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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).

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).

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.

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

On-board computer applications for safety and energy-efficient operations have become popular. These applications require access to data of shipboard machinery and equipment.

To access data of navigational equipment, a data exchange standard, the IEC 61162 series can be used. However, access of data from other on-board components and systems (e.g. machinery, safety equipment and hull) have not yet been standardised.

Exchanging non-standardised data between and/or among applications requires name-based aggregation and format mapping. However, this requires a large amount of labour, which hinders the use of such data.

To improve these situations, this document defines unified rules for developing machine and human-readable identifiers and data structures for shipboard machinery and equipment, with the objective to facilitate exchange and processing of sensor data from ships.

This document defines two concepts and their models for data exchange: one is Data Channel, and the other is Time Series Data. This document thus defines two distinct data structures and file formats: A Data Channel List, which contains the necessary meta-data, and a Time Series Data format for measurements. The time-series format is designed to be lightweight and it therefore contains minimal meta-data information only in the form of a reference to the channel list.

Data Channel is a concept that represents virtual data transmission channels, and defines time-invariant properties. Data Channel can be viewed as a static description for the different sensor data streams.

Data Channel is composed of Data Channel ID and Data Channel Property.

Data Channel ID uniquely identifies the logical data channels. Data Channel Property defines attributes of Data Channel.

There are three types of Data Channel ID. One is Local ID, which is a unique identifier used on-board a ship, and another is Universal ID, which is a universal identifier, composed of Name Entity, Ship ID (e.g., IMO numbers) and Local ID. The other ID is Short ID, a short alternative ID of Local ID.

The purpose of this document is for exchanging data on-board a ship; however, in the future, shipboard machinery and equipment may be connected directly to the Internet.

Therefore, considering the compatibility between Data Channel ID and URLs, which are used to identify data on the Internet, Data Channel ID has a hierarchical structure with slashes as delimiters. To represent a hierarchy, Data Channel is categorised in accordance with the standardised categorising rule and named by concatenating these category names with slashes.

In Annexes B and C, two types of categorising rules and example of codebook, lists of standardised category names given in accordance with the rules, are defined for reference.

They are not designed to unify Data Channel ID, but it is assumed that some entities will develop, maintain and manage codebook and that they will be disclosed widely.

Data Channel Property is assumed to be used to automate data processing and help understanding of data. Data Channel Property shall be used because it is considered to be essential to both computer applications and humans for the reasons mentioned above.

Time Series Data is a concept that represents collection of time-stamped data. Time Series Data is assumed to be used for sharing latest data and for analysing trends made over time-stamped data.

For reliable data exchange, this document mandates the use of XML (Extensible Markup Language) and XML Schema for data encoding and data structure definition. Using XML and XML schemas makes it possible to define data structures precisely and validate data in accordance with such definitions.

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As a result, it is believed that data can be exchanged more reliably between and/or among computer applications.

Further, for convenience and efficiency, this document also defines data-structures in JSON and CSV format.

It is assumed that data from shipboard machinery and equipment will be collected by shipboard data servers, which are defined in ISO 19847. Then, the data encoded in accordance with this document, in some cases, could be encrypted for security reasons, will be shared between and/or among computer applications in a wide variety of means, such as in Hyper Text Transfer Protocol (HTTP), in Message Queue Telemetry Transport (MQTT) or by e-mail through the servers. As described above, external computer applications can retrieve on-board data uniformly by accessing the servers.

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Ships and marine technology — Standard data for shipboard machinery and equipment

1 Scope

This document applies to the structure of the ship and to shipboard machinery and equipment, and is intended for implementers of software used for the capture and processing of sensor data from the objects mentioned above.

For those purposes, this document describes the way to name the sensor, required data item, and the way to describe the data above.

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/IEC 80000 series, *Quantities and units*

W3C XML: Extensible Markup Language (XML) 1.0, W3C Recommendation

W3C XML Schema Part 1: XML Schema Part 1: Structures, W3C Recommendation

W3C XML Schema Part 2: XML Schema Part 2: Datatypes, W3C Recommendation

RFC 3339, *Date and Time on the Internet: Timestamps*

RFC 4180, *Common Format and MIME Type for Comma-Separated Values (CSV) Files*

RFC 5234, *Augmented BNF for Syntax Specifications: ABNF*

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 http://www.electropedia.org/

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

3.1
alert data
information that represents abnormal conditions of shipboard machinery and equipment

3.2
analogue data
numerical information obtained from sensors such as temperature sensors and pressure sensors

Note 1 to entry: Analogue data is a physical value converted from raw electric signals, such as 4-20 mA or 0-5 V.