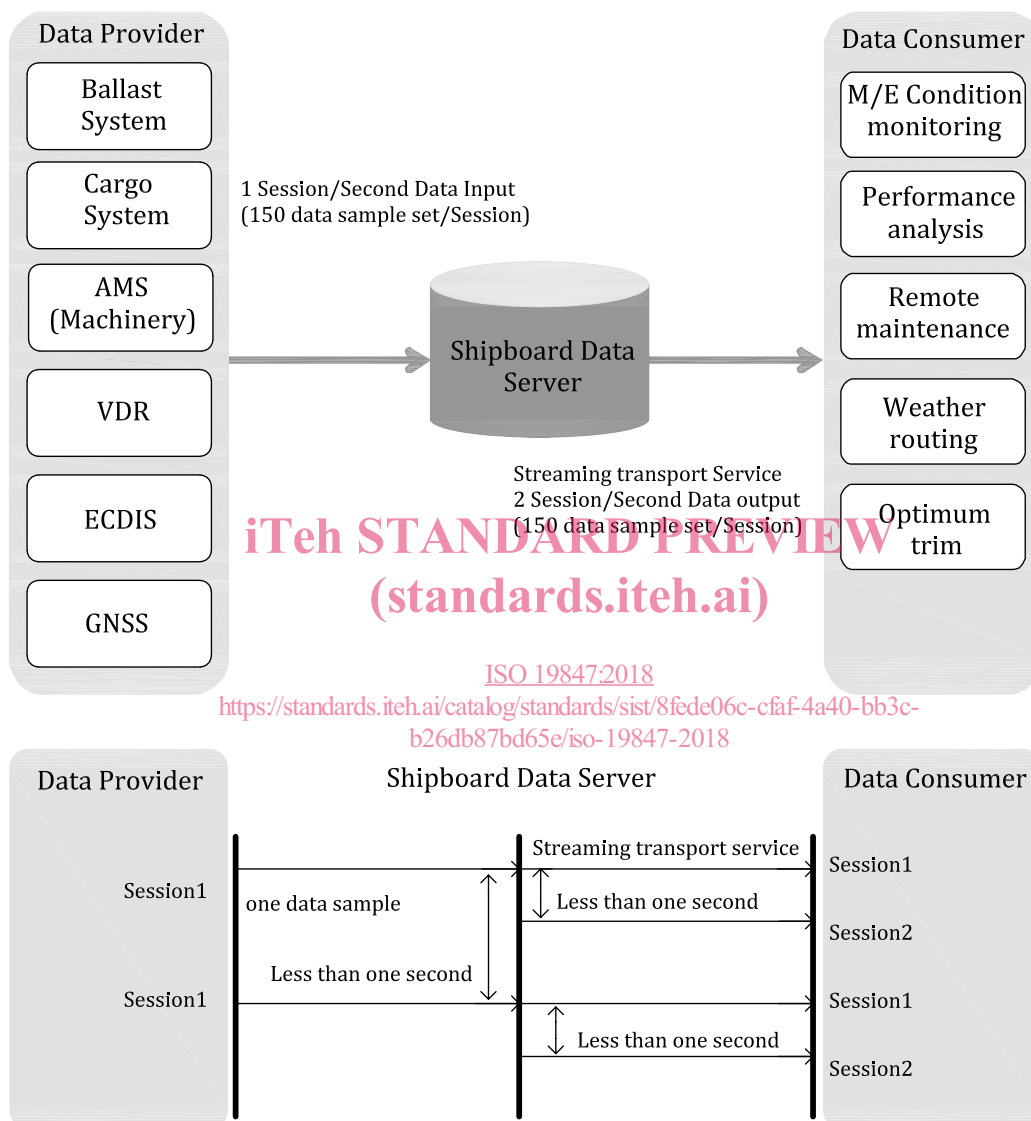


Figure 3 — Streaming transport processing performance requirement

### 5.1.2 Storage function

The shipboard data server shall be able to store input data, which are defined in [6.3.1](#), for at least 30 days.

The manufacturer shall give guidance in a user or installation manual on how much storage space is required per one record. Information about total storage capacity within the ship data sever shall also be provided.

The shipboard data server shall provide means to assist the user in estimating if the total storage capacity of the shipboard data server is sufficient for the required time period.

NOTE The shipboard data server can have a redundant function to protect management data and actual recorded data (e.g., RAID 1, 3 and 5 systems).

### 5.1.3 Interface function

The shipboard data server shall be able to provide data input and output functions (see 6.3).

The shipboard data server shall have one or more ethernet interfaces where data are transmitted at 100 Mbps or greater.

NOTE The shipboard data server can also have other interfaces capable of serial communications or other means for input of data.

### 5.1.4 Condition monitoring function

The shipboard data server shall be able to monitor the status of the following conditions:

- a) system failure of shipboard data server processor;
- b) failure to access storage device;
- c) failure of recording interface;
- d) loss of UTC synchronization;
- e) storage device full or having insufficient capacity for storing configured records up to 30 days.

The shipboard data server shall be able to report the above statuses to other systems on-board (see 5.1.8) and may provide local indication for the above statuses.

### 5.1.5 Data backup and restoration functions

The shipboard data server shall have backup and restoration functions for

- management data, and
- actual recorded data.

### 5.1.6 Function to protect against unauthorised access

The shipboard data server shall have protected settings, management data, actual recorded data and other items from accidental and/or unauthorised access.

### 5.1.7 REDS security

#### 5.1.7.1 Physical protection

Unused connection points such as USB ports shall be physically blocked from easy access by a user without a tool or key.

#### 5.1.7.2 Operational protection

USB connection points intended for keyboards, printers, etc. shall be blocked from easy access to avoid connection and use of a different device than intended, e.g. by means of a tool or key or by password-protection (disable/enable) in the device set-up.

Connection points used for access to data storage shall be configured to permit connection only to data sources identified as USB device class 08h (USB mass storage).