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Maritime navigation and radiocommunication equipment and systems – Digital interfaces –
Part 460: Multiple talkers and multiple listeners – Ethernet interconnection – Safety and security

IEC 61162-460:2015-08(en)

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MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – DIGITAL INTERFACES –

Part 460: Multiple talkers and multiple listeners – Ethernet interconnection – Safety and security

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The text of this standard is based on the following documents:

FDIS	Report on voting
80/764/FDIS	80/769/RVD

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

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

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This International Standard is to be used in conjunction with IEC 61162-450:2011.

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.

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MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – DIGITAL INTERFACES –

Part 460: Multiple talkers and multiple listeners – Ethernet interconnection – Safety and security

1 Scope

This part of IEC 61162 is an add-on to the IEC 61162-450 standard where higher safety and security standards are needed, e.g. due to higher exposure to external threats or to improve network integrity. This standard provides requirements and test methods for equipment to be used in an IEC 61162-460 compliant network as well as requirements for the network itself and requirements for interconnection from the network to other networks. This standard also contains requirements for a redundant IEC 61162-460 compliant network.

This standard extends the informative guidance given in Annex D of IEC 61162-450:2011. It does not introduce new application level protocol requirements to those that are defined in IEC 61162-450.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

IEC 61162-450:2011, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 450: Multiple talker and multiple listeners – Ethernet interconnection*

IEC 61924-2:2012, *Maritime navigation and radiocommunication equipment and systems – Integrated navigation systems – Part 2: Modular structure for INS – Operational and performance requirements, methods of testing and required test results*

IEC 62288:2014, *Maritime navigation and radiocommunication equipment and systems – Presentation of navigation-related information on shipborne navigational displays – General requirements, methods of testing and required test results*

IEEE 802.1D-2004, *IEEE Standards for Local Area Networks: Media Access Control (MAC) Bridges*

IEEE 802.1Q-2005, *Virtual Bridged Local Area Networks*

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

ISOC RFC 1112, *Host Extensions for IP Multicasting*

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

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ISOC RFC 3411, *An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks*

ISOC RFC 4604, *Using Internet Group Management Protocol Version 3 (IGMPv3) and Multicast Listener Discovery Protocol Version 2 (MLDv2) for Source-Specific Multicast*

ISOC RFC 5424, *The Syslog Protocol*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61162-450, as well as the following apply.

3.1
450-Node
device compliant with the IEC 61162-450 standard and which satisfies additional requirements specified in this standard

Note 1 to entry: This also includes nodes only implementing the ONF function block.

3.2
460-Forwarder
network infrastructure device that can safely exchange data streams between a 460-Network and other controlled networks including other 460-Networks

3.3
460-Gateway
network infrastructure device that connects 460-Networks and uncontrolled networks and which satisfies the safety and security requirements as specified in this standard

3.4
460-Network
network which consists of only 460-Nodes, 460-Switches, 460-Forwarder, 460-Gateway and 460-Wireless gateway as well as 450-Nodes

3.5
460-Node
device compliant with the requirement of a 450-Node and which satisfies the safety and security requirements as specified in this standard

3.6
460-Switch
network infrastructure device used to interconnect nodes on a 460-Network and which satisfies the safety and security requirements as specified in this standard

3.7
460-Wireless gateway
network infrastructure device that connects a 460-Network and wireless networks and which satisfies the safety and security requirements as specified in this standard

3.8
advanced encryption standard
AES
symmetric-key block cipher algorithm which is based on a substitution-permutation network (SPN) and does not use the data encryption standard (DES) feistel network

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3.9
alarm
highest priority of an alert, announcing a situation or condition requiring immediate attention, decision and, if necessary, action by the bridge team, to maintain the safe navigation of the ship

3.10
application level gateway
network infrastructure device that connects 460-Networks with other networks and which satisfies the safety and security requirements as specified in this standard

3.11
backdoor
installed program allowing remote access to a computer by providing a method of bypassing normal authentication

3.12
controlled network
any network that has been designed to operate such that authorities are satisfied by documented evidence that it does not pose any security risks to any connected network nodes

Note 1 to entry: For example any IEC 61162-450 compliant network that is approved by classification society, flag state or recognized organization (RO).

3.13
category B alerts
alerts where no additional information for decision support is necessary besides the information which can be presented at the central alert management HMI

3.14
caution
lowest priority of an alert

Note 1 to entry: Caution raises a bridge team's awareness of a condition which does not warrant an alarm or warning condition, but still requires attention out of the ordinary consideration of the situation or of given information.

3.15
demilitarized zone
DMZ
physical or logical sub-network that contains and exposes an organization's external-facing services to a larger and un-trusted network, usually Internet

3.16
denial of service
DoS
attempt to prevent legitimate users from accessing a machine or network resource

3.17
flow
combination of the following information: source and destination MAC address, source and destination IP address, protocol, source and destination UDP/TCP port number

3.18
failure mode and effects analysis
FMEA
failure mode, effects and criticality analysis
FMECA
analytic method as specified in IEC 60812

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Note 1 to entry: FMECA extends FMEA by including a criticality analysis, which is used to chart the probability of failure modes against the severity of their consequences.

3.19
internet control message protocol
ICMP
protocol according to ISOC RFC 792

3.20
internet group management protocol
IGMP
protocol according to ISOC RFC 1112 (version 1), ISOC RFC 2236 (version 2) and ISOC RFC 4604 (version 3)

3.21
loss rate
amount of lost data by the receiving device of a flow as lost packets per total amount of packets, measured at the input port of a device

Note 1 to entry: The loss rate is expressed in percent.

3.22
malware
malicious code
software used or created to disrupt computer operation

3.23
maximum network load
cumulative maximum amount of all traffic from all network nodes and network infrastructure components of a single 460-Network

Note 1 to entry: The maximum network load is measured in bytes per second (B/s).

3.24
maximum transmission rate
maximum number of bytes per second that can be transmitted by a network node or network infrastructure equipment

3.25
neighbour MAC address
MAC (media access control) address of connected 450-Node or 460-Node as seen by 460-Switch and as reported by SNMP (simple network management protocol)

3.26
network infrastructure components
devices that connect at least two nodes in a 460-Network and two different networks such as 460-Switch, 460-Forwarder, 460-Gateway and 460-Wireless gateway

3.27
nominal network capacity
network capacity as a bit rate which is based on the configuration

Note 1 to entry: The capacity is the lowest capacity of any switch in the network to route all traffic.

Note 2 to entry: This is used for specifying capabilities of equipment.

3.28
other network function
ONF
function block that interfaces to the network as specified in IEC 61162-450

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Note 1 to entry: The ONF represents a function that is allowed to share the infrastructure of an IEC 61162-450 network but does not use the protocols defined in IEC 61162-450.

3.29
rapid spanning tree protocol
RSTP
protocol according to IEEE 802.1D

3.30
removable external data source
REDS
user removable non-network data source, including, but not limited to compact discs, memory sticks and Bluetooth[1] devices

3.31
ring topology
topology where each node is connected in series to two other nodes

3.32
RSA
public-key cryptosystem as described in IEEE 1363

3.33
safety
protection of networks from un-intentional threats such as system mal-functioning, mis-configuration and mis-operation

3.34
secure area
area with defined physical perimeters and barriers, with physical entry controls or access point protection or access point observation

Note 1 to entry: A ship's navigation bridge with closed consoles and access observation by the Master or Officer of the watch is an example of a secure area.

3.35
security
protection of networks from intentional threats such as virus, worm, denial-of-service attacks, illicit access, etc.

3.36
simple network management protocol
SNMP
protocol according to ISOC RFC 3411

3.37
shipborne network
data network infrastructure on board a ship to exchange data between equipment on board

Note 1 to entry: This may or may not be connected to shore by satellites or other means

3.38
sniffing
monitoring and analysis of the network traffic

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[1] Bluetooth is the trademark of a product supplied by Bluetooth Special Interest Group.

This information is given for the convenience of users of this standard and does not constitute an endorsement by IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.

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3.39
stream
combination of all flows from a device which use same protocol

3.40
syslog
protocol according to ISOC RFC 5424 which is used for an external logging in IEC 61162-450

3.41
system integrator
person or organisation responsible for the functionality of the integrated 460-network

3.42
threat
potential cause of an incident in computer security that may result in harm to the system

3.43
traffic
combination of all streams from a device

3.44
uncontrolled network
data network that is not an IEC 61162-450 compliant, IEC 61162-460 compliant or a controlled network

EXAMPLE: Wireless networks.

3.45
virtual local area network
VLAN
network according to IEEE 802.1Q

3.46
virtual private network
VPN
extension of a private network through encapsulated, encrypted, and authenticated links across shared or public networks

3.47
warning
announcing a situation or condition requiring attention but no immediate attention or action by the bridge team

Note 1 to entry: Warnings are presented for precautionary reasons to make the bridge team aware of changed conditions which are not immediately hazardous, but may become so, if no forward-looking decision is made or action is taken.

3.48
wireless access point
wireless AP
device that connects wireless devices to wired devices through various wireless technologies such as Wi-Fi, Bluetooth

4 High-level requirements

4.1 Overview

This standard is based on IEC 61162-450 which is indispensable for this standard. This standard specifies more stringent requirements for equipment, system design and operation.

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