

ICS 35.080
CCS L 77



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 45615-2025

**Systems and software engineering - Methods and tools for
model-based systems and software engineering**

系统与软件工程 基于模型的系统与软件工程方法和工具

(English Translation)

Issued on: April 25, 2025

Implemented on: November 1, 2025

**Issued by: State Administration for Market Regulation, China National
Standardization Administration**

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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.

This document is equivalent to ISO/IEC/IEEE24641.2023 "Systems and software engineering model-based systems and software engineering methods and Tools.

Introduction

As the size and complexity of systems grow, some system engineers have begun to apply model-based systems and software engineering.

(MBSSE) methodology to manage complexity, maintain consistency, ensure traceability, and achieve other goals during system development.

In the MBSSE approach, systems and software engineering activities rely on evolving models of the system of interest and its survival.

The most important or primary source of knowledge for the lifecycle process. The system of interest can be any entity represented by the system model, such as a project portfolio, project, product or company.

The advantages of MBSSE are significantly different from "engineering using models", which has been a major part of many engineering disciplines for decades.

"Engineering using models" is mainly based on specific models that are independent of each other and related to the subject area.

They are very useful in their own disciplines and in the practice of system analysis, but they cannot share a comprehensive understanding of the system architecture among stakeholders, such as machine Computer-aided design (CAD) in mechanical engineering, aerodynamic models, control loop simulation, etc. In addition, due to differences in methods and terminology and diversity (e.g., model-driven development MDD), MBSSE is usually applicable to specific engineering discipline contexts (e.g., software engineering MDD).

MBSSE is a formal application of modeling to support system engineering or software engineering activities.

The MBSSE method makes it easier to develop a logically consistent multi-view framework.

Multi-view architecture description serves as a bridge, allowing various models of the system or software of interest to span multiple disciplines, Traceable, verifiable and dynamically linked throughout its life cycle; and at all levels, from systems of systems to system elements, across multiple it is a discipline that drives the processes, activities, and tasks of systems engineering and software engineering throughout all stages of its life cycle.

From the MBSSE perspective, other engineering disciplines (mechanical, thermal, electronic, electrical, etc.) should also be considered.

Therefore, the necessity of applying MBSSE in the organization needs to be clearly stated.

Supports the establishment of the context of each project within its overall ecosystem, as well as supporting the exchange of models between stakeholder organizations.

This document divides the MBSSE-related processes into four process groups.

- MBSSE planning;
- Model construction;
- Model support;
- MBSSE implementation.

Each process is defined in terms of purpose, inputs, results, and supporting tasks. Task descriptions include tools and method guidance, as well as success Recommendations on the capabilities required to implement these tools and methods. The four process groups in this document, ISO/IEC/IEEE15288 and ISO/IEC /the four process groups in IEEE12207 and the life cycle model and stages described in ISO/IEC/IEEE24748-1 are the relationship between them is shown in Appendix A.

This document is intended to benefit those who acquire, supply, develop, operate and maintain MBSSE tools and methodologies and may be used by the following interested parties.

use.

- a) Organizations that need to implement or build a model to understand, adopt and develop MBSSE processes, tools and methods (also helpful Evaluate and select relevant tools and methods based on business or user-related criteria);
- b) Tool providers that promote or utilize MBSSE practices - tools for MBSSE planning, model building, model support, MBSSE execution, etc.

Provides a recommended tool capability set.

In this document, a system of systems is like a system and benefits from the same processes, methods and tool capabilities.

The relationship between this document and other standards is shown in Appendix E.

Systems and Software Engineering Model-Based Systems Software Engineering Methods and Tools

1 Scope

This document specifies tool capabilities and methods for Model-Based Systems and Software Engineering (MBSSE), including.

- The overall structure of the MBSSE specific process and the reference model of the process set, and describe the components of the reference model integrated together way;
- The relationships between the components of the reference model;
- Specific processes for model-based systems and software engineering, which are described in terms of purpose, input, results, and tasks;
- Methods to support tasks defined by a specific process;
- Tool capabilities to automate or semi-automate tasks or methods.

This document does not add any additional life cycle processes for systems and software, but rather specifies a set of MBSSE reference model. This reference model not only shows

the life cycle perspective of system engineering problem solving and system evolution, but also shows it shows the cognitive perspective of modeling and model management. It can maintain and promote the system and software life cycle in the digital transformation and digital age.

process.

The processes defined in this document apply to both a single project and an organization that executes multiple projects.

Carry out model-based systems and software engineering activities at any stage in the life cycle of the system of interest.

Note: "Organization" generally refers to a team, company, or other entity that is responsible for developing, maintaining, and managing the structure and operations of a project.

It can be a small software development team, a large company, or even an open source community.

2 Normative references

This document has no normative references.

3.1 Terms and Definitions

The following terms and definitions apply to this document.

ISO, IEC and IEEE maintain databases of terminology used in standardization at the following websites.

---IEEE Standards Online Dictionary. Available at <https://dictionary.ieee.org>.

NOTE For other terms and definitions in the field of systems and software engineering, see ISO/IEC/IEEE 24765, which is available as SEVOCAB (Systems and Software Engineering).

3.1.1

Analytical model

A model that describes a mathematical relationship.

Example. Differential equations that support quantitative analysis of system parameters.