Standard Guide for
Implementation of a Fleet Management System Network[1]

This standard is issued under the fixed designation F 1756; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide provides an overview and guide for the selection and implementation by shipowners and operators of a Fleet Management System (FMS) network of computer services in a client/server architecture (see Fig. 1). The FMS is based upon a wide area enterprise network consisting of an unspecified number of Shipboard Information Technology Platforms (SITPs) and one or more shoreside Land-Based Information Technology Platforms (LITPs), which provides management services for the shipping enterprise. The FMS can be understood as a computer system comprised of one or more LITPs and one or more SITPs. It can be characterized as mission critical 24 × 365 (24 h/day, 365 days/year).

1.2 The SITP (see Fig. 1) provides a set of software services, including:

1.2.1 *Communications Services*, to communicate between vessels and with shore via multiple wireless communication technologies;

1.2.2 *Data Acquisition Services*, providing access to shipboard system data as required for use by other systems and management purposes; and,

1.2.3 *Executive Services*, providing software process administration and control.

1.2.4 In total, the SITP provides the capability for multiple shipboard computer systems to share data with each other and to communicate with shore-based management or other vessels or both.

1.3 The SITP is understood to consist of integrated hardware, software, a data repository, and standardized procedures, which provide the ability to send, receive, process, transfer, and store data or messages in digital form in a common mode from shipboard systems or administrative utilities or both, and from designated sources outside the network, for example, systems accessed through wireless communication services, such as satellite, VHF, HF, and so forth. Shipboard systems include navigational, machinery control and monitoring, cargo control, communications, and so forth. The SITP also will provide the capability for the remote administration and maintenance of associated computer systems aboard the vessel.

1.4 The SITP requires an underlying hardware and network infrastructure, including a shipboard computer local area network (LAN), file servers, workstations, wireless communications transceivers, cabling, other electronic and optical devices, video display units, keyboards, and so forth.

1.5 The SITP also requires underlying system software providing network operating system (NOS) services, DBMS services, and other system software.

1.6 There also is a layer of shipboard application systems, which are designed to capitalize on the FMS infrastructure to share data with other shipboard systems and management ashore. Those systems also would be able to capitalize on the remote management capabilities of the FMS.

1.7 The LITP is an asset that can exchange operating and administrative data from individual ships and maintain a DBMS to support fleet management and other maritime applications. The LITP will support data repositories, file servers, workstations or personal computers (PCs), and a communication hub providing connectivity to distributed satellite services, VHF (very high frequency), HF/MF (high frequency/medium frequency), and land lines. The DBMS makes possible the development of knowledge-based "decision aids" by providing the ability to retrieve, process, and analyze operational data.

1.8 This guide does not purport to address all the requirements for a SITP, which forms a path for data for direct control of the operation or condition of the vessel or the vessel subsystems.

1.9 In all cases, it shall be possible for all units of navigation equipment resident on the Navigation Equipment Bus to operate and display essential operating data independently of the FMS.

1.10 In all cases, it shall be possible for all units resident on the Control, Monitoring, and Alarm Bus to operate and display essential operating data independently of the FMS.

1.11 In all cases, it shall be possible for all units resident on the Communications Bus to operate and display essential operating data independently of the FMS.
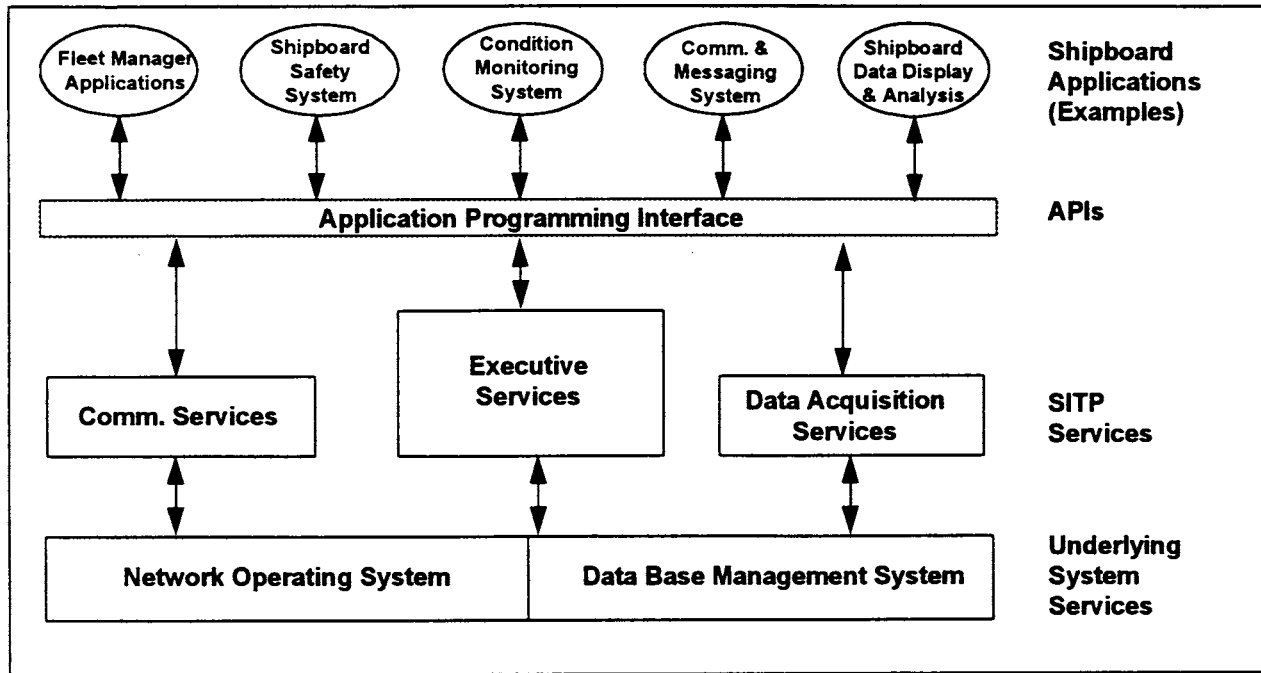
FIG. 1 Typical Architecture

1.12 Values shown in this guide are in SI units.

1.13 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:* [2]

E 919 Specification for Software Documentation for a Computerized System (Discontinued 2000)[3]

E 1013 Terminology Relating to Computerized Systems (Discontinued 2000)[3]

F 1166 Practice for Human Engineering Design for Marine Systems, Equipment, and Facilities

F 1757 Guide for Digital Communication Protocols for Computerized Systems

2.2 *ANSI Standards:*[4]

X3.172 Dictionary for Information Systems

X3.172a Dictionary for Information Systems (Computer Security Glossary)

2.3 *IEEE Standards:*[5]

IEEE 1028–1988(R1993) Standard for Software Review and Audit

IEEE 1012–1986(1992) Standard for Verification and Validation Plans

IEEE 45 Recommended Practice for Electrical Installations on Shipboard

IEEE 802 Standards for Local and Metropolitan Area Networks—Overview and Architecture

IEEE 802 Standards for Local and Metropolitan Area Networks—Interoperable LAN/MAN Security

IEEE 802.10e and 10f Supplements to IEEE 802.10

IEEE 1003

IEEE 1063 Standard for Software User Documentation

2.4 *IEC Documents:*[4]

IEC 50 International Electrotechnical Vocabulary (IEV)

IEC 92–504 Electrical Installations in Ships; Special Features–Control and Instrumentation

IEC 533 Electromagnetic Compatability of Electrical and Electronic Installations in Ships and of Mobile and Fixed Offshore Units

IEC 945 Maritime Navigation and Radiocommunication Equipment and Systems

IEC 1069 Industrial–Process Measurement and Control—Evaluation of System Properties for the Purpose of System Assessment, Part 1: General Considerations and Methodology; Part 2: Assessment Methodology

IEC 1162 Maritime Navigation and Radiocommunication Equipment and Systems—Digital Interfaces

IEC 1209 Integrated Bridge Systems (IBS) for Ships

2.5 *NMEA (National Marine Electronics Association) Standard:*[6]

NMEA 0183 Standard for Interfacing Electronic Marine

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Withdrawn.

[4] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

[5] Available from Institute of Electrical and Electronics Engineers, Inc. (IEEE), 445 Hoes Ln., P.O. Box 1331, Piscataway, NJ 08854-1331, http://www.ieee.org.

[6] Available from the National Marine Electronics Association (NMEA) Seven Riggs Ave., Severna Park, MD 21146.

Navigational Devices

3. Terminology

3.1 *Definitions:* Definitions of terms in this guide and described below are in accordance with Terminology E 1013 and ANSI X3.172 and X3.172a.

3.1.1 *application program*, *n*—a computer program that performs a task related to the process being controlled rather than to the functioning of the computer itself.

3.1.2 *application programming interface (API)*, *n*—an API is a set of rules for linking various software components of a network.

3.1.3 *automatic information system (AIS)*, *n*—automatic distribution of a ship's voyage information to all interested parties, that is, other ships, port state, owner, and so forth.

3.1.4 *baseband network*, *n*—only one transmission can be on the network at any given time.

3.1.5 *black box test*, *n*—black box tests are based on the design specification and do not require a knowledge of the internal program structure.

3.1.6 *certification*, *n*—the 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.

3.1.7 *client server database engine*, *n*—a commercial data base management system serving as a repository for all critical ship operating and configuration information.

3.1.8 *computer program*, *n*—a set of ordered instructions that specify operations in a form suitable for execution by a digital computer.

3.1.9 *computer system*, *n*—a 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.

3.1.10 *configuration manager*, *n*—utilities that determine the data to be collected, the processing and storage rules, the standard software functions that facilitate the interfaces between systems and the FMS process servers and other configuration parameters.

3.1.11 *data replicator/message processor*, *n*—a software module that is responsible for receiving, decoding, and storing communications and transmissions received from ships. This module also prepares data for transmission to a ship through the land-based communications hub.

3.1.12 *document management system*, *n*—an application that allows procedures manuals to be stored and accessed electronically on shipboard and to be updated electronically.

3.1.13 *electronic mail system*, *n*—a messaging and file transfer system for both ship and shore.

3.1.14 *fault tolerance*, *n*—the built-in capacity of a system to provide continued correct execution in the presence of a limited number of hardware of software faults.

3.1.15 *fleet management system (FMS)*, *n*—a system of computer services in a client/server architecture, based on a wide area enterprise network consisting of an unspecified number of SITPs and the LITP. The FMS can be understood as a computer system comprised of one or many shipboard systems and one of many shoreside systems. It can be characterized as mission critical 24 × 365 (24 h/day, 365 days/year).

3.1.16 *independent*, *n*—independent as applied to two systems means that either system will operate with the failure of any part of the other system excluding the source of power.

3.1.17 *interface*, *n*—the interface attribute describes the methods and rules governing interaction between different entities.

3.1.18 *integration tests*, *n*—tests performed during the hardware/software integration process before computer system validation to verify compatibility.

3.1.19 *land-based communications hub*, *n*—a 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.

3.1.20 *local area network (LAN)*, *n*—a network that connects computer systems resident in a small area. For purposes of this guide, the SITP is considered a shipboard LAN with access to similar shoreside and shipboard units through radio and satellite telecommunication services.

3.1.21 *MSAT*—satellite communications service covering North America

3.1.22 *multitasking*, *n*—the capability to handle more than one task at a time

3.1.23 *NAVTEX*, *n*—a system for the broadcast and automatic reception of maritime safety information by means of a narrow-band direct-printing telegraphy.

3.1.24 *network interface unit (NIU)*, *n*—the network interface units (NIUs) provide for connection and message translation to enable data streams from systems, both hardware and software, which may use various standard and proprietary communication protocols to be stored and accessed in the FMS database in a standard format.

3.1.25 *ship information technology platform (computing)*, *n*—an integrated system of software, hardware, communication links, and standardized procedures that provide the ability to collect, process, and store information in digital form.

3.1.26 *ship earth station*, *n*—a mobile earth station for maritime service located aboard a ship. Typically, a small lightweight terminal with omnidirectional antenna with interfaces for a personal computer or any other data terminal equipment for message generation and display, for example, Inmarsat C, or a steerable antenna mounted on a stabilized platform, for example, Inmarsat A and B and M.

3.1.27 *single failure criterion*, *n*—a criterion applied to a system such that it is capable of performing its safety task in the presence of any single failure.

3.1.28 *software*, *n*—programs, procedures, rules, and associated documentation pertaining to the operation of a computer system.

3.1.29 *software cycle*—the software cycle typically includes a requirements phase, a design phase, an implementation phase, a test phase, an installation and checkout phase, and an operation and maintenance phase.

3.1.30 *validation*—the test and evaluation of the integrated computer system, hardware and software, to ensure compliance with the functional, performance, and interface requirements.