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Ships and marine technology — Guidelines for implementation of a fleet management system network

Navires et technologie maritime — Lignes directrices pour la mise en oeuvre d'un système de management d'une flotte par réseau

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 15849 was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 10, *Computer applications*.

Introduction

Competent information management is essential for safe and productive operation of ships and for regulatory compliance. A short list of some of the functions affected includes decision aids for communications, cargo operations, maintenance and repair, personnel records and environmental protection.

The shipbuilding and shipping industries have identified a need to develop comprehensive standards and guides for implementing computer-based shipboard data-management systems.

It is the intent of this International Standard to provide guidelines for the design and implementation of an open client/server architecture for computer and communication networks for shipboard and shore-based applications, as well as guidelines to application software providers to allow ready integration of software applications.

Furthermore, it is the intent of this International Standard to provide guidelines that will promote and enable remote support of the shipboard data systems/networks from support offices ashore.

This International Standard is also intended to assist vessel owners, designers, shipyards, equipment suppliers and computer service providers in the development of contract technical specifications which detail the services to be supported, performance required and criteria for acceptance for specific installations.

Ships and marine technology — Guidelines for implementation of a fleet management system network

1 Scope

This International Standard provides an overview and guide for the selection and implementation by shipowners and operators of a fleet management system (FMS) network of computer services. This includes

a) guidelines for the general infrastructure, including wide area network, data transmission services and common database facilities,

b) guidelines for the shipboard installations, including services to application programs, and

c) guidelines for land-based installations, including services to application programs.

This International Standard does not purport to address the requirements for safety-related systems, e.g. navigation, radio communication as well as systems used to control the operation of the ship.

This International Standard does not purport to address any of the environmental considerations associated with the use of the fleet management system.

2 Terms and definitions

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

2.1
application program
computer program that performs a task related to the process being controlled rather than to the functioning of the computer itself

2.2
application program interface
API
software tool kit that can be used as a building block that facilitates connections primarily between applications and other constituent network software, but that can also provide linkages for other elements of the network

2.3
black box test
test that is based on the design application and does not require a knowledge of the internal program structure

2.4
certification
process of formal approval, by an authority empowered to do so, of arrangements or systems for the reception, storage or transmission of data and intelligence relative to the management, operation or control of vessels

2.5
client/server database engine
commercial database management system serving as a repository for all critical ship operating and configuration information

2.6
client/server architecture
architecture of computers called servers that manage shared resources and provide access to those shared resources as a service to their clients

2.7
computer system
functional unit, consisting of one or more computers and associated software, that uses common storage for all or part of a program and also for all or part of the data necessary for the execution of the program

2.8
fault tolerance
built-in capacity of a system to provide continued correct execution in the presence of a limited number of hardware or software faults

2.9
independent
independent, as applied to two systems, means that either system will operate with the failure of any part of the other system

2.10
interface
interface attribute describes the methods and rules governing interaction between different entities

2.11
land-based communications hub
land-based computer system that provides uniform access to multiple maritime satellite services, as well as access to public telephone networks, e-mail and the Internet

2.12
ship earth station
mobile earth station for maritime satellite service located aboard a ship

2.13
software
programs, procedures, rules and associated documentation pertaining to the operation of a computer system

2.14
validation
test and evaluation of an integrated computer system (hardware and software) to ensure compliance with the functional, performance and interface requirements

2.15
ship information technology platform
SITP
integrated system of software, hardware, communication links and standardized procedures that provide common services to shipboard systems in a standardized form

2.16
verification
process to determine if the product of each phase of the digital computer system development process satisfies the requirements set by the previous phase

2.17
white box test
test where the test plan is based on knowledge of the internal structure of the module being tested

See **black box test** (2.3)

2.18
workstation
computer and associated visual display unit (monitor) configured as an input/output (I/O) device to perform certain tasks

3 Abbreviated terms

For the purposes of this International Standard, the following abbreviated terms apply.

ANSI	American National Standards Institute
API	application program interface
CCITT	Consultative Committee for International Telegraphy and Telephony
DAC	discretionary access control
DBMS	data base management system
FMS	fleet management system
FMSN	fleet management system network
IBS	integrated bridge systems
IEV	International Electrotechnical Vocabulary
LAN	local area network
NOS	network operation system
LITP	land-based information technology platform
NMEA	National Marine Electronics Association
SITP	shipboard information technology platform
STEP	standard for the exchange of product data (ISO)
VDU	visual display unit
WAN	wide area network

4 FMS network architecture

4.1 General architecture

The FMS architecture is shown schematically in Figure 1. The FMS is based upon a wide-area enterprise network, consisting of an unspecified number of SITPs and one or more shoreside LITPs which provides management services for the shipping enterprise. In total, the SITP enables multiple shipboard computer systems to share data with each other and to communicate with shore-based management and/or other vessels.

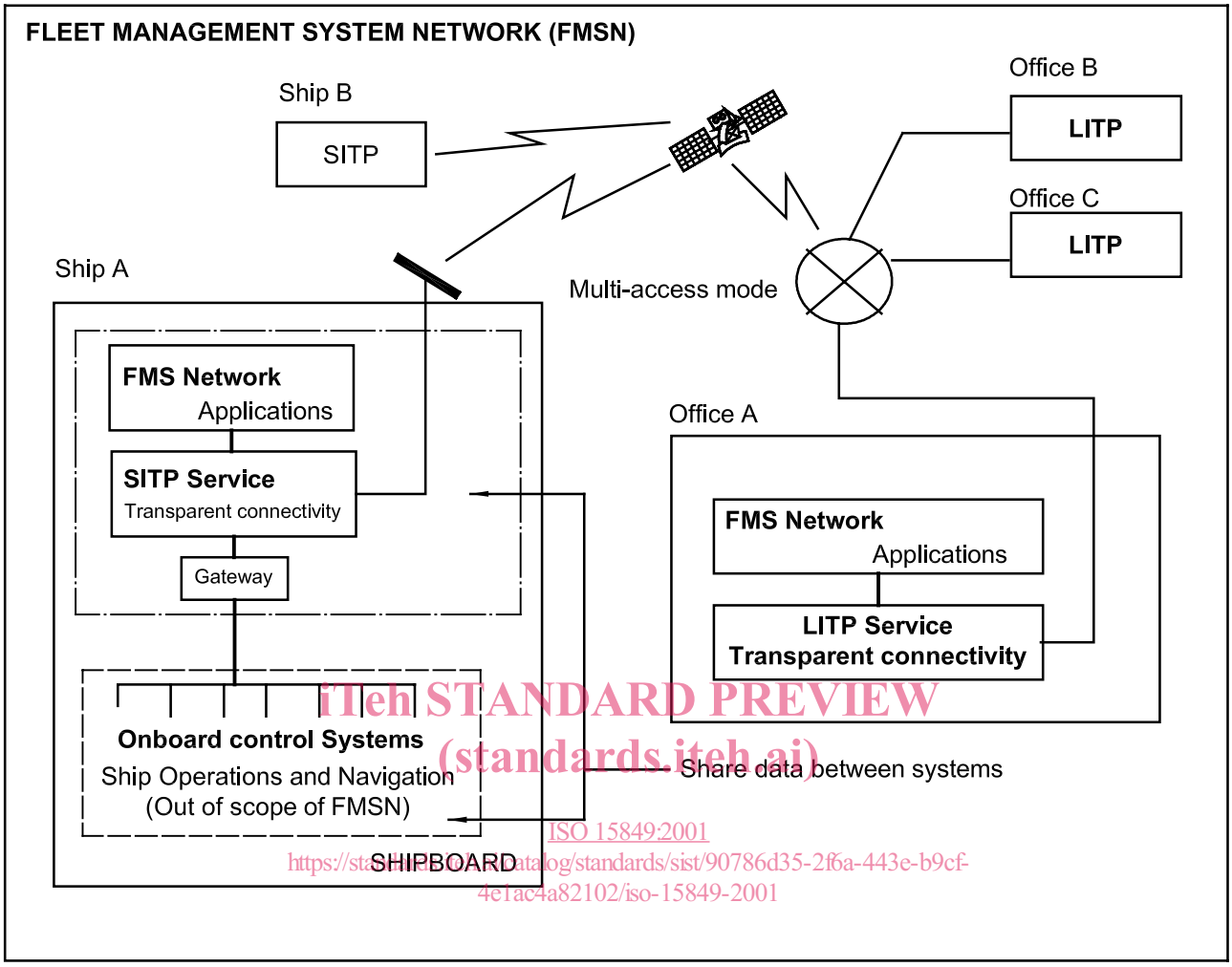

Figure 1 — Schematic of SITP / LITP connectivity

The FMS provides multi-vendor connectivity, distributed processing and electronic data interchange between networks, computers, workstations and peripherals. It also maintains databases and computer applications software that promote safety of life at sea, protection of the environment and operational efficiencies throughout the life cycle of the vessel/fleet. The FMS may incorporate satellite gateways to coastal communications hubs providing access to land-based networks such as telephone lines, facsimile, e-mail Internet services, and expanded satellite services through land-earth stations.

4.2 Network design

An underlying computer network is assumed to support the FMS. The functions of the FMS enable a communication network that provides for the exchange of information between nodes or devices capable of transmitting or receiving information in the form of electronic or optical signals. The process is enabled by communications protocols, which define the rules that must be implemented in the hardware and software.

4.3 Network management

The FMS is based upon a WAN consisting of a number of LAN which are geographically dispersed over large areas and which are continuously or intermittently linked through wireless communications by bridges and gateway devices. The group responsible for managing the FMS will normally be located in the principle shoreside office. The

primary task of the network management system is to oversee and report on the operation of the network, which may comprise products from many different vendors.

It is the responsibility of the user of this International Standard to establish appropriate safety and health and environmental practices and to determine the applicability of the various regulatory instruments.

4.4 Network security

A security function should be provided which is responsible for the following:

a) data confidentiality;

b) data integrity;

c) data authentication;

d) access control.

4.5 Encryption

Radio communications between SITPs and LITPs are exposed to electronic monitoring, and messages transmitted in clear text will be exposed to eavesdropping and intrusion. Data encryption is the most effective protection against such intrusions and should be available for security sensitive communications. The encryption protocol should provide for multiple algorithms and the assignment of separate algorithms for different types of data. A critical element of the encryption program is the control of data encyphering and data decyphering keys (a key management system). This system is responsible for key origination, application, recording, assignment and deletion.

4.6 Database model

Database maintenance and availability are key features of the FMS. Each SITP and LITP will maintain separate databases. Each site will incorporate a DBMS, including replication capability, as part of the SITP or LITP installation. This DBMS should be independent of the core management software. Data modelling embraces the concept that data should be structured in a neutral format separate from the applications software allowing for the exchange of data between applications using the same data model.

4.7 Database management system (DBMS)

4.7.1 General

The database management system supports a data repository that provides for storage of data in digital form and manages

a) persistent storage of data collected by the system,

b) data replication on demand, scheduled or event driven,

c) integration of information at multiple remote sites,

d) open database connectivity,

e) query language,

f) concurrency/multiple users,

g) referential integrity, and

h) translators for applicable data models.