SLOVENSKI STANDARD
SIST EN 4660-003:2011

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Aeronavtika - Modularne in odprte letalske elektronske arhitekture - 003. del: Komunikacije/omrežje

Aerospace series - Modular and Open Avionics Architectures - Part 003: Communications/Network

Luft- und Raumfahrt - Modulare und offene Avionikarchitekturen - Teil 003: Kommunikation/Netzwerk

Série aérospatiale - Architectures Avioniques Modulaires et Ouvertes - Partie 003: Communication/Réseau

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

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EUROPEAN STANDARD

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EN 4660-003

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English Version

Aerospace series - Modular and Open Avionics Architectures - Part 003: Communications/Network

Série aérospatiale - Architectures Avioniques Modulaires et Ouvertes - Partie 003: Communication/Réseau

Luft- und Raumfahrt - Modulare und offene Avionikarchitekturen - Teil 003: Kommunikation/Netzwerk

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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 4660-003:2011) 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of an identical text or by endorsement, at the latest by August 2011, and conflicting national standards shall be withdrawn at the latest by August 2011.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 & 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 goals for the ASAAC Programme are:

1. Reduced life cycle costs.

2. Improved mission performance.

3. Improved operational performance.

The ASAAC 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 system.

The guidelines for system implementation through application of the standards.

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

Standard for Architecture

Standard for Software

Standard for Packaging

Standard for Communications and Network

Standard for Common Functional Modules

Guidelines for System Issues
- **System Management**
- **Fault Management**
- **Initialisation / Shutdown**
- **Configuration / Reconfiguration**
- **Time Management**
- **Security**
- **Safety**
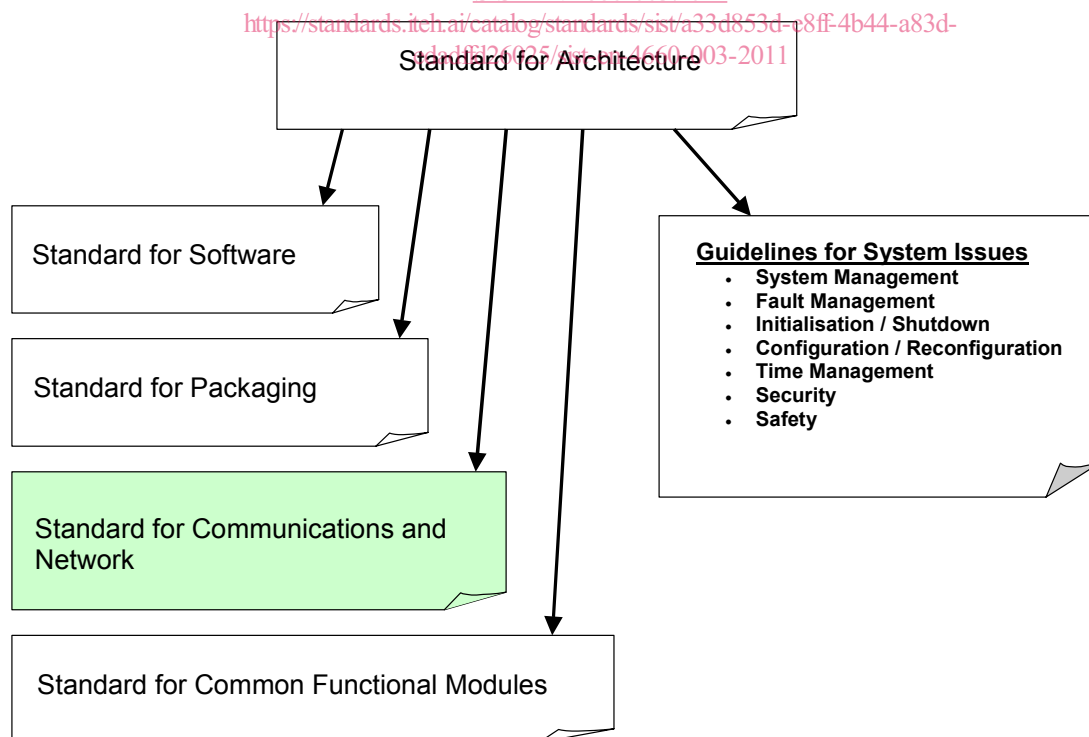
Figure 1 — ASAAC Standards Documentation Hierarchy

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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, Terms, definitions and abbreviations,

Clause 4, Network definition

Clause 5, Discussion of issues related to the network.

1 Scope

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

The purpose of this standard is to establish by means of well defined interfaces and functionality, a network design that is technology transparent, that is open to a multi-vendor market and that can make the best use of Commercial Off The Shelf (COTS) technologies. Therefore, the associated data communication network topology, protocols and technologies are not identified in this document. For these items the document identifies the issues that should be considered when defining a specific network implementation to support the ASAAC architecture and provides guidelines to assist.

Although the physical organisation and implementation of the network shall remain the System Designers choice, in accordance with the best use of the current technology, it is necessary to define interfaces and parameter sets in order to achieve a logical definition of the network with a defined functionality. This definition includes:

— The generic functionality applicable to all networks.

— The logical interfaces to the Operating System and Module Support Layers.

— The physical interfaces to the Common Functional Modules (CFM).

The ASAAC Standards are intended to be independent of specific technologies, including network technologies. This document identifies the principle interfaces for the Network, in Clause 4, and where appropriate, provides requirements on network parameters to be defined. The interfaces relevant to the network are the Module Support Layer to Operating System (MOS), Module Physical Interface (MPI) and Module Logical Interface (MLI). The MOS and MPI are generically defined elsewhere (Standards for Software see EN 4660-005 and Packaging see EN 4660-004). The MLI is clearly a function of the selected network. The MOS and MPI definitions are generic and will need to be supported by network specific information. There is no network-dependent information in the Software or Packaging standards. So a future network specification will not only define the particular MLI, but will also need to define the specific aspects of the MPI, topologies, system properties etc.

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1.1 Relationship with other ASAAC Standards

The definition of the complete Communications and Network Interfaces is partitioned and is covered by the following ASAAC standards:

— Network physical Interfaces – ASAAC Standards for Packaging.

— Module to Module Communication functions – ASAAC Standards for Software.

— Operating System to Network interface – ASAAC Standards for Software.

— CFM Software Architecture – ASAAC Standards for Software.

— Network physical requirements and properties that define the capability and behaviour required to support CFM to CFM communications – This document.

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/IEC 7498-1, *Open System Interconnect Basic Reference Model*

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

EN 4660-002, *Aerospace series — Modular and Open Avionics Architectures — Part 002: Common Functional Modules*

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*

MIL-STD-1553B, *Multiplex Data Bus*

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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[1] In preparation at the date of publication of this standard.

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 expresses 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.

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

3.2 Abbreviations

APOS	Application to Operating System [interface]
ASAAC	Allied Standard Avionics Architecture Council
BER	Bit Error Rate
CFM	Common Functional Module
COTS	Commercial Off The Shelf
DMA	Direct Memory Access
Gbps	Giga bits per second
GLI	GSM Logical Interface
GSM	Generic System Manager
IEC	International Electrotechnical Commission
IMA	Integrated Modular Avionics
ISO	International Standards Organisation
ISR	Interrupt Service Routine
LCC	Life Cycle Cost
Mbps	Mega bits per second
MLI	Module Logical Interface
MOS	Module Support Layer to Operating System [interface]
MPI	Module Physical Interface
MMU	Memory Management Unit
MRM	Module Resource Manager

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MSL	Module Support Layer
MSU	Module Support Unit
NIU	Network Interface Unit
NSM	Network Support Module
OLI	OS Logical Interface
OS	Operating System
OSI	Open Systems Interconnect
OSL	Operating System Layer
QoS	Quality of Service
RTBP	Run Time Blueprint
SMBP	System Management to Blueprint [interface]
SMLI	System Management Logical Interface
SMOS	System Management to Operating System [interface]
TC	Transfer Connection
TLS	Three-Layer Stack
VC	Virtual Channel

4 Network Definition

4.1 Overview

The communications over an ASAAC network are defined and managed by a set of ASAAC interfaces, these being:

- The Module Support Layer to Operating System Layer (MOS) interface

- The Module Physical Interface (MPI)

- The Module Logical Interface (MLI)

These are illustrated in the ASAAC Software model diagram in Figure 2. Each of the interfaces is discussed in this standard and where appropriate, references to the ASAAC standards where they are specified in full, are provided. This software model presents the appearance of a single network to the application software.
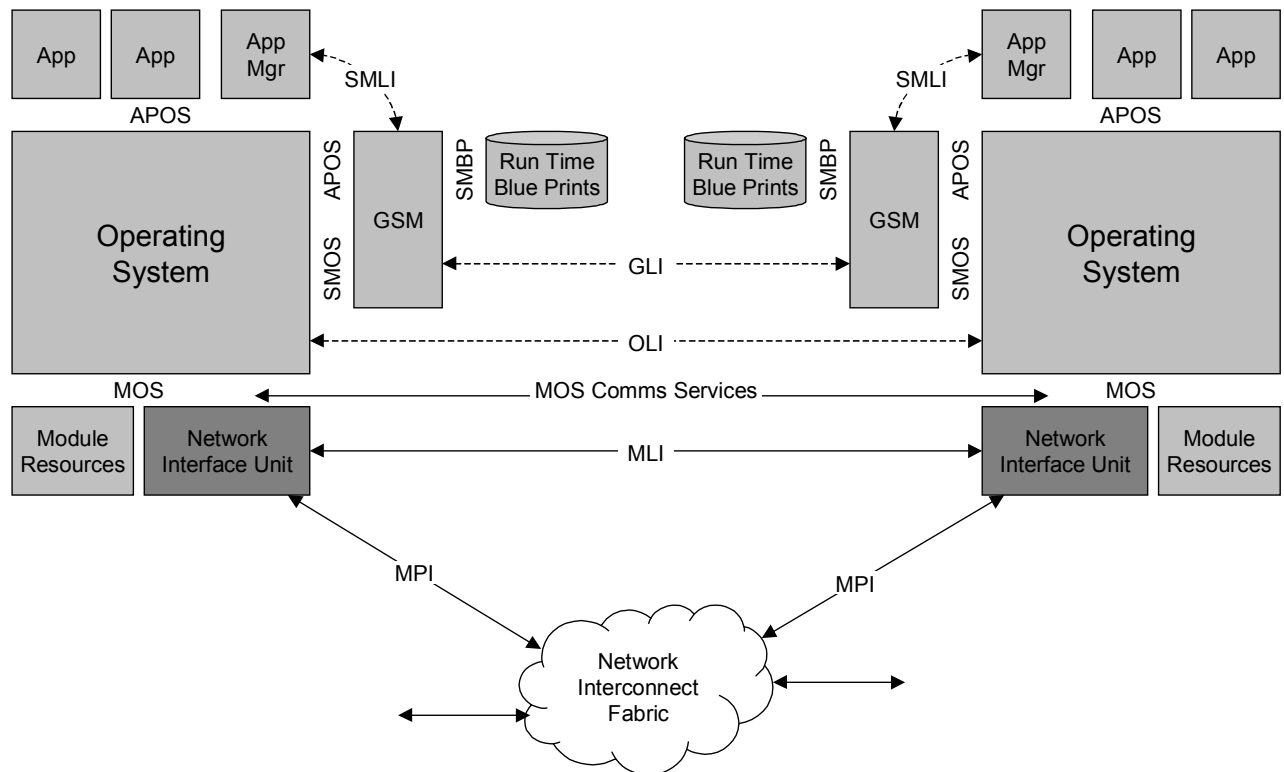
Figure 2 — Software and Communications Model

It shall be noted that the ASAAC Standards are independent of specific technologies and therefore the data communication network topology, protocols and technologies are not defined by this document. The definitions for the Interfaces in the following subclauses, however, discuss some of the parameters which are not covered by the ASAAC Standards but which will need to be specified for each system design.

4.2 Specific Network Requirements

There are a number of specific network requirements having an impact on the network design. These are shown as architectural requirements in Table 1 and system requirements in Table 2.

Table 1 — Architecture Requirements

Title	Description
ASAAC network	Only used to transfer digital information within the ASAAC core
Open standards	No proprietary standards, processes or components shall be specified
Scalability	The network shall be scaleable for all system sizes
Single logical network	The network shall appear to be a single network to application software
Network connections	The network should support a high level of inter-connectivity
---- " ----	The network should support minimum interconnections between racks & sensors/effectors e.g. to minimise wing root wiring

continued

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