International Standard

ISO 19847

Ships and marine technology — Shipboard data servers for sharing field data at sea

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

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Contents

Page

iTeh Standards
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Document Preview

ISO 19847:2024
https://standards.iteh.ai/catalog/standards/iso/6e83c4a3-17f6-4255-8e3a-d1f554da2663/iso-19847-2024

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

This second edition cancels and replaces the first edition (ISO 19847:2018), which has been technically revised.

The main changes are as follows:

— In Clause 7, a specific security requirement on the shipboard data server has been added.

— In Clause 8, a test standard in a tabular arrangement of test objectives, conditions, methods, and test criteria has been added.

— In Annex H, implementation requirements for the calculation function have been added.

— In Clause 5, additional examples of an output statement for reporting status have been added.

— In Clause 6, an additional output function with JSON data has been added.

— In Annex C, additional query parameters to designate date and time, search for partial matches of Local IDs and obtain down sampling data have been added.

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 to ensure ships operate safely and efficiently are becoming increasingly popular.

These applications require access to data which is provided by shipboard machinery and equipment.

Navigational instruments can 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 standardized.

For the purpose of sharing field data at sea, including non-standardized machinery data, this document 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 specified in ISO 16425. The requirements for cyber security on the shipboard data server are specified.

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Ships and marine technology — Shipboard data servers for sharing field data at sea

1 Scope

This document specifies requirements for shipboard data servers that are 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.

This document is intended for users and developers of shipboard data servers, as well as users and developers of systems that record data on, or retrieve data from, shipboard data servers.

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 8601-1, *Date and time — Representations for information interchange — Part 1: Basic rules*

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

ISO 19848:2024, *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 60945, *Maritime navigation and radiocommunication equipment and systems — General requirements — Methods of testing and required test results*

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

IEC 61162-450:2018, *Maritime navigation and radiocommunication equipment and systems — Digital interfaces — Part 450: Multiple talkers and multiple listeners — Ethernet interconnection*

IEC 62923-1, *Maritime navigation and radiocommunication equipment and systems — Bridge alert management — Part 1: Operational and performance requirements, methods of testing and required test results*

IEC 62923-2, *Maritime navigation and radiocommunication equipment and systems — Bridge alert management — Part 2: Alert and cluster identifiers and other additional features*

INTERNET SOCIETY (ISOC) RFC 3986, *Uniform Resource Identifier (URI): Generic Syntax [online]. Edited by T. Berners-Lee, W3C/MIT, R. Fielding, Day Software, L. Masinter and Adobe Systems. January* 2005 *[viewed 2023-05-13]. Available at* https://datatracker.ietf.org/doc/html/rfc3986

IACS Rec.166, *Recommendation on Cyber Resilience*

3 Terms and definitions

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

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
actual recorded data
actual (sensor) data acquired from *data providers* (3.10) and recorded to the *shipboard data server* (3.38)

3.2
Alias ID
symbol to refer to one or more *Local IDs* (3.24) with different names

3.3
Alias List
list defining a list of virtual *Data Channel IDs*

Note 1 to entry: The Data Channel ID is the identifier for the *Data Channel* (3.7) that identifies Data Channel universally and on-board a ship. There are three types of Data Channel ID: Universal ID, *Local ID* (3.24) and Short ID.

3.4
calculation function
functions to provide calculated data (e.g. min, max and average)

Note 1 to entry: The calculated data provided is in accordance with the calculation data structures specified in ISO 19848.

3.5
calculation list
list which defines the *calculation function* (3.4) that executes calculations, and the input and output parameters given to the calculation element

3.6
comma-separated value
CSV
method of storing tabular data in plain text in a file in which each row of the file forms a data record and in which fields within one data record are separated by a comma character

3.7
Data Channel
virtual channel for data transmission from shipboard machinery and equipment to the *shipboard data server* (3.38), defining static properties of data

[SOURCE: ISO 19848:2024, 3.5]

3.8
Data Channel List
list of definitions for the *Data Channel* (3.7) that define the Data Channel ID and the Data Channel Property, and is shared through the *shipboard data server* (3.38)

Note 1 to entry: The Data Channel Property shows attributes of the *Data Channel* (3.7), such as units, ranges and others.

[SOURCE: ISO 19848:2024, 3.7]

3.9
Data Channel Type
identification of the types of *Data Channels* (3.7), such as row numeric value, average value, alarms and status

Note 1 to entry: See ISO 19848:2024, 5.2 a).

3.10
data provider
equipment that provides (sends) data to the *shipboard data server* ([3.38](#)) and has interfaces for providing data

3.11
Data Source Information
description of communication protocols and formats in which a *data provider* ([3.10](#)) sends data

3.12
data sample
measurement datum that has a timestamp

3.13
eXtensible markup language
XML
text-based data description language used for exchanging data on the Internet

[SOURCE: ISO 19848:2024, 3.10]

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 *file transfer protocol* ([3.14](#)) with a secure sockets layer (SSL) or transport layer security (TLS)

3.16
Function ID
identification for the calculation function with which the *shipboard data server* ([3.38](#)) performs the calculation

3.17
hypertext transfer protocol
HTTP
communication protocol used to exchange hypertext markup language (HTML) or other contents on the internet

3.18
hypertext transfer protocol over SSL/TLS
HTTPS
protocol in which web servers and clients encrypt data transmissions

3.19
internet control message protocol
ICMP
protocol consisting of communication rules that are used for purposes such as notifications of errors in the processing of datagrams, and notifications of information relating to communication

Note 1 to entry: This protocol is according to RFC 792.

3.20
internet group management protocol
IGMP
protocol which is used on IPv4 networks to report multicast group memberships

Note 1 to entry: This protocol is according to RFC 1112, RFC 2236 and RFC 4604.

3.21
input parameter
variable which gives information to the calculation function which is needed to perform the calculation

3.22
java script 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).

Note 2 to entry: It is similar to *eXtensible markup language* (3.13).

3.23
Local Data Name
identifier for *Data Channels* (3.7), which is named in accordance with a *Naming Rule* (3.28)

Note 1 to entry: The syntax of the identification string shall be disclosed and precisely defined using the augmented Backus-Naur form (ABNF).

Note 2 to entry: See ISO 19848:2024, 5.1.3 b).

3.24
Local ID
identification of an on-board *Data Channel* (3.7) locally, consisting of a *Naming Rule* (3.28) and a *Local Data Name* (3.23)

3.25
management data
catalogues that allow access to, and interpretation of, recorded data

EXAMPLE Timestamped *Data Source Information* (3.11), *Data Channel List* (3.8) and *Alias List* (3.3).

3.26
malware
malicious code
software used or created to disrupt computer operation

[SOURCE: IEC 61162-460:2018, 3.23]

3.27
message queuing telemetry transport protocol
MQTT protocol
protocol for machine-to-machine (M2M)/Internet of Things (IoT) connectivity designed as an extremely lightweight publish/subscribe messaging transport; it is also one of the streaming protocols

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

3.28
Naming Rule
set 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 19848:2024, 5.1.3 a).

3.29
network file system
NFS
distributed file system and a protocol for distributed file systems and other protocol specifications

Note 1 to entry: This system is defined by RFC 1094, RFC 1813 and RFC 3530.

3.30
owner
specified person who can restrict editors and users

3.31
output parameter
variable which gives destinations to the calculation function to which calculation results are output

3.32
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]

3.33
REST API
program invocation convention for using web systems from outside, developed in accordance with the architectural style called representational state transfer (REST)

Note 1 to entry: Resource operations are designated by *HTTP* (3.17) sources. Results are sent back in *XML* (3.13), *JSON* (3.22) and other formats.

3.34
secure file transfer protocol
SFTP
protocol that uses the *SSH* (3.35) protocol to securely transfer files between computers

3.35
secure shell
SSH
cryptographic protocol that allows secure communications over an unsecured network

3.36
session
stateful or stateless dialogue established to exchange data between a *shipboard data server* (3.38) and shipboard equipment or systems

3.37
server message block
SMB
protocol for sharing files and printers among several Windows®[2)] computers in networks

3.38
shipboard data server
information hub of a ship that stores data from shipboard machinery and equipment, shares data at sea including machine data, and sends stored data outboard

[SOURCE: ISO 19848:2024, 3.18]

3.39
syslog
standard for message logging

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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 the product named. Equivalent products may be used if they can be shown to lead to the same results.

2)   Windows® is the trademark of products supplied by the Microsoft Corporation. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.

4 Abbreviated terms

AMS	alarm monitoring system
BWMS	ballast water management 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	hypertext markup language
HTTP	hypertext transfer protocol
HTTPS	hypertext transfer protocol over SSL/TLS
IT	Information technology
JSON	java script object notation
M/E	main engine
MQTT	message queuing telemetry transport
NFS	network file system
OPC UA	open platform communications unified architecture
OT	operational technology
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
TCP	transmission control protocol
TLS	transport layer security
UDP	user datagram protocol
URI	uniform resource identifier
UTC	coordinated universal time
UTM	unified threat management
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

5.1.1.1 General

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.

5.1.1.2 Input data processing performance

The shipboard data server using the request-response transport service shall process input data from a set of 30 data samples per session, within one second, from at least five simultaneous sessions (e.g. VDR, GNSS, alarm and monitoring systems, ballast systems and cargo systems). See Figure 1.
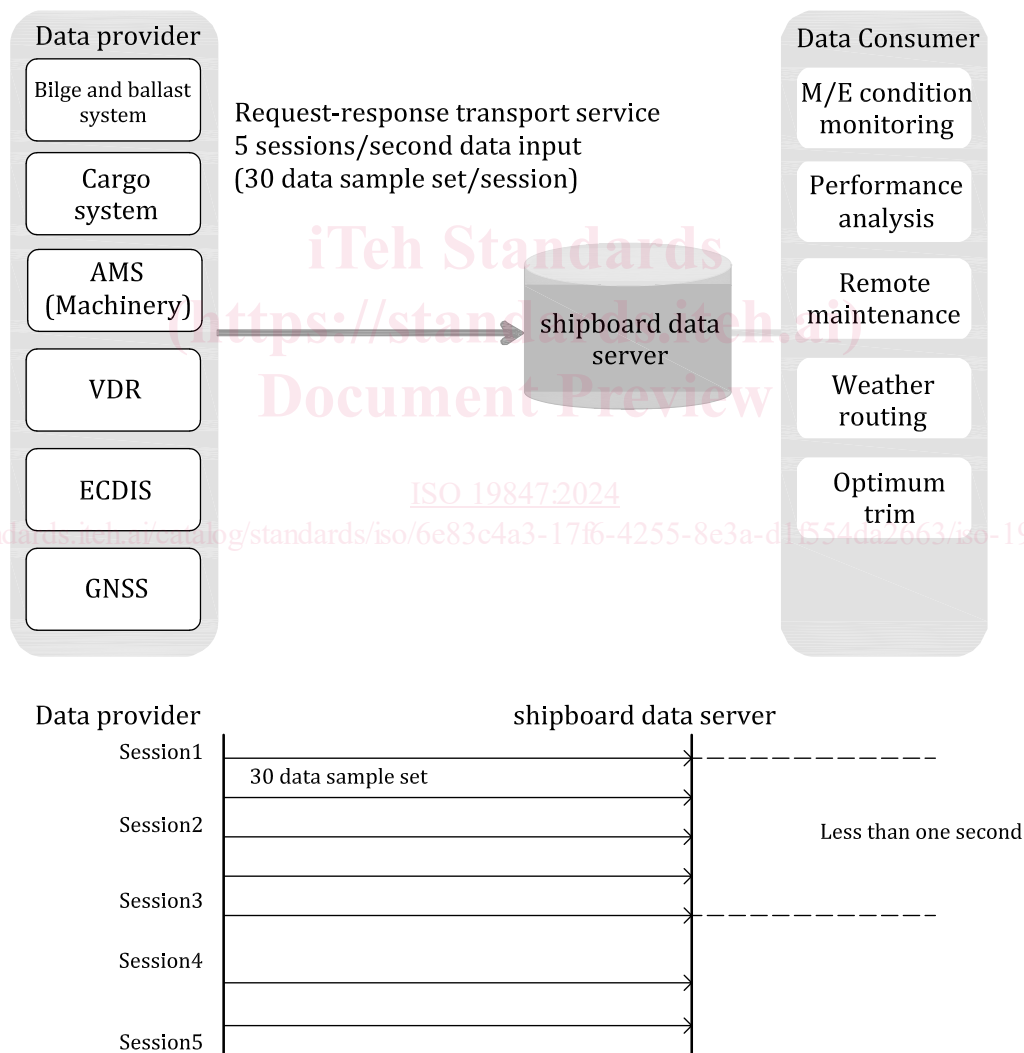

Figure 1 — Input data processing performance requirement

5.1.1.3 Output data processing performance

When the shipboard data server is using the request-response transport service:

— it shall be able to process the read request of a set of 30 data samples per session, from at least five sessions simultaneously (e.g. main engine condition monitoring, weather-routing, optimum trim, remote maintenance and performance analysis);

— the five sessions shall be processed in less than five seconds; and

— the size of the database shall meet the manufacturer's limit.

When the shipboard data server is using the file transport service:

— it shall have a processing performance to respond to the read requests of a set of 30 data samples per session;

— at least one session shall be processed in less than five seconds; and

— the size of database shall meet the manufacturer's limit.

See Figure 2.

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