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Ships and marine technology — General requirements for the asynchronous time-insensitive ship-shore data transmission

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Foreword

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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.

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This document was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*.

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.

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Introduction

Sharing data between ships and the shore to ensure the safe and efficient operation of ships is becoming increasingly common.

Progress has been made in establishing data sharing between ships and the shore, related to ports, cargo and shipping routes. This includes the development of and discussions around standards such as related to Maritime Single Window and e-Navigation, which help to share some stylized data safely and in a timely manner between ships and shore.

On the other hand, the ship-shore communication environment is still narrower than those on land, and its connection is unstable. Therefore, a method for stably and efficiently sharing files of any format with a relatively large file size, such as various data and image files used in ship operation business applications, between ships and shore has not yet been standardized.

For example, in ship operations, onboard and on-shore application users determine the timing of data transmission and reception in relation to the connection status and communication quality of ship-shore communication each time, and perform data retransmission processing independently for each application.

In order to further promote the safe and efficient operation of ships, it is increasingly important to be able to send and receive files between ships and shore in a stable and efficient manner asynchronously without being affected by the ship-shore communication status.

In this document, asynchronous communication means the communication and/or application processing perspective, such as time-insensitive data transmission for non-real-time applications where the timing of the data generating and consuming can be different.

Although ISO 19847 and ISO 19848 provide standardized processes for efficient collection and storage of data for ship equipment systems, the method of asynchronously transmitting and receiving a large amount of ship equipment data accumulated on board between ships and shore has not been standardized yet. In order to promote shore support for ship operation and maintenance of onboard equipment systems, there is a need for a stable and efficient method for transmitting and receiving such onboard field data asynchronously between ships and shore.

This document specifies the functional requirements but does not intend to specify technical protocols.

Please see Annex A for more information on the correlation of between the different relevant standards.

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Ships and marine technology — General requirements for the ~~Asynchronous~~synchronous time-insensitive ship-shore data transmission

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1 Scope

This document describes the requirements involved in ship to shore data communication between the shipboard data servers and the on-shore data servers. It provides information on:

- asynchronous communication;
- a method to measure end-to-end communication quality;
- transport integrity;
- transport security (e.g. encryption, authentication and authorization);
- management of data transmission (e.g. prioritization, logging, carrier awareness/management);
- communication optimization (e.g. deduplication, compression, resume, multiplexing);
- compliance with the data communication protocols, including but not limited to ISO 19847.

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- the security of the data producer/consumer (e.g. identity management);
- communication equipment requirements;
- carrier performance requirements (e.g. bandwidth and latency).

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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/IEC-20922, Information technology — Message Queuing Telemetry Transport (MQTT) v3.1.1

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/https://www.electropedia.org/>

3.1 asynchronous communication

Time-insensitive data transmission for onboard applications that transmit ship data and/or non-real-time applications where the timing of the data generating and consuming can be different.

Note 1 to entry: This definition is not from the data protocol perspective.

Note 2 to entry: ISO 19847 is an example of an onboard application.

Note 3 to entry: The scope of the definition of asynchronous communication in this standard cover document covers messaging services such as message queuing telemetry transport and similar protocols but not streaming using datagram protocol.

Note 4 to entry: Table 1 compares the definition of synchronous and asynchronous communication.

Table 1.— Intentions regarding synchronous/asynchronous in this document

Table with 2 columns: Communication/application perspective, Synchronous, Asynchronous. Synchronous: The receiver sends a response, and the sender waits for the response before sending the next data. Asynchronous: The receiver sends a response, and the sender sends the next data without waiting for the response.

3.2 data transport agent

software installed on a ship or shore that interfaces with peripheral devices and systems

Note 1 to entry: The data transport agent collects and sends data to the asynchronous data management agent (3.3) or receives data from the asynchronous data management.

3.3 asynchronous data management agent

software used for the control and transport of data between ship and shore data transport agent (3.2)

4 Abbreviated terms

- AES advanced encryption standard
AES-CCM AES-Counter with Cipher Block Chaining Message Authentication Code
AES-GCM AES-Galois/Counter Mode
API Application Programming Interface
BIZ-LAN Business Local Area Network
ChaCha20 a stream cipher specified in RFC 7539
ChaCha20-Poly1305 a cryptographic algorithm that combines ChaCha20 and Poly1305
DH Diffie-Hellman key exchange algorithm

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DHE	Diffie-Hellman Ephemeral key exchange algorithm
DMZ	DeMilitarized Zone
ECDH	Elliptic Curve <u>elliptic curve</u> Diffie-Hellman key exchange algorithm
ECDHE	Elliptic Curve <u>elliptic curve</u> Diffie-Hellman Ephemeral <u>ephemeral</u> key exchange algorithm
ECDSA	Elliptic Curve Digital Signature Algorithm <u>elliptic curve digital signature algorithm</u>
F/W	Firewall <u>firewall</u>
GraphQL	Query <u>query</u> language and runtime designed for APIs
HTTP	Hypertext Transfer Protocol <u>hypertext transfer protocol</u>
IoT	Internet of Things <u>things</u>
LAN	Local Area Network <u>local area network</u>
MQTT	Message Queuing Telemetry Transport <u>message queuing telemetry transport</u>
OT	Operational Technology <u>operational technology</u>
Poly1305	a cryptographic message authentication mode specified in RFC 7539 <u>8439</u>
PSEC-KEM	Provably Secure Elliptic Curve <u>provably secure elliptic curve</u> encryption with Key Encapsulation Mechanisms <u>key encapsulation mechanisms</u>
REST	REpresentational State Transfer <u>state transfer</u>
RSASSA-PKCS1-v1_5	a digital signature algorithm specified in RFC 8017
RSASSA-PSS	a digital signature algorithm specified in RFC 8017
SHA-256	Secure Hash Algorithm <u>secure hash algorithm</u> -256
SHA-384	Secure Hash Algorithm <u>secure hash algorithm</u> -384
SHA-512	Secure Hash Algorithm <u>secure hash algorithm</u> -512
TCP	Transmission Control Protocol <u>transmission control protocol</u>
TLS1.3	Transport Layer Security <u>transport layer security</u> version 1.3
UDP	User Datagram Protocol <u>user datagram protocol</u>
UR E22	International Association of Classification Societies (IACS) Unified Requirement Electrical and Electronic Installations 22
UTM	Unified Threat Management <u>unified threat management</u>
VSAT	Very Small Aperture Terminal <u>very small aperture terminal</u>

5 General requirements

5.1 General

Communication between shore and ship are usually initiated from the vessel side. The vessel in most cases has a random IP address and it is difficult to change the firewall rules to allow traffic from shore

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