SLOVENSKI STANDARD
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Vesoljska tehnika - Ploščadi za simulacijsko modeliranje

Space engineering - Simulation modelling platform

Raumfahrttechnik - Software-Modellierungs-Platform

Ingénierie Spatiale - Plateforme informatique de modèles de simulation

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Space engineering - Simulation modelling platform

Ingénierie Spatiale - Plateforme informatique de modèles de simulation

Raumfahrttechnik - Software-Modellierungs-Platform

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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European Foreword

This document (prEN 16603-40-07:2019) has been prepared by Technical Committee CEN/CLC/TC 5 “Space”, the secretariat of which is held by DIN (Germany).

This document (prEN 16603-40-07:2019) originates from ECSS-E-ST-40-07C DIR1.

This document is currently submitted to the CEN ENQUIRY.

This document has been developed to cover specifically space systems and will the-refore have precedence over any EN covering the same scope but with a wider do-main of applicability (e.g.: aerospace).

Introduction

Space programmes have developed simulation software for a number of years, which are used for a variety of applications including analysis, engineering operations preparation and training. Typically different departments perform developments of these simulators, running on several different platforms and using different computer languages. A variety of subcontractors are involved in these projects and as a result a wide range of simulation models are often developed. This standard addresses the issues related to portability and reuse of simulation models. It is based on the work performed by ESA in the development of the Simulator Portability Standards SMP1 and SMP2 starting from the mid-end of the nineties.

This standard integrates the ECSS-E-ST-40 with additional requirements which are specific to the development of simulation software. The formulation of this standard takes into account:

- The existing ISO 9000 family of documents, and
- The Simulation Model Portability specification version 1.2.

The intended readership of this standard is the simulator software customer and supplier.

1 Scope

ECSS-E-ST-40-07 is a standard based on ECSS-E-ST-40 for the engineering of simulation software. It includes:

- The adaptation of the ECSS-E-ST-40 requirements for simulation software, with additional specific provisions;
- The tailoring of some provisions of the ECSS-E-ST-40 requirements for simulation software;

ECSS-E-ST-40-07 follows the structure of ECSS-E-ST-40.

ECSS-E-ST-40-07 complements ECSS-E-ST-40 in being more specific to simulator software, it indicates new provisions, ways of tailoring, and common practices in the domain, but it does not attempt to give detailed descriptions of how to carry out the processes defined in ECSS-E-ST-40. It indicates, however, particular practices that can be applicable for simulation software engineering.

This standard can be used:

- As an additional standard to ECSS-E-ST-40. This standard provides the additional requirements which are specific to the development of simulation software.
- To help customers in using and tailoring ECSS-E-ST-40. This standard provides the additional requirements which a customer can make applicable on the simulator software developed by the supplier.
- To assist suppliers in using ECSS-E-ST-40. This standard provides a technical specification which a supplier can follow in-order to be compliant with the requirements specific to the development of simulation software.
- To assist customers and suppliers in adapting or writing organizational procedures and standards that conform to the requirements of ECSS-E-ST-40.

This standard may be tailored for the specific characteristic and constrains of a space project in conformance with ECSS-S-ST-00.

Applicability

This standard lays down requirements for simulation models' interfaces and environment for the purpose of model re-use and exchange to allow simulation models to be run in any conformant simulation infrastructure.

A consequence of being compliant to this standard for a model is the *possibility* of being reused in several simulation facilities or even in several projects. However, adherence to this standard does not imply or guarantees model reusability, it is only a precondition. Other characteristics of the model, to be defined outside this standard, such as its functional interfaces and behaviour, its configuration data as well as quality, suitability and performance, etc. are also heavily affecting the potential for a model to be reused. In addition agreements need to be reached on simulation infrastructure compatibility, model validation status as well as legal issues and export control restrictions.

Therefore this standard *enables* but does not mandate, impose nor guarantee successful model re-use and exchange.

Model reuse in this standard is meant both at source-code and binary level, with the latter restricted to a fixed platform.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this ECSS Standard. For dated references, subsequent amendments to, or revision of any of these publications do not apply. However, parties to agreements based on this ECSS Standard are encouraged to investigate the possibility of applying the more recent editions of the normative documents indicated below. For undated references, the latest edition of the publication referred to applies.

EN reference	Reference in text	Title
EN 16601-00-01	ECSS-S-ST-00-01	ECSS system - Glossary of terms
EN 16603-40	ECSS-E-ST-40	Space engineering - Software general requirements
	https://www.w3.org/TR/xmlschema11-2/	XML schema specification
	http://www.opengroup.org	The UUID specification from Open Group.
	https://www.osgi.org/developer/specifications/	OSGi Specifications

3 Terms, definitions and abbreviated terms

3.1 Terms from other standards

a. For the purpose of this Standard, the terms and definitions from ECSS-S-ST-00-01 and ECSS-E-ST-40 apply.

b. For the purpose of this Standard, the terms and definitions from ECSS-E-ST-70 apply, in particular the following term:

1. mission

3.2 Terms specific to the present standard

In the following list of terms, underlined words are further defined in the same list.

3.2.1 aggregate

relationship between two components where one component can continue to exist if the other component is destroyed

3.2.2 breakpoint

set of pairs variable-value that define the state of a simulation.

3.2.3 component

building block of a simulation that can be instantiated and that has a well-defined contract to its environment

3.2.4 composite

component implementing composition

3.2.5 composition

hierarchical relationship where child component is destroyed if the parent component is destroyed

3.2.6 configuration

specification of values for fields of components

3.2.7 consumer

component that either calls an interface, or subscribes to an event source, or receives data in one of its input fields from an output field of another component

3.2.8 container

typed collection of child components

3.2.9 contract

set of interfaces, operations, fields, entry points, event sinks, event sources and all the associated constraints, used to interact with a component

3.2.10 data transfer

copy of value from an input field to an output field

3.2.11 Entry Point

operation without parameters that does not return a value, which can be added to the scheduler or event manager service

3.2.12 epoch time

absolute time of the simulation scenario

3.2.13 event manager

component that implements the IEventManager interface

NOTE The IEventManager interface is specified in clause 5.3.5.

3.2.14 event sink

receiver of specific notifications, owned by a component and registered via a subscription mechanism

3.2.15 event source

emitter of specific notifications, owned by a component and offering a subscription mechanism

3.2.16 exception

non-recoverable error that can occur when calling into an operation or property

3.2.17 field

feature characterised by a value type and holding a value

3.2.18 input field

field explicitly marked for receiving values as a result of a data transfer

3.2.19 interface

named set of properties and operations

3.2.20 logger

component that implements the ILogger interface

NOTE The ILogger interface is specified in clause 5.3.1b.

3.2.21 mission time

relative time measuring elapsed time from a mission specific point in time

3.2.22 model

defined collection of fields, associations, entry points, event sinks, event sources, containers, constants, value types, properties and operations, realising a set of interfaces

3.2.23 model implementation

executable code implementing a model

3.2.24 model instance

occurrence of a model implementation

3.2.25 output field

field explicitly marked for being the source of a value in a data transfer

3.2.26 operation

declaration of a behavioural feature of a component or an interface with optional parameters, return value and raised exceptions

3.2.27 package

collection of type implementations

3.2.28 platform

set of subsystems/technologies that provide a coherent set of functionality through APIs and specified usage patterns

3.2.29 property

typed feature of a class, an interface or a component that can be accessed by two operations, the setter and the getter, not necessarily both present

3.2.30 reference

pointer to a component having autonomous lifecycle

3.2.31 resolver

component that implements the IResolver interface

NOTE The IResolver interface is specified in clause 5.3.6.

3.2.32 schedule

ordered execution of entry points