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Software engineering — Metamodel for development methodologies

Ingénierie du logiciel — Métamodèle pour les méthodologies de développement

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Foreword

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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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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 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*, SC 7, *Systems and Software engineering*.

This second edition cancels and replaces the first edition (ISO/IEC 24744:2007), which has been technically revised. It also incorporates the Amendment ISO/IEC 24744:2007/Amd.1:2010.

Introduction

Development methodologies may be described in the context of an underpinning metamodel, but the precise mechanisms that permit them to be defined in terms of their metamodels are usually difficult to explain and do not cover all needs. For example, it is difficult to devise a practice that allows the definition of properties of the elements that compose the methodology and, at the same time, of the entities (such as work products) created when the methodology is applied. This document introduces, as a (potential) standard, the Software Engineering Metamodel for Development Methodologies, a comprehensive metamodel that makes use of a new approach to defining methodologies based on the concept of powertype. The SEMDM is aimed to the definition of methodologies in information-based domains, i.e. areas characterized by their intensive reliance on information management and processing, such as software, business or systems engineering. The SEMDM combines key advantages of other metamodelling approaches with none of their known drawbacks, allowing the seamless integration of process, modelling and people aspects of methodologies. Refer to Annex B where other metamodels are mapped to SEMDM and a brief synopsis of problems is provided.

Various methodologies are defined, used, or implied by a growing number of standards and it is desirable that the concepts used by each methodology be harmonized. A vehicle for harmonization is the SEMDM. Conformance to this metamodel will ensure a consistent approach to defining each methodology with consistent concepts and terminology.

This document also presents a proposed notation for the ISO/IEC 24744 standard metamodel. The notation presented here is mainly graphical and supports most of the classes found in ISO/IEC 24744.

Purpose

The SEMDM follows an approach that is minimalist in depth but very rich in width (encompassing domains that are seldom addressed by a single approach). It therefore includes only those higher-level concepts truly generic across a wide range of application areas and at a higher level of abstraction than other extant metamodels. The major aim of the SEMDM is to deliver a highly generic metamodel that does not unnecessarily constrain the resulting methodologies, while providing for the creation of rich and expressive instances.

In order to achieve this objective, the SEMDM incorporates ideas from several metamodel approaches plus some results of recent research (see [4, 5, 6, 7, 9, 10, 17] for details). This will facilitate:

- The communication between method engineers, and between method engineers and users of methodology (i.e. developers).
- The assembly of methodologies from pre-existing repositories of method fragments.
- The creation of methodology metamodels by extending the standard metamodel via the extension mechanisms provided to this effect.
- The comparison and integration of methodologies and associated metamodels.
- The interoperability of modelling and methodology support tools.

The relation of SEMDM to some existing methodologies and metamodels is illustrated in Annex B.

Audience

Since many classes in the SEMDM represent the endeavour domain (as opposed to the methodology domain), it might look like developers enacting the methodology would be direct users of the metamodel. This is not true. Classes in the SEMDM that model endeavour-level elements serve for the method engineer to establish the structure and behaviour of the endeavour domain, and are not used directly during enactment. Only methodology elements, i.e. classes and objects created by the method engineer from the metamodel, are used by developers at the endeavour level, thus supporting both the creation of “packaged” methodologies as well as tailored, project-specific methodologies.

Here the term “method engineer” refers collectively to either a person constructing a methodology on site for a particular purpose or a person creating a "packaged" methodology as a "shrink-wrapped" process product.

Software engineering — Metamodel for development methodologies

1 Scope

This International Standard defines the Software Engineering Metamodel for Development Methodologies (SEMDM), which establishes a formal framework for the definition and extension of development methodologies for information-based domains (IBD), such as software, business or systems, including three major aspects: the process to follow, the products to use and generate, and the people and tools involved.

This metamodel can serve as a formal basis for the definition and extension of any IBD development methodology and of any associated metamodel, and will be typically used by method engineers while undertaking such definition and extension tasks.

The metamodel does not rely upon nor dictate any particular approach to IBD development and is, in fact, sufficiently generic to accommodate any specific approach such as object-orientation, agent-orientation, component-based development, etc.

2 Conformance

A metamodel is defined in accordance with this International Standard if it:

a. Describes the scope of the concepts in the metamodel in relation to the scope of the elements defined in clause 7.

b. Defines the mapping between the concepts that are addressed in the metamodel, and that are within the scope of this International Standard, and the corresponding elements of this Standard (i.e. the elements of the standard cannot be substituted by others of identical intent but different construction).

A development methodology is defined in accordance with this International Standard if it is generated from a conformant metamodel as defined in the first paragraph of this clause (2 Conformance).

A development or engineering tool is developed in accordance with this International Standard if it implements a conformant metamodel as defined in the first paragraph of this clause (2 Conformance). If the purpose of the tool involves the creation of methodologies, then it is developed in accordance with this Standard if it also implements the necessary features so as to make the mechanisms described in sub-clause 8.1 available to the tool's users. If the purpose of the tool involves the extension of the metamodel, then it is developed in accordance with this Standard if it also implements the necessary features so as to make the mechanisms described in sub-clause 9.1 available to the tool's users.

NOTE 1 The metamodel thus defined does not necessarily have to include all the elements defined in clause 7 – only those that are relevant to the purpose of the said metamodel are required.

NOTE 2 Conformance for methodologies or conformance for tools can be established without any necessity of explicitly including the detailed metamodel for any relevant work product kind or model unit kind. It is adequate to define the mappings of any such work products to the WorkProductKind and ModelUnitKind classes of the SEMDM.

3 Terms and definitions

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

NOTE This Standard uses a self-consistent set of core concepts that is as compatible as possible with other standards (such as ISO/IEC 12207, ISO/IEC 15504, etc.).