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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

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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).

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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.

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.

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.

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*

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]

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
Java Script Objection 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).

Note 2 to entry: It is similar to *XML* (3.13).

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®[1)] 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 Objection 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.

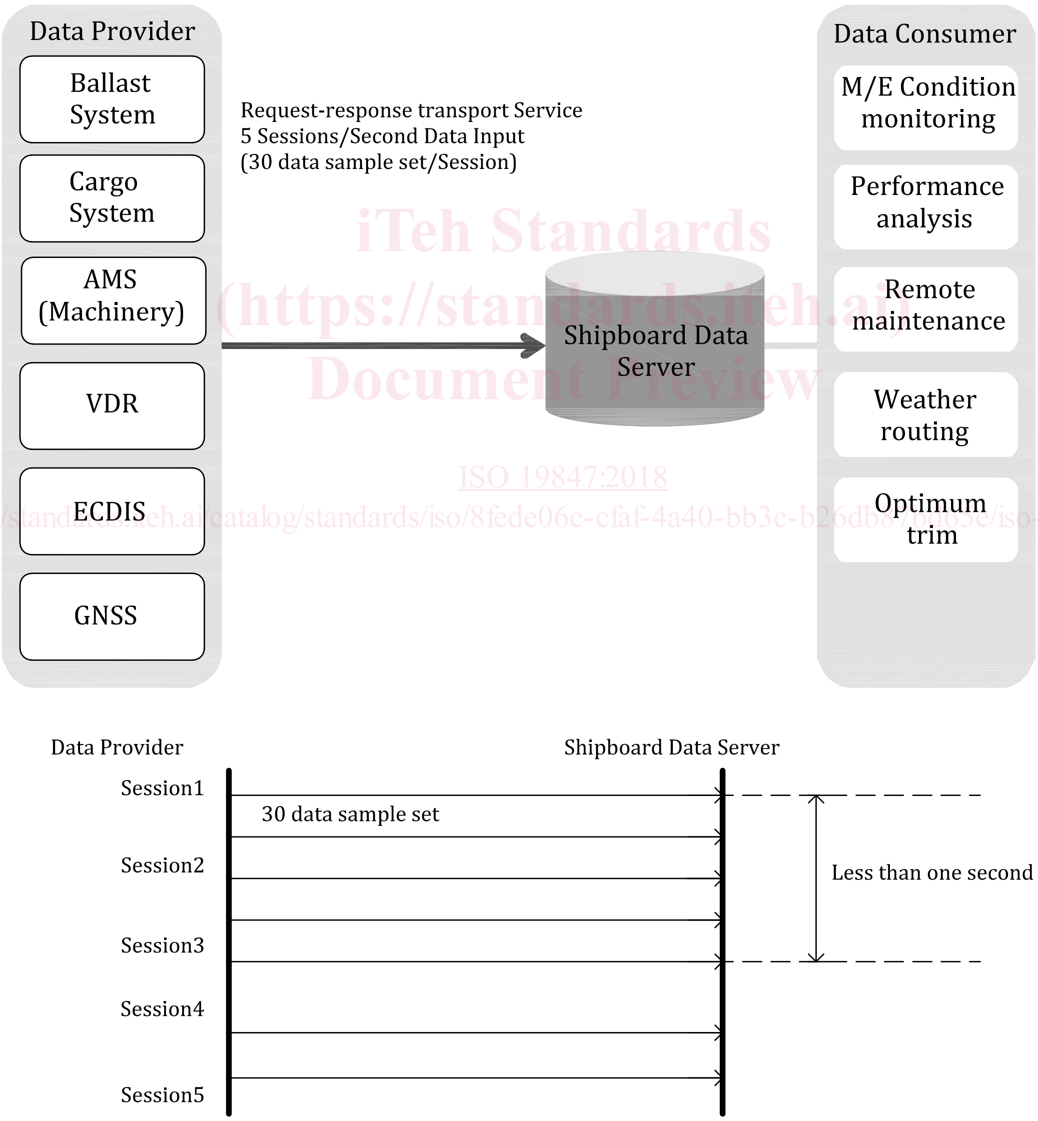

Figure 1 — Input data processing performance requirement

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.

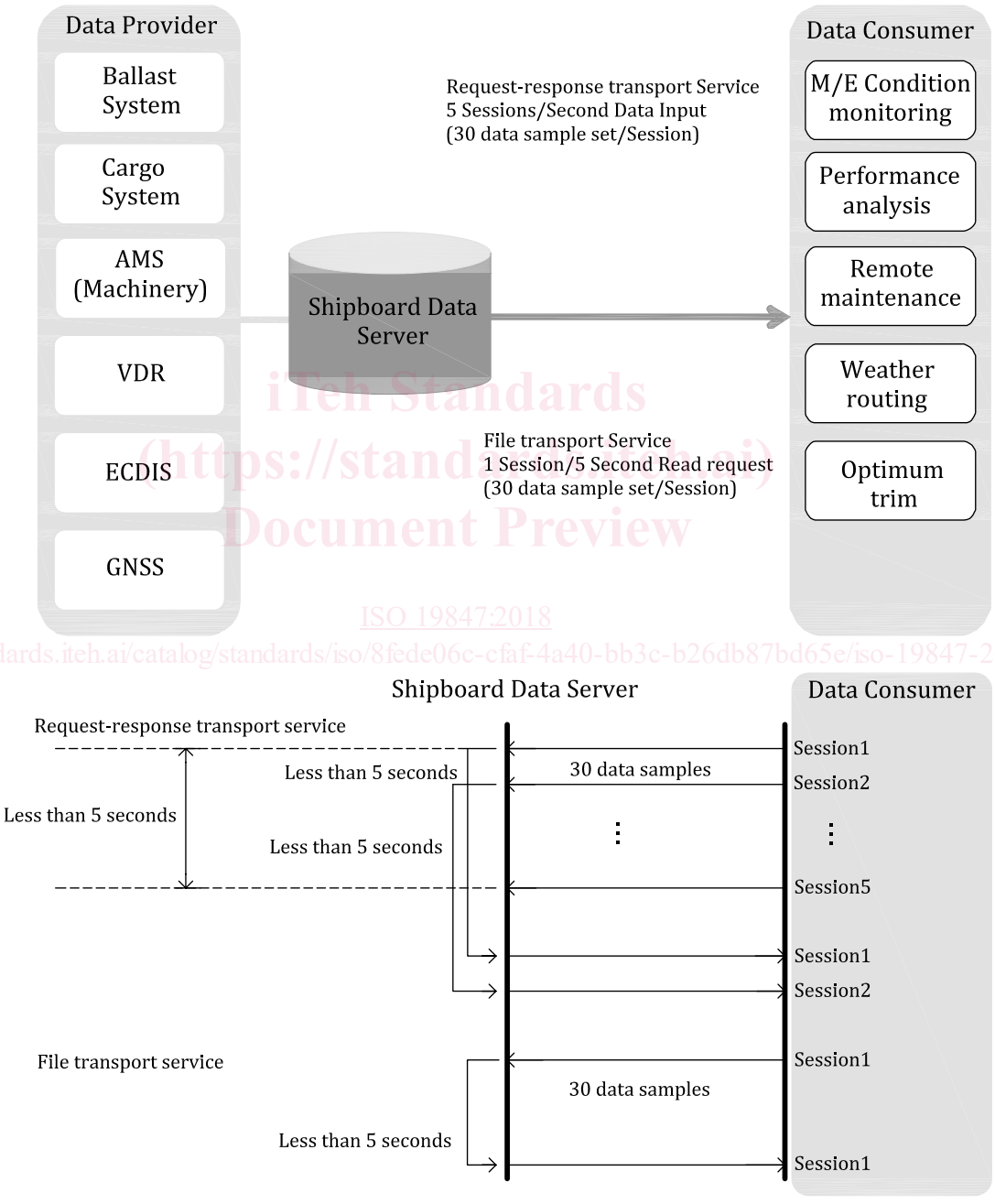

Figure 2 — Output data processing performance requirement

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.

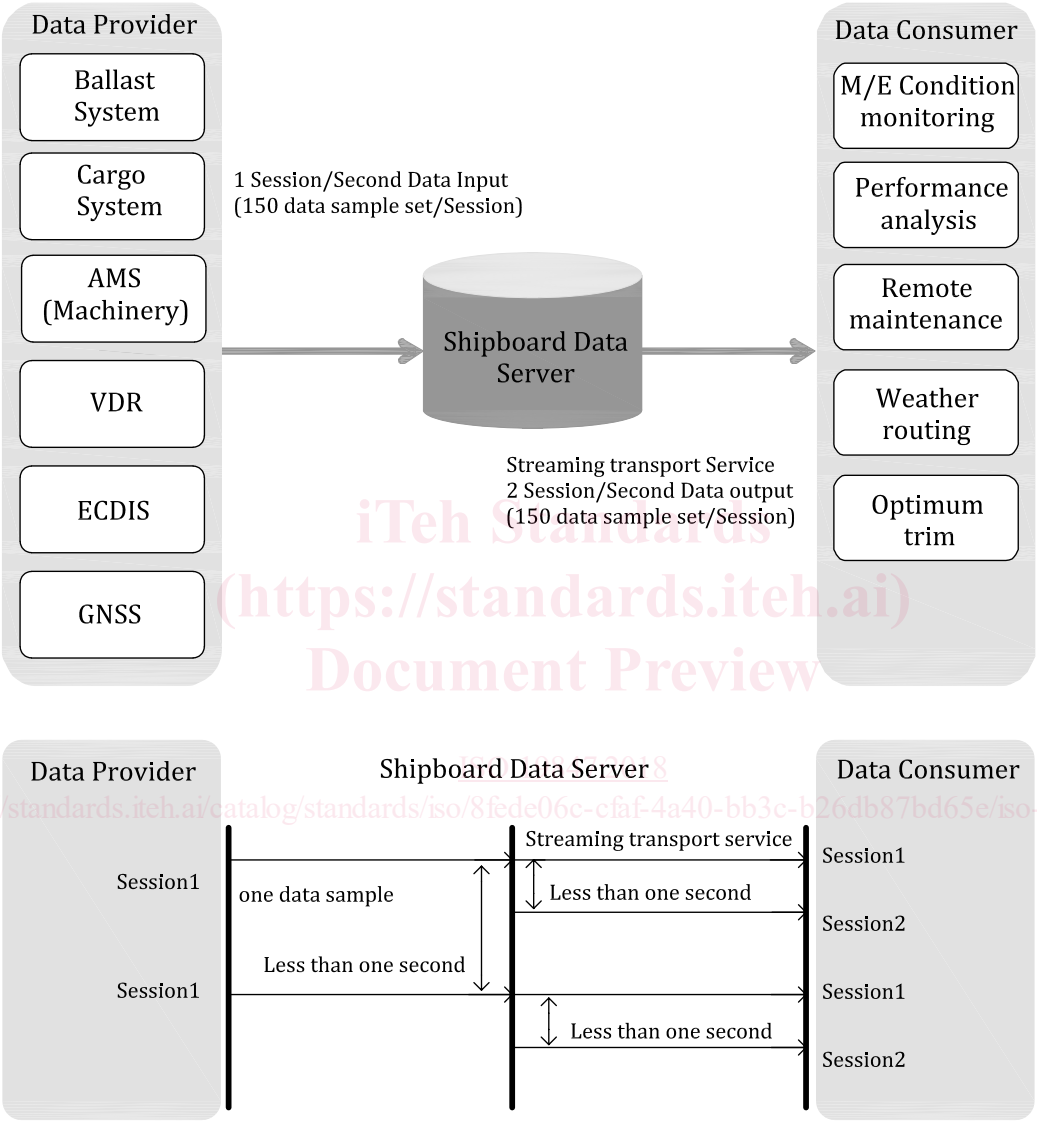

Figure 3 — Streaming transport processing performance requirement

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.