



IEC 61162-460

Edition 1.0 2015-08

INTERNATIONAL STANDARD



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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 47.020.70

ISBN 978-2-8322-2850-0

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	6
1 Scope.....	8
2 Normative references.....	8
3 Terms and definitions	9
4 High-level requirements	13
4.1 Overview.....	13
4.2 Description.....	14
4.3 General requirements.....	14
4.3.1 Equipment and system requirements	14
4.3.2 Physical composition requirements.....	15
4.3.3 Logical composition requirements.....	15
4.4 Physical component requirements	15
4.4.1 450-Node.....	15
4.4.2 460-Node.....	15
4.4.3 460-Switch.....	16
4.4.4 460-Forwarder	16
4.4.5 460-Gateway and 460-Wireless gateway	16
4.5 Logical component requirements	16
4.5.1 Network monitoring function	16
4.5.2 System management function.....	16
4.6 System documentation requirements	17
4.7 Secure area requirements	17
5 Network traffic management requirements.....	17
5.1 460-Node requirements	17
5.2 460-Switch requirements	18
5.2.1 Resource allocation	18
5.2.2 Loop prevention	18
5.3 460-Forwarder requirements.....	18
5.3.1 Traffic separation	18
5.3.2 Resource allocation	18
5.3.3 Traffic prioritization	19
5.4 System design requirements	20
5.4.1 Documentation.....	20
5.4.2 Traffic.....	20
6 Security requirements	20
6.1 Security scenarios.....	20
6.1.1 Threat scenarios	20
6.1.2 Internal threats.....	20
6.1.3 External threats	21
6.2 Internal security requirements	21
6.2.1 General	21
6.2.2 Denial of service protection	21
6.2.3 REDS security	22
6.2.4 Access control	22
6.3 External security requirements	23
6.3.1 Overview	23

6.3.2	Firewalls	24
6.3.3	Communication security	24
6.3.4	460-Node	24
6.3.5	460-Gateway	25
6.3.6	460-Wireless gateway	26
6.4	Additional security issues	26
7	Redundancy requirements	26
7.1	General requirements	26
7.1.1	General	26
7.1.2	Interface redundancy	27
7.1.3	Device redundancy	27
7.2	460-Node requirements	27
7.3	460-Switch requirements	28
7.4	460-Forwarder requirements	28
7.5	460-Gateway and 460-Wireless gateway requirements	28
7.6	Network monitoring function requirements	28
7.7	System design requirements	28
8	Network monitoring requirements	28
8.1	Network status monitoring	28
8.1.1	460-Network	28
8.1.2	460-Node	28
8.1.3	460-Switch	29
8.1.4	460-Forwarder	29
8.1.5	460-Gateway and 460-Wireless gateway	29
8.2	Network monitoring function	29
8.2.1	General	29
8.2.2	Network load monitoring function	30
8.2.3	Redundancy monitoring function	31
8.2.4	Network topology monitoring function	31
8.2.5	Syslog recording function	31
8.2.6	Redundancy of network monitoring function	32
8.2.7	Alert management	32
9	Controlled network requirements	32
10	Methods of testing and required test results	33
10.1	Subject of tests	33
10.2	Test site	33
10.3	General requirements	34
10.4	450-Node	34
10.5	460-Node	34
10.5.1	Network traffic management	34
10.5.2	Security	35
10.5.3	Redundancy	37
10.5.4	Monitoring	37
10.6	460-Switch	37
10.6.1	Resource allocation	37
10.6.2	Loop prevention	37
10.6.3	Security	38
10.6.4	Monitoring	39

10.7	460-Forwarder	39
10.7.1	Traffic separation	39
10.7.2	Resource allocation	39
10.7.3	Traffic prioritisation	40
10.7.4	Security	40
10.7.5	Monitoring.....	41
10.8	460-Gateway.....	42
10.8.1	Denial of service behaviour	42
10.8.2	Access control to configuration setup	42
10.8.3	Communication security	42
10.8.4	Firewall.....	42
10.8.5	Application server	43
10.8.6	Interoperable access to file storage of DMZ	43
10.8.7	Additional security.....	44
10.8.8	Monitoring.....	44
10.9	460-Wireless gateway	44
10.9.1	General	44
10.9.2	Security	44
10.9.3	Monitoring.....	45
10.10	Controlled network	45
10.11	Network monitoring function	45
10.11.1	General	45
10.11.2	Network load monitoring function.....	46
10.11.3	Redundancy monitoring function.....	46
10.11.4	Network topology monitoring function	46
10.11.5	Syslog recording function	47
10.11.6	Alert management.....	47
10.12	System level	48
10.12.1	General	48
10.12.2	System management function.....	49
10.12.3	System design	49
10.12.4	Network monitoring function	51
10.12.5	Network load monitoring function.....	51
10.12.6	Redundancy monitoring function.....	51
10.12.7	Network topology monitoring function	51
Annex A (informative) Communication scenarios between an IEC 61162-460 network and uncontrolled networks		52
A.1	General.....	52
A.2	Routine off-ship.....	52
A.3	Routine on-ship.....	53
A.4	460-Gateway usage for direct connection with equipment	53
Annex B (informative) Summary of redundancy protocols in the IEC 62439 series		54
B.1	Summary of redundancy protocols	54
B.2	RSTP recovery time	54
Annex C (informative) Guidance for testing.....		56
C.1	Methods of test	56
C.2	Observation	56
C.3	Inspection of documented evidence	56
C.4	Measurement	56

C.5 Analytical evaluation	57
Annex D (informative) Some examples to use this standard	58
Annex E (normative) IEC 61162 interfaces for the network monitoring function.....	60
Bibliography	61
Figure 1 – Functional overview of IEC 61162-460 requirement applications.....	14
Figure 2 – 460-Network with 460-Gateway	23
Figure 3 – An example of redundancy	27
Figure 4 – Example of network status recording information.....	30
Figure A.1 – Usage model for communication between a IEC 61162-450 network and shore networks	52
Figure D.1 – 460-Forwarder used between two networks	58
Figure D.2 – 460-Forwarder used between two networks	58
Figure D.3 – 460-Gateway used for e-Navigation services	59
Figure D.4 – 460-Gateway used for remote maintenance	59
Figure E.1 – Network monitoring function logical interfaces.....	60
Table 1 – Traffic prioritization with CoS and DSCP	19
Table B.1 – Redundancy protocols and recovery times	54
Table E.1 – Sentences received by the network monitoring function.....	60
Table E.2 – Sentences transmitted by the network monitoring function.....	60

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**MARITIME NAVIGATION AND RADIOCOMMUNICATION
EQUIPMENT AND SYSTEMS – DIGITAL INTERFACES –****Part 460: Multiple talkers and multiple listeners –
Ethernet interconnection – Safety and security**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61162-460 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

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.

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.

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

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

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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*

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*