INTERNATIONAL STANDARD

IEC 61162-410

First edition
2001-11

Maritime navigation and radiocommunication equipment and systems – Digital interfaces –

Part 410: Multiple talkers and multiple listeners – Ship systems interconnection – Transport profile requirements and basic transport profile

Reference number
IEC 61162-410:2001(E)

Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

Consolidated editions

The IEC is now publishing consolidated versions of its publications. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

Further information on IEC publications

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology. Information relating to this publication, including its validity, is available in the IEC Catalogue of publications (see below) in addition to new editions, amendments and corrigenda. Information on the subjects under consideration and work in progress undertaken by the technical committee which has prepared this publication, as well as the list of publications issued, is also available from the following:

- **IEC Web Site (www.iec.ch)**

- **Catalogue of IEC publications**

  The on-line catalogue on the IEC web site (www.iec.ch/catlg-e.htm) enables you to search by a variety of criteria including text searches, technical committees and date of publication. On-line information is also available on recently issued publications, withdrawn and replaced publications, as well as corrigenda.

- **IEC Just Published**

  This summary of recently issued publications (www.iec.ch/JP.htm) is also available by email. Please contact the Customer Service Centre (see below) for further information.

- **Customer Service Centre**

  If you have any questions regarding this publication or need further assistance, please contact the Customer Service Centre:

  Email: custserv@iec.ch
  Tel: +41 22 919 02 11
  Fax: +41 22 919 03 00

INTERNATIONAL STANDARD

IEC 61162-410

First edition
2001-11

Maritime navigation and radiocommunication equipment and systems – Digital interfaces –

Part 410: Multiple talkers and multiple listeners – Ship systems interconnection – Transport profile requirements and basic transport profile

International Electrotechnical Commission 3, rue de Varembé Geneva, Switzerland
Telefax: +41 22 919 0300 e-mail: inmail@iec.ch IEC web site http://www.iec.ch

Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE XB

For price, see current catalogue

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – DIGITAL INTERFACES –

Part 410: Multiple talkers and multiple listeners – Ship systems interconnection – Transport profile requirements and basic transport profile

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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 the 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 National Committees.
3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61162-410 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
80/311/FDIS	80/326/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 3.

The special typographical conventions and nomenclature used in this standard are defined in IEC 61162-400 annex A.

Annexes A, B, C and D are for information only.

The committee has decided that the contents of this publication will remain unchanged until June 2005. At this date, the publication will be

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

INTRODUCTION

International Standard IEC 61162 is a four-part standard which specifies four digital interfaces for applications in marine navigation, radiocommunication and system integration.

The four parts are:

IEC 61162-1 Single talker and multiple listeners

IEC 61162-2 Single talker and multiple listeners, high speed transmission

IEC 61162-3 Multiple talkers and multiple listeners – Serial data instrument network

IEC 61162-4 Multiple talkers and multiple listeners – Ship systems interconnection.

Part 4 of the standard is subdivided into a number of individual standards with part numbers in the 400 series.

This part of the standard contains the specification of the requirements to an IEC 61162-4 transport profile (T-profile) and also the specification of one implementation, based on redundant Ethernet and Internet protocol functionality. The T-profile is the protocol transport mechanisms that offer simple message or byte stream transport services to the higher protocol layers (defined in other parts of the standard). In addition, the T-profile also offers services for time distribution and physical network management.

The use of Internet and Ethernet protocols offer low cost and high efficiency data transport in any kind of system. However, for safety related applications, certain measures have to be taken to avoid that particulars of office-quality and off-the-shelf technology create safety risks. This part of the standard specifies mechanisms by which a certain degree of quality of service can be guaranteed from these networks, including the provision of redundancy.

Other T-profile documents will be prepared with specifications of the same T-profile requirements over other transport protocols. This will be issued in the same number series as this standard (IEC 61162-41x).

Relationship with the other parts of the IEC 61162 series of standards is defined in annex B to IEC 61162-400.

MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – DIGITAL INTERFACES –

Part 410: Multiple talkers and multiple listeners – Ship systems interconnection – Transport profile requirements and basic transport profile

1 Scope and object

This part of IEC 61162-4 defines the general requirements of the T-profile and three implementations of the T-profile over the Internet V4 (IPV4) protocol suite. Part 400 of this standard defines the relationship between the different protocol levels (T-profile, A-profile and companion standards) and part 401 defines the A-profile, the immediate user of the protocol level defined in this part.

The different components of the IEC 61162-4 standard are defined in IEC 61162-400. The T-profile is the specification of the communication services and the communication protocols used by the LNA to implement the A-profile functionality. Basically, the T-profile consists of the following components:

a) a transport layer interface (TLI) definition that specifies the services and the semantics that will be available to the application level of the LNA (and in some cases the MAU). This includes data transport as well as time and network management services. The TLI will be general to all T-profiles and is defined in this part 410 of the standard,

b) A T-profile protocol definition that specifies how the services provided by the TLI and additional time distribution and physical network management services are implemented on the protocol level. This part 410 contains a number of alternative T-profile protocol specifications using the Internet V4 series of standards. Additional parts of this standard will address other T-profiles based on other protocol families.

Note that the time distribution and network management functionality may or may not include specific TLI services. For some systems this functionality may be interfaced to directly by the underlying operating system. Note also that time distribution and network management are not strictly speaking transport related protocol functionality. However, the implementation of these services is normally dependent on the transport protocols in use and is, thus, placed in the T-profile part of the standard.

The purpose of this standard is to define and describe the services that will be provided at the transport level interface in a way which is completely independent of the underlying network environment as well as defining one possible implementation of these services over the Internet V4 protocols. The separation of service and protocol definitions allows the specification of several different transport profiles, each one dedicated to a specific network environment, and to use the same transport service interface in all cases.

Clause 4 defines the transport level services and clause 5 describes the transport layer interface through which the services are offered. These clauses define the general, network independent services.

Clause 6 defines the transport profile architecture for redundant Ethernet and Internet protocols version 4 (IPV4). Clause 7 defines the architecture for a local area non-redundant Internet network. These clauses define two specific implementations of the T-profile services.

Clause 8 defines a simple MAU-LNA protocol for use over wide area network (WAN) TCP/IP links. This can be used to implement a WAN architecture for the overall system. The WAN architecture is not intended for integrated ship control systems, but can be used for remote test integration and remote maintenance and diagnostics. The WAN protocol can also be used to support MAUs that are located in other host computers than the LNA, but on one local network (conformance class 4).

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61162. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 61162 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 61162-400, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 400: Multiple talkers and multiple listeners – Ship systems interconnection – Introduction and general principles*

ISO 8802-3, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications*

ISO/IEC 9595: *Information technology – Open Systems Interconnection – Common management information service*

ISO/IEC 9596-1: *Information technology – Open Systems Interconnection – Common management information protocol – Part 1: Specification*

RFC 768:1980, *User Datagram Protocol (UDP), Internet Activities Board recommended standard*

RFC 793:1981, *Transmission Control Protocol (TCP), Internet Activities Board recommended standard*

RFC 826:1982, *Address Resolution Protocol (ARP), Internet Activities Board elective standard*

RFC 894:1984, *Internet Protocol on Ethernet Networks, Internet Activities Board elective standard*

RFC 1157:1990, *Simple Network Management Protocol (SNMP)*

RFC 1189:1990, *Common Management Information Services and Protocols for the Internet (CMOT and CMIP)*

RFC 1213:1991, *Management Information Base for Network Management of TCP/IP-based Internets: MIB-II*

RFC 1305:1992, *Network Time Protocol, Version 3 – Specification and Implementation*

RFC 2030:1996, *Simple Network Time Protocol (SNTP), Version 4 for IPv4, IPv6 and OSI*

RFC 2500:1999, *Internet Official Protocol Standards – Internet Activities Board standard*

NOTE RFC (request for comments) is a document, issued by the Internet engineering task force (IETF) the International standardization body for the Internet, that describes a part of the Internet protocol. Some RFCs are accepted as official Internet standards and listed in the “Internet Official Protocol Standards” itself an RFC.

3 Definitions

For the purpose of this part of IEC 61162, the definitions in IEC 61162-400 and the following definitions apply:

3.1
broadcast
see multicast

3.2
CL – connectionless
a connectionless communication means that sender and receiver do not have to know each other. There is no association established between sender(s) and receiver(s) before messages are sent (see also peer-to-peer and client-server)

3.3
client-server
a client-server communication link is established by the client after a server has allowed the connection attempt by the establishment of a listening connection point. The client is the active part while the server allows the connection (see also connectionless and peer-to-peer)

3.4
CMIP – common management information protocol
see ISO/IEC 9595 and ISO/IEC 9596-1

3.5
CMIS – common management information services
see ISO/IEC 9595 and ISO/IEC 9596-1

3.6
CMOT – CMIS/CMIP over TCP/IP
an Internet proposed standard protocol. Its status is elective (see RFC 1189)

3.7
CO – connection-oriented
the opposite of CL (connectionless). A data exchange where an association between sender and receiver exists

3.8
connection point
an entity that can represent a communication link end point (for established connections) or a connection attempt between two host computers in some state. It is also used for connectionless communication, but in this case it represents just the local host computer’s port to the network

3.9
Ethernet
refers to a carrier sense multiple access collision detect (CSMA/CD) local area network protocol standard as defined in ISO/IEC 8802-3. The medium access control (MAC) frame format shall use the Internet protocol type (0800) in the length/protocol field (see RFC 894).

Any type of Ethernet can be used in systems compliant with this standard as long as they fulfil relevant technical requirements and the system integrator ensures compatibility between the integrated components. The most relevant technologies are:

- 10Base-5 – thick coaxial, shared media bus – can be used in environments that require noise immunity;
- 10Base-2 – thin (RG58) coaxial, shared media bus – can be used in environments with low noise immunity requirements;
- 10Base-T – shielded or unshielded twisted pair – used in conjunction with a repeating or switching hub;
- 10Base-F – fibre optic media, as above, but for very high noise immunity applications;
- 100Base-TX – shielded or unshielded twisted pair, as above. Note that this medium requires special precautions to extend network lengths beyond 200 m;
- 100Base-FX – fibre optic, as previous, but for very high noise immunity.

The recommended solution is the use of non-duplex switching hubs with 10 and/or 100 megabit links to the host computers.

The system integrator must make sure that the relevant physical characteristics of the selected network solution satisfies the requirements defined in ISO/IEC 8802-3 and other applicable standards

3.10
ICMP – Internet control message protocol
an integral part of the Internet protocols (see 3.12)

3.11
IGMP – Internet group management protocol
a protocol used between hosts and multicast routers on a single physical network to establish hosts' membership in particular multicast groups. Multicast routers use this information, in conjunction with a multicast routing protocol, to support IP multicast forwarding across the Internet. The IGMP standard is part of the Internet RFC system, but is currently not used in this standard

3.12
IP – Internet protocol.
refers to RFC 2500. All required parts as defined by that document shall be implemented in an Internet compliant protocol stack. It is also required that the system in question implements the ARP (see RFC 826) address resolution protocol. Optionally, other address resolution schemes can be used at the discretion of the system integrator.

RFC 2500 will give additional information as to which additional standards apply to conforming implementations of the Internet protocol.

RFC 1918 lists a set of reserved private address spaces that can be used for a ship-board control network that must not be connected to off-ship or other ship-board Internets. For the purpose of this standard, it is recommended that the following network addresses are used:

172.16.0.1 to 172.16.255.254 (network mask 255.255.0.0 – class B)

3.13
IPV4 – Internet protocol version 4
the version used in this issue of the standard (see previous subclause)

3.14
IPV6 – Internet protocol version 6
the proposed next generation Internet protocol. It is currently not sufficiently accepted to be viable as the basis of this standard, but future generations of this standard are expected to migrate to IPV6

3.15
LAN – local area network
a network within a delimited physical area. Typical for control system networks (see also WAN, MAN)

3.16
LNAC – LNA communication module interface
a variant of TLI that is dedicated to MAU-LNA communication

3.17
loop-back interface
refers to the loop-back function in the Internet protocol whereby an Internet message can be sent between two entities on the same network host. The complete class A network number 127 is assigned the “loop-back” function (see RFC1060). The address 127.0.0.1 will be used for the loop-back

3.18
MA – management agent
an SNMP agent located in a network element (NE)

3.19
MAN – metropolitan area network
a network between LAN and WAN. The area the network covers is more than local, but not worldwide

3.20
MIB – management information base
basis for physical network management protocol

[RFC 1213]

3.21
MTU – maximum transmission unit
the largest message that can be transmitted over a given T-profile without fragmentation. For Ethernet, the MTU is 1 500 octets

3.22
multicast
a transport mechanism by which any number of computer hosts can be reached with one transmitted message. This transport mechanism is referred to as multicast or broadcast. The T-profile specification defines the actual physical mechanism that is used to implement this service

3.23
NE – network element
term used within SNMP to identify a managed entity in a network. This is typically a host computer with its protocol entities, a router, a gateway or a switch

3.24
NMA – network management applications
applications within a NMS

3.25
NMS – network management station
a host computer, with software implementing one or more NMA, that is responsible for physical network monitoring (see MIB and SNMP)

3.26
NNN – network node number
an identification of one node on a TP network. This is typically the Internet host number (excluding the network part of the address) for IPV4 networks. The NNN shall be unique and unambiguous for one node, even if this node is on a redundant network with two different network addresses. The NNN is a 32-bit unsigned integer