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Software and systems engineering — Reference model for product line engineering and management

Ingénierie du logiciel et des systèmes - Modèle de référence pour l'ingénierie et la gestion de lignes de produits

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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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and systems engineering*.

This second edition cancels and replaces the first edition (ISO/IEC 26550:2013), of which it constitutes a minor revision.

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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 1990s.

This International Standard provides a reference model consisting of an abstract representation of the key processes of software and systems product line engineering and management and the relationships between the processes. Two key characteristics, the need for both domain and application engineering lifecycle processes and the need for the explicit variability definition, differentiate product line engineering from single-system engineering. The goal of domain engineering is to define and implement domain assets commonly used by member products within a product line, while the goal of application engineering is to develop applications by exploiting the domain assets including common and variable assets. Domain engineering explicitly defines product line variability which reflects the specific needs of different markets and market segments. Variability may be embedded in domain assets. During application engineering, the domain assets are deployed in accordance with the defined variability models.

The reference model for SSPL engineering and management can be used in subsequent standardization efforts to create standards having a high level of abstraction (e.g. product management, scoping, requirements engineering, design, realization, verification and validation, and organizational and technical management), a medium level of abstraction (e.g. configuration management, variability modeling, risk management, quality assurance, measurement, evaluation, asset repository), or a detailed level of abstraction (e.g. texture, configuration mechanism, asset mining) for software and systems product line engineering.

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Software and systems engineering — Reference model for product line engineering and management

1 Scope

This International Standard is the entry point of the whole suite of International Standards for software and systems product line engineering and management.

The scope of this International Standard is to

— provide the terms and definitions specific to software and systems product line engineering and management,

— define a reference model for the overall structure and processes of software and systems product line engineering and management and describe how the components of the product line reference model fit together, and

— define interrelationships between the components of the product line reference model.

This International Standard does not describe any methods and tools associated with software and systems product line engineering and management. Descriptions of such methods and tools will appear in the consecutive International Standards (ISO/IEC 26551[1)] to ISO/IEC 26556[2)]). This International Standard does not deal with terms and definitions addressed by ISO/IEC/IEEE 24765:2010 that provides a common vocabulary applicable to all systems and software engineering work.

Whenever this International Standard refers to "products", it means "system-level products" consisting of software systems or both hardware and software systems. It may be useful for the engineering and management of product lines that consist of only hardware systems but it has not been explicitly created to support such hardware product lines. This International Standard is not intended to help the engineering, production, warehousing, logistics, and management of physical items that, possibly combined with software, comprise the products. These processes belong to other disciplines (e.g. mechanics, electronics).

NOTE Annex A provides further information on products.

This International Standard, including the product line reference model and the terms and definitions, has been produced starting from References [6], [7], and [8] which finally resulted in a broad consensus from National Member Bodies at the time of publication. In addition to this background process, structures from ISO/IEC 12207:2008, ISO/IEC/IEEE 15288:2015, ISO/IEC 15940:2006 and ISO/IEC 14102:2008 have been used as a baseline.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

There are no normative references cited in this document.

1) Second edition to be published.

2) Under development.

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3 Terms and definitions

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

3.1
application architecture
architecture including the architectural structure and rules (e.g. common rules and constraints) that constrains a specific member product within a product line

Note 1 to entry: The application architecture captures the high-level design of a specific member product of a product line. An application architecture of the member products included in the product line reuses (possibly with modifications) the common parts and binds variable parts of the domain architecture. In most cases, an application architecture of the member products needs to develop application-specific variability.

3.2
application asset
output of a specific application engineering process (e.g. application realization) that may be exploited in other lifecycle processes of application engineering and may be adapted as a domain asset based on a product management decision

Note 1 to entry: Application asset encompasses requirements, an architectural design, components, and tests. In contrast to domain assets that need to support the mass-customization of multiple applications within the product line, most application assets do not contain variability. However, applications may possess variability (e.g. end-users may be enabled to mass-customize the applications they are using by binding application variability during run time). Application Assets may thus possess variability as well, but the variability of an application asset only serves the purposes of the particular application, for which the application asset has been created. As a result, the scope of application asset variability is typically much narrower than the scope of domain asset variability.

Note 2 to entry: Application assets are not physical products available off-the-shelf and ready for commissioning. Physical products (e.g. mechanical parts, electronic components, harnesses, optic lenses) are stored and managed according to the best practices of their respective disciplines. Application assets have their own life cycles; ISO/IEC/IEEE 15288 may be used to manage a life cycle.

3.3
application design
process of application engineering where a single application architecture conforming to the domain architecture is derived

3.4
application engineering
life cycle consisting of a set of processes in which the application assets and member products of the product line are implemented and managed by reusing domain assets in conformance to the domain architecture and by binding the variability of the platform

Note 1 to entry: Application engineering in the traditional sense means the development of single products without the strategic reuse of domain assets and without explicit variability modeling and binding.

3.5
application realization
process of application engineering that develops application assets, some of which may be derived from domain assets, and member products based on the application architecture and the sets of application assets and domain assets

3.6
asset base
reusable assets produced from both domain and application engineering

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