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Technologies de l'information — Ingénierie des systèmes et du logiciel — Outils et méthodes pour tester une gamme de produits



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Contents

Page

Foreword ... **vi**
Introduction ... **vii**
1 Scope ... **1**
2 Normative references ... **1**
3 Terms and definitions ... **1**
4 Abbreviated terms ... **2**
5 Reference model for product line testing ... **2**
5.1 Overview ... 2
5.2 Product line test management ... 4
5.3 Domain testing ... 4
5.4 Asset management in testing ... 5
5.5 Variability management in testing ... 5
5.6 Application testing ... 5
6 Product line test management ... **7**
6.1 General ... 7
6.2 Product line test strategy ... 8
6.2.1 Principal constituents ... 8
6.2.2 Define product line test goals ... 8
6.2.3 Identify and analyse risks in product line test ... 9
6.2.4 Establish product line test strategies ... 9
6.3 Product line test process ... 9
6.3.1 Principal constituents ... 9
6.3.2 Select and tailor domain test process ... 10
6.3.3 Select and tailor application-specific test process ... 10
6.4 Product line test planning ... 11
6.4.1 Principal constituents ... 11
6.4.2 Develop organizational test plan ... 11
6.4.3 Gain consensus on organizational test plan ... 12
6.4.4 Document and share organizational test plan ... 12
6.5 Product line test monitoring and control ... 12
6.5.1 Principal constituents ... 12
6.5.2 Initiate monitoring and controlling product line test progress ... 13
6.5.3 Monitor product line test progress ... 13
6.5.4 Control product line test progress ... 14
6.5.5 Report product line test progress ... 14
7 Domain testing ... **14**
7.1 General ... 14
7.2 Domain test initiation and design ... 15
7.2.1 Principal constituents ... 15
7.2.2 Domain test initiation ... 16
7.2.3 Domain test design for unit testing ... 17
7.2.4 Domain test design for integration testing ... 18
7.2.5 Domain test design for system testing ... 19
7.3 Domain test environment set-up and maintenance ... 21
7.3.1 Principal constituents ... 21
7.3.2 Set up domain test environments ... 21
7.3.3 Enable interoperability with other domain engineering environments ... 22
7.3.4 Maintain domain test environments ... 22
7.4 Domain test execution ... 22
7.4.1 Principal constituents ... 22
7.4.2 Domain static testing ... 23
7.4.3 Domain dynamic test execution ... 24

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7.5 Domain test reporting ... 25
7.5.1 Principal constituents ... 25
7.5.2 Analyse domain test results ... 26
7.5.3 Create/update domain test reports ... 26

8 Asset management in testing ... 26
8.1 General ... 26
8.2 Domain test artefacts as domain assets ... 26
8.2.1 Principal constituents ... 26
8.2.2 Identify domain test artefacts managed as domain assets ... 27
8.2.3 Structure configuration and annotation for domain test assets ... 27
8.3 Application test artefacts as application assets ... 28
8.3.1 Principal constituents ... 28
8.3.2 Identify application test artefacts managed as application assets ... 28
8.3.3 Structure configuration and annotation for application test assets ... 29

9 Variability management in testing ... 29
9.1 General ... 29
9.2 Variability mechanism category in testing ... 30
9.2.1 Principal constituents ... 30
9.2.2 Identify variability mechanisms in testing by category ... 31
9.2.3 Guide the use of variability mechanism category by PL test strategy ... 31
9.2.4 Guide the use of variability mechanism category by test levels ... 32
9.2.5 Trace the usage status of variability mechanism category in testing ... 32
9.2.6 Update variability mechanism category in testing ... 33
9.3 Variability in test artefacts ... 33
9.3.1 Principal constituents ... 33
9.3.2 Define variability type in test artefacts ... 34
9.3.3 Define variability representation in test artefacts ... 34
9.4 Traceability of variability in test ... 35
9.4.1 Principal constituents ... 35
9.4.2 Define explicit links between variability in test assets and variability model ... 35
9.4.3 Define explicit links between application test assets and application variability model ... 36

10 Application testing ... 36
10.1 General ... 36
10.2 Application test initiation and design ... 37
10.2.1 Principal constituents ... 37
10.2.2 Application test initiation ... 37
10.2.3 Application-specific test design for unit testing ... 38
10.2.4 Application test design for integration testing ... 40
10.2.5 Application test design for system testing ... 41
10.3 Application test environment set-up and maintenance ... 42
10.3.1 Principal constituents ... 42
10.3.2 Set up application test environments ... 43
10.3.3 Enable interoperability with other application engineering environments ... 43
10.3.4 Maintain application test environments ... 44
10.4 Application test execution ... 44
10.4.1 Principal constituents ... 44
10.4.2 Application static testing ... 45
10.4.3 Application dynamic test execution ... 46
10.5 Application test reporting ... 47
10.5.1 Principal constituents ... 47
10.5.2 Analyse application test results ... 48
10.5.3 Create/update application test reports ... 48

Annex A (informative) **Exemplar product line test strategy ... 49**

Annex B (informative) **Execution of SSPL testing ... 51**

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Annex C (informative) **Mapping of ISO/IEC/IEEE 29119-2 and ISO/IEC/IEEE 15288** **52**
Bibliography **54**

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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).

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For an explanation of 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7*, Software and systems engineering*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

The main purpose of this document is to deal with the capabilities of methods and tools of software and systems product line (SSPL) testing. This document defines how methods and tools can support the software and systems product line-specific testing processes.

Product line engineering sets up a common product line platform including identified key variability and develops individual systems on top of the platform. Variability realizes flexibility among member products, and it is closely related to the purpose of the product line reuse. In addition to the verification and validation of commonalities, domain testing generates reusable test artefacts, so as to minimize test efforts in application testing. However, variability continues throughout the product line life cycle, and its resolution phase is diverse. Thus, the complexity of product line testing becomes high. Testing in product line engineering differs from testing in the single system development in the following aspects:

— there are two testing life cycles, domain testing and application testing;

— test cases generated during domain testing can be incomplete due to unresolved variability;

— integration and system testing should be executed in the absence of non-functioning components because even complete test cases can interact with components or subsystems that include unresolved variability;

— application testing should be performed by reusing domain test assets and avoid retesting what has been tested during domain testing;

— test cases including variability are executable at different stages because the binding times of variabilities differ; and

— regression testing is performed in both domain testing and application testing. In application testing, when variability bindings are conducted, regression testing is performed as necessary.

This document addresses the product line-specific testing processes with the guidance of a set of tools' and methods' capabilities for supporting testing in software and systems product lines.

This document is intended to benefit the groups of people that acquire, supply, develop, operate and maintain tools and methods of testing for software and systems product lines. This document can be used in one or more of the following modes:

— by an organization intended to implement product lines – to understand, adopt and enact the processes, tools and methods of testing for product line. This also helps the organization evaluate and select relevant tools and methods based on business and user-related criteria;

— by a tool vendor who facilitate or leverage product line engineering practices – to provide a set of tool capabilities that should be embodied in a tool for supporting testing of a product line.

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 product line testing. Other standards in the ISO/IEC 26550 family are as follows:

ISO/IEC 26550, ISO/IEC 26551, ISO/IEC 26555, ISO/IEC 26557, ISO/IEC 26558 and ISO/IEC 26559 are published. ISO/IEC 26552, ISO/IEC 26553, ISO/IEC 26556, ISO/IEC 26560, ISO/IEC 26561, ISO/IEC 26562 and ISO/IEC 26563 are planned International Standards. The following list provides an overview of the series:

— 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;

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— processes and capabilities of methods and tools for domain realization and application realization are provided in ISO/IEC 26553;

— 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 modelling are provided in ISO/IEC 26558;

— 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) are to be developed.

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Information technology — Software and systems engineering — Tools and methods for product line testing

1 Scope

This document, within the methods and tools of testing for software and systems product lines:

— provides the terms and definitions specific to testing for software and systems product lines;

— defines processes performed during product line testing (those processes are described in terms of purpose, inputs, tasks and outcomes);

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

— defines tool capabilities to automate/semi-automate tasks or defined method capabilities.

This document concerns processes and capabilities of testing methods and tools for a family of products, not for a single system.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 26555, *Software and systems engineering — Tools and methods for product line technical management*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at http://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
absent variants
variants that are not determined or developed at the specific time

3.2
application testing
sub-process of application engineering where domain test artefacts are reused to uncover evidence of defects in the application

3.3
application test asset
application-specific test asset that has reuse potential

3.4
aspect
special consideration within product line engineering process groups and tasks to which one can associate specialized methods and tools

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3.5
domain testing
domain engineering phase whose role is to test domain artefacts

Note 1 to entry: Testing of artefacts related to a product line (domain) rather than to an individual product.

3.6
domain test asset
domain test artefacts that will be reused in *application testing* (3.2)

Note 1 to entry: Domain test assets can be reused in *domain testing* (3.5), e.g., test plans, artefacts of regression testing. In this document, however, the platform role of domain asset, which can be reused for member products, is the central theme.

3.7
domain test requirements
specific elements of a domain artefact that should be covered by *domain testing* (3.5)

Note 1 to entry: Domain test requirements cover functional and non-functional commonality and variability, and they include both their normal and error conditions.

3.8
product line test strategy
scope of *domain testing* (3.5) and *application testing* (3.2)

Note 1 to entry: Many variants may not be implemented in domain engineering. To cope with the impacts of un-implemented variants to domain integration testing and system testing, the appropriate test strategy should be established.

3.9
texture
architectural texture
collection of common development rules and constraints for realizing the applications of a product line

3.10
variability binding
selection of a certain variant for a variation point

3.11
variability in test cases
variability included in domain test cases that will be bound during application testing in order to derive concrete test cases

4 Abbreviated terms

CRS	commonality and reuse strategy
SAS	sample application strategy
SSPL	software and systems product line
UML	unified modelling language

5 Reference model for product line testing

5.1 Overview

The key characteristics of product line testing are that there are two test processes: domain testing and application testing, with variability included in domain artefacts. The major difference between

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