ICS 35.080
CCS L 77

NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 45803-2025

System and software engineering - Model-based systems engineering - Unified architecture modeling language

系统与软件工程 基于模型的系统工程 统一架构建模语言

Issued on: May 30, 2025 **Implemented on: December 1, 2025**

Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part 1: Structure and drafting rules for standardization documents" Drafting.

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This document was proposed and coordinated by the National Technical Committee for Information Technology Standardization (SAC/TC28).

This document was drafted by: China Electronics Standardization Institute, Beijing University of Aeronautics and Astronautics, Beijing Institute of Technology, Commercial Aircraft Corporation of China Beijing Civil Aircraft Technology Research Center, China North Industries Group Corps Equipment Research Institute, Beijing Institute of Technology Yangtze River Delta Research Institute Institute (Jiaxing), Jinhang Digital Technology Co., Ltd., Beijing Honeycomb Intelligent Innovation System Technology Co., Ltd., National Defense Science and Technology University of the People's Liberation Army University of Science and Technology of China, Southern University of Science and Technology, China Ordnance Industry Information Center, Sany Heavy Industry Co., Ltd., Beijing Hushi Technology Co., Ltd., Beijing University of Science and Technology, CapitaLand Technology Changsha Co., Ltd., CSSC Lingjiu Electronics (Wuhan) Co., Ltd., Inspur Software Technology Co., Ltd., Shandong Shanke Digital Economy Research Institute Co., Ltd., Beijing Guqi Data Technology Co., Ltd., China Academy of Space Systems Science and Engineering, National Application Software Product Quality Inspection and Testing Center, Jiaxing Wennuo Financial Big Data Technology Research Institute, Chongqing Software Evaluation Center Co., Ltd.

China Unicom (Zhejiang) Industrial Internet Co., Ltd., Southwest Computer Co., Ltd., Heyuanda Information Technology Co., Ltd., Laiwei Technology (Zhejiang) Co., Ltd., Beijing Honghu Yuntu Technology Co., Ltd., Shenzhen United Information Technology Co., Ltd., Hubei Huazhong Electric Power Technology Development Co., Ltd. and China Unicom Online Information Technology Co., Ltd.

The main drafters of this document are: Fan Kefeng, Lu Jinzhi, Li Wenpeng, Su Wei, Wang Guoxin, Zhang Yangyang, Ma Junda, Wang Hao, Yu Dongmei, Wang Jianguo, Jiang Suqian, Che Jiangtao, Chen Jinwei, Li Xiaobo, Zheng Xiaochen, Lan Xiaoping, Qie Yongjun, Song Nan, Liu Xiaojian, Xie Hong, Li Xiwu, Li Zhaochuan, Li Wang, Dong Dai, Li Shulin, Lou Li, Wang Gongtao, Duan Haibo, Zheng Xufei, Yang Chen, Gao Yanan, Guo Mengxue, Luo Xueshan, Hua Chuanjian, Wang Guozhang, Qianghui, Zhifei, Tang Daijia, Tian Aihua, Luo Mingqiang, Yan Yan, Zhang Tiantian, Tang Jian, Li Junlin, Lu Jiping, Hu Xiaodu, Liu Wenjun, Zhang Ruotong, Niu Longfei.

Introduction

As the complexity of equipment development process increases, model-based systems engineering (MBSE) is widely used in various equipment development processes.

In the process of project management, overall design, demand analysis, architecture design and other activities, the efficiency and effectiveness of research and development can be improved.

In the design process, different levels of architecture design require different modeling languages. For example, the system level uses the UPDM modeling language, and the system The hierarchy uses SysML modeling language, and the subsystem hierarchy uses EAST-ADL modeling language. The semantics and storage structure of different modeling languages The differences make language integration and interaction difficult.

Therefore, this document defines a unified architecture modeling language to unify the various modeling languages used in the forward design process of complex equipment.

The architecture view description and expression realizes the integration of multiple modeling languages, data interoperability and consistent transmission.

The grammatical definitions of the meta-metamodel class, meta-model class, and model class of the language clarify the grammatical structure of the language and support the unified modeling language-based tools.

Tool development and model integration.

This document is based on the Meta-Object Framework (MOF) framework. Figure 1 shows the four layers of the Unified Architecture Modeling Language.

The layers are M3 (meta-meta model layer), M2 (meta model layer), M1 (model layer), and M0 (system layer).

The process of layer instantiation, M0 to M3 is a layer-by-layer abstraction process.

Figure 1 Modeling framework based on MOF The main contents of each level in Figure 1 are as follows.

a) M3 is the meta-metamodel layer, which represents the highest level of metamodel abstraction, that is, the meta-language of the metamodel.

There is no difference in the type, only the level of abstraction in the meta-object mechanism. In this way, designers can unify the meta-objects according to their needs.

Limitations of the model---Use the combination of meta-meta models to build a multi-domain meta-model library to achieve abstraction and interaction of different models.

Based on the meaning of the meta-object mechanism M3 layer, the unified architecture modeling language provides six meta-meta-models and their rules.

The six meta-meta-models are divided into attribute elements, There are two types of elements. the former refers to the attribute element model, which is used to describe the properties of non-attribute elements; the latter includes the graph element model The extended concept is used to specify the six meta-meta models.

The relationship between models and their rules and constraints are explained. These extended concepts include decomposition, sectioning, class reference, etc.

b) M2 is the metamodel layer, which is the instantiation of the meta-metamodel. The M2 layer framework based on the meta-object mechanism includes Graph metamodel, object metamodel, node metamodel, role metamodel, relationship metamodel, attribute metamodel and metamodel b extension, The modeling language is formed by the combination of metamodels. These metamodels provide modeling means for system design in a graphical way.

c) M1 is the model layer. The model is an instantiation of the metamodel. It is a modeling process in the usual sense and is used to describe the system life cycle. activities.

d) M0 is the system layer, which is the true representation of the model layer in the real world, that is, the problem of concern from a certain system perspective. describe.

This document specifies six meta-meta-models and extensions based on the M3-M1 framework of the meta-object mechanism.

The model class implements the specification definition of the unified architecture modeling language.

Systems and Software Engineering Model-Based Systems Engineering Unified Architecture Modeling Language

1 Scope

This document establishes the overall framework of the unified architecture modeling language and specifies the keyword vocabulary structure and class grammar structure.

This document is suitable for the unified description of the architectural view of model-based system engineering, and realizes the existing modeling through a lower-level text language.

Functional coverage of languages (such as UML, SysML, UPDM, BPMN, OPM, etc.), and scalability, customized according to task scenarios A domain-specific modeling language supports data interaction and semantic integration between different tools through a unified data format.

2 Normative references

GB 3100