SLOVENSKI STANDARD
SIST EN 4660-002:2011

01-december-2011

Aeronavtika - Modularne in odprte letalske elektronske arhitekture - 002. del: CFM

Aerospace series - Modular and Open Avionics Architectures - Part 002: Common Functional Modules

Luft- und Raumfahrt - Modulare und offene Avionikarchitekturen - Teil 002: CFM

Série aérospatiale - Architectures Avioniques Modulaires et Ouvertes - Partie 002: CFM

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Ta slovenski standard je istoveten z: **EN 4660-002:2011**

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ICS:

49.090	Oprema in instrumenti v zračnih in vesoljskih plovilih	On-board equipment and instruments

SIST EN 4660-002:2011 **en**

2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

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EUROPEAN STANDARD

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English Version

Aerospace series - Modular and Open Avionics Architectures - Part 002: Common Functional Modules

Série aérospatiale - Architectures Avioniques Modulaires et Ouvertes - Partie 002: CFM

Luft- und Raumfahrt - Modulare und offene Avionikarchitekturen - Teil 002: CFM

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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Foreword

This document (EN 4660-002:2011) has been prepared by the Aerospace and Defence Industries Association of Europe - Standardization (ASD-STAN).

After enquiries and votes carried out in accordance with the rules of this Association, this Standard has received the approval of the National Associations and the Official Services of the member countries of ASD, prior to its presentation to CEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2011, and conflicting national standards shall be withdrawn at the latest by August 2011.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

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0 Introduction

0.1 Purpose

This document was produced under the ASAAC Phase II Contract.

The purpose of the ASAAC Programme is to define and validate a set of open architecture standards, concepts and guidelines for Advanced Avionics Architectures (A3) in order to meet the three main ASAAC drivers. The standards, concepts and guidelines produced by the Programme are to be applicable to both new aircraft and update programmes.

The three main drivers for the ASAAC Programme are:

1. Reduced life cycle costs.

2. Improved mission performance.

3. Improved operational performance.

The Standards are organised as a set of documents including:

— A set of agreed standards that describe, using a top down approach, the Architecture overview to all interfaces required to implement the core within avionics systems,

— The guidelines for system implementation through application of the standards.

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The document hierarchy is given hereafter: *(in this figure, the current document is highlighted)*

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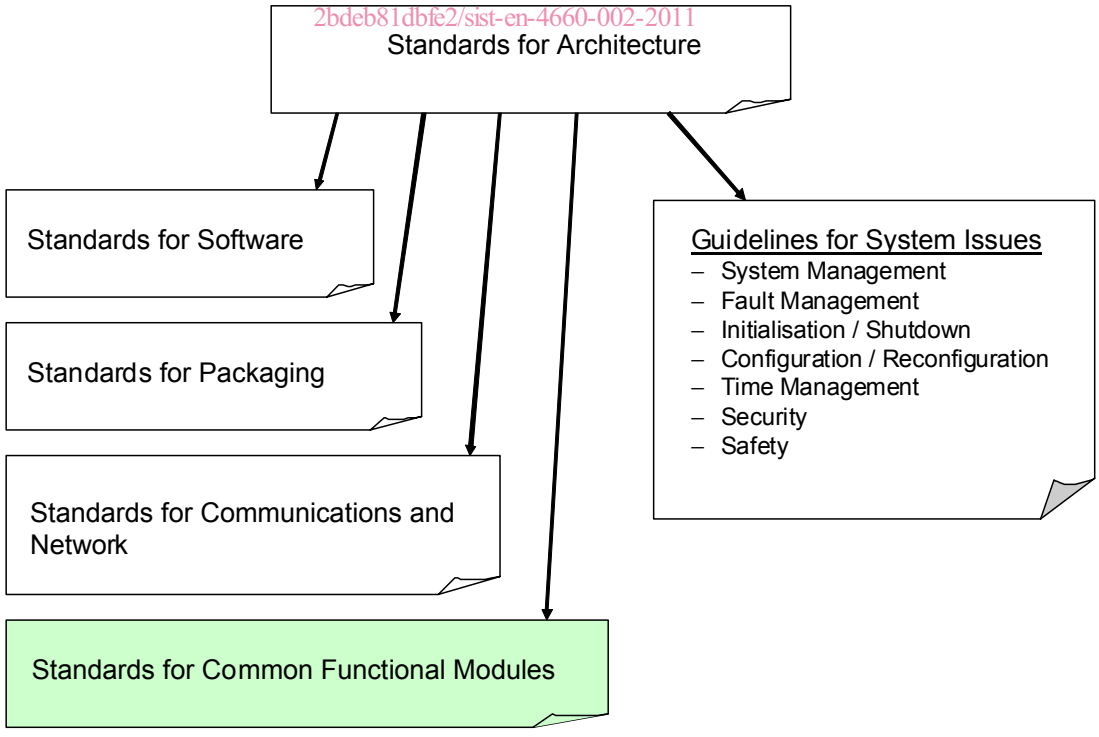

Figure 1 — ASAAC Standard Documentation Hierarchy

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0.2 Document structure

The document contains the following clauses:

Clause 1, scope of the document.

Clause 2, normative references.

Clause 3, the terms, definitions and abbreviations.

Clauses 4 and 5 provide CFM concept definition, requirements and standards.

Clause 6 provides guidelines for implementation of standards.

Performance sheets for each of the CFMs are attached to the end of the document. These sheets contain a list of attributes to be defined by the system designer and used by the CFM provider.

1 Scope

This standard defines the functionality and principle interfaces for the Common Functional Module (CFM) to ensure the interoperability of Common Functional Modules and provides design guidelines to assist in implementation of such a CFM. It is one of a set of standards that define an ASAAC (Allied Standard Avionics Architecture Council) Integrated Modular Avionics System.

This definition of interfaces and functionality allows a CFM design that is interoperable with all other CFM to this standard, that is technology transparent, that is open to a multi-vendor market and that can make the best use of COTS technologies.

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Although the physical organisation and implementation of a CFM should remain the manufacturer's choice, in accordance with the best use of the current technology, it is necessary to define a structure for each CFM in order to achieve a logical definition of the CFM with a defined functionality. This definition includes:

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— The Generic CFM, which defines the generic functionality applicable to the complete set of CFMs. The generic functionality is defined in 4.1.

— The processing capability, which defines the unique functionality associated with each CFM type within the set. This functionality is defined in 4.3.

— The logical and physical interfaces that enable CFMs to be interoperable and interchangeable, these are defined in Clause 6.

— The functionality required by a CFM to support the operation of the System is defined in Clause 6.

1.1 Relationship with other ASAAC Standards

The definition of the complete CFM is partitioned and is covered by the following ASAAC standards:

— CFM Mechanical properties and physical Interfaces – ASAAC Standards for Packaging.

— CFM Communication functions – ASAAC Standards for Software.

— CFM Network interface – ASAAC Standards for Communications and Network.

— CFM Software architecture – ASAAC Standards for Software.

— CFM Functional requirements – This document.

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2 Normative references

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

ISO 1540, *Aerospace — Characteristics of aircraft electrical systems*

EN 4660-001, *Aerospace series — Modular and Open Avionics Architectures — Part 001: Architecture*

EN 4660-003, *Aerospace series — Modular and Open Avionics Architectures — Part 003: Communications/Network*

EN 4660-004, *Aerospace series — Modular and Open Avionics Architectures — Part 004: Packaging*

EN 4660-005, *Aerospace series — Modular and Open Avionics Architectures — Part 005: Software*

ASAAC2-GUI-32450-001-CPG Issue 01, *Final Draft of Guidelines for System Issues* [1)]

— *Volume 1 — System Management.*

— *Volume 2 — Fault Management.*

— *Volume 3 — Initialisation and Shutdown.*

— *Volume 4 — Configuration / Reconfiguration.*

— *Volume 5 — Time Management.*

— *Volume 6 — Security.*

— *Volume 7 — Safety.*

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3 Terms, definitions and abbreviations

3.1 Terms and definitions

Use of “shall”, “should” and “may” within the standards observe the following rules:

— The word SHALL in the text express a mandatory requirement of the standard.

— The word SHOULD in the text expresses a recommendation or advice on implementing such a requirement of the standard. It is expected that such recommendations or advice will be followed unless good reasons are stated for not doing so.

1) Published by: Allied Standard Avionics Architecture Council.

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— The word MAY in the text expresses a permissible practice or action. It does not express a requirement of the standard.

Open System: A system with characteristics that comply with specified, publicly maintained, readily available standards and that therefore can be connected to other systems that comply with these same standards.

3.2 Abbreviations

2D : Two Dimensional

3D : Three Dimensional

A3 : Advanced Avionics Architecture

AGT : Absolute Global Time

ALT : Absolute Local Time

APOS : Application to Operating System Interface

ASAAC : Allied Standard Avionics Architecture Council

BIT : Built-in Test

CBIT : Continuous BIT

CFM : Common Functional Module

CORBA : Common Object Request Broker Architecture

COTS : Commercial Off The Shelf

CRC : Cyclic Redundancy Check

dc : Direct Current

DPM : Data Processing Module

DSP : Digital Signal Processor

EDAC : Error Detection And Correction

FFT : Fast Fouriert Transformation

FIR : Finite Impulse response Filter

FMECA : Fault Mode Effect and Criticality Analysis

GPM : Graphic Processing Module

GSM : Generic System Management

HW : Hardware

HDD : Head-Down Display

HMD : Helmet Mounted Display

HUD : Head-Up Display

IBIT : Initiated BIT

ID : Identification

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IDL	:	Interface Definition Language
IEEE	:	Institute of Electrical and Electronics Engineers
IFFT	:	Inverse Fast Fourier Transformation
IMA	:	Integrated Modular Avionics
ISO	:	International Standards Organisation
ITM	:	Integrated Test and Maintenance
JTAG	:	Joint Test Action Group
MC	:	Module Controller
MIS	:	Module Initialisation Support
MLI	:	Module Logical Interface
MMM	:	Mass Memory Module
MOS	:	Module Support Layer to Operating System Interface
MPI	:	Module Physical Interface
MSL	:	Module Support Layer
MSU	:	Module Support Unit
MTP	:	Maintenance Test Port
N/A	:	Not Applicable
NIU	:	Network Interface Unit
NSM	:	Network Support Module
OMG	:	Object Management Group
O/P	:	Output
OS	:	Operating System
OSL	:	Operating System Layer
PBIT	:	Power-up / power-down BIT
PCM	:	Power Conversion Module
PCU	:	Power Conversion Unit
PE	:	Processing Element
PMS	:	Power Management System
PSA	:	Power Switch Array
PSE	:	Power Supply Element
PU	:	Processing Unit
RC	:	Reference Clock
RLT	:	Relative Local Time

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RTBP : Runtime Blueprints

RU : Routing Unit

SPM : Signal Processing Module

TC : Transfer Connection

TLS : Three Layer Stack

Vdc : Voltage dc

3.3 Conventions used in this Standard

The Interface Definition Language (IDL) as defined in the Common Object Request Broker Architecture (CORBA) 2.3 is used to express the MOS services as programming language independent services in this document.

The conventions used in this document are as follows:

3.3.1 Special Fonts

Words that have a special meaning appear in specific fonts or font styles. All code listings, reserved words and the name of actual data structures, constants, and routines are shown in `Courier`.

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3.3.2 Naming Conventions

Parameter and variable names contain only words with lower case letters, which are separated by underscore.

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Example `vc_message`

NOTE Upper and lower case letters are treated as the same letter.

4 CFM Definition

The Common Functional Modules (CFMs) are line replaceable items and provide an ASAAC IMA system with a computational capability, network support capability and power conversion capability. The following set of modules have been defined for use within an IMA core processing system:

— Signal Processing Module (SPM).

— Data Processing Module (DPM).

— Graphics Processing Module (GPM).

— Mass Memory Module (MMM).

— Network Support Module (NSM).

— Power Conversion Module (PCM).

This set of CFMs complies with the generic CFM format defined in this clause.

It is assumed that a System Design Specification will be raised for each specific project implementation in which the detailed performance requirements for each CFM will appear.

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4.1 Generic CFM

4.1.1 Generic CFM – Description

The internal architecture of each CFM consists of a set of functional elements that are applied to each CFM implementation. These are shown graphically in Figure 2 and are detailed below. All functions, with the exception of the Processing Unit, are generic to each CFM type.

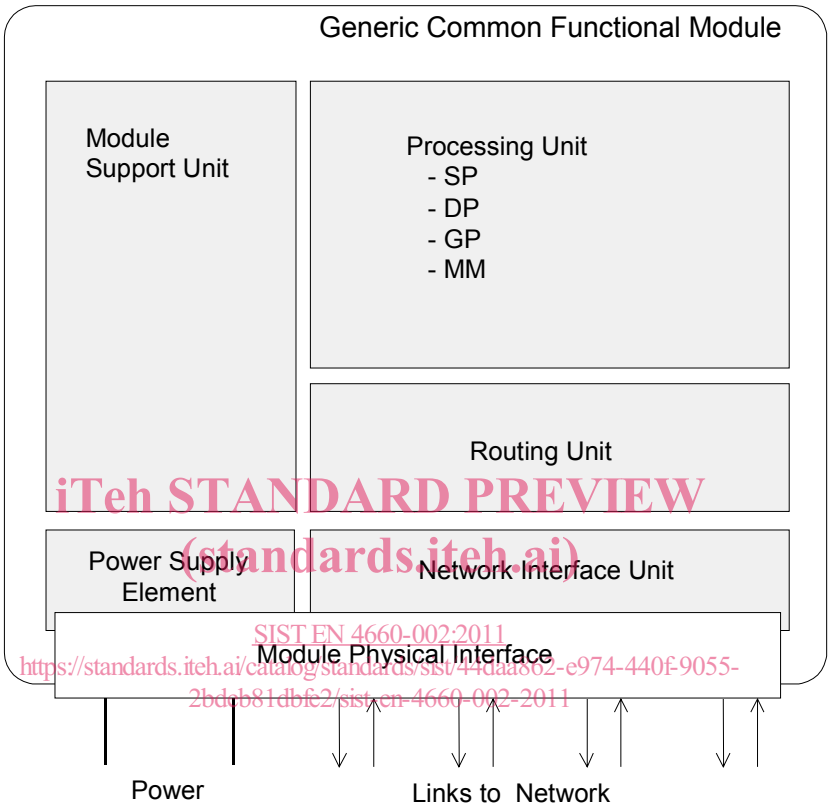

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Figure 2 — Functional representation of a generic CFM
(For PCM and NSM refer to Figure 3)

— The Module Support Unit (MSU) controls and monitors the module and provides common functions such as Built-in-Test (BIT) control, module initialisation, time management, status recording/reporting and support for MLI (Clause 5), system management and debugging.

— The Processing Unit (PU) provides the specific function of a CFM, for example data processing, signal processing, mass storage. These are defined in 4.3.

— The Module Physical Interface (MPI) defines the physical characteristics of the module and implements the mechanical, optical, electrical and cooling interfaces. These are detailed in Clause 5 and are fully defined in EN 4660-004.

— The Routing Unit (RU) provides the internal communications capability of the CFM and interconnects the Network Interface Unit (NIU) with the Processing Unit (PU) and the Module Support Unit (MSU). The RU also provides a direct coupling between a network input link and a network output link. The RU is controlled by the MSU.