INTERNATIONAL STANDARD

ISO/IEC 26558

First edition
2017-07

Software and systems engineering — Methods and tools for variability modelling in software and systems product line

Ingénierie des systèmes et du logiciel — Méthodes et outils pour modéliser la variabilité dans les gammes de produits des logiciels et systèmes

Reference number
ISO/IEC 26558:2017(E)

COPYRIGHT PROTECTED DOCUMENT

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

Foreword ..... **v**

Introduction ..... **vi**

1 Scope **1**

2 Normative references **1**

3 Terms and definitions **1**

4 Variability modelling in software and systems product line **2**
4.1 Overview 2
4.2 Reference model for variability modelling in software and systems product line 4

5 Variability model management **6**
5.1 General 6
5.2 Variability model planning 7
5.2.1 Purpose of variability model planning 7
5.2.2 Design variability modelling strategy 7
5.2.3 Define quality assurance measures for variability modelling 8
5.2.4 Assign responsibility for variability modelling 8
5.2.5 Record variability model plan 8
5.3 Variability model enabling 9
5.3.1 Purpose of variability model enabling 9
5.3.2 Provide guidance for variability modelling 10
5.3.3 Mobilize roles and responsibilities for variability modelling 10
5.3.4 Enable variability model-centric variability management 10
5.3.5 Enable variability modelling operations 11
5.3.6 Enable quality assurance measurement for variability modelling 11
5.4 Variability model managing 11
5.4.1 Purpose of variability model managing 11
5.4.2 Review the plan versus actual of variability modelling 12
5.4.3 Control issues on domain/application variability modelling 13
5.4.4 Control issues on variability model-centred variability management 13
5.4.5 Control issues on variability model support 13
5.4.6 Support corrective actions for variability modelling 14
5.4.7 Make improvement actions for variability modelling 14

6 Variability modelling **14**
6.1 General 14
6.2 Domain variability modelling 15
6.2.1 Purpose of domain variability modelling 15
6.2.2 Construct domain variability model 15
6.2.3 Annotate domain variability model 16
6.2.4 Verify domain variability model 16
6.2.5 Optimize domain variability model 17
6.3 Application variability modelling 17
6.3.1 Purpose of application variability modelling 17
6.3.2 Construct application variability model 18
6.3.3 Annotate application variability model 18
6.3.4 Verify application variability model 18
6.3.5 Optimize application variability model 19
6.4 Relating variability model to artefacts 19
6.4.1 Purpose of relating variability model to artefacts 19
6.4.2 Retrieve variation points and variants in relevant artefacts 20
6.4.3 Relate domain variability model to domain artefacts 20
6.4.4 Relate application variability model to application artefacts 20
6.5 Relating domain variability model to application variability model 21
6.5.1 Purpose of domain variability model to application variability model 21

6.5.2 Trace binding decisions made in an application 22
6.5.3 Establish relations between domain and application variability models 22
6.5.4 Add decision-related annotations to relations 22
6.5.5 Verify relations between domain and application variability models 23

7 Variability model support 23
7.1 General 23
7.2 Relating variability model to variability mechanism 23
7.2.1 Purpose of relating variability model to variability mechanism 23
7.2.2 Identify variability including variability mechanism constraints 24
7.2.3 Establish relations from variability model to variability mechanism 24
7.2.4 Add variability mechanism constraint annotations into variability model 25
7.3 Quality assurance for variability model 25
7.3.1 Purpose of quality assurance for variability model 25
7.3.2 Objectively evaluate variability modelling activities 26
7.3.3 Objectively evaluate variability model work products 26
7.3.4 Communicate and resolve noncompliance issues 27
7.3.5 Establish records of variability modelling quality assurance activities 27
7.4 Binding decision support 28
7.4.1 Purpose of binding decision support 28
7.4.2 Establish full of references to binding decision tables 28
7.4.3 Verify binding decisions from variability models view 29
7.5 Application configuration support 29
7.5.1 Purpose of application configuration support 29
7.5.2 Relate variability models to binding decision tables 30
7.5.3 Provide different views of variability models by binding stages 30
7.5.4 Support full of traces from variability model to artefacts 30

Annex A (informative) **Variability meta model 32**

Annex B (informative) **Orthogonal variability model 33**

Annex C (informative) **Formal descriptions for variability relationships 34**

Annex D (informative) **Orthogonal variability decision table 35**

Annex E (informative) **Orthogonal variability model validation 36**

Bibliography 38

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 Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and systems engineering*.

Introduction

Software and Systems Product Line (SSPL) engineering and management creates, exploits and manages a common platform to develop a family of products (e.g. software products, systems architectures) at lower cost, reduced time to market and with better quality. As a result, it has gained increasing global attention since the 1990s.

Variability, which differentiates a member product from other products within a product line, plays an important role in SSPL; and hundreds of variabilities are introduced throughout the whole SSPL domain engineering stages. Those variabilities are defined, refined, newly added as domain engineering stages go forward. Variabilities thus are modelled carefully so as to manage and control them in a systematic way. This document deals with methods and tools capability for supporting variability modelling using consistent notations and for managing and/or utilizing variability models in domain and application engineering lifecycle processes.

This document can be used in the following modes:

— by the users of this document: to benefit people who want to adopt SSPL for producing their products by guiding how to model variabilities among member products;

— by a product line organization: to provide guidance in the evaluation and selection for methods and tools for variability modelling;

— by providers of tools and methods: to provide guidance in implementing or developing methods and tools by providing a comprehensive set of methods and tools capabilities for supporting variability modelling.

The ISO/IEC 26550 family of standards addresses both engineering and management processes and capabilities of methods and tools in terms of the key characteristics of product line development. This document provides processes and capabilities of methods and tools for variability modelling in product lines. Other ISO/IEC 26550 family of standards are as follows:

— processes and capabilities of methods and tools for domain requirements engineering and application requirements engineering are provided in ISO/IEC 26551;

— processes and capabilities of methods and tools for domain design and application design are provided in ISO/IEC 26552;

— processes and capabilities of methods and tools for domain realization and application realization are provided in ISO/IEC 26553 (International Standard under development);

— processes and capabilities of methods and tools for domain testing and application testing are provided in ISO/IEC 26554;

— processes and capabilities of methods and tools for technical management are provided in ISO/IEC 26555;

— processes and capabilities of methods and tools for organizational management are provided in ISO/IEC 26556;

— processes and capabilities of methods and tools for variability mechanisms are provided in ISO/IEC 26557;

— processes and capabilities of methods and tools for variability traceability are provided in ISO/IEC 26559;

— processes and capabilities of methods and tools for product management are provided in ISO/IEC 26560;

— processes and capabilities of methods and tools for technical probe are provided in ISO/IEC 26561;

— processes and capabilities of methods and tools for transition management are provided in ISO/IEC 26562;

— processes and capabilities of methods and tools for configuration management of asset are provided in ISO/IEC 26563;

— others (ISO/IEC 26564 to ISO/IEC 26599): to be developed.

ISO/IEC 26550, ISO/IEC 26551 and ISO/IEC 26555 are published. ISO/IEC 26557 and ISO/IEC 26559 are to be published. ISO/IEC 26552, ISO/IEC 26553, ISO/IEC 26554, ISO/IEC 26556, ISO/IEC 26560, ISO/IEC 26561, ISO/IEC 26562, ISO/IEC 26563 are planned International Standards.

Software and systems engineering — Methods and tools for variability modelling in software and systems product line

1 Scope

This document, within the context of methods and tools for supporting explicit and/or separate variability modelling, variability model management and variability model support in software and systems product lines**:**

— provides the terms and definitions specific to variability modelling for software and systems product line;

— defines processes for variability modelling, variability model management and variability model support throughout the product line lifecycle. Those processes are described in terms of purpose, inputs, tasks and outcomes;

— defines method capabilities to support the defined tasks of each process;

— defines tool capabilities that automate or semi-automate tasks and methods.

This document does not concern processes and capabilities of tools and methods for a single system but rather deals with those for a family of products.

2 Normative references

There are no normative references in this document.