IEC 61162-450

Edition 2.0 2018-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Maritime navigation and radiocommunication equipment and systems – Digital interfaces –
Part 450: Multiple talkers and multiple listeners – Ethernet interconnection

Matériels et systèmes de navigation et de radiocommunication maritimes – Interfaces numériques –
Partie 450: Émetteurs multiples et récepteurs multiples – Interconnexion Ethernet

IEC 61162-450:2018-05(en-fr)

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MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – DIGITAL INTERFACES –

Part 450: Multiple talkers and multiple listeners – Ethernet interconnection

FOREWORD

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International Standard IEC 61162-450 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

This bilingual version (2018-10) corresponds to the monolingual English version, published in 2018-05.

This second edition of IEC 61162-450 cancels and replaces the first edition published in 2011 and Amendment 1:2016. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) network traffic filtering based on IGMP snooping added;

b) network traffic balancing added;

c) new encapsulation of IEC 61162-3 PGNs added;

d) new alternative for binary file transfer added: TCP/IP based on Annex H of IEC 62388:2007 on radars;

e) general authentication tag "a:" added to support managing of cyber security risk.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
80/880/FDIS	80/885/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

The French version of this standard has not been voted upon.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 61162 series, published under the general title *Maritime navigation and radiocommunication equipment and systems -Digital interfaces*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – DIGITAL INTERFACES –

Part 450: Multiple talkers and multiple listeners – Ethernet interconnection

1 Scope

This part of IEC 61162 specifies interface requirements and methods of test for high speed communication between shipboard navigation and radiocommunication equipment as well as between such systems and other ship systems that need to communicate with navigation and radio-communication equipment. This document is based on the application of an appropriate suite of existing international standards to provide a framework for implementing data transfer between devices on a shipboard Ethernet network.

This document specifies an Ethernet based bus type network where any listener can receive messages from any sender with the following properties.

- This document includes provisions for multicast distribution of information formatted according to IEC 61162-1, for example position fixes and other measurements, as well as provisions for transmission of general data blocks (binary file), for example between radar and VDR, and also includes provisions for multicast distribution of information formatted according to IEC 61162-3, for example position fixes and other measurements.
- This document is limited to protocols for equipment (network nodes) connected to a single Ethernet network consisting only of OSI level one or two devices and cables (Network infrastructure).
- This document provides requirements only for equipment interfaces. By specifying protocols for transmission of IEC 61162-1 sentences, IEC 61162-3 PGN messages and general binary file data, these requirements will guarantee interoperability between equipment implementing this document as well as a certain level of safe behaviour of the equipment itself.
- This document permits equipment using other protocols than those specified in this document to share a network infrastructure, provided that it is supplied with interfaces which satisfy the requirements described for ONF.
- This document includes provisions for filtering of the network traffic in order to limit the amount of traffic to manageable level for each individual equipment.

This document does not contain any system requirements other than the ones that can be inferred from the sum of individual equipment requirements. An associated standard, IEC 61162-460, further addresses system requirements.

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.

IEC 60825-2, *Safety of laser products – Part 2: Safety of optical fibre communication systems (OFCS)*

IEC 60945, *Maritime navigation and radiocommunication equipment and systems – General Requirements – Methods of testing and required test results*

IEC 61162-1:2016, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 1: Single talker and multiple listeners*

IEC 61162-3:2008, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 3: Serial data instrument network*

IEEE Std 802.3-2015, *IEEE Standard for Ethernet*

ISOC RFC 768, *User Datagram Protocol, Standard STD0006*

ISOC RFC 791, *Internet Protocol (IP), Standard STD0005 (and updates)*

ISOC RFC 792, *Internet Control Message Protocol (ICMP), Standard STD0005 (and updates)*

RFC 793:1981, *Transmission Control Protocol (TCP)*

ISOC RFC 826, *An ethernet Address Resolution Protocol*

ISOC RFC 1112, *Host Extensions for IP Multicasting, Standard STD0005 (and updates)*, (include IGMP version 1)

ISOC RFC 1918, *Address Allocation for Private Internets, Best Current Practice BCP0005*

ISOC RFC 2236, *Internet Group Management Protocol, Version 2*

ISOC RFC 2474, *Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers*

ISOC RFC 3376, *Internet Group Management Protocol, Version 3*

ISOC RFC 5000, *Internet Official Protocol Standards, Standard 0001*

ISOC RFC 5227, *IPv4 Address Conflict Detection*

ISOC RFC 5424, *The Syslog Protocol*

NMEA 0183:2008, *Standard for interfacing marine electronic devices, Version 4.00*

NOTE The standards of the Internet Society (ISOC) are available on the IETF websites http://www.ietf.org. Later updates can be tracked at http://www.rfc-editor.org/rfcsearch.html.

3 Terms and definitions

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

3.1
ASCII
printable 7 bit character encoded in one byte

3.2
binary file
data block without formatting known to this protocol, i.e., non IEC 61162-1 formatted data, that can be transmitted with the protocol defined in 7.3 or in 7.5

Note 1 to entry: The term "binary file" is used to differentiate the general data transfer protocol (which may or may not be in ordinary text format) from the transmission of sentences that is always in 7 bit ASCII format.

3.3
byte
group of 8 bits treated as one unit

Note 1 to entry: This corresponds to what is also sometimes called an octet.

3.4
command-response pair
CRP
messages exchanged between parties that synchronize state changes on both sides through the exchange

Note 1 to entry: CRP are defined in Annex A.

Note 2 to entry: Both the command and the reply message may also be used as a sensor broadcast message in some cases. Thus, the implementation of the semantics of the message exchange is somewhat different between different users of the exchange.

3.5
datagram
atomic UDP transmission unit on the Ethernet as defined in ISOC RFC 768 and as constrained elsewhere in this document

3.6
Ethernet
carrier sense, multiple access collision detect (CSMA/CD) local area network protocol standard as defined in IEEE Std 802.3 and later revisions and additions to IEEE 802

Note 1 to entry: The types of Ethernet media that can be used for implementation of this document are defined in Clause 5.

3.7
function block
specified functionality implemented by equipment

Note 1 to entry: Equipment normally implements multiple function blocks. Requirements to equipment are the sum of requirements to the function blocks it implements. Function blocks are defined in Clause 4.

3.8
Internet Group Management Protocol
IGMP
communications protocol used by hosts and adjacent routers on IPv4 networks to establish multicast group memberships

Note 1 to entry: The IGMP is an integral part of IP multicast.

3.9
IGMP snooping
process of listening to Internet Group Management Protocol (IGMP) network traffic

3.10
Internet assigned number authority
IANA
global coordination of the Domain Name Server (DNS) Root, IP addressing, and other Internet protocol resources, including UDP and TCP port numbers

Note 1 to entry: The currently assigned numbers are listed in http://www.iana.org/assignments/port-numbers.

3.11
Internet protocol
IP
signalling protocol used and defined in ISOC RFC 791 (and updates)

3.12
message
collection of one or more sentences that are grouped by mechanisms internal to the sentence, for instance by sequence numbers as in the TXT sentence

Note 1 to entry: A stand-alone sentence is a message.

3.13
message type
classification of IEC 61162-1 sentence formatters into SBM, MSM and CRP types

Note 1 to entry: SBM, MSM and CRP types are defined in Annex A.

Note 2 to entry: This document defines different requirements to the transmission of different message types.

3.14
multi-sentence message
MSM
logical group of messages and/or sentences where the full meaning of the group is dependent on the receiver reading the full group

Note 1 to entry: Multi-sentence messages that are grouped together with a TAG construct are also a sentence group.

Note 2 to entry: MSM are defined in Annex A.

3.15
network
physical Ethernet network with one Internet address space, consisting only of the network nodes, switches, cables and supporting equipment such as power supply units

3.16
network function block
NF
function block responsible for physical connectivity to the network and connectivity to the transport layer as described in 4.3

3.17
network infrastructure
part of the network that provides a transmission path between network nodes

Note 1 to entry: The network nodes are not part of the network infrastructure.

3.18
network node
physical device connected to the network and which have an Internet address

Note 1 to entry: It is also called an Internet host.

Note 2 to entry: A network node will normally correspond to equipment. “Equipment” is used in this document.

3.19
other network function block
ONF
function block that interfaces to the network, but which is not using the protocol definition in Clauses 5, 6 and 7

Note 1 to entry: For example, real time streaming of radar and CCTV image transfer, or VDR sound transfer.

Note 2 to entry: Requirements as defined in 4.7 ensure that an ONF can co-reside with SF network nodes and function blocks that make use of this document's protocol.

3.20
PGN to network gateway function block
PNGF
function block that enables transfer of sentences between the network and devices that are compliant with the IEC 61162-3 serial data instrument network interface

3.21
PGN message
parameter group number message
message consisting of an 8-bit or 16-bit number that identifies each parameter group

Note 1 to entry: The parameter group number (PGN) is analogous to the three-character sentence formatter in IEC 61162-1. By definition, parameter groups identified by 16-bit parameter group numbers are broadcast to all addresses on the network. Parameter groups identified by 8-bit parameter group numbers may be used to direct data for use by a specific address.

[SOURCE: IEC 61162-3:2008, 3.1.21, modified – The word "message" has been added to the term, and the definition has been rephrased.]

3.22
sensor broadcast message
SBM
message consisting of only one sentence

Note 1 to entry: SBMs are sent with a sufficiently high update rate to ensure that the receiver can maintain the correct status even in environments where some messages may be lost.

Note 2 to entry: SBMs are defined in Annex A.

3.23
sentence
standard information carrying unit as described in IEC 61162-1

3.24
sentence group
logical group of sentences (which may consist of only one) that need to be processed together to give full meaning to the information contained in the sentence(s)

Note 1 to entry: The grouping of sentences into sentence group is done by TAG block mechanisms.

Note 2 to entry: This document allows the explicit grouping of sentences by using coding in a datagram. This document does not enforce any relationship between datagram and sentence group. Thus a datagram may contain more than one sentence group, or a sentence group may be split over two or more datagrams.

3.25
serial to network gateway function block
SNGF
function block that enables transfer of sentences between the network and devices that are compliant with the IEC 61162-1 and IEC 61162-2 serial line interface