
Software Engineering — Metamodel for Development Methodologies

*Ingénierie du logiciel — Métamodèle pour les méthodologies de
développement*

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

This document is a preview generated by EVS

© ISO/IEC 2007

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

	Page
1	Scope 1
1.1	Purpose..... 1
1.2	Audience..... 1
2	Conformance 2
3	Terms and definitions 2
4	Naming, diagramming and definition conventions, and abbreviated terms 4
4.1	Naming, diagramming and definition conventions 4
4.2	Abbreviations 5
5	Basic Concepts 5
5.1	Method Engineering 6
5.2	Dual-Layer Modelling 6
5.3	Powertypes and Clabjects 6
5.4	Uniting Process and Product 7
5.5	Process Assessment 7
6	Introduction to the SEMDM 8
6.1	Highly Abstract View 8
6.2	Abstract View and Core Classes 8
6.3	Process Classes 9
6.4	Producer Classes 11
6.5	Product Classes 12
6.6	Connection between Process and Product 13
6.7	Support Classes 14
7	Metamodel Elements 15
7.1	Classes 15
7.2	Enumerated Types 63
8	Using the Metamodel 64
8.1	Usage Rules 64
8.2	Usage Guidelines 65
9	Extending the Metamodel 66
9.1	Extension Rules 66
9.2	Extension Guidelines 67
Annex A (informative) Worked Example 68	
Annex B (informative) Mappings to Other Metamodelling Approaches 74	
Bibliography 78	

Table of Figures

Figure 1 – The three areas of expertise, or domains, which act as a context for SEMDM 5

Figure 2 – Highly abstract view of the SEMDM 8

Figure 3 – Abstract view of the SEMDM, showing the core classes in the metamodel 9

Figure 4 – Work units 10

Figure 5 – Stages 11

Figure 6 – Producers 12

Figure 7 – Work product and modelling classes 13

Figure 8 – Actions and constraints 14

Figure 9 – Support classes 14

This document is a preview generated by EVS

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

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.

ISO/IEC 24744 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and systems engineering*.

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 International Standard introduces the Software Engineering Metamodel for Development Methodologies SEMDM, a comprehensive metamodel that makes use of a new approach to defining methodologies based on the concept of powertype. The SEMDM is aimed at 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 metamodeling 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 is a preview generated by EVS

Software Engineering — Metamodel for Development Methodologies

1 Scope

This International Standard defines the Software Engineering Metamodel for Development Methodologies (SEMMDM), 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 work 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.

1.1 Purpose

This International Standard 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 SEMMDM 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 SEMMDM incorporates ideas from several metamodel approaches plus some results of recent research (see [1-7] 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; and
- The interoperability of modelling and methodology support tools.

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

1.2 Audience

Since many classes in the SEMMDM 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 SEMMDM 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.

2 Conformance

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

- describes the scope of the concepts in the metamodel in relation to the scope of the elements defined in Clause 7; and
- 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 International Standard (i.e. its elements 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 International Standard if it also implements the necessary features so as to make the mechanisms described in 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 International Standard if it also implements the necessary features so as to make the mechanisms described in 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. Unless otherwise noted, the definitions are specific to this International Standard.

The following concepts are defined only for their usage throughout this International Standard.

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

3.1

information-based domain

IBD

realm of activity for which information is the most valuable asset

NOTE This means that information creation, manipulation and dissemination are the most important activities within information-based domains. Typical information-based domains are software and systems engineering, business process reengineering and knowledge management.