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Informationsteknologi – OMG SysML

Information technology – Object management group systems modeling language (OMG SysML)

DANSK STANDARD
Danish Standards Association

Göteborg Plads 1
DK-2150 Nordhavn

Tel: +45 39 96 61 01

Fax: +45 39 96 61 02

dansk.standard@ds.dk

www.ds.dk

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FOREWORD

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by the Object Management Group (OMG) and was adopted, under the PAS procedure, by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

This document is related to:

- ITU-T Recommendation X.902 (1995) | ISO/IEC 10746-2:1995, *Information Technology - Open Distributed Processing - Reference Model: Foundations*
- ITU-T Recommendation X.903 (1995) | ISO/IEC 10746-3:1995, *Information Technology - Open Distributed Processing - Reference Model: Architecture*
- ITU-T Recommendation X.920 (1997) | ISO/IEC 14750:1997, *Information Technology - Open Distributed Processing - Interface Definition Language*

Apart from this Foreword, the text of this document is identical with that for the OMG specification for Systems Modeling Language, v1.4.1.

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INTRODUCTION

The rapid growth of distributed processing has led to a need for a coordinating framework for this standardization and ITU-T Recommendations X.901-904 | ISO/IEC 10746, the Reference Model of Open Distributed Processing (RM-ODP) provides such a framework. It defines an architecture within which support of distribution, interoperability and portability can be integrated.

RM-ODP Part 2 (ISO/IEC 10746-2) defines the foundational concepts and modeling framework for describing distributed systems. The scopes and objectives of the RM-ODP Part 2 and the UML, while related, are not the same and, in a number of cases, the RM-ODP Part 2 and the UML specification use the same term for concepts which are related but not identical (e.g., interface). Nevertheless, a specification using the Part 2 modeling concepts can be expressed using UML with appropriate extensions (using stereotypes, tags, and constraints).

RM-ODP Part 3 (ISO/IEC 10746-3) specifies a generic architecture of open distributed systems, expressed using the foundational concepts and framework defined in Part 2. Given the relation between UML as a modeling language and Part 3 of the RM-ODP standard, it is easy to show that UML is suitable as a notation for the individual viewpoint specifications defined by the RM-ODP.

This International Standard for OMG Systems Modeling Language is a standard for the technology specification of an ODP system. It defines a technology to provide the infrastructure required to support functional distribution of an ODP system, specifying functions required to manage physical distribution, communications, processing and storage, and the roles of different technology objects in supporting those functions.

This International Standard defines a general-purpose language for systems engineering applications, called the OMG Systems Modeling Language (OMG SysML^{TM}). Throughout the rest of this International Standard the language will be referred to as SysML.

SysML supports the specification, analysis, design, verification, and validation of a broad range of complex systems. These systems may include hardware, software, information, processes, personnel, and facilities.

It is common practice for engineers to use a wide range of modeling languages, tools, and techniques on large systems projects. SysML is intended to unify diverse modeling languages used by systems engineers and can be used with a wide variety of discipline- and domain-specific modeling languages.

SysML reuses a subset of UML 2.5 and provides additional extensions needed to address the requirements in UML for SE. SysML uses the UML 2.5 extension mechanisms as further elaborated in Clause 17 as the primary mechanism to specify the extensions to UML 2.5. This revision of SysML relies on several new features incorporated into UML 2.5. Any use of the term “UML 2” or “UML” in this International Standard, unless otherwise noted, will refer to UML 2.5 in general and the UML 2.5 specification in particular.

Since SysML uses UML 2.5 as its foundation, systems engineers modeling with SysML and software engineers modeling with UML 2.5 will be able to collaborate on models of software-intensive systems. This will improve communication among the various stakeholders who participate in the systems development process and promote interoperability among modeling tools. It is anticipated that SysML will be customized to model domain-specific applications, such as automotive, aerospace, communication, and information systems.

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Information technology - Object Management Group Systems Modeling Language (OMG SysML 1.4.1)

1 Scope

1.1 General

The purpose of this International Standard is to specify the Systems Modeling Language (SysML), a general-purpose modeling language for systems engineering. Its intent is to specify the language so that systems engineering modelers may learn to apply and use SysML; modeling tool vendors may implement and support SysML; and both can provide feedback to improve future versions. Note that a definition of “system” and “systems engineering” can be found in ISO/IEC/IEEE 15288.

SysML reuses a subset of UML 2 and provides additional extensions to satisfy the requirements of the language. This International Standard documents the language architecture in terms of the parts of UML 2 that are reused and the extensions to UML 2. The International Standard includes the concrete syntax (notation) for the complete language and specifies the extensions to UML 2. The reusable portion of the UML 2 standard is not included directly in the International Standard but is included by reference. The International Standard also provides examples of how the language can be used to solve common systems engineering problems.

SysML is designed to provide simple but powerful constructs for modeling a wide range of systems engineering problems. It is particularly effective in specifying requirements, structure, behavior, allocations, and constraints on system properties to support engineering analysis. The language is intended to support multiple processes and methods such as structured, object-oriented, and others, but each methodology may impose additional constraints on how a construct or diagram kind may be used. This version of the language supports most, but not all, of the requirements of the UML for Systems Engineering RFP, as shown in the Requirements Traceability referenced by Annex F. These gaps are intended to be addressed in future versions of SysML as indicated in the matrix.

The following sub clauses provide background information about this International Standard. Instructions for both systems engineers and tool vendors who read this International Standard are provided in “How to Read this International Standard.” The main body of this International Standard describes the normative technical content. The annexes include additional information to aid in understanding and implementation of this International Standard.

2 Normative References

The following normative documents contain provisions, which through reference in this text, constitute provisions of this International Standard. Subsequent amendments to, or revisions of, any of these publications do not apply.

- ISO/IEC Directives, Part 2, Rules for the structure and drafting of International Standards, 7th Edition 2016
- ISO/IEC 10303-233:2012, STEP AP233, Product data representation and exchange: application protocol: Systems engineering
- ISO/IEC IEEE 15288:2015, Systems and software engineering - System life cycle process

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- OMG Specification formal/2015-03-01, Unified Modeling Language, (UML) V2.5 (http://www.omg.org/spec/UML/2.5/)
- OMG Specification formal/2012-01-01, Object Constraint Language (OCL), V2.3.1 (http://www.omg.org/spec/OCL/2.3.1/)
- OMG Specification formal/2015-06-05, Meta Object Facility (MOF), V2.5 (http://www.omg.org/spec/MOF/2.5/)
- OMG Specification formal/2015-06-01, Diagram Definition, V1.1 (http://www.omg.org/spec/DD/1.1/)
- OMG Document ad/03-03-41, UML for Systems Engineering RFP (http://www.omg.org/cgi-bin/doc?ad/2003-03-41)
- OMG Document ormsc/2014-06-01, Model Driven Architecture (MDA) Guide rev. 2.0 (http://www.omg.org/cgi-bin/doc?ormsc/2014-06-01)
- VIM Edition 3 (VIM3), “International vocabulary of metrology - Basic and general concepts and associated terms (VIM)”, JCGM 200:2012 (JCGM 200:2008 with minor corrections)
- [Dybkaer-2010] Rene Dybkaer, “ISO terminological analysis of the VIM3 concepts of ‘quantity’ and ‘kind-of-quantity’”, Metrologia 47, (2010) 127-143

3 Additional Information

3.1 Relationships to Other Standards

SysML is defined as an extension of the OMG UML 2 standard. See Clause 2 for the current version of the UML 2 standard.

SysML is intended to be supported by two evolving interoperatility standards including the OMG XMI 2 model interchange standard for UML 2 modeling tools and the ISO 10303 STEP AP233 data interchange standard for systems engineering tools. Overviews of the approach to model interchange and relevant references are included in Annex G.

SysML supports the OMG’s Model Driven Architecture (MDA) initiative by its reuse of UML and related standards. See OMG MDA Guide rev 2.0.

3.2 How to Read this International Standard

This International Standard is intended to be read by systems engineers so they may learn and apply SysML, and by modeling tool vendors so they may implement and support SysML.

Systems engineers should read the Overview, Diagram Elements, and Usage Examples sub clauses in each clause, and explore the UML Extensions as they see fit. Modeling tool vendors should read all clauses. In addition, systems engineers and vendors should read Annex D, “Sample Problem,” to understand how the language is applied to an example, and the document referenced byAnnex F, “Requirements Traceability,” to understand how the requirements in the UML for SE RFP are satisfied by this International Standard.

Although the clauses are organized into logical groupings that can be read sequentially, this International Standard can be used for reference and may be read in a non-sequential manner.

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